QUICK REFERENCE INDEX

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Revision: May 2004
Publication No. SM3E-1B15U2

NISSAN SENTRA

MODEL B15 SERIES

A	GENERAL INFORMATION	GI	General Information
B	ENGINE	EM	Engine Mechanical
		LU	Engine Lubrication System
		CO	Engine Cooling System
		EC	Engine Control System
		FL	Fuel System
		EX	Exhaust System
		ACC	Accelerator Control System
C	TRANSMISSION/ TRANSAXLE	CL	Clutch
		MT	Manual Transaxle
		AT	Automatic Transaxle
D	DRIVELINE/AXLE	FAX	Front Axle
		RAX	Rear Axle
E	SUSPENSION	FSU	Front Suspension
		RSU	Rear Suspension
		WT	Road Wheels & Tires
F	BRAKES	BR	Brake System
		PB	Parking Brake System
		BRC	Brake Control System
G	STEERING	PS	Power Steering System
H	RESTRAINTS	SB	Seat Belts
		SRS	Supplemental Restraint System (SRS)
I	BODY	BL	Body, Lock & Security System
		GW	Glasses, Window System & Mirrors
		RF	Roof
		EI	Exterior & Interior
		IP	Instrument Panel
		SE	Seat
J	AIR CONDITIONER	MTC	Manual Air Conditioner
K	ELECTRICAL	SC	Starting & Charging System
		LT	Lighting System
		DI	Driver Information System
		WW	Wiper, Washer & Horn
		BCS	Body Control System
		LAN	LAN System
		AV	Audio Visual, Navigation & Telephone System
		ACS	Auto Cruise Control System
		PG	Power Supply, Ground & Circuit Elements
L	MAINTENANCE	MA	Maintenance
M	INDEX	IDX	Alphabetical Index

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FOREWORD

This manual contains maintenance and repair procedures for the 2003 NISSAN SENTRA.

In order to assure your safety and the efficient functioning of the vehicle, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first be completely satisfied that neither personal safety nor the vehicle's safety will be jeopardized by the service method selected.

NISSAN NORTH AMERICA, INC.
Technical Publications Department
Gardena, California

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SERVICE MANUAL: Model: _____ **Year:** _____

PUBLICATION NO. (Refer to Quick Reference Index): _____

Please describe any Service Manual issues or problems in detail:

Page number(s) _____ *Note: Please include a copy of each page, marked with your comments.*

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Are the trouble diagnosis procedures logical and easy to use? (circle your answer) YES NO

If no, what page number(s)?_____*Note: Please include a copy of each page, marked with your comments.*

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Is the organization of the manual clear and easy to follow? (circle your answer) YES NO

Please comment: _____

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What information should be included in NISSAN Service Manuals to better support you in servicing or repairing customer vehicles?

_____

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DATE: _____ YOUR NAME: _____ POSITION: _____

DEALER: _____ DEALER NO.: _____ ADDRESS: _____

CITY:_____ STATE/PROV./COUNTRY: _____ ZIP/POSTAL CODE: _____

QUICK REFERENCE CHART: SENTRA (EQUIPPED WITH 1.8L, QG ENGINE)

Engine Tune-Up Data

Engine		QG18DE
Classification		Gasoline
Cylinder arrangement		4, in-line
Displacement cm^3 (cu in)		1,769 (107.94)
Bore × stroke mm (in)		80.0 x 88.0 (3.150 x 3.465)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		5
Compression ratio		9.5

Drive Belt Deflection and Tension

Component		Deflection Adjustment Unit: mm (in)			Tension Adjustment *1 Unit: N (kg, lb)		
		Used Belt		New Belt	Used Belt		New Belt
		Limit	After Adjustment		Limit	After Adjustment	
Generator	With air conditioner compressor	8.1 (0.319)	5.3 - 5.7 (0.209 - 0.244)	4.5 - 5.0 (0.177- 0.197)	292 (30, 66)	652 - 740 (66.5 - 75.5, 146.6 - 166.4)	789 - 877 (80.5 - 89.5, 177.4 - 197.1)
	Without air conditioner compressor	10.2 (0.402)	6.5 - 7.0 (0.256 - 0.276)	5.5 - 6.1 (0.217 - 0.240)	292 (30, 60)	652 - 740 (66.5 - 75.5, 146.6 - 166.4)	789 - 877 (80.5 - 89.5, 177.4 - 197.1)
Power steering oil pump		7.1 (0.280)	4.4 - 4.9 (0.173 - 0.193)	3.9 - 4.4 (0.154 - 0.173)	196 (20, 44)	495 - 583 (50.5 -59.5, 111.4 - 131.2)	603- 691 (61.5 - 70.5, 135.6 - 155.5)
Applied pushing force		98 N (10 kg, 22 lb)			—		

*1: If the belt tension gauge cannot be installed at check points shown, check belt tension at a different location on the belt.

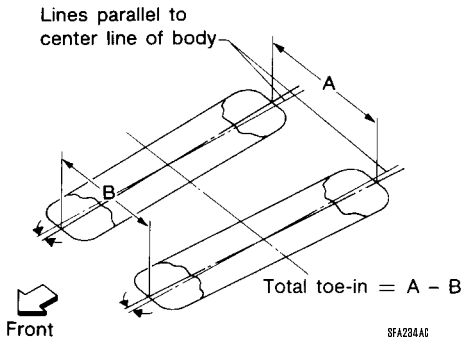
Spark Plugs (Double Platinum - Tipped)

Type	Standard	PLFR5A-11
	Hot	PLFR4A-11
	Cold	PLFR6A-11
Plug gap		nominal 1.1 mm (0.043 in)

QUICK REFERENCE CHART: SENTRA (EQUIPPED WITH 1.8L, QG ENGINE)

2003

Front Wheel Alignment (Unladen*1)



Camber Degree minute (decimal degree)		Minimum	–1°10' (–1.17°)
		Nominal	–0°25' (–0.42°)
		Maximum	0°20′ (0.33°)
		Left and right difference	45′ (0.75°) or less
Caster Degree minute (decimal degree)		Minimum	0°51′ (0.85°)
		Nominal	1°36′ (1.60°)
		Maximum	2°21′ (2.35°)
		Left and right difference	45′ (0.75°) or less
Kingpin inclination Degree minute (decimal degree)		Minimum	13°58′ (13.97°)
		Nominal	14°43′ (14.72°)
		Maximum	15°28′ (15.47°)
Total toe-in	Distance (A - B) mm (in)	Minimum	1 (0.039")
		Nominal	2 (0.079")
		Maximum	3 (0.118")
	Angle (left plus right) Degree minute (decimal degree)	Minimum	5.5′ (0.08°)
		Nominal	11′ (0.18°)
		Maximum	16′ (0.27°)
Wheel turning angle Full turn*2	Inside Degree minute (decimal degree)	Minimum	34° (34.0°)
		Nominal	37° (37.0°)
		Maximum	38° (38.0°)
	Outside Degree minute (decimal degree)	Nominal	31° (31.0°)

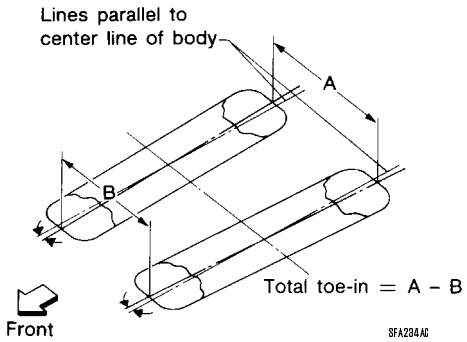
*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

QUICK REFERENCE CHART: SENTRA (EQUIPPED WITH 1.8L, QG ENGINE)

2003

Rear Wheel Alignment (Unladen*)



Camber Degree minute (decimal degree)		Minimum	–1°45′ (–1.75°)
		Nominal	–1°00′ (–1.00°)
		Maximum	–0°15′ (–0.25°)
Total toe-in	Distance (A - B) mm (in)	Minimum	–3 (–0.12)
		Nominal	1 (0.04)
		Maximum	5 (0.20)
	Angle (left plus right) Degree minute (decimal degree)	Minimum	–16′ (–0.27°)
		Nominal	5′30″ (0.09°)
		Maximum	26′ (0.43°)

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

Brake

Unit: mm (in)

Front brake	Brake model	CL25VA
	Cylinder bore diameter	57.2 (2.252)
	Pad length × width × thickness	125.6 × 46.0 × 11.0 (4.94 × 1.811 × 0.433)
	Rotor outer diameter × thickness	257 × 22 (10.12 × 0.87)
Rear brake	Brake model	LT20G
	Cylinder bore diameter/caliper bore diameter	15.87 (5/8) type a 17.45 (11/16) type b
	Lining length × width × thickness	219.4 × 35 × 4.5 (8.64 × 1.38 × 0.177)
	Drum inner diameter/Disc diameter × thickness	203.2 (8)
Master cylinder	Cylinder bore diameter	23.81 (15/16)
Control valve	Valve model	Dual proportioning valve
	Split point [kPa (kg/cm^2, psi)] × reducing ratio	1,961 (20,284) × 0.2
Brake booster	Booster model	M215T
	Diaphragm diameter	Primary: 230 (9.06) Secondary: 205 (8.07)
Brake fluid	Recommended brake fluid	Genuine NISSAN Super Heavy Duty Brake Fluid or equivalent, DOT 3 (US FMVSS No. 116)

Disc Brake - Repair Limits

Unit: mm (in)

Brake model	CL25VA
Pad wear limit Minimum thickness	2.0 (0.079)
Rotor repair limit Minimum thickness	20 (0.79)

QUICK REFERENCE CHART: SENTRA (EQUIPPED WITH 1.8L, QG ENGINE)

2003

Drum Brake - Repair Limits

Unit: mm (in)

Brake model		LT20G
Lining wear limit	Minimum thickness	1.5 (0.059)
Drum repair limit	Maximum inner diameter	204.5 (8.05)
	Maximum out-of round	0.03 (0.0012)

Refill Capacities

Engine Coolant Capacity (Approximate)

Unit: ℓ (US qt, Imp qt)

Drain and refill without reservoir	M/T (RS5F70A)	6.0 (6 3/8, 5 1/4)
	A/T (RE4F03B)	5.9 (6 1/4, 5 1/4)
Reservoir tank (at MAX level)		0.7 (3/4, 5/8)

Engine Oil Capacity (Approximate)

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	2.7 (2 7/8, 2 3/8)
	Without oil filter change	2.5 (2 5/8, 2 1/4)
Dry engine (engine overhaul)		3.1 (3 1/4, 2 3/4)

Miscellaneous Capacities (Approximate)

System description		Metric measurement	US measurement	Imp measurement
Fuel tank		50 ℓ	13 1/4 gal	11 gal
Power steering system		1.0 ℓ	2 1/8 pt	1 3/4 pt
Transaxle	M/T (RS5F70A)	3.0 ℓ	3 1/8 qt	2 5/8 qt
	A/T (RE4F03B)	7.0 ℓ	7 3/8 qt	6 1/8 qt
Air conditioning system	Refrigerant	0.45 - 0.55 kg	0.99 - 1.21 lb	0.99 - 1.21 lb
	Compressor oil	180 mℓ	6.1 fl oz	6.3 fl oz

[QR25DE]

QUICK REFERENCE CHART: SENTRA (EQUIPPED WITH 2.5L, QR ENGINE)

Engine Tune-Up Data

Engine		QR25DE
Cylinder arrangement		4 in-line
Displacement cm^3 (cu in)		2,488 (151.82)
Bore and stroke mm (in)		89.0 x 100 (3.50 - 3.94)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Compression ratio		9.5
Compression pressure kPa (kg/cm^2, psi) / 250 rpm	Standard	1,250 (12.8, 182)
	Minimum	1,060 (10.8, 154)
	Differential limit between cylinders	100 (1.0, 14)

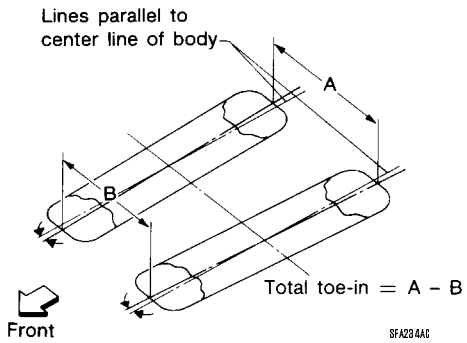
Drive Belt Deflection and Tension

Tension of drive belts	Auto adjustment by auto-tensioner

Spark Plugs (Double Platinum Tipped)

Type	Standard	PLFR5A-11
	Hot	PLFR4A-11
	Cold	PLFR6A-11
Plug gap		nominal 1.1 mm (0.043 in)

Front Wheel Alignment (Unladen*1)

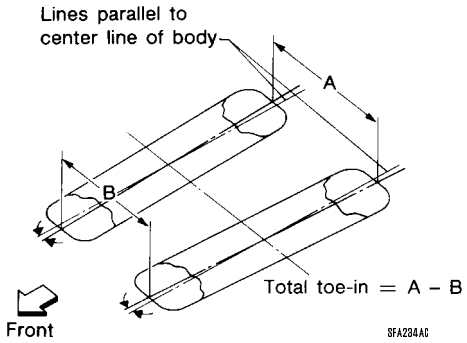


Camber Degree minute (decimal degree)	Minimum	–1°12' (–1.2°)
	Nominal	–0°27' (–0.45°)
	Maximum	0°18′ (0.3°)
	Left and right difference	45′ (0.75°) or less
Caster Degree minute (decimal degree)	Minimum	0°58′ (0.97°)
	Nominal	1°43′ (1.72°)
	Maximum	2°28′ (2.47°)
	Left and right difference	45′ (0.75°) or less
Kingpin inclination Degree minute (decimal degree)	Minimum	14°03′ (14.05°)
	Nominal	14°46′ (14.77°)
	Maximum	15°31′ (15.52°)

Total toe-in	Distance (A - B) mm (in)	Minimum	1 (0.039”)
		Nominal	2 (0.079”)
		Maximum	3 (0.118”)
	Angle (left plus right) Degree minute (decimal degree)	Minimum	5.5′ (0.08°)
		Nominal	11′ (0.18°)
		Maximum	16′ (0.27°)
Wheel turning angle Full turn*2	Inside Degree minute (decimal degree)	Minimum	29° (29.0°)
		Nominal	32° (32.0°)
		Maximum	33° (33.0°)
	Outside Degree minute (decimal degree)	Nominal	27° (27.0°)

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

Rear Wheel Alignment (Unladen*)



Camber Degree minute (decimal degree)		Minimum	–1°45′ (–1.75°)
		Nominal	–1°00′ (–1.00°)
		Maximum	–0°15′ (–0.25°)
Total toe-in	Distance (A - B) mm (in)	Minimum	–3 (–0.12)
		Nominal	1 (0.04)
		Maximum	5 (0.20)
	Angle (left plus right) Degree minute (decimal degree)	Minimum	–16′ (–0.27°)
		Nominal	5′30″ (0.09°)
		Maximum	26′ (0.43°)

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

Brake

Unit: mm (in)

Front brake	Brake model	CL25VB
	Cylinder bore diameter	57.2 (2.252)
	Pad length × width × thickness	125.6 × 46.0 × 11.0 (4.94 × 1.811 × 0.433)
	Rotor outer diameter × thickness	280 × 22 (11.02 × 0.87)
Rear brake	Brake model	CL9HC
	Cylinder bore diameter/caliper bore diameter	33.96 (1 11/32)
	Lining length × width × thickness	89.1 × 39.5 × 10 (3.508 × 1.555 × 0.39)
	Drum inner diameter/Disc diameter × thickness	258 × 9 (10.16 × 0.35)
Master cylinder	Cylinder bore diameter	23.81 (15/16)

Control valve	Valve model	Dual proportioning valve
	Split point [kPa (kg/cm^2, psi)] × reducing ratio	2,942 (30,427) × 0.2
Brake booster	Booster model	M215T
	Diaphragm diameter	Primary: 230 (9.06) Secondary: 205 (8.07)
Brake fluid	Recommended brake fluid	Genuine NISSAN Super Heavy Duty Brake Fluid or equivalent, DOT 3 (US FMVSS No. 116)

Disc Brake - Repair Limits

Unit: mm (in)

Brake model	CL25VB (Front)	CL9HC (Rear)
Pad wear limit Minimum thickness	2.0 (0.079)	2.0 (0.079)
Rotor repair limit Minimum thickness	20 (0.79)	8 (0.31)

Refill Capacities

Engine Coolant Capacity (Approximate)

Unit: ℓ (US qt, Imp qt)

Drain and refill (without reservoir)	M/T (RS5F51A, RS6F51H)	6.1 (6 1/2, 5 3/8)
	A/T (RE4F04B)	6.0 (6 3/8, 5 1/4)
Reservoir tank (at MAX level)		0.7 (3/4, 5/8)

Engine Oil Capacity (Approximate)

Unit: ℓ (US qt, Imp qt)

Drain and refill	With oil filter change	3.9 (4 1/8, 3 3/8)
	Without oil filter change	3.7 (3 7/8, 3 1/4)
Dry engine (engine overhaul)		4.4 (4 5/8, 3 7/8)

Miscellaneous Capacity (Approximate)

System description		Metric measurement	US measurement	Imp measurement
Fuel tank		50 ℓ	13 1/4 gal	11 gal
Power steering system		1.0 ℓ	2 1/8 pt	1 3/4 pt
Transaxle	M/T (RS5F51A, RS6F51H)	2.3 ℓ	2 3/8 qt	2 qt
	A/T (RE4F04B)	8.5 ℓ	9 qt	7 1/2 qt
Air conditioning system	Refrigerant	0.45 - 0.55 kg	0.99 - 1.21 lb	0.99 - 1.21 lb
	Compressor oil	180 mℓ	6.1 fl oz	6.3 fl oz

T&T® NEW PUMPS INC

Product Catalog
Volume 1

American, Asian & European Applications

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All the information in this catalog were compiled from the most recent and trusted sources of information. Every item on this catalog have been revised to ensure the accuracy on this catalog.

NOTES

YEAR	VEHICLE DETAIL	PART NO.
AM General		
Hummer		
V8		
2001-1999	6.5L 395 CID	**51086**
1996-1995	5.7L 350 CID	**41049**
1996-1994	6.5L 395 CID	**51062**
Acura		
CL		
L4		
1999-1998	2.3L 2254cc; Driven off the timing belt	**16209**
1997	2.2L 2156cc; Driven off the timing belt	**16209**
V6		
2003-2001	3.2L 3210cc	**26383**
1999-1997	3.0L 2997cc	**26383**
CSX		
L4		
2009-2008	2.0L 1998cc 122 CID; Technology	**26461**
2009-2008	2.0L 1998cc 122 CID; Touring	**26461**
2009-2008	2.0L 1998cc 122 CID; Type-S	**26495**
EL		
L4		
2005-2001	1.7L 1668cc; Sold in Canada	**16419**
2000-1997	1.6L 1590cc 97 CID	**16352**
Integra		
All		
2001-1997	B18B1 Desig.; GS	**16349**
2001-1997	B18C5 Desig.	**16468**
2001-1996	B18B1 Desig.; LS	**16349**
2000-1996	B18C1 Desig.	**16468**
1998-1996	B18B1 Desig.; RS	**16349**
1996	B18B1 Desig.; Special Edition	**16349**
L4		
2001	1.8L 1797cc; GS-R	**16289**
2001-1997	1.8L 1797cc; Type R	**16468**
2001-1997	1.8L 1834cc; GS	**16349**
2001-1996	1.8L 1834cc; LS	**16349**
2000-1996	1.8L 1797cc; GS-R	**16468**
1998-1996	1.8L 1834cc; RS	**16349**
1995	1.8L 1834cc; Special Edition	**16224**
1995-1990	1.8L 1834cc; LS	**16224**
1995-1990	1.8L 1834cc; RS	**16224**
1993-1992	1.7L 1678cc	**16321**
1993-1990	1.8L 1834cc; GS	**16224**
1991-1990	1.8L 1834cc	**16224**
1991-1990	1.8L 1834cc	**41038**
1989-1986	1.6L 1590cc	**16115**
Legend		
V6		
1995-1993	3.2L 3206cc; With 1 Hose Connection	**76288**
1995-1993	3.2L 3206cc; With 2 Hose Connections	**46218**
1992-1991	3.2L 3206cc	**46218**

YEAR	VEHICLE DETAIL	PART NO.
Acura (cont'd)		
Legend (cont'd)		
V6		
1990-1987	2.7L 2675cc	**36097**
1987-1986	2.5L 2494cc	**36097**
MDX		
All		
2002-2001	J35A3 Desig.	**26383**
V6		
2009-2007	3.7L 3664cc	**26470**
2002-2001	3.5L 3471cc	**26470**
NSX		
V6		
2005-1997	3.2L 3179cc; C32B1 Desig.	**36219**
2005-1991	3.0L 2977cc; C30A1 Desig.	**36219**
RDX		
V6		
2013	3.5L 3471cc	**26470**
RL		
V6		
2012-2010	3.7L 3664cc	**26470**
2009	3.7L 3664cc; J37A2 Desig.	**26470**
2008-2005	3.5L 3471cc; J35A8 Desig.	**26470**
2004-1996	3.5L 3475cc; C35A1 Desig.	**46354**
RSX		
L4		
2006-2005	2.0L 1998cc 122 CID; K20Z1 Desig.; Type-S	**26495**
2006-2002	2.0L 1998cc 122 CID	**26434**
2004-2002	2.0L 1998cc 122 CID; K20A2 Desig.; Type-S	**26495**
SLX		
V6		
1999-1998	3.5L 3494cc	**26365**
1997-1996	3.2L 3165cc	**26278**
TL		
L5		
1998-1995	2.5L 2451cc	**16347**
V6		
2013-2009	3.5L 3471cc	**26470**
2013-2009	3.7L 3664cc	**26470**
2008-2007	3.5L 3471cc; J35A8 Desig.	**26470**
2008-2004	3.2L 3210cc; J32A3 Desig.	**26470**
2003-1999	3.2L 3210cc	**26383**
1998-1996	3.2L 3206cc	**46348**
TSX		
L4		
2014-2009	2.4L 2354cc	**26233**
2008-2004	2.4L 2354cc	**26461**
V6		
2012-2010	3.5L 3471cc	**26470**

YEAR	VEHICLE DETAIL	PART NO.
Acura (cont'd)		
Vigor		
L5		
1994-1993	2.5L 2451cc	**16347**
1992	2.5L 2451cc	**16374**
ZDX		
V6		
2013-2010	3.7L 3664cc	**26470**
American Motors		
AMX		
L6		
1980	4.2L 258 CID; Standard Rotation	**33403**
1979-1978	4.2L 258 CID	**33077**
V8		
1979-1978	5.0L 304 CID	**43401**
Ambassador		
L6		
1971	4.2L 258 CID	**33986**
1971	4.2L 4228cc 258 CID	**33986**
1971	4.2L 4229cc 258 CID	**33986**
1970-1966	3.8L 3802cc 232 CID	**33843**
1967-1966	3.3L 199 CID	**33843**
1965	3.8L 232 CID	**33843**
V8		
1974-1973	5.0L 304 CID	**43401**
1974-1973	5.9L 360 CID	**43401**
1974-1973	6.6L 401 CID	**43401**
American		
L6		
1965	3.8L 3802cc 232 CID	**33021**
Classic		
L6		
1966-1965	3.3L 3261cc 199 CID	**33843**
1966-1965	3.8L 3802cc 232 CID	**33843**
Concord		
L4		
1982-1980	2.5L 151 CID; 8 Valve; General Motors Built Eng.	**21107**
L6		
1983-1981	4.2L 258 CID; 12 Valve; OHV; VIN C; w/Out Serp Drive, Standard Rotation	**33403**
1983-1981	4.2L 258 CID; VIN C; w/Serp Drive, Reverse Rotation	**33404**
1980	4.2L 258 CID; Standard Rotation	**33403**
1979	3.8L 232 CID; OHV	**33077**
1979	4.2L 258 CID; OHV	**33077**
1979-1978	3.8L 232 CID	**21107**
1979-1978	4.2L 258 CID	**21107**
1978	3.8L 232 CID; Sold in United States	**33077**
1978	4.2L 258 CID; Sold in United States	**33077**
V8		
1979-1978	5.0L 304 CID; OHV	**43401**

YEAR	VEHICLE DETAIL	PART NO.
American Motors (cont'd)		
Eagle		
L4		
1984-1983	2.5L 150 CID; 8 Valve; AMC Built Eng.; OHV; w/Out Serp Drive, Standard Rotation	**33403**
1984-1983	2.5L 150 CID; 8 Valve; AMC Built Eng.; VIN U; w/Serp Drive, Reverse Rotation	**33404**
1983-1981	2.5L 151 CID; 8 Valve; General Motors Built Eng.; VIN B	**21107**
L6		
1988-1987	4.2L 258 CID; 12 Valve; w/Out Serp Drive, Standard Rotation	**33414**
1988-1987	4.2L 258 CID; 12 Valve; w/Serp Drive, Reverse Rotation	**33413**
1986-1981	4.2L 258 CID; 12 Valve; w/Serp Drive, Reverse Rotation	**33404**
1986-1980	4.2L 258 CID; 12 Valve; w/Out Serp Drive, Standard Rotation	**33403**
Gremlin		
L6		
1978-1975	3.8L 232 CID; 12 Valve	**33077**
1978-1975	4.2L 258 CID; 12 Valve	**33077**
1974-1973	3.8L 232 CID	**33986**
1974-1972	4.2L 258 CID	**33986**
1974-1971	3.8L 3802cc 232 CID	**33986**
1974-1971	4.2L 4228cc 258 CID	**33986**
1974-1971	4.2L 4229cc 258 CID	**33986**
1971	3.8L 232 CID	**33986**
V8		
1976-1973	5.0L 304 CID	**43401**
Hornet		
L6		
1977-1975	3.8L 232 CID; 12 Valve	**33077**
1977-1975	4.2L 258 CID; 12 Valve	**33077**
1974-1973	3.8L 3802cc 232 CID	**33986**
1974-1973	4.2L 4228cc 258 CID	**33986**
1974-1971	3.8L 232 CID	**33986**
1974-1971	4.2L 258 CID	**33986**
1974-1971	4.2L 4229cc 258 CID	**33986**
V8		
1977-1973	5.0L 304 CID	**43401**
1974-1973	5.9L 360 CID	**43401**
Javelin		
L6		
1974-1971	3.8L 3802cc 232 CID	**33986**
1974-1971	4.2L 4228cc 258 CID	**33986**
1974-1971	4.2L 4229cc 258 CID	**33986**
V8		
1974-1973	5.0L 4982cc 304 CID; Sold in United States	**43401**
1974-1973	5.9L 5899cc 360 CID; Sold in United States	**43401**

YEAR	VEHICLE DETAIL	PART NO.
American Motors (cont'd)		
Javelin (cont'd)		
V8		
1974-1973	5.9L 5900cc 360 CID; Sold in United States	**43401**
1974-1973	6.6L 6571cc 401 CID; Sold in United States	**43401**
1974-1973	6.6L 6572cc 401 CID; Sold in United States	**43401**
1973	5.0L 4983cc 304 CID; Sold in United States	**43401**
Marlin		
L6		
1967-1966	3.3L 3261cc 199 CID	**33843**
1967-1966	3.8L 3802cc 232 CID	**33843**
1965	3.8L 3802cc 232 CID	**33021**
Matador		
L6		
1978-1975	4.2L 258 CID; 12 Valve	**33077**
1974-1973	3.8L 232 CID	**33986**
1974-1973	4.2L 258 CID	**33986**
1974-1971	3.8L 3802cc 232 CID	**33986**
1974-1971	4.2L 4228cc 258 CID	**33986**
1974-1971	4.2L 4229cc 258 CID	**33986**
V8		
1978-1973	5.9L 360 CID	**43401**
1977-1973	5.0L 304 CID	**43401**
1976-1973	6.6L 401 CID	**43401**
Pacer		
L6		
1980	4.2L 258 CID; Standard Rotation	**33403**
1979-1975	4.2L 258 CID	**33077**
1978-1975	3.8L 232 CID	**33077**
V8		
1979-1978	5.0L 304 CID	**43401**
Rambler		
L6		
1969	3.3L 3261cc 199 CID	**33843**
1969	3.8L 3802cc 232 CID	**33843**
Rebel		
L6		
1970-1967	3.8L 232 CID	**33843**
1967	3.3L 199 CID	**33843**
Spirit		
L4		
1982-1980	2.5L 151 CID; General Motors Built Eng.	**21107**
L6		
1983-1981	4.2L 258 CID	**33404**
1983-1981	4.2L 258 CID; 12 Valve; w/Serp Drive, Reverse Rotation	**33404**
1983-1980	4.2L 258 CID; 12 Valve; w/Out Serp Drive, Standard Rotation	**33403**
1979	3.8L 232 CID	**33077**

YEAR	VEHICLE DETAIL	PART NO.
American Motors (cont'd)		
Spirit (cont'd)		
L6		
1979	4.2L 258 CID	**33077**
V8		
1979	5.0L 304 CID	**43401**
Asuna		
Sunrunner		
L4		
1993-1992	1.6L 1588cc 98 CID; G16KC Desig.; Sold in Canada; VIN U	**11048**
Audi		
100		
L5		
1991-1989	2.3L 2309cc; NF Desig.; Driven off the timing belt	**28171**
V6		
1994-1992	2.8L 2771cc	**38263**
100 Quattro		
L5		
1991-1989	2.3L 2309cc; NF Desig.; Driven off the timing belt	**28171**
V6		
1994-1992	2.8L 2771cc	**38263**
100 Series		
L4		
1977-1975	1.9L 1871cc; All 100 Series	**28004**
1971-1970	1.8L 1760cc 107 CID; All 100 Series	**28004**
1969	1.8L 1760cc; All 100 Series	**28004**
200		
L5		
1991-1989	2.2L 2226cc; Driven off the timing belt	**28171**
1989	2.2L 2226cc; MC Desig.; Turbocharged	**18052**
200 Quattro		
L5		
1991-1990	2.2L 2226cc; Driven off the timing belt	**28171**
4000		
L4		
1987-1984	1.8L 1780cc	**28065**
1983-1982	1.6L 1588cc 97 CID	**28065**
1983-1982	1.6L 1588cc 97 CID; DIESEL; Turbocharged	**28065**
1981	1.7L 1715cc; FROM CHASSIS #81B-149-000	**28066**
1981	1.7L 1715cc; FROM CHASSIS #81B-149-001	**28065**
1980	1.6L 1588cc 97 CID	**28066**
1980	1.6L 1588cc 97 CID; FROM CHASSIS #81B-149-000	**28066**
L5		
1986-1985	2.2L 2226cc	**18052**
1984	2.2L 2144cc; Sold in Canada	**18052**
1984-1980	2.2L 2144cc	**18052**

YEAR	VEHICLE DETAIL	PART NO.
Audi (cont'd)		
4000 Quattro		
L5		
1987-1984	2.2L 2226cc	**18052**
5000		
L5		
1988-1987	2.3L 2309cc; GAS; Sedan	**18052**
1988-1986	2.2L 2226cc; GAS; Sedan; Turbocharged	**18052**
1988-1985	2.2L 2226cc	**18052**
1987	2.3L 2309cc; GAS; Naturally Aspirated; Sedan	**18052**
1987-1985	2.2L 2226cc; GAS; Wagon	**18052**
1985	2.2L 2226cc; GAS; Sedan	**18052**
1985-1983	2.2L 2144cc; GAS; Sedan; Turbocharged	**18052**
1985-1980	2.2L 2144cc	**18052**
1985-1979	2.0L 1986cc	**28071**
1984	2.2L 2144cc; GAS; Wagon	**18052**
1983-1979	2.0L 1986cc; DIESEL; Sedan	**28071**
1982-1980	2.2L 2144cc; GAS; Sedan	**18052**
1979-1978	2.2L 2144cc; GAS	**18019**
80		
L4		
1990-1988	2.0L 1983cc	**41038**
1990-1988	2.0L 1983cc; 3A Desig.	**28065**
L5		
1992-1991	2.3L 2309cc; Driven off the timing belt	**28171**
1991	2.3L 2309cc; NG Desig.; Driven off the timing belt	**28171**
80 Quattro		
L5		
1992-1989	2.3L 2309cc; NG Desig.; Driven off the timing belt	**28171**
1988	2.3L 2309cc	**18052**
1988	2.3L 2309cc; NG Desig.; FROM CHASSIS #394743; Driven off the timing belt	**28171**
1988	2.3L 2309cc; TO CHASSIS #394742	**18052**
90		
L4		
1988	2.0L 1983cc	**28066**
L5		
1988	2.3L 2309cc; TO CHASSIS #394742	**18052**
V6		
1995-1993	2.8L 2771cc	**38263**
90 Quattro		
L5		
1991-1988	2.3L 2309cc; FROM CHASSIS #394743; Driven off the timing belt	**28171**
V6		
1995-1993	2.8L 2771cc	**38263**

YEAR	VEHICLE DETAIL	PART NO.
Audi (cont'd)		
A3		
L4		
2005-2004	2.0L 1984cc 121 CID; Sold in Mexico	**18978**
A3 Quattro		
V6		
2009-2006	3.2L 3189cc 195 CID	**18471**
A4		
L4		
2006-2001	1.8L 1781cc; Driven off the timing belt	**18377**
2000-1997	1.8L 1781cc	**28401**
2000-1997	1.8L 1781cc; With Bolt on Pulley	**28401**
V6		
2008-2005	3.2L 3123cc	**28146**
2005	3.0L 2976cc; BGN Desig.; Driven off the timing belt	**28469**
2005-2002	3.0L 2976cc; Driven off the timing belt	**28469**
2004-2002	3.0L 2976cc; AVK Desig.; VIN T; Driven off the timing belt	**28469**
2001-1996	2.8L 2771cc	**38333**
A4 Quattro		
L4		
2005-2001	1.8L 1781cc; Driven off the timing belt	**18377**
2001-1997	1.8L 1781cc	**28401**
2000-1997	1.8L 1781cc; With Bolt on Pulley	**28401**
V6		
2009-2005	3.2L 3123cc	**28146**
2006-2005	3.0L 2976cc; BGN Desig.; Driven off the timing belt	**28469**
2006-2002	3.0L 2976cc; Driven off the timing belt	**28469**
2004-2002	3.0L 2976cc; AVK Desig.; VIN T; Driven off the timing belt	**28469**
2001-1996	2.8L 2771cc	**38333**
A6		
V6		
2009-2006	3.2L 3123cc	**28146**
2004-2002	3.0L 2976cc	**28446**
2004-2002	3.0L 2976cc; AVK Desig.; Driven off the timing belt	**28469**
2001-1996	2.8L 2771cc	**38333**
1995	2.8L 2771cc	**38263**
A6 Quattro		
V6		
2011-2009	3.0L 2995cc	**28146**
2008-2005	3.2L 3123cc	**28146**
2004-2003	2.7L 2671cc; VIN D	**28446**
2004-2002	3.0L 2976cc	**28446**
2004-2002	3.0L 2976cc; AVK Desig.; Driven off the timing belt	**28469**
2004-2002	3.0L 2976cc; Driven off the timing belt	**28469**
2002	2.7L 2671cc; APB Desig.	**28446**
2001-1996	2.8L 2771cc	**38333**
1995	2.8L 2771cc	**38263**

YEAR	VEHICLE DETAIL	PART NO.
Audi (cont'd)		
A6 Quattro (cont'd)		
V8		
2004-2000	4.2L 4172cc; Driven off the timing belt	**28362**
2004-2000	4.2L 4172cc; Driven off the timing belt	**38410**
A8		
V8		
2000-1997	3.7L 3697cc; Driven off the timing belt	**28362**
A8 Quattro		
V8		
2006-2004	4.2L 4172cc; Driven off the timing belt	**38410**
2006-1997	4.2L 4172cc; Driven off the timing belt	**28362**
2002-2000	4.2L 4172cc; Driven off the timing belt	**38410**
Allroad Quattro		
V6		
2005-2003	2.7L 2671cc	**28446**
2005-2001	2.7L 2671cc; Turbocharged	**28446**
Cabriolet		
V6		
1998-1996	2.8L 2771cc	**38333**
1995-1994	2.8L 2771cc	**38263**
Coupe		
L5		
1987	2.3L 2309cc	**18052**
1984-1981	2.2L 2144cc	**18052**
Coupe Quattro		
L5		
1991-1990	2.3L 2309cc; 7A Desig.; Driven off the timing belt	**28171**
Fox		
L4		
1979-1975	1.6L 1588cc 97 CID	**28066**
1976	1.6L 1588cc 97 CID; Sold in Canada	**28066**
1976	1.6L 1588cc 97 CID; Sold in United States	**28066**
1974-1973	1.5L 1471cc	**28066**
1974-1973	1.5L 1471cc 90 CID	**28066**
Q7		
V6		
2013-2009	3.0L 2967cc 181 CID	**28146**
RS6		
V8		
2004-2003	4.2L 4172cc; Driven off the timing belt	**28362**
S4		
L5		
1994-1992	2.2L 2226cc	**18279**
1994-1992	2.2L 2226cc; Driven off the timing belt	**38410**
V6		
2012-2010	3.0L 2995cc	**28146**
2002-2000	2.7L 2671cc	**28446**
V8		
2004	4.2L 4163cc; Driven off the timing belt	**38410**

YEAR	VEHICLE DETAIL	PART NO.
Audi (cont'd)		
S5		
V6		
2012-2010	3.0L 2995cc	**28146**
S6		
L5		
1997-1995	2.2L 2226cc	**18279**
1995	2.2L 2226cc; AAN Desig.; Turbocharged	**18279**
V8		
2004	4.2L 4172cc; Driven off the timing belt	**38410**
2003-2002	4.2L 4172cc; Driven off the timing belt	**28362**
S8		
V8		
2003-2001	4.2L 4172cc; Driven off the timing belt	**28362**
TT		
L4		
2009-2008	2.0L 1984cc 121 CID; BPY Desig.	**26470**
2006-2000	1.8L 1781cc; Driven off the timing belt	**18377**
TT Quattro		
L4		
2011	2.0L 1984cc 121 CID; CETA Desig.	**26470**
2011-2009	2.0L 1984cc 121 CID; CDMA Desig.	**26470**
2006-2000	1.8L 1781cc; Driven off the timing belt	**18377**
V6		
2009-2008	3.2L 3189cc 195 CID	**18471**
2006-2004	3.2L 3189cc 195 CID	**18471**
Avanti		
II		
V8		
2004-2001	5.7L 350 CID	**71615**
1980-1977	5.7L 350 CID	**41984**
1976-1973	6.6L 400 CID	**41109**
1972-1969	5.7L 350 CID	**41898**
1969-1968	5.4L 327 CID	**41898**
BMW		
1600		
L4		
1971-1964	1.6L 1573cc 96 CID	**28153**
1800		
L4		
1971-1968	1.8L 1766cc 108 CID	**28153**
1967-1963	1.8L 1773cc 108 CID	**28153**
2000		
L4		
1972-1966	2.0L 1990cc 121 CID	**28153**
2002		
L4		
1976-1966	2.0L 1990cc 121 CID	**28153**
2500		
L6		
1971-1970	2.5L 2494cc 152 CID; EXC. Threaded Style Fan Clutch	**18122**

YEAR	VEHICLE DETAIL	PART NO.
BMW (cont'd)		
2500 (cont'd)		
L6		
1971-1970	2.5L 2494cc 152 CID; With thread on style fan clutch	**18117**
1968	2.5L 2495cc 152 CID	**18122**
2800		
L6		
1974-1968	2.8L 2788cc	**18117**
1974-1968	2.8L 2788cc 170 CID; EXC. Threaded Style Fan Clutch	**18122**
1974-1968	2.8L 2788cc 170 CID; With thread on style fan clutch	**18117**
3.0CS		
L6		
1974-1972	3.0L 2985cc 182 CID; EXC. Threaded Style Fan Clutch	**18122**
1974-1971	3.0L 2985cc 182 CID; With thread on style fan clutch	**18117**
3.0CSL		
L6		
1971	3.0L 2985cc 182 CID; With thread on style fan clutch	**18117**
3.0CSi		
L6		
1974-1972	3.0L 2985cc 182 CID; EXC. Threaded Style Fan Clutch	**18122**
1974-1971	3.0L 2985cc 182 CID; With thread on style fan clutch	**18117**
3.0S		
L6		
1971	3.0L 2985cc	**18117**
318i		
L4		
1999-1996	1.9L 1895cc	**18275**
1995-1994	1.8L 1796cc; Convertible	**18275**
1995-1991	1.8L 1796cc; Sedan	**18275**
1992-1991	1.8L 1796cc; Convertible	**18275**
1985-1984	1.8L 1766cc 107 CID	**28152**
318is		
L4		
1999-1996	1.9L 1895cc	**18275**
1995-1991	1.8L 1796cc	**18275**
1995-1991	1.8L 1796cc; Coupe	**18275**
318ti		
L4		
1999-1996	1.9L 1895cc	**18275**
1995	1.8L 1796cc	**18275**
320i		
All		
1995-1992	Sold in Canada	**18261**
L4		
1983-1980	1.8L 1766cc 107 CID	**28149**
1979-1977	2.0L 1990cc 121 CID	**28149**

YEAR	VEHICLE DETAIL	PART NO.
BMW (cont'd)		
320i (cont'd)		
L6		
2005-2001	2.2L 2171cc 132 CID	**18261**
323Ci		
L6		
2000	2.5L 2494cc 152 CID	**18261**
323i		
L6		
2006	2.5L 2497cc	**18261**
2000-1998	2.5L 2494cc 152 CID	**18261**
323is		
L6		
1999-1998	2.5L 2494cc 152 CID	**18261**
325		
L6		
1987	2.7L 2693cc	**28119**
325Ci		
L6		
2006-2001	2.5L 2494cc 152 CID	**18261**
2005-2003	2.5L 2494cc 152 CID; M56 Desig.	**18261**
2005-2001	2.5L 2494cc 152 CID; M54 Desig.	**18261**
325e		
L6		
1987-1984	2.7L 2693cc	**28119**
1987-1984	2.7L 2693cc; M20 Desig.	**28119**
325es		
L6		
1987-1986	2.7L 2693cc; M20 Desig.	**28119**
325i		
L6		
2005-2003	2.5L 2494cc 152 CID	**18261**
2005-2003	2.5L 2494cc 152 CID; M56 Desig.	**18261**
1995	2.5L 2494cc 152 CID	**18261**
1995-1994	2.5L 2494cc 152 CID; M50TU Desig.	**18261**
1993-1988	2.5L 2494cc 152 CID	**28120**
1987	2.5L 2494cc 152 CID	**28119**
325iX		
L6		
1991-1988	2.5L 2494cc 152 CID	**28120**
325is		
L6		
1995-1993	2.5L 2494cc 152 CID; M50TU Desig.	**18261**
1995-1988	2.5L 2494cc 152 CID	**28120**
1992	2.5L 2494cc 152 CID; M50 Desig.	**18261**
1987	2.5L 2494cc 152 CID	**28119**
325xi		
L6		
2005-2001	2.5L 2494cc 152 CID	**18261**
328Ci		
L6		
2000	2.8L 2793cc; M52 Desig.	**18261**

YEAR	VEHICLE DETAIL	PART NO.
BMW (cont'd)		
328i		
L6		
2000-1996	2.8L 2793cc	**18261**
2000-1996	2.8L 2793cc; M52 Desig.	**18261**
328is		
L6		
1999-1996	2.8L 2793cc; M52 Desig.	**18261**
330Ci		
L6		
2006-2001	3.0L 2979cc	**18261**
2006-2001	3.0L 2979cc; M54 Desig.	**18261**
330i		
L6		
2006-2001	3.0L 2979cc	**18261**
2005-2001	3.0L 2979cc; M54 Desig.	**18261**
330xi		
L6		
2005-2001	3.0L 2979cc; M54 Desig.	**18261**
524td		
L6		
1986-1985	2.4L 2443cc	**28154**
1986-1985	2.4L 2443cc; DIESEL	**28154**
525i		
L6		
2005-2001	2.5L 2494cc 152 CID	**18261**
1995-1991	2.5L 2494cc 152 CID; DOHC	**18261**
1990-1989	2.5L 2494cc 152 CID	**28120**
528e		
All		
1987-1982		**28119**
L6		
1988	2.7L 2693cc	**28120**
1988-1982	2.7L 2693cc; SOHC	**28119**
528i		
L6		
2000-1999	2.8L 2793cc; M52TU Desig.	**18261**
2000-1997	2.8L 2793cc	**18261**
2000-1997	2.8L 2793cc; M52 Desig.	**18261**
1981-1980	2.8L 2788cc	**18117**
1981-1979	2.8L 2788cc; 12 Valve; M30 Desig.; With Disengaging Fan	**28119**
1979	2.8L 2788cc	**18122**
530i		
L6		
2005-2001	3.0L 2979cc	**18261**
1978-1975	3.0L 2985cc	**18122**
V8		
1995-1994	3.0L 2997cc	**38276**
533i		
L6		
1984-1983	3.2L 3210cc	**18117**

YEAR	VEHICLE DETAIL	PART NO.
BMW (cont'd)		
535i		
L6		
1993-1985	3.5L 3430cc	**18117**
540i		
V8		
2003-1999	4.4L 4398cc	**48465**
2000-1999	4.4L 4398cc	**38276**
1995-1994	4.0L 3982cc; M60 Desig.	**38276**
630CSi		
L6		
1978-1977	3.0L 2985cc	**18122**
633CSi		
L6		
1984-1980	3.2L 3210cc	**18117**
1979-1978	3.2L 3210cc	**18122**
635CSi		
L6		
1989-1985	3.5L 3430cc	**18117**
733i		
L6		
1984-1980	3.2L 3210cc	**18117**
1984-1978	3.2L 3210cc	**18122**
735i		
L6		
1992-1987	3.5L 3430cc	**18117**
1986-1985	3.5L 3430cc	**18122**
735iL		
L6		
1992-1988	3.5L 3430cc	**18117**
740i		
V8		
2001-1999	4.4L 4398cc	**48465**
2001-1999	4.4L 4398cc; DOHC	**48465**
1995	4.0L 3982cc	**48332**
1994-1993	4.0L 3982cc	**38276**
740iL		
V8		
2001-1999	4.4L 4398cc; DOHC	**48465**
1995	4.0L 3982cc	**48332**
1994-1993	4.0L 3982cc	**38276**
840Ci		
V8		
1995-1994	4.0L 3982cc	**48332**
850CSi		
V12		
1995-1994	5.6L 5576cc	**38236**
850Ci		
V12		
1995	5.4L 5379cc	**38236**
1994-1993	5.0L 4988cc	**38236**

YEAR	VEHICLE DETAIL	PART NO.
BMW (cont'd)		
850i		
V12		
1992-1991	5.0L 4988cc	**38236**
Bavaria		
L6		
1974-1972	2.8L 2788cc 170 CID	**18122**
1974-1972	3.0L 2985cc 182 CID	**18122**
L6		
L6		
1987	3.5L 3430cc	**18117**
L7		
L6		
1987-1986	3.5L 3430cc	**18117**
M3		
L4		
1991-1988	2.3L 2302cc	**38151**
L6		
1999-1996	3.2L 3152cc	**18261**
1995	3.0L 2990cc	**18261**
M5		
L6		
1993-1991	3.6L 3553cc	**28234**
1988	3.5L 3453cc	**18117**
M6		
L6		
1988-1987	3.5L 3453cc	**18117**
X3		
L6		
2006-2004	2.5L 2494cc 152 CID	**18261**
2006-2004	3.0L 2979cc	**18261**
X5		
L6		
2006-2001	3.0L 2979cc	**18261**
V8		
2003-2002	4.6L 4598cc	**48465**
2003-2000	4.4L 4398cc	**48465**
Z3		
L4		
1998-1996	1.9L 1895cc	**18275**
L6		
2002-2000	3.2L 3152cc	**18261**
2001	3.0L 2979cc	**18261**
2001-1999	2.5L 2494cc 152 CID	**18261**
2000	2.8L 2793cc	**18261**
1999	2.8L 2793cc; M52TU Desig.	**18261**
1999-1998	3.2L 3152cc; S52 Desig.	**18261**
1999-1997	2.8L 2793cc; M52 Desig.	**18261**
Z4		
L6		
2005-2003	2.5L 2494cc 152 CID	**18261**
2005-2003	3.0L 2979cc	**18261**

YEAR	VEHICLE DETAIL	PART NO.
BMW (cont'd)		
Z8		
V8		
2003	4.8L 4837cc	**48465**
Buick		
Allure		
V6		
2010	3.0L 182 CID	**11103**
2010	3.6L 217 CID	**11103**
2009-2005	3.8L 3800cc 231 CID	**21075**
2008-2005	3.6L 217 CID	**11103**
Apollo		
L6		
1975	4.1L 250 CID; Driven off the timing belt	**22107**
1974-1973	4.1L 250 CID	**21895**
V8		
1975	4.3L 260 CID; W/O A/C	**41100**
1975	4.3L 260 CID; With A/c	**41120**
1975	5.7L 350 CID	**31018**
1974-1973	5.7L 5736cc 350 CID	**31018**
Century		
L4		
1996-1993	2.2L 2190cc 134 CID; VIN 4	**11032**
1992-1987	2.5L 2474cc 151 CID; VIN R	**31041**
1986-1982	2.5L 2474cc 151 CID; VIN R	**31000**
1983-1982	2.5L 2474cc 151 CID; VIN 5	**31000**
V6		
2005-2000	3.1L 189 CID	**11033**
1998-1997	3.1L 189 CID	**11033**
1996-1995	3.1L 3097cc 189 CID	**11033**
1994	3.1L 189 CID	**11033**
1993-1989	3.3L 204 CID; VIN N	**21050**
1989-1987	2.8L 173 CID	**11033**
1988-1986	3.8L 3800cc 231 CID; VIN 3	**21050**
1986	2.8L 173 CID; VIN X	**31001**
1985	2.8L 173 CID; Sold in Canada; VIN X	**31001**
1985-1984	3.8L 3800cc 231 CID; VIN 3	**31028**
1985-1982	3.0L 181 CID; VIN E	**31028**
1984-1982	2.8L 173 CID; Sold in Canada	**31001**
1979	3.8L 231 CID	**31018**
1979-1978	3.2L 196 CID	**31018**
1977-1975	3.8L 231 CID	**31018**
V8		
1981	4.4L 267 CID	**41121**
1981	5.7L 350 CID; DIESEL; VIN N; W/O A/C 2nd Design	**41120**
1981-1980	4.3L 265 CID; VIN S	**41975**
1980-1979	4.9L 301 CID	**41975**
1979-1977	5.7L 350 CID; VIN L	**41121**
1977	5.7L 350 CID; VIN H	**31018**
1977	5.7L 350 CID; VIN J	**31018**

YEAR	VEHICLE DETAIL	PART NO.
Buick (cont'd)		
Century (cont'd)		
V8		
1977	5.7L 350 CID; VIN R; W/O A/C	**41100**
1977	5.7L 350 CID; VIN R; With A/c	**41120**
1977	6.6L 403 CID	**41975**
Commercial Chassis		
V8		
1996-1994	5.7L 350 CID	**41069**
1993-1992	5.7L 350 CID	**41049**
1991	5.0L 305 CID	**41049**
Electra		
V6		
1990-1986	3.8L 3800cc 231 CID	**21050**
1985	3.0L 181 CID; FWD; VIN E	**31028**
1985	3.8L 3800cc 231 CID; FWD; VIN 3	**31028**
1984-1981	4.1L 252 CID	**31018**
V8		
1987-1986	5.0L 307 CID; VIN Y	**41120**
1985-1981	5.0L 307 CID; GAS; VIN Y; W/O A/C	**41100**
1985-1981	5.0L 307 CID; GAS; VIN Y; With A/c	**41120**
1985-1981	5.7L 350 CID; DIESEL; VIN N; W/O A/C	**41100**
1985-1981	5.7L 350 CID; DIESEL; VIN N; With A/c	**41120**
1981-1978	5.7L 350 CID; Emission Control	**31018**
1980	4.9L 301 CID	**41975**
1980-1978	5.7L 350 CID; W/O A/C	**41100**
1979-1977	5.7L 350 CID; W A/c Or H/d Cool	**41120**
1979-1977	6.6L 403 CID	**41100**
1979-1977	6.6L 403 CID; W A/c Or H/d Cool	**41120**
1977	5.7L 350 CID	**41100**
1977	5.7L 350 CID; VIN H; Aluminum Housing	**31018**
1977	5.7L 350 CID; VIN J; Aluminum Housing	**31018**
Enclave		
V6		
2014-2008	3.6L 217 CID	**11103**
Encore		
L4		
2013	1.4L 1364cc 83 CID	**21662**
Estate Wagon		
V8		
1983-1981	5.0L 307 CID; GAS; VIN Y; W/O A/C	**41100**
1983-1981	5.0L 307 CID; GAS; VIN Y; With A/c	**41120**
1983-1981	5.7L 350 CID; DIESEL; VIN N; W/O A/C	**41100**
1983-1981	5.7L 350 CID; DIESEL; VIN N; With A/c	**41120**
1980	4.9L 301 CID	**41975**
1980-1977	5.7L 350 CID	**41100**
1980-1977	5.7L 350 CID; W A/c Or H/d Cool	**41120**
1979-1977	6.6L 403 CID	**41100**
1979-1977	6.6L 403 CID; W A/c Or H/d Cool	**41120**
1973	5.7L 5736cc 350 CID; VIN H; Aluminum Housing	**31018**

YEAR	VEHICLE DETAIL	PART NO.
Buick (cont'd)		
Estate Wagon (cont'd)		
V8		
1973	5.7L 5736cc 350 CID; VIN J; Aluminum Housing	**31018**
LaCrosse		
L4		
2013-2010	2.4L 2384cc 145 CID; Pump is driven off the timing chain	**21092**
V6		
2013-2010	3.6L 217 CID	**11103**
2010	3.0L 182 CID	**11103**
2009-2005	3.8L 3800cc 231 CID	**21075**
2008-2005	3.6L 217 CID	**11103**
LeSabre		
L6		
1970	4.1L 250 CID	**21895**
V6		
2005-1996	3.8L 3800cc 231 CID	**21075**
1995-1992	3.8L 3800cc 231 CID; VIN L	**21050**
1991	3.8L 3800cc 231 CID; VIN C	**21050**
1990-1986	3.8L 3800cc 231 CID	**21050**
1986	3.0L 181 CID	**21050**
1984-1981	4.1L 252 CID	**31018**
1984-1977	3.8L 3800cc 231 CID	**31018**
1977-1976	3.8L 231 CID	**31018**
V8		
1990-1988	5.0L 307 CID; VIN Y	**41120**
1986	5.0L 307 CID; VIN Y	**41120**
1985-1981	5.0L 307 CID; GAS; VIN Y; W/O A/C	**41100**
1985-1981	5.0L 307 CID; GAS; VIN Y; With A/c	**41120**
1985-1981	5.7L 350 CID; DIESEL; VIN N; W/O A/C	**41100**
1985-1981	5.7L 350 CID; DIESEL; VIN N; With A/c	**41120**
1982	4.4L 267 CID; VIN J	**41121**
1981-1978	5.7L 350 CID; Emission Control	**31018**
1980-1978	5.7L 350 CID; W/O A/C	**41100**
1980-1977	4.9L 301 CID	**41975**
1980-1977	5.7L 350 CID; W A/c Or H/d Cool	**41120**
1978-1977	6.6L 403 CID	**41100**
1977	5.7L 350 CID	**41100**
1977	5.7L 350 CID; VIN H; Aluminum Housing	**31018**
1977-1975	5.7L 350 CID; VIN J; Aluminum Housing	**31018**
1974-1973	5.7L 5736cc 350 CID; VIN H; Aluminum Housing	**31018**
1974-1973	5.7L 5736cc 350 CID; VIN J; Aluminum Housing	**31018**
Lucerne		
V6		
2011-2009	3.9L 3880cc 237 CID	**11006**
2008-2006	3.8L 3800cc 231 CID	**21075**
V8		
2011-2006	4.6L 281 CID	**11076**

YEAR	VEHICLE DETAIL	PART NO.
Buick (cont'd)		
Opel		
L4		
1979-1976	1.8L 1816cc	**11127**
Park Avenue		
V6		
2005-1996	3.8L 3800cc 231 CID	**21075**
1995	3.8L 3800cc 231 CID; VIN K	**21050**
1995-1991	3.8L 3800cc 231 CID	**21050**
1995-1991	3.8L 3800cc 231 CID; VIN 1	**21050**
1994-1991	3.8L 3800cc 231 CID; VIN L	**21050**
Rainier		
L6		
2007-2004	4.2L 256 CID; VIN S	**21097**
V8		
2007	5.3L 325 CID	**71617**
2006-2005	5.3L 323 CID; VIN M	**71616**
2004	5.3L 323 CID; VIN P	**71616**
Reatta		
V6		
1991	3.8L 3800cc 231 CID; VIN L	**21050**
1990-1988	3.8L 3800cc 231 CID	**21050**
Regal		
L4		
2014-2011	2.0L 1998cc 122 CID; Pump is driven off the timing chain	**21092**
2014-2011	2.4L 2384cc 145 CID; Pump is driven off the timing chain	**21092**
V6		
2004-1996	3.8L 3800cc 231 CID	**21075**
1996-1989	3.1L 189 CID	**11033**
1995-1990	3.8L 3800cc 231 CID; VIN L	**21050**
1989-1988	2.8L 173 CID	**11033**
1987-1986	3.8L 3800cc 231 CID; VIN 7	**31018**
1987-1986	3.8L 3800cc 231 CID; VIN A	**31018**
1985-1982	3.8L 3800cc 231 CID	**31018**
1984-1982	4.1L 252 CID	**31018**
1979	3.8L 231 CID	**31018**
1979-1978	3.2L 196 CID	**31018**
1977-1975	3.8L 231 CID	**31018**
V8		
1987-1986	5.0L 307 CID; VIN Y	**41120**
1983-1982	5.7L 350 CID; DIESEL; VIN N; With A/c	**41120**
1982	5.0L 305 CID; VIN H	**41121**
1982	5.7L 350 CID; DIESEL; VIN N; W/O A/C 1st Design	**41100**
1982-1981	5.7L 350 CID; DIESEL; VIN N; W/O A/C 2nd Design	**41120**
1981	4.4L 267 CID	**41121**
1981-1980	4.3L 265 CID; VIN S	**41975**
1980-1979	4.9L 301 CID	**41975**
1977	5.7L 350 CID; VIN H	**31018**

YEAR	VEHICLE DETAIL	PART NO.
Buick (cont'd)		
Regal (cont'd)		
V8		
1977	5.7L 350 CID; VIN J	**31018**
1977	5.7L 350 CID; VIN L	**41121**
1977	5.7L 350 CID; VIN R; W/O A/C	**41100**
1977	5.7L 350 CID; VIN R; With A/c	**41120**
Rendezvous		
V6		
2006	3.6L 217 CID	**11033**
2005-2004	3.6L 217 CID	**11103**
2005-2002	3.4L 207 CID	**11033**
Riviera		
V6		
1999-1996	3.8L 3800cc 231 CID	**21075**
1995	3.8L 3800cc 231 CID; VIN 1	**21050**
1995	3.8L 3800cc 231 CID; VIN K	**21050**
1993-1991	3.8L 3800cc 231 CID; VIN L	**21050**
1990-1986	3.8L 3800cc 231 CID	**21050**
1984-1981	4.1L 252 CID	**31018**
1984-1979	3.8L 3800cc 231 CID	**31018**
V8		
1985-1981	5.0L 307 CID; GAS; VIN Y; W/O A/C	**41100**
1985-1981	5.0L 307 CID; GAS; VIN Y; With A/c	**41120**
1985-1981	5.7L 350 CID; DIESEL; VIN N; W/O A/C	**41100**
1985-1981	5.7L 350 CID; DIESEL; VIN N; With A/c	**41120**
1980	5.0L 307 CID; VIN Y	**41121**
1977	5.7L 350 CID; VIN J; Aluminum Housing	**31018**
Roadmaster		
V8		
1996-1994	5.7L 350 CID	**41069**
1993-1992	5.7L 350 CID; VIN 7	**41049**
1991	5.0L 305 CID; VIN E	**41049**
Skyhawk		
L4		
1989-1987	2.0L 122 CID; VIN 1	**11032**
1986-1984	1.8L 112 CID; VIN J	**11017**
1986-1983	2.0L 122 CID; VIN P	**21007**
1986-1982	1.8L 112 CID; VIN 0	**11017**
1984-1983	2.0L 122 CID; VIN B	**21007**
1982	1.8L 112 CID; VIN G	**21007**
V6		
1978-1975	3.8L 231 CID	**31018**
Skylark		
L4		
1998-1996	2.4L 2392cc 146 CID; VIN T; Pump is driven off the timing chain	**21076**
1995	2.3L 138 CID; VIN D	**11043**
1994-1988	2.3L 138 CID	**11043**
1991-1986	2.5L 2474cc 151 CID; General Motors Built Eng.; VIN U; With Bolt on Pulley	**21067**

YEAR	VEHICLE DETAIL	PART NO.
Buick (cont'd)		
Skylark (cont'd)		
L4		
1991-1986	2.5L 2474cc 151 CID; VIN U; With Pressed On Pulley	**21000**
1985-1982	2.5L 2474cc 151 CID; VIN R; With Pressed On Pulley	**21000**
1985-1982	2.5L 2474cc 151 CID; VIN R; With Universal Triple Groove Pulley	**31000**
1983-1980	2.5L 2474cc 151 CID; VIN 5; With Pressed On Pulley	**21000**
1983-1980	2.5L 2474cc 151 CID; VIN 5; With Universal Triple Groove Pulley	**31000**
L6		
1971-1968	4.1L 250 CID	**21895**
V6		
1998-1994	3.1L 189 CID	**11033**
1993-1991	3.3L 204 CID	**21050**
1990-1989	3.3L 204 CID; FWD; VIN N	**21050**
1988-1986	3.0L 181 CID; FWD; VIN L	**21050**
1985	2.8L 173 CID; VIN W	**31001**
1985-1981	2.8L 173 CID; VIN X	**31001**
1984-1982	2.8L 173 CID; VIN Z	**31001**
1979-1978	3.8L 3800cc 231 CID	**31018**
1977-1975	3.8L 231 CID	**31018**
V8		
1979-1978	5.0L 305 CID	**41121**
1979-1978	5.7L 350 CID	**41121**
1977	4.9L 301 CID	**41975**
1977-1975	5.7L 350 CID; W/O A/C	**41100**
1977-1975	5.7L 350 CID; With A/c	**41120**
1976-1975	4.3L 260 CID; W/O A/C	**41100**
1976-1975	4.3L 260 CID; With A/c	**41120**
Somerset		
L4		
1987-1986	2.5L 2474cc 151 CID; FWD; VIN U; With Bolt on Pulley	**21067**
1987-1986	2.5L 2474cc 151 CID; FWD; VIN U; With Pressed On Pulley	**21000**
Somerset Regal		
L4		
1985	2.5L 2474cc 151 CID; FWD; VIN U; With Bolt on Pulley	**21067**
1985	2.5L 2474cc 151 CID; FWD; VIN U; With Pressed On Pulley	**21000**
Special		
L6		
1969-1968	4.1L 4097cc 250 CID; Sold in United States	**21895**
1969-1968	4.1L 4098cc 250 CID; Sold in United States	**21895**
Terraza		
V6		
2007-2006	3.9L 3880cc 237 CID	**11006**
2006-2005	3.5L 213 CID	**11033**

YEAR	VEHICLE DETAIL	PART NO.
Buick (cont'd)		
Verano		
L4		
2014-2013	2.0L 1998cc 122 CID; Pump is driven off the timing chain	**21092**
2014-2012	2.4L 145 CID; Pump is driven off the timing chain	**21092**
Cadillac		
ATS		
V6		
2014-2013	3.6L 217 CID	**11103**
Allante		
V8		
1993	4.6L 281 CID	**11064**
1992-1989	4.5L 273 CID	**71023**
1988-1987	4.1L 250 CID	**71023**
Brougham		
V8		
1992-1991	5.0L 305 CID	**41049**
1992-1990	5.7L 350 CID	**41049**
CTS		
V6		
2014-2010	3.0L 182 CID	**11103**
2007-2005	2.8L 2792cc 170 CID	**11103**
2004-2003	3.2L 197 CID; VIN N	**21079**
V8		
2011-2009	6.2L 376 CID	**71619**
2007-2006	6.0L 5967cc 364 CID	**71618**
2005-2004	5.7L 346 CID	**71618**
Catera		
V6		
2001-1997	3.0L 2962cc 181 CID	**21079**
Cimarron		
L4		
1986-1983	2.0L 122 CID	**21007**
1984-1983	2.0L 122 CID	**41038**
1982	1.8L 112 CID	**21007**
V6		
1988-1987	2.8L 173 CID	**11033**
1986-1985	2.8L 173 CID	**11020**
Commercial Chassis		
V8		
1996-1994	5.7L 350 CID	**41069**
1993-1992	5.7L 350 CID	**41049**
1993-1991	4.9L 300 CID; VIN B	**71023**
1990	4.5L 273 CID; VIN 3	**71023**
1989-1988	4.5L 273 CID; VIN 5	**71023**
1987-1985	4.1L 250 CID; VIN 8	**71023**
DTS		
V8		
2011	4.6L 281 CID	**11076**
2010-2006	4.6L 281 CID; VIN 9	**11076**

YEAR	VEHICLE DETAIL	PART NO.
Cadillac (cont'd)		
DTS (cont'd)		
V8		
2010-2006	4.6L 281 CID; VIN Y	**11076**
DeVille		
V6		
1982-1980	4.1L 252 CID	**31018**
V8		
2005-1996	4.6L 281 CID; VIN 9	**11072**
2005-1996	4.6L 281 CID; VIN Y	**11072**
1995-1991	4.9L 300 CID	**71023**
1994	4.6L 281 CID	**11064**
1990	4.5L 273 CID; VIN 3	**71023**
1989-1988	4.5L 273 CID; VIN 5	**71023**
1987-1985	4.1L 250 CID; VIN 8	**71023**
1984-1982	4.1L 250 CID	**41010**
1984-1979	5.7L 350 CID; VIN N	**41120**
1981-1980	6.0L 368 CID	**41003**
1979-1977	7.0L 425 CID	**41003**
1976-1974	8.2L 500 CID	**41003**
1974-1973	7.7L 7735cc 472 CID; 2nd Type, With Single Groove Power Steering Pulley	**41003**
Eldorado		
V6		
1982-1981	4.1L 252 CID	**31018**
V8		
2002-1995	4.6L 281 CID	**11072**
1994-1993	4.6L 281 CID	**11064**
1993-1991	4.9L 300 CID	**71023**
1990-1988	4.5L 273 CID	**71023**
1987-1986	4.1L 250 CID	**71023**
1985-1982	4.1L 250 CID	**41010**
1985-1981	5.7L 350 CID	**41120**
1981-1980	6.0L 368 CID; VIN 9	**41003**
1980	5.7L 350 CID; DIESEL	**41120**
1979	5.7L 350 CID; DIESEL; Sold in United States	**41120**
1978-1977	7.0L 425 CID; VIN S	**41003**
1978-1977	7.0L 425 CID; VIN T	**41003**
1976-1974	8.2L 500 CID; VIN S	**41003**
1973	8.2L 500 CID; VIN S; 2nd Type, With Single Groove Power Steering Pulley	**41003**
Escalade		
V8		
2014-2009	6.2L 376 CID	**71617**
2013-2009	6.0L 5967cc 364 CID	**71617**
2008-2007	6.2L 6199cc 378 CID	**71617**
2006-2002	6.0L 5967cc 364 CID	**71616**
2005-2002	5.3L 325 CID	**71616**
2000-1999	5.7L 350 CID	**41077**

YEAR	VEHICLE DETAIL	PART NO.
Cadillac (cont'd)		
Escalade ESV		
V8		
2014-2011	6.2L 6162cc 376 CID	**71617**
2010-2007	6.2L 6199cc 378 CID	**71617**
2006-2003	6.0L 5967cc 364 CID	**71616**
Escalade EXT		
V8		
2013-2011	6.2L 6162cc 376 CID	**71617**
2010-2007	6.2L 6199cc 378 CID	**71617**
2006-2002	6.0L 5967cc 364 CID	**71616**
Fleetwood		
V6		
1982-1980	4.1L 252 CID; VIN 4	**31018**
V8		
1996-1994	5.7L 350 CID	**41069**
1993	5.7L 350 CID; VIN 7	**41049**
1992-1991	4.9L 300 CID; VIN B	**71023**
1990	4.5L 273 CID; VIN 3	**71023**
1989-1988	4.5L 273 CID; VIN 5	**71023**
1987-1985	4.1L 250 CID; FWD	**71023**
1986	5.0L 307 CID; VIN Y	**41120**
1985-1982	4.1L 250 CID; RWD; VIN 8	**41010**
1985-1979	5.7L 350 CID; DIESEL; VIN N	**41120**
1984-1981	6.0L 368 CID; VIN 9	**41003**
1982	6.0L 368 CID; VIN 6	**41003**
1980	6.0L 368 CID; VIN 6	**41003**
1979-1977	7.0L 425 CID; VIN S	**41003**
1979-1977	7.0L 425 CID; VIN T	**41003**
1976-1975	8.2L 500 CID; VIN S	**41003**
1974-1973	7.7L 7735cc 472 CID; 2nd Type, With Single Groove Power Steering Pulley	**41003**
SRX		
V6		
2014-2012	3.6L 217 CID	**11103**
2011-2010	2.8L 2792cc 170 CID	**11103**
2011-2010	3.0L 182 CID	**11103**
2009-2004	3.6L 217 CID; VIN 7	**11103**
2006-2004	3.6L 217 CID	**11103**
STS		
V6		
2011-2005	3.6L 217 CID	**11103**
Seville		
V6		
1982-1981	4.1L 252 CID; VIN 4	**31018**
V8		
2004-1995	4.6L 281 CID; VIN Y; Special Tool Required	**11072**
2003-1995	4.6L 281 CID; VIN 9; Special Tool Required	**11072**
1994-1993	4.6L 281 CID; Special Tool Required	**41069**
1993-1991	4.9L 300 CID; VIN B	**71023**

YEAR	VEHICLE DETAIL	PART NO.
Cadillac (cont'd)		
Seville (cont'd)		
V8		
1990	4.5L 273 CID; VIN 3	**71023**
1989-1988	4.5L 273 CID; VIN 5	**71023**
1987-1986	4.1L 250 CID; VIN 8	**71023**
1985-1982	4.1L 250 CID; VIN 8	**41010**
1985-1978	5.7L 350 CID; DIESEL; VIN N	**41120**
1981-1980	6.0L 368 CID; VIN 9	**41003**
1980	5.7L 350 CID; VIN 8	**41120**
1979-1978	5.7L 350 CID; VIN B	**41120**
1977-1976	5.7L 350 CID; VIN R	**41120**
XTS		
V6		
2014-2013	3.6L 217 CID	**11103**
Chevrolet		
Astra		
L4		
2008-2007	1.8L 1796cc 110 CID; Sold in Mexico; With 23 Tooth Pulley	**11002**
2006-2004	2.0L 2000cc 122 CID; Sold in Mexico	**99448**
2003-2000	1.8L 1796cc 110 CID; Sold in Mexico; With 23 Tooth Pulley	**11002**
2002-2001	2.2L 2198cc 134 CID; Sold in Mexico	**16375**
Astro		
L4		
1990-1987	2.5L 2474cc 151 CID	**21040**
1986-1985	2.5L 2474cc 151 CID	**31022**
V6		
2005-1996	4.3L 262 CID	**41077**
1995-1987	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID	**41121**
Avalanche		
V8		
2013-2007	5.3L 5328cc 325 CID	**71617**
2009-2007	6.0L 5967cc 364 CID	**71617**
Avalanche 1500		
V8		
2006	5.3L 5328cc 325 CID	**71616**
2005-2002	5.3L 323 CID	**71616**
Avalanche 2500		
V8		
2006-2002	8.1L 496 CID	**51089**
Aveo		
L4		
2011-2009	1.6L 1598cc 98 CID	**11184**
2008-2004	1.6L 1598cc 98 CID	**11003**
Aveo5		
L4		
2011-2009	1.6L 1598cc 98 CID	**11184**
2008-2006	1.6L 1598cc 98 CID	**11003**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
B60		
V8		
1991	6.0L 366 CID	**71078**
1990-1980	6.0L 366 CID	**71084**
1985-1980	7.0L 427 CID	**71084**
B7		
V8		
2002-2001	8.1L 496 CID	**41090**
2000-1999	7.4L 454 CID	**61094**
1998-1997	6.5L 395 CID	**51074**
1998-1994	7.0L 7011cc 427 CID	**71078**
1998-1993	6.0L 366 CID	**71078**
Bel Air		
L6		
1973-1968	4.1L 250 CID	**21895**
1967-1965	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967-1965	4.1L 4098cc 250 CID; Sold in United States	**21895**
1965-1963	3.8L 3769cc 230 CID	**21895**
1962-1961	3.8L 3852cc 235 CID	**31563**
1959-1955	3.8L 3852cc 235 CID	**31563**
V8		
1981	4.4L 267 CID	**41121**
1975-1972	5.7L 350 CID	**41109**
1975-1972	6.6L 400 CID	**41109**
1975-1972	7.4L 454 CID	**41002**
1971-1970	5.7L 5736cc 350 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/4 Bbl Carb	**41002**
1971-1970	7.4L 454 CID; W/4 Bbl Carb	**41002**
1969	5.3L 5358cc 327 CID	**41109**
1969	5.7L 5736cc 350 CID	**41109**
1969	6.5L 6489cc 396 CID	**41002**
1969	7.0L 6998cc 427 CID	**41002**
1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1964-1962	5.3L 5358cc 327 CID	**41898**
1964-1957	4.6L 4638cc 283 CID	**41898**
1957-1955	4.3L 4343cc 265 CID	**41898**
Beretta		
L4		
1996-1992	2.2L 2190cc 134 CID	**11032**
1994-1990	2.3L 140 CID	**11043**
1991-1990	2.2L 134 CID	**11032**
1989-1987	2.0L 122 CID	**11032**
V6		
1996-1990	3.1L 189 CID	**11033**
1989-1987	2.8L 173 CID	**11033**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Biscayne		
L6		
1972-1968	4.1L 250 CID	**21895**
1967-1965	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967-1965	4.1L 4098cc 250 CID; Sold in United States	**21895**
1965-1963	3.8L 3769cc 230 CID	**21895**
1962-1961	3.8L 3852cc 235 CID	**31563**
1959-1958	3.8L 3852cc 235 CID	**31563**
V8		
1972	5.7L 350 CID	**41109**
1972	6.6L 400 CID	**41109**
1972	7.4L 454 CID	**41002**
1971-1970	5.7L 5736cc 350 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/4 Bbl Carb	**41002**
1971-1970	7.4L 454 CID; W/4 Bbl Carb	**41002**
1969	5.3L 5358cc 327 CID	**41109**
1969	5.7L 5736cc 350 CID	**41109**
1969	6.5L 6489cc 396 CID	**41002**
1969	7.0L 6998cc 427 CID	**41002**
1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1964-1962	5.3L 5358cc 327 CID	**41898**
1964-1958	4.6L 4638cc 283 CID	**41898**
Blazer		
L6		
1974-1972	4.1L 250 CID	**21895**
1973	4.8L 292 CID	**31896**
1971-1969	4.1L 4097cc 250 CID	**21895**
1970	4.8L 4801cc 292 CID	**31896**
V6		
2005-1996	4.3L 262 CID	**41077**
1995	4.3L 262 CID	**41049**
V8		
1994	6.5L 395 CID	**51062**
1994-1989	5.7L 350 CID	**41049**
1991-1987	6.2L 379 CID	**51008**
1988-1987	5.7L 350 CID	**41121**
1987	5.0L 305 CID	**41121**
1974-1973	5.7L 350 CID	**41109**
1973	7.4L 454 CID	**41002**
1973-1972	5.0L 5031cc 307 CID	**41109**
1972	5.7L 5736cc 350 CID	**41109**
1971-1969	5.0L 5031cc 307 CID	**41898**
1971-1969	5.7L 5736cc 350 CID	**41898**
C10		
L6		
1984-1978	4.1L 250 CID	**21107**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
C10 (cont'd)		
L6		
1980-1978	4.8L 292 CID	**21030**
1977-1975	4.1L 250 CID	**21110**
1977-1975	4.8L 292 CID	**21137**
V6		
1986-1985	4.3L 262 CID	**41121**
V8		
1986-1985	5.7L 350 CID; GAS; VIN M	**41121**
1986-1982	5.7L 350 CID; GAS; VIN L	**41121**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51008**
1986-1981	5.0L 305 CID; GAS; VIN F	**41121**
1986-1981	5.0L 305 CID; GAS; VIN H	**41121**
1985	6.2L 379 CID; DIESEL; VIN J	**51008**
1983-1982	5.7L 350 CID; GAS; VIN M	**41121**
1982	6.2L 379 CID; DIESEL; VIN J	**51008**
1981-1980	5.0L 305 CID; GAS; VIN G	**41121**
1981-1980	5.7L 350 CID; DIESEL; W/O A/C	**41100**
1981-1980	5.7L 350 CID; GAS	**41121**
1981-1978	5.7L 350 CID; DIESEL	**41120**
1980	7.4L 454 CID; VIN W	**41002**
1980-1977	6.6L 400 CID	**41121**
1980-1976	7.4L 454 CID; VIN S	**41002**
1979-1977	5.0L 305 CID; GAS; VIN U	**41121**
1979-1977	5.7L 350 CID; GAS; VIN L	**41121**
1976	6.6L 400 CID	**41109**
1976-1975	5.7L 350 CID	**41109**
1975	7.4L 454 CID; VIN Z	**41002**
C10 Pickup		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1971-1968	4.1L 4097cc 250 CID	**21895**
1971-1965	4.8L 4801cc 292 CID	**31896**
1967-1966	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967-1966	4.1L 4098cc 250 CID; Sold in United States	**21895**
1966-1963	3.8L 3769cc 230 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID; VIN Z	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972	5.7L 350 CID	**41898**
1972-1970	6.6L 6588cc 402 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1971-1969	5.7L 5736cc 350 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1967-1961	4.6L 4638cc 283 CID	**41898**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
C10 Suburban		
L6		
1980-1978	4.1L 250 CID	**21107**
1977-1975	4.1L 250 CID	**21110**
1974-1973	4.8L 292 CID	**31896**
1971-1968	4.8L 4801cc 292 CID	**31896**
V8		
1986-1982	5.0L 305 CID; VIN F	**41121**
1986-1982	6.2L 379 CID	**51008**
1986-1981	5.0L 305 CID; VIN H	**41121**
1980	5.0L 305 CID; VIN G	**41121**
1980	5.7L 350 CID; DIESEL; W/O A/C	**41100**
1980	7.4L 454 CID; VIN W	**41002**
1980-1978	5.7L 350 CID; DIESEL; With A/c	**41120**
1980-1976	7.4L 454 CID; VIN S	**41002**
1979-1977	5.0L 305 CID; VIN U	**41121**
1975-1973	7.4L 454 CID; VIN Z	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1972	6.6L 6588cc 402 CID; VIN U	**41898**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1971	6.6L 6588cc 402 CID; VIN K	**41898**
1970	6.6L 6588cc 402 CID; VIN E	**41898**
1968	5.3L 5358cc 327 CID	**41898**
C1500		
V6		
1998-1996	4.3L 262 CID	**41077**
1995-1988	4.3L 262 CID	**41049**
V8		
1999-1996	5.0L 305 CID	**41077**
1999-1996	5.7L 350 CID	**41077**
1998-1997	6.5L 395 CID; w/ Drilled & Tapped Hub For Bold On Pulley & Fan Clutch	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat; 1st Design	**51062**
1996	6.5L 395 CID; Double Thermostat; 2nd Design	**51074**
1995-1994	6.5L 395 CID	**51062**
1995-1993	5.0L 305 CID	**41049**
1995-1993	5.7L 350 CID	**41049**
1993-1990	7.4L 454 CID	**41038**
1993-1988	6.2L 379 CID	**51062**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; With 6.9" Hub Height	**41049**
1991-1988	5.0L 305 CID	**41049**
1991-1988	5.7L 350 CID	**41049**
C1500 Suburban		
V8		
1999	6.5L 395 CID; DIESEL; VIN F; With Pressed On Pulley	**51086**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
C1500 Suburban (cont'd)		
V8		
1999	6.5L 395 CID; VIN F; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1999-1996	5.7L 350 CID	**41077**
1998-1996	6.5L 395 CID; VIN F	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat; 1st Design	**51062**
1995	6.5L 395 CID; DIESEL; VIN F	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1994	5.7L 350 CID	**51062**
1992	5.7L 350 CID; Reverse Rotation; With 6.9" Hub Height	**41049**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
C20		
L6		
1986-1978	4.8L 292 CID	**21030**
1984-1978	4.1L 250 CID	**21107**
1977-1975	4.1L 250 CID	**21110**
1977-1975	4.8L 292 CID	**21137**
V6		
1986-1985	4.3L 262 CID	**41121**
V8		
1986-1982	5.7L 350 CID; GAS; VIN L	**41121**
1986-1982	5.7L 350 CID; GAS; VIN M	**41121**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51008**
1986-1982	6.2L 379 CID; DIESEL; VIN J	**51008**
1986-1981	5.0L 305 CID; GAS; VIN H	**41121**
1986-1980	7.4L 454 CID; VIN W	**41002**
1981-1980	5.7L 350 CID; GAS	**41121**
1980	5.0L 305 CID; GAS; VIN G	**41121**
1980-1977	6.6L 400 CID	**41121**
1980-1976	7.4L 454 CID; VIN S	**41002**
1979-1977	5.0L 305 CID; GAS; VIN U	**41121**
1979-1977	5.7L 350 CID; GAS; VIN L	**41121**
1976	6.6L 400 CID	**41109**
1976-1975	5.7L 350 CID	**41109**
1975	7.4L 454 CID; VIN Z	**41002**
C20 Pickup		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1965	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1967-1966	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967-1966	4.1L 4098cc 250 CID; Sold in United States	**21895**
1965-1963	3.8L 3769cc 230 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
C20 Pickup (cont'd)		
V8		
1974-1973	7.4L 454 CID; VIN Z	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1970	6.6L 6588cc 402 CID	**41898**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1967-1961	4.6L 4638cc 283 CID	**41898**
C20 Suburban		
L6		
1982-1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID; VIN T	**21137**
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1968	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
V8		
1986-1982	6.2L 379 CID	**51008**
1986-1981	5.0L 305 CID; VIN H	**41121**
1986-1980	7.4L 454 CID; VIN W	**41002**
1980	5.0L 305 CID; VIN G	**41121**
1980-1977	6.6L 400 CID	**41121**
1980-1976	7.4L 454 CID; VIN S	**41002**
1979-1977	5.0L 305 CID; VIN U	**41121**
1976	6.6L 400 CID; VIN U	**41109**
1975-1973	7.4L 454 CID; VIN Z	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1972	6.6L 6588cc 402 CID; VIN U	**41898**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1971	6.6L 6588cc 402 CID; VIN K	**41898**
1970	6.6L 6588cc 402 CID; VIN E	**41898**
1968	5.3L 5358cc 327 CID	**41898**
C2500		
V6		
1995-1988	4.3L 262 CID	**41049**
V8		
2000-1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
2000-1996	5.7L 350 CID	**41077**
2000-1991	7.4L 454 CID	**41038**
1999-1997	6.5L 395 CID; w/ Drilled & Tapped Hub For Bold On Pulley & Fan Clutch	**51074**
1998-1996	5.0L 305 CID	**41077**
1996	6.5L 395 CID; DIESEL; Single Thermostat; 1st Design	**51062**
1996	6.5L 395 CID; Double Thermostat; 2nd Design	**51074**
1995-1993	5.0L 305 CID	**41049**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
C2500 (cont'd)		
V8		
1995-1993	5.7L 350 CID	**41049**
1995-1992	6.5L 395 CID	**51062**
1993-1988	6.2L 379 CID	**51062**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; With 6.9" Hub Height	**41049**
1991-1988	5.0L 305 CID	**41049**
1991-1988	5.7L 350 CID	**41049**
C2500 Suburban		
V8		
1999	6.5L 395 CID; DIESEL; VIN F; With Pressed On Pulley	**51086**
1999	6.5L 395 CID; VIN F; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1999-1996	5.7L 350 CID	**41077**
1999-1996	7.4L 454 CID; VIN J; Reverse Rotation	**41038**
1998-1996	6.5L 395 CID; VIN F	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat; 1st Design	**51062**
1995-1994	6.5L 395 CID; DIESEL; VIN F	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1992	7.4L 454 CID; VIN N; Reverse Rotation	**41038**
1992	5.7L 350 CID; Reverse Rotation; With 6.9" Hub Height	**41049**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
C30		
L6		
1986-1978	4.8L 292 CID	**21030**
1980-1978	4.1L 250 CID	**21107**
1977-1975	4.8L 292 CID	**21137**
1975	4.1L 250 CID	**21110**
V8		
1986	5.0L 305 CID; GAS; VIN H	**41121**
1986-1982	5.7L 350 CID; GAS; VIN M	**41121**
1986-1982	6.2L 379 CID; DIESEL; VIN J	**51008**
1986-1980	7.4L 454 CID; VIN W	**41002**
1983	5.7L 350 CID; GAS; VIN L	**41121**
1981-1980	5.7L 350 CID; GAS	**41121**
1980-1976	7.4L 454 CID; VIN S	**41002**
1979-1978	5.0L 305 CID; GAS; VIN U	**41121**
1979-1977	5.7L 350 CID; GAS; VIN L	**41121**
1979-1977	6.6L 400 CID	**41121**
1978	5.7L 350 CID; DIESEL	**41120**
1976	6.6L 400 CID	**41109**
1976-1975	5.7L 350 CID	**41109**
1975	7.4L 454 CID; VIN Z	**41002**
C30 Pickup		
L6		
1974-1973	4.8L 292 CID	**31896**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
C30 Pickup (cont'd)		
L6		
1974-1972	4.1L 250 CID	**21895**
1972-1965	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1967-1966	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967-1966	4.1L 4098cc 250 CID; Sold in United States	**21895**
1965-1964	3.8L 3769cc 230 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID; VIN Z	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1970	6.6L 6588cc 402 CID	**41898**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1967-1961	4.6L 4638cc 283 CID	**41898**
C3500		
V8		
2004-2003	5.7L 350 CID	**41077**
2003-2001	8.1L 496 CID	**41090**
2003-2001	8.1L 496 CID; RWD	**41090**
2000-1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
2000-1996	5.7L 350 CID	**41077**
2000-1988	7.4L 454 CID	**41038**
1999	6.5L 395 CID; Double Thermostat; w/ Drilled & Tapped Hub For Bold On Pulley & Fan Clutch	**51074**
1998-1997	6.5L 395 CID; w/ Drilled & Tapped Hub For Bold On Pulley & Fan Clutch	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat; 1st Design	**51062**
1996	6.5L 395 CID; Double Thermostat; 2nd Design	**51074**
1995-1993	5.7L 350 CID	**41049**
1995-1992	6.5L 395 CID	**51062**
1993-1988	6.2L 379 CID	**51062**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; With 6.9" Hub Height	**41049**
1991-1988	5.7L 350 CID	**41049**
C3500HD		
V8		
1999-1996	6.5L 395 CID	**51074**
1995-1992	5.7L 350 CID	**41073**
C4500 Kodiak		
V8		
2009-2006	6.6L 403 CID	**71053**
2009-2003	8.1L 496 CID	**41090**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
C4500 Kodiak (cont'd)		
V8		
2005-2003	6.6L 403 CID	**21098**
C5500 Kodiak		
V8		
2009-2006	6.6L 403 CID	**71053**
2009-2003	8.1L 496 CID	**41090**
2005-2003	6.6L 403 CID	**21098**
1991	6.0L 366 CID	**71078**
1990	6.0L 366 CID	**71084**
C60		
V8		
1990	7.0L 427 CID	**71084**
1990-1980	6.0L 366 CID	**71084**
C60 Kodiak		
V8		
1996-1990	6.0L 366 CID	**71078**
1996-1990	7.0L 7011cc 427 CID	**71078**
C6500 Kodiak		
V8		
2009-2001	8.1L 496 CID	**41090**
2000-1999	7.4L 454 CID	**61094**
1998-1997	6.0L 366 CID	**71078**
1998-1997	7.0L 7011cc 427 CID	**71078**
C70		
V8		
1990-1980	6.0L 366 CID	**71084**
1990-1980	7.0L 427 CID	**71084**
1980	7.4L 454 CID	**71084**
C70 Kodiak		
V8		
1996-1991	6.0L 366 CID	**71078**
1996-1991	7.0L 7011cc 427 CID	**71078**
1990	6.0L 366 CID	**71084**
1990	7.0L 7011cc 427 CID	**71084**
C7500 Kodiak		
V8		
2009-2001	8.1L 496 CID	**41090**
2000-1999	7.4L 454 CID	**61094**
1998-1997	6.0L 366 CID	**71078**
1998-1997	7.0L 7011cc 427 CID	**71078**
Camaro		
L4		
1986-1985	2.5L 2474cc 151 CID	**31022**
1984-1982	2.5L 2474cc 151 CID	**21107**
L6		
1979-1975	4.1L 250 CID	**21107**
1974-1968	4.1L 250 CID	**21895**
1969-1967	3.8L 3769cc 230 CID	**21895**
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Camaro (cont'd)		
L6		
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
V6		
2014-2010	3.6L 217 CID	**11103**
2002-1996	3.8L 3800cc 231 CID	**21075**
1995	3.8L 3800cc 231 CID	**21050**
1995-1993	3.4L 207 CID	**31070**
1992-1990	3.1L 189 CID	**31037**
1989-1987	2.8L 173 CID	**31037**
1986-1985	2.8L 173 CID	**31001**
1984-1982	2.8L 173 CID	**41006**
1981-1980	3.8L 229 CID	**31018**
1981-1980	3.8L 3800cc 231 CID	**31018**
V8		
2002-1998	5.7L 350 CID	**71615**
1997-1993	5.7L 350 CID	**41068**
1992-1988	5.0L 305 CID	**41049**
1992-1988	5.7L 350 CID	**41049**
1987	5.7L 350 CID	**41121**
1987-1977	5.0L 305 CID	**41121**
1981-1980	4.4L 267 CID	**41121**
1981-1977	5.7L 350 CID	**41121**
1976	5.0L 305 CID	**41109**
1976-1975	5.7L 350 CID	**41109**
1973-1972	5.7L 350 CID	**41109**
1973-1969	5.0L 5031cc 307 CID	**41109**
1972-1970	6.6L 6588cc 402 CID	**41002**
1971-1969	5.7L 5736cc 350 CID	**41109**
1969	4.9L 4949cc 302 CID	**41109**
Caprice		
L6		
1979-1977	4.1L 250 CID	**21107**
1969-1968	4.1L 250 CID	**21895**
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
V6		
2014-2012	3.6L 217 CID	**11103**
1993-1992	4.3L 262 CID	**41049**
1990-1989	4.3L 262 CID	**41049**
1988-1985	4.3L 262 CID; VIN Z	**41121**
1985	3.8L 3800cc 231 CID	**31018**
1984-1983	3.8L 229 CID; VIN 9	**41121**
1984-1980	3.8L 3800cc 231 CID; VIN A	**31018**
1982-1980	3.8L 229 CID; VIN K	**41121**
V8		
2011	6.0L 5967cc 364 CID	**71619**
1996-1994	4.3L 265 CID	**41069**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Caprice (cont'd)		
V8		
1996-1994	5.7L 350 CID; Includes Police	**41069**
1993-1989	5.0L 305 CID; VIN E	**41049**
1993-1989	5.7L 350 CID; VIN 7	**41049**
1990-1986	5.0L 307 CID; VIN Y	**41120**
1988-1982	5.0L 305 CID; Includes Police	**41121**
1988-1982	5.7L 350 CID; Includes Police	**41121**
1985-1980	5.7L 350 CID; DIESEL; VIN N; Without A/c; With A/c	**41120**
1982	5.7L 350 CID; DIESEL; W/O A/C 1st Design	**41100**
1982	5.7L 350 CID; DIESEL; With A/c; W/O A/C 2nd Design	**41120**
1982-1980	4.4L 267 CID	**41121**
1981-1980	5.7L 350 CID; DIESEL; VIN N; W/O A/C	**41100**
1981-1980	5.7L 350 CID; Excluding Diesel	**41121**
1981-1977	5.0L 305 CID	**41121**
1979-1977	5.7L 350 CID	**41121**
1976-1972	5.7L 350 CID	**41109**
1976-1972	6.6L 400 CID	**41109**
1976-1972	7.4L 454 CID	**41002**
1971-1970	5.7L 5736cc 350 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/4 Bbl Carb	**41002**
1971-1970	7.4L 454 CID; W/4 Bbl Carb	**41002**
1969	6.5L 6489cc 396 CID	**41002**
1969	7.0L 6998cc 427 CID	**41002**
1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
Captiva Sport		
L4		
2014-2012	2.4L 145 CID; Pump is driven off the timing chain	**21092**
V6		
2012	3.0L 182 CID	**11103**
Cavalier		
L4		
2005-2003	2.2L 2198cc 134 CID; VIN F; Pump is driven off the timing chain	**21092**
2004-2003	2.2L 134 CID; VIN 6; Pump is driven off the timing chain	**21092**
2002	2.2L 2198cc 134 CID	**11032**
2002-1996	2.4L 2392cc 146 CID; Pump is driven off the timing chain	**21076**
2002-1992	2.2L 2190cc 134 CID	**11032**
1995	2.3L 138 CID	**11043**
1991-1990	2.2L 134 CID	**11032**
1989-1987	2.0L 122 CID	**11032**
1986-1983	2.0L 122 CID	**21007**
1982	1.8L 112 CID	**21007**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Cavalier (cont'd)		
V6		
1994-1990	3.1L 189 CID	**11033**
1989-1987	2.8L 173 CID	**11033**
1986-1985	2.8L 173 CID	**11020**
Celebrity		
L4		
1990-1987	2.5L 2474cc 151 CID	**31041**
1986-1982	2.5L 2474cc 151 CID; With Pressed On Pulley	**21000**
1986-1982	2.5L 2474cc 151 CID; With Universal Triple Groove Pulley	**31000**
V6		
1990	3.1L 189 CID	**11033**
1989-1987	2.8L 173 CID	**11033**
1986-1982	2.8L 173 CID	**31001**
Chevelle		
L6		
1973-1968	4.1L 250 CID	**21895**
1969-1968	3.8L 3769cc 230 CID	**21895**
V8		
1973-1972	5.0L 5031cc 307 CID	**41109**
1973-1972	5.7L 350 CID	**41109**
1973-1972	7.4L 454 CID	**41002**
1972	6.6L 6588cc 402 CID	**41109**
1971	5.0L 5031cc 307 CID; W/2 Bbl Carb	**41109**
1971	5.7L 5736cc 350 CID; W/2 Bbl Carb	**41109**
1971	6.6L 400 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/4 Bbl Carb	**41002**
1971-1970	7.4L 454 CID; W/4 Bbl Carb	**41002**
1970	6.5L 396 CID; W/4 Bbl Carb	**41002**
1970-1969	5.0L 5031cc 307 CID	**41109**
1970-1969	5.7L 5736cc 350 CID	**41109**
1969	6.5L 6489cc 396 CID	**41002**
1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1967-1966	4.6L 4638cc 283 CID	**41898**
1965-1964	4.6L 4638cc 283 CID; W/O A/C; w/ A/c	**41898**
1965-1964	5.3L 5358cc 327 CID; W/O A/C; w/ A/c	**41898**
Chevette		
L4		
1987-1985	1.6L 98 CID; VIN C	**31004**
1986-1985	1.8L 1819cc 110 CID; DIESEL; VIN D	**21027**
1984-1981	1.8L 1819cc 110 CID; DIESEL; VIN D	**31009**
1984-1976	1.6L 98 CID	**31004**
1977-1976	1.4L 1393cc 85 CID	**31004**
Chevy		
L4		
2002-1998	1.4L 1389cc 85 CID; Sold in Mexico; Driven off the timing belt	**11057**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Chevy (cont'd)		
L4		
1997-1996	1.6L 1600cc 98 CID; Sold in Mexico; Driven off the timing belt	**11057**
1997-1995	1.4L 1400cc 85 CID; Sold in Mexico; Driven off the timing belt	**11057**
Chevy II		
L4		
1968-1962	2.5L 2507cc 153 CID	**21895**
L6		
1968	3.8L 3769cc 230 CID; Without A/c	**21895**
1968	4.1L 250 CID; Without A/c	**21895**
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
1967-1962	3.2L 3180cc 194 CID	**21895**
1966-1964	3.8L 3769cc 230 CID	**21895**
V8		
1968	5.0L 5031cc 307 CID	**41898**
1968	5.7L 5736cc 350 CID	**41898**
1968	6.5L 6489cc 396 CID	**51981**
1968-1965	5.3L 5358cc 327 CID	**41898**
1967-1963	4.6L 4638cc 283 CID	**41898**
Chevy Monza		
L4		
2003	1.6L 1597cc 97 CID; Sold in Mexico; Driven off the timing belt	**11057**
Citation		
L4		
1983-1980	2.5L 2474cc 151 CID; With Pressed On Pulley	**21000**
1983-1980	2.5L 2474cc 151 CID; With Universal Triple Groove Pulley	**31000**
V6		
1983-1980	2.8L 173 CID	**31001**
Citation II		
L4		
1985-1984	2.5L 2474cc 151 CID; With Pressed On Pulley	**21000**
1985-1984	2.5L 2474cc 151 CID; With Universal Triple Groove Pulley	**31000**
V6		
1985-1984	2.8L 173 CID	**31001**
Classic		
L4		
2005-2004	2.2L 2198cc 134 CID; VIN F; Pump is driven off the timing chain	**21092**
Cobalt		
L4		
2010-2008	2.0L 1998cc 122 CID; Pump is driven off the timing chain	**21092**
2010-2005	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Cobalt (cont'd)		
L4		
2008-2006	2.4L 145 CID; VIN B; Pump is driven off the timing chain	**21092**
2007-2005	2.0L 122 CID; Pump is driven off the timing chain	**21092**
Colorado		
L4		
2012-2007	2.9L 2921cc 178 CID	**21097**
L5		
2012-2007	3.7L 3654cc 223 CID	**21097**
2006-2004	3.5L 3460cc 211 CID	**21097**
V8		
2012-2010	5.3L 325 CID	**71617**
2009	5.3L 5328cc 325 CID	**71617**
Commercial Chassis		
V8		
1994-1991	5.7L 350 CID	**41069**
Corsa		
L4		
2008-2003	1.8L 1796cc 110 CID; Sold in Mexico	**11001**
Corsica		
L4		
1996-1992	2.2L 2190cc 134 CID	**11032**
1991-1990	2.2L 134 CID	**11032**
1989-1987	2.0L 122 CID	**11032**
V6		
1996-1990	3.1L 189 CID	**11033**
1989-1987	2.8L 173 CID	**11033**
Corvette		
V8		
2011-2009	6.2L 376 CID	**71619**
2011-2009	7.0L 7011cc 427 CID	**71619**
2008	6.2L 376 CID	**71618**
2008-2006	7.0L 7011cc 427 CID	**71618**
2007-2005	6.0L 5967cc 364 CID	**71618**
2004-1997	5.7L 350 CID	**71615**
1996	5.7L 350 CID	**41066**
1996	5.7L 350 CID; VIN 5	**41066**
1996-1993	5.7L 350 CID; VIN P	**41066**
1995-1990	5.7L 350 CID; VIN J; ZR-1	**41056**
1992	5.7L 350 CID; VIN J	**41063**
1991-1984	5.7L 350 CID	**41016**
1982-1974	5.7L 350 CID; With Upper Heater Outlet	**41984**
1980	5.0L 305 CID; VIN H; With Upper Heater Outlet	**41984**
1973	5.7L 5736cc 350 CID; With Upper Heater Outlet	**41984**
1972	5.7L 350 CID; With Upper Heater Outlet	**41984**
1971	5.7L 5736cc 350 CID; With Upper Heater Outlet	**41984**
1970-1969	5.7L 5736cc 350 CID	**41898**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Corvette (cont'd)		
V8		
1968-1962	5.3L 5358cc 327 CID	**41898**
1961-1957	4.6L 4638cc 283 CID	**41898**
1956-1955	4.3L 4343cc 265 CID	**41898**
Cruze		
L4		
2014-2011	1.4L 1364cc 83 CID	**21662**
2014-2011	1.8L 1796cc 110 CID	**11184**
Del Ray		
L6		
1958	3.8L 3852cc 235 CID	**31563**
V8		
1958	4.6L 4638cc 283 CID	**41898**
El Camino		
L6		
1977-1975	4.1L 250 CID	**21107**
1974-1968	4.1L 250 CID	**21895**
1969-1968	3.8L 3769cc 230 CID	**21895**
V6		
1987-1985	4.3L 262 CID	**41121**
1984-1980	3.8L 229 CID	**41121**
1984-1980	3.8L 3800cc 231 CID	**31018**
1979	3.8L 231 CID	**41121**
1979-1978	3.3L 200 CID; VIN M	**41121**
1979-1978	3.8L 3800cc 231 CID; VIN A	**31018**
V8		
1987-1977	5.0L 305 CID	**41121**
1984-1983	5.7L 350 CID; DIESEL	**41120**
1982-1979	4.4L 267 CID	**41121**
1979-1977	5.7L 350 CID	**41121**
1976	5.0L 305 CID	**41109**
1976-1974	6.6L 400 CID	**41109**
1976-1972	5.7L 350 CID	**41109**
1975-1972	7.4L 454 CID	**41002**
1973-1972	5.0L 5031cc 307 CID	**41109**
1972	6.6L 6588cc 402 CID	**41002**
1971	5.0L 5031cc 307 CID; W/2 Bbl Carb	**41109**
1971	5.7L 5736cc 350 CID; W/2 Bbl Carb	**41109**
1971-1970	7.4L 454 CID; W/4 Bbl Carb	**41002**
1970	6.5L 396 CID; W/4 Bbl Carb	**41002**
1970	6.6L 6555cc 400 CID; W/4 Bbl Carb	**41002**
1970-1969	5.0L 5031cc 307 CID	**41109**
1970-1969	5.7L 5736cc 350 CID	**41109**
1969	6.5L 6489cc 396 CID	**41002**
1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1967-1966	4.6L 4638cc 283 CID	**41898**
1965-1964	4.6L 4638cc 283 CID; W/O A/C; w/ A/c	**41898**
1965-1964	5.3L 5358cc 327 CID; W/O A/C; w/ A/c	**41898**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Equinox		
L4		
2014-2012	2.4L 145 CID; Pump is driven off the timing chain	**21092**
2011	2.4L 2384cc 145 CID; Pump is driven off the timing chain	**21092**
2010	2.4L 145 CID; Pump is driven off the timing chain	**21092**
V6		
2014-2013	3.6L 217 CID	**11103**
2012-2010	3.0L 182 CID	**11103**
2009	3.4L 207 CID; VIN F	**11145**
2009-2008	3.6L 217 CID	**11103**
2008-2005	3.4L 207 CID	**11145**
Express 1500		
V6		
2014-1997	4.3L 262 CID	**41077**
1996	4.3L 262 CID; Base	**41077**
1996	4.3L 262 CID; LS	**41077**
V8		
2014-2007	5.3L 5328cc 325 CID	**71617**
2006-2003	5.3L 323 CID	**71616**
2002-1996	5.0L 305 CID	**41077**
2002-1996	5.7L 350 CID; VIN R	**41077**
2000-1997	5.7L 350 CID	**41077**
1996	5.7L 350 CID; Base	**41077**
1996	5.7L 350 CID; LS	**41077**
Express 2500		
V6		
2004-1997	4.3L 262 CID	**41077**
1996	4.3L 262 CID; Base	**41077**
1996	4.3L 262 CID; LS	**41077**
V8		
2014-2007	4.8L 294 CID	**71617**
2014-2007	6.0L 5967cc 364 CID	**71617**
2013-2006	6.6L 400 CID	**71053**
2006-2003	4.8L 294 CID	**71616**
2006-2003	6.0L 5967cc 364 CID	**71616**
2005-2003	5.3L 323 CID	**71616**
2002-1999	6.5L 395 CID; DIESEL	**51086**
2002-1996	5.0L 305 CID	**41077**
2002-1996	5.7L 350 CID; VIN R	**41077**
2000-1997	5.7L 350 CID	**41077**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	5.7L 350 CID; Base	**41077**
1996	5.7L 350 CID; LS	**41077**
1996	6.5L 395 CID	**51062**
Express 3500		
V8		
2014-2007	4.8L 294 CID	**71617**
2014-2007	6.0L 5967cc 364 CID	**71617**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Express 3500 (cont'd)		
V8		
2013-2006	6.6L 400 CID	**71053**
2006-2005	4.8L 294 CID	**71616**
2006-2003	6.0L 5967cc 364 CID	**71616**
2002-2001	8.1L 496 CID	**41090**
2002-1999	6.5L 395 CID; DIESEL	**51086**
2002-1996	5.7L 350 CID; VIN R	**41077**
2000-1997	5.7L 350 CID	**41077**
2000-1996	7.4L 454 CID	**41038**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	5.7L 350 CID; Base	**41077**
1996	5.7L 350 CID; LS	**41077**
1996	6.5L 395 CID	**51062**
Express 4500		
V8		
2013-2009	6.0L 5967cc 364 CID	**71617**
2013-2009	6.6L 400 CID	**71053**
G10		
L6		
1984-1978	4.1L 250 CID; VIN D	**21107**
1977-1975	4.1L 250 CID	**21110**
V6		
1995-1987	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID; VIN N	**41121**
V8		
1995-1987	5.0L 305 CID; VIN H; With Serpentine Belt	**41049**
1993-1987	5.7L 350 CID; VIN K; With Serpentine Belt	**41049**
1988-1987	5.7L 350 CID; VIN K; Without Serpentine Belt	**41121**
1986-1982	5.0L 305 CID; VIN F	**41121**
1986-1982	5.7L 350 CID; VIN L; Without Serpentine Belt	**41121**
1986-1981	5.0L 305 CID; VIN H	**41121**
1981	5.0L 305 CID; VIN G	**41121**
1981-1977	5.7L 350 CID; VIN L	**41121**
1980	5.0L 305 CID	**41121**
G10 Van		
L6		
1974-1967	4.1L 250 CID	**21895**
1969-1966	3.8L 230 CID	**21895**
1964	3.2L 194 CID	**21895**
V8		
1971-1970	5.7L 350 CID	**41898**
1971-1968	5.0L 307 CID	**41898**
G20		
L6		
1984-1978	4.1L 250 CID; VIN D	**21107**
1978	4.8L 292 CID	**21030**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
G20 (cont'd)		
L6		
1977-1975	4.1L 250 CID	**21110**
1977-1975	4.8L 292 CID	**21137**
V6		
1995-1987	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID; VIN N	**41121**
V8		
1995-1994	6.5L 395 CID; DIESEL; VIN P	**51062**
1995-1987	5.0L 305 CID; VIN H; With Serpentine Belt	**41049**
1995-1987	5.7L 350 CID; VIN K; With Serpentine Belt	**41049**
1993-1983	6.2L 379 CID; VIN C	**51008**
1988-1987	5.7L 350 CID; VIN K; Without Serpentine Belt	**41121**
1986-1984	5.7L 350 CID; VIN M; Without Serpentine Belt	**41121**
1986-1982	5.7L 350 CID; VIN L; Without Serpentine Belt	**41121**
1986-1981	5.0L 305 CID; VIN F	**41121**
1986-1981	5.0L 305 CID; VIN H	**41121**
1985-1984	6.2L 379 CID; VIN J	**51008**
1982	5.7L 350 CID; VIN M; Without Serpentine Belt	**41121**
1981	5.0L 305 CID; VIN G	**41121**
1981-1980	5.7L 350 CID; VIN M	**41121**
1981-1977	5.7L 350 CID; VIN L	**41121**
1980	5.0L 305 CID	**41121**
G20 Van		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1971	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1969-1967	3.8L 3769cc 230 CID	**21895**
V8		
1971-1970	5.7L 5736cc 350 CID	**41898**
1970-1968	5.0L 5031cc 307 CID	**41898**
G30		
L6		
1984-1981	4.1L 250 CID; VIN D	**21107**
1979-1978	4.1L 250 CID; VIN D	**21107**
1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID	**21137**
1976	4.1L 250 CID	**21110**
V6		
2002-2001	4.3L 262 CID	**41077**
1996-1987	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID; VIN N	**41121**
V8		
1996	5.7L 350 CID; VIN K	**41049**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
G30 (cont'd)		
V8		
1996	6.5L 395 CID	**51074**
1996	6.5L 395 CID; VIN Y	**51062**
1996-1988	7.4L 454 CID	**41038**
1995-1994	6.5L 395 CID; DIESEL; VIN Y	**51062**
1995-1987	5.7L 350 CID; VIN K; With Serpentine Belt	**41049**
1993-1983	6.2L 379 CID; VIN J	**51008**
1988-1987	5.7L 350 CID; VIN K; Without Serpentine Belt	**41121**
1988-1982	5.7L 350 CID; VIN M; Without Serpentine Belt	**41121**
1986-1982	5.7L 350 CID; VIN L; Without Serpentine Belt	**41121**
1985	5.0L 305 CID; VIN F	**41121**
1984	6.2L 379 CID; VIN C	**51008**
1982	5.0L 305 CID; VIN F	**41121**
1982	5.0L 305 CID; VIN H	**41121**
1981-1980	5.7L 350 CID; VIN M	**41121**
1980-1977	5.7L 350 CID; VIN L	**41121**
G30 Van		
L6		
1974	4.8L 292 CID	**31896**
1974-1970	4.1L 250 CID	**21895**
1972-1971	4.8L 292 CID	**31896**
V8		
1971-1970	5.7L 350 CID	**41898**
HHR		
L4		
2011-2007	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
2011-2006	2.4L 145 CID; Pump is driven off the timing chain	**21092**
2010-2008	2.0L 1998cc 122 CID; Pump is driven off the timing chain	**21092**
2006	2.2L 2189cc 134 CID; Pump is driven off the timing chain	**21092**
Impala		
L4		
2014	2.4L 2384cc 145 CID; Pump is driven off the timing chain	**21092**
L6		
1979-1977	4.1L 250 CID	**21107**
1973-1965	4.1L 250 CID	**21895**
1965-1963	3.8L 3769cc 230 CID	**21895**
1962-1959	3.8L 3852cc 235 CID	**31563**
V6		
2014-2012	3.6L 217 CID	**11103**
2011-2006	3.5L 3490cc 213 CID	**11006**
2011-2006	3.9L 3880cc 237 CID	**11006**
2005-2000	3.4L 207 CID	**11033**
2005-2000	3.8L 3800cc 231 CID; Includes LS & SS	**21075**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Impala (cont'd)		
V6		
1985	3.8L 3800cc 231 CID	**31018**
1985	4.3L 262 CID; VIN Z	**41121**
1984-1983	3.8L 229 CID; VIN 9	**41121**
1984-1980	3.8L 3800cc 231 CID; VIN A	**31018**
1982-1980	3.8L 229 CID; VIN K	**41121**
V8		
1996-1994	5.7L 350 CID; Includes Police	**41069**
1985-1982	5.0L 305 CID; Includes Police	**41121**
1985-1982	5.7L 350 CID; Includes Police	**41121**
1985-1980	5.7L 350 CID; DIESEL; VIN N; Without A/c; With A/c	**41120**
1982	5.7L 350 CID; DIESEL; W/O A/C 1st Design	**41100**
1982	5.7L 350 CID; DIESEL; With A/c; W/O A/C 2nd Design	**41120**
1982-1980	4.4L 267 CID	**41121**
1981-1980	5.7L 350 CID; DIESEL; VIN N; W/O A/C	**41100**
1981-1980	5.7L 350 CID; Excluding Diesel	**41121**
1981-1977	5.0L 305 CID	**41121**
1979-1977	5.7L 350 CID	**41121**
1976-1972	5.7L 350 CID	**41109**
1976-1972	6.6L 400 CID	**41109**
1976-1972	7.4L 454 CID	**41002**
1971-1970	5.7L 5736cc 350 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/4 Bbl Carb	**41002**
1971-1970	7.4L 454 CID; W/4 Bbl Carb	**41002**
1969	5.3L 5358cc 327 CID	**41109**
1969	5.7L 5736cc 350 CID	**41109**
1969	6.5L 6489cc 396 CID	**41002**
1969	7.0L 6998cc 427 CID	**41002**
1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1964-1962	5.3L 5358cc 327 CID	**41898**
1964-1959	4.6L 4638cc 283 CID	**41898**
K10		
L6		
1984-1978	4.1L 250 CID	**21107**
1980-1979	4.8L 292 CID	**21030**
1977-1975	4.1L 250 CID	**21110**
1976-1975	4.8L 292 CID	**21137**
V6		
1986-1985	4.3L 262 CID	**41121**
V8		
1986-1982	5.7L 350 CID; GAS	**41121**
1986-1982	6.2L 379 CID; DIESEL	**51008**
1986-1981	5.0L 305 CID; GAS	**41121**
1981-1980	5.7L 350 CID; VIN L	**41121**
1980	5.7L 350 CID; VIN M	**41121**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
K10 (cont'd)		
V8		
1980-1979	7.4L 454 CID	**41002**
1980-1977	6.6L 400 CID	**41121**
1979-1977	5.0L 305 CID; GAS	**41121**
1979-1977	5.7L 350 CID; GAS	**41121**
1976	7.4L 454 CID	**41002**
1976-1975	5.7L 350 CID	**41109**
1976-1975	6.6L 400 CID	**41109**
K10 Pickup		
L6		
1974-1972	4.1L 250 CID	**21895**
1973-1972	4.8L 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1970-1969	4.8L 4801cc 292 CID	**31896**
1969	3.8L 3769cc 230 CID	**21895**
1967-1966	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967-1966	4.1L 4098cc 250 CID; Sold in United States	**21895**
1966-1965	4.8L 4801cc 292 CID	**31896**
1965-1964	3.8L 3769cc 230 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1967-1961	4.6L 4638cc 283 CID	**41898**
K10 Suburban		
L6		
1980-1978	4.1L 250 CID	**21107**
1977-1975	4.1L 250 CID	**21110**
1974-1972	4.1L 250 CID	**21895**
1971-1968	4.1L 4097cc 250 CID	**21895**
1970-1969	4.8L 292 CID	**31896**
V8		
1986-1985	5.0L 305 CID; VIN H	**41121**
1986-1982	6.2L 379 CID	**51008**
1985-1984	5.0L 305 CID; VIN F	**41121**
1983-1981	5.0L 305 CID; VIN H	**41121**
1982	5.0L 305 CID; VIN F	**41121**
1980	5.0L 305 CID; VIN G	**41121**
1979-1977	5.0L 305 CID; VIN U	**41121**
1979-1977	6.6L 400 CID	**41121**
1976	6.6L 400 CID; VIN U	**41109**
1975	6.6L 400 CID; VIN M	**41109**
1973	5.0L 5031cc 307 CID	**41109**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
K10 Suburban (cont'd)		
V8		
1972	6.6L 6588cc 402 CID; VIN E	**41898**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1971	6.6L 6588cc 402 CID; VIN K	**41898**
1970	6.6L 6588cc 402 CID; VIN E	**41898**
1968	5.3L 5358cc 327 CID	**41898**
K1500		
V6		
1998-1996	4.3L 262 CID	**41077**
1995-1988	4.3L 262 CID	**41049**
V8		
1999-1997	5.0L 305 CID	**41077**
1999-1996	5.7L 350 CID	**41077**
1998-1997	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1996	6.5L 395 CID; DIESEL; Double Thermostat	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat	**51062**
1995-1994	6.5L 395 CID; DIESEL	**51062**
1995-1993	5.0L 305 CID	**41049**
1995-1993	5.7L 350 CID	**41049**
1993-1988	6.2L 379 CID; DIESEL	**51062**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; With 6.9" Hub Height	**41049**
1991-1988	5.0L 305 CID	**41049**
1991-1988	5.7L 350 CID	**41049**
K1500 Suburban		
V8		
1999	6.5L 395 CID; DIESEL; VIN F; With Pressed On Pulley	**51086**
1999	6.5L 395 CID; VIN F; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1999-1996	5.7L 350 CID	**41077**
1998-1996	6.5L 395 CID; VIN F	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat; 1st Design	**51062**
1995	6.5L 395 CID; DIESEL; VIN F	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1992	5.7L 350 CID; Reverse Rotation; With 6.9" Hub Height	**41049**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
K20		
L6		
1986-1978	4.8L 292 CID	**21030**
1980-1978	4.1L 250 CID	**21107**
1977-1975	4.8L 292 CID	**21137**
1976-1975	4.1L 250 CID	**21110**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
K20 (cont'd)		
V6		
1985	4.3L 262 CID	**41121**
V8		
1986-1982	5.7L 350 CID; GAS	**41121**
1986-1982	6.2L 379 CID; DIESEL	**51008**
1985	5.0L 305 CID; GAS	**41121**
1981-1980	5.7L 350 CID; VIN L	**41121**
1981-1980	5.7L 350 CID; VIN M	**41121**
1980	5.0L 305 CID; GAS	**41121**
1980	7.4L 454 CID	**41002**
1980-1977	6.6L 400 CID	**41121**
1979-1977	5.7L 350 CID; GAS	**41121**
1978-1977	5.0L 305 CID; GAS	**41121**
1978-1976	7.4L 454 CID	**41002**
1976-1975	5.7L 350 CID	**41109**
1976-1975	6.6L 400 CID	**41109**
K20 Panel		
L6		
1967	4.1L 250 CID	**21895**
V8		
1967	4.6L 283 CID	**41898**
1967	5.4L 327 CID	**41898**
K20 Pickup		
L6		
1974-1972	4.1L 250 CID	**21895**
1974-1972	4.8L 292 CID	**31896**
1971-1969	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1967-1966	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967-1966	4.1L 4098cc 250 CID; Sold in United States	**21895**
1967-1965	4.8L 4801cc 292 CID	**31896**
1965-1964	3.8L 3769cc 230 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1968-1966	5.3L 5358cc 327 CID	**41898**
1967-1961	4.6L 4638cc 283 CID	**41898**
K20 Suburban		
L6		
1982-1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID; VIN T	**21137**
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1968	4.8L 4801cc 292 CID	**31896**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
K20 Suburban (cont'd)		
L6		
1971-1968	4.1L 4097cc 250 CID	**21895**
V8		
1986-1985	5.0L 305 CID; VIN H	**41121**
1986-1982	6.2L 379 CID	**51008**
1985	7.4L 454 CID; VIN W	**41002**
1980-1977	6.6L 400 CID	**41121**
1978-1977	5.0L 305 CID; VIN U	**41121**
1976	6.6L 400 CID; VIN U	**41109**
1975	6.6L 400 CID; VIN M	**41109**
1973	5.0L 5031cc 307 CID	**41109**
1973	7.4L 454 CID; VIN Z	**41002**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1968	5.3L 5358cc 327 CID	**41898**
K2500		
V6		
1995-1988	4.3L 262 CID	**41049**
V8		
2000	6.5L 395 CID; DIESEL; Turbocharged	**51086**
2000-1996	5.7L 350 CID	**41077**
2000-1991	7.4L 454 CID	**41038**
1999	6.5L 395 CID; DIESEL; Turbocharged; With Pressed On Pulley	**51086**
1999-1997	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1998-1997	5.0L 305 CID	**41077**
1996	6.5L 395 CID; DIESEL; Double Thermostat	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat	**51062**
1995-1993	5.0L 305 CID	**41049**
1995-1993	5.7L 350 CID	**41049**
1995-1992	6.5L 395 CID; DIESEL	**51062**
1993-1988	6.2L 379 CID; DIESEL	**51062**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; With 6.9" Hub Height	**41049**
1991-1988	5.0L 305 CID	**41049**
1991-1988	5.7L 350 CID	**41049**
K2500 Suburban		
V8		
1999	6.5L 395 CID; DIESEL; VIN F; With Pressed On Pulley	**51086**
1999	6.5L 395 CID; VIN F; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1999-1996	5.7L 350 CID	**41077**
1999-1996	7.4L 454 CID; VIN J; Reverse Rotation	**41038**
1998-1996	6.5L 395 CID; VIN F	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat; 1st Design	**51062**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
K2500 Suburban (cont'd)		
V8		
1995-1994	6.5L 395 CID; DIESEL; VIN F	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1992	7.4L 454 CID; VIN N; Reverse Rotation	**41038**
1992	5.7L 350 CID	**41073**
1992	5.7L 350 CID; Reverse Rotation; With 6.9" Hub Height	**41049**
K30		
L6		
1986-1978	4.8L 292 CID	**21030**
1977	4.8L 292 CID	**21137**
V8		
1986-1982	5.7L 350 CID; GAS	**41121**
1986-1982	6.2L 379 CID; DIESEL	**51008**
1986-1980	7.4L 454 CID	**41002**
1981-1980	5.7L 350 CID; VIN M	**41121**
1980	5.7L 350 CID; VIN L	**41121**
1980-1977	6.6L 400 CID	**41121**
1979-1977	5.7L 350 CID; GAS	**41121**
1977	7.4L 454 CID	**41002**
K3500		
V8		
2000	6.5L 395 CID; DIESEL; Turbocharged	**51086**
2000-1996	5.7L 350 CID	**41077**
2000-1988	7.4L 454 CID	**41038**
1999	6.5L 395 CID; DIESEL; Turbocharged; With Pressed On Pulley	**51086**
1999-1997	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1996	6.5L 395 CID; DIESEL; Double Thermostat	**51074**
1996	6.5L 395 CID; DIESEL; Single Thermostat	**51062**
1995-1993	5.7L 350 CID	**41049**
1995-1992	6.5L 395 CID; DIESEL	**51062**
1993-1988	6.2L 379 CID; DIESEL	**51062**
1992	5.7L 350 CID; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; With 6.9" Hub Height	**41049**
1991-1988	5.7L 350 CID	**41049**
LLV		
L4		
1993-1987	2.5L 2474cc 151 CID	**21040**
LUV		
L4		
2003-2000	2.2L 2200cc 134 CID; Sold in Mexico	**16375**
1982-1981	1.8L 111 CID; VIN N	**11127**
1982-1981	2.2L 134 CID; VIN S	**36132**
1980-1976	1.8L 111 CID	**11127**
1975	1.8L 111 CID	**31046**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Laguna		
V8		
1976	5.0L 305 CID	**41109**
1976-1974	6.6L 400 CID	**41109**
1976-1973	5.7L 350 CID	**41109**
1975-1973	7.4L 454 CID	**41002**
Lumina		
L4		
1993	2.2L 2180cc 133 CID	**11032**
1992-1990	2.5L 2474cc 151 CID	**31041**
V6		
2001-1990	3.1L 189 CID	**11033**
1999-1998	3.8L 3800cc 231 CID	**21075**
1997	3.4L 207 CID	**11033**
1996	3.4L 207 CID	**11145**
1995-1991	3.4L 207 CID	**11033**
Lumina APV		
V6		
1996	3.4L 207 CID	**11033**
1995-1992	3.8L 3800cc 231 CID	**21050**
1995-1990	3.1L 189 CID	**11033**
Luv Pickup		
L4		
1974-1972	1.8L 111 CID	**31046**
Malibu		
L4		
2013-2008	2.4L 145 CID; Pump is driven off the timing chain	**21092**
2008-2004	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
1999-1997	2.4L 2392cc 146 CID; Pump is driven off the timing chain	**21076**
L6		
1977-1975	4.1L 250 CID	**21107**
1974-1973	4.1L 250 CID	**21895**
V6		
2012-2008	3.6L 217 CID	**11103**
2010-2007	3.5L 3490cc 213 CID	**11006**
2007-2006	3.9L 3880cc 237 CID	**11006**
2006-2004	3.5L 213 CID	**11033**
2003-1997	3.1L 189 CID	**11033**
1983-1981	3.8L 229 CID	**41121**
1983-1980	3.8L 3800cc 231 CID	**31018**
1983-1980	3.8L 3800cc 231 CID	**41038**
1982-1980	3.8L 229 CID	**41038**
1979-1978	3.3L 200 CID; VIN M	**41121**
1979-1978	3.8L 3800cc 231 CID; VIN A	**31018**
V8		
1983	5.7L 350 CID; DIESEL	**41120**
1983-1977	5.0L 305 CID	**41121**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Malibu (cont'd)		
V8		
1982	5.7L 350 CID; DIESEL; W/O A/C 1st Design	**41100**
1982	5.7L 350 CID; DIESEL; W/O A/C 2nd Design	**41120**
1982-1979	4.4L 267 CID	**41121**
1980-1977	5.7L 350 CID	**41121**
1976	5.0L 305 CID	**41109**
1976-1974	6.6L 400 CID	**41109**
1976-1973	5.7L 350 CID	**41109**
1975-1973	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1967-1966	4.6L 4638cc 283 CID	**41898**
1967-1966	5.3L 5358cc 327 CID	**41898**
1965-1964	4.6L 4638cc 283 CID; W/O A/C; w/ A/c	**41898**
1965-1964	5.3L 5358cc 327 CID; W/O A/C; w/ A/c	**41898**
Metro		
L3		
2000-1998	1.0L 993cc 61 CID	**11058**
L4		
2001-1998	1.3L 1295cc 79 CID	**11058**
1992	1.3L 1295cc 79 CID	**11058**
Monte Carlo		
V6		
2007-2006	3.5L 3490cc 213 CID	**11006**
2006	3.9L 3880cc 237 CID	**11006**
2005-1998	3.8L 3800cc 231 CID	**21075**
2004-2000	3.4L 207 CID	**11033**
1999-1995	3.1L 189 CID	**11033**
1997	3.4L 207 CID	**11033**
1996	3.4L 207 CID	**11145**
1995	3.4L 207 CID	**11033**
1988-1985	4.3L 262 CID	**41121**
1987-1986	3.8L 231 CID; Sold in Canada; VIN A	**31018**
1985	3.8L 3800cc 231 CID; Sold in Canada; VIN A	**31018**
1984-1980	3.8L 229 CID	**41121**
1984-1980	3.8L 3800cc 231 CID	**31018**
1979	3.8L 231 CID	**31018**
1979-1978	3.3L 200 CID	**41121**
V8		
1988-1977	5.0L 305 CID	**41121**
1984-1983	5.7L 350 CID; DIESEL; VIN N	**41120**
1982	5.7L 350 CID; DIESEL; VIN N; W/O A/C 1st Design	**41100**
1982	5.7L 350 CID; VIN N; W/O A/C 2nd Design	**41120**
1982-1979	4.4L 267 CID	**41121**
1977	5.7L 350 CID	**41121**
1976	5.0L 305 CID	**41109**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Monte Carlo (cont'd)		
V8		
1976-1972	5.7L 350 CID	**41109**
1976-1972	6.6L 400 CID	**41109**
1971-1970	5.7L 5736cc 350 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/2 Bbl Carb	**41109**
1971-1970	6.6L 400 CID; W/4 Bbl Carb	**41002**
1971-1970	7.4L 454 CID; W/4 Bbl Carb	**41002**
Monza		
L4		
1980-1978	2.5L 2474cc 151 CID	**21107**
V6		
1980	3.8L 3800cc 231 CID	**31018**
1979	3.8L 231 CID	**31018**
1979-1978	3.2L 196 CID	**31018**
1978	3.8L 3800cc 231 CID	**31018**
Nova		
L4		
1988	1.6L 1588cc 98 CID; FI	**15076**
1988-1985	1.6L 1588cc 98 CID; CARB	**15057**
1970-1969	2.5L 2507cc 153 CID	**21895**
L6		
1979-1975	4.1L 250 CID	**21107**
1974	4.1L 250 CID; Without A/c	**21895**
1973-1970	4.1L 250 CID	**21895**
1970	3.8L 3769cc 230 CID	**21895**
1969	3.8L 3769cc 230 CID; Without A/c	**21895**
1969	4.1L 250 CID; Without A/c	**21895**
V8		
1979-1977	5.0L 305 CID	**41121**
1979-1977	5.7L 350 CID	**41121**
1976	5.0L 305 CID	**41109**
1976-1972	5.7L 350 CID	**41109**
1975	4.3L 262 CID	**41109**
1973-1969	5.0L 5031cc 307 CID	**41109**
1971-1969	5.7L 5736cc 350 CID	**41109**
1970	6.5L 396 CID	**41002**
1970	6.6L 6588cc 402 CID	**41002**
1969	6.5L 6489cc 396 CID	**41002**
Optra		
L4		
2007-2006	2.0L 2000cc; Sold in Canada	**16375**
2006	2.0L 2000cc 122 CID; Sold in Mexico	**16375**
2005-2004	2.0L 1998cc 122 CID	**16375**
P10		
L6		
1980-1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID	**21137**
V8		
1977	6.6L 400 CID	**41121**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
P10 (cont'd)		
V8		
1975	5.7L 350 CID	**41109**
P10 Series		
L4		
1965-1963	2.5L 2507cc 153 CID	**21895**
L6		
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
1967	4.8L 4801cc 292 CID	**31896**
1967-1963	3.8L 3769cc 230 CID	**21895**
1966	3.2L 3180cc 194 CID	**21895**
1962	3.8L 3852cc 235 CID	**31563**
V8		
1962	4.6L 4638cc 283 CID	**41898**
P10 Van		
L6		
1974-1968	4.1L 250 CID	**21895**
1968	3.8L 230 CID	**21895**
V8		
1973	5.0L 307 CID; VIN X	**41109**
1973	7.4L 454 CID	**41002**
P20		
L6		
1989-1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID	**21137**
V8		
1989-1982	6.2L 379 CID; DIESEL; VIN J	**51008**
1989-1980	5.7L 350 CID	**41121**
1979	7.4L 454 CID; VIN S	**41002**
1976	7.4L 454 CID; VIN Y	**41002**
1976-1975	5.7L 350 CID	**41109**
P20 Series		
L6		
1967-1965	4.8L 4801cc 292 CID	**31896**
1965-1963	3.8L 3769cc 230 CID	**21895**
1961-1960	3.8L 3852cc 235 CID	**31563**
V8		
1962-1961	4.6L 4638cc 283 CID	**41898**
P20 Van		
L6		
1974-1970	4.1L 250 CID	**21895**
1974-1968	4.8L 292 CID	**31896**
V8		
1973	5.0L 307 CID; VIN X	**41109**
1973	7.4L 454 CID	**41002**
1972	5.7L 350 CID	**41898**
1971-1970	5.7L 350 CID; VIN E	**41898**
1969-1968	5.0L 307 CID; VIN E	**41898**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
P30		
L6		
1989-1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID	**21137**
1976	4.1L 250 CID	**21110**
V6		
1999-1996	4.3L 262 CID	**41077**
1995-1990	4.3L 262 CID	**41121**
V8		
1999	6.5L 395 CID; DIESEL	**51086**
1999-1997	5.7L 350 CID	**41077**
1999-1996	7.4L 454 CID; Reverse Rotation	**41038**
1998-1997	6.5L 395 CID	**51074**
1997-1990	7.4L 454 CID; Standard Rotation	**41002**
1996	5.7L 350 CID; VIN K	**41121**
1996	5.7L 350 CID; VIN R	**41077**
1996-1994	6.5L 395 CID; DIESEL	**51062**
1995-1980	5.7L 350 CID	**41121**
1993-1991	6.2L 379 CID; DIESEL	**51008**
1990-1982	6.2L 379 CID; DIESEL; VIN J	**51008**
1988-1982	7.4L 454 CID; VIN W	**41002**
1979-1978	7.4L 454 CID; VIN S	**41002**
1977-1976	7.4L 454 CID; VIN Y	**41002**
1976	6.6L 400 CID	**41109**
1976	7.4L 454 CID; VIN S	**41002**
1976-1975	5.7L 350 CID	**41109**
1975	7.4L 454 CID	**41002**
P30 Series		
L6		
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
1967-1965	4.8L 4801cc 292 CID	**31896**
1965-1963	3.8L 3769cc 230 CID	**21895**
1961-1960	3.8L 3852cc 235 CID	**31563**
V8		
1962-1961	4.6L 4638cc 283 CID	**41898**
P30 Van		
L6		
1974-1970	4.1L 250 CID	**21895**
1974-1968	4.8L 292 CID	**31896**
V8		
1974-1973	7.4L 454 CID	**41002**
1973	5.0L 307 CID; VIN X	**41109**
1972	5.7L 350 CID	**41898**
1971-1970	5.7L 350 CID; VIN E	**41898**
1969-1968	5.0L 307 CID; VIN E	**41898**
P6000		
V8		
1996-1992	6.0L 366 CID	**71078**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
P6000 (cont'd)		
V8		
1996-1992	7.0L 7011cc 427 CID	**71078**
Prizm		
L4		
2002-1998	1.8L 110 CID	**15376**
R10		
V6		
1987	4.3L 262 CID; VIN Z	**41121**
V8		
1987	5.0L 305 CID; VIN H	**41121**
1987	5.7L 350 CID; VIN K	**41121**
1987	6.2L 379 CID; DIESEL; VIN C	**51008**
R10 Suburban		
V8		
1988	6.2L 379 CID; DIESEL; VIN C	**51062**
1988-1987	5.7L 350 CID; VIN K	**41121**
1987	5.0L 305 CID; VIN H	**41121**
1987	6.2L 379 CID	**51008**
R1500 Suburban		
V8		
1991-1989	5.7L 350 CID; Reverse Rotation	**41049**
1991-1989	6.2L 379 CID; DIESEL; VIN C	**51062**
R20		
L6		
1988-1987	4.8L 292 CID; VIN T	**21030**
V6		
1987	4.3L 262 CID; VIN Z	**41121**
V8		
1988-1987	5.7L 350 CID; VIN K	**41121**
1988-1987	6.2L 379 CID; DIESEL; VIN J	**51008**
1988-1987	7.4L 454 CID; VIN N	**41002**
1987	5.0L 305 CID; VIN H	**41121**
1987	6.2L 379 CID; DIESEL; VIN C	**51008**
R20 Suburban		
V8		
1988	6.2L 379 CID; DIESEL; VIN J	**51062**
1988	7.4L 454 CID	**41038**
1988	7.4L 454 CID; VIN N; Reverse Rotation	**41038**
1988-1987	5.7L 350 CID; VIN K	**41121**
1987	6.2L 379 CID	**51008**
1987	7.4L 454 CID; VIN N	**41002**
R2500		
V8		
1989	6.2L 379 CID; DIESEL; VIN J	**51008**
1989	7.4L 454 CID; VIN N	**41002**
R2500 Suburban		
V8		
1991-1989	5.7L 350 CID; Reverse Rotation	**41049**
1991-1989	6.2L 379 CID; DIESEL; VIN J	**51062**
1991-1989	7.4L 454 CID	**41038**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
R2500 Suburban (cont'd)		
V8		
1991-1989	7.4L 454 CID; VIN N; Reverse Rotation	**41038**
R30		
L6		
1988-1987	4.8L 292 CID; VIN T	**21030**
V8		
1988-1987	5.7L 350 CID	**41038**
1988-1987	5.7L 350 CID; VIN K	**41121**
1988-1987	5.7L 350 CID; VIN M	**41121**
1988-1987	6.2L 379 CID; DIESEL; VIN J	**51008**
1988-1987	7.4L 454 CID; VIN N	**41002**
1988-1987	7.4L 454 CID; VIN W	**41002**
R3500		
V8		
1991-1989	5.7L 350 CID; VIN K	**41121**
1991-1989	6.2L 379 CID; DIESEL; VIN J	**51008**
1991-1989	7.4L 454 CID; VIN N	**41002**
1989	7.4L 454 CID; VIN W	**41002**
S10		
L4		
2003-2001	2.2L 2190cc 134 CID; Crew Cab Pickup	**11032**
2003-2001	2.2L 2190cc 134 CID; Standard Cab Pickup	**11032**
2003-1995	2.2L 2190cc 134 CID	**11032**
2003-1994	2.2L 2190cc 134 CID; Extended Cab Pickup	**11032**
2002-2000	2.2L 2190cc 134 CID; VIN 5	**11032**
2000	2.2L 2190cc 134 CID; Standard Cab Pickup; w/ NV3500/M50 Transmission	**11032**
2000-1994	2.2L 2190cc 134 CID; VIN 4	**11032**
1999-1994	2.2L 2190cc 134 CID; Standard Cab Pickup	**11032**
1993-1987	2.5L 2474cc 151 CID	**21040**
1993-1987	2.5L 2474cc 151 CID; Extended Cab Pickup	**21040**
1993-1987	2.5L 2474cc 151 CID; Standard Cab Pickup	**21040**
1986-1985	2.5L 2474cc 151 CID; Extended Cab Pickup	**31022**
1986-1985	2.5L 2474cc 151 CID; Standard Cab Pickup	**31022**
1986-1985	2.5L 2474cc 151 CID; VIN E	**31022**
1985-1982	1.9L 119 CID; Extended Cab Pickup	**21013**
1985-1982	1.9L 119 CID; Standard Cab Pickup	**21013**
1985-1982	1.9L 119 CID; VIN A	**21013**
1984-1983	2.0L 122 CID; Extended Cab Pickup	**31015**
1984-1983	2.0L 122 CID; Standard Cab Pickup	**31015**
1984-1983	2.0L 122 CID; VIN Y	**31015**
V6		
2004-2003	4.3L 262 CID; VIN X	**41077**
2004-2001	4.3L 262 CID; Crew Cab Pickup	**41077**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
S10 (cont'd)		
V6		
2003-1996	4.3L 262 CID; Extended Cab Pickup	**41077**
2003-1996	4.3L 262 CID; Standard Cab Pickup	**41077**
2002-1999	4.3L 262 CID; VIN W	**41077**
1999	4.3L 262 CID; VIN X	**41077**
1995-1988	4.3L 262 CID	**41049**
1995-1988	4.3L 262 CID; Extended Cab Pickup	**41049**
1995-1988	4.3L 262 CID; Standard Cab Pickup	**41049**
1993-1987	2.8L 173 CID; VIN R	**41035**
1992-1987	2.8L 173 CID; Extended Cab Pickup	**41035**
1992-1987	2.8L 173 CID; Standard Cab Pickup	**41035**
1986	2.8L 173 CID; VIN R	**41006**
1986-1982	2.8L 173 CID; Extended Cab Pickup	**41006**
1986-1982	2.8L 173 CID; Standard Cab Pickup	**41006**
1985-1982	2.8L 173 CID; VIN B	**41006**
S10 Blazer		
L4		
1988-1987	2.5L 2474cc 151 CID	**21040**
1986-1985	2.5L 2474cc 151 CID	**31022**
1984-1983	1.9L 119 CID	**21013**
1984-1983	2.0L 122 CID	**31015**
V6		
1994-1988	4.3L 262 CID	**41049**
1989-1987	2.8L 173 CID	**41035**
1986-1983	2.8L 173 CID	**41006**
SSR		
V8		
2006-2005	6.0L 364 CID	**71616**
2004-2003	5.3L 325 CID	**71616**
Silverado 1500		
V6		
2013-2002	4.3L 262 CID; VIN X	**41077**
2006-2002	4.3L 262 CID	**41077**
2002-1999	4.3L 262 CID; VIN W	**41077**
V8		
2013-2010	5.3L 5328cc 325 CID	**71617**
2013-2009	6.2L 376 CID	**71617**
2013-2007	4.8L 294 CID	**71617**
2013-2007	6.0L 5967cc 364 CID	**71617**
2009-2007	5.3L 325 CID	**71617**
2006	5.3L 325 CID; VIN T	**71616**
2006	5.3L 5328cc 325 CID; VIN Z	**71616**
2006-2003	6.0L 5967cc 364 CID; VIN N	**71616**
2006-1999	4.8L 294 CID; VIN V	**71616**
2005-2002	5.3L 323 CID; VIN Z	**71616**
2005-1999	5.3L 323 CID; VIN T	**71616**
Silverado 1500 HD		
V8		
2007	6.0L 5967cc 364 CID	**71617**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Silverado 1500 HD (cont'd)		
V8		
2006-2005	6.0L 5967cc 364 CID; VIN U	**71616**
2003-2001	6.0L 5967cc 364 CID; VIN U	**71616**
Silverado 2500		
V8		
2004-1999	6.0L 5967cc 364 CID; VIN U	**71616**
2000-1999	5.3L 323 CID; VIN T	**71616**
Silverado 2500 HD		
V8		
2013-2006	6.6L 400 CID	**71053**
2007-2001	8.1L 496 CID; VIN G	**51089**
2006-2001	6.0L 5967cc 364 CID; VIN U	**71616**
2005-2001	6.6L 400 CID; DIESEL	**21098**
Silverado 3500		
V8		
2007	6.0L 5967cc 364 CID	**71617**
2007-2006	6.6L 400 CID	**71053**
2007-2001	8.1L 496 CID; VIN G	**51089**
2006-2001	6.0L 5967cc 364 CID; VIN U	**71616**
2005-2001	6.6L 400 CID; DIESEL	**21098**
Silverado 3500 HD		
V8		
2013-2007	6.0L 5967cc 364 CID	**71617**
Sonic		
L4		
2014-2012	1.8L 1796cc 110 CID	**11184**
2013-2012	1.4L 1364cc 83 CID	**21662**
Spectrum		
L4		
1988-1985	1.5L 1471cc 92 CID; Driven off the timing belt	**11031**
Sprint		
All		
1992-1989	Turbocharged	**11058**
L3		
1988-1987	1.0L 993cc 61 CID; Turbocharged	**11029**
Suburban		
L6		
1967-1966	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967-1966	4.1L 4098cc 250 CID; Sold in United States	**21895**
1967-1965	4.8L 4801cc 292 CID	**31896**
1967-1963	3.8L 3769cc 230 CID	**21895**
1962-1960	3.8L 3852cc 235 CID	**31563**
V8		
1967-1966	5.3L 5358cc 327 CID	**41898**
1967-1961	4.6L 4638cc 283 CID	**41898**
Suburban 1500		
V8		
2014-2007	5.3L 5328cc 325 CID	**71617**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Suburban 1500 (cont'd)		
V8		
2009-2007	6.0L 5967cc 364 CID	**71617**
2006	5.3L 5328cc 325 CID	**71616**
2006	6.0L 5967cc 364 CID; VIN U	**71616**
2005-2000	5.3L 323 CID	**71616**
1999-1996	5.7L 350 CID	**41077**
1995	5.7L 350 CID	**41049**
Suburban 2500		
V8		
2013-2007	6.0L 5967cc 364 CID	**71617**
2009	6.0L 6000cc 366 CID	**71617**
2006-2004	6.0L 5967cc 364 CID; VIN U	**71616**
2006-2001	8.1L 496 CID; VIN G	**51089**
2003-2000	6.0L 5967cc 364 CID	**71616**
T6500		
V8		
1998-1997	6.0L 366 CID	**71078**
T7500		
V8		
1998-1997	6.0L 366 CID	**71078**
Tahoe		
V8		
2014-2007	5.3L 5328cc 325 CID	**71617**
2013-2008	6.0L 5967cc 364 CID	**71617**
2009	6.2L 376 CID	**71617**
2009-2007	4.8L 294 CID	**71617**
2008	6.2L 6199cc 378 CID	**71617**
2006	5.3L 325 CID; VIN T	**71616**
2006	5.3L 5328cc 325 CID; VIN Z	**71616**
2006-2004	4.8L 294 CID; VIN V	**71616**
2005-2004	5.3L 323 CID; VIN T	**71616**
2005-2004	5.3L 323 CID; VIN Z	**71616**
2003-2000	4.8L 294 CID	**71616**
2003-2000	5.3L 323 CID	**71616**
2000-1996	5.7L 350 CID	**41077**
1999-1997	6.5L 395 CID; DIESEL; VIN S	**51074**
1996	6.5L 395 CID; DIESEL; VIN S; Early Model	**51062**
1996	6.5L 395 CID; DIESEL; VIN S; Late Model	**51074**
1995	5.7L 350 CID; VIN K	**41049**
1995	6.5L 395 CID; DIESEL; VIN S	**51062**
Tigra		
All		
1999	Sold in Mexico; Driven off the timing belt	**11057**
Tracker		
L4		
2003-1999	2.0L 122 CID	**16342**
2002-1999	1.6L 1588cc 98 CID	**16374**
1998	1.6L 1588cc 98 CID	**11048**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
Tracker (cont'd)		
L4		
1991-1989	1.6L 1588cc 98 CID	**11048**
V6		
2004-2001	2.5L 2500cc	**26385**
Trailblazer		
L6		
2009-2002	4.2L 256 CID	**21097**
V8		
2009-2007	6.0L 5967cc 364 CID	**71617**
2008-2007	5.3L 325 CID	**71617**
2006	5.3L 325 CID	**71616**
2006	6.0L 5967cc 364 CID	**71616**
Trailblazer EXT		
L6		
2006-2002	4.2L 256 CID	**21097**
V8		
2006	5.3L 325 CID	**71616**
2005	5.3L 323 CID	**71616**
2004-2003	5.3L 325 CID	**71616**
Traverse		
V6		
2014-2009	3.6L 217 CID	**11103**
Truck		
L6		
1955-1953	3.8L 3852cc 235 CID	**31563**
1953	3.5L 3548cc 217 CID; Sold in United States	**31563**
Uplander		
V6		
2009-2006	3.9L 3880cc 237 CID	**11006**
2006-2005	3.5L 213 CID	**11033**
V10		
V6		
1987	4.3L 262 CID	**41121**
V8		
1987	5.0L 305 CID	**41121**
1987	5.7L 350 CID	**41121**
1987	6.2L 379 CID; DIESEL; VIN C	**51008**
V10 Suburban		
V8		
1988	6.2L 379 CID; DIESEL; VIN C	**51062**
1988-1987	5.7L 350 CID; VIN K	**41121**
1987	6.2L 379 CID	**51008**
V1500 Suburban		
V8		
1991-1989	5.7L 350 CID; Reverse Rotation	**41049**
1991-1989	6.2L 379 CID; DIESEL; VIN C	**51062**
V20		
L6		
1987	4.8L 292 CID	**21030**

YEAR	VEHICLE DETAIL	PART NO.
Chevrolet (cont'd)		
V20 (cont'd)		
V8		
1987	5.7L 350 CID	**41121**
1987	6.2L 379 CID; DIESEL; VIN C	**51008**
1987	6.2L 379 CID; DIESEL; VIN J	**51008**
V20 Suburban		
V8		
1988	6.2L 379 CID; DIESEL; VIN J	**51062**
1988	7.4L 454 CID	**41038**
1988-1987	5.7L 350 CID; VIN K	**41121**
1987	6.2L 379 CID	**51008**
1987	7.4L 454 CID; VIN N	**41002**
V2500 Suburban		
V8		
1991-1989	5.7L 350 CID; Reverse Rotation	**41049**
1991-1989	6.2L 379 CID; DIESEL; VIN J	**51062**
1990	7.4L 454 CID	**41038**
V30		
L6		
1988-1987	4.8L 292 CID	**21030**
V8		
1988-1987	5.7L 350 CID	**41121**
1988-1987	6.2L 379 CID; DIESEL; VIN J	**51008**
1988-1987	7.4L 454 CID	**41002**
V3500		
V8		
1991-1989	5.7L 350 CID	**41121**
1991-1989	6.2L 379 CID; DIESEL; VIN J	**51008**
1991-1989	7.4L 454 CID	**41002**
Venture		
V6		
2005-1997	3.4L 207 CID	**11033**
W3500 Tiltmaster		
V8		
2008-2007	6.0L 5967cc 364 CID	**71617**
2006-2004	6.0L 5967cc 364 CID	**71616**
2003-1996	5.7L 350 CID	**41077**
W4500 Tiltmaster		
V8		
2010-2007	6.0L 5967cc 364 CID	**71617**
2006-2004	6.0L 5967cc 364 CID	**71616**
2003-1998	5.7L 350 CID	**41077**
Chrysler		
200		
L4		
2014-2011	2.4L 2360cc 144 CID	**13038**
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
300		
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**

YEAR	VEHICLE DETAIL	PART NO.
Chrysler (cont'd)		
300 (cont'd)		
V6		
2010-2008	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**13217**
2010-2005	3.5L 3497cc 215 CID	**23010**
2007-2005	2.7L 2700cc 167 CID; VIN R; Pump is driven off the timing chain	**23161**
V8		
2013-2012	6.4L 6424cc 392 CID	**33653**
2013-2011	5.7L 345 CID	**33653**
2010-2005	6.1L 6059cc 370 CID	**33170**
2008-2005	5.7L 345 CID	**33170**
1967-1966	7.2L 440 CID	**33040**
1966	7.2L 7211cc 440 CID	**33040**
1966-1964	6.3L 383 CID	**33040**
1966-1964	6.3L 6286cc 383 CID	**33040**
1965-1964	6.8L 413 CID	**33040**
1961-1959	6.8L 413 CID	**33040**
300M		
V6		
2004-1999	3.5L 3497cc 215 CID; Driven off the timing belt	**23162**
Aspen		
V8		
2009	4.7L 285 CID; VIN P	**43163**
2009	5.7L 345 CID	**63341**
2008-2007	4.7L 285 CID; VIN N	**43163**
2008-2007	5.7L 345 CID	**63168**
2007	4.7L 285 CID; VIN P	**43163**
Cirrus		
L4		
2000	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**
2000-1999	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
1997	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
1996	2.4L 2429cc 148 CID; Hydraulic Tensioner; Driven off the timing belt	**23153**
1996-1995	2.4L 2429cc 148 CID; Mechanical Tensioner; Driven off the timing belt	**23300**
1995	2.4L 2429cc 148 CID	**26399**
1995	2.4L 2429cc 148 CID; Driven off the timing belt	**23153**
V6		
2000-1995	2.5L 2497cc 152 CID	**23152**
Concorde		
V6		
2004-2002	3.5L 3497cc 215 CID; VIN G; Driven off the timing belt	**23162**
2004-2002	3.5L 3497cc 215 CID; VIN M; Driven off the timing belt	**23162**
2004-1998	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**23161**

YEAR	VEHICLE DETAIL	PART NO.
Chrysler (cont'd)		
Concorde (cont'd)		
V6		
2001-1998	3.2L 3200cc 197 CID; Driven off the timing belt	**23162**
1997	3.5L 3497cc 215 CID; With 6 Mounting Bolts; Driven off the timing belt	**23158**
1997-1995	3.5L 3497cc 215 CID; With 3 Mounting Bolts; Driven off the timing belt	**13151**
1996-1993	3.3L 3301cc 201 CID; With Serpentine Belt	**13140**
1994-1993	3.5L 3497cc 215 CID; Driven off the timing belt	**13141**
Conquest		
L4		
1989-1988	2.6L 2555cc 156 CID	**23124**
Cordoba		
L6		
1983-1980	3.7L 3687cc 225 CID	**33100**
V8		
1983-1981	5.2L 318 CID	**43103**
1980-1979	5.2L 318 CID; W/2 Bbl Carb	**43103**
1980-1978	5.9L 360 CID; W/4 Bbl Carb	**43103**
1978-1975	5.2L 318 CID; With Air Pump	**43103**
1978-1975	5.2L 318 CID; Without Air Pump	**43053**
1978-1975	6.6L 400 CID	**33040**
1977-1975	5.9L 360 CID	**43103**
Crossfire		
V6		
2008-2004	3.2L 3200cc 195 CID	**38379**
Daytona		
L4		
1993-1992	2.2L 135 CID	**23139**
E Class		
L4		
1984	2.2L 135 CID	**23110**
1984-1983	2.6L 2555cc 156 CID; VIN G	**23111**
1983	2.2L 135 CID; VIN C	**23110**
Fifth Avenue		
V8		
1989-1983	5.2L 318 CID	**43103**
Grand Voyager		
V6		
2000	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
2000	3.3L 3301cc 201 CID	**13126**
Imperial		
V6		
1993-1991	3.8L 230 CID	**13126**
1991-1990	3.3L 3301cc 201 CID	**13126**
V8		
1983-1981	5.2L 318 CID	**43103**
1975-1970	7.2L 440 CID	**33040**

YEAR	VEHICLE DETAIL	PART NO.
Chrysler (cont'd)		
Imperial (cont'd)		
V8		
1969-1966	7.2L 7211cc 440 CID	**33040**
1965	6.7L 6769cc 413 CID	**33040**
1964-1963	6.7L 6769cc 413 CID; Without A/c; Except VC-2 300k	**33040**
1964-1959	6.7L 6769cc 413 CID; With A/c	**33040**
1962-1959	6.7L 6769cc 413 CID; Without A/c	**33040**
Intrepid		
V6		
2004-2000	3.5L 3497cc 215 CID; Driven off the timing belt	**23162**
2004-1998	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**23161**
2001-1998	3.2L 3200cc 197 CID; Driven off the timing belt	**23162**
1997-1996	3.3L 3301cc 201 CID	**13140**
1997-1995	3.5L 3497cc 215 CID; Driven off the timing belt	**13151**
1995-1994	3.3L 201 CID	**13140**
1993	3.3L 3301cc 201 CID	**13140**
LHS		
V6		
2001-1999	3.5L 3497cc 215 CID; Driven off the timing belt	**23162**
1997	3.5L 3497cc 215 CID; 6 Fasteners; Driven off the timing belt	**23158**
1997-1995	3.5L 3497cc 215 CID; 3 Fasteners; Driven off the timing belt	**13151**
1994	3.5L 3497cc 215 CID; Driven off the timing belt	**13141**
Laser		
L4		
1986	2.5L 2507cc 153 CID	**23110**
1986-1984	2.2L 135 CID	**23110**
LeBaron		
L4		
1993-1990	2.5L 2507cc 153 CID; Naturally Aspirated	**23127**
1992-1990	2.5L 2507cc 153 CID; GTC	**23127**
1992-1990	2.5L 2507cc 153 CID; Turbocharged	**23127**
1990	2.2L 135 CID; GTC	**23127**
1990	2.2L 135 CID; Turbocharged	**23127**
1989	2.2L 135 CID; Naturally Aspirated	**23122**
1989	2.2L 135 CID; Turbocharged	**23122**
1989	2.5L 2507cc 153 CID; Naturally Aspirated	**23122**
1989	2.5L 2507cc 153 CID; Turbocharged	**23122**
1988-1986	2.5L 2507cc 153 CID	**23110**
1988-1982	2.2L 135 CID	**23110**
1985-1982	2.6L 2555cc 156 CID	**23111**
L6		
1981-1978	3.7L 3687cc 225 CID	**33100**

YEAR	VEHICLE DETAIL	PART NO.
Chrysler (cont'd)		
LeBaron (cont'd)		
V6		
1995-1991	3.0L 2972cc 181 CID; GTC; Driven off the timing belt	**23121**
1990	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
V8		
1981-1979	5.2L 318 CID	**43103**
1979-1978	5.9L 360 CID	**43103**
1978-1977	5.2L 318 CID; With Air Pump	**43103**
1978-1977	5.2L 318 CID; Without Air Pump	**43053**
Neon		
L4		
2002-2000	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**
New Yorker		
L4		
1988-1983	2.2L 135 CID	**23110**
1987-1986	2.5L 2507cc 153 CID	**23110**
1985-1983	2.6L 2555cc 156 CID	**23111**
L6		
1982	3.7L 3687cc 225 CID	**33100**
V6		
1996-1995	3.5L 3497cc 215 CID; Driven off the timing belt	**13151**
1994	3.5L 3497cc 215 CID; Driven off the timing belt	**13141**
1993-1991	3.8L 230 CID	**13126**
1993-1990	3.3L 3301cc 201 CID	**13126**
1989-1988	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
V8		
1982-1981	5.2L 318 CID	**43103**
1980-1979	5.2L 318 CID; Except E-58	**43103**
1980-1979	5.9L 360 CID; Except E-58	**43103**
1980-1979	5.9L 360 CID; With 4 BBL, E-58 Hi-Perf	**43103**
1978-1975	6.6L 400 CID	**33040**
1978-1970	7.2L 440 CID	**33040**
1977	5.9L 360 CID	**43103**
1972	6.6L 6555cc 400 CID	**33040**
1969-1966	7.2L 7211cc 440 CID	**33040**
1965	6.7L 6769cc 413 CID	**33040**
1964-1963	6.7L 6769cc 413 CID; Without A/c; Except VC-2 300k	**33040**
1964-1959	6.7L 6769cc 413 CID; With A/c	**33040**
1963	7.0L 6981cc 426 CID; With A/c	**33040**
1963	7.0L 6981cc 426 CID; Without A/c; Except VC-2 300k	**33040**
1962-1959	6.7L 6769cc 413 CID; Without A/c	**33040**
Newport		
L6		
1981-1979	3.7L 3687cc 225 CID	**33100**

YEAR	VEHICLE DETAIL	PART NO.
Chrysler (cont'd)		
Newport (cont'd)		
V8		
1981	5.2L 318 CID	**43103**
1980-1979	5.2L 318 CID; Except E-58	**43103**
1980-1979	5.9L 360 CID; Except E-58	**43103**
1980-1979	5.9L 360 CID; With 4 BBL, E-58 Hi-Perf	**43103**
1978-1972	6.6L 400 CID	**33040**
1978-1970	7.2L 440 CID	**33040**
1977-1974	5.9L 360 CID	**43103**
1972-1971	5.9L 360 CID	**43103**
1971-1965	6.3L 6286cc 383 CID	**33040**
1969-1966	7.2L 7211cc 440 CID	**33040**
1964-1963	5.9L 5917cc 361 CID; Without A/c; Except VC-2 300k	**33040**
1964-1963	6.7L 6769cc 413 CID; Without A/c; Except VC-2 300k	**33040**
1964-1962	6.7L 6769cc 413 CID; With A/c	**33040**
1964-1961	5.9L 5917cc 361 CID; With A/c	**33040**
1963	7.0L 6981cc 426 CID; With A/c	**33040**
1963	7.0L 6981cc 426 CID; Without A/c; Except VC-2 300k	**33040**
1962	6.7L 6769cc 413 CID; Without A/c	**33040**
1962-1961	5.9L 5917cc 361 CID; Without A/c	**33040**
1960-1959	6.7L 6769cc 413 CID; With A/c	**33040**
1960-1959	6.7L 6769cc 413 CID; Without A/c	**33040**
PT Cruiser		
L4		
2010-2009	2.4L 2429cc 148 CID; Naturally Aspirated; Non-Turbo; Driven off the timing belt	**23300**
2009-2007	2.4L 2429cc 148 CID; Turbocharged; VIN 8	**13167**
2008-2005	2.4L 2429cc 148 CID; Turbocharged; VIN E	**13167**
2008-2001	2.4L 2429cc 148 CID; Naturally Aspirated; VIN B; Non-Turbo; Driven off the timing belt	**23300**
2007-2005	2.4L 2429cc 148 CID; Turbocharged; VIN S	**13167**
2007-2003	2.4L 2429cc 148 CID; Turbocharged; VIN G	**13167**
2005-2004	2.4L 2429cc 148 CID; Turbocharged; VIN 8	**13167**
Pacifica		
V6		
2008-2007	4.0L 3952cc 241 CID; VIN X	**23010**
2008-2005	3.8L 230 CID	**23651**
2006-2005	3.5L 3497cc 215 CID	**23010**
2004	3.5L 3497cc 215 CID; Driven off the timing belt	**23162**
Prowler		
V6		
2002	3.5L 3497cc 215 CID; Driven off the timing belt	**23162**

YEAR	VEHICLE DETAIL	PART NO.
Chrysler (cont'd)		
Sebring		
L4		
2010-2007	2.4L 2360cc 144 CID	**13038**
2006-2001	2.4L 2429cc 148 CID; With Cogged Pump Pulley; Driven off the timing belt	**23300**
2005-2001	2.4L 2351cc; Without Cogged Pump Pulley	**26399**
1999-1997	2.0L 1996cc 122 CID; Coupe; Driven off the timing belt	**23150**
1998-1997	2.4L 2429cc 148 CID; Convertible; Driven off the timing belt	**23300**
1996	2.4L 2429cc 148 CID; Driven off the timing belt	**23153**
1996-1995	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**
V6		
2010-2008	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**13217**
2010-2007	3.5L 3497cc 215 CID	**23010**
2007-2001	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**23161**
2005-2003	3.0L 2972cc 181 CID; VIN H	**26437**
2005-2001	3.0L 2972cc 181 CID	**23152**
2000-1996	2.5L 2497cc 152 CID; Convertible; VIN H	**23152**
2000-1995	2.5L 2497cc 152 CID; Coupe; VIN N	**23152**
TC Maserati		
L4		
1990	2.2L 135 CID; 8 Valve Engine	**23127**
1989	2.2L 135 CID	**23122**
V6		
1991-1990	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Town & Country		
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
2010-2009	3.8L 3778cc 231 CID	**23231**
2010-2008	3.3L 3301cc 201 CID	**23231**
2010-2008	4.0L 3952cc 241 CID; VIN X	**23010**
2008	3.8L 230 CID	**23231**
2007-2001	3.3L 3301cc 201 CID; Mini Passenger Van; VIN R	**13165**
2007-2001	3.8L 230 CID; Mini Passenger Van; VIN L	**13165**
2003-2001	3.3L 3301cc 201 CID; Mini Passenger Van; VIN 3	**13165**
2001	3.3L 3301cc 201 CID; Mini Passenger Van; VIN G	**13165**
2000-1998	3.3L 3301cc 201 CID; VIN G	**13126**
2000-1996	3.3L 3301cc 201 CID; VIN R	**13126**
2000-1994	3.8L 230 CID; VIN L	**13126**
1993-1990	3.3L 3301cc 201 CID; VIN R	**13126**

YEAR	VEHICLE DETAIL	PART NO.
Chrysler (cont'd)		
Voyager		
L4		
2003-2000	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
V6		
2004-2001	3.3L 3301cc 201 CID	**13165**
2000	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
2000	3.3L 3301cc 201 CID	**13126**
Daewoo		
Lanos		
L4		
2002-1999	1.5L 1498cc	**16459**
2002-1999	1.6L 1588cc 98 CID; From VIN #E183135	**16459**
Leganza		
L4		
2003-1999	2.2L 2200cc	**16375**
Nubira		
L4		
2002-1999	2.0L 1998cc	**16375**
Daihatsu		
Charade		
L3		
1992-1988	1.0L 993cc 61 CID	**26238**
L4		
1992-1989	1.3L 1295cc	**16237**
DeSoto		
Adventurer		
V8		
1960-1959	6.3L 6286cc 383 CID	**33040**
DeSoto		
V8		
1961	5.9L 361 CID	**33040**
Firedome		
V8		
1959	6.3L 6286cc 383 CID	**33040**
Fireflite		
V8		
1960	5.9L 5917cc 361 CID	**33040**
1959	6.3L 6286cc 383 CID	**33040**
Firesweep		
V8		
1959	5.9L 5917cc 361 CID	**33040**
Dodge		
2000 GTX		
L4		
1990-1989	2.0L 1997cc 122 CID	**26168**
330		
L6		
1964-1963	3.7L 3687cc 225 CID	**33100**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
330 (cont'd)		
V8		
1964	4.5L 4473cc 273 CID	**43919**
1964	6.3L 6286cc 383 CID	**33040**
1964-1963	5.2L 5212cc 318 CID	**43919**
1964-1963	5.9L 5917cc 361 CID	**33040**
1964-1963	7.0L 6981cc 426 CID	**33040**
1963	6.7L 6769cc 413 CID	**33040**
400		
L4		
1983-1982	2.2L 135 CID	**23110**
1983-1982	2.6L 2555cc 156 CID	**23111**
440		
L6		
1964-1963	3.7L 3687cc 225 CID	**33100**
V8		
1964	4.5L 4473cc 273 CID	**43919**
1964	6.3L 6286cc 383 CID	**33040**
1964-1963	5.2L 5212cc 318 CID	**43919**
1964-1963	5.9L 5917cc 361 CID	**33040**
1964-1963	7.0L 6981cc 426 CID	**33040**
1963	6.7L 6769cc 413 CID	**33040**
600		
L4		
1988-1986	2.5L 2507cc 153 CID	**23110**
1988-1983	2.2L 135 CID	**23110**
1985-1983	2.6L 2555cc 156 CID	**23111**
880		
V8		
1964-1963	5.9L 5917cc 361 CID	**33040**
A100		
L6		
1970	3.2L 198 CID	**33100**
1970-1964	3.7L 3687cc 225 CID	**33100**
1969-1964	2.8L 170 CID	**33100**
V8		
1970-1967	5.2L 318 CID	**43919**
1967	4.5L 273 CID	**43919**
Aries		
L4		
1989	2.2L 135 CID	**23122**
1989	2.5L 2507cc 153 CID	**23122**
1988-1986	2.5L 2507cc 153 CID	**23110**
1988-1981	2.2L 135 CID	**23110**
1985-1981	2.6L 2555cc 156 CID	**23111**
Aspen		
L6		
1980-1976	3.7L 3687cc 225 CID	**33100**
V8		
1980-1976	5.2L 318 CID	**43103**
1980-1976	5.9L 360 CID	**43103**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Atos		
L4		
2009-2005	1.1L 1086cc 66 CID; Sold in Mexico	**16504**
2004-2001	1.0L 1000cc 61 CID; Sold in Mexico	**16504**
Avenger		
L4		
2013-2008	2.4L 2360cc 144 CID	**13038**
1999-1995	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
2010-2008	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**13217**
2010-2008	3.5L 3497cc 215 CID	**23010**
2000-1995	2.5L 2497cc 152 CID	**23152**
B100		
L6		
1980-1975	3.7L 3687cc 225 CID	**33100**
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1978	5.9L 360 CID	**43103**
1977-1976	5.9L 360 CID; With Air Pump	**43103**
1977-1976	5.9L 360 CID; Without Air Pump	**43053**
1977-1975	5.2L 5211cc 318 CID; With Air Pump	**43103**
1977-1975	5.2L 5211cc 318 CID; Without Air Pump	**43053**
B100 Van		
L6		
1974-1971	3.7L 3687cc 225 CID	**33100**
1971	3.2L 3254cc 198 CID	**33100**
V8		
1974	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 318 CID; Without Air Pump	**43053**
1974	5.9L 360 CID; With Air Pump	**43103**
1974	5.9L 360 CID; Without Air Pump	**43053**
1973-1971	5.2L 318 CID; W/O A/C	**43053**
1973-1971	5.2L 318 CID; w/ A/c	**43103**
1973-1971	5.9L 360 CID; W/O A/C	**43053**
1973-1971	5.9L 360 CID; w/ A/c	**43103**
B150		
L6		
1987-1981	3.7L 3687cc 225 CID	**33100**
V6		
1994-1993	3.9L 3906cc 239 CID	**43160**
1992	3.9L 3906cc 239 CID	**43159**
1991-1988	3.9L 3906cc 239 CID	**43103**
V8		
1994-1993	5.2L 5211cc 318 CID	**43160**
1991-1981	5.2L 5211cc 318 CID	**43103**
B1500		
V6		
1998-1995	3.9L 3906cc 239 CID	**43160**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
B1500 (cont'd)		
V8		
1998	5.9L 360 CID	**43160**
1998-1995	5.2L 5211cc 318 CID	**43160**
B200		
L6		
1980	3.7L 3687cc 225 CID	**33100**
1979	3.7L 225 CID	**33100**
1978-1975	3.7L 3687cc 225 CID	**33100**
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1980-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; With Air Pump	**43103**
1977-1975	5.2L 5211cc 318 CID; Without Air Pump	**43053**
1977-1975	5.9L 360 CID; With Air Pump	**43103**
1977-1975	5.9L 360 CID; Without Air Pump	**43053**
B200 Van		
L6		
1974-1971	3.7L 3687cc 225 CID	**33100**
1971	3.2L 3254cc 198 CID	**33100**
V8		
1974	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 318 CID; Without Air Pump	**43053**
1974	5.9L 360 CID; With Air Pump	**43103**
1974	5.9L 360 CID; Without Air Pump	**43053**
1974	6.6L 400 CID	**33040**
1973-1971	5.2L 318 CID; W/O A/C	**43053**
1973-1971	5.2L 318 CID; w/ A/c	**43103**
1973-1971	5.9L 360 CID; W/O A/C	**43053**
1973-1971	5.9L 360 CID; w/ A/c	**43103**
B250		
L6		
1987-1981	3.7L 3687cc 225 CID	**33100**
V6		
1994-1993	3.9L 3906cc 239 CID	**43160**
1992	3.9L 3906cc 239 CID	**43159**
1991-1988	3.9L 3906cc 239 CID	**43103**
V8		
1994-1993	5.2L 5211cc 318 CID	**43160**
1994-1993	5.9L 360 CID	**43160**
1992	5.9L 360 CID	**43159**
1991-1984	5.9L 360 CID	**43103**
1991-1981	5.2L 5211cc 318 CID	**43103**
1981	5.9L 360 CID	**43103**
B2500		
V6		
1997-1995	3.9L 3906cc 239 CID	**43160**
V8		
1998-1995	5.2L 5211cc 318 CID	**43160**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
B2500 (cont'd)		
V8		
1998-1995	5.9L 360 CID	**43160**
B300		
L6		
1980	3.7L 225 CID	**33100**
1979-1975	3.7L 3687cc 225 CID	**33100**
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1980-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; With Air Pump	**43103**
1977-1975	5.2L 5211cc 318 CID; Without Air Pump	**43053**
1977-1975	5.9L 360 CID; With Air Pump	**43103**
1977-1975	5.9L 360 CID; Without Air Pump	**43053**
B300 Van		
L6		
1974-1971	3.7L 3687cc 225 CID	**33100**
V8		
1974	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 318 CID; Without Air Pump	**43053**
1974	5.9L 360 CID; With Air Pump	**43103**
1974	5.9L 360 CID; Without Air Pump	**43053**
1973-1971	5.2L 318 CID; W/O A/C	**43053**
1973-1971	5.2L 318 CID; w/ A/c	**43103**
1973-1971	5.9L 360 CID; W/O A/C	**43053**
1973-1971	5.9L 360 CID; w/ A/c	**43103**
B350		
V8		
1994-1993	5.2L 5211cc 318 CID	**43160**
1994-1993	5.9L 360 CID	**43160**
1992	5.9L 360 CID	**43159**
1991-1981	5.2L 5211cc 318 CID	**43103**
1991-1981	5.9L 360 CID	**43103**
B3500		
V8		
1998-1995	5.2L 5211cc 318 CID	**43160**
1998-1995	5.9L 360 CID	**43160**
Caliber		
L4		
2012-2007	2.0L 1998cc 122 CID	**13038**
2011-2007	2.4L 2360cc 144 CID	**13038**
2009-2007	1.8L 1798cc 110 CID	**13038**
Caravan		
L4		
2007-1997	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
1996	2.4L 2429cc 148 CID; Hydraulic Tensioner; Driven off the timing belt	**23153**
1996	2.4L 2429cc 148 CID; Mechanical Tensioner; Driven off the timing belt	**23300**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Caravan (cont'd)		
L4		
1995-1990	2.5L 2507cc 153 CID	**23127**
1989	2.5L 2507cc 153 CID	**23122**
1988	2.5L 2507cc 153 CID	**23110**
1987-1984	2.2L 135 CID	**23110**
1987-1984	2.6L 2555cc 156 CID	**23111**
V6		
2007-2001	3.3L 3301cc 201 CID	**13165**
2000-1990	3.3L 3301cc 201 CID	**13126**
2000-1987	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
1999-1996	3.8L 230 CID	**13126**
Challenger		
L4		
1983-1978	2.6L 2555cc 156 CID; RWD	**23116**
1979-1978	1.6L 1597cc 98 CID	**33105**
L6		
1972-1970	3.7L 3687cc 225 CID	**33100**
1971-1970	3.2L 3254cc 198 CID	**33100**
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
2010-2009	3.5L 3497cc 215 CID	**23010**
V8		
2013-2011	5.7L 345 CID	**33653**
2013-2011	6.4L 6424cc 392 CID	**33653**
2010-2008	6.1L 6059cc 370 CID	**33170**
1974	5.2L 5212cc 318 CID	**43053**
1974	5.9L 360 CID	**43103**
1973	5.6L 5572cc 340 CID	**43103**
1973-1970	5.2L 5212cc 318 CID; W/O A/C	**43053**
1973-1970	5.2L 5212cc 318 CID; w/ A/c	**43103**
1972-1970	5.6L 5572cc 340 CID	**43053**
1971	7.2L 7211cc 440 CID	**33040**
1971-1970	6.3L 6286cc 383 CID	**33040**
1971-1970	7.0L 6981cc 426 CID	**33040**
1970	7.2L 440 CID	**33040**
Charger		
L4		
1987-1983	2.2L 135 CID	**23110**
1986-1984	1.6L 1595cc 97 CID	**23113**
L6		
1976	3.7L 3687cc 225 CID	**33100**
1974-1969	3.7L 3687cc 225 CID	**33100**
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
2010-2008	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**13217**
2010-2006	3.5L 3497cc 215 CID	**23010**
2007-2006	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**23161**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Charger (cont'd)		
V8		
2013-2012	6.4L 6424cc 392 CID	**33653**
2013-2011	5.7L 345 CID	**33653**
2010-2006	6.1L 6059cc 370 CID	**33170**
2008-2006	5.7L 345 CID	**33170**
1978-1977	5.2L 318 CID; With Air Pump	**43103**
1978-1975	5.2L 318 CID; Without Air Pump	**43053**
1978-1974	5.9L 360 CID	**43103**
1978-1972	6.6L 400 CID	**33040**
1976	5.2L 318 CID; With Air Condition	**43103**
1975	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 5212cc 318 CID	**43053**
1974-1970	7.2L 440 CID	**33040**
1973	5.6L 5572cc 340 CID	**43103**
1973-1970	5.2L 5212cc 318 CID; W/O A/C	**43053**
1973-1970	5.2L 5212cc 318 CID; w/ A/c	**43103**
1972-1971	5.6L 5572cc 340 CID; W/O A/C	**43053**
1972-1971	5.6L 5572cc 340 CID; w/ A/c	**43103**
1971-1968	7.0L 6981cc 426 CID	**33040**
1971-1966	6.3L 6286cc 383 CID	**33040**
1969-1968	5.2L 5212cc 318 CID; W/O A/C	**43919**
1969-1967	7.2L 7211cc 440 CID	**33040**
1967-1966	7.0L 6981cc 426 CID; W/O A/C	**33040**
1966	4.5L 4473cc 273 CID; W/O A/C	**43919**
1966	5.9L 5917cc 361 CID	**33040**
Colt		
L4		
1994	1.8L 1834cc 112 CID; FWD; Driven off the timing belt	**33147**
1994-1993	2.4L 2351cc	**13148**
1994-1985	1.5L 1468cc 90 CID; FWD	**23115**
1993	1.8L 1834cc 112 CID; FWD	**23135**
1992	1.8L 1834cc 112 CID; Driven off the timing belt	**33147**
1991-1985	2.0L 1997cc 122 CID; Vista	**23118**
1990-1989	1.6L 1597cc 98 CID; FWD; Hatchback	**23131**
1990-1989	1.8L 1754cc 107 CID; FWD; Wagon	**23108**
1988-1980	1.6L 1597cc 98 CID; FWD	**23108**
1984	2.0L 1995cc 122 CID; Vista	**23118**
1984-1981	1.4L 1410cc; FWD	**23115**
1980-1979	1.4L 1410cc; FWD	**23106**
1980-1978	2.6L 2555cc 156 CID; 4 Dr.; RWD; Wagon	**23116**
1979	1.6L 1597cc 98 CID; FWD; Hatchback	**23104**
1978	1.6L 1597cc 98 CID; RWD	**33105**
1977-1976	2.0L 1995cc 122 CID; RWD	**23116**
Conquest		
L4		
1986-1985	2.6L 2555cc 156 CID; From 2-85 To 11-86	**23120**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Conquest (cont'd)		
L4		
1985-1984	2.6L 2555cc 156 CID; Up to 1-85	**23116**
Coronet		
L6		
1976-1970	3.7L 3687cc 225 CID	**33100**
V8		
1976-1975	5.2L 318 CID	**43053**
1976-1972	6.6L 400 CID	**33040**
1976-1972	7.2L 440 CID	**33040**
1974	5.2L 5212cc 318 CID	**43053**
1973	5.9L 360 CID; W/O A/C	**43053**
1973	5.9L 360 CID; w/ A/c	**43103**
1973-1972	5.6L 5572cc 340 CID; W/O A/C	**43053**
1973-1972	5.6L 5572cc 340 CID; w/ A/c	**43103**
1973-1970	5.2L 5212cc 318 CID; W/O A/C	**43053**
1973-1970	5.2L 5212cc 318 CID; w/ A/c	**43103**
1971	7.0L 426 CID	**33040**
1971-1966	6.3L 6286cc 383 CID	**33040**
1970	7.2L 440 CID	**33040**
1970-1967	7.0L 6981cc 426 CID	**33040**
1969-1967	7.2L 7211cc 440 CID	**33040**
1969-1965	5.2L 5212cc 318 CID; W/O A/C	**43919**
1968-1965	4.5L 4473cc 273 CID; W/O A/C	**43919**
1967-1965	7.0L 6981cc 426 CID; W/O A/C	**33040**
1966	5.9L 5917cc 361 CID	**33040**
1966	7.2L 440 CID	**33040**
1965	5.9L 5917cc 361 CID; w/ A/c	**33040**
1965	6.3L 6286cc 383 CID; w/ A/c	**33040**
1965	6.7L 6769cc 413 CID; w/ A/c	**33040**
1959	6.3L 6286cc 383 CID	**33040**
1959-1958	5.9L 5917cc 361 CID	**33040**
1958	5.7L 5737cc 350 CID	**33040**
D100		
V6		
1989-1988	3.9L 3906cc 239 CID	**43103**
V8		
1989-1986	5.2L 5211cc 318 CID	**43103**
1988-1986	5.9L 360 CID	**43103**
1979-1978	5.2L 5211cc 318 CID	**43103**
1979-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1978-1975	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; W/O A/C	**43053**
1977-1975	5.2L 5211cc 318 CID; w/ A/c	**43103**
1977-1975	5.9L 360 CID; W/O A/C	**43053**
1977-1975	5.9L 360 CID; w/ A/c	**43103**
D100 Pickup		
L6		
1971-1970	3.2L 3254cc 198 CID	**33100**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
D100 Pickup (cont'd)		
V8		
1974-1973	7.2L 440 CID	**33040**
1974-1971	5.9L 360 CID; W/O A/C	**43053**
1974-1971	5.9L 360 CID; w/ A/c	**43103**
1974-1971	6.6L 400 CID	**33040**
1974-1970	5.2L 318 CID; W/O A/C	**43053**
1974-1970	5.2L 318 CID; w/ A/c	**43103**
1971-1968	6.3L 6286cc 383 CID	**33040**
1969-1968	5.2L 5212cc 318 CID	**43919**
D100 Series		
L6		
1965-1961	2.8L 2786cc 170 CID	**33100**
V8		
1967-1966	6.3L 6286cc 383 CID	**33040**
1967-1960	5.2L 5212cc 318 CID	**43919**
D150		
V6		
1993	3.9L 3906cc 239 CID	**43160**
1992	3.9L 3906cc 239 CID	**43159**
1991-1988	3.9L 3906cc 239 CID	**43103**
V8		
1993	5.2L 5211cc 318 CID	**43160**
1993	5.9L 360 CID	**43160**
1992	5.2L 5211cc 318 CID	**43159**
1991-1984	5.9L 360 CID	**43103**
1991-1978	5.2L 5211cc 318 CID	**43103**
1982-1978	5.9L 360 CID	**43103**
1978	7.2L 440 CID	**33040**
1978-1977	6.6L 400 CID	**33040**
1977	5.2L 5211cc 318 CID; W/O A/C	**43053**
1977	5.2L 5211cc 318 CID; w/ A/c	**43103**
1977	5.9L 360 CID; W/O A/C	**43053**
1977	5.9L 360 CID; w/ A/c	**43103**
D200		
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1980-1978	5.9L 360 CID	**43103**
1978-1975	6.6L 400 CID	**33040**
1978-1975	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; W/O A/C	**43053**
1977-1975	5.2L 5211cc 318 CID; w/ A/c	**43103**
1977-1975	5.9L 360 CID; W/O A/C	**43053**
1977-1975	5.9L 360 CID; w/ A/c	**43103**
D200 Pickup		
V8		
1974-1973	7.2L 440 CID	**33040**
1974-1971	5.9L 360 CID; W/O A/C	**43053**
1974-1971	5.9L 360 CID; w/ A/c	**43103**
1974-1971	6.6L 400 CID	**33040**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
D200 Pickup (cont'd)		
V8		
1974-1970	5.2L 318 CID; W/O A/C	**43053**
1974-1970	5.2L 318 CID; w/ A/c	**43103**
1971-1968	6.3L 6286cc 383 CID	**33040**
1969-1968	5.2L 5212cc 318 CID	**43919**
D200 Series		
V8		
1967-1966	6.3L 6286cc 383 CID	**33040**
1967-1960	5.2L 5212cc 318 CID	**43919**
D250		
L6		
1993-1989	5.9L 359 CID	**23145**
V6		
1993	3.9L 3906cc 239 CID	**43160**
1992	3.9L 3906cc 239 CID	**43159**
1991-1988	3.9L 3906cc 239 CID	**43103**
V8		
1993	5.2L 5211cc 318 CID	**43160**
1993	5.9L 360 CID	**43160**
1992	5.2L 5211cc 318 CID	**43159**
1992-1984	5.9L 360 CID	**43103**
1991-1981	5.2L 5211cc 318 CID	**43103**
1982-1981	5.9L 360 CID	**43103**
D300		
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1980-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1978-1975	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; W/O A/C	**43053**
1977-1975	5.2L 5211cc 318 CID; w/ A/c	**43103**
1977-1975	5.9L 360 CID; W/O A/C	**43053**
1977-1975	5.9L 360 CID; w/ A/c	**43103**
D300 Pickup		
V8		
1974-1973	7.2L 440 CID	**33040**
1974-1972	5.9L 360 CID; W/O A/C	**43053**
1974-1972	5.9L 360 CID; w/ A/c	**43103**
1974-1971	6.6L 400 CID	**33040**
1974-1970	5.2L 318 CID; W/O A/C	**43053**
1974-1970	5.2L 318 CID; w/ A/c	**43103**
1971	5.9L 5899cc 360 CID; W/O A/C	**43053**
1971	5.9L 5899cc 360 CID; w/ A/c	**43103**
1971-1968	6.3L 6286cc 383 CID	**33040**
1969-1968	5.2L 5212cc 318 CID	**43919**
D300 Series		
V8		
1967-1966	6.3L 6286cc 383 CID	**33040**
1967-1960	5.2L 5212cc 318 CID	**43919**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
D350		
L6		
1993-1989	5.9L 359 CID	**23145**
V8		
1993	5.9L 360 CID	**43160**
1992-1981	5.9L 360 CID	**43103**
1983-1981	5.2L 5211cc 318 CID	**43103**
D50		
L4		
1982-1981	2.0L 1997cc 122 CID	**23116**
Dakota		
L4		
2002-1996	2.5L 2507cc 153 CID	**23136**
1995-1990	2.5L 2507cc 153 CID	**23127**
1989	2.5L 2507cc 153 CID	**23122**
1988-1987	2.2L 135 CID	**23110**
V6		
2010-2004	3.7L 226 CID	**43163**
2003-1993	3.9L 3906cc 239 CID	**43160**
1992	3.9L 3906cc 239 CID	**43159**
1991-1987	3.9L 3906cc 239 CID	**43103**
V8		
2010-2002	4.7L 285 CID	**43163**
2003-1998	5.9L 360 CID	**43160**
1999-1993	5.2L 5211cc 318 CID	**43160**
1992	5.2L 5211cc 318 CID	**43159**
1991-1990	5.2L 5211cc 318 CID	**43128**
1989	5.2L 5211cc 318 CID	**43103**
Dart		
L6		
1976-1960	3.7L 3687cc 225 CID	**33100**
1976-1960	3.7L 3687cc 225 CID	**41038**
1974-1970	3.2L 198 CID	**41038**
1974-1970	3.2L 3254cc 198 CID	**33100**
1974-1970	3.2L 3254cc 198 CID	**41038**
1971	3.7L 225 CID	**41038**
1971-1960	2.8L 2786cc 170 CID	**41038**
1969-1961	2.8L 170 CID	**41038**
1969-1961	2.8L 2786cc 170 CID	**33100**
V8		
1976-1975	5.2L 318 CID; Without Air Pump; W/O A/C	**43053**
1976-1975	5.2L 318 CID; w/ A/c	**43103**
1976-1974	5.9L 360 CID	**41038**
1976-1974	5.9L 360 CID; w/ A/c	**43103**
1976-1967	5.2L 318 CID	**41038**
1974	5.2L 5212cc 318 CID; Without Air Pump; W/O A/C	**43053**
1974	5.9L 5900cc 360 CID	**41038**
1974-1971	5.9L 5899cc 360 CID	**41038**
1974-1970	5.2L 5212cc 318 CID; w/ A/c	**43103**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Dart (cont'd)		
V8		
1974-1966	5.2L 5212cc 318 CID	**41038**
1973-1970	5.2L 5212cc 318 CID; W/O A/C	**43053**
1973-1970	5.6L 5572cc 340 CID; W/O A/C	**43053**
1973-1970	5.6L 5572cc 340 CID; w/ A/c	**43103**
1973-1968	5.6L 340 CID	**41038**
1973-1968	5.6L 5572cc 340 CID	**41038**
1969-1968	5.2L 5212cc 318 CID; W/O A/C	**43919**
1969-1968	5.6L 5572cc 340 CID; W/O A/C	**43919**
1969-1964	4.5L 273 CID	**41038**
1969-1964	4.5L 4473cc 273 CID	**41038**
1969-1964	4.5L 4473cc 273 CID; W/O A/C	**43919**
1969-1964	6.3L 383 CID	**41038**
1969-1960	6.3L 6286cc 383 CID	**41038**
1969-1960	6.3L 6286cc 383 CID; W/O A/C	**33040**
1967	5.2L 318 CID; W/O A/C	**43919**
1965	6.8L 413 CID	**41038**
1965-1961	6.7L 6769cc 413 CID	**41038**
1963-1960	5.2L 5212cc 318 CID	**41038**
1963-1960	5.2L 5212cc 318 CID; W/O A/C	**43919**
1962-1961	6.8L 413 CID	**41038**
1962-1960	5.2L 318 CID	**41038**
1962-1960	5.9L 5917cc 361 CID	**41038**
1961-1960	5.9L 361 CID	**41038**
1960	6.3L 383 CID	**41038**
Daytona		
L4		
1993-1992	2.2L 135 CID	**23139**
1993-1990	2.5L 2507cc 153 CID	**23127**
1990	2.2L 135 CID	**23127**
1989	2.2L 135 CID	**23122**
1989	2.5L 2507cc 153 CID	**23122**
1988-1986	2.5L 2507cc 153 CID	**23110**
1988-1984	2.2L 135 CID	**23110**
V6		
1993-1990	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Diplomat		
L6		
1982-1978	3.7L 3687cc 225 CID	**33100**
V8		
1989-1979	5.2L 318 CID	**43103**
1985	5.2L 5211cc 318 CID	**43103**
1983	5.2L 5211cc 318 CID	**43103**
1978	5.9L 360 CID	**43103**
1978-1977	5.2L 318 CID; With Air Pump	**43103**
1978-1977	5.2L 318 CID; Without Air Pump	**43053**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Durango		
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
2009-2004	3.7L 226 CID	**43163**
1999-1998	3.9L 3906cc 239 CID	**43160**
V8		
2013-2011	5.7L 345 CID	**33653**
2009	5.7L 345 CID	**63341**
2009-2000	4.7L 285 CID	**43163**
2008-2004	5.7L 345 CID	**63168**
2003-1998	5.9L 360 CID	**43160**
2000-1998	5.2L 5211cc 318 CID	**43160**
Dynasty		
L4		
1993-1990	2.5L 2507cc 153 CID	**23127**
1989	2.5L 2507cc 153 CID	**23122**
1988	2.5L 2507cc 153 CID	**23110**
V6		
1993-1990	3.3L 3301cc 201 CID	**13126**
1993-1988	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Grand Caravan		
L4		
1997	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
1996	2.4L 2429cc 148 CID; Hydraulic Tensioner; Driven off the timing belt	**23153**
1988	2.5L 2507cc 153 CID	**23110**
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
2010-2009	3.8L 3778cc 231 CID	**23231**
2010-2008	3.3L 3301cc 201 CID	**23231**
2010-2008	4.0L 3952cc 241 CID	**23010**
2008	3.8L 230 CID	**23231**
2007-2001	3.3L 3301cc 201 CID	**13165**
2007-2001	3.8L 230 CID	**13165**
2000-1994	3.8L 230 CID	**13126**
2000-1992	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
2000-1990	3.3L 3301cc 201 CID	**13126**
1989-1988	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Intrepid		
V6		
2004-2000	3.5L 3497cc 215 CID; Driven off the timing belt	**23162**
2004-1998	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**23161**
2001-1998	3.2L 3200cc 197 CID; Driven off the timing belt	**23162**
1997	3.5L 3497cc 215 CID; 6 Fasteners; Driven off the timing belt	**23158**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Intrepid (cont'd)		
V6		
1997-1995	3.5L 3497cc 215 CID; 3 Fasteners; Driven off the timing belt	**13151**
1997-1993	3.3L 3301cc 201 CID	**13140**
1994-1993	3.5L 3497cc 215 CID; Driven off the timing belt	**13141**
Journey		
L4		
2013-2009	2.4L 2360cc 144 CID	**13038**
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
2010-2009	3.5L 3497cc 215 CID	**23010**
Lancer		
L4		
1989	2.2L 135 CID	**23122**
1989	2.5L 2507cc 153 CID	**23122**
1988-1986	2.5L 2507cc 153 CID	**23110**
1988-1985	2.2L 135 CID	**23110**
Magnum		
V6		
2008	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**13217**
2008-2005	3.5L 3497cc 215 CID	**23010**
2007-2005	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**23161**
V8		
2008-2006	6.1L 6059cc 370 CID	**33170**
2008-2005	5.7L 345 CID	**33170**
1979	5.2L 318 CID	**43103**
1979-1978	5.9L 360 CID	**43103**
1978	5.2L 318 CID; With Air Pump	**43103**
1978	5.2L 318 CID; Without Air Pump	**43053**
1978	6.6L 400 CID	**33040**
Mini Ram		
L4		
1988-1987	2.5L 2507cc 153 CID	**23110**
1987-1984	2.2L 135 CID	**23110**
1987-1984	2.6L 2555cc 156 CID	**23111**
V6		
1988-1987	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Mirada		
L6		
1983-1980	3.7L 3687cc 225 CID	**33100**
V8		
1983-1981	5.2L 318 CID	**43103**
1980	5.9L 360 CID	**43103**
Monaco		
L6		
1978-1977	3.7L 3687cc 225 CID	**33100**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Monaco (cont'd)		
V6		
1992-1991	3.0L 2972cc 182 CID; With Side Mounted Thermostat	**33138**
1991-1990	3.0L 2972cc 182 CID	**33411**
V8		
1978-1975	5.2L 318 CID	**43103**
1978-1974	5.9L 360 CID	**43103**
1978-1972	6.6L 400 CID	**33040**
1978-1970	7.2L 440 CID	**33040**
1973-1971	5.9L 360 CID; W/O A/C	**43053**
1973-1971	5.9L 360 CID; w/ A/c	**43103**
1971-1966	6.3L 6286cc 383 CID	**33040**
1970	5.2L 5212cc 318 CID; W/O A/C	**43053**
1970	5.2L 5212cc 318 CID; w/ A/c	**43103**
1969-1968	5.2L 5212cc 318 CID; W/O A/C	**43919**
1969-1966	7.2L 7211cc 440 CID	**33040**
1966-1965	7.0L 6981cc 426 CID; W/O A/C	**33040**
1965	6.3L 6286cc 383 CID; w/ A/c	**33040**
1965	6.7L 6769cc 413 CID; w/ A/c	**33040**
Neon		
L4		
2005	2.4L 2429cc 148 CID; Non-Turbo; Driven off the timing belt	**23300**
2005	2.4L 2429cc 148 CID; Turbo	**13167**
2005-1995	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**
2004-2003	2.4L 2429cc 148 CID	**13167**
1995	2.0L 1997cc 122 CID; Driven off the timing belt	**23150**
Nitro		
V6		
2011	3.7L 226 CID	**43163**
2011	3.7L 3700cc 226 CID	**43163**
2011-2007	4.0L 3952cc 241 CID	**23010**
2010-2009	3.7L 226 CID; VIN K	**43163**
2008-2007	3.7L 226 CID	**43163**
Omni		
L4		
1990	2.2L 135 CID	**23127**
1989	2.2L 135 CID	**23122**
1988-1981	2.2L 135 CID	**23110**
1986-1983	1.6L 1595cc 97 CID	**23113**
1983-1978	1.7L 105 CID	**23101**
P100		
L6		
1968	3.7L 3687cc 225 CID	**33100**
P200		
L6		
1972	3.7L 3687cc 225 CID	**33100**
1968-1967	3.7L 3687cc 225 CID	**33100**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
P300		
L6		
1972	3.7L 3687cc 225 CID	**33100**
1968-1967	3.7L 3687cc 225 CID	**33100**
Polara		
L6		
1971-1970	3.7L 3687cc 225 CID	**33100**
V8		
1973-1972	6.6L 400 CID	**33040**
1973-1971	5.9L 360 CID; W/O A/C	**43053**
1973-1971	5.9L 360 CID; w/ A/c	**43103**
1973-1970	5.2L 5212cc 318 CID; W/O A/C	**43053**
1973-1970	5.2L 5212cc 318 CID; w/ A/c	**43103**
1973-1970	7.2L 440 CID	**33040**
1971-1966	6.3L 6286cc 383 CID	**33040**
1969-1966	7.2L 7211cc 440 CID	**33040**
1969-1960	5.2L 5212cc 318 CID; W/O A/C	**43919**
1967	7.0L 6981cc 426 CID	**33040**
1967-1965	7.0L 6981cc 426 CID; W/O A/C	**33040**
1967-1964	4.5L 4473cc 273 CID; W/O A/C	**43919**
1965	6.7L 6769cc 413 CID; w/ A/c	**33040**
1965-1963	6.3L 6286cc 383 CID; w/ A/c	**33040**
1964-1963	5.9L 5917cc 361 CID; w/ A/c	**33040**
1963	6.7L 6769cc 413 CID; w/ A/c	**33040**
1962-1961	6.7L 6769cc 413 CID	**33040**
1962-1960	5.9L 5917cc 361 CID	**33040**
1962-1960	6.3L 6286cc 383 CID	**33040**
Power Ram 50		
L4		
1986-1985	2.6L 2555cc 156 CID; Standard Cab Pickup; From 2-85	**23120**
1985	2.3L 2346cc; DIESEL; Standard Cab Pickup	**33117**
1984	2.0L 1995cc; Standard Cab Pickup	**23114**
1983	2.0L 1997cc; Standard Cab Pickup	**23114**
Raider		
L4		
1989-1987	2.6L 2555cc 156 CID	**23120**
V6		
1989	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Ram 1500		
V6		
2010-2002	3.7L 226 CID	**43163**
2004-2002	3.7L 226 CID; 4WD; Crew Cab Pickup	**43160**
2004-2002	3.7L 226 CID; 4WD; Standard Cab Pickup	**43160**
2004-2002	3.7L 226 CID; Crew Cab Pickup; RWD	**43160**
2004-2002	3.7L 226 CID; RWD; Standard Cab Pickup	**43160**
2001-1994	3.9L 3906cc 239 CID	**43160**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Ram 1500 (cont'd)		
V8		
2010-2009	5.7L 345 CID	**63341**
2010-2003	4.7L 285 CID	**43163**
2008-2003	5.7L 345 CID	**63168**
2004-2002	4.7L 287 CID	**43163**
2003-2002	5.9L 360 CID; 4WD; Crew Cab Pickup	**43160**
2003-2002	5.9L 360 CID; Crew Cab Pickup; RWD	**43160**
2003-1994	5.9L 360 CID; 4WD; Standard Cab Pickup	**43160**
2003-1994	5.9L 360 CID; RWD; Standard Cab Pickup	**43160**
2003-1994	5.9L 360 CID; VIN Z	**43160**
2001-1995	5.2L 5211cc 318 CID; 4WD; Extended Cab Pickup	**43160**
2001-1995	5.2L 5211cc 318 CID; Extended Cab Pickup; RWD	**43160**
2001-1995	5.9L 360 CID; 4WD; Extended Cab Pickup	**43160**
2001-1995	5.9L 360 CID; Extended Cab Pickup; RWD	**43160**
2001-1994	5.2L 5211cc 318 CID; 4WD; Standard Cab Pickup	**43160**
2001-1994	5.2L 5211cc 318 CID; RWD; Standard Cab Pickup	**43160**
2001-1994	5.2L 5211cc 318 CID; VIN Y	**43160**
1997-1995	5.2L 5211cc 318 CID; VIN T	**43160**
Ram 1500 Van		
V6		
2001-1999	3.9L 3906cc 239 CID	**43160**
V8		
2003-1999	5.2L 5211cc 318 CID; VIN Y	**43160**
2003-1999	5.9L 360 CID; VIN Z	**43160**
Ram 2500		
L6		
2010-2007	6.7L 408 CID	**23222**
2009-2002	5.9L 359 CID	**73158**
2008-1995	5.9L 359 CID; Cummins Built Eng.; DIESEL	**23145**
2001	5.9L 359 CID; 4WD; Crew Cab Pickup; Cummins Built Eng.; Turbocharged	**23145**
2001	5.9L 359 CID; Crew Cab Pickup; Cummins Built Eng.; RWD; Turbocharged	**23145**
2001-1994	5.9L 359 CID; 4WD; Cummins Built Eng.; Standard Cab Pickup; Turbocharged	**23145**
2001-1994	5.9L 359 CID; Cummins Built Eng.; RWD; Standard Cab Pickup; Turbocharged	**23145**
1999-1995	5.9L 359 CID; 4WD; Cummins Built Eng.; Extended Cab Pickup; Turbocharged	**23145**
1999-1995	5.9L 359 CID; Cummins Built Eng.; Extended Cab Pickup; RWD; Turbocharged	**23145**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Ram 2500 (cont'd)		
L6		
1998	5.9L 359 CID; 4WD; Crew Cab Pickup; Cummins Built Eng.; Turbocharged	**23145**
1998	5.9L 359 CID; Crew Cab Pickup; Cummins Built Eng.; RWD; Turbocharged	**23145**
V10		
2003-1994	8.0L 7990cc 488 CID	**43169**
V8		
2010-2009	5.7L 345 CID	**63341**
2008-2003	5.7L 345 CID	**63168**
2002-1994	5.9L 360 CID; 4WD; Standard Cab Pickup	**43160**
2002-1994	5.9L 360 CID; RWD; Standard Cab Pickup	**43160**
2002-1994	5.9L 360 CID; VIN Z	**43160**
2001	5.9L 360 CID; 4WD; Crew Cab Pickup	**43160**
2001	5.9L 360 CID; Crew Cab Pickup; RWD	**43160**
1999-1995	5.9L 360 CID; 4WD; Extended Cab Pickup	**43160**
1999-1995	5.9L 360 CID; Extended Cab Pickup; RWD	**43160**
1998	5.9L 360 CID; 4WD; Crew Cab Pickup	**43160**
1998	5.9L 360 CID; Crew Cab Pickup; RWD	**43160**
1996-1995	5.2L 5211cc 318 CID; 4WD; Extended Cab Pickup	**43160**
1996-1995	5.2L 5211cc 318 CID; Extended Cab Pickup; RWD	**43160**
1996-1995	5.2L 5211cc 318 CID; VIN T	**43160**
1996-1995	5.9L 360 CID; VIN 5	**43160**
1996-1994	5.2L 5211cc 318 CID; 4WD; Standard Cab Pickup	**43160**
1996-1994	5.2L 5211cc 318 CID; RWD; Standard Cab Pickup	**43160**
1996-1994	5.2L 5211cc 318 CID; VIN Y	**43160**
Ram 2500 Van		
V6		
2001	3.9L 3906cc 239 CID	**43160**
V8		
2003-1999	5.2L 5211cc 318 CID; VIN T	**43160**
2003-1999	5.2L 5211cc 318 CID; VIN Y	**43160**
2003-1999	5.9L 360 CID; VIN Z	**43160**
Ram 3500		
L6		
2010-2007	6.7L 408 CID	**23222**
2009-2002	5.9L 359 CID	**73158**
2008-1995	5.9L 359 CID; Cummins Built Eng.; DIESEL	**23145**
2001-1994	5.9L 359 CID; 4WD; Cummins Built Eng.; Standard Cab Pickup; Turbocharged	**23145**
2001-1994	5.9L 359 CID; Cummins Built Eng.; RWD; Standard Cab Pickup; Turbocharged	**23145**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Ram 3500 (cont'd)		
L6		
1998	5.9L 359 CID; 4WD; Crew Cab Pickup; Cummins Built Eng.; Turbocharged	**23145**
1998	5.9L 359 CID; Crew Cab Pickup; Cummins Built Eng.; RWD; Turbocharged	**23145**
1997-1995	5.9L 359 CID; 4WD; Cummins Built Eng.; Extended Cab Pickup; Turbocharged	**23145**
1997-1995	5.9L 359 CID; Cummins Built Eng.; Extended Cab Pickup; RWD; Turbocharged	**23145**
V10		
2003-1994	8.0L 7990cc 488 CID	**43169**
V8		
2009	5.7L 345 CID	**63341**
2008-2003	5.7L 345 CID	**63168**
2002-1997	5.9L 360 CID; VIN Z	**43160**
2002-1994	5.9L 360 CID; 4WD; Standard Cab Pickup	**43160**
2002-1994	5.9L 360 CID; RWD; Standard Cab Pickup	**43160**
2002-1994	5.9L 360 CID; VIN 5	**43160**
1998	5.9L 360 CID; 4WD; Crew Cab Pickup	**43160**
1998	5.9L 360 CID; Crew Cab Pickup; RWD	**43160**
1997-1995	5.9L 360 CID; 4WD; Extended Cab Pickup	**43160**
1997-1995	5.9L 360 CID; Extended Cab Pickup; RWD	**43160**
1994	5.9L 360 CID; VIN Z	**43160**
Ram 3500 Van		
V8		
2003-1999	5.2L 5211cc 318 CID; VIN T	**43160**
2003-1999	5.2L 5211cc 318 CID; VIN Y	**43160**
2003-1999	5.9L 360 CID; VIN Z	**43160**
Ram 4500		
All		
2010-2008		**23222**
Ram 50		
L4		
1993-1990	2.4L 2351cc; Standard Cab Pickup	**23114**
1991-1990	2.4L 2351cc; Extended Cab Pickup	**23114**
1989-1988	2.0L 1995cc 122 CID; Extended Cab Pickup	**23114**
1989-1988	2.6L 2555cc 156 CID; Extended Cab Pickup; From 2-85	**23120**
1989-1985	2.6L 2555cc 156 CID; Standard Cab Pickup; From 2-85	**23120**
1989-1984	2.0L 1995cc 122 CID; Standard Cab Pickup	**23114**
1985	2.3L 2346cc 143 CID; DIESEL; Standard Cab Pickup	**33117**
1983	2.0L 1997cc 122 CID; Standard Cab Pickup	**23114**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Ram 50 (cont'd)		
V6		
1991-1990	3.0L 2972cc 181 CID; Extended Cab Pickup; Driven off the timing belt	**23121**
1991-1990	3.0L 2972cc 181 CID; Standard Cab Pickup; Driven off the timing belt	**23121**
Ram 5500		
L6		
2010-2008	6.7L 408 CID	**23222**
Ramcharger		
L6		
1980-1974	3.7L 3687cc 225 CID	**33100**
V8		
1993	5.2L 5211cc 318 CID	**43160**
1993	5.9L 360 CID	**43160**
1992	5.2L 5211cc 318 CID	**43159**
1992-1984	5.9L 360 CID	**43103**
1991-1984	5.2L 5211cc 318 CID	**43103**
1981-1978	5.2L 5211cc 318 CID	**43103**
1981-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1978-1974	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; With Air Pump	**43103**
1977-1975	5.2L 5211cc 318 CID; Without Air Pump	**43053**
1977-1974	5.9L 360 CID; With Air Pump	**43103**
1977-1974	5.9L 360 CID; Without Air Pump	**43053**
1974	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 318 CID; Without Air Pump	**43053**
1974	6.6L 400 CID	**33040**
Rampage		
L4		
1984-1982	2.2L 135 CID	**23110**
Royal		
V8		
1959	6.3L 6286cc 383 CID	**33040**
1959-1958	5.9L 5917cc 361 CID	**33040**
1958	5.7L 5737cc 350 CID	**33040**
Royal Mini Ram		
L4		
1987-1984	2.2L 135 CID	**23110**
1987-1984	2.6L 2555cc 156 CID	**23111**
V6		
1987	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Royal Monaco		
V8		
1977	5.2L 318 CID	**43103**
1977-1975	5.9L 360 CID	**43103**
1977-1975	6.6L 400 CID	**33040**
1977-1975	7.2L 440 CID	**33040**
1975	5.2L 318 CID	**43103**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
SX 2.0		
L4		
2005-2003	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**
Shadow		
L4		
1994-1990	2.2L 135 CID	**23127**
1994-1990	2.5L 2507cc 153 CID	**23127**
1989	2.2L 135 CID	**23122**
1989	2.5L 2507cc 153 CID	**23122**
1988	2.5L 2507cc 153 CID	**23110**
1988-1987	2.2L 135 CID	**23110**
V6		
1994-1992	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Spirit		
L4		
1995-1990	2.5L 2507cc 153 CID	**23127**
1992	2.2L 135 CID	**23139**
1989	2.5L 2507cc 153 CID	**23122**
V6		
1994-1989	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Sprinter 2500		
L5		
2007-2004	2.7L 2687cc 165 CID	**78007**
2003	2.7L 2687cc 165 CID	**78008**
Sprinter 3500		
L5		
2007-2004	2.7L 2687cc 165 CID	**78007**
2003	2.7L 2687cc 165 CID	**78008**
St. Regis		
L6		
1981-1979	3.7L 3687cc 225 CID	**33100**
V8		
1981-1979	5.2L 318 CID	**43103**
1980-1979	5.9L 360 CID	**43103**
Stealth		
V6		
1996-1991	3.0L 2972cc 181 CID; DOHC	**33129**
1996-1991	3.0L 2972cc 181 CID; SOHC; Driven off the timing belt	**23121**
Stratus		
L4		
2006-2001	2.4L 2429cc 148 CID; With Cogged Pump Pulley; Driven off the timing belt	**23300**
2005-2001	2.4L 2351cc; Without Cogged Pump Pulley	**26399**
2000-1997	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
2000-1995	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
Stratus (cont'd)		
L4		
1996-1995	2.4L 2429cc 148 CID; Hydraulic Tensioner; Driven off the timing belt	**23153**
1996-1995	2.4L 2429cc 148 CID; Mechanical Tensioner; Driven off the timing belt	**23300**
V6		
2006-2001	2.7L 2700cc 167 CID; Pump is driven off the timing chain	**23161**
2002-2001	3.0L 2972cc 181 CID	**23152**
2000-1995	2.5L 2497cc 152 CID	**23152**
Truck		
V8		
1971-1970	6.7L 6769cc 413 CID	**43918**
1971-1969	5.9L 5917cc 361 CID	**43918**
1960	5.9L 5917cc 361 CID	**43918**
Viper		
V10		
1993-1992	8.0L 7990cc 488 CID	**33137**
W100		
V6		
1989	3.9L 3906cc 239 CID	**43103**
V8		
1989-1986	5.2L 5211cc 318 CID	**43103**
1988-1986	5.9L 360 CID	**43103**
1977-1975	5.2L 5211cc 318 CID; W/O A/C	**43053**
1977-1975	5.2L 5211cc 318 CID; w/ A/c	**43103**
1977-1975	5.9L 360 CID; W/O A/C	**43053**
1977-1975	5.9L 360 CID; w/ A/c	**43103**
1977-1975	6.6L 400 CID	**33040**
1977-1975	7.2L 440 CID	**33040**
W100 Pickup		
V8		
1974	6.6L 400 CID	**33040**
1974	7.2L 440 CID	**33040**
1974-1972	5.9L 360 CID; W/O A/C	**43053**
1974-1972	5.9L 360 CID; w/ A/c	**43103**
1974-1970	5.2L 318 CID; W/O A/C	**43053**
1974-1970	5.2L 318 CID; w/ A/c	**43103**
1971	6.6L 400 CID	**33040**
1971-1968	6.3L 6286cc 383 CID	**33040**
1969-1968	5.2L 5212cc 318 CID	**43919**
W100 Series		
V8		
1967-1966	6.3L 6286cc 383 CID	**33040**
1967-1960	5.2L 5212cc 318 CID	**43919**
W150		
V6		
1993	3.9L 3906cc 239 CID	**43160**
1992	3.9L 3906cc 239 CID	**43159**
1991-1989	3.9L 3906cc 239 CID	**43103**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
W150 (cont'd)		
V8		
1993	5.2L 5211cc 318 CID	**43160**
1993	5.9L 360 CID	**43160**
1992	5.2L 5211cc 318 CID	**43159**
1991-1984	5.9L 360 CID	**43103**
1991-1978	5.2L 5211cc 318 CID	**43103**
1981-1978	5.9L 360 CID	**43103**
1978	7.2L 440 CID	**33040**
1978-1977	6.6L 400 CID	**33040**
1977	5.2L 5211cc 318 CID; W/O A/C	**43053**
1977	5.2L 5211cc 318 CID; w/ A/c	**43103**
1977	5.9L 360 CID; W/O A/C	**43053**
1977	5.9L 360 CID; w/ A/c	**43103**
W200		
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1980-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1978-1975	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; W/O A/C	**43053**
1977-1975	5.2L 5211cc 318 CID; w/ A/c	**43103**
1977-1975	5.9L 360 CID; W/O A/C	**43053**
1977-1975	5.9L 360 CID; w/ A/c	**43103**
1975	5.2L 318 CID; W/O A/C	**43053**
1975	5.2L 318 CID; w/ A/c	**43103**
W200 Pickup		
V8		
1974	6.6L 400 CID	**33040**
1974	7.2L 440 CID	**33040**
1974-1971	5.9L 360 CID; W/O A/C	**43053**
1974-1971	5.9L 360 CID; w/ A/c	**43103**
1974-1970	5.2L 318 CID; W/O A/C	**43053**
1974-1970	5.2L 318 CID; w/ A/c	**43103**
1971	6.6L 400 CID	**33040**
1971-1969	6.3L 6286cc 383 CID	**33040**
1969	5.2L 5212cc 318 CID	**43919**
W200 Series		
V8		
1967-1966	6.3L 6286cc 383 CID	**33040**
1967-1960	5.2L 5212cc 318 CID	**43919**
W250		
L6		
1993-1989	5.9L 359 CID	**23145**
V8		
1993	5.2L 5211cc 318 CID	**43160**
1993	5.9L 360 CID	**43160**
1992	5.2L 5211cc 318 CID	**43159**
1991-1984	5.9L 360 CID	**43103**
1991-1981	5.2L 5211cc 318 CID	**43103**

YEAR	VEHICLE DETAIL	PART NO.
Dodge (cont'd)		
W250 (cont'd)		
V8		
1982-1981	5.9L 360 CID	**43103**
W300		
V8		
1980	5.2L 5211cc 318 CID	**43103**
1980-1978	5.9L 360 CID	**43103**
1978	5.2L 5211cc 318 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1978-1975	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; W/O A/C	**43053**
1977-1975	5.2L 5211cc 318 CID; w/ A/c	**43103**
1977-1975	5.9L 360 CID; W/O A/C	**43053**
1977-1975	5.9L 360 CID; w/ A/c	**43103**
W300 Pickup		
V8		
1974-1972	5.9L 360 CID; W/O A/C	**43053**
1974-1972	5.9L 360 CID; w/ A/c	**43103**
1974-1970	5.2L 318 CID; W/O A/C	**43053**
1974-1970	5.2L 318 CID; w/ A/c	**43103**
1971	5.9L 5899cc 360 CID; W/O A/C	**43053**
1971	5.9L 5899cc 360 CID; w/ A/c	**43103**
1971	6.3L 6286cc 383 CID	**33040**
1969-1968	5.2L 5212cc 318 CID	**43919**
1969-1968	6.3L 6286cc 383 CID	**33040**
W300 Series		
V8		
1967	6.3L 6286cc 383 CID	**33040**
1967-1960	5.2L 5212cc 318 CID	**43919**
W350		
L6		
1993-1989	5.9L 359 CID	**23145**
V8		
1993	5.9L 360 CID	**43160**
1992	5.9L 360 CID	**33100**
1991-1981	5.9L 360 CID	**43103**
1983-1982	5.2L 5211cc 318 CID	**43103**
Eagle		
2000 GTX		
L4		
1993	2.0L 1995cc 122 CID; DOHC	**26212**
1993	2.0L 1995cc 122 CID; SOHC	**26168**
1992-1991	2.0L 1997cc 122 CID; DOHC	**26212**
1992-1991	2.0L 1997cc 122 CID; SOHC	**26168**
Medallion		
L4		
1989-1988	2.2L 2163cc 132 CID	**23410**
Premier		
L4		
1989-1988	2.5L 150 CID	**23412**

YEAR	VEHICLE DETAIL	PART NO.
Eagle (cont'd)		
Premier (cont'd)		
V6		
1992-1991	3.0L 2972cc 182 CID; With Side Mounted Thermostat	**33138**
1991-1988	3.0L 2972cc 182 CID; With Top Mounted Thermostat	**33411**
Summit		
L4		
1996-1994	1.8L 1834cc 112 CID; Driven off the timing belt	**33147**
1996-1993	1.5L 1468cc 90 CID	**23115**
1996-1993	2.4L 2351cc; VIN G	**13148**
1993-1992	1.8L 1834cc 112 CID	**23135**
1992	2.4L 2351cc	**26168**
1991-1989	1.5L 1468cc 90 CID	**23115**
1990-1989	1.6L 1597cc 98 CID	**23131**
Talon		
L4		
1998-1995	2.0L 1997cc 122 CID; Naturally Aspirated; Driven off the timing belt	**23150**
1998-1995	2.0L 1997cc 122 CID; Turbocharged	**13148**
1994-1993	1.8L 1755cc 107 CID	**23108**
1994-1990	2.0L 1997cc 122 CID	**26212**
Vision		
V6		
1997	3.5L 3497cc 215 CID; With 6 Mounting Bolts; Driven off the timing belt	**23158**
1997-1995	3.5L 3497cc 215 CID; With 3 Mounting Bolts; Driven off the timing belt	**13151**
1997-1993	3.3L 3301cc 201 CID	**13140**
1994-1993	3.5L 3497cc 215 CID; Driven off the timing belt	**13141**
Vista		
L4		
1991-1989	2.0L 1997cc 122 CID	**23118**
Fiat		
Palio		
L4		
2008-2005	1.8L 1796cc 110 CID; Sold in Mexico	**11001**
Ford		
Aerostar		
L4		
1987-1986	2.3L 140 CID	**22054**
V6		
1997-1995	3.0L 182 CID	**42095**
1997-1990	4.0L 245 CID	**42060**
1994-1986	3.0L 182 CID	**42039**
1986	2.8L 171 CID	**42023**
Aspire		
L4		
1997-1994	1.3L 1295cc	**22049**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
B600		
L6		
1989-1987	6.6L 401 CID	**42062**
V8		
1989-1988	7.0L 429 CID	**62037**
1989-1980	6.1L 370 CID	**62037**
B700		
L6		
1989-1987	6.6L 401 CID	**42062**
V8		
1989-1980	6.1L 370 CID	**62037**
1989-1980	7.0L 429 CID	**62037**
Bronco		
L6		
1992-1987	4.9L 300 CID	**52048**
1986-1983	4.9L 300 CID	**32020**
1982-1980	4.9L 300 CID	**32030**
1974-1973	3.3L 200 CID	**22044**
1972-1966	2.8L 2786cc 170 CID	**22044**
1967-1966	3.9L 3933cc 240 CID	**22033**
V8		
1996-1988	5.0L 302 CID	**42044**
1996-1988	5.8L 351 CID	**42044**
1987-1983	5.8L 351 CID	**42953**
1986-1980	5.0L 302 CID	**42953**
1982-1978	5.8L 351 CID; Modified	**42932**
1981-1980	5.8L 351 CID; w/ Windsor Engine	**42953**
1979-1978	5.8L 351 CID	**42932**
1979-1978	6.6L 400 CID	**42932**
1977-1969	5.0L 302 CID	**42028**
1968-1966	4.7L 4727cc 289 CID; Without Thermactor Emission Control	**42028**
Bronco II		
V6		
1990-1986	2.9L 177 CID	**42042**
1985-1984	2.8L 171 CID	**42023**
C600		
V8		
1986-1980	6.1L 370 CID	**62037**
C700		
V8		
1986-1980	6.1L 370 CID	**62037**
1986-1980	7.0L 429 CID	**62037**
C800		
V8		
1986-1980	6.1L 370 CID	**62037**
1986-1980	7.0L 429 CID	**62037**
CF6000		
L6		
1990-1986	6.6L 401 CID	**42062**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
CF7000		
L6		
1997-1993	5.9L 359 CID	**23145**
1993-1992	6.6L 401 CID	**42071**
1993-1991	6.6L 401 CID	**42072**
1991-1986	6.6L 401 CID	**42062**
CF8000		
L6		
1997-1993	8.3L 504 CID	**70047**
1993-1992	7.8L 473 CID	**42072**
1991-1987	7.8L 473 CID	**42062**
Club Wagon		
L6		
1967	3.9L 3933cc 240 CID	**22033**
1965	3.9L 3933cc 240 CID	**22033**
Contour		
L4		
2000-1998	2.0L 1989cc 121 CID	**12115**
1997-1995	2.0L 1989cc 121 CID	**32088**
V6		
2000-1995	2.5L 2450cc 155 CID	**12091**
Country Sedan		
L6		
1972-1965	3.9L 3933cc 240 CID	**22033**
Country Squire		
L6		
1972-1965	3.9L 3933cc 240 CID	**22033**
V8		
1991-1990	5.0L 302 CID	**42052**
1991-1988	5.0L 302 CID; Incl. Brougman, X	**42052**
1989-1988	5.0L 302 CID; From 6-88	**42052**
1988	5.0L 302 CID; To 6-88	**42014**
1987	5.0L 302 CID	**42014**
1974	5.8L 351 CID; Windsor	**42953**
1974-1973	7.5L 7539cc 460 CID; Incl. Brougman, X	**42114**
1974-1973	7.5L 7539cc 460 CID; Includes Police	**42114**
1974-1972	5.8L 351 CID; Cleveland, Modified	**42932**
1974-1972	6.6L 400 CID; Cleveland, Modified	**42932**
1974-1971	6.6L 400 CID; Incl. Brougman, X	**42932**
1973	7.0L 7030cc 429 CID; Includes Police	**42114**
1973-1970	7.0L 7030cc 429 CID; Incl. Brougman, X	**42114**
1972-1970	5.0L 4949cc 302 CID; Incl. Brougman, X	**42953**
1972-1970	5.0L 4949cc 302 CID; Windsor	**42953**
1972-1970	5.8L 351 CID; Windsor	**42953**
1972-1970	7.0L 7030cc 429 CID; VIN N	**42114**
1971	6.4L 6391cc 390 CID; VIN Y; Includes Police	**62075**
1971	6.6L 400 CID	**42932**
1971-1970	7.0L 7030cc 429 CID; VIN K	**42114**
1971-1969	6.4L 6391cc 390 CID; Incl. Brougman, X	**62075**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Country Squire (cont'd)		
V8		
1970-1968	6.4L 6391cc 390 CID; VIN X; Includes Police	**62075**
1969	5.8L 351 CID	**42028**
1969	6.4L 6391cc 390 CID; VIN S; Includes Police	**62075**
1969	7.0L 7014cc 428 CID; Incl. Brougman, X	**62075**
1969	7.0L 7030cc 429 CID; Incl. Brougman, X	**62075**
1969-1968	5.0L 4949cc 302 CID	**42028**
1969-1968	7.0L 7014cc 428 CID; VIN P; Includes Police	**62075**
1968	6.4L 6391cc 390 CID; VIN Z; Includes Police	**62075**
1967	6.4L 6391cc 390 CID	**62075**
1967-1966	7.0L 6997cc 427 CID	**62075**
1967-1965	4.7L 4727cc 289 CID	**42028**
1966-1965	5.8L 5769cc 352 CID	**62075**
Courier		
L4		
1982-1979	2.0L 1989cc 122 CID	**42043**
1982-1977	2.3L 140 CID	**22005**
1979-1972	1.8L 110 CID	**42043**
Crown Victoria		
V8		
2011-2003	4.6L 281 CID	**32128**
2002-2001	4.6L 281 CID; Short Pump; 2 1/2" Hub Height	**32128**
2002-1999	4.6L 281 CID; Long Pump 3 7/16" Hub Height, w/7 Vane 3 1/4" Diameter Shrouded Impeller	**32119**
2002-1999	4.6L 281 CID; Long Pump, 3 7/16" Hub Height, w/8 Vane 3 5/8" Diameter Non-Shrouded Impeller	**32113**
1998	4.6L 281 CID	**32113**
1997-1992	4.6L 281 CID	**32066**
Custom		
L6		
1972-1965	3.9L 3933cc 240 CID	**22033**
V8		
1972	5.8L 5752cc 351 CID; Sold in United States; Cleveland, Modified	**42932**
1972	5.8L 5753cc 351 CID; Sold in United States; Cleveland, Modified	**42932**
1972	6.6L 6555cc 400 CID; Sold in United States; Cleveland, Modified	**42932**
1972	6.6L 6556cc 400 CID; Sold in United States; Cleveland, Modified	**42932**
1972-1971	6.6L 6555cc 400 CID; Sold in United States; Incl. Brougman, X	**42932**
1972-1971	6.6L 6556cc 400 CID; Sold in United States; Incl. Brougman, X	**42932**
1972-1970	5.0L 4949cc 302 CID; Incl. Brougman, X	**42953**
1972-1970	5.0L 4949cc 302 CID; Windsor	**42953**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Custom (cont'd)		
V8		
1972-1970	5.8L 5752cc 351 CID; Sold in United States; Windsor	**42953**
1972-1970	5.8L 5753cc 351 CID; Sold in United States; Windsor	**42953**
1972-1970	7.0L 7030cc 429 CID; Incl. Brougman, X	**42114**
1972-1970	7.0L 7030cc 429 CID; VIN N	**42114**
1971	6.6L 6555cc 400 CID; Sold in United States	**42932**
1971	6.6L 6556cc 400 CID; Sold in United States	**42932**
1971-1970	7.0L 7030cc 429 CID; VIN K	**42114**
1971-1969	6.4L 6391cc 390 CID; Incl. Brougman, X	**62075**
1971-1968	6.4L 6391cc 390 CID; VIN Y; Includes Police	**62075**
1970-1969	7.0L 7014cc 428 CID; Incl. Brougman, X	**62075**
1970-1968	7.0L 7014cc 428 CID; VIN P; Includes Police	**62075**
1969	5.8L 5752cc 351 CID; Sold in United States	**42028**
1969	5.8L 5753cc 351 CID; Sold in United States	**42028**
1969	7.0L 7030cc 429 CID; Incl. Brougman, X	**62075**
1969-1968	5.0L 4949cc 302 CID	**42028**
1968	6.4L 6391cc 390 CID; VIN Z; Includes Police	**62075**
1967-1965	4.7L 4727cc 289 CID	**42028**
1967-1965	6.4L 6391cc 390 CID	**62075**
1966	7.0L 6997cc 427 CID	**62075**
1966-1965	5.8L 5769cc 352 CID	**62075**
Custom 500		
L6		
1972-1968	3.9L 3933cc 240 CID	**22033**
1972-1965	3.9L 240 CID	**22033**
V8		
1977	6.6L 400 CID; Cleveland, Modified	**42932**
1977-1975	5.8L 351 CID; w/ Windsor Engine; Incl. Brougman, X	**42953**
1977-1974	5.8L 351 CID; Windsor	**42953**
1977-1972	5.8L 351 CID; Cleveland, Modified	**42932**
1977-1971	6.6L 400 CID; Incl. Brougman, X	**42932**
1976	6.6L 400 CID	**42932**
1976-1975	7.5L 460 CID; Incl. Brougman, X	**42114**
1976-1975	7.5L 460 CID; Includes Police	**42114**
1975-1972	6.6L 400 CID; Cleveland, Modified	**42932**
1974-1973	7.5L 7539cc 460 CID; Incl. Brougman, X	**42114**
1974-1973	7.5L 7539cc 460 CID; Includes Police	**42114**
1973	7.0L 7030cc 429 CID; Includes Police	**42114**
1973-1970	7.0L 7030cc 429 CID; Incl. Brougman, X	**42114**
1972-1970	5.0L 4949cc 302 CID; Incl. Brougman, X	**42953**
1972-1970	5.0L 4949cc 302 CID; Windsor	**42953**
1972-1970	5.8L 351 CID; Windsor	**42953**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Custom 500 (cont'd)		
V8		
1972-1970	7.0L 7030cc 429 CID; VIN N	**42114**
1971	6.4L 6391cc 390 CID; VIN Y; Includes Police	**62075**
1971	6.6L 400 CID	**42932**
1971-1970	7.0L 7030cc 429 CID; VIN K	**42114**
1971-1969	6.4L 6391cc 390 CID; Incl. Brougman, X	**62075**
1970	6.4L 6391cc 390 CID; VIN X; Includes Police	**62075**
1970-1969	7.0L 7014cc 428 CID; Incl. Brougman, X	**62075**
1970-1968	7.0L 7014cc 428 CID; VIN P; Includes Police	**62075**
1969	5.8L 351 CID	**42028**
1969	7.0L 7030cc 429 CID; Incl. Brougman, X	**62075**
1969-1968	5.0L 4949cc 302 CID	**42028**
1969-1968	6.4L 6391cc 390 CID; VIN Y; Includes Police	**62075**
1968	6.4L 6391cc 390 CID; VIN Z; Includes Police	**62075**
1967-1966	6.4L 390 CID	**62075**
1967-1965	4.7L 289 CID	**42028**
1967-1965	7.0L 427 CID	**62075**
1966	7.0L 428 CID	**62075**
1966-1965	5.8L 352 CID	**62075**
E-100 Econoline		
L6		
1983	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1978	4.9L 300 CID	**32030**
1977-1972	4.9L 300 CID	**22033**
1974-1971	3.9L 3933cc 240 CID	**22033**
1974-1968	3.9L 240 CID	**22033**
1970-1968	2.8L 2786cc 170 CID	**22044**
V8		
1983-1979	5.0L 302 CID	**42953**
1983-1975	5.8L 351 CID; w/ Windsor Engine	**42953**
1978	7.5L 460 CID	**42114**
1975	5.0L 302 CID	**42953**
1974-1973	5.0L 302 CID; Without Thermactor Emission Control	**42028**
1972-1968	5.0L 302 CID	**42028**
E-100 Econoline Club Wagon		
L6		
1983	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1978	4.9L 300 CID	**32030**
1977-1975	4.9L 300 CID	**22033**
V8		
1983-1979	5.0L 302 CID	**42953**
1983-1975	5.8L 351 CID; w/ Windsor Engine	**42953**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
E-150		
V6		
2003	4.2L 256 CID	**42105**
V8		
2013-2010	4.6L 281 CID	**32130**
2013-2003	5.4L 330 CID	**32130**
2007-2003	4.6L 281 CID	**32130**
E-150 Club Wagon		
V6		
2003	4.2L 256 CID	**42105**
V8		
2005-2003	4.6L 281 CID	**32130**
2005-2003	5.4L 330 CID	**32130**
E-150 Econoline		
L6		
1996-1993	4.9L 300 CID	**52099**
1992	4.9L 300 CID	**52079**
1991-1987	4.9L 300 CID	**52048**
1986-1984	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1983	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1978	4.9L 300 CID	**32030**
1977-1976	4.9L 300 CID	**22033**
1975	4.9L 300 CID	**32030**
V6		
2002-1997	4.2L 256 CID	**42105**
V8		
2002-1997	4.6L 281 CID	**32122**
2002-1997	5.4L 330 CID	**32122**
1996-1988	5.8L 351 CID	**42044**
1996-1987	5.0L 302 CID	**42044**
1986-1979	5.0L 302 CID	**42953**
1985-1975	5.8L 351 CID; w/ Windsor Engine	**42953**
1984	6.9L 420 CID	**52018**
1980-1976	7.5L 460 CID	**42114**
1975	5.0L 302 CID	**42953**
E-150 Econoline Club Wagon		
L6		
1996-1993	4.9L 300 CID	**52099**
1992	4.9L 300 CID	**52079**
1991-1987	4.9L 300 CID	**52048**
1986-1984	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1983	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1975	4.9L 300 CID	**32030**
1977-1975	4.9L 300 CID	**22033**
V6		
2002-1997	4.2L 256 CID	**42105**
E-150 Econoline Club Wagon (cont'd)		
V8		
2002-1997	4.6L 281 CID	**32122**
2002-1997	5.4L 330 CID	**32122**
1996-1988	5.8L 351 CID	**42044**
1996-1987	5.0L 302 CID	**42044**
1986-1979	5.0L 302 CID	**42953**
1985-1975	5.8L 351 CID; w/ Windsor Engine	**42953**
1979	7.5L 460 CID	**42114**
1977-1976	7.5L 460 CID	**42114**
E-250		
V6		
2003	4.2L 256 CID	**42105**
V8		
2013-2010	4.6L 281 CID	**32130**
2013-2003	5.4L 330 CID	**32130**
2007-2003	4.6L 281 CID	**32130**
E-250 Econoline		
L6		
1996-1993	4.9L 300 CID	**52099**
1992	4.9L 300 CID	**52079**
1991-1987	4.9L 300 CID	**52048**
1986-1984	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1983	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1975	4.9L 300 CID	**32030**
V6		
2002-1997	4.2L 256 CID	**42105**
V8		
2002-1997	5.4L 330 CID	**32122**
1996-1988	5.8L 351 CID	**42044**
1991-1987	5.0L 302 CID	**42044**
1986-1979	5.0L 302 CID	**42953**
1985-1975	5.8L 351 CID; w/ Windsor Engine	**42953**
1980-1975	7.5L 460 CID	**42114**
1975	5.0L 302 CID	**42953**
E-250 Econoline Club Wagon		
L6		
1991-1987	4.9L 300 CID	**52048**
1986-1984	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1983	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1980-1977	4.9L 300 CID	**32030**
V8		
1991-1989	7.3L 445 CID; DIESEL; Naturally Aspirated; Direct	**52018**
1991-1988	5.8L 351 CID	**42044**
1991-1975	7.5L 460 CID	**42114**
1989-1988	7.5L 460 CID; FI; With Multiport Injection	**52081**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
E-250 Econoline Club Wagon (cont'd)		
V8		
1988	7.3L 445 CID; DIESEL	**52018**
1987-1983	6.9L 420 CID	**52018**
1985-1975	5.8L 351 CID; w/ Windsor Engine	**42953**
1982	6.6L 400 CID	**42932**
1980-1979	5.0L 302 CID	**42953**
E-250 Super Duty		
V8		
2005-2004	5.4L 330 CID	**32130**
E-350		
V10		
2003	6.8L 415 CID	**32109**
V8		
2003	5.4L 330 CID	**32130**
2003	7.3L 445 CID; DIESEL; FI; Turbocharged; Direct Injection	**72114**
E-350 Club Wagon		
V10		
2005	6.8L 415 CID	**32109**
2003	6.8L 415 CID	**32109**
V8		
2005-2004	6.0L 363 CID; DIESEL; Turbocharged	**76058**
2005-2003	5.4L 330 CID	**32130**
2003	7.3L 445 CID; DIESEL; FI; Turbocharged; Direct Injection	**72114**
E-350 Econoline		
L6		
1996-1993	4.9L 300 CID	**52099**
1992	4.9L 300 CID	**52079**
1991-1987	4.9L 300 CID	**52048**
1986-1984	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1983	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1975	4.9L 300 CID	**32030**
V10		
2002-1997	6.8L 415 CID	**32109**
V8		
2002-1997	5.4L 330 CID	**32122**
2002-1996	7.3L 445 CID; DIESEL; FI; Turbocharged; Direct Injection	**72114**
1996-1995	7.5L 460 CID	**52086**
1996-1988	5.8L 351 CID	**42044**
1995	7.3L 445 CID; DIESEL; FI; Turbocharged; Direct Injection	**72096**
1994-1992	7.5L 460 CID; From 2-3-92	**52077**
1994-1989	7.3L 445 CID; DIESEL; Naturally Aspirated; Direct	**52018**
1992-1975	7.5L 460 CID	**42114**
1989-1988	7.5L 460 CID; FI; With Multiport Injection	**52081**
1988	7.3L 445 CID; DIESEL	**52018**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
E-350 Econoline (cont'd)		
V8		
1987-1983	6.9L 420 CID	**52018**
1985-1975	5.8L 351 CID; w/ Windsor Engine	**42953**
1982	6.6L 400 CID	**42932**
1982-1979	5.0L 302 CID	**42953**
1975	5.0L 302 CID	**42953**
E-350 Econoline Club Wagon		
L6		
1996-1993	4.9L 300 CID	**52099**
1992	4.9L 300 CID	**52079**
1991-1987	4.9L 300 CID	**52048**
1986-1984	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1983	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1977	4.9L 300 CID	**32030**
V10		
2002-1997	6.8L 415 CID	**32109**
V8		
2002-1997	5.4L 330 CID	**32122**
2002-1996	7.3L 445 CID; DIESEL; FI; Turbocharged; Direct Injection	**72114**
1996-1995	7.5L 460 CID	**52086**
1996-1988	5.8L 351 CID	**42044**
1995	7.3L 445 CID; DIESEL; FI; Turbocharged; Direct Injection	**72096**
1994-1992	7.5L 460 CID; From 2-3-92	**52077**
1994-1989	7.3L 445 CID; DIESEL; Naturally Aspirated; Direct	**52018**
1992-1977	7.5L 460 CID	**42114**
1989-1988	7.5L 460 CID; FI; With Multiport Injection	**52081**
1988	7.3L 445 CID; DIESEL	**52018**
1987-1983	6.9L 420 CID	**52018**
1985-1977	5.8L 351 CID; w/ Windsor Engine	**42953**
1982	6.6L 400 CID	**42932**
1980-1979	5.0L 302 CID	**42953**
E-350 Super Duty		
V10		
2010-2004	6.8L 415 CID	**32109**
V8		
2013-2004	5.4L 330 CID	**32130**
2010-2006	6.0L 363 CID; DIESEL; Turbocharged	**76058**
2005-2004	6.0L 363 CID	**76058**
E-450 Econoline Super Duty		
V10		
2002-2000	6.8L 415 CID	**32109**
V8		
2002-2000	5.4L 330 CID	**32130**
2002-2000	7.3L 445 CID	**72114**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
E-450 Econoline Super Duty Stripped		
V10		
2002-2000	6.8L 415 CID	**32109**
V8		
2002-2000	5.4L 330 CID	**32130**
2002-2000	7.3L 445 CID	**72114**
E-450 Super Duty		
All		
2013-2006		**32130**
2004-2003		**32130**
V10		
2010-2003	6.8L 415 CID	**32109**
V8		
2008-2004	6.0L 363 CID; DIESEL; Turbocharged	**76058**
2003	7.3L 445 CID; DIESEL; Turbocharged	**72114**
E-450 Super Duty Stripped Chassis		
V10		
2003	6.8L 415 CID	**32109**
V8		
2003	5.4L 330 CID	**32130**
2003	7.3L 445 CID; DIESEL; Turbocharged	**72114**
E-550 Econoline Super Duty		
V10		
2002	6.8L 415 CID	**32109**
V8		
2002	7.3L 445 CID	**72114**
E-550 Super Duty		
V10		
2003	6.8L 415 CID	**32109**
V8		
2003	7.3L 445 CID; DIESEL; Turbocharged	**72114**
EXP		
L4		
1988-1986	1.9L 116 CID; Driven off the timing belt	**22040**
1985-1982	1.6L 1598cc 98 CID; Driven off the timing belt	**22040**
Econoline Super Duty		
V10		
1999-1997	6.8L 415 CID	**32109**
V8		
1999-1997	5.4L 330 CID	**32122**
1999-1996	7.3L 445 CID	**72114**
1996	5.8L 351 CID	**42044**
Edge		
L4		
2013-2012	2.0L 1999cc 122 CID	**12126**
V6		
2010-2007	3.5L 3496cc 213 CID; Pump is driven off the timing chain	**32023**
Elite		
V8		
1976-1975	5.8L 351 CID; Modified	**42932**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Elite (cont'd)		
V8		
1976-1975	5.8L 351 CID; w/ Windsor Engine; Windsor	**42953**
1976-1975	6.6L 400 CID; Modified	**42932**
1976-1975	7.5L 460 CID; Includes Police	**42114**
Escape		
L4		
2013	2.0L 1999cc 122 CID	**12126**
2013-2009	2.5L 2488cc 152 CID; VIN 7	**12126**
2010-2009	2.5L 2488cc 152 CID; VIN 3	**12126**
2008-2005	2.3L 140 CID; ELECTRIC/GAS	**12126**
2008-2005	2.3L 140 CID; GAS	**12126**
2004-2001	2.0L 1989cc 121 CID	**12115**
V6		
2012-2009	3.0L 183 CID	**12250**
2008-2006	3.0L 183 CID	**12489**
2005-2003	3.0L 182 CID	**12132**
2003-2001	3.0L 182 CID	**12091**
Escort		
L4		
2003	2.0L 1989cc 121 CID	**12115**
2002-2000	2.0L 1989cc 121 CID; DOHC; ZX2	**12115**
2002-1997	2.0L 1989cc 121 CID; Driven off the timing belt	**22107**
2000-1999	2.0L 1989cc 121 CID; DOHC; ZX2 S/R	**12115**
1999-1998	2.0L 1989cc 121 CID; DOHC; ZX2 Cool Coupe	**12115**
1999-1998	2.0L 1989cc 121 CID; DOHC; ZX2 Hot Coupe	**12115**
1996-1991	1.8L 112 CID	**22068**
1996-1991	1.9L 116 CID; From 4/91 Round Edge Pulley; Driven off the timing belt	**22069**
1991	1.9L 116 CID; Before 4/91 Square Tooth Belt; Driven off the timing belt	**22065**
1990-1985	1.9L 116 CID; Driven off the timing belt	**22040**
1987-1984	2.0L 1989cc 122 CID; DIESEL; Driven off the timing belt	**26067**
1985-1981	1.6L 1598cc 98 CID; Driven off the timing belt	**22040**
Excursion		
V10		
2005-2000	6.8L 415 CID	**32109**
V8		
2005-2004	6.0L 363 CID	**76058**
2005-2003	5.4L 330 CID	**32130**
2005-2003	6.0L 363 CID; DIESEL; Turbocharged	**70133**
2003-2000	7.3L 445 CID; DIESEL	**72114**
2002-2000	5.4L 330 CID	**32122**
Expedition		
V8		
2009	5.4L 330 CID	**32130**
2006-2003	5.4L 330 CID	**32130**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Expedition (cont'd)		
V8		
2004-2003	4.6L 281 CID	**32130**
2002-1997	4.6L 281 CID	**32122**
2002-1997	5.4L 330 CID	**32122**
Explorer		
L4		
2013-2012	2.0L 1999cc 122 CID	**12126**
V6		
2010-1997	4.0L 245 CID; VIN E	**42108**
2005-2002	4.0L 245 CID; VIN K; VIN K	**42108**
2000-1991	4.0L 245 CID; VIN X; VIN X	**42060**
V8		
2010-2002	4.6L 281 CID	**32127**
2001-1996	5.0L 302 CID	**32101**
Explorer Sport Trac		
V6		
2010-2007	4.0L 245 CID	**42108**
2005-2001	4.0L 245 CID	**42108**
V8		
2010-2007	4.6L 281 CID	**32127**
F Super Duty		
V8		
1997-1996	7.3L 445 CID; DIESEL; Turbocharged; Direct Injection	**72114**
1997-1995	7.5L 460 CID	**52086**
1995-1994	7.3L 445 CID	**72096**
1994	7.3L 445 CID; DIESEL; Turbocharged; Direct Injection	**52018**
1994-1992	7.5L 460 CID; From 2-3-92	**52077**
1994-1990	7.5L 460 CID; Naturally Aspirated	**52018**
1992-1990	7.5L 460 CID; Before 2-3-92	**42114**
1989-1988	7.5L 460 CID	**52081**
1988	7.5L 460 CID; Naturally Aspirated; With MFI	**52018**
1988	7.5L 460 CID; With CARB	**42114**
F-100		
L6		
1982-1978	4.9L 300 CID	**32030**
1977	4.9L 300 CID; Excluding Serial #80,001	**22033**
1977	4.9L 300 CID; From Serial #80,001	**32030**
1977	4.9L 300 CID; To Serial #80,001	**22033**
1976	4.9L 300 CID	**32030**
1975	3.9L 240 CID; Without Thermactor Emission Control	**22033**
1975	4.9L 300 CID; With Thermactor Emission Control System	**32030**
1975	4.9L 300 CID; Without Thermactor Emission Control	**22033**
V6		
1983-1982	3.8L 232 CID	**42016**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
F-100 (cont'd)		
V8		
1983-1980	5.0L 302 CID	**42953**
1982-1981	4.2L 255 CID	**42953**
1981	5.8L 351 CID; Windsor	**42953**
1981	5.8L 351 CID; w/ Modified Engine	**42932**
1979	7.5L 460 CID	**42114**
1979-1977	5.8L 351 CID; w/ Modified Engine	**42932**
1979-1977	5.8L 351 CID; w/ Windsor Engine	**42953**
1979-1977	6.6L 400 CID	**42932**
1979-1976	5.0L 302 CID; From #B75001	**42953**
1977-1975	7.5L 460 CID	**42114**
1976-1975	5.0L 302 CID; TO #B75001	**42953**
1976-1975	5.9L 360 CID	**62075**
1976-1975	6.4L 390 CID	**62075**
F-100 Pickup		
L6		
1974	4.9L 300 CID; With Thermactor Emission Control System	**32030**
1974-1973	3.9L 3933cc 240 CID; Without Thermactor Emission Control	**22033**
1974-1973	4.9L 300 CID; Without Thermactor Emission Control	**22033**
1972-1965	3.9L 3933cc 240 CID	**22033**
1972-1965	4.9L 300 CID	**22033**
V8		
1974	5.9L 360 CID	**62075**
1974	6.4L 390 CID	**62075**
1974-1973	7.5L 7539cc 460 CID	**42114**
1974-1969	5.0L 302 CID; TO #B75001	**42953**
1972-1968	5.9L 360 CID	**62075**
1972-1968	6.4L 390 CID	**62075**
1967-1965	5.8L 5769cc 352 CID	**62075**
F-150		
L6		
1996-1993	4.9L 300 CID	**52099**
1992-1987	4.9L 300 CID	**52048**
1986-1985	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1984	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1978	4.9L 300 CID	**32030**
1977	4.9L 300 CID; Excluding Serial #80,001	**22033**
1977	4.9L 300 CID; From Serial #80,001	**32030**
1977	4.9L 300 CID; To Serial #80,001	**22033**
1976	4.9L 300 CID	**32030**
1975	3.9L 240 CID; Without Thermactor Emission Control	**22033**
1975	4.9L 300 CID; With Thermactor Emission Control System	**32030**
1975	4.9L 300 CID; Without Thermactor Emission Control	**22033**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
F-150 (cont'd)		
V6		
2008-1997	4.2L 256 CID	**42105**
V8		
2010	4.6L 281 CID	**32130**
2009	4.6L 281 CID	**32127**
2006-2003	4.6L 281 CID	**32130**
2006-2003	5.4L 330 CID	**32130**
2004-2003	5.4L 330 CID; Harley-Davidson Edition; Supercharged	**32125**
2004-2001	5.4L 330 CID; Lightning; Supercharged	**32125**
2002-2000	5.4L 330 CID; BI-FUEL; VIN Z	**32122**
2002-2000	5.4L 330 CID; CNG; VIN M	**32122**
2002-1998	4.6L 281 CID	**32122**
2002-1997	5.4L 330 CID; GAS; VIN L	**32122**
2001-1999	5.4L 330 CID; Lightning; Supercharged	**32121**
1996-1988	5.8L 351 CID	**42044**
1996-1987	5.0L 302 CID	**42044**
1987-1980	5.8L 351 CID; Windsor	**42953**
1986-1980	5.0L 302 CID	**42953**
1984	6.9L 420 CID; DIESEL; Naturally Aspirated	**52018**
1981-1977	5.8L 351 CID; w/ Modified Engine	**42932**
1979-1977	5.8L 351 CID; w/ Windsor Engine	**42953**
1979-1977	6.6L 400 CID	**42932**
1979-1976	5.0L 302 CID; From #B75001	**42953**
1979-1975	7.5L 460 CID	**42114**
1976-1975	5.0L 302 CID; TO #B75001	**42953**
1976-1975	5.9L 360 CID	**62075**
1976-1975	6.4L 390 CID	**62075**
F-150 Heritage		
V6		
2004	4.2L 256 CID	**42105**
2004	4.2L 256 CID; Extended Cab Pickup	**42105**
2004	4.2L 256 CID; Standard Cab Pickup	**42105**
V8		
2004	4.6L 281 CID	**32130**
2004	5.4L 330 CID	**32130**
F-250		
L6		
1996-1993	4.9L 300 CID	**52099**
1992-1987	4.9L 300 CID	**52048**
1986-1985	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1984	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1978	4.9L 300 CID	**32030**
1977	4.9L 300 CID; Excluding Serial #80,001	**22033**
1977	4.9L 300 CID; From Serial #80,001	**32030**
1977	4.9L 300 CID; To Serial #80,001	**22033**
1976	4.9L 300 CID	**32030**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
F-250 (cont'd)		
L6		
1975	4.9L 300 CID; From Serial #80,001	**32030**
1975	4.9L 300 CID; To Serial #80,001	**22033**
1975	4.9L 300 CID; Without Thermactor Emission Control	**22033**
V8		
2002-1997	4.6L 281 CID	**32122**
1999-1998	5.4L 330 CID; BI-FUEL; VIN Z	**32122**
1999-1997	5.4L 330 CID; CNG; VIN M	**32122**
1999-1997	5.4L 330 CID; GAS; VIN L	**32122**
1997-1996	7.3L 445 CID; DIESEL; Turbocharged; Direct Injection	**72114**
1997-1995	7.5L 460 CID	**52086**
1997-1988	5.8L 351 CID	**42044**
1996-1987	5.0L 302 CID	**42044**
1995-1994	7.3L 445 CID	**72096**
1994-1992	7.5L 460 CID; From 2-3-92	**52077**
1994-1988	7.3L 445 CID; DIESEL; Naturally Aspirated	**52018**
1993	7.3L 445 CID; DIESEL; Turbocharged	**52018**
1992-1990	7.5L 460 CID; Before 2-3-92	**42114**
1989-1988	7.5L 460 CID; With CARB	**42114**
1989-1988	7.5L 460 CID; With MFI	**52081**
1987-1983	6.9L 420 CID; DIESEL; Naturally Aspirated	**52018**
1987-1983	7.5L 460 CID	**42114**
1987-1980	5.8L 351 CID; Windsor	**42953**
1986-1980	5.0L 302 CID	**42953**
1982-1977	6.6L 400 CID	**42932**
1981-1977	5.8L 351 CID; w/ Modified Engine	**42932**
1979-1977	5.8L 351 CID; w/ Windsor Engine	**42953**
1979-1976	5.0L 302 CID; From #B75001	**42953**
1979-1975	7.5L 460 CID	**42114**
1976-1975	5.0L 302 CID; TO #B75001	**42953**
1976-1975	5.9L 360 CID	**62075**
1976-1975	6.4L 390 CID	**62075**
F-250 Pickup		
L6		
1974	4.9L 300 CID; With Thermactor Emission Control System	**32030**
1974-1973	3.9L 3933cc 240 CID; Without Thermactor Emission Control	**22033**
1974-1973	4.9L 300 CID; Without Thermactor Emission Control	**22033**
1972-1965	3.9L 3933cc 240 CID	**22033**
1972-1965	4.9L 300 CID	**22033**
V8		
1974	5.9L 360 CID	**62075**
1974	6.4L 390 CID	**62075**
1974-1973	7.5L 7539cc 460 CID	**42114**
1974-1972	5.0L 302 CID; TO #B75001	**42953**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
F-250 Pickup (cont'd)		
V8		
1972-1968	5.9L 360 CID	**62075**
1972-1968	6.4L 390 CID	**62075**
1967-1965	5.8L 5769cc 352 CID	**62075**
F-250 Super Duty		
V10		
2009-1999	6.8L 415 CID	**32109**
V8		
2010-2008	6.4L 391 CID	**42157**
2010-2003	5.4L 330 CID	**32130**
2007-2004	6.0L 363 CID; DIESEL; Turbocharged; From 9-22-03	**76058**
2004-2003	6.0L 363 CID; DIESEL; Turbocharged; To 9-22-03	**70133**
2003-1999	7.3L 445 CID; DIESEL; Turbocharged; Direct Injection	**72114**
2002-1999	5.4L 330 CID	**32122**
F-350		
L6		
1996-1993	4.9L 300 CID	**52099**
1992-1987	4.9L 300 CID	**52048**
1986-1985	4.9L 300 CID	**32020**
1984	4.9L 300 CID; With Dual Rear Wheels	**32083**
1984	4.9L 300 CID; Without Dual Rear Wheels	**32020**
1982-1978	4.9L 300 CID	**32030**
1977	4.9L 300 CID; Excluding Serial #80,001	**22033**
1977-1975	4.9L 300 CID; From Serial #80,001	**32030**
1977-1975	4.9L 300 CID; To Serial #80,001	**22033**
1975	4.9L 300 CID; Without Thermactor Emission Control	**22033**
V8		
1997-1996	7.3L 445 CID; DIESEL; Turbocharged; Direct Injection	**72114**
1997-1995	7.5L 460 CID	**52086**
1997-1988	5.8L 351 CID	**42044**
1995-1994	7.3L 445 CID	**72096**
1994-1992	7.5L 460 CID; From 2-3-92	**52077**
1994-1988	7.3L 445 CID; DIESEL; Naturally Aspirated	**52018**
1993	7.3L 445 CID; DIESEL; Turbocharged	**52018**
1992-1990	7.5L 460 CID; Before 2-3-92	**42114**
1989-1988	7.5L 460 CID; With CARB	**42114**
1989-1988	7.5L 460 CID; With MFI	**52081**
1987-1983	6.9L 420 CID; DIESEL; Naturally Aspirated	**52018**
1987-1983	7.5L 460 CID	**42114**
1987-1980	5.8L 351 CID; Windsor	**42953**
1982-1977	6.6L 400 CID	**42932**
1981-1977	5.8L 351 CID; w/ Modified Engine	**42932**
1980	5.0L 302 CID	**42953**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
F-350 (cont'd)		
V8		
1979-1977	5.8L 351 CID; w/ Windsor Engine	**42953**
1979-1976	5.0L 302 CID; From #B75001	**42953**
1979-1975	7.5L 460 CID	**42114**
1976-1975	5.0L 302 CID; TO #B75001	**42953**
1976-1975	5.9L 360 CID	**62075**
1976-1975	6.4L 390 CID	**62075**
F-350 Pickup		
L6		
1974	4.9L 300 CID; With Thermactor Emission Control System	**32030**
1974-1973	3.9L 3933cc 240 CID; Without Thermactor Emission Control	**22033**
1974-1973	4.9L 300 CID; Without Thermactor Emission Control	**22033**
1972-1965	3.9L 3933cc 240 CID	**22033**
1972-1965	4.9L 300 CID	**22033**
V8		
1974	5.9L 360 CID	**62075**
1974	6.4L 390 CID	**62075**
1974-1973	7.5L 7539cc 460 CID	**42114**
1974-1972	5.0L 302 CID; TO #B75001	**42953**
1972-1968	5.9L 360 CID	**62075**
1972-1968	6.4L 390 CID	**62075**
1967-1965	5.8L 5769cc 352 CID	**62075**
1966-1964	5.9L 5917cc 361 CID	**62075**
F-350 Super Duty		
V10		
2009-1999	6.8L 415 CID	**32109**
V8		
2010-2008	6.4L 391 CID	**42157**
2010-2003	5.4L 330 CID	**32130**
2007-2004	6.0L 363 CID; DIESEL; Turbocharged; From 9-22-03	**76058**
2004-2003	6.0L 363 CID; DIESEL; Turbocharged; To 9-22-03	**70133**
2003-1999	7.3L 445 CID; DIESEL; Turbocharged; Direct Injection	**72114**
2002-1999	5.4L 330 CID	**32122**
F-450 Super Duty		
V10		
2009-1999	6.8L 415 CID	**32109**
V8		
2010-2008	6.4L 391 CID	**42157**
2007-2004	6.0L 363 CID; DIESEL; Turbocharged; From 9-22-03	**76058**
2004-2003	6.0L 363 CID; DIESEL; Turbocharged; To 9-22-03	**70133**
2003-1999	7.3L 445 CID; DIESEL; Turbocharged; Direct Injection	**72114**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
F-550 Super Duty		
V10		
2009-1999	6.8L 415 CID	**32109**
V8		
2010-2008	6.4L 391 CID	**42157**
2007-2004	6.0L 363 CID; DIESEL; Turbocharged; From 9-22-03	**76058**
2004-2003	6.0L 363 CID; DIESEL; Turbocharged; To 9-22-03	**70133**
2003-1999	7.3L 445 CID; DIESEL; Turbocharged; Direct Injection	**72114**
F53		
V10		
2008-1999	6.8L 415 CID	**32109**
V8		
1997-1995	7.5L 460 CID; Stripped Chassis	**52086**
1994-1993	7.5L 460 CID; Stripped Chassis	**52077**
1992	7.5L 460 CID; Stripped Chassis; Before 2-3-92	**42114**
1992	7.5L 460 CID; Stripped Chassis; From 2-3-92	**52077**
1991-1990	7.5L 460 CID; Stripped Chassis	**42114**
1989	7.5L 460 CID; FI; Stripped Chassis; With Multiport Injection	**52081**
1988	7.5L 460 CID; With CARB	**42114**
1988	7.5L 460 CID; With MFI	**52081**
F59		
V8		
1997-1996	7.3L 445 CID	**72114**
1995-1994	7.3L 445 CID	**72096**
1994	7.3L 445 CID; DIESEL; Turbocharged; VIN K	**52018**
1994-1989	7.3L 445 CID; DIESEL; Naturally Aspirated; VIN M	**52018**
F600		
L6		
1994-1993	5.9L 359 CID	**23145**
1993-1992	6.6L 401 CID	**42071**
1993-1991	6.6L 401 CID	**42072**
1991-1986	6.6L 401 CID	**42062**
1989-1987	7.8L 473 CID	**42062**
V8		
1994-1980	7.0L 429 CID	**62037**
1991-1980	6.1L 370 CID	**62037**
F650		
L6		
2013-2008	6.7L 408 CID	**73158**
2008-2002	5.9L 359 CID	**73158**
2001-2000	5.9L 359 CID	**23145**
V8		
2003-2000	7.3L 444 CID	**73716**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
F700		
L6		
1997-1993	5.9L 359 CID	**23145**
1993-1992	6.6L 401 CID	**42072**
1991-1987	7.8L 473 CID	**42062**
1991-1986	6.6L 401 CID	**42062**
V8		
1998-1980	7.0L 429 CID	**62037**
1991-1980	6.1L 370 CID	**62037**
F750		
L6		
2013-2008	6.7L 408 CID	**73158**
2008-2002	5.9L 359 CID	**73158**
2001-2000	5.9L 359 CID	**23145**
V8		
2003-2000	7.3L 444 CID	**73716**
F800		
L6		
1999-1993	5.9L 359 CID	**23145**
1998-1992	8.3L 504 CID	**70047**
1991-1986	7.8L 473 CID	**42062**
V8		
1998-1997	7.0L 429 CID	**62037**
1991-1980	6.1L 370 CID	**62037**
1990-1980	7.0L 429 CID	**62037**
FT800		
V8		
1990-1988	6.1L 370 CID	**62037**
1990-1988	7.0L 429 CID	**62037**
1986-1980	6.1L 370 CID	**62037**
1986-1980	7.0L 429 CID	**62037**
Fairlane		
L6		
1970-1969	4.1L 250 CID	**22960**
1968	3.3L 200 CID	**22044**
1967-1966	3.3L 3277cc 200 CID; Without Thermactor Emission Control; With Thermactor Emission Control System	**22044**
1965-1964	3.3L 3277cc 200 CID	**22044**
1965-1963	2.8L 2786cc 170 CID	**22044**
V8		
1970	5.0L 4949cc 302 CID	**42953**
1970	5.8L 351 CID	**42932**
1970	7.0L 7030cc 429 CID	**42114**
1969	5.8L 351 CID	**42028**
1969	7.0L 6997cc 427 CID	**62075**
1969-1968	5.0L 4949cc 302 CID	**42028**
1969-1968	6.4L 6391cc 390 CID	**62075**
1969-1968	7.0L 7014cc 428 CID	**62075**
1968-1965	4.7L 4727cc 289 CID	**42028**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Fairlane (cont'd)		
V8		
1967	6.4L 6391cc 390 CID; Without Thermactor Emission Control; With Thermactor Emission Control System	**62075**
1967	7.0L 6997cc 427 CID; Without Thermactor Emission Control; With Thermactor Emission Control System	**62075**
1966	6.4L 6391cc 390 CID	**62075**
Fairmont		
L4		
1983	2.3L 140 CID	**22054**
1982-1978	2.3L 140 CID	**22005**
L6		
1983-1978	3.3L 200 CID	**22002**
V8		
1982-1980	4.2L 255 CID	**42953**
1979-1978	5.0L 302 CID	**42953**
Falcon		
L6		
1970	4.1L 250 CID	**22044**
1970-1968	3.3L 200 CID	**22044**
1969-1965	2.8L 2786cc 170 CID	**22044**
1967-1965	3.3L 3277cc 200 CID	**22044**
1964-1960	2.4L 2360cc 144 CID	**22044**
V8		
1970-1969	5.0L 4949cc 302 CID	**42028**
1968-1965	4.7L 4727cc 289 CID	**42028**
Festiva		
L4		
1993	1.3L 1295cc	**22049**
1990-1988	1.3L 1295cc	**22049**
Fiesta		
L4		
2005-2003	1.6L 1596cc 97 CID; Sold in Mexico	**82001**
2000-1998	1.3L 1299cc 79 CID; Sold in Mexico	**82003**
1980-1978	1.6L 1598cc 98 CID	**32003**
Fiesta Ikon		
L4		
2004-2002	1.6L 1596cc 97 CID; Sold in Mexico	**82001**
Five Hundred		
V6		
2007-2005	3.0L 183 CID	**42144**
Flex		
All		
2010-2009	VIN C; Pump is driven off the timing chain	**32023**
Focus		
L4		
2012-2005	2.0L 121 CID	**12126**
2007-2003	2.3L 140 CID	**12126**
2004-2000	2.0L 1989cc 121 CID; DOHC	**12115**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Focus (cont'd)		
L4		
2003-2000	2.0L 1989cc 121 CID; SOHC; Driven off the timing belt	**32123**
Freestar		
V6		
2007-2004	3.9L 238 CID	**32102**
2007-2004	4.2L 256 CID	**32102**
Freestyle		
V6		
2007-2005	3.0L 183 CID	**42144**
Fusion		
L4		
2013	2.0L 2000cc 122 CID	**12126**
2013-2010	2.5L 2488cc 152 CID	**12126**
2009-2006	2.3L 140 CID	**12126**
V6		
2012-2010	3.0L 183 CID	**12250**
2012-2010	3.5L 3496cc 213 CID; Pump is driven off the timing chain	**32023**
2009-2006	3.0L 183 CID	**12489**
2007-2006	3.0L 183 CID	**12132**
Galaxie		
L6		
1967-1965	3.9L 3933cc 240 CID	**22033**
V8		
1967-1966	7.0L 7014cc 428 CID	**62075**
1967-1965	4.7L 4727cc 289 CID	**42028**
1967-1965	6.4L 6391cc 390 CID	**62075**
1967-1965	7.0L 6997cc 427 CID	**62075**
1966-1965	5.8L 5769cc 352 CID	**62075**
Galaxie 500		
L6		
1967-1965	3.9L 240 CID	**22033**
V8		
1974-1973	7.5L 7539cc 460 CID; Includes Police	**42114**
1974-1972	5.8L 351 CID; Cleveland, Modified	**42932**
1974-1972	6.6L 400 CID; Cleveland, Modified	**42932**
1974-1970	5.8L 351 CID; Windsor	**42953**
1973	7.0L 7030cc 429 CID; Includes Police	**42114**
1972-1970	5.0L 4949cc 302 CID; Windsor	**42953**
1972-1970	7.0L 7030cc 429 CID; VIN N	**42114**
1971	6.6L 400 CID	**42932**
1971-1970	7.0L 7030cc 429 CID; VIN K	**42114**
1971-1969	6.4L 6391cc 390 CID; VIN Y; Includes Police	**62075**
1970	6.4L 6391cc 390 CID; VIN X; Includes Police	**62075**
1969	5.8L 351 CID	**42028**
1969	6.4L 6391cc 390 CID; VIN S; Includes Police	**62075**
1969-1968	5.0L 4949cc 302 CID	**42028**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Galaxie 500 (cont'd)		
V8		
1969-1968	7.0L 7014cc 428 CID; VIN P; Includes Police	**62075**
1968	6.4L 6391cc 390 CID; VIN X; Includes Police	**62075**
1968	6.4L 6391cc 390 CID; VIN Z; Includes Police	**62075**
1968	7.0L 7014cc 428 CID; VIN Q; Includes Police	**62075**
1967-1965	4.7L 289 CID	**42028**
1967-1965	6.4L 390 CID	**62075**
1967-1965	7.0L 427 CID	**62075**
1966-1965	5.8L 352 CID	**62075**
Granada		
L4		
1982-1981	2.3L 140 CID	**22005**
L6		
1982-1981	3.3L 200 CID	**22002**
1980-1975	4.1L 250 CID	**22960**
1977-1975	3.3L 200 CID; From 4-12-75	**22002**
1975	3.3L 200 CID; To 4-12-75	**22044**
V6		
1982	3.8L 232 CID	**42016**
V8		
1981-1980	4.2L 255 CID	**42953**
1980-1975	5.0L 302 CID	**42953**
1977-1975	5.8L 351 CID	**42953**
Ka		
L4		
2005-2002	1.6L 1596cc 97 CID; Sold in Mexico	**82001**
L800		
V8		
1985-1980	6.1L 370 CID	**62037**
1985-1980	7.0L 429 CID	**62037**
LN600		
V8		
1985-1980	6.1L 370 CID	**62037**
LN700		
V8		
1985-1980	6.1L 370 CID	**62037**
1985-1980	7.0L 429 CID	**62037**
LN7000		
L6		
1997-1993	5.9L 359 CID	**23145**
1993-1992	6.6L 401 CID	**42072**
1991-1987	6.6L 401 CID	**42062**
1988-1987	7.8L 473 CID	**42062**
LN800		
V8		
1985-1980	6.1L 370 CID	**62037**
1985-1980	7.0L 429 CID	**62037**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
LN8000		
L6		
1997-1993	8.3L 504 CID	**70047**
1993-1992	7.8L 473 CID	**42072**
1991-1987	7.8L 473 CID	**42062**
LTD		
L4		
1986-1983	2.3L 140 CID	**22054**
L6		
1983	3.3L 200 CID	**22002**
V6		
1986-1983	3.8L 232 CID	**42016**
V8		
1986	5.0L 302 CID	**42014**
1986	5.8L 351 CID	**42014**
1985-1984	5.0L 302 CID; Excluding CFI, w/Automatic Overdrive Transmission; w/CFI	**42024**
1985-1984	5.0L 302 CID; w/CFI	**43053**
1985-1980	5.0L 302 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1985-1980	5.8L 351 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1984-1980	5.0L 302 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1984-1980	5.8L 351 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1982-1981	4.2L 255 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1982-1981	4.2L 255 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1979	5.0L 302 CID	**42052**
1979	5.8L 351 CID	**42052**
1978	7.5L 460 CID	**42114**
1978-1977	5.0L 302 CID	**42953**
1978-1975	6.6L 400 CID	**42932**
1978-1972	5.8L 351 CID; Cleveland, Modified	**42932**
1978-1970	5.8L 351 CID; Windsor	**42953**
1977-1975	7.5L 460 CID; Includes Police	**42114**
1974-1973	7.5L 7539cc 460 CID; Includes Police	**42114**
1974-1972	6.6L 400 CID; Cleveland, Modified	**42932**
1973	7.0L 7030cc 429 CID; Includes Police	**42114**
1972-1970	5.0L 4949cc 302 CID; Windsor	**42953**
1972-1970	7.0L 7030cc 429 CID; VIN N	**42114**
1971	6.4L 6391cc 390 CID; VIN Y; Includes Police	**62075**
1971	6.6L 400 CID	**42932**
1971-1970	7.0L 7030cc 429 CID; VIN K	**42114**
1970-1968	6.4L 6391cc 390 CID; VIN X; Includes Police	**62075**
1969	5.8L 351 CID	**42028**
1969	6.4L 6391cc 390 CID; VIN S; Includes Police	**62075**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
LTD (cont'd)		
V8		
1969-1968	5.0L 4949cc 302 CID	**42028**
1969-1968	7.0L 7014cc 428 CID; VIN P; Includes Police	**62075**
1968	6.4L 6391cc 390 CID; VIN Z; Includes Police	**62075**
1967	6.4L 6391cc 390 CID; Sold in United States	**62075**
1967	6.4L 6392cc 390 CID; Sold in United States	**62075**
1967-1966	7.0L 7014cc 428 CID	**62075**
1967-1965	4.7L 4727cc 289 CID	**42028**
1967-1965	7.0L 6997cc 427 CID	**62075**
1966-1965	5.8L 5769cc 352 CID	**62075**
1966-1965	6.4L 6391cc 390 CID	**62075**
1965	7.0L 428 CID	**62075**
LTD Crown Victoria		
V8		
1991-1990	5.0L 302 CID	**42052**
1991-1988	5.0L 302 CID; Incl. Brougman, X	**42052**
1991-1987	5.8L 351 CID	**42014**
1991-1987	5.8L 351 CID; Incl. Brougman, X	**42014**
1989-1988	5.0L 302 CID; From 6-88	**42052**
1988	5.0L 302 CID; To 6-88	**42014**
1987	5.0L 302 CID	**42014**
LTD II		
V8		
1979-1977	5.0L 302 CID; Windsor	**42953**
1979-1977	5.8L 351 CID; Modified	**42932**
1979-1977	5.8L 351 CID; Windsor	**42953**
1978-1977	6.6L 400 CID; Modified	**42932**
Lobo		
V8		
2004-2003	5.4L 330 CID; Harley-Davidson Edition; Sold in Mexico; Supercharged	**32125**
Maverick		
L6		
1977-1976	3.3L 200 CID	**22002**
1977-1970	4.1L 250 CID	**22960**
1975	3.3L 200 CID; From 4-12-75	**22002**
1975	3.3L 200 CID; To 4-12-75	**22044**
1974-1970	3.3L 200 CID	**22044**
1970	2.8L 2786cc 170 CID	**22044**
V8		
1977-1975	5.0L 302 CID	**42953**
1974-1971	5.0L 4949cc 302 CID	**42953**
Mustang		
L4		
1993-1983	2.3L 140 CID	**22054**
1982-1979	2.3L 140 CID	**22005**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Mustang (cont'd)		
L6		
1982-1979	3.3L 200 CID	**22002**
1973-1969	4.1L 250 CID	**22960**
1970-1968	3.3L 200 CID	**22044**
1967-1965	3.3L 3277cc 200 CID	**22044**
1965	2.8L 2786cc 170 CID	**22044**
V6		
2010-2005	4.0L 245 CID	**42108**
2004	3.9L 238 CID	**42103**
2004-1996	3.8L 232 CID	**42103**
1995-1994	3.8L 232 CID	**42090**
1986-1983	3.8L 232 CID	**42016**
1979	2.8L 171 CID	**42047**
V8		
2009-2003	4.6L 281 CID	**32119**
2004-2002	4.6L 281 CID	**32128**
2001	4.6L 281 CID; BULLIT	**32128**
1999	4.6L 281 CID; Long Pump 3 7/16" Hub Height, w/7 Vane 3 1/4" Diameter Shrouded Impeller; Cobra, GT	**32119**
1999	4.6L 281 CID; Long Pump, 3 7/16" Hub Height, w/8 Vane 3 5/8" Diameter Non-Shrouded Impeller; Cobra, GT	**32113**
1998-1996	4.6L 281 CID; Cobra, GT	**32113**
1995-1994	5.0L 302 CID	**42087**
1993-1986	5.0L 302 CID	**42038**
1985-1984	5.0L 302 CID; w/CFI	**42035**
1985-1982	5.0L 302 CID; Excluding CFI	**42024**
1982-1980	4.2L 255 CID; Excluding CFI	**42024**
1979	5.0L 302 CID	**42024**
1973	5.0L 4949cc 302 CID	**42953**
1973-1971	5.8L 351 CID	**42932**
1972	5.0L 302 CID	**42953**
1971	5.0L 302 CID; W/2 Bbl Carb; W/4 Bbl Carb	**42953**
1971-1970	7.0L 7030cc 429 CID	**42114**
1970	5.0L 302 CID; Boss	**42953**
1970	5.0L 302 CID; Windsor; Excluding Boss	**42953**
1970	5.8L 351 CID; Boss	**42932**
1970	5.8L 351 CID; Windsor; Excluding Boss	**42953**
1970-1969	7.0L 7014cc 428 CID; Cobra Jet	**62075**
1969	5.0L 4949cc 302 CID; W/2 Bbl Carb; W/4 Bbl Carb; Boss	**42028**
1969	5.8L 351 CID; W/2 Bbl Carb; W/4 Bbl Carb; Boss	**42028**
1969	6.4L 6391cc 390 CID; Cobra Jet	**62075**
1968	5.0L 4949cc 302 CID	**42028**
1968	7.0L 6997cc 427 CID	**62075**
1968-1967	4.7L 4727cc 289 CID	**42028**
1968-1967	6.4L 6391cc 390 CID	**62075**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Mustang (cont'd)		
V8		
1966-1964	4.7L 4727cc 289 CID; Without Thermactor Emission Control; With Thermactor Emission Control System	**42028**
Mustang II		
L4		
1978-1974	2.3L 140 CID	**22005**
V6		
1978-1974	2.8L 171 CID	**42047**
V8		
1978-1976	5.0L 302 CID; From 3-15-76	**42953**
P-100		
L6		
1967-1965	2.8L 2786cc 170 CID; Without Thermactor Emission Control	**22044**
P-350		
L6		
1976-1975	4.9L 300 CID	**22033**
1974-1973	4.9L 300 CID; Without Thermactor Emission Control	**22033**
1972-1968	3.9L 3933cc 240 CID	**22033**
V8		
1973	5.9L 360 CID	**62075**
1973-1972	6.4L 390 CID	**62075**
Pinto		
L4		
1980-1974	2.3L 140 CID	**22005**
1974-1971	2.0L 1989cc 122 CID	**22964**
V6		
1979-1975	2.8L 171 CID	**42047**
Probe		
L4		
1997-1993	2.0L 1989cc 122 CID	**22078**
1992-1989	2.2L 133 CID; Driven off the timing belt	**22053**
V6		
1997-1993	2.5L 2450cc 152 CID; Pulley Pilot Dia. 32mm	**26318**
1994-1993	2.5L 2450cc 152 CID; Pulley Pilot Dia. 16mm	**26259**
1992-1990	3.0L 182 CID	**32059**
Ranchero		
L6		
1973-1969	4.1L 250 CID	**22960**
1968	3.3L 200 CID	**22044**
1967-1964	3.3L 3277cc 200 CID	**22044**
1965-1962	2.8L 2786cc 170 CID	**22044**
V8		
1979-1977	5.0L 302 CID; Windsor	**42953**
1979-1972	5.8L 351 CID; Modified	**42932**
1979-1971	5.8L 351 CID; Windsor	**42953**
1978-1972	6.6L 400 CID; Modified	**42932**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Ranchero (cont'd)		
V8		
1977-1975	7.5L 460 CID; Includes Police	**42114**
1974	7.5L 7539cc 460 CID; Includes Police	**42114**
1974-1971	5.0L 4949cc 302 CID; Windsor	**42953**
1973-1970	7.0L 7030cc 429 CID	**42114**
1970	5.0L 4949cc 302 CID	**42953**
1970	5.8L 351 CID	**42932**
1969	5.8L 351 CID	**42028**
1969-1968	5.0L 4949cc 302 CID	**42028**
1969-1968	6.4L 6391cc 390 CID	**62075**
1969-1968	7.0L 7014cc 428 CID	**62075**
1967	6.4L 6391cc 390 CID; Without Thermactor Emission Control; With Thermactor Emission Control System	**62075**
1967-1966	4.7L 4727cc 289 CID	**42028**
Ranger		
L4		
2011-2001	2.3L 140 CID	**12126**
2001-1998	2.5L 153 CID	**22093**
1997-1995	2.3L 140 CID	**22093**
1994-1983	2.3L 140 CID; GAS	**22054**
1988-1983	2.0L 1989cc 122 CID; GAS	**22054**
V6		
2011-2002	4.0L 245 CID	**42108**
2008-1995	3.0L 182 CID	**42095**
2001	4.0L 245 CID; VIN E	**42108**
2000-1990	4.0L 245 CID	**42060**
1994-1991	3.0L 182 CID	**42039**
1992-1986	2.9L 177 CID	**42042**
1985-1983	2.8L 171 CID	**42023**
1985-1983	2.8L 171 CID	**42043**
Taurus		
L4		
2013	2.0L 1999cc 122 CID	**12126**
1991-1989	2.5L 153 CID; From 2-85	**22056**
1989-1986	2.5L 153 CID; Before 2-89	**12041**
V6		
2010	3.5L 3496cc 213 CID; VIN T; Pump is driven off the timing chain	**32023**
2010-2008	3.5L 3496cc 213 CID; VIN W; Pump is driven off the timing chain	**32023**
2007-2005	3.0L 182 CID; 12 Valve; OHV; Flex Fuel	**32094**
2005	3.0L 182 CID; 24 Valve; DOHC	**12132**
2004-2003	3.0L 182 CID	**12132**
2004-2001	3.0L 182 CID; 12 Valve; FLEX; OHV	**32094**
2004-2001	3.0L 182 CID; 24 Valve; DOHC	**12091**
2000-1996	3.0L 182 CID; 12 Valve; OHV	**32094**
2000-1996	3.0L 182 CID; 24 Valve; DOHC	**22098**
1995	3.0L 182 CID; FLEX	**32034**
1995	3.0L 182 CID; GAS	**32094**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Taurus (cont'd)		
V6		
1995-1994	3.8L 232 CID	**32089**
1995-1993	3.2L 195 CID; w/ SHO Engine	**32082**
1995-1989	3.0L 182 CID; w/ SHO Engine	**32061**
1994-1986	3.0L 182 CID; w/ Vulcan Engine	**32034**
1993-1988	3.8L 232 CID	**42051**
V8		
1999-1996	3.4L 207 CID	**12106**
Taurus X		
V6		
2009-2008	3.5L 3496cc 213 CID; Pump is driven off the timing chain	**32023**
Tempo		
L4		
1994-1992	2.3L 140 CID	**12041**
1991-1988	2.3L 140 CID	**12022**
1986-1984	2.0L 1989cc 122 CID; DIESEL; Driven off the timing belt	**26067**
1986-1984	2.3L 140 CID	**12022**
V6		
1994-1992	3.0L 182 CID	**12070**
Thunderbird		
L4		
1988-1983	2.3L 140 CID	**22054**
L6		
1982-1980	3.3L 200 CID	**22002**
V6		
1997-1996	3.8L 232 CID	**42103**
1995-1994	3.8L 232 CID; Naturally Aspirated	**42090**
1995-1994	3.8L 232 CID; Supercharged	**42055**
1993-1989	3.8L 232 CID; Supercharged; With Supercharger	**42055**
1993-1989	3.8L 232 CID; Without Supercharger	**42050**
1988	3.8L 232 CID; Naturally Aspirated	**42050**
1987-1982	3.8L 232 CID	**42016**
V8		
2005-2002	3.9L 242 CID	**12124**
1997-1994	4.6L 281 CID	**32113**
1993-1991	5.0L 302 CID	**42057**
1988-1986	5.0L 302 CID	**42038**
1985	5.0L 302 CID; w/CFI	**42014**
1984-1983	5.0L 302 CID	**42052**
1982-1980	4.2L 255 CID	**42052**
1981-1980	5.0L 302 CID	**42052**
1979-1977	5.8L 351 CID; Modified	**42932**
1979-1977	5.8L 351 CID; w/ Windsor Engine; Windsor	**42953**
1978-1977	6.6L 400 CID; Modified	**42932**
1976-1975	7.5L 460 CID; Includes Police	**42114**
1974-1972	7.5L 7539cc 460 CID; Includes Police	**42114**

YEAR	VEHICLE DETAIL	PART NO.
Ford (cont'd)		
Thunderbird (cont'd)		
V8		
1973-1970	7.0L 7030cc 429 CID; Includes Police	**42114**
1972	6.6L 400 CID	**42932**
1968-1965	6.4L 6391cc 390 CID	**62075**
1967-1966	7.0L 7014cc 428 CID	**62075**
Torino		
L6		
1974-1969	4.1L 250 CID	**22960**
1968	3.3L 200 CID	**22044**
V8		
1976-1975	7.5L 460 CID; Includes Police	**42114**
1976-1972	5.8L 351 CID; Modified	**42932**
1976-1972	6.6L 400 CID; Modified	**42932**
1976-1971	5.8L 351 CID; Windsor	**42953**
1974	7.5L 7539cc 460 CID; Includes Police	**42114**
1974-1971	5.0L 4949cc 302 CID; Windsor	**42953**
1973	7.5L 7539cc 460 CID	**42114**
1973-1970	7.0L 7030cc 429 CID	**42114**
1970	5.0L 4949cc 302 CID	**42953**
1970	5.8L 351 CID	**42932**
1969	5.8L 351 CID	**42028**
1969-1968	5.0L 4949cc 302 CID	**42028**
1969-1968	6.4L 6391cc 390 CID	**62075**
1969-1968	7.0L 7014cc 428 CID	**62075**
1968	4.7L 4727cc 289 CID	**42028**
1968	7.0L 6997cc 427 CID	**62075**
Transit Connect		
L4		
2013-2010	2.0L 121 CID	**12126**
Windstar		
V6		
2003-1996	3.8L 232 CID	**32102**
2000-1995	3.0L 182 CID	**32094**
1995	3.8L 232 CID	**32089**
Freightliner		
108SD		
L6		
2012	6.7L 6691cc 408 CID	**73158**
Business Class M2		
L6		
2012-2007	5.9L 5882cc 359 CID	**73158**
FC70		
L6		
2004	5.9L 5883cc 359 CID	**73158**
2003-2002	5.9L 5882cc 359 CID	**73158**
2001-1999	5.9L 5882cc 359 CID	**23145**
FC80		
L6		
2007-2002	5.9L 5882cc 359 CID	**73158**

YEAR	VEHICLE DETAIL	PART NO.
Freightliner (cont'd)		
FC80 (cont'd)		
L6		
2001-1999	5.9L 5882cc 359 CID	**23145**
FL50		
L6		
2003-2002	5.9L 5882cc 359 CID	**73158**
2001-1995	5.9L 5882cc 359 CID	**23145**
1998-1995	8.3L 8277cc 505 CID	**70047**
FL60		
L6		
2003-2002	5.9L 5882cc 359 CID	**73158**
2001-1991	5.9L 5882cc 359 CID	**23145**
1998-1992	8.3L 8277cc 505 CID	**70047**
FL70		
L6		
2003-2002	5.9L 5882cc 359 CID	**73158**
2001-1991	5.9L 5882cc 359 CID	**23145**
1998-1992	8.3L 8277cc 505 CID	**70047**
FL80		
L6		
2003-2002	5.9L 5882cc 359 CID	**73158**
2001-1991	5.9L 5882cc 359 CID	**23145**
1998-1992	8.3L 8277cc 505 CID	**70047**
FS65		
L4		
2005-2004	3.9L 238 CID	**23145**
L6		
2004-2002	5.9L 359 CID	**73158**
2001-1996	5.9L 359 CID	**23145**
1998	8.3L 505 CID	**70047**
M2 106		
L6		
2013-2007	6.7L 6690cc 408 CID	**73158**
MT35		
L4		
2005	3.9L 238 CID	**23145**
2004-1997	3.9L 3921cc 239 CID	**23145**
L6		
2009-2004	5.9L 5882cc 359 CID	**73158**
MT45		
L4		
2005-2000	3.9L 238 CID	**23145**
L6		
2011-2002	5.9L 5882cc 359 CID	**73158**
2001-1998	5.9L 5882cc 359 CID	**23145**
MT55		
L6		
2011-2002	5.9L 5882cc 359 CID	**73158**
2001-1999	5.9L 5882cc 359 CID	**23145**

YEAR	VEHICLE DETAIL	PART NO.
Freightliner (cont'd)		
Sprinter 2500		
L5		
2006-2004	2.7L 2687cc 165 CID	**78007**
2003-2002	2.7L 2687cc 165 CID	**78008**
Sprinter 3500		
L5		
2006-2004	2.7L 2687cc 165 CID	**78007**
2003-2002	2.7L 2687cc 165 CID	**78008**
XC		
L6		
2005-2002	5.9L 5882cc 359 CID	**73158**
GMC		
Acadia		
V6		
2014-2007	3.6L 217 CID	**11103**
B6000		
V8		
1991-1990	6.0L 366 CID	**71078**
1989-1980	6.0L 366 CID	**71084**
1985-1980	7.0L 427 CID	**71084**
B7		
V8		
2002-2001	8.1L 496 CID	**41090**
2000-1999	7.4L 454 CID	**61094**
1998	6.5L 395 CID	**51074**
1998-1994	7.0L 7011cc 427 CID	**71078**
1998-1993	6.0L 366 CID	**71078**
C15		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1978	4.8L 292 CID	**21030**
1977-1976	4.1L 250 CID; VIN D	**21110**
1977-1975	4.8L 292 CID; VIN T	**21137**
1975	4.1L 250 CID; VIN Q	**21110**
V8		
1978	5.7L 350 CID; DIESEL; VIN Z	**41120**
1978	6.6L 400 CID; VIN R	**41121**
1978-1977	5.0L 305 CID; VIN U	**41121**
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1975	7.4L 454 CID	**41002**
1976	6.6L 400 CID; VIN U	**41109**
1976-1975	5.7L 350 CID	**41109**
C15 Suburban		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1977-1976	4.1L 250 CID; VIN D	**21110**
1975	4.1L 250 CID; VIN Q	**21110**
V8		
1978	5.7L 350 CID; DIESEL; VIN Z	**41120**
1978-1977	5.0L 305 CID; VIN U	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
C15 Suburban (cont'd)		
V8		
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1975	7.4L 454 CID	**41002**
1976-1975	5.7L 350 CID	**41109**
C15/C1500 Pickup		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1971-1968	4.1L 4097cc 250 CID	**21895**
1971-1967	4.8L 4801cc 292 CID	**31896**
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972	5.7L 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1971-1969	5.7L 5736cc 350 CID	**41898**
1967	4.6L 4638cc 283 CID	**41898**
C15/C1500 Suburban		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1971-1968	4.1L 4097cc 250 CID	**21895**
1971-1968	4.8L 4801cc 292 CID	**31896**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
C1500		
L6		
1984-1979	4.1L 250 CID; VIN D	**21107**
1980-1979	4.8L 292 CID	**21030**
V6		
1998-1996	4.3L 262 CID; VIN W	**41077**
1995-1988	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID	**41121**
V8		
1999-1996	5.0L 305 CID; VIN M	**41077**
1999-1996	5.7L 350 CID; VIN R	**41077**
1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN S; Double Thermostat; 2nd Design	**51074**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
C1500 (cont'd)		
V8		
1996	6.5L 395 CID; DIESEL; VIN S; Single Thermostat; 1st Design	**51062**
1995-1994	6.5L 395 CID; DIESEL	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1988	5.0L 305 CID; VIN H	**41049**
1993-1988	6.2L 379 CID; DIESEL; VIN C	**51062**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1991-1988	5.7L 350 CID; VIN K	**41049**
1986-1985	5.7L 350 CID; GAS; VIN M	**41121**
1986-1985	6.2L 379 CID; DIESEL; VIN J	**51062**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51062**
1986-1981	5.0L 305 CID; VIN F	**41121**
1986-1981	5.0L 305 CID; VIN H	**41121**
1986-1979	5.7L 350 CID; GAS; VIN L	**41121**
1982	6.2L 379 CID; DIESEL; VIN J	**51062**
1981-1980	5.0L 305 CID; VIN G	**41121**
1981-1980	5.7L 350 CID; DIESEL; VIN Z; Without A/c	**41100**
1981-1979	5.7L 350 CID; GAS; VIN M	**41121**
1980	5.7L 350 CID; GAS; VIN P	**41121**
1980-1979	7.4L 454 CID	**41002**
1979	5.0L 305 CID; VIN U	**41121**
1979	6.6L 400 CID; VIN R	**41121**
C1500 Suburban		
L6		
1980-1979	4.1L 250 CID; VIN D	**21107**
V8		
1999	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
1999-1996	5.7L 350 CID; VIN R	**41077**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Single Thermostat; 1st Design	**51062**
1995	6.5L 395 CID; DIESEL	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1986-1985	5.7L 350 CID; GAS; VIN M	**41121**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51062**
1986-1981	5.0L 305 CID; VIN F	**41121**
1986-1981	5.0L 305 CID; VIN H	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
C1500 Suburban (cont'd)		
V8		
1986-1979	5.7L 350 CID; GAS; VIN L	**41121**
1981-1980	5.0L 305 CID; VIN G	**41121**
1981-1980	5.7L 350 CID; DIESEL; VIN Z; Without A/c	**41100**
1981-1980	5.7L 350 CID; GAS; VIN M	**41121**
1980-1979	7.4L 454 CID	**41002**
1979	5.0L 305 CID; VIN U	**41121**
C25		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1978	4.8L 292 CID	**21030**
1977	4.1L 250 CID; VIN D	**21110**
1977-1975	4.8L 292 CID; VIN T	**21137**
1975	4.1L 250 CID; VIN Q	**21110**
V8		
1978-1977	5.0L 305 CID; VIN U	**41121**
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1977	6.6L 400 CID; VIN R	**41121**
1978-1975	7.4L 454 CID	**41002**
1976	6.6L 400 CID; VIN U	**41109**
1976-1975	5.7L 350 CID	**41109**
C25 Suburban		
L6		
1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID; VIN T	**21137**
V8		
1978	6.6L 400 CID; VIN R	**41121**
1978-1977	5.0L 305 CID; VIN U	**41121**
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1975	7.4L 454 CID	**41002**
1976-1975	5.7L 350 CID	**41109**
C25/C2500 Pickup		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1967	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1967	4.6L 4638cc 283 CID	**41898**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
C25/C2500 Suburban		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1968	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1972	5.7L 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1971-1969	5.7L 5736cc 350 CID	**41898**
C2500		
L6		
1986-1979	4.8L 292 CID	**21030**
1984-1979	4.1L 250 CID; VIN D	**21107**
V6		
1995-1988	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID	**41121**
V8		
2000-1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
2000-1996	5.7L 350 CID; VIN R	**41077**
2000-1996	7.4L 454 CID	**41038**
1999	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1998-1996	5.0L 305 CID; VIN M	**41077**
1996	6.5L 395 CID; DIESEL; VIN F; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Single Thermostat; 1st Design	**51062**
1996	6.5L 395 CID; DIESEL; VIN S; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN S; Single Thermostat; 1st Design	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1992	6.5L 395 CID; DIESEL	**51062**
1995-1991	7.4L 454 CID; VIN N	**41038**
1995-1988	5.0L 305 CID; VIN H	**41049**
1993-1989	6.2L 379 CID; DIESEL; VIN J	**51062**
1993-1988	6.2L 379 CID; DIESEL; VIN C	**51062**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1991-1988	5.7L 350 CID; VIN K	**41049**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51062**
1986-1982	6.2L 379 CID; DIESEL; VIN J	**51062**
1986-1981	5.0L 305 CID; VIN H	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
C2500 (cont'd)		
V8		
1986-1980	5.7L 350 CID; GAS; VIN M	**41121**
1986-1979	5.7L 350 CID; GAS; VIN L	**41121**
1986-1979	7.4L 454 CID	**41002**
1980	5.0L 305 CID; VIN G	**41121**
1980	5.7L 350 CID; GAS; VIN P	**41121**
1979	5.0L 305 CID; VIN U	**41121**
1979	6.6L 400 CID; VIN R	**41121**
C2500 Suburban		
L6		
1984	4.8L 292 CID	**21030**
1982-1979	4.8L 292 CID	**21030**
V8		
1999	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
1999-1996	5.7L 350 CID; VIN R	**41077**
1999-1996	7.4L 454 CID	**41038**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Single Thermostat; 1st Design	**51062**
1995-1994	6.5L 395 CID; DIESEL	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1992	7.4L 454 CID; VIN N	**41038**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1986-1982	5.0L 305 CID; VIN H	**41121**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51062**
1986-1982	6.2L 379 CID; DIESEL; VIN J	**51062**
1986-1980	5.7L 350 CID; GAS; VIN M	**41121**
1986-1979	5.7L 350 CID; GAS; VIN L	**41121**
1986-1979	7.4L 454 CID	**41002**
1980	5.7L 350 CID; DIESEL; VIN Z; Without A/c	**41100**
C35		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID; VIN T	**21137**
1975	4.1L 250 CID; VIN Q	**21110**
V8		
1978	5.0L 305 CID; VIN U	**41121**
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1977	6.6L 400 CID; VIN R	**41121**
1978-1975	7.4L 454 CID	**41002**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
C35 (cont'd)		
V8		
1976	6.6L 400 CID; VIN U	**41109**
1976-1975	5.7L 350 CID	**41109**
C35/C3500 Pickup		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1967	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1967	4.6L 4638cc 283 CID	**41898**
C3500		
L6		
1986-1979	4.8L 292 CID	**21030**
1980-1979	4.1L 250 CID; VIN D	**21107**
V8		
2000-1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
2000-1996	5.7L 350 CID; VIN R	**41077**
2000-1996	7.4L 454 CID	**41038**
1999	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Single Thermostat; 1st Design	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1992	6.5L 395 CID; DIESEL	**51062**
1995-1988	7.4L 454 CID; VIN N	**41038**
1993-1988	6.2L 379 CID; DIESEL; VIN J	**51062**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1991-1988	5.7L 350 CID; VIN K	**41049**
1986	5.0L 305 CID; VIN H	**41121**
1986-1982	6.2L 379 CID; DIESEL; VIN J	**51062**
1986-1979	5.7L 350 CID; GAS; VIN M	**41121**
1986-1979	7.4L 454 CID	**41002**
1980-1979	5.7L 350 CID; GAS; VIN L	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
C3500 (cont'd)		
V8		
1979	6.6L 400 CID; VIN R	**41121**
C3500HD		
V8		
1995-1992	5.7L 350 CID	**41073**
C4500 Topkick		
V8		
2009-2006	6.6L 403 CID	**71053**
2009-2003	8.1L 496 CID	**41090**
2005-2003	6.6L 403 CID	**21098**
C5000 Topkick		
V8		
1991-1990	6.0L 366 CID	**71078**
C5500 Topkick		
V8		
2009-2006	6.6L 403 CID	**71053**
2009-2003	8.1L 496 CID	**41090**
2005-2003	6.6L 403 CID	**21098**
C6000		
V8		
1990	6.0L 366 CID	**71078**
1990	7.0L 427 CID	**71078**
1989-1980	6.0L 366 CID	**71084**
C6000 Topkick		
V8		
1996-1990	6.0L 366 CID	**71078**
1996-1990	7.0L 7011cc 427 CID	**71078**
C6500 Topkick		
V8		
2009-2001	8.1L 496 CID	**41090**
2000-1999	7.4L 454 CID	**51074**
2000-1999	7.4L 454 CID	**61094**
1998-1997	6.0L 366 CID	**71078**
1998-1997	7.0L 7011cc 427 CID	**71078**
C7000		
V8		
1990	6.0L 366 CID	**71078**
1990	7.0L 427 CID	**71078**
1989-1980	6.0L 366 CID	**71084**
1989-1980	7.0L 427 CID	**71084**
1980	7.4L 454 CID	**71084**
C7000 Topkick		
V8		
1996-1990	6.0L 366 CID	**71078**
1996-1990	7.0L 7011cc 427 CID	**71078**
C7500 Topkick		
V8		
2009-2001	8.1L 496 CID	**41090**
2000-1999	7.4L 454 CID	**51074**
2000-1999	7.4L 454 CID	**61094**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
C7500 Topkick (cont'd)		
V8		
1998-1997	6.0L 366 CID	**71078**
1998-1997	7.0L 7011cc 427 CID	**71078**
Caballero		
V6		
1987-1985	4.3L 262 CID; VIN Z	**41121**
1984-1983	3.8L 229 CID; VIN 9	**41121**
1984-1979	3.8L 3800cc 231 CID; VIN A	**31018**
1982-1980	3.8L 229 CID; VIN K	**41121**
1979	3.8L 231 CID; VIN 2	**31018**
1979-1978	3.3L 200 CID; VIN M	**41121**
V8		
1987-1979	5.0L 305 CID; VIN H	**41121**
1984-1983	5.7L 350 CID; DIESEL; VIN N	**41121**
1982-1979	4.4L 267 CID; VIN J	**41121**
1979-1978	5.7L 350 CID	**41121**
1978	5.0L 305 CID	**41121**
Canyon		
L4		
2012-2007	2.9L 2921cc 178 CID; VIN 9	**21097**
2006-2004	2.8L 2770cc 169 CID	**21097**
L5		
2012-2007	3.7L 3654cc 223 CID	**21097**
2006-2004	3.5L 3460cc 211 CID	**21097**
V8		
2012-2010	5.3L 325 CID	**71617**
2009	5.3L 5328cc 325 CID	**71617**
Envoy		
L6		
2009-2002	4.2L 256 CID	**21097**
V8		
2009-2007	5.3L 325 CID	**71617**
2006	5.3L 325 CID	**71616**
2005	5.3L 323 CID	**71616**
Envoy XL		
L6		
2006-2002	4.2L 256 CID	**21097**
V8		
2006	5.3L 325 CID	**71616**
2005-2003	5.3L 323 CID	**71616**
Envoy XUV		
L6		
2005-2004	4.2L 256 CID	**21097**
V8		
2005-2004	5.3L 323 CID	**71616**
G15		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1977-1976	4.1L 250 CID; VIN D	**21110**
1975	4.1L 250 CID; VIN Q	**21110**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
G15 (cont'd)		
V8		
1978-1977	5.0L 305 CID	**41121**
1978-1977	5.7L 350 CID	**41121**
1976-1975	5.7L 350 CID	**41109**
G15/G1500 Van		
L6		
1974-1967	4.1L 250 CID	**21895**
1969-1967	3.8L 230 CID	**21895**
V8		
1974-1973	5.7L 350 CID	**41109**
1972	5.0L 307 CID; With Threaded Power Steering Boss	**41121**
1972	5.0L 307 CID; Without Threaded Power Steering Boss	**41109**
1972	5.7L 350 CID; With Threaded Power Steering Boss	**41121**
1972	5.7L 350 CID; Without Threaded Power Steering Boss	**41109**
1971	5.7L 350 CID	**41898**
1971-1968	5.0L 307 CID	**41898**
G1500		
L6		
1984-1979	4.1L 250 CID; VIN D	**21107**
V6		
1995-1987	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID	**41121**
V8		
1995-1994	5.0L 305 CID; VIN H	**41049**
1992-1987	5.0L 305 CID	**41049**
1992-1987	5.7L 350 CID; With Serpentine Belt	**41049**
1988-1985	5.7L 350 CID; Without Serpentine Belt	**41121**
1986-1979	5.0L 305 CID	**41121**
1984-1979	5.7L 350 CID	**41121**
1979	6.6L 400 CID	**41121**
G25		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1978	4.8L 292 CID; VIN T	**21030**
1977-1975	4.8L 292 CID; VIN T	**21137**
V8		
1978-1977	5.0L 305 CID	**41121**
1978-1977	5.7L 350 CID	**41121**
1978-1977	6.6L 400 CID	**41121**
1976-1975	5.7L 350 CID	**41109**
1976-1975	7.4L 454 CID	**41002**
G25/G2500 Van		
L6		
1974-1967	4.1L 250 CID	**21895**
1969-1967	3.8L 230 CID	**21895**
V8		
1974-1973	5.7L 350 CID	**41109**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
G25/G2500 Van (cont'd)		
V8		
1972	5.0L 307 CID; With Threaded Power Steering Boss	**41121**
1972	5.0L 307 CID; Without Threaded Power Steering Boss	**41109**
1972	5.7L 350 CID; With Threaded Power Steering Boss	**41121**
1972	5.7L 350 CID; Without Threaded Power Steering Boss	**41109**
1971-1970	5.7L 350 CID	**41898**
1971-1968	5.0L 307 CID	**41898**
G2500		
L6		
1984-1979	4.1L 250 CID; VIN D	**21107**
V6		
1995-1987	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID	**41121**
V8		
1995-1994	5.0L 305 CID; VIN H	**41049**
1995-1994	5.7L 350 CID; VIN K	**41049**
1995-1994	6.5L 395 CID	**51062**
1993-1992	6.2L 379 CID; DIESEL	**51008**
1993-1989	6.2L 379 CID	**51008**
1992-1987	5.0L 305 CID	**41049**
1992-1987	5.7L 350 CID; With Serpentine Belt	**41049**
1988-1985	5.7L 350 CID; Without Serpentine Belt	**41121**
1988-1983	6.2L 379 CID; DIESEL	**51008**
1986-1985	6.2L 379 CID	**51008**
1986-1979	5.0L 305 CID	**41121**
1984-1979	5.7L 350 CID	**41121**
1980-1979	6.6L 400 CID	**41121**
G35		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1978	4.8L 292 CID; VIN T	**21030**
1977-1975	4.8L 292 CID; VIN T	**21137**
V8		
1978-1977	5.7L 350 CID	**41121**
1978-1977	6.6L 400 CID	**41121**
1976	7.4L 454 CID	**41002**
1976-1975	5.7L 350 CID	**41109**
G35/G3500 Van		
L6		
1974-1972	4.1L 250 CID	**21895**
1971	4.1L 4097cc 250 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972	5.7L 5736cc 350 CID; With Threaded Power Steering Boss	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
G35/G3500 Van (cont'd)		
V8		
1972	5.7L 5736cc 350 CID; Without Threaded Power Steering Boss	**41109**
1971	5.7L 5736cc 350 CID	**41898**
G3500		
L6		
1984-1982	4.1L 250 CID; VIN D	**21107**
1979	4.1L 250 CID; VIN D	**21107**
V6		
1995-1987	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID	**41121**
V8		
1996	5.7L 350 CID	**41077**
1996	5.7L 350 CID; Magnavan; Except G3	**41077**
1996	5.7L 350 CID; Rally Camper Special; Except G3	**41077**
1996	5.7L 350 CID; Rally Camper Special; G3	**41049**
1996	5.7L 350 CID; Rally STX; Except G3	**41077**
1996	5.7L 350 CID; Rally STX; G3	**41049**
1996	5.7L 350 CID; Rally; Except G3	**41077**
1996	5.7L 350 CID; Rally; G3	**41049**
1996	5.7L 350 CID; Vandura Special; Except G3	**41077**
1996	5.7L 350 CID; Vandura Special; G3	**41049**
1996	5.7L 350 CID; Vandura; Except G3	**41077**
1996	5.7L 350 CID; Vandura; G3	**41049**
1996	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; Magnavan	**51074**
1996	6.5L 395 CID; DIESEL; Rally	**51074**
1996	6.5L 395 CID; DIESEL; Rally Camper Special	**51074**
1996	6.5L 395 CID; DIESEL; Rally Camper Special; G3	**51062**
1996	6.5L 395 CID; DIESEL; Rally STX	**51074**
1996	6.5L 395 CID; DIESEL; Rally STX; G3	**51062**
1996	6.5L 395 CID; DIESEL; Rally; G3	**51062**
1996	6.5L 395 CID; DIESEL; Vandura	**51074**
1996	6.5L 395 CID; DIESEL; Vandura Special	**51074**
1996	6.5L 395 CID; DIESEL; Vandura Special; G3	**51062**
1996	6.5L 395 CID; DIESEL; Vandura; G3	**51062**
1996-1988	7.4L 454 CID	**41038**
1996-1988	7.4L 454 CID; Reverse Rotation	**41038**
1995-1994	5.7L 350 CID; VIN K	**41049**
1995-1994	6.5L 395 CID	**51062**
1995-1994	6.5L 395 CID; DIESEL	**51062**
1995-1988	5.7L 350 CID	**41049**
1993-1992	6.2L 379 CID	**51008**
1993-1983	6.2L 379 CID; DIESEL	**51008**
1992-1987	5.7L 350 CID; With Serpentine Belt	**41049**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
G3500 (cont'd)		
V8		
1990-1985	6.2L 379 CID	**51008**
1988-1985	5.7L 350 CID; Without Serpentine Belt	**41121**
1987-1986	5.7L 350 CID	**41121**
1984-1979	5.7L 350 CID	**41121**
1981	5.0L 305 CID	**41121**
1980-1979	6.6L 400 CID	**41121**
Jimmy		
L6		
1982-1978	4.1L 250 CID; VIN D	**21107**
1977-1976	4.1L 250 CID; VIN D	**21110**
1975	4.1L 250 CID; VIN Q	**21110**
1974-1972	4.1L 250 CID	**21895**
1973	4.8L 292 CID	**31896**
1971-1970	4.1L 4097cc 250 CID	**21895**
V6		
2005	4.3L 4294cc	**41077**
2004-1996	4.3L 262 CID	**41077**
V8		
1991-1989	5.7L 350 CID; VIN K	**41049**
1991-1982	6.2L 379 CID; DIESEL	**51008**
1988-1987	5.7L 350 CID; VIN K	**41121**
1987-1981	5.0L 305 CID; VIN H	**41121**
1986-1977	5.7L 350 CID; VIN L	**41121**
1982-1981	5.0L 305 CID; VIN F	**41121**
1981-1980	5.0L 305 CID; VIN G	**41121**
1979-1977	5.0L 305 CID; VIN U	**41121**
1979-1977	6.6L 400 CID; VIN R	**41121**
1976	5.7L 350 CID; VIN L	**41109**
1976	6.6L 400 CID; VIN U	**41109**
1976	7.4L 454 CID; VIN Y	**41002**
1976-1974	5.7L 350 CID; VIN V	**41109**
1975	6.6L 400 CID; VIN M	**41109**
1975-1974	5.7L 350 CID; VIN Y	**41109**
1973	5.7L 5736cc 350 CID; VIN Y	**41109**
1973	7.4L 454 CID	**41002**
1971-1970	5.7L 5736cc 350 CID	**41898**
K15		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1977-1976	4.1L 250 CID; VIN D	**21110**
1976-1975	4.8L 292 CID; VIN T	**21137**
1975	4.1L 250 CID; VIN Q	**21110**
V8		
1978-1977	5.0L 305 CID; VIN U	**41121**
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1977	6.6L 400 CID; VIN R	**41121**
1976	6.6L 400 CID; VIN U	**41109**
1976	7.4L 454 CID	**41002**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
K15 (cont'd)		
V8		
1976-1975	5.7L 350 CID	**41109**
K15 Suburban		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1977-1976	4.1L 250 CID; VIN D	**21110**
1975	4.1L 250 CID; VIN Q	**21110**
V8		
1978-1977	5.0L 305 CID; VIN U	**41121**
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1977	6.6L 400 CID; VIN R	**41121**
1976	6.6L 400 CID; VIN U	**41109**
1976-1975	5.7L 350 CID	**41109**
K15/K1500 Pickup		
L6		
1974	4.8L 4801cc 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1971-1970	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1968-1967	4.8L 4801cc 292 CID	**31896**
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
V8		
1974	5.7L 350 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1971-1968	5.0L 5031cc 307 CID	**41898**
1967	4.6L 4638cc 283 CID	**41898**
K15/K1500 Suburban		
L6		
1974-1972	4.1L 250 CID	**21895**
1971-1970	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1968	4.8L 4801cc 292 CID	**31896**
V8		
1974	5.7L 350 CID	**41109**
1974	7.4L 7439cc 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1970	5.0L 5031cc 307 CID	**41898**
1972-1969	5.7L 5736cc 350 CID	**41898**
1968	5.0L 5031cc 307 CID	**41898**
K1500		
L6		
1984-1979	4.1L 250 CID; VIN D	**21107**
1980-1979	4.8L 292 CID	**21030**
V6		
1998-1996	4.3L 262 CID; VIN W	**41077**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
K1500 (cont'd)		
V6		
1995-1988	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID	**41121**
V8		
1999-1996	5.0L 305 CID; VIN M	**41077**
1999-1996	5.7L 350 CID; VIN R	**41077**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN S; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN S; Single Thermostat; 1st Design	**51062**
1995-1994	6.5L 395 CID; DIESEL	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1988	5.0L 305 CID; VIN H	**41049**
1993-1988	6.2L 379 CID; DIESEL; VIN C	**51062**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1991-1988	5.7L 350 CID; VIN K	**41049**
1986-1985	5.7L 350 CID; GAS; VIN M	**41121**
1986-1985	6.2L 379 CID; DIESEL; VIN J	**51062**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51062**
1986-1981	5.0L 305 CID; VIN H	**41121**
1986-1979	5.7L 350 CID; GAS; VIN L	**41121**
1980	5.7L 350 CID; GAS; VIN M	**41121**
1980-1979	6.6L 400 CID; VIN R	**41121**
1980-1979	7.4L 454 CID	**41002**
1979	5.0L 305 CID; VIN U	**41121**
K1500 Suburban		
L6		
1980-1979	4.1L 250 CID; VIN D	**21107**
V8		
1999	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
1999-1996	5.7L 350 CID; VIN R	**41077**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Single Thermostat; 1st Design	**51062**
1995	6.5L 395 CID; DIESEL	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51062**
1986-1979	5.7L 350 CID; GAS; VIN L	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
K1500 Suburban (cont'd)		
V8		
1985-1983	5.0L 305 CID; VIN F	**41121**
1982	5.0L 305 CID; VIN H	**41121**
1981-1980	5.7L 350 CID; GAS; VIN M	**41121**
1980-1979	6.6L 400 CID; VIN R	**41121**
1979	5.0L 305 CID; VIN U	**41121**
K25		
L6		
1978	4.1L 250 CID; VIN D	**21107**
1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID; VIN T	**21137**
1976	4.1L 250 CID; VIN D	**21110**
1975	4.1L 250 CID; VIN Q	**21110**
V8		
1978-1977	5.0L 305 CID; VIN U	**41121**
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1977	6.6L 400 CID; VIN R	**41121**
1978-1976	7.4L 454 CID	**41002**
1976	6.6L 400 CID; VIN U	**41109**
1976-1975	5.7L 350 CID	**41109**
K25 Suburban		
L6		
1978	4.8L 292 CID	**21030**
1977-1975	4.8L 292 CID; VIN T	**21137**
V8		
1978-1977	5.0L 305 CID; VIN U	**41121**
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1977	6.6L 400 CID; VIN R	**41121**
1977-1976	7.4L 454 CID	**41002**
1976	6.6L 400 CID; VIN U	**41109**
1976-1975	5.7L 350 CID	**41109**
K25/K2500 Pickup		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1970	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
1968-1967	4.8L 4801cc 292 CID	**31896**
1967	4.1L 4097cc 250 CID; Sold in United States	**21895**
1967	4.1L 4098cc 250 CID; Sold in United States	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID	**41002**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
1967	4.6L 4638cc 283 CID	**41898**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
K25/K2500 Suburban		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1968	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974	7.4L 7439cc 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**
K2500		
L6		
1986-1979	4.8L 292 CID	**21030**
1980	4.1L 250 CID; VIN D	**21107**
V6		
1995-1988	4.3L 262 CID	**41049**
1985	4.3L 262 CID	**41121**
V8		
2000-1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
2000-1996	5.7L 350 CID; VIN R	**41077**
2000-1996	7.4L 454 CID	**41038**
1999	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1998	5.0L 305 CID; VIN M	**41077**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Single Thermostat; 1st Design	**51062**
1996	6.5L 395 CID; DIESEL; VIN S; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN S; Single Thermostat; 1st Design	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1992	6.5L 395 CID; DIESEL	**51062**
1995-1991	7.4L 454 CID; VIN N	**41038**
1995-1988	5.0L 305 CID; VIN H	**41049**
1993-1989	6.2L 379 CID; DIESEL; VIN J	**51062**
1993-1988	6.2L 379 CID; DIESEL; VIN C	**51062**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1991-1988	5.7L 350 CID; VIN K	**41049**
1986-1982	6.2L 379 CID; DIESEL; VIN C	**51062**
1986-1982	6.2L 379 CID; DIESEL; VIN J	**51062**
1986-1979	5.7L 350 CID; GAS; VIN L	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
K2500 (cont'd)		
V8		
1986-1979	5.7L 350 CID; GAS; VIN M	**41121**
1979	6.6L 400 CID; VIN R	**41121**
K2500 Suburban		
L6		
1984	4.8L 292 CID	**21030**
1982-1979	4.8L 292 CID	**21030**
V8		
1999	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
1999-1996	5.7L 350 CID; VIN R	**41077**
1999-1996	7.4L 454 CID	**41038**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Single Thermostat; 1st Design	**51062**
1995-1994	6.5L 395 CID; DIESEL	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1992	7.4L 454 CID; VIN N	**41038**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1986-1982	6.2L 379 CID; DIESEL; VIN J	**51062**
1986-1980	5.7L 350 CID; GAS; VIN M	**41121**
1981-1979	5.7L 350 CID; GAS; VIN L	**41121**
1979	6.6L 400 CID; VIN R	**41121**
K35		
L6		
1978	4.8L 292 CID	**21030**
1977	4.8L 292 CID; VIN T	**21137**
V8		
1978-1977	5.7L 350 CID; GAS; VIN L	**41121**
1978-1977	6.6L 400 CID; VIN R	**41121**
K35/K3500 Pickup		
L6		
1974-1973	4.8L 292 CID	**31896**
1974-1972	4.1L 250 CID	**21895**
1972-1968	4.8L 4801cc 292 CID	**31896**
1971-1968	4.1L 4097cc 250 CID	**21895**
V8		
1974	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID	**41002**
1973	5.0L 5031cc 307 CID	**41109**
1973	5.7L 5736cc 350 CID	**41109**
1972-1969	5.7L 5736cc 350 CID	**41898**
1972-1968	5.0L 5031cc 307 CID	**41898**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
K3500		
L6		
1986-1979	4.8L 292 CID	**21030**
V8		
2000-1999	6.5L 395 CID; DIESEL; With Pressed On Pulley	**51086**
2000-1996	5.7L 350 CID; VIN R	**41077**
2000-1996	7.4L 454 CID	**41038**
1999	6.5L 395 CID; DIESEL; With Drilled & Tapped Hub For Bolt on Pulley & Fan Clutch	**51074**
1998-1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Double Thermostat; 2nd Design	**51074**
1996	6.5L 395 CID; DIESEL; VIN F; Single Thermostat; 1st Design	**51062**
1995-1993	5.7L 350 CID; VIN K	**41049**
1995-1992	6.5L 395 CID; DIESEL	**51062**
1995-1988	7.4L 454 CID; VIN N	**41038**
1993-1988	6.2L 379 CID; DIESEL; VIN J	**51062**
1992	5.7L 350 CID; VIN K; With 5.8" Hub Height	**41073**
1992	5.7L 350 CID; VIN K; With 6.9" Hub Height	**41049**
1991-1988	5.7L 350 CID; VIN K	**41049**
1986-1982	6.2L 379 CID; DIESEL; VIN J	**51062**
1986-1979	5.7L 350 CID; GAS; VIN M	**41121**
1986-1979	7.4L 454 CID	**41002**
1980-1979	5.7L 350 CID; GAS; VIN L	**41121**
1980-1979	6.6L 400 CID; VIN R	**41121**
P15		
L6		
1978	4.8L 292 CID; VIN T	**21030**
P15/P1500 Van		
L6		
1974-1968	4.1L 250 CID	**21895**
1969-1967	3.8L 230 CID	**21895**
1967	4.8L 292 CID	**21895**
V8		
1973	5.0L 307 CID	**41109**
1971-1970	5.0L 307 CID	**41898**
P1500		
L6		
1980-1979	4.8L 292 CID; VIN T	**21030**
V8		
1979	7.4L 454 CID	**41002**
P25		
L6		
1978	4.8L 292 CID; VIN T	**21030**
V8		
1978-1977	5.7L 350 CID	**41121**
1976-1975	5.7L 350 CID	**41109**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
P25/P2500 Van		
L6		
1974-1972	4.1L 250 CID	**21895**
1974-1967	4.8L 292 CID	**21895**
1970	4.1L 250 CID	**21895**
1967	4.1L 250 CID	**21895**
V8		
1974-1973	5.7L 350 CID	**41109**
1973	5.0L 307 CID	**41109**
1971-1970	5.7L 350 CID	**41898**
1971-1968	5.0L 307 CID	**41898**
P2500		
L6		
1989	4.8L 292 CID; VIN T	**21030**
1987-1979	4.8L 292 CID; VIN T	**21030**
V8		
1989-1982	6.2L 379 CID	**51008**
1989-1979	5.7L 350 CID	**41121**
P35		
L6		
1978	4.8L 292 CID; VIN T	**21030**
V8		
1978-1977	5.7L 350 CID	**41121**
1978-1975	7.4L 454 CID	**41002**
1976-1975	5.7L 350 CID	**41109**
P35/P3500 Van		
L6		
1974-1970	4.1L 250 CID	**21895**
1974-1967	4.8L 292 CID	**21895**
1967	4.1L 250 CID	**21895**
V8		
1974-1973	5.7L 350 CID	**41109**
1974-1973	7.4L 454 CID	**41002**
1973	5.0L 307 CID	**41109**
1971-1970	5.7L 350 CID	**41898**
1971-1968	5.0L 307 CID	**41898**
P3500		
L6		
1989-1979	4.8L 292 CID; VIN T	**21030**
V6		
1999-1997	4.3L 262 CID; VIN W	**41077**
1996	4.3L 262 CID; VIN W; With Serpentine Belt	**41077**
1996	4.3L 262 CID; Without Serpentine Belt	**41121**
1995-1990	4.3L 262 CID	**41121**
V8		
1999	6.5L 395 CID; DIESEL	**51086**
1999-1996	5.7L 350 CID	**41077**
1999-1996	7.4L 454 CID	**41038**
1998-1997	6.5L 395 CID	**51074**
1997-1991	7.4L 454 CID; Without Serpentine Belt	**41002**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
P3500 (cont'd)		
V8		
1995-1979	5.7L 350 CID	**41121**
1990-1982	6.2L 379 CID	**51008**
1990-1979	7.4L 454 CID	**41002**
P6500		
V8		
1996-1992	6.0L 366 CID	**71078**
1996-1992	7.0L 7011cc 427 CID	**71078**
PB1000 Series		
L4		
1965-1964	2.5L 2507cc 153 CID	**21895**
L6		
1966	3.8L 3769cc 230 CID	**21895**
1963	3.8L 3769cc 230 CID	**21895**
PB15 Series		
L6		
1966	4.1L 4097cc 250 CID; Sold in United States	**21895**
1966	4.1L 4098cc 250 CID; Sold in United States	**21895**
1966	4.8L 4801cc 292 CID	**21895**
PB1500 Series		
L4		
1965	2.5L 153 CID	**21895**
L6		
1965-1963	3.8L 3769cc 230 CID	**21895**
PB25 Series		
L6		
1966	4.1L 4097cc 250 CID; Sold in United States	**21895**
1966	4.1L 4098cc 250 CID; Sold in United States	**21895**
1966	4.8L 4801cc 292 CID	**21895**
PB2500 Series		
L4		
1965	2.5L 153 CID	**21895**
L6		
1965-1963	3.8L 3769cc 230 CID	**21895**
R1500		
V6		
1987	4.3L 262 CID; VIN Z	**41121**
V8		
1987	5.0L 305 CID; VIN H	**41121**
1987	5.7L 350 CID	**41121**
1987	6.2L 379 CID; VIN C	**51008**
R1500 Suburban		
V8		
1991-1987	5.7L 350 CID	**41121**
1991-1987	6.2L 379 CID; VIN C	**51008**
1987	5.0L 305 CID; VIN H	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
R2500		
L6		
1988-1987	4.8L 292 CID	**21030**
V6		
1987	4.3L 262 CID; VIN Z	**41121**
V8		
1989-1987	5.7L 350 CID	**41121**
1989-1987	6.2L 379 CID; VIN J	**51008**
1989-1987	7.4L 454 CID	**41002**
1987	5.0L 305 CID; VIN H	**41121**
1987	6.2L 379 CID; VIN C	**51008**
R2500 Suburban		
V8		
1991-1988	7.4L 454 CID	**41038**
1991-1987	5.7L 350 CID	**41121**
1991-1987	6.2L 379 CID; VIN J	**51008**
1991-1987	7.4L 454 CID	**41002**
R3500		
L6		
1988-1987	4.8L 292 CID	**21030**
V8		
1991-1987	5.7L 350 CID	**41121**
1991-1987	6.2L 379 CID; VIN J	**51008**
1991-1987	7.4L 454 CID	**41002**
S15		
L4		
1990-1987	2.5L 2474cc 151 CID	**21040**
1986-1985	2.5L 2474cc 151 CID	**31022**
1985-1982	1.9L 119 CID	**21013**
1984-1983	2.0L 122 CID; VIN Y	**31015**
V6		
1990-1988	4.3L 262 CID; VIN Z	**41049**
1990-1987	2.8L 173 CID; VIN R	**41035**
1986	2.8L 173 CID; VIN R	**41006**
1985-1982	2.8L 173 CID; VIN B	**41006**
S15 Jimmy		
L4		
1990-1987	2.5L 2474cc 151 CID	**21040**
1986	2.5L 2474cc 151 CID; VIN E	**31022**
1985	2.5L 2474cc 151 CID	**31022**
1984-1983	1.9L 119 CID	**21013**
1984-1983	2.0L 122 CID	**31015**
V6		
1989-1987	2.8L 173 CID	**41035**
1986-1983	2.8L 173 CID	**41006**
Safari		
L4		
1990-1987	2.5L 2474cc 151 CID; VIN E	**21040**
1986-1985	2.5L 2474cc 151 CID	**31022**
V6		
2005-1996	4.3L 262 CID	**41077**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
Safari (cont'd)		
V6		
1995-1987	4.3L 262 CID	**41049**
1986-1985	4.3L 262 CID	**41121**
Savana 1500		
V6		
2010-2003	4.3L 262 CID; VIN X	**41077**
2002-1998	4.3L 262 CID; VIN W	**41077**
1997-1996	4.3L 262 CID	**41077**
V8		
2013-2007	5.3L 5328cc 325 CID	**71617**
2007	5.3L 325 CID	**71617**
2006	5.3L 325 CID	**71616**
2005-2003	5.3L 323 CID	**71616**
2002-1996	5.0L 305 CID	**41077**
2002-1996	5.7L 350 CID	**41077**
Savana 2500		
V6		
2005-2003	4.3L 262 CID; VIN X	**41077**
2002-1998	4.3L 262 CID; VIN W	**41077**
1997-1996	4.3L 262 CID	**41077**
V8		
2013-2007	4.8L 294 CID	**71617**
2013-2007	6.0L 5967cc 364 CID	**71617**
2013-2006	6.6L 400 CID	**71053**
2006-2003	4.8L 294 CID	**71616**
2006-2003	6.0L 5967cc 364 CID	**41090**
2006-2003	6.0L 5967cc 364 CID	**71616**
2005-2003	5.3L 323 CID	**71616**
2002-2000	6.5L 395 CID; DIESEL	**51086**
2002-1996	5.0L 305 CID	**41077**
2002-1996	5.7L 350 CID	**41077**
1999-1996	6.5L 395 CID; DIESEL	**51074**
Savana 3500		
V8		
2013-2007	4.8L 294 CID	**71617**
2013-2007	6.0L 5967cc 364 CID	**71617**
2013-2006	6.6L 400 CID	**71053**
2006-2004	4.8L 294 CID	**71616**
2006-2003	6.0L 5967cc 364 CID	**41090**
2006-2003	6.0L 5967cc 364 CID	**71616**
2002-2000	6.5L 395 CID; DIESEL	**51086**
2002-1996	5.7L 350 CID	**41077**
2000-1996	7.4L 454 CID	**41038**
1999-1996	6.5L 395 CID; DIESEL	**51074**
Savana 4500		
V8		
2013-2009	6.6L 400 CID	**71053**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
Sierra		
V8		
2010-2008	6.2L 6199cc 378 CID	**71617**
2010-2007	5.3L 5328cc 325 CID	**71617**
Sierra 1500		
V6		
2012-2011	4.3L 262 CID	**41077**
2010-2002	4.3L 262 CID; VIN X	**41077**
2002-1999	4.3L 262 CID; VIN W	**41077**
V8		
2013-2009	6.2L 376 CID	**71617**
2013-2007	4.8L 294 CID	**71617**
2013-2007	5.3L 5328cc 325 CID	**71617**
2013-2007	6.0L 5967cc 364 CID	**71617**
2009-2007	5.3L 325 CID	**71617**
2006	5.3L 325 CID	**71616**
2006-2002	6.0L 5967cc 364 CID	**71616**
2006-1999	4.8L 294 CID	**71616**
2005-1999	5.3L 323 CID	**71616**
Sierra 1500 HD		
V8		
2007	6.0L 5967cc 364 CID	**71617**
2006-2005	6.0L 5967cc 364 CID	**71616**
2003-2001	6.0L 5967cc 364 CID	**71616**
Sierra 2500		
V8		
2004-1999	6.0L 5967cc 364 CID	**71616**
2000-1999	5.3L 323 CID	**71616**
Sierra 2500 HD		
V8		
2013-2007	6.0L 5967cc 364 CID	**71617**
2013-2006	6.6L 400 CID	**71053**
2007-2001	8.1L 496 CID	**51089**
2006-2001	6.0L 5967cc 364 CID	**71616**
2005-2001	6.6L 400 CID; DIESEL	**21098**
2004	6.6L 403 CID; DIESEL	**21098**
Sierra 3500		
V8		
2007	6.0L 5967cc 364 CID	**71617**
2007-2006	6.6L 400 CID	**71053**
2007-2001	8.1L 496 CID	**51089**
2006-2001	6.0L 5967cc 364 CID	**71616**
2005-2001	6.6L 400 CID; DIESEL	**21098**
2004	6.6L 403 CID; DIESEL	**21098**
Sierra 3500 HD		
V8		
2013-2007	6.0L 5967cc 364 CID	**71617**
2013-2007	6.6L 400 CID	**71053**
Sierra C3		
V8		
2001	6.0L 5967cc 364 CID	**71616**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
Sonoma		
L4		
2003-1994	2.2L 2190cc 134 CID	**11032**
1993-1991	2.5L 2474cc 151 CID	**21040**
V6		
2004-1996	4.3L 262 CID	**41077**
1995-1991	4.3L 262 CID	**41049**
1993-1991	2.8L 173 CID	**41035**
Sprint		
L6		
1977-1976	4.1L 250 CID	**21107**
1972-1971	4.1L 250 CID	**21895**
V8		
1977	5.0L 305 CID	**41121**
1977	5.7L 350 CID	**41121**
1976	5.0L 305 CID	**41109**
1976-1974	6.6L 400 CID	**41109**
1976-1972	5.7L 350 CID	**41109**
1975-1974	6.6L 402 CID	**41002**
1975-1971	7.4L 454 CID	**41002**
1973-1971	5.0L 5031cc 307 CID	**41109**
1972-1971	6.6L 6588cc 402 CID	**41002**
1971	5.7L 5736cc 350 CID	**41109**
1971	6.6L 6588cc 402 CID; Big Block	**41002**
1971	6.6L 6588cc 402 CID; Small Block	**41109**
Syclone		
V6		
1991	4.3L 262 CID	**41049**
T6500		
V8		
1998-1997	6.0L 366 CID	**71078**
T7500		
V8		
1998-1997	6.0L 366 CID	**71078**
Terrain		
L4		
2013-2010	2.4L 145 CID; Pump is driven off the timing chain	**21092**
V6		
2014-2013	3.6L 217 CID	**11103**
2012-2010	3.0L 182 CID	**11103**
Tracker		
L4		
1991-1989	1.6L 1588cc 98 CID	**11048**
Typhoon		
V6		
1993-1992	4.3L 262 CID	**41049**
V1500		
V6		
1987	4.3L 262 CID; VIN Z	**41121**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
V1500 (cont'd)		
V8		
1987	5.0L 305 CID	**41121**
1987	5.7L 350 CID; VIN K	**41121**
1987	6.2L 379 CID; DIESEL; VIN C	**51008**
V1500 Suburban		
V8		
1991-1987	5.7L 350 CID; VIN K	**41121**
1991-1987	6.2L 379 CID; DIESEL; VIN C	**51008**
V2500		
L6		
1987	4.8L 292 CID	**21030**
V8		
1987	5.7L 350 CID; VIN K	**41121**
1987	6.2L 379 CID; DIESEL; VIN C	**51008**
1987	6.2L 379 CID; DIESEL; VIN J	**51008**
V2500 Suburban		
V8		
1991-1987	5.7L 350 CID; VIN K	**41121**
1991-1987	6.2L 379 CID; DIESEL; VIN J	**51008**
V3500		
L6		
1988-1987	4.8L 292 CID	**21030**
V8		
1991-1987	5.7L 350 CID; VIN K	**41121**
1991-1987	6.2L 379 CID; DIESEL; VIN J	**51008**
1991-1987	7.4L 454 CID	**41002**
1988-1987	5.7L 350 CID; VIN M	**41121**
W3500 Forward		
V8		
2008-2007	6.0L 5967cc 364 CID	**71617**
2006-2004	6.0L 5967cc 364 CID	**71616**
W4500 Forward		
V8		
2010	6.0L 5967cc 364 CID	**71617**
2008-2007	6.0L 5967cc 364 CID	**71617**
2006-2004	6.0L 5967cc 364 CID	**71616**
Yukon		
V8		
2013-2011	6.2L 6162cc 376 CID	**71617**
2013-2008	6.0L 5967cc 364 CID	**71617**
2013-2007	5.3L 5328cc 325 CID	**71617**
2010	6.2L 376 CID	**71617**
2009-2007	4.8L 294 CID	**71617**
2009-2007	6.2L 6199cc 378 CID	**71617**
2006	5.3L 325 CID	**71616**
2006-2001	6.0L 5967cc 364 CID	**71616**
2006-2000	4.8L 294 CID	**71616**
2005-2000	5.3L 323 CID	**71616**
2000-1996	5.7L 350 CID	**41077**

YEAR	VEHICLE DETAIL	PART NO.
GMC (cont'd)		
Yukon (cont'd)		
V8		
1997	6.5L 395 CID; DIESEL	**51074**
1996	6.5L 395 CID; DIESEL; Early	**51062**
1996	6.5L 395 CID; DIESEL; Late Model	**51074**
1995-1994	6.5L 395 CID; DIESEL	**51062**
1995-1992	5.7L 350 CID	**41049**
Yukon XL 1500		
V8		
2013-2009	6.2L 376 CID	**71617**
2013-2007	5.3L 5328cc 325 CID	**71617**
2009-2007	6.0L 5967cc 364 CID	**71617**
2008-2007	6.2L 6199cc 378 CID	**71617**
2006	5.3L 5328cc 325 CID	**71616**
2006-2001	6.0L 5967cc 364 CID	**71616**
2005-2000	5.3L 323 CID	**71616**
Yukon XL 2500		
V8		
2013-2007	6.0L 5967cc 364 CID	**71617**
2006-2004	6.0L 5967cc 364 CID; VIN U	**71616**
2006-2001	8.1L 496 CID; VIN G	**51089**
2003-2000	6.0L 5967cc 364 CID	**71616**
Geo		
Metro		
L3		
1997-1989	1.0L 993cc 61 CID	**11058**
L4		
1997-1995	1.3L 1295cc 79 CID	**11058**
1994-1992	1.3L 1298cc 79 CID	**11058**
Prizm		
L4		
1997-1993	1.6L 1588cc 98 CID	**15271**
1997-1993	1.8L 1788cc 110 CID	**15272**
1992-1990	1.6L 1587cc	**15076**
1989	1.6L 1588cc 98 CID	**15057**
Spectrum		
L4		
1989	1.5L 1471cc 92 CID; Driven off the timing belt	**11031**
Storm		
L4		
1993-1992	1.8L 1788cc 110 CID	**16221**
1993-1990	1.6L 1588cc 98 CID	**16221**
Tracker		
L4		
1997-1989	1.6L 1588cc 98 CID	**11048**
Honda		
Accord		
L4		
2012-2008	2.4L 2354cc	**26233**
2007-2006	2.4L 2354cc; K24A8 Desig.	**26434**

YEAR	VEHICLE DETAIL	PART NO.
Honda (cont'd)		
Accord (cont'd)		
L4		
2005-2003	2.4L 2354cc; K24A4 Desig.	**26461**
2002-1998	2.3L 2254cc; Driven off the timing belt	**16209**
2002-1998	2.3L 2254cc; F23A1 Desig.; Driven off the timing belt	**16209**
2002-1998	2.3L 2254cc; F23A4 Desig.; Driven off the timing belt	**16209**
2002-1998	2.3L 2254cc; F23A5 Desig.; Driven off the timing belt	**16209**
1997-1994	2.2L 2156cc; F22B1 Desig.; Driven off the timing belt	**16209**
1997-1994	2.2L 2156cc; F22B2 Desig.; Driven off the timing belt	**16209**
1997-1990	2.2L 2156cc; Driven off the timing belt	**16209**
1989-1986	2.0L 1955cc	**16083**
1989-1986	2.0L 1955cc; CARB	**16083**
1989-1986	2.0L 1955cc; FI	**16083**
1985-1984	1.8L 1829cc	**16056**
1983-1982	1.8L 1751cc	**16035**
1981-1980	1.8L 1751cc	**16029**
1979	1.8L 1751cc	**16034**
1979	1.8L 1751cc; EK1 Desig.; Driven off the timing belt	**16209**
1978-1976	1.6L 1599cc	**16034**
1978-1976	1.6L 1599cc; Driven off the timing belt	**16209**
V6		
2012	3.5L 3471cc	**26470**
2011-2008	3.5L 3471cc; Coupe	**26470**
2007-2005	3.0L 2997cc	**26470**
2005-2003	3.0L 2977cc	**26470**
2003	3.0L 2997cc 183 CID	**26470**
2002-1998	3.0L 2997cc	**26383**
1997-1995	2.7L 2675cc	**36097**
Accord Crosstour		
V6		
2012-2010	3.5L 3471cc	**26470**
CR-V		
L4		
2011-2010	2.4L 2354cc	**26233**
2009-2007	2.4L 2354cc; Excluding Japan Built	**26461**
2009-2007	2.4L 2354cc; Japan Built	**26434**
2006-2002	2.4L 2354cc	**26434**
2001-1997	2.0L 1972cc	**16349**
CRX		
L4		
1991-1988	1.5L 1493cc	**16130**
1991-1988	1.6L 1590cc 97 CID	**16130**
Civic		
L4		
2011-2006	1.8L 1799cc	**26056**
2010-2006	2.0L 1998cc 122 CID; K20Z3 Desig.	**26495**

YEAR	VEHICLE DETAIL	PART NO.
Honda (cont'd)		
Civic (cont'd)		
L4		
2008-2006	1.3L 1339cc; Sold in Mexico	**26216**
2005	1.7L 1668cc	**16419**
2005	1.7L 1668cc; D17A1 Desig.	**16419**
2005	1.7L 1668cc; D17A2 Desig.	**16419**
2005	1.7L 1668cc; D17A6 Desig.	**16419**
2005	1.7L 1668cc; D17A7 Desig.	**16419**
2005-2002	2.0L 1998cc 122 CID	**26434**
2004-2002	1.7L 1700cc	**16419**
2004-2002	1.7L 1700cc; D17A1 Desig.	**16419**
2004-2002	1.7L 1700cc; D17A2 Desig.	**16419**
2004-2002	1.7L 1700cc; D17A6 Desig.	**16419**
2004-2002	1.7L 1700cc; D17A7 Desig.	**16419**
2001	1.7L 1668cc	**16419**
2001	1.7L 1668cc; D17A1 Desig.	**16419**
2001	1.7L 1668cc; D17A2 Desig.	**16419**
2001	1.7L 1668cc; D17A6 Desig.	**16419**
2001	1.7L 1668cc; D17A7 Desig.	**16419**
2000-1999	1.6L 1590cc 97 CID	**16468**
2000-1999	1.6L 1595cc	**16352**
2000-1998	1.6L 1590cc 97 CID; D16B5 Desig.	**16352**
2000-1996	1.6L 1590cc	**16352**
2000-1996	1.6L 1590cc 97 CID	**16352**
2000-1996	1.6L 1590cc 97 CID; D16Y7 Desig.	**16352**
2000-1996	1.6L 1590cc 97 CID; D16Y8 Desig.	**16352**
2000-1996	1.6L 1590cc; D16Y5 Desig.	**16352**
1995-1992	1.5L 1493cc; CX	**16130**
1995-1992	1.5L 1493cc; DX	**16130**
1995-1992	1.5L 1493cc; LX	**16130**
1995-1992	1.5L 1493cc; VX	**16250**
1995-1992	1.5L 1493cc; w/ VTEC Engine	**16250**
1995-1992	1.6L 1590cc 97 CID	**16250**
1995-1992	1.6L 1590cc 97 CID; w/ VTEC Engine	**16250**
1991-1988	1.5L 1493cc	**16130**
1991-1988	1.6L 1590cc 97 CID	**16130**
1987	1.5L 1491cc 91 CID	**16069**
1987-1984	1.3L 1342cc 82 CID	**16069**
1987-1984	1.5L 1487cc	**16069**
1986	1.5L 1493cc	**16069**
1983-1980	1.3L 1335cc	**16043**
1983-1980	1.5L 1487cc	**16035**
1979-1975	1.5L 1487cc	**16029**
1979-1975	1.5L 1487cc	**16034**
1979-1973	1.2L 1237cc	**16033**
1979-1973	1.2L 1237cc; 1200	**16033**
Civic del Sol		
L4		
1997-1996	1.6L 1590cc 97 CID; D16Y7 Desig.	**16352**

YEAR	VEHICLE DETAIL	PART NO.
Honda (cont'd)		
Civic del Sol (cont'd)		
L4		
1997-1996	1.6L 1590cc 97 CID; D16Y8 Desig.	**16352**
1997-1996	1.6L 1595cc; B16A2 Desig.; w/ VTEC Engine	**16468**
1995-1994	1.6L 1590cc 97 CID; B16A3 Desig.	**16321**
1995-1993	1.5L 1493cc	**16130**
1995-1993	1.6L 1590cc 97 CID; D16Z6 Desig.; SOHC; w/ VTEC Engine	**16250**
Element		
L4		
2011-2003	2.4L 2354cc	**26461**
Fit		
L4		
2008-2007	1.5L 1497cc	**91047**
Insight		
L3		
2006-2000	1.0L 995cc 61 CID; ELECTRIC/GAS	**16494**
Odyssey		
L4		
1998	2.3L 2234cc; F23A7 Desig.; Driven off the timing belt	**16209**
1997-1995	2.2L 2156cc; F22B6 Desig.; Driven off the timing belt	**16209**
V6		
2012-2011	3.5L 3471cc	**26470**
2010-2005	3.5L 3471cc; J35A6 Desig.	**26470**
2010-2005	3.5L 3471cc; J35A7 Desig.	**26470**
2004-1999	3.5L 3474cc	**26383**
Passport		
L4		
1996-1994	2.6L 2559cc	**26133**
V6		
2002-1998	3.2L 3165cc	**26385**
1997-1995	3.2L 3165cc	**26278**
Pilot		
V6		
2012-2005	3.5L 3471cc	**26470**
2004-2003	3.5L 3475cc	**26383**
Prelude		
L4		
2001-1998	2.2L 2156cc	**16273**
1997-1993	2.2L 2156cc; DOHC	**16273**
1996-1994	2.2L 2156cc; S; SOHC; Driven off the timing belt	**16209**
1996-1992	2.3L 2259cc; Si	**16251**
1994-1992	2.3L 2259cc; Si 4WS	**16251**
1993	2.2L 2156cc; SOHC; Driven off the timing belt	**16209**
1992	2.2L 2156cc; Driven off the timing belt	**16209**
1991	2.0L 1958cc	**16129**
1991-1990	2.1L 2056cc; FI	**16129**

YEAR	VEHICLE DETAIL	PART NO.
Honda (cont'd)		
Prelude (cont'd)		
L4		
1990-1988	2.0L 1958cc; 2.0 S; CARB	**16131**
1990-1988	2.0L 1958cc; 2.0 Si; FI	**16129**
1989-1988	2.0L 1958cc; 2.0 Si 4WS; FI	**16129**
1987-1985	2.0L 1955cc; 2.0 Si; FI	**16083**
1987-1983	1.8L 1829cc; CARB	**16056**
1982	1.8L 1751cc	**16035**
1981-1980	1.8L 1751cc	**16029**
1979	1.8L 1751cc	**16034**
Ridgeline		
V6		
2011-2006	3.5L 3471cc	**26470**
S2000		
L4		
2009-2004	2.2L 2157cc	**16403**
2003-2000	2.0L 1997cc	**16403**
Wagovan		
L4		
1987-1986	1.5L 1487cc	**16069**
1984	1.5L 1487cc	**16069**
Hummer		
H1		
V8		
2004	6.5L 395 CID	**51086**
2003-2002	6.5L 395 CID; DIESEL	**51086**
H2		
V8		
2009	6.2L 376 CID	**71617**
2008	6.2L 6199cc 378 CID	**71617**
2007	6.0L 5967cc 364 CID	**71617**
2006-2003	6.0L 5967cc 364 CID	**71616**
H3		
L5		
2010-2008	3.7L 3653cc 223 CID	**21097**
2010-2007	3.7L 3654cc 223 CID	**21097**
2006	3.5L 3460cc 211 CID	**21097**
V8		
2010-2008	5.3L 5328cc 325 CID	**71617**
H3T		
L5		
2010-2009	3.7L 3654cc 223 CID	**21097**
V8		
2010	5.3L 325 CID	**71617**
2009	5.3L 5328cc 325 CID	**71617**
Hyundai		
Accent		
L4		
2012-2006	1.6L 1599cc	**26364**
2006-2001	1.6L 1600cc	**26364**
2003	1.5L 1495cc	**23115**

YEAR	VEHICLE DETAIL	PART NO.
Hyundai (cont'd)		
Accent (cont'd)		
L4		
2002	1.5L 1495cc	**26364**
2001-1995	1.5L 1495cc; SOHC	**23115**
1997-1995	1.5L 1495cc	**23115**
Azera		
V6		
2013-2007	3.3L 3342cc	**33048**
2011-2007	3.8L 3778cc	**33048**
2006	3.8L 3778cc; VIN F	**33048**
Elantra		
L4		
2012-1999	2.0L 1975cc	**36353**
1998	1.8L 1796cc	**36353**
1997-1996	1.8L 1795cc	**36353**
1995-1993	1.8L 1836cc	**26212**
1995-1992	1.6L 1596cc	**23131**
Entourage		
V6		
2008-2007	3.8L 3778cc	**33048**
Excel		
L4		
1994-1986	1.5L 1468cc	**23115**
Genesis		
V6		
2013-2009	3.8L 3778cc	**33048**
Genesis Coupe		
V6		
2013-2010	3.8L 3778cc	**33048**
Santa Fe		
L4		
2006-2001	2.4L 2351cc	**26477**
2004-2001	2.4L 2351cc	**26399**
V6		
2012-2010	3.5L 3470cc	**33048**
2009-2007	3.3L 3342cc	**33048**
2006	3.5L 3467cc	**26463**
2006-2001	2.7L 2656cc	**26462**
2005-2003	3.5L 3500cc	**26463**
Scoupe		
L4		
1995-1993	1.5L 1495cc	**23115**
1992-1991	1.5L 1468cc	**23115**
Sonata		
L4		
2005-1999	2.4L 2351cc	**26477**
2004-2002	2.4L 2351cc	**26399**
1998-1992	2.0L 1997cc	**26212**
1991-1989	2.4L 2351cc	**23118**
V6		
2010-2006	3.3L 3342cc	**33048**

YEAR	VEHICLE DETAIL	PART NO.
Hyundai (cont'd)		
Sonata (cont'd)		
V6		
2005-2002	2.7L 2656cc	**26462**
2001-1999	2.5L 2493cc	**26462**
1998-1990	3.0L 2972cc; Driven off the timing belt	**23121**
Stellar		
L4		
1987	2.0L 1997cc	**23114**
Tiburon		
L4		
2008-2003	2.0L 1975cc	**36353**
2001-1998	2.0L 1997cc	**36353**
1997	1.8L 1795cc	**36353**
1997	2.0L 1975cc	**36353**
V6		
2008-2003	2.7L 2656cc	**26462**
Tucson		
L4		
2009-2005	2.0L 1975cc	**36353**
V6		
2009-2005	2.7L 2656cc	**26462**
Veracruz		
V6		
2012-2007	3.8L 3778cc	**33048**
XG300		
V6		
2001	3.0L 2972cc	**26463**
XG350		
V6		
2005-2002	3.5L 3500cc	**26463**
Infiniti		
EX35		
V6		
2012-2008	3.5L 3498cc	**16426**
EX37		
V6		
2013	3.7L 3696cc	**16426**
FX35		
V6		
2012-2003	3.5L 3498cc	**16426**
FX37		
V6		
2013	3.7L 3696cc	**16426**
FX50		
V8		
2013-2009	5.0L 5026cc; VK50VE Desig.	**16488**
G20		
L4		
2002-1999	2.0L 2000cc	**16213**
1996-1991	2.0L 1998cc	**16213**

YEAR	VEHICLE DETAIL	PART NO.
Infiniti (cont'd)		
G25		
V6		
2012-2011	2.5L 2496cc 152 CID	**16426**
G35		
V6		
2008-2003	3.5L 3498cc	**16426**
G37		
V6		
2013-2008	3.7L 3696cc	**16426**
I30		
V6		
2001-1996	3.0L 2988cc 182 CID	**16309**
I35		
V6		
2004-2002	3.5L 3498cc	**16426**
J30		
V6		
1997-1993	3.0L 2960cc 181 CID	**36268**
JX35		
V6		
2013	3.5L 3498cc	**16426**
M30		
V6		
1992-1990	3.0L 2960cc 181 CID	**16058**
M35		
V6		
2010-2006	3.5L 3498cc	**16426**
M35h		
V6		
2013-2012	3.5L 3498cc	**16426**
M37		
V6		
2013-2011	3.7L 3696cc	**16426**
M56		
V8		
2013-2011	5.6L 5552cc	**16488**
2011	5.6L 5552cc	**16426**
Q45		
V8		
2001-1998	4.1L 4130cc	**26388**
1997	4.1L 4130cc	**26304**
1996-1994	4.5L 4494cc	**26304**
1993-1990	4.5L 4494cc	**36239**
Q50		
V6		
2014	3.5L 3498cc	**16426**
2014	3.7L 3696cc	**16426**
Q60		
V6		
2014	3.7L 3696cc	**16426**

YEAR	VEHICLE DETAIL	PART NO.
Infiniti (cont'd)		
QX4		
V6		
2003-2001	3.5L 3498cc	**16309**
2000-1997	3.3L 3275cc	**46338**
QX50		
V6		
2014	3.7L 3696cc	**16426**
QX56		
V8		
2013-2004	5.6L 5552cc	**16488**
QX60		
V6		
2014	3.5L 3498cc	**16426**
QX70		
V6		
2014	3.7L 3696cc	**16426**
V8		
2014	5.0L 5026cc	**16488**
QX80		
V8		
2014	5.6L 5552cc	**16488**
International		
100		
L6		
1974	4.2L 258 CID	**33986**
1974	4.2L 4228cc 258 CID	**33986**
1974	4.2L 4229cc 258 CID	**33986**
1010		
L6		
1973-1972	4.2L 258 CID	**33986**
1973-1972	4.2L 4228cc 258 CID	**33986**
1973-1972	4.2L 4229cc 258 CID	**33986**
1110		
L6		
1973-1972	4.2L 258 CID	**33986**
1973-1972	4.2L 4228cc 258 CID	**33986**
1973-1972	4.2L 4229cc 258 CID	**33986**
1210		
L6		
1973-1972	4.2L 258 CID	**33986**
1973-1972	4.2L 4228cc 258 CID	**33986**
1973-1972	4.2L 4229cc 258 CID	**33986**
1310		
L6		
1973-1972	4.2L 258 CID	**33986**
1973-1972	4.2L 4228cc 258 CID	**33986**
1973-1972	4.2L 4229cc 258 CID	**33986**
1652SC		
V8		
2005-2004	7.3L 444 CID	**73716**

YEAR	VEHICLE DETAIL	PART NO.
International (cont'd)		
1652UPS		
V8		
1997-1995	7.3L 444 CID	**73716**
200		
L6		
1974	4.2L 258 CID	**33986**
1974	4.2L 4228cc 258 CID	**33986**
1974	4.2L 4229cc 258 CID	**33986**
3000		
L6		
2002-1996	7.6L 466 CID; DT466 Desig.	**73712**
V8		
2000-1997	7.3L 444 CID	**73716**
3000FE		
L6		
1999-1997	7.6L 466 CID; DT466 Desig.	**73712**
3000IC		
L6		
2002-2000	7.6L 466 CID; DT466 Desig.	**73712**
V8		
2002-2000	7.3L 444 CID	**73716**
3000RE		
L6		
2005	7.6L 466 CID; DT466 Desig.	**73712**
3200		
L6		
2006-2002	7.6L 466 CID; DT466 Desig.	**73712**
3400		
V8		
2002-1996	7.3L 444 CID	**73716**
3600		
L6		
2001	7.6L 466 CID; DT466 Desig.	**73712**
1999-1995	7.6L 466 CID; DT466 Desig.	**73712**
V8		
1999-1994	7.3L 444 CID	**73716**
3700		
L6		
1990	7.6L 466 CID; DT466 Desig.	**73712**
V8		
1994	7.3L 444 CID	**73716**
3800		
L6		
2004-1990	7.6L 466 CID; DT466 Desig.	**73712**
V8		
2004-1994	7.3L 444 CID	**73716**
3900FC		
L6		
1996	7.6L 466 CID; DT466 Desig.	**73712**
1994-1991	7.6L 466 CID; DT466 Desig.	**73712**

YEAR	VEHICLE DETAIL	PART NO.
International (cont'd)		
4300		
L6		
2012-2009	7.6L 466 CID; DT466 Desig.	**73712**
4300LP		
L6		
2012-2002	7.6L 466 CID; DT466 Desig.	**73712**
4400		
L6		
2012-2009	7.6L 466 CID; DT466 Desig.	**73712**
4400LP		
L6		
2012-2002	7.6L 466 CID; DT466 Desig.	**73712**
4600LP		
V8		
1994	7.3L 444 CID	**73716**
4700		
L6		
1993	7.6L 466 CID; DT466 Desig.	**73712**
1991-1990	7.6L 466 CID; DT466 Desig.	**73712**
4700LP		
L6		
2002-1994	7.6L 466 CID; DT466 Desig.	**73712**
V8		
2002-1994	7.3L 444 CID	**73716**
4700LPX		
V8		
2002-1995	7.3L 444 CID	**73716**
7300		
L6		
2006-2002	7.6L 466 CID; DT466 Desig.	**73712**
C900		
L4		
1964	2.5L 2491cc 152 CID	**71099**
Cargostar		
L6		
1984	7.6L 466 CID; DT466 Desig.	**73712**
1980	7.6L 466 CID; DT466 Desig.	**73712**
D900		
L4		
1965	2.5L 2491cc 152 CID	**71099**
Durastar		
L6		
2013	7.6L 466 CID; DT466 Desig.	**73712**
Genesis RE		
L6		
2002-1998	7.6L 466 CID; DT466 Desig.	**73712**
V8		
2002-1996	7.3L 444 CID	**73716**
M Series Van		
L4		
1967-1961	2.5L 152 CID	**71099**

YEAR	VEHICLE DETAIL	PART NO.
International (cont'd)		
M1100		
L6		
1972	4.2L 258 CID	**33986**
1972	4.2L 4228cc 258 CID	**33986**
1972	4.2L 4229cc 258 CID	**33986**
V8		
1972-1969	5.0L 304 CID	**71099**
M1200		
L6		
1972	4.2L 258 CID	**33986**
1972	4.2L 4228cc 258 CID	**33986**
1972	4.2L 4229cc 258 CID	**33986**
V8		
1972-1969	5.0L 304 CID	**71099**
1968	4.4L 266 CID	**71099**
MA1200		
V8		
1971-1969	5.0L 304 CID	**71099**
1968	4.4L 266 CID	**71099**
MS1210		
L6		
1974-1972	4.2L 258 CID	**33986**
1974-1972	4.2L 4228cc 258 CID	**33986**
1974-1972	4.2L 4229cc 258 CID	**33986**
V8		
1974-1972	5.0L 304 CID	**71099**
S1753		
L6		
1989-1988	7.6L 466 CID; DT466 Desig.	**73712**
S1853		
L6		
1989-1988	7.6L 466 CID; DT466 Desig.	**73712**
S1854		
L6		
1989-1988	7.6L 466 CID; DT466 Desig.	**73712**
S1924		
L6		
1982-1980	7.6L 466 CID; DT466 Desig.	**73712**
S1925		
L6		
1982-1980	7.6L 466 CID; DT466 Desig.	**73712**
S1954		
L6		
1989-1988	7.6L 466 CID; DT466 Desig.	**73712**
1985	7.6L 466 CID; DT466 Desig.	**73712**
1983-1981	7.6L 466 CID; DT466 Desig.	**73712**
S1955		
L6		
1989-1988	7.6L 466 CID; DT466 Desig.	**73712**
1983-1981	7.6L 466 CID; DT466 Desig.	**73712**

YEAR	VEHICLE DETAIL	PART NO.
International (cont'd)		
S2125		
L6		
1981-1980	7.6L 466 CID; DT466 Desig.	**73712**
S2155		
L6		
1984	7.6L 466 CID; DT466 Desig.	**73712**
S2524		
L6		
1982-1980	7.6L 466 CID; DT466 Desig.	**73712**
S2554		
L6		
1985	7.6L 466 CID; DT466 Desig.	**73712**
1983-1981	7.6L 466 CID; DT466 Desig.	**73712**
Scout		
L4		
1971-1968	2.5L 152 CID	**71099**
1971-1961	2.5L 2491cc 152 CID	**71099**
1970-1968	3.2L 196 CID	**71099**
1970-1967	3.2L 3212cc 196 CID	**71099**
1970-1966	3.2L 3203cc 196 CID	**71099**
V8		
1970-1969	5.0L 304 CID	**71099**
1970-1969	5.0L 4982cc 304 CID	**71099**
1970-1969	5.0L 4983cc 304 CID	**71099**
Scout II		
L4		
1980-1971	3.2L 196 CID	**71099**
1974-1971	3.2L 3203cc 196 CID	**71099**
1974-1971	3.2L 3212cc 196 CID	**71099**
1971	2.5L 2491cc 152 CID	**71099**
L6		
1974-1972	4.2L 4228cc 258 CID	**33986**
1973	4.2L 258 CID	**33986**
1973	4.2L 4229cc 258 CID	**33986**
V8		
1980-1975	5.6L 345 CID	**71099**
1980-1971	5.0L 304 CID	**71099**
1975	6.4L 392 CID	**71099**
1974	6.4L 6424cc 392 CID	**71099**
1974-1971	5.0L 4982cc 304 CID	**71099**
1974-1971	5.0L 4983cc 304 CID	**71099**
1974-1971	5.6L 5654cc 345 CID	**71099**
1971	5.6L 345 CID	**71099**
Travelall		
V8		
1975	5.0L 304 CID	**71099**
1975	5.6L 345 CID	**71099**
1975	6.4L 392 CID	**71099**

YEAR	VEHICLE DETAIL	PART NO.
Isuzu		
Amigo		
L4		
2000-1998	2.2L 2180cc	**16375**
1994-1989	2.6L 2559cc	**26133**
1993-1989	2.3L 2254cc	**26105**
V6		
2000-1998	3.2L 3165cc	**26365**
Ascender		
L6		
2008-2003	4.2L 256 CID	**21097**
V8		
2006	5.3L 325 CID	**71616**
2005-2003	5.3L 323 CID	**71616**
Axiom		
V6		
2004	3.5L 3494cc	**26365**
2003	3.5L 3491cc	**26365**
2002	3.5L 3475cc	**26365**
Hombre		
L4		
2000-1996	2.2L 2180cc	**11032**
V6		
2000	4.3L 262 CID	**41077**
1999-1997	4.3L 4294cc	**41077**
I-Mark		
L4		
1989	1.6L 1588cc	**16160**
1989-1987	1.5L 1471cc; Turbocharged; Driven off the timing belt	**11031**
1989-1985	1.5L 1471cc; Driven off the timing belt	**11031**
1985-1981	1.8L 1817cc; GAS	**11127**
1983-1981	1.8L 1817cc; DIESEL	**31009**
Impulse		
L4		
1992	1.8L 1817cc; DOHC	**16221**
1992-1990	1.6L 1588cc; DOHC	**16220**
1989-1988	2.3L 2254cc	**26105**
1987-1985	2.0L 1994cc	**11127**
1987-1983	1.9L 1949cc; GAS; Naturally Aspirated	**11127**
NPR		
V8		
2012-2007	6.0L 5967cc 364 CID	**71617**
2006-2004	6.0L 5967cc 364 CID	**71616**
1996-1992	5.7L 350 CID	**41073**
NPR-HD		
V8		
2008-2007	6.0L 5967cc 364 CID	**71617**
2006-2004	6.0L 5967cc 364 CID	**71616**
Oasis		
L4		
1999	2.3L 2234cc; Driven off the timing belt	**16209**

YEAR	VEHICLE DETAIL	PART NO.
Isuzu (cont'd)		
Oasis (cont'd)		
L4		
1998	2.3L 2254cc; Driven off the timing belt	**16209**
1997-1996	2.2L 2156cc; Driven off the timing belt	**16209**
Pickup		
L4		
1995-1988	2.6L 2559cc	**26133**
1995-1986	2.3L 2254cc	**26105**
1987-1983	1.9L 1949cc; GAS	**11127**
1987-1981	2.2L 2238cc; DIESEL	**36132**
1982-1981	1.8L 1817cc; GAS	**11127**
V6		
1994-1991	3.1L 3137cc	**41035**
Rodeo		
L4		
2003-1998	2.2L 2180cc	**16375**
1997-1991	2.6L 2559cc	**26133**
V6		
2004-1998	3.2L 3165cc	**26365**
1997-1993	3.2L 3165cc	**26278**
1992-1991	3.1L 3137cc	**41035**
Rodeo Sport		
L4		
2003-2001	2.2L 2180cc	**16375**
Stylus		
L4		
1993-1991	1.6L 1588cc; SOHC	**16221**
1992	1.8L 1817cc; DOHC	**16221**
1991	1.6L 1588cc; DOHC	**16220**
Trooper		
L4		
1991-1988	2.6L 2559cc; Incl. Trooper Ii	**26133**
1987-1986	2.2L 2238cc; DIESEL; Incl. Trooper Ii	**36132**
1987-1986	2.3L 2254cc; GAS; Incl. Trooper Ii	**26105**
1985-1984	1.9L 1949cc; Incl. Trooper Ii	**11127**
V6		
2002-1998	3.5L 3475cc; Incl. Trooper Ii	**26365**
1997-1992	3.2L 3165cc; Incl. Trooper Ii	**26278**
1991-1989	2.8L 2827cc; Incl. Trooper Ii	**41035**
VehiCROSS		
V6		
2001-1999	3.5L 3475cc	**26365**
i-280		
L4		
2006	2.8L 2770cc 169 CID	**21097**
i-290		
L4		
2008-2007	2.9L 2921cc 178 CID	**21097**
i-350		
L5		
2006	3.5L 3460cc 211 CID	**21097**

YEAR	VEHICLE DETAIL	PART NO.
Isuzu (cont'd)		
i-370		
L5		
2008-2007	3.7L 3654cc 223 CID	**21097**
Jaguar		
S-Type		
V6		
2008-2002	3.0L 183 CID	**32129**
2001-2000	3.0L 183 CID	**32118**
V8		
2008-2003	4.2L 4196cc	**12124**
2002-2000	4.0L 3996cc 244 CID	**12124**
Super V8		
V8		
2009-2005	4.2L 4196cc	**12124**
Vanden Plas		
L6		
1997-1995	4.0L 3980cc	**12356**
V8		
2009-2004	4.2L 4196cc	**12124**
2003-1998	4.0L 3996cc 244 CID	**12124**
X-Type		
V6		
2008-2002	3.0L 183 CID	**12091**
2007-2002	3.0L 2967cc 181 CID	**12091**
2005-2002	2.5L 152 CID	**12091**
XF		
V8		
2010-2009	4.2L 4196cc	**12124**
XJ6		
L6		
1997-1995	4.0L 3980cc	**12356**
XJ8		
V8		
2009-2004	4.2L 4196cc	**12124**
2003-1998	4.0L 3996cc 244 CID	**12124**
XJR		
L6		
1997-1995	4.0L 3980cc	**12356**
V8		
2009-2004	4.2L 4196cc	**12124**
2003-1998	4.0L 3996cc 244 CID	**12124**
XJS		
L6		
1996-1995	4.0L 3980cc	**12356**
XK		
V8		
2009-2007	4.2L 4196cc	**12124**
XK8		
V8		
2006-2003	4.2L 4196cc	**12124**
2002-1997	4.0L 3996cc 244 CID	**12124**

YEAR	VEHICLE DETAIL	PART NO.
Jaguar (cont'd)		
XKR		
V8		
2009-2003	4.2L 4196cc	**12124**
2002-2000	4.0L 3996cc 244 CID	**12124**
Jeep		
475		
L4		
1956	2.2L 2197cc 134 CID	**33053**
CJ3		
L4		
1960-1959	2.2L 2197cc 134 CID; Without Pulley	**33053**
CJ5		
L4		
1983	2.5L 151 CID; General Motors Built Eng.; VIN B	**21107**
1983	2.5L 151 CID; Without Serpentine Belt	**33403**
1982-1980	2.5L 151 CID; General Motors Built Eng.	**21107**
1971-1968	2.2L 2197cc 134 CID; With Pulley	**33052**
1971-1968	2.2L 2197cc 134 CID; Without Pulley	**33053**
1960-1959	2.2L 2197cc 134 CID; Without Pulley	**33053**
L6		
1983-1981	4.2L 258 CID; VIN C; With Serpentine Belt	**33404**
1983-1980	4.2L 258 CID; VIN C; Without Serpentine Belt	**33403**
1979	4.2L 258 CID; VIN C	**33077**
1978-1975	3.8L 232 CID; VIN E	**33077**
1978-1975	4.2L 258 CID; VIN A	**33077**
1974-1972	3.8L 232 CID	**33021**
1974-1972	4.2L 258 CID	**33021**
V8		
1981-1973	5.0L 304 CID	**43401**
CJ5A		
L4		
1968-1966	2.2L 134 CID; With Pulley	**33052**
1968-1966	2.2L 134 CID; Without Pulley	**33053**
CJ6		
L4		
1971-1968	2.2L 2197cc 134 CID; With Pulley	**33052**
1971-1968	2.2L 2197cc 134 CID; Without Pulley	**33053**
1960-1959	2.2L 2197cc 134 CID; Without Pulley	**33053**
L6		
1975	3.8L 232 CID; VIN E	**33077**
1975	4.2L 258 CID; VIN A	**33077**
1974-1972	3.8L 232 CID	**33021**
1974-1972	4.2L 258 CID	**33021**
V8		
1975-1973	5.0L 304 CID	**43401**
CJ6A		
L4		
1968-1966	2.2L 134 CID; With Pulley	**33052**

YEAR	VEHICLE DETAIL	PART NO.
Jeep (cont'd)		
CJ6A (cont'd)		
L4		
1968-1966	2.2L 134 CID; Without Pulley	**33053**
CJ7		
L4		
1986-1983	2.5L 150 CID; Reverse Rotation; With Serpentine Belt	**33404**
1986-1983	2.5L 150 CID; Without Serpentine Belt	**33403**
1983	2.5L 150 CID; AMC Built Eng.; VIN U; Reverse Rotation; With Serpentine Belt	**33404**
1983	2.5L 150 CID; AMC Built Eng.; VIN U; Without Serpentine Belt	**33403**
1983	2.5L 151 CID; General Motors Built Eng.; VIN B	**21107**
1983	2.5L 151 CID; Without Serpentine Belt	**33403**
1982-1980	2.5L 151 CID; General Motors Built Eng.	**21107**
L6		
1986-1981	4.2L 258 CID; VIN C; With Serpentine Belt	**33404**
1986-1980	4.2L 258 CID; VIN C; Without Serpentine Belt	**33403**
1979	4.2L 258 CID; VIN C	**33077**
1978-1976	3.8L 232 CID; VIN E	**33077**
1978-1976	4.2L 258 CID; VIN A	**33077**
V8		
1981-1976	5.0L 304 CID	**43401**
Cherokee		
L4		
2000-1999	2.5L 150 CID	**23136**
1998-1991	2.5L 150 CID; Excluding China Models	**23136**
1996-1991	2.5L 150 CID; VIN P; Reverse Rotation; China Models	**33413**
1990-1987	2.5L 150 CID; Reverse Rotation; With Serpentine Belt	**33413**
1990-1987	2.5L 150 CID; Without Serpentine Belt	**33414**
1987-1985	2.1L 126 CID	**33409**
1986-1984	2.5L 150 CID; AMC Built Eng.; Reverse Rotation; With Serpentine Belt	**33404**
1986-1984	2.5L 150 CID; AMC Built Eng.; Without Serpentine Belt	**33403**
L6		
2001-1991	4.0L 242 CID	**23412**
1990-1987	4.0L 242 CID; With 2.3" Hub Height and 3 5/16" Diameter Hub	**23412**
1990-1987	4.0L 242 CID; With 3.72" Hub Height and 2 5/8" Diameter Hub	**33413**
1983-1981	4.2L 258 CID; VIN C; Reverse Rotation; With Serpentine Belt	**33404**
1983-1981	4.2L 258 CID; VIN C; Without Serpentine Belt	**33403**
1980	4.2L 258 CID	**33403**
1979-1977	4.2L 258 CID; VIN C	**33077**
1977-1975	4.2L 258 CID; VIN A	**33077**
1974	4.2L 258 CID	**33021**

YEAR	VEHICLE DETAIL	PART NO.
Jeep (cont'd)		
Cherokee (cont'd)		
V6		
1986-1984	2.8L 173 CID	**41006**
V8		
1983-1974	5.9L 360 CID	**43401**
1978-1974	6.6L 401 CID	**43401**
Comanche		
L4		
1992-1991	2.5L 150 CID; China Models	**23136**
1992-1991	2.5L 150 CID; Reverse Rotation; Excluding China Models	**33413**
1990-1987	2.5L 150 CID; Reverse Rotation; With Serpentine Belt	**33413**
1990-1987	2.5L 150 CID; Without Serpentine Belt	**33414**
1986	2.5L 150 CID; Reverse Rotation; With Serpentine Belt	**33404**
1986	2.5L 150 CID; Without Serpentine Belt	**33403**
L6		
1992-1991	4.0L 242 CID	**23412**
1990-1987	4.0L 242 CID; With 2.3" Hub Height and 3 5/16" Diameter Hub	**23412**
1990-1987	4.0L 242 CID; With 3.72" Hub Height and 2 5/8" Diameter Hub	**33413**
V6		
1986	2.8L 173 CID	**41006**
Commander		
V6		
2010-2006	3.7L 226 CID	**43163**
V8		
2009-2006	4.7L 285 CID	**43163**
2008-2006	5.7L 345 CID	**33170**
Compass		
L4		
2013-2007	2.0L 1998cc 122 CID	**13038**
2013-2007	2.4L 2360cc 144 CID	**13038**
DJ3		
L4		
1960-1959	2.2L 2197cc 134 CID; Without Pulley	**33053**
DJ5		
L4		
1971-1967	2.2L 2197cc 134 CID; With Pulley	**33052**
1971-1967	2.2L 2197cc 134 CID; Without Pulley	**33053**
L6		
1973-1972	3.8L 232 CID; VIN E	**33021**
DJ6		
L4		
1968	2.2L 2197cc 134 CID; With Pulley	**33052**
1968	2.2L 2197cc 134 CID; Without Pulley	**33053**
F-134		
L4		
1965-1963	2.2L 2197cc 134 CID; Without Pulley	**33053**

YEAR	VEHICLE DETAIL	PART NO.
Jeep (cont'd)		
F4		
L4		
1960-1959	2.2L 134 CID; Without Pulley	**33053**
1958-1957	2.2L 2197cc 134 CID; Without Pulley	**33053**
FC150		
L4		
1966	2.2L 2197cc 134 CID; With Pulley	**33052**
1966-1957	2.2L 2197cc 134 CID	**33053**
FC170		
L4		
1966	2.2L 2197cc 134 CID; With Pulley	**33052**
1966-1964	2.2L 2197cc 134 CID	**33053**
FJ3		
L4		
1964	2.2L 2197cc 134 CID; Without Pulley	**33053**
FJ3A		
L4		
1964	2.2L 134 CID; Without Pulley	**33053**
1962-1961	2.2L 2197cc 134 CID; Without Pulley	**33053**
Gladiator		
L6		
1967-1965	3.8L 3802cc 232 CID	**33021**
Grand Cherokee		
L6		
2004	4.0L 3956cc 241 CID	**33000**
2004-1999	4.0L 242 CID	**33000**
1998-1993	4.0L 242 CID	**23136**
1995	4.0L 242 CID; Sold in United States	**23136**
V6		
2013-2011	3.6L 3604cc 220 CID	**43369**
2010-2005	3.7L 226 CID	**43163**
V8		
2013-2012	6.4L 6424cc 392 CID	**33653**
2013-2011	5.7L 345 CID	**33653**
2010-2006	6.1L 6059cc 370 CID	**33170**
2009	4.7L 285 CID; VIN P	**43163**
2008-2005	5.7L 345 CID	**33170**
2008-2002	4.7L 285 CID; VIN N	**43163**
2007	4.7L 285 CID; VIN P	**43163**
2004-2002	4.7L 285 CID	**43163**
2004-2002	4.7L 285 CID; VIN J	**43163**
2001-1999	4.7L 287 CID	**43163**
2001-1999	4.7L 287 CID; VIN N	**43163**
1998	5.9L 360 CID	**43160**
1998-1993	5.2L 5211cc 318 CID	**43160**
Grand Wagoneer		
L6		
1986-1984	4.2L 258 CID; VIN C; Reverse Rotation; With Serpentine Belt	**33404**
1986-1984	4.2L 258 CID; VIN C; Without Serpentine Belt	**33403**

YEAR	VEHICLE DETAIL	PART NO.
Jeep (cont'd)		
Grand Wagoneer (cont'd)		
V8		
1991-1984	5.9L 360 CID	**43401**
J-100		
L6		
1972	3.8L 232 CID	**33021**
1971-1965	3.8L 3802cc 232 CID	**33021**
J-200		
L6		
1964	3.8L 232 CID	**33021**
J-210		
L6		
1964	3.8L 232 CID	**33021**
J-220		
L6		
1964	3.8L 232 CID	**33021**
J-230		
L6		
1964	3.8L 232 CID	**33021**
J-2500		
L6		
1973-1972	4.2L 258 CID	**33021**
1971-1965	3.8L 3802cc 232 CID	**33021**
V8		
1973	5.9L 360 CID; VIN N	**43401**
1973	5.9L 360 CID; VIN P	**43401**
J-2600		
L6		
1973-1972	4.2L 258 CID	**33021**
1970-1965	3.8L 3802cc 232 CID	**33021**
V8		
1973	5.9L 360 CID; VIN N	**43401**
1973	5.9L 360 CID; VIN P	**43401**
J-2700		
L6		
1969-1965	3.8L 3802cc 232 CID	**33021**
J-2800		
L6		
1967-1965	3.8L 3802cc 232 CID	**33021**
J-300		
L6		
1964	3.8L 232 CID	**33021**
J-310		
L6		
1964	3.8L 232 CID	**33021**
J-320		
L6		
1964	3.8L 232 CID	**33021**
J-330		
L6		
1964	3.8L 232 CID	**33021**

YEAR	VEHICLE DETAIL	PART NO.
Jeep (cont'd)		
J-3500		
L6		
1970-1965	3.8L 3802cc 232 CID	**33021**
J-3600		
L6		
1970-1965	3.8L 3802cc 232 CID	**33021**
J-3700		
L6		
1970-1968	3.8L 3802cc 232 CID	**33021**
1966-1965	3.8L 3802cc 232 CID	**33021**
J-3800		
L6		
1971	4.2L 4228cc 258 CID; Sold in United States	**33021**
1971	4.2L 4229cc 258 CID; Sold in United States	**33021**
1968-1965	3.8L 3802cc 232 CID	**33021**
J-4500		
L6		
1973-1971	4.2L 4228cc 258 CID; Sold in United States	**33021**
1973-1971	4.2L 4229cc 258 CID; Sold in United States	**33021**
1970	3.8L 3802cc 232 CID	**33021**
V8		
1973	5.9L 5899cc 360 CID; Sold in United States; VIN N	**43401**
1973	5.9L 5900cc 360 CID; Sold in United States; VIN N	**43401**
J-4600		
L6		
1973-1971	4.2L 4228cc 258 CID; Sold in United States	**33021**
1973-1971	4.2L 4229cc 258 CID; Sold in United States	**33021**
1970	3.8L 3802cc 232 CID	**33021**
V8		
1973	5.9L 5899cc 360 CID; Sold in United States; VIN N	**43401**
1973	5.9L 5900cc 360 CID; Sold in United States; VIN N	**43401**
J-4700		
L6		
1973-1971	4.2L 4228cc 258 CID; Sold in United States	**33021**
1973-1971	4.2L 4229cc 258 CID; Sold in United States	**33021**
1970	3.8L 3802cc 232 CID	**33021**
V8		
1973	5.9L 5899cc 360 CID; Sold in United States; VIN N	**43401**
1973	5.9L 5900cc 360 CID; Sold in United States; VIN N	**43401**

YEAR	VEHICLE DETAIL	PART NO.
Jeep (cont'd)		
J-4800		
L6		
1973-1971	4.2L 4228cc 258 CID; Sold in United States	**33021**
1973-1971	4.2L 4229cc 258 CID; Sold in United States	**33021**
V8		
1973	5.9L 5899cc 360 CID; Sold in United States; VIN N	**43401**
1973	5.9L 5900cc 360 CID; Sold in United States; VIN N	**43401**
J10		
L6		
1987	4.2L 258 CID; Reverse Rotation; With Serpentine Belt	**33413**
1987	4.2L 258 CID; Without Serpentine Belt	**33414**
1986-1981	4.2L 258 CID; VIN C; Reverse Rotation; With Serpentine Belt	**33404**
1986-1981	4.2L 258 CID; VIN C; Without Serpentine Belt	**33403**
1980	4.2L 258 CID; Without Serpentine Belt	**33403**
1979-1975	4.2L 258 CID	**33077**
1974	4.2L 258 CID	**33021**
V8		
1988-1974	5.9L 360 CID; VIN N	**43401**
1978-1974	5.9L 360 CID; VIN P	**43401**
1978-1974	6.6L 401 CID	**43401**
J20		
L6		
1976	4.2L 258 CID	**33077**
1974	4.2L 258 CID	**33021**
V8		
1988-1974	5.9L 360 CID; VIN N	**43401**
1978-1975	5.9L 360 CID; VIN P	**43401**
1978-1974	6.6L 401 CID	**43401**
Jeepster		
L4		
1971-1967	2.2L 2197cc 134 CID; With Pulley	**33052**
1971-1967	2.2L 2197cc 134 CID; Without Pulley	**33053**
L6		
1973-1972	3.8L 232 CID	**33021**
1973-1972	4.2L 258 CID	**33021**
V8		
1973	5.0L 304 CID	**43401**
Liberty		
L4		
2005-2002	2.4L 148 CID; Driven off the timing belt	**23300**
V6		
2012	3.7L 3700cc 226 CID	**43163**
2012-2011	3.7L 226 CID	**43163**
2011	3.7L 3701cc 226 CID	**43163**
2010-2006	3.7L 226 CID; VIN K	**43163**
2005-2002	3.7L 226 CID	**43163**

YEAR	VEHICLE DETAIL	PART NO.
Jeep (cont'd)		
Patriot		
L4		
2013-2007	2.0L 1998cc 122 CID	**13038**
2013-2007	2.4L 2360cc 144 CID	**13038**
Scrambler		
L4		
1985-1983	2.5L 150 CID; VIN U; Reverse Rotation; With Serpentine Belt	**33404**
1985-1983	2.5L 150 CID; VIN U; Without Serpentine Belt	**33403**
1983-1981	2.5L 151 CID; General Motors Built Eng.	**21107**
L6		
1985-1981	4.2L 258 CID; Reverse Rotation; With Serpentine Belt	**33404**
1985-1981	4.2L 258 CID; Without Serpentine Belt	**33403**
TJ		
L4		
2006-2005	2.4L 148 CID; Sold in Canada; Driven off the timing belt	**23300**
2003	2.4L 148 CID; Sold in Canada; Driven off the timing belt	**23300**
2002-1997	2.5L 150 CID	**23136**
L6		
2006-2000	4.0L 242 CID	**33000**
1999-1997	4.0L 242 CID	**23136**
Wagoneer		
L4		
1987	2.5L 150 CID; VIN H; Reverse Rotation; With Serpentine Belt	**33413**
1987	2.5L 150 CID; VIN H; Without Serpentine Belt	**33414**
1986-1984	2.5L 150 CID; Reverse Rotation; With Serpentine Belt	**33404**
1986-1984	2.5L 150 CID; Without Serpentine Belt	**33403**
L6		
1990-1987	4.0L 242 CID; With 2.3" Hub Height and 3 5/16" Diameter Hub	**23412**
1990-1987	4.0L 242 CID; With 3.72" Hub Height and 2 5/8" Diameter Hub	**33413**
1983-1981	4.2L 258 CID; Reverse Rotation; With Serpentine Belt	**33404**
1983-1980	4.2L 258 CID; VIN C; Without Serpentine Belt	**33403**
1973-1972	4.2L 258 CID	**33021**
1971-1966	3.8L 3802cc 232 CID	**33021**
V6		
1986-1984	2.8L 173 CID	**41006**
V8		
1983-1973	5.9L 360 CID	**43401**
1978-1974	6.6L 401 CID	**43401**
Wrangler		
L4		
2007-2003	2.4L 148 CID; Driven off the timing belt	**23300**
2002-1997	2.5L 150 CID	**23136**

YEAR	VEHICLE DETAIL	PART NO.
Jeep (cont'd)		
Wrangler (cont'd)		
L4		
1995-1991	2.5L 150 CID	**23136**
1990-1987	2.5L 150 CID; With Serpentine Belt	**33413**
1990-1987	2.5L 150 CID; Without Serpentine Belt	**33414**
L6		
2006-2000	4.0L 242 CID	**33000**
1999-1997	4.0L 242 CID	**23136**
1995-1991	4.0L 242 CID	**23136**
1990-1987	4.2L 258 CID; With Serpentine Belt	**33413**
1990-1987	4.2L 258 CID; Without Serpentine Belt	**33414**
V6		
2011-2007	3.8L 3778cc 231 CID	**23654**
Kia		
Amanti		
V6		
2009-2007	3.8L 3778cc	**33048**
2006-2004	3.5L 3497cc	**26463**
Borrego		
V6		
2011-2009	3.8L 3778cc	**33048**
Magentis		
L4		
2005-2001	2.4L 2351cc	**26477**
V6		
2006-2005	2.7L 2656cc	**26462**
2004-2002	2.7L 2700cc	**26462**
2001	2.5L 2500cc	**26462**
Optima		
L4		
2006-2001	2.4L 2351cc	**26477**
V6		
2006-2002	2.7L 2656cc	**26462**
2001	2.5L 2500cc	**26462**
Rio		
L4		
2011-2006	1.6L 1599cc	**26364**
2005	1.6L 1594cc	**26473**
2001	1.5L 1493cc	**26473**
Rio5		
L4		
2011-2006	1.6L 1599cc	**26364**
Sedona		
V6		
2012-2011	3.5L 3470cc	**33048**
2010-2006	3.8L 3778cc	**33048**
2005-2002	3.5L 3497cc	**26463**
Sephia		
L4		
2001-1998	1.8L 1793cc	**26393**
1997-1995	1.6L 1597cc; DOHC	**26305**

YEAR	VEHICLE DETAIL	PART NO.
Kia (cont'd)		
Sephia (cont'd)		
L4		
1997-1995	1.8L 1839cc; DOHC	**26305**
1995	1.6L 1597cc; SOHC	**22049**
1994	1.6L 1597cc	**22049**
Sorento		
V6		
2013-2011	3.5L 3470cc	**33048**
2009-2008	3.3L 3342cc	**33048**
2009-2007	3.8L 3778cc	**33048**
2006-2003	3.5L 3497cc	**26448**
Soul		
L4		
2011-2010	2.0L 1975cc	**36353**
Spectra		
L4		
2009-2004	2.0L 1975cc	**36353**
2004-2000	1.8L 1793cc	**26393**
Spectra5		
L4		
2009-2005	2.0L 1975cc	**36353**
Sportage		
L4		
2010-2005	2.0L 1975cc	**36353**
2002-2000	2.0L 1998cc 122 CID; Driven off the timing belt	**26450**
2000	2.0L 1998cc 122 CID; Non timing belt driven	**26393**
1999-1995	2.0L 1998cc 122 CID; DOHC; Driven off the timing belt	**26450**
1995	2.0L 1998cc 122 CID; SOHC; Driven off the timing belt	**22053**
V6		
2010-2005	2.7L 2656cc	**26462**
Land Rover		
Defender 110		
V8		
1993	3.9L 3950cc	**38368**
Defender 90		
V8		
1997	4.0L 3950cc	**38369**
1995-1994	3.9L 3950cc	**38368**
Discovery		
V8		
2004-2003	4.6L 4554cc 278 CID	**38369**
2002-1996	4.0L 3950cc	**38369**
1995-1994	3.9L 3950cc	**38369**
Freelander		
V6		
2005-2002	2.5L 2500cc 153 CID; Driven off the timing belt	**18496**

YEAR	VEHICLE DETAIL	PART NO.
Land Rover (cont'd)		
LR3		
V8		
2009-2005	4.4L 4394cc	**12124**
Range Rover		
V8		
2009-2006	4.2L 4196cc	**12124**
2009-2006	4.4L 4394cc	**12124**
2002-1996	4.6L 4554cc 278 CID	**38369**
2000-1995	4.0L 3950cc	**38369**
1995	4.2L 4200cc	**38369**
1995-1993	3.9L 3950cc	**38368**
1994-1993	4.2L 4200cc	**38368**
1992-1989	3.9L 3947cc	**38368**
1988-1987	3.5L 3532cc 216 CID	**38368**
1974-1970	3.5L 3528cc 215 CID	**38368**
Range Rover Sport		
V8		
2009-2006	4.2L 4196cc	**12124**
2009-2006	4.4L 4394cc	**12124**
Lexus		
ES250		
V6		
1991-1990	2.5L 2508cc	**25258**
ES300		
V6		
2003-1999	3.0L 2995cc	**25306**
1998-1996	3.0L 2959cc	**25306**
1995-1994	3.0L 2995cc	**25306**
1993	3.0L 2959cc	**25290**
1992	3.0L 2959cc	**25258**
ES330		
V6		
2006-2004	3.3L 3300cc 202 CID	**25306**
ES350		
V6		
2011-2007	3.5L 3456cc	**45047**
GS300		
L6		
2005-1998	3.0L 2997cc	**25395**
1997-1993	3.0L 2997cc	**35256**
GS400		
V8		
2000-1998	4.0L 3969cc	**45257**
GS430		
V8		
2007-2001	4.3L 4293cc	**45257**
GX470		
V8		
2009-2003	4.7L 4663cc 285 CID	**45257**

YEAR	VEHICLE DETAIL	PART NO.
Lexus (cont'd)		
HS250h		
L4		
2012-2010	2.4L 2362cc	**15414**
IS300		
L6		
2005-2001	3.0L 2997cc	**25395**
LS400		
V8		
2000-1996	4.0L 3969cc	**45257**
1995-1990	4.0L 3967cc	**45257**
LS430		
V8		
2006-2001	4.3L 4293cc	**45257**
LX450		
L6		
1997-1996	4.5L 4477cc	**35269**
LX470		
V8		
2007-1998	4.7L 4663cc 285 CID	**45257**
RX300		
V6		
2003-1999	3.0L 2995cc	**25306**
RX330		
V6		
2006-2004	3.3L 3300cc 202 CID	**25306**
RX350		
V6		
2011-2007	3.5L 3456cc	**45047**
RX400h		
V6		
2008-2006	3.3L 3300cc 202 CID	**25306**
RX450h		
V6		
2011-2010	3.5L 3456cc	**45047**
SC300		
L6		
2000-1992	3.0L 2997cc; 10 Fastener	**35411**
2000-1992	3.0L 2997cc; 11 Fastener	**35256**
SC400		
V8		
2000-1996	4.0L 3969cc	**45257**
1995-1992	4.0L 3967cc	**45257**
SC430		
V8		
2010-2002	4.3L 4293cc	**45257**
Lincoln		
Aviator		
V8		
2005-2003	4.6L 281 CID	**32130**
Blackwood		
V8		
2002	5.4L 330 CID	**32122**

YEAR	VEHICLE DETAIL	PART NO.
Lincoln (cont'd)		
Continental		
L6		
1985-1984	2.4L 146 CID; DIESEL; VIN L	**28154**
V6		
1994	3.8L 232 CID	**32089**
1993-1988	3.8L 232 CID	**42051**
1982	3.8L 232 CID	**42016**
V8		
2002	4.6L 281 CID	**32128**
2002-1995	4.6L 281 CID; VIN V	**22097**
2001	4.6L 281 CID; Long Pump, 3 7/16" Hub Height, w/8 Vane 3 5/8" Diameter Non-Shrouded Impeller	**32113**
2001	4.6L 281 CID; Short Pump; 2 1/2" Hub Height	**32128**
1987-1986	5.0L 302 CID	**42038**
1985	5.0L 302 CID	**42024**
1984-1982	5.0L 302 CID	**42052**
1980	5.0L 302 CID	**42052**
1980	5.8L 351 CID	**42052**
1979-1977	6.6L 400 CID	**42932**
1978-1975	7.5L 460 CID	**42114**
1974-1970	7.5L 7539cc 460 CID	**42114**
LS		
V6		
2005-2003	3.0L 182 CID	**32129**
2002-2000	3.0L 182 CID	**32118**
V8		
2006-2000	3.9L 242 CID	**12124**
MKS		
V6		
2010	3.5L 3496cc 213 CID; VIN T; Pump is driven off the timing chain	**32023**
2010-2009	3.7L 3726cc 227 CID; VIN R; Pump is driven off the timing chain	**32023**
MKT		
L4		
2014-2013	2.0L 1999cc 122 CID	**12126**
V6		
2010	3.5L 3496cc 213 CID; VIN T; Pump is driven off the timing chain	**32023**
2010	3.7L 3726cc 227 CID; VIN R; Pump is driven off the timing chain	**32023**
MKX		
V6		
2010-2007	3.5L 3496cc 213 CID; Pump is driven off the timing chain	**32023**
MKZ		
L4		
2014-2013	2.0L 1999cc 122 CID	**12126**
2012-2011	2.5L 2488cc 152 CID	**12126**

YEAR	VEHICLE DETAIL	PART NO.
Lincoln (cont'd)		
MKZ (cont'd)		
V6		
2012-2007	3.5L 3496cc 213 CID; Pump is driven off the timing chain	**32023**
Mark III		
V8		
1971-1970	7.5L 7539cc 460 CID	**42114**
Mark IV		
V8		
1976-1975	7.5L 460 CID	**42114**
1974-1972	7.5L 7539cc 460 CID	**42114**
Mark LT		
V8		
2006	5.4L 330 CID	**32130**
Mark V		
V8		
1979-1977	6.6L 400 CID	**42932**
1978-1977	7.5L 460 CID	**42114**
Mark VI		
V8		
1983-1980	5.0L 302 CID	**42052**
1980	5.8L 351 CID	**42052**
Mark VII		
L6		
1985-1984	2.4L 146 CID; DIESEL; VIN L	**28154**
V8		
1992-1986	5.0L 302 CID	**42038**
1985	5.0L 302 CID	**42024**
1984	5.0L 302 CID; Aluminum Pump	**42052**
1984	5.0L 302 CID; Cast Iron Pump	**42014**
Mark VIII		
V8		
1998-1993	4.6L 281 CID	**32113**
Navigator		
V8		
2009	5.4L 330 CID	**32130**
2006-2002	5.4L 330 CID	**32130**
2001-1998	5.4L 330 CID	**32122**
Town Car		
V8		
2011-2002	4.6L 281 CID	**32128**
2001	4.6L 281 CID; Long Pump, 3 7/16" Hub Height, w/8 Vane 3 5/8" Diameter Non-Shrouded Impeller	**32113**
2001	4.6L 281 CID; Short Pump; 2 1/2" Hub Height	**32128**
2000-1998	4.6L 281 CID	**32113**
1997-1991	4.6L 281 CID	**32066**
1988-1985	5.0L 302 CID; To 6-88	**42014**
1984-1981	5.0L 302 CID	**42052**

YEAR	VEHICLE DETAIL	PART NO.
Lincoln (cont'd)		
Versailles		
V8		
1980-1977	5.0L 302 CID	**42953**
1977	5.8L 351 CID	**42953**
Zephyr		
V6		
2006	3.0L 183 CID; VIN 1	**12489**
Mazda		
2		
L4		
2012	1.5L 1498cc 91 CID; Sold in Mexico	**87057**
3		
L4		
2013-2010	2.5L 2489cc 152 CID	**12126**
2013-2004	2.0L 2000cc 122 CID	**12126**
2013-2004	2.3L 2260cc	**12126**
2012-2006	2.0L 2000cc 122 CID	**41038**
323		
L4		
1995-1986	1.6L 1597cc	**22049**
1994-1993	1.8L 1839cc	**22049**
1991-1990	1.8L 1839cc	**22049**
1989-1988	1.6L 1597cc; Turbocharged	**22068**
5		
L4		
2013-2012	2.5L 2489cc 152 CID	**12126**
2010-2007	2.3L 2260cc 138 CID	**12126**
2006	2.3L 2260cc	**12126**
6		
L4		
2013-2009	2.5L 2488cc 152 CID	**12126**
2008-2003	2.3L 2260cc	**12126**
V6		
2012-2009	3.7L 3726cc 227 CID; Pump is driven off the timing chain	**32023**
2008-2003	3.0L 2968cc	**12489**
616		
L4		
1971-1970	1.6L 1586cc 97 CID	**36300**
626		
L4		
2002-1993	2.0L 1991cc	**22078**
1992-1988	2.2L 2184cc; Driven off the timing belt	**22053**
1987-1986	2.0L 1998cc 122 CID; Except Early 1986 With Round Tooth Design	**26111**
1986	2.0L 1998cc 122 CID; GAS; With Square Tooth Design	**26060**
1985-1984	2.0L 1998cc 122 CID; DIESEL; Driven off the timing belt	**26067**
1985-1984	2.0L 1998cc 122 CID; GAS; With Square Tooth Design; Early 1984	**26060**
1983	2.0L 1970cc; With Square Tooth Design	**26060**

YEAR	VEHICLE DETAIL	PART NO.
Mazda (cont'd)		
626 (cont'd)		
L4		
1982-1979	2.0L 1970cc	**42043**
V6		
2002-1995	2.5L 2497cc	**26318**
1994-1993	2.5L 2497cc; Pulley Pilot Dia. 16mm	**26259**
1994-1993	2.5L 2497cc; Pulley Pilot Dia. 32mm	**26318**
808		
L4		
1977	1.6L 1587cc	**36300**
1974-1972	1.6L 1587cc	**36300**
929		
V6		
1995-1992	3.0L 2954cc	**36260**
1991-1990	3.0L 2954cc; DOHC; S	**36225**
1991-1988	3.0L 2954cc; Base; SOHC	**36166**
B1600		
L4		
1974-1972	1.6L 1586cc 97 CID	**36300**
B1800		
L4		
1978-1977	1.8L 1796cc; Standard Cab Pickup	**42043**
B2000		
L4		
1987-1986	2.0L 1998cc 122 CID; Extended Cab Pickup; Round Tooth Design	**26111**
1987-1986	2.0L 1998cc 122 CID; Standard Cab Pickup; Round Tooth Design	**26111**
1986	2.0L 1998cc 122 CID; Extended Cab Pickup; Square Tooth Design	**26060**
1986	2.0L 1998cc 122 CID; Standard Cab Pickup; Square Tooth Design	**26060**
1984-1979	2.0L 1970cc; Standard Cab Pickup	**42043**
B2200		
L4		
1993-1987	2.2L 2184cc; Extended Cab Pickup; Driven off the timing belt	**22053**
1993-1987	2.2L 2184cc; Standard Cab Pickup; Driven off the timing belt	**22053**
B2300		
L4		
2010-2002	2.3L 2300cc	**12126**
2001	2.3L 2294cc	**12126**
1997-1995	2.3L 2295cc; Extended Cab Pickup	**22093**
1997-1995	2.3L 2295cc; Standard Cab Pickup	**22093**
1994	2.3L 2295cc; Extended Cab Pickup	**22054**
1994	2.3L 2295cc; Standard Cab Pickup	**22054**
B2500		
L4		
2001-1998	2.5L 2492cc	**22093**
2001-1998	2.5L 2492cc; Standard Cab Pickup	**22093**
2000-1998	2.5L 2492cc; Extended Cab Pickup	**22093**

YEAR	VEHICLE DETAIL	PART NO.
Mazda (cont'd)		
B2600		
L4		
1993-1989	2.6L 2606cc; Extended Cab Pickup	**16167**
1993-1989	2.6L 2606cc; Standard Cab Pickup	**16167**
1988-1987	2.6L 2555cc; Extended Cab Pickup	**23120**
1988-1987	2.6L 2555cc; Standard Cab Pickup	**23120**
B3000		
V6		
2008-2006	3.0L 2954cc	**42095**
2005-2001	3.0L 2954cc; Extended Cab Pickup	**42095**
2005-2001	3.0L 2954cc; Standard Cab Pickup	**42095**
2003-1999	3.0L 182 CID; Extended Cab Pickup	**42095**
2003-1999	3.0L 182 CID; Standard Cab Pickup	**42095**
1998	3.0L 2954cc; Extended Cab Pickup	**42095**
1998	3.0L 2954cc; Standard Cab Pickup	**42095**
1997	3.0L 2983cc; Standard Cab Pickup	**42095**
1996-1995	3.0L 2983cc; Extended Cab Pickup	**42095**
1995	3.0L 2983cc; Standard Cab Pickup	**42095**
1994	3.0L 2983cc; Extended Cab Pickup	**42039**
1994	3.0L 2983cc; Standard Cab Pickup	**42039**
B4000		
V6		
2010-2006	4.0L 4016cc	**42108**
2005-2001	4.0L 4016cc; Extended Cab Pickup	**42108**
2000-1994	4.0L 4016cc; Extended Cab Pickup	**42060**
1999	4.0L 4016cc; Standard Cab Pickup	**42060**
1997-1994	4.0L 4016cc; Standard Cab Pickup	**42060**
CX-7		
L4		
2012-2010	2.5L 2488cc 152 CID	**12126**
2012-2007	2.3L 2260cc	**12126**
CX-9		
V6		
2012-2008	3.7L 3726cc 227 CID; Pump is driven off the timing chain	**32023**
2007	3.5L 3496cc 213 CID; Pump is driven off the timing chain	**32023**
Cosmo		
R2		
1978-1976	1.3L 1308cc	**26053**
GLC		
L4		
1985-1981	1.5L 1490cc; Hatchback	**16050**
1985-1981	1.5L 1490cc; Sedan	**16050**
1983-1981	1.5L 1490cc; Wagon	**16020**
1980-1979	1.4L 1415cc	**16020**
1978-1977	1.3L 1272cc	**16020**
MPV		
L4		
1994-1989	2.6L 2606cc	**16167**

YEAR	VEHICLE DETAIL	PART NO.
Mazda (cont'd)		
MPV (cont'd)		
V6		
2006-2003	3.0L 183 CID	**12132**
2003-2002	3.0L 183 CID	**12091**
2001-2000	2.5L 2497cc	**12091**
1998-1996	3.0L 2954cc	**36394**
1995-1989	3.0L 2954cc	**36166**
MX-3		
L4		
1995-1994	1.6L 1597cc	**26305**
1993-1992	1.6L 1597cc	**22049**
V6		
1995-1994	1.8L 1845cc	**26318**
1993-1992	1.8L 1845cc; Pulley Pilot Dia. 16mm	**26259**
1993-1992	1.8L 1845cc; Pulley Pilot Dia. 32mm	**26318**
MX-5 Miata		
L4		
2013-2006	2.0L 2000cc 122 CID	**12126**
MX-6		
L4		
1997-1993	2.0L 1991cc	**22078**
1992-1988	2.2L 2184cc; Driven off the timing belt	**22053**
V6		
1997-1995	2.5L 2497cc	**26318**
1994-1993	2.5L 2497cc; Pulley Pilot Dia. 16mm	**26259**
1994-1993	2.5L 2497cc; Pulley Pilot Dia. 32mm	**26318**
Miata		
L4		
2005-1999	1.8L 1839cc	**26305**
1997-1994	1.8L 1839cc	**26305**
1993-1990	1.6L 1597cc	**22068**
Millenia		
V6		
2002-1995	2.3L 2254cc	**26328**
2002-1995	2.5L 2497cc	**26318**
Mizer		
L4		
1977-1976	1.3L 1272cc	**16020**
Navajo		
V6		
1994-1991	4.0L 4016cc	**42060**
Protege		
L4		
2003-2001	2.0L 2000cc	**22078**
2001-1999	1.6L 1589cc	**26305**
2000-1999	1.8L 1839cc; DOHC	**22078**
1998-1995	1.5L 1489cc	**26371**
1998-1995	1.8L 1839cc	**26305**
1994-1990	1.8L 1839cc; DOHC	**22068**
1994-1990	1.8L 1839cc; SOHC	**22049**

YEAR	VEHICLE DETAIL	PART NO.
Mazda (cont'd)		
Protege5		
L4		
2003-2002	2.0L 2000cc	**22078**
RX-7		
R2		
1995-1993	1.3L 1308cc	**26266**
1988-1986	1.3L 1308cc; Naturally Aspirated	**36102**
1988-1986	1.3L 1308cc; Turbocharged	**36102**
Rotary Pickup		
R2		
1977-1974	1.3L 1308cc	**26053**
Tribute		
L4		
2011-2009	2.5L 2488cc 152 CID	**12126**
2008	2.3L 140 CID	**12126**
2006-2005	2.3L 140 CID	**12126**
2004-2001	2.0L 1991cc	**12115**
V6		
2008	3.0L 183 CID	**12132**
2006	3.0L 183 CID	**12132**
2005	3.0L 182 CID	**12132**
2004	3.0L 183 CID	**12091**
2004	3.0L 183 CID	**12132**
2003	3.0L 2954cc	**12132**
2003-2001	3.0L 2954cc	**12091**
Mercedes-Benz		
190		
L4		
1965-1964	1.9L 116 CID	**28178**
190B		
L4		
1962-1961	1.9L 116 CID	**28178**
190C		
L4		
1965-1963	1.9L 116 CID	**28178**
190D		
L4		
1985-1984	2.2L 2197cc	**38195**
L5		
1989-1986	2.5L 2497cc; DIESEL	**38228**
190E		
L4		
1993-1991	2.3L 2299cc	**78175**
1988-1985	2.3L 2299cc	**78175**
1984	2.3L 2299cc	**78173**
L6		
1993-1987	2.6L 2599cc	**38202**
190SL		
L4		
1963-1961	1.9L 116 CID	**28178**

YEAR	VEHICLE DETAIL	PART NO.
Mercedes-Benz (cont'd)		
200		
L4		
1968-1966	2.0L 121 CID	**28178**
200D		
L4		
1968-1966	2.0L 121 CID	**28178**
220D		
L4		
1973-1968	2.2L 2197cc 134 CID; DIESEL; 3 1/2" Hub Height	**28172**
230		
L4		
1978-1976	2.3L 2307cc	**28172**
240D		
L4		
1983-1974	2.4L 2404cc; 3 1/2" Hub Height	**28172**
250C		
L6		
1972-1970	2.8L 2778cc 169 CID; 3 1/2" Hub Height	**28172**
260E		
L6		
1989-1987	2.6L 2599cc	**38202**
280		
L6		
1976-1973	2.8L 2746cc	**28172**
280C		
L6		
1976-1973	2.8L 2746cc	**28172**
280CE		
L6		
1981	2.8L 2778cc	**28172**
1980-1978	2.8L 2746cc	**28172**
280E		
L6		
1981	2.8L 2778cc	**28172**
1980-1977	2.8L 2746cc	**28172**
280S		
L6		
1976-1975	2.8L 2746cc	**28172**
1971-1968	2.8L 2778cc	**28172**
280SE		
L6		
1980-1977	2.8L 2746cc	**28172**
1972-1968	2.8L 2778cc	**28172**
V8		
1973-1972	4.5L 4520cc	**38176**
1970	3.5L 3504cc	**38176**
280SEL		
L6		
1971-1968	2.8L 2778cc 169 CID	**28172**
V8		
1973-1972	4.5L 4520cc 276 CID	**38176**

YEAR	VEHICLE DETAIL	PART NO.
Mercedes-Benz (cont'd)		
280SL		
L6		
1971-1968	2.8L 2778cc 169 CID	**28172**
300CD		
L5		
1985-1983	3.0L 2998cc; With 3 1/2" Hub Height and 5/8" Thick Hub	**28172**
1982-1978	3.0L 3005cc; With 3 1/2" Hub Height and 5/8" Thick Hub	**28172**
300CE		
L6		
1993	3.2L 3199cc	**48345**
1993	3.2L 3199cc; DOHC	**48313**
1992-1990	3.0L 2962cc	**48222**
1992-1988	3.0L 2962cc; GAS	**38202**
300D		
L5		
1993-1990	2.5L 2497cc; Turbocharged	**38228**
1985-1983	3.0L 2998cc; With 3 1/2" Hub Height and 5/8" Thick Hub	**28172**
1982-1975	3.0L 3005cc; With 3 1/2" Hub Height and 5/8" Thick Hub	**28172**
L6		
1987	3.0L 2998cc; DIESEL	**38228**
1987	3.0L 2998cc; Turbocharged	**38228**
300E		
L6		
1993	2.8L 2799cc	**48345**
1993	2.8L 2799cc; DOHC	**48313**
1993	3.0L 2962cc	**48345**
1993	3.2L 3199cc	**48345**
1993	3.2L 3199cc; DOHC	**48313**
1992-1986	3.0L 2962cc; GAS	**38202**
300SD		
L5		
1985-1983	3.0L 2998cc; With 3 1/2" Hub Height and 5/8" Thick Hub	**28172**
1982-1978	3.0L 3005cc; With 3 1/2" Hub Height and 5/8" Thick Hub	**28172**
L6		
1993-1992	3.4L 3449cc; Turbocharged	**38228**
300SDL		
L6		
1987-1986	3.0L 2998cc; DIESEL	**38228**
1987-1986	3.0L 2998cc; Turbocharged	**38228**
300SE		
L6		
1993-1992	3.2L 3199cc	**48351**
1991-1988	3.0L 2962cc; GAS	**38202**
300SEL		
L6		
1991-1988	3.0L 2962cc; GAS	**38202**

YEAR	VEHICLE DETAIL	PART NO.
Mercedes-Benz (cont'd)		
300SEL (cont'd)		
V8		
1973	4.5L 4520cc	**38176**
1971-1970	3.5L 3504cc	**38176**
1971-1970	6.3L 6329cc 386 CID	**38176**
300SL		
L6		
1993-1990	3.0L 2962cc	**48222**
1992-1990	3.0L 2962cc; GAS	**38202**
300TD		
L5		
1985-1983	3.0L 2998cc; With 3 1/2" Hub Height and 5/8" Thick Hub	**28172**
1982-1979	3.0L 3005cc; With 3 1/2" Hub Height and 5/8" Thick Hub	**28172**
L6		
1987	3.0L 2998cc; DIESEL	**38228**
1987	3.0L 2998cc; Turbocharged	**38228**
300TE		
L6		
1993	3.2L 3199cc	**48345**
1993	3.2L 3199cc; 4WD Only	**38202**
1993	3.2L 3199cc; DOHC	**48313**
1992-1988	3.0L 2962cc; GAS	**38202**
350SDL		
L6		
1991-1990	3.4L 3449cc; Turbocharged	**38228**
400E		
V8		
1993-1992	4.2L 4196cc	**48315**
400SE		
V8		
1992	4.2L 4196cc	**48315**
400SEL		
V8		
1993	4.2L 4196cc	**48315**
420SEL		
V8		
1991-1986	4.2L 4196cc	**38231**
450SE		
V8		
1976-1973	4.5L 4520cc	**38176**
450SEL		
V8		
1980-1973	4.5L 4520cc	**38176**
450SL		
V8		
1980-1973	4.5L 4520cc	**38176**
450SLC		
V8		
1980-1973	4.5L 4520cc	**38176**

YEAR	VEHICLE DETAIL	PART NO.
Mercedes-Benz (cont'd)		
500E		
V8		
1993-1992	5.0L 4973cc	**48315**
500SEC		
V8		
1993	5.0L 4973cc	**48315**
500SEL		
V8		
1993-1992	5.0L 4973cc	**48315**
500SL		
V8		
1993-1990	5.0L 4973cc	**48315**
560SEC		
V8		
1991-1986	5.6L 5547cc	**38231**
560SEL		
V8		
1991-1986	5.6L 5547cc	**38231**
560SL		
V8		
1989-1986	5.6L 5547cc	**38231**
600		
V8		
1972-1968	6.3L 6329cc 386 CID	**38176**
C230		
L4		
2002	2.3L 2295cc	**38440**
2000-1999	2.3L 2295cc	**38440**
1998	2.3L 2295cc	**78314**
1997	2.3L 2295cc	**38440**
C240		
V6		
2005-2001	2.6L 2597cc	**38379**
C280		
L6		
1997-1994	2.8L 2799cc	**48345**
1995-1994	2.8L 2799cc	**48313**
V6		
2000-1999	2.8L 2799cc; With 2 Hose Connections	**38379**
1999-1998	2.8L 2799cc	**38380**
C320		
V6		
2005-2001	3.2L 3199cc	**38379**
C36 AMG		
L6		
1997-1995	3.6L 3606cc	**48345**
1996-1995	3.6L 3606cc	**48313**
C43 AMG		
V8		
2000	4.3L 4266cc	**38379**
2000-1998	4.3L 4266cc	**38380**

YEAR	VEHICLE DETAIL	PART NO.
Mercedes-Benz (cont'd)		
C43 AMG (cont'd)		
V8		
1999-1998	4.3L 4266cc; With 2 Hose Connections	**38379**
C55 AMG		
V8		
2006-2005	5.5L 5439cc 335 CID	**38380**
CL500		
V8		
2006	5.0L 4966cc	**38379**
2005-2000	5.0L 4973cc	**38379**
2000	5.0L 4973cc	**38380**
1999	5.0L 4973cc	**48346**
1998	5.0L 4973cc 303 CID; From Engine #300 00210	**38379**
1998	5.0L 4973cc; From Engine #300 00210	**38379**
CL55 AMG		
V8		
2002-2001	5.5L 5439cc 335 CID	**38380**
CLK320		
V6		
2005-2004	3.2L 3199cc	**38379**
2003	3.2L 3199cc; Convertible; From Vin#30 033141	**38379**
2003	3.2L 3199cc; Coupe	**38379**
2003-1998	3.2L 3199cc	**38380**
2002-1998	3.2L 3199cc; From Vin#30 033141	**38379**
CLK430		
V8		
2003-2000	4.3L 4266cc	**38379**
2000-1999	4.3L 4266cc	**38380**
1999	4.3L 4266cc; With 2 Hose Connections	**38379**
CLK500		
V8		
2006	5.0L 4966cc	**38379**
2005-2003	5.0L 4973cc	**38379**
CLK55 AMG		
V8		
2006-2001	5.5L 5439cc 335 CID	**38380**
CLS500		
V8		
2006	5.0L 4966cc	**38379**
E300		
L6		
1999-1995	3.0L 2996cc; DIESEL	**38228**
E320		
L6		
2005	3.2L 3222cc	**38379**
1997-1996	3.2L 3199cc	**48351**
1995-1994	3.2L 3199cc	**48313**
1995-1994	3.2L 3199cc	**48345**
V6		
2005-2004	3.2L 3199cc	**38379**

YEAR	VEHICLE DETAIL	PART NO.
Mercedes-Benz (cont'd)		
E320 (cont'd)		
V6		
2005-1998	3.2L 3199cc	**38380**
2003	3.2L 3199cc; With 2 Hose Connections; From Vin#30 033141	**38379**
2002-1998	3.2L 3199cc; From Vin#30 033141	**38379**
E420		
V8		
1997	4.2L 4196cc	**48346**
1995-1994	4.2L 4196cc; From Engine #975020772	**48346**
1995-1994	4.2L 4196cc; To Engine #975020771	**48315**
E430		
V8		
2002-2000	4.3L 4266cc	**38379**
1999	4.3L 4266cc; Late Model; With 2 Hose Connections	**38379**
1999-1998	4.3L 4266cc	**38380**
E500		
V8		
2006-2004	5.0L 4966cc	**38379**
2005-2003	5.0L 4973cc	**38379**
1994	5.0L 4973cc; From Engine #974010205	**48346**
1994	5.0L 4973cc; To Engine #974010204	**48315**
E55 AMG		
V8		
2002-1999	5.5L 5439cc 335 CID	**38380**
G500		
V8		
2008-2007	5.0L 4966cc	**38379**
2008-2006	5.0L 4966cc	**38380**
2005	5.0L 4973cc	**38380**
2004-2002	5.0L 4966cc	**38380**
G55 AMG		
V8		
2005-2003	5.5L 5439cc 335 CID	**38380**
ML320		
V6		
2003-2000	3.2L 3199cc	**38379**
1999	3.2L 3199cc; Late Model	**38379**
ML350		
All		
2005-2003		**38379**
ML430		
V8		
2001	4.3L 4266cc	**38379**
2000-1999	4.3L 4266cc	**38380**
1999	4.3L 4266cc; With 2 Hose Connections	**38379**
ML500		
V8		
2007	5.0L 4973cc	**38380**
2006	5.0L 4966cc	**38380**

YEAR	VEHICLE DETAIL	PART NO.
Mercedes-Benz (cont'd)		
ML500 (cont'd)		
V8		
2005-2002	5.0L 4973cc	**38380**
2003-2002	5.0L 4973cc; With 2 Hose Connections	**38379**
ML55 AMG		
V8		
2003-2000	5.5L 5439cc 335 CID	**38380**
R500		
V8		
2007	5.0L 4973cc	**38379**
2006	5.0L 4966cc	**38379**
S320		
L6		
1999	3.2L 3199cc	**48351**
1994	3.2L 3199cc	**48351**
S350		
L6		
1995-1994	3.4L 3449cc; Turbocharged	**38228**
V6		
2006	3.7L 3724cc	**38379**
S420		
V8		
1999-1996	4.2L 4196cc	**48346**
1995-1994	4.2L 4196cc; From Engine #971026751	**48346**
1995-1994	4.2L 4196cc; To Engine #971026750	**48315**
S430		
V8		
2006-2000	4.3L 4266cc	**38379**
2000	4.3L 4266cc	**38380**
S500		
V8		
2006-2001	5.0L 4966cc	**38379**
2000	5.0L 4966cc; Late Model	**38379**
1999-1996	5.0L 4973cc	**48346**
1995-1994	5.0L 4973cc; From Engine #970056886	**48346**
1995-1994	5.0L 4973cc; To Engine #970056885	**48315**
S55 AMG		
V8		
2002-2001	5.5L 5439cc 335 CID	**38380**
SL320		
L6		
1997-1994	3.2L 3199cc	**48345**
1995-1994	3.2L 3199cc	**48313**
SL500		
V8		
2006	5.0L 4966cc	**38379**
2005-2000	5.0L 4973cc	**38379**
1999-1996	5.0L 4973cc	**48346**
1995-1994	5.0L 4973cc; From Engine #972103778	**48346**
1995-1994	5.0L 4973cc; To Engine #972103777	**48315**

YEAR	VEHICLE DETAIL	PART NO.
Mercedes-Benz (cont'd)		
SLK230		
L4		
2004-1999	2.3L 2295cc	**38440**
1998	2.3L 2295cc	**78314**
SLK320		
V6		
2004	3.2L 3199cc	**38379**
2003-2001	3.2L 3199cc	**38380**
2003-2001	3.2L 3199cc; From Vin#30 033141	**38379**
Mercury		
Bobcat		
L4		
1980-1975	2.3L 140 CID	**22005**
V6		
1979-1975	2.8L 171 CID	**42047**
Brougham		
V8		
1967	6.7L 6720cc 410 CID; Includes Police	**62075**
1967	7.0L 6997cc 427 CID; Includes Police	**62075**
1967	7.0L 7014cc 428 CID; Includes Police	**62075**
Capri		
L4		
1994-1991	1.6L 1598cc 98 CID	**22068**
1986-1983	2.3L 140 CID	**22054**
1982-1979	2.3L 140 CID	**22005**
1974-1971	2.0L 1989cc 122 CID	**22964**
L6		
1982-1979	3.3L 200 CID	**22002**
V6		
1986-1983	3.8L 232 CID	**42016**
1979	2.8L 171 CID	**42047**
1977	2.8L 171 CID	**42047**
1974	2.8L 171 CID	**42047**
1973	2.6L 2606cc	**42047**
V8		
1986	5.0L 302 CID	**42038**
1985-1984	5.0L 302 CID; FI; Except Central Injection	**42024**
1985-1984	5.0L 302 CID; FI; With Central Injection	**42035**
1985-1982	5.0L 302 CID; CARB	**42024**
1982-1980	4.2L 255 CID; CARB	**42024**
1979	5.0L 302 CID	**42024**
Colony Park		
V8		
1991-1990	5.0L 302 CID	**42052**
1989-1988	5.0L 302 CID; From 6-88	**42052**
1988-1987	5.0L 302 CID; To 6-88	**42014**
1974-1973	6.6L 400 CID	**42932**
1974-1973	7.5L 7539cc 460 CID; Includes Police	**42114**
1973	5.8L 351 CID	**42932**
1973	7.0L 7030cc 429 CID; Includes Police	**42114**

YEAR	VEHICLE DETAIL	PART NO.
Mercury (cont'd)		
Colony Park (cont'd)		
V8		
1972	7.5L 7539cc 460 CID	**42114**
1972-1971	5.8L 351 CID; Modified	**42932**
1972-1971	5.8L 351 CID; Windsor	**42953**
1972-1971	6.6L 400 CID	**42953**
1972-1971	7.0L 7030cc 429 CID	**42114**
1970	7.0L 7030cc 429 CID; Includes Police	**62075**
1970-1965	6.4L 6391cc 390 CID; Includes Police	**62075**
1968-1966	7.0L 7014cc 428 CID; Includes Police	**62075**
1967-1966	6.7L 6720cc 410 CID; Includes Police	**62075**
1967-1965	7.0L 6997cc 427 CID; Includes Police	**62075**
Comet		
L6		
1977-1976	3.3L 200 CID	**22002**
1977-1971	4.1L 250 CID	**22960**
1975	3.3L 200 CID; With A/c	**22002**
1975	3.3L 200 CID; Without A/c (from 4-12-75)	**22002**
1975	3.3L 200 CID; Without A/c To 4-12-1975	**22044**
1974	3.3L 200 CID; Without Thermactor Emission Control	**22044**
1973	3.3L 200 CID	**22044**
1969	4.1L 250 CID	**22960**
1968	3.3L 200 CID	**22044**
1967-1964	3.3L 3277cc 200 CID	**22044**
1964-1961	2.8L 2786cc 170 CID	**22044**
1963-1960	2.4L 2360cc 144 CID	**22044**
V8		
1977-1975	5.0L 302 CID	**42953**
1974-1971	5.0L 4949cc 302 CID	**42953**
1969	5.0L 4949cc 302 CID	**42028**
1969	5.8L 351 CID	**42028**
1969-1968	6.4L 6391cc 390 CID	**62075**
1967-1965	4.7L 4727cc 289 CID	**42028**
Cougar		
L4		
2002-1999	2.0L 1989cc 121 CID	**12115**
1986-1984	2.3L 140 CID	**22054**
1982-1981	2.3L 140 CID	**22005**
L6		
1982-1980	3.3L 200 CID	**22002**
V6		
2002-1999	2.5L 2450cc 155 CID	**12091**
1997-1996	3.8L 232 CID	**42103**
1995-1994	3.8L 232 CID	**42090**
1993-1989	3.8L 232 CID; Without Supercharger	**42050**
1990-1989	3.8L 232 CID; With Supercharger	**42055**
1988	3.8L 232 CID	**42050**
1987-1982	3.8L 232 CID	**42016**

YEAR	VEHICLE DETAIL	PART NO.
Mercury (cont'd)		
Cougar (cont'd)		
V8		
1997-1994	4.6L 281 CID	**32113**
1993-1991	5.0L 302 CID	**42057**
1988-1986	5.0L 302 CID	**42038**
1985	5.0L 302 CID; With Central Injection, Without Towing	**42014**
1984-1983	5.0L 302 CID	**42052**
1982-1980	4.2L 255 CID	**42052**
1981-1980	5.0L 302 CID	**42052**
1979-1977	5.0L 302 CID	**42953**
1979-1975	5.8L 351 CID; w/ Modified Engine	**42932**
1979-1975	5.8L 351 CID; w/ Windsor Engine	**42953**
1978-1973	6.6L 400 CID	**42932**
1976-1975	7.5L 460 CID	**42114**
1974-1973	5.8L 351 CID	**42953**
1974-1973	7.5L 7539cc 460 CID	**42114**
1972-1971	5.8L 351 CID	**42932**
1971	7.0L 7030cc 429 CID	**42114**
1970	5.0L 302 CID; Windsor	**42953**
1970	5.8L 351 CID; Modified	**42932**
1970	5.8L 351 CID; Windsor	**42953**
1970-1968	7.0L 7014cc 428 CID	**62075**
1969	5.0L 302 CID	**42028**
1969	5.8L 351 CID	**42028**
1969-1967	6.4L 6391cc 390 CID	**62075**
1968	5.0L 4949cc 302 CID	**42028**
1968	7.0L 6997cc 427 CID	**62075**
1968-1967	4.7L 4727cc 289 CID	**42028**
Cyclone		
V8		
1971	5.8L 351 CID; VIN M	**42932**
1970	5.0L 4949cc 302 CID	**42953**
1970	5.8L 351 CID	**42932**
Grand Marquis		
V8		
2011-2003	4.6L 281 CID	**32128**
2002-2001	4.6L 281 CID; Long Pump, 3 7/16" Hub Height, w/8 Vane 3 5/8" Diameter Non-Shrouded Impeller	**32113**
2002-2001	4.6L 281 CID; Short Pump; 2 1/2" Hub Height	**32128**
2000-1998	4.6L 281 CID	**32113**
1997-1992	4.6L 281 CID	**32066**
1991-1990	5.0L 302 CID	**42052**
1989-1988	5.0L 302 CID; From 6-88	**42052**
1989-1985	5.8L 351 CID	**42014**
1988-1986	5.0L 302 CID; To 6-88	**42014**
1985-1980	5.0L 302 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**

YEAR	VEHICLE DETAIL	PART NO.
Mercury (cont'd)		
Grand Marquis (cont'd)		
V8		
1984-1980	5.0L 302 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1982-1981	4.2L 255 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1982-1981	4.2L 255 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1981-1980	5.8L 351 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1981-1980	5.8L 351 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1979	5.0L 302 CID	**42052**
1979	5.8L 351 CID; w/ Windsor Engine	**42052**
1978	5.8L 351 CID; w/ Modified Engine	**42052**
1978	7.5L 460 CID	**42114**
1978-1977	6.6L 400 CID	**42052**
1977-1975	7.5L 460 CID; Includes Police	**42114**
1976-1975	6.6L 400 CID	**42932**
LN7		
L4		
1983-1982	1.6L 1598cc 98 CID; Driven off the timing belt	**22040**
Lynx		
L4		
1987-1985	1.9L 116 CID; Driven off the timing belt	**22040**
1987-1984	2.0L 1989cc 122 CID; DIESEL; Driven off the timing belt	**26067**
1985-1981	1.6L 1598cc 98 CID; Driven off the timing belt	**22040**
Marauder		
V8		
2004-2003	4.6L 281 CID	**32128**
1970	7.0L 7030cc 429 CID	**42114**
1970-1969	6.4L 6391cc 390 CID; Includes Police	**62075**
1967-1965	6.4L 6391cc 390 CID; Includes Police	**62075**
1965	7.0L 6997cc 427 CID; Includes Police	**62075**
Mariner		
L4		
2011-2009	2.5L 2488cc 152 CID	**12126**
2008-2005	2.3L 140 CID	**12126**
V6		
2011-2009	3.0L 183 CID	**12250**
2008-2006	3.0L 183 CID	**12489**
2006-2005	3.0L 182 CID	**12132**
Marquis		
L4		
1986	2.3L 140 CID	**22054**
1985-1983	2.3L 140 CID; Incl. Monter	**22054**
L6		
1983	3.3L 200 CID	**22002**
1983	3.3L 200 CID; Incl. Monter	**22002**

YEAR	VEHICLE DETAIL	PART NO.
Mercury (cont'd)		
Marquis (cont'd)		
V6		
1986-1983	3.8L 232 CID	**42016**
1986-1983	3.8L 232 CID; Incl. Monter	**42016**
V8		
1985	5.0L 302 CID; Base; Incl. Monter; Except Hi Output	**42052**
1985	5.0L 302 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1982-1981	4.2L 255 CID; Base; Incl. Monter; Except Hi Output	**42052**
1982-1981	4.2L 255 CID; Brougham; Incl. Monter; Except Hi Output	**42052**
1982-1981	4.2L 255 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1982-1981	4.2L 255 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1982-1980	5.0L 302 CID; Base; Incl. Monter; Except Hi Output	**42052**
1982-1980	5.0L 302 CID; Brougham; Incl. Monter; Except Hi Output	**42052**
1982-1980	5.0L 302 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1982-1980	5.0L 302 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1981-1980	5.8L 351 CID; Excluding Heavy Duty; Excluding Police; Excluding Taxi	**42052**
1981-1980	5.8L 351 CID; Includes Taxi; Includes Police; Includes Heavy Duty	**42014**
1979	5.0L 302 CID	**42052**
1979	5.0L 302 CID; Incl. Monter	**42052**
1979	5.8L 351 CID; w/ Windsor Engine	**42052**
1979	5.8L 351 CID; w/ Windsor Engine; Incl. Monter	**42052**
1978	5.8L 351 CID; w/ Modified Engine	**42052**
1978	7.5L 460 CID	**42114**
1978-1977	6.6L 400 CID	**42052**
1978-1971	6.6L 400 CID; Incl. Monter	**42932**
1977-1975	7.5L 460 CID; Incl. Monter	**42114**
1977-1975	7.5L 460 CID; Includes Police	**42114**
1976-1973	6.6L 400 CID	**42932**
1974-1973	7.5L 7539cc 460 CID; Incl. Monter	**42114**
1974-1973	7.5L 7539cc 460 CID; Includes Police	**42114**
1973	5.8L 351 CID	**42932**
1973	7.0L 7030cc 429 CID; Incl. Monter	**42114**
1973	7.0L 7030cc 429 CID; Includes Police	**42114**
1972	7.5L 7539cc 460 CID	**42114**
1972-1971	5.8L 351 CID; Modified	**42932**
1972-1971	5.8L 351 CID; Windsor	**42953**
1972-1971	6.6L 400 CID	**42953**
1972-1970	7.0L 7030cc 429 CID	**42114**
1970-1968	6.4L 6391cc 390 CID; Incl. Monter	**62075**
1970-1968	6.4L 6391cc 390 CID; Includes Police	**62075**

YEAR	VEHICLE DETAIL	PART NO.
Mercury (cont'd)		
Marquis (cont'd)		
V8		
1969	7.0L 7030cc 429 CID; Incl. Monter	**62075**
1969-1968	7.0L 7014cc 428 CID; Incl. Monter	**62075**
1969-1967	7.0L 7014cc 428 CID; Includes Police	**62075**
1967	6.7L 6720cc 410 CID; Includes Police	**62075**
1967	7.0L 6997cc 427 CID; Includes Police	**62075**
Milan		
L4		
2011-2010	2.5L 2488cc 152 CID	**12126**
2009-2006	2.3L 140 CID	**12126**
V6		
2011-2010	3.0L 183 CID	**12250**
2009-2006	3.0L 183 CID	**12489**
2007-2006	3.0L 183 CID	**12132**
Monarch		
L6		
1980-1975	4.1L 250 CID	**22960**
1977-1976	3.3L 200 CID	**22002**
1977-1975	3.3L 200 CID; From 4-12-75	**22002**
1975	3.3L 200 CID; To 4-12-75	**22044**
1975	3.3L 200 CID; With A/c	**22002**
1975	3.3L 200 CID; Without A/c	**22044**
V8		
1980	4.2L 255 CID	**42953**
1980-1975	5.0L 302 CID	**42953**
1977-1975	5.8L 351 CID; w/ Windsor Engine	**42953**
Montclair		
V8		
1968-1966	7.0L 7014cc 428 CID; Includes Police	**62075**
1968-1965	6.4L 6391cc 390 CID; Includes Police	**62075**
1967-1966	6.7L 6720cc 410 CID; Includes Police	**62075**
1967-1965	7.0L 6997cc 427 CID; Includes Police	**62075**
Montego		
L6		
1974-1969	4.1L 250 CID	**22960**
1968	3.3L 200 CID	**22044**
V6		
2007-2005	3.0L 183 CID	**42144**
V8		
1976-1975	7.5L 460 CID	**42114**
1976-1972	6.6L 400 CID	**42932**
1976-1971	5.8L 351 CID; Modified	**42932**
1976-1971	5.8L 351 CID; Windsor	**42953**
1974-1973	7.5L 7539cc 460 CID	**42114**
1974-1970	5.0L 4949cc 302 CID	**42953**
1973-1970	7.0L 7030cc 429 CID	**42114**
1970	5.8L 351 CID	**42932**
1969	5.0L 4949cc 302 CID	**42028**
1969	5.8L 351 CID	**42028**

YEAR	VEHICLE DETAIL	PART NO.
Mercury (cont'd)		
Montego (cont'd)		
V8		
1969-1968	6.4L 6391cc 390 CID	**62075**
1969-1968	7.0L 7014cc 428 CID	**62075**
1968	7.0L 6997cc 427 CID	**62075**
Monterey		
V6		
2007-2004	4.2L 256 CID	**32102**
V8		
1974-1973	6.6L 400 CID	**42932**
1974-1973	7.5L 7539cc 460 CID; Includes Police	**42114**
1973	5.8L 351 CID	**42932**
1973	7.0L 7030cc 429 CID; Includes Police	**42114**
1972	7.5L 7539cc 460 CID	**42114**
1972-1971	5.8L 351 CID; Modified	**42932**
1972-1971	5.8L 351 CID; Windsor	**42953**
1972-1971	6.6L 400 CID	**42953**
1972-1970	7.0L 7030cc 429 CID	**42114**
1970-1966	7.0L 7014cc 428 CID; Includes Police	**62075**
1970-1965	6.4L 6391cc 390 CID; Includes Police	**62075**
1967-1966	6.7L 6720cc 410 CID; Includes Police	**62075**
1967-1965	7.0L 6997cc 427 CID; Includes Police	**62075**
Mountaineer		
V6		
2010-1998	4.0L 245 CID	**42108**
V8		
2010-2002	4.6L 281 CID	**32127**
2001-1997	5.0L 302 CID	**32101**
Mystique		
L4		
2000-1997	2.0L 1989cc 121 CID; From 12-97	**12115**
1997-1995	2.0L 1989cc 121 CID	**32088**
V6		
2000-1995	2.5L 2450cc 155 CID	**12091**
Sable		
L4		
1986	2.5L 153 CID	**12041**
V6		
2009-2008	3.5L 3496cc 213 CID; Pump is driven off the timing chain	**32023**
2005	3.0L 182 CID; DOHC	**12132**
2005-2003	3.0L 182 CID; VIN 2	**32094**
2005-2000	3.0L 182 CID; VIN U	**32094**
2004-2001	3.0L 182 CID; GAS; VIN S	**12091**
2001	3.0L 182 CID; VIN 2	**32094**
2000-1996	3.0L 182 CID; DOHC; VIN S	**22098**
2000-1995	3.0L 182 CID; 12 Valve; OHV; VIN U	**32094**
1995-1994	3.8L 232 CID	**32089**
1994-1986	3.0L 182 CID	**32034**
1993-1988	3.8L 232 CID	**42051**

YEAR	VEHICLE DETAIL	PART NO.
Mercury (cont'd)		
Topaz		
L4		
1994-1992	2.3L 140 CID	**12041**
1991-1984	2.3L 140 CID	**12022**
1986-1984	2.0L 1989cc 122 CID; DIESEL; Driven off the timing belt	**26067**
V6		
1994-1992	3.0L 182 CID	**12070**
Tracer		
L4		
1999-1997	2.0L 1989cc 121 CID; Driven off the timing belt	**22107**
1996-1992	1.9L 116 CID; From 4/91 Round Edge Pulley; Driven off the timing belt	**22069**
1996-1991	1.8L 112 CID	**22068**
1991	1.9L 116 CID; Square Tooth Belt; Driven off the timing belt	**22065**
1989-1987	1.6L 1598cc 98 CID	**22049**
Villager		
V6		
2002-1999	3.3L 3275cc	**16300**
1998-1993	3.0L 182 CID	**16074**
Zephyr		
L4		
1983	2.3L 140 CID	**22054**
1982-1978	2.3L 140 CID	**22005**
L6		
1983-1978	3.3L 200 CID	**22002**
V8		
1982-1980	4.2L 255 CID	**42953**
1979-1978	5.0L 302 CID	**42953**
Merkur		
Scorpio		
V6		
1989-1988	2.9L 177 CID	**42042**
XR4Ti		
L4		
1989-1985	2.3L 140 CID	**22054**
Mitsubishi		
3000GT		
V6		
1999-1997	3.0L 2972cc 181 CID; DOHC	**33129**
1999-1997	3.0L 2972cc 181 CID; SOHC; Driven off the timing belt	**23121**
1996-1991	3.0L 2972cc 181 CID	**33129**
Cordia		
L4		
1988-1984	2.0L 1997cc 122 CID	**23118**
1988-1983	1.8L 1795cc	**23118**
Diamante		
V6		
2004	3.5L 3497cc 215 CID	**23152**

YEAR	VEHICLE DETAIL	PART NO.
Mitsubishi (cont'd)		
Diamante (cont'd)		
V6		
2004	3.5L 3497cc 215 CID	**26437**
2001-1997	3.5L 3497cc 215 CID	**23152**
1996-1992	3.0L 2972cc 181 CID; SOHC; Driven off the timing belt	**23121**
1995-1992	3.0L 2972cc 181 CID; DOHC	**33129**
Eclipse		
L4		
2005-2000	2.4L 2351cc	**26399**
1999-1996	2.4L 2351cc	**13148**
1999-1995	2.0L 1997cc 122 CID; Naturally Aspirated; Driven off the timing belt	**23150**
1999-1995	2.0L 1997cc 122 CID; Turbocharged	**13148**
1994-1990	1.8L 1755cc 107 CID	**23108**
1994-1990	2.0L 1997cc 122 CID	**26212**
V6		
2012-2006	3.8L 3828cc 230 CID	**23152**
2005-2000	3.0L 2972cc 181 CID	**23152**
Endeavor		
V6		
2011-2010	3.8L 3828cc 230 CID	**23152**
2008-2004	3.8L 3828cc 230 CID	**23152**
2004	3.8L 3797cc 230 CID	**23152**
Expo		
L4		
1995-1993	2.4L 2351cc	**13148**
1992	2.4L 2351cc; From 6-92	**13148**
1992	2.4L 2351cc; To 6-92	**26168**
Expo LRV		
L4		
1994-1993	2.4L 2351cc	**13148**
1994-1992	1.8L 1834cc 112 CID; Driven off the timing belt	**33147**
1993-1992	1.8L 1834cc 112 CID	**23135**
Galant		
L4		
2011-2004	2.4L 2378cc	**23152**
2003-1999	2.4L 2351cc	**26399**
1998-1994	2.4L 2351cc	**13148**
1993-1989	2.0L 1997cc 122 CID	**26212**
1992-1989	2.0L 1997cc 122 CID; SOHC	**26168**
1987-1985	2.4L 2351cc	**23118**
V6		
2003-1999	3.0L 2972cc 181 CID	**23152**
1988	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Lancer		
L4		
2014-2009	2.4L 2360cc 144 CID	**13038**
2013-2008	2.0L 1998cc 122 CID	**13038**
2007-2004	2.0L 1999cc 122 CID	**26360**

YEAR	VEHICLE DETAIL	PART NO.
Mitsubishi (cont'd)		
Lancer (cont'd)		
L4		
2006-2005	2.0L 1997cc 122 CID	**26360**
2006-2005	2.4L 2378cc	**26399**
2004	2.4L 2400cc	**26399**
2004-2002	2.0L 2000cc	**26360**
Mighty Max		
L4		
1996-1990	2.4L 2351cc; Standard Cab Pickup	**23114**
1994-1990	2.4L 2351cc; Extended Cab Pickup	**23114**
1989-1988	2.0L 1997cc 122 CID; Extended Cab Pickup	**23114**
1989-1988	2.6L 2555cc 156 CID; Extended Cab Pickup	**23120**
1989-1986	2.6L 2555cc 156 CID; Standard Cab Pickup	**23120**
1989-1983	2.0L 1997cc 122 CID; Standard Cab Pickup	**23114**
1985	2.6L 2555cc 156 CID; Standard Cab Pickup; From 2-85	**23120**
1985	2.6L 2555cc 156 CID; Standard Cab Pickup; To 1-85	**23116**
1985-1983	2.3L 2346cc 143 CID; DIESEL; Standard Cab Pickup	**33117**
1985-1983	2.6L 2555cc 156 CID; To 1-85	**23116**
V6		
1994-1990	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
1994-1990	3.0L 2972cc 181 CID; Extended Cab Pickup; Driven off the timing belt	**23121**
1994-1990	3.0L 2972cc 181 CID; Standard Cab Pickup; Driven off the timing belt	**23121**
Mirage		
L4		
2002-1997	1.5L 1468cc 90 CID	**26359**
2002-1997	1.8L 1834cc 112 CID	**26360**
1996-1993	1.8L 1834cc 112 CID; Driven off the timing belt	**33147**
1996-1985	1.5L 1468cc 90 CID	**23115**
1992-1991	1.6L 1597cc 98 CID; Naturally Aspirated	**23131**
1989	1.6L 1597cc 98 CID; Turbocharged	**23131**
1988-1985	1.6L 1597cc 98 CID; Turbocharged	**23108**
Montero		
L4		
1989-1983	2.6L 2555cc 156 CID	**23120**
V6		
2006-2004	3.8L 3828cc 230 CID; Sport Utility	**26415**
2005-2003	3.8L 3797cc 230 CID; Sport Utility	**26415**
2002-2001	3.5L 3497cc 215 CID	**26415**
2000-1997	3.5L 3497cc 215 CID	**26460**
1996	3.5L 3497cc 215 CID; From 5-96	**26415**
1996	3.5L 3497cc 215 CID; To 4-96	**26310**
1996-1995	3.0L 2972cc 181 CID	**26460**

YEAR	VEHICLE DETAIL	PART NO.
Mitsubishi (cont'd)		
Montero (cont'd)		
V6		
1994-1989	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Montero Sport		
L4		
1999-1998	2.4L 2351cc	**26389**
V6		
2004-1999	3.5L 3497cc 215 CID	**26460**
2003-1997	3.0L 2972cc 181 CID	**26460**
Outlander		
L4		
2013-2008	2.4L 2360cc 144 CID	**13038**
2006-2004	2.4L 2378cc	**26399**
Outlander Sport		
L4		
2013-2011	2.0L 1998cc 122 CID	**13038**
Precis		
L4		
1994-1987	1.5L 1468cc	**23115**
RVR		
L4		
2011	2.0L 1998cc 122 CID	**13038**
Raider		
V6		
2009-2006	3.7L 226 CID	**43163**
V8		
2007-2006	4.7L 285 CID	**43163**
Sigma		
V6		
1990-1989	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Starion		
L4		
1989-1986	2.6L 2555cc 156 CID; From 12-86	**23124**
1987-1985	2.6L 2555cc 156 CID; From 2-85	**23120**
1985-1983	2.6L 2555cc 156 CID; To 1-85	**23116**
Tredia		
L4		
1988-1984	2.0L 1997cc 122 CID	**23118**
1988-1983	1.8L 1795cc	**23118**
Van		
L4		
1990-1987	2.4L 2351cc; Standard Cargo Van	**23114**
1990-1987	2.4L 2351cc; Standard Passenger Van	**23114**
Nissan		
1200		
L4		
1973-1971	1.2L 1171cc 72 CID	**16026**
200SX		
L4		
1998-1995	1.6L 1597cc 97 CID	**16214**

YEAR	VEHICLE DETAIL	PART NO.
Nissan (cont'd)		
200SX (cont'd)		
L4		
1998-1995	2.0L 1998cc	**16213**
1988-1984	2.0L 1974cc	**16063**
1987-1984	1.8L 1809cc	**16063**
1983-1982	2.2L 2187cc	**36031**
1981-1977	2.0L 1952cc	**36031**
V6		
1988-1987	3.0L 2960cc 181 CID	**16058**
210		
L4		
1982-1981	1.4L 1393cc 85 CID; W/out A/c From 8-79	**16026**
1982-1981	1.5L 1488cc	**16026**
1982-1980	1.2L 1237cc	**16026**
1982-1979	1.4L 1393cc 85 CID; With A/c	**16026**
1982-1979	1.5L 1488cc; With A/c	**16026**
1980-1979	1.4L 1393cc 85 CID; w/o A/c From 8-79	**16026**
1980-1979	1.5L 1488cc; w/o A/c From 8-79	**16026**
1979	1.4L 1393cc 85 CID; W/out A/c From 8-79	**16026**
1979	1.4L 1393cc 85 CID; w/o A/c To 7-79	**16010**
1979	1.5L 1488cc; w/o A/c To 7-79	**16010**
240SX		
L4		
1998-1989	2.4L 2389cc	**16206**
240Z		
L6		
1973-1970	2.4L 2393cc 146 CID	**16011**
260Z		
L6		
1974	2.6L 2565cc	**16011**
280Z		
L6		
1978-1975	2.8L 2753cc	**16011**
300ZX		
V6		
1996-1990	3.0L 2960cc	**26201**
1989-1984	3.0L 2960cc	**16058**
310		
L4		
1982	1.5L 1488cc	**16041**
1981	1.5L 1488cc	**16010**
1980-1979	1.4L 1393cc 85 CID	**16010**
350Z		
V6		
2009-2003	3.5L 3498cc	**16426**
2003	3.5L 3498cc 213 CID	**16426**
370Z		
V6		
2014-2009	3.7L 3696cc	**16426**

YEAR	VEHICLE DETAIL	PART NO.
Nissan (cont'd)		
510		
L4		
1981-1980	2.0L 1952cc; With A/c	**36031**
1981-1980	2.0L 1952cc; Without A/c	**36008**
1979-1978	2.0L 1952cc; Non Thermal Fan Clutch	**36008**
1979-1978	2.0L 1952cc; Thermal Fan Clutch	**36031**
1973-1968	1.6L 1595cc 97 CID; With Fan Clutch	**36008**
1973-1968	1.6L 1595cc 97 CID; Without Fan Clutch	**16009**
520 Pickup		
L4		
1968-1966	1.3L 1299cc 79 CID; J13 Desig.; Datsun	**36179**
1965	1.3L 1299cc 79 CID; Without Fan Clutch	**36179**
521 Pickup		
L4		
1972-1970	1.6L 1595cc 97 CID; Without Fan Clutch	**16009**
1969	1.3L 1299cc 79 CID; Without Fan Clutch	**36179**
610		
L4		
1976-1975	2.0L 1952cc; With A/c From 4-76	**36031**
1976-1975	2.0L 1952cc; Without A/c To 3-76	**36008**
1974	2.0L 1952cc 119 CID; With A/c From 4-76	**36031**
1974	2.0L 1952cc 119 CID; Without A/c To 3-76	**36008**
1973	1.8L 1770cc 108 CID; Without A/c	**16009**
620 Pickup		
L4		
1974	1.8L 1770cc 108 CID	**16009**
1973-1972	1.6L 1595cc 97 CID	**16009**
710		
L4		
1977-1975	2.0L 1952cc; With A/c	**36031**
1976-1975	2.0L 1952cc; Without A/c	**36008**
720		
L4		
1986-1983	2.0L 1952cc	**36031**
1986-1983	2.4L 2389cc	**36031**
1986-1983	2.5L 2488cc; DIESEL	**36198**
1983-1981	2.2L 2164cc; DIESEL; SD22 Desig.	**36198**
1982-1981	2.2L 2187cc; 4WD; w/ Automatic Trans.	**36031**
1982-1981	2.2L 2187cc; RWD; w/ Automatic Trans.	**36031**
1982-1981	2.2L 2187cc; Z22 Desig.; w/ Standard Trans.; Without Fan Clutch	**16009**
1980	2.0L 1952cc; 8 Valve; w/ Automatic Trans.	**36008**
1980	2.0L 1952cc; L20B Desig.	**36031**
1980	2.0L 1952cc; w/ Standard Trans.; Without A/c	**16009**
810		
L6		
1981-1977	2.4L 2393cc	**16011**

YEAR	VEHICLE DETAIL	PART NO.
Nissan (cont'd)		
Altima		
L4		
2013-2002	2.5L 2500cc	**16427**
2001-1993	2.4L 2389cc	**16270**
V6		
2014-2002	3.5L 3498cc	**16426**
Aprio		
L4		
2008	1.6L 1598cc 98 CID; K4M Desig.; Nissan Built Eng.; Sold in Mexico	**26800**
Armada		
V8		
2014-2005	5.6L 5552cc	**16488**
Axxess		
L4		
1995-1990	2.4L 2389cc	**16162**
B210		
L4		
1978	1.4L 1393cc 85 CID; w/o A/c To 7-79	**16010**
1978-1975	1.4L 1393cc 85 CID; With A/c	**16026**
1977-1975	1.4L 1393cc 85 CID; Without A/c	**16010**
1974	1.3L 1288cc 79 CID	**16010**
Cabstar		
L4		
2008	2.5L 2488cc; Sold in Mexico	**93084**
Cabstar E		
L4		
2008	2.5L 2488cc; Sold in Mexico	**93084**
Cube		
L4		
2014-2009	1.8L 1798cc	**16218**
D21		
L4		
1994-1990	2.4L 2389cc; KA24E Desig.	**16206**
1989-1986	2.4L 2389cc; Z24 Desig.	**36031**
V6		
1994-1990	3.0L 2960cc 181 CID; 4WD; VG30E Desig.; VIN H	**46104**
1994-1990	3.0L 2960cc 181 CID; RWD; VIN H	**16058**
1989-1986	3.0L 2960cc; 4WD; VG30 Desig.; VIN H	**46104**
1989-1986	3.0L 2960cc; RWD; VIN H	**16058**
F10		
L4		
1978-1976	1.4L 1393cc 85 CID	**16010**
Frontier		
L4		
2014-2005	2.5L 2500cc	**93007**
2004-1998	2.4L 2389cc	**16206**
V6		
2014-2005	4.0L 3954cc	**16426**
2004-1999	3.3L 3275cc	**46338**

YEAR	VEHICLE DETAIL	PART NO.
Nissan (cont'd)		
GT-R		
V6		
2014-2009	3.8L 3799cc	**16426**
Maxima		
L6		
1984-1981	2.4L 2393cc	**16011**
1983-1981	2.8L 2793cc	**16011**
V6		
2014-2002	3.5L 3498cc	**16426**
2001-1995	3.0L 2988cc 182 CID	**16309**
1994-1992	3.0L 2960cc 181 CID; 12 Valve	**16074**
1994-1992	3.0L 2960cc 181 CID; 24 Valve	**46252**
1991-1985	3.0L 2960cc 181 CID	**16074**
Micra		
L4		
2007-2006	1.4L 1386cc 85 CID; Sold in Mexico	**93044**
Multi		
L4		
1988-1987	2.0L 1974cc 122 CID; Sold in Canada	**16116**
1986	2.0L 1974cc 122 CID; CA20E Desig.; From 7-86	**16116**
1986	2.0L 1974cc 122 CID; CA20E Desig.; To 7-86	**16114**
Murano		
V6		
2014-2003	3.5L 3498cc	**16426**
NV1500		
V6		
2013-2012	4.0L 3954cc	**16426**
NV200		
L4		
2013	2.0L 1997cc	**16218**
NV2500		
V6		
2013-2012	4.0L 3954cc	**16426**
V8		
2013-2012	5.6L 5552cc	**16488**
NV3500		
V6		
2013-2012	4.0L 3954cc	**16426**
V8		
2013-2012	5.6L 5552cc	**16488**
NX		
L4		
1993-1991	1.6L 1597cc 97 CID	**16214**
1993-1991	2.0L 1998cc	**16213**
Pathfinder		
L4		
1988-1987	2.4L 2389cc	**36031**
V6		
2014-2005	4.0L 3954cc	**16426**
2004-2001	3.5L 3498cc; VQ35DE Desig.	**16309**

YEAR	VEHICLE DETAIL	PART NO.
Nissan (cont'd)		
Pathfinder (cont'd)		
V6		
2000-1996	3.3L 3275cc	**46338**
1995-1987	3.0L 2960cc 181 CID	**46104**
V8		
2012-2008	5.6L 5552cc	**16488**
2004	5.6L 5600cc 342 CID	**16488**
Pickup		
L4		
1997-1995	2.4L 2389cc; KA24E Desig.	**16206**
V6		
1996	3.0L 2960cc; 4WD; VIN H	**46104**
1995	3.0L 2960cc 181 CID; 4WD; VIN H	**46104**
1995	3.0L 2960cc 181 CID; RWD	**16058**
Platina		
L4		
2008-2002	1.6L 1598cc 98 CID; Sold in Mexico	**26800**
Pulsar		
L4		
1983	1.6L 1597cc; E16 Desig.	**16041**
Pulsar NX		
L4		
1990-1989	1.6L 1597cc 97 CID	**16207**
1989-1988	1.8L 1809cc; CA18DE Desig.; DOHC; To 10-86	**16116**
1988-1987	1.6L 1597cc; E16I Desig.	**16041**
1987	1.6L 1597cc; CA16DE Desig.; DOHC; To 10-86	**16116**
1986-1983	1.6L 1597cc; E16 Desig.	**16041**
Quest		
V6		
2014-2004	3.5L 3498cc	**16426**
2002-1999	3.3L 3275cc	**16300**
1998-1993	3.0L 2960cc 181 CID	**16074**
Rogue		
L4		
2013-2008	2.5L 2500cc	**16427**
Sentra		
L4		
2012-2007	2.0L 1997cc 122 CID	**16218**
2012-2002	2.5L 2500cc; QR25DE Desig.	**16427**
2006-2000	1.8L 1809cc	**26416**
2001-1998	2.0L 1998cc	**16213**
1999-1991	1.6L 1597cc 97 CID	**16214**
1994-1991	2.0L 1998cc	**16213**
1990-1989	1.6L 1597cc 97 CID	**16207**
1988-1987	1.6L 1597cc	**16041**
1987	1.6L 1597cc 97 CID	**16041**
1986-1983	1.7L 1688cc; DIESEL	**16044**
1985-1983	1.6L 1597cc	**16041**
1983-1982	1.5L 1488cc	**16041**

YEAR	VEHICLE DETAIL	PART NO.
Nissan (cont'd)		
Stanza		
L4		
1992-1990	2.4L 2389cc	**16162**
1989-1987	2.0L 1974cc	**16116**
1986-1982	2.0L 1974cc	**16114**
Titan		
V8		
2014-2004	5.6L 5552cc	**16488**
Van		
L4		
1988-1987	2.4L 2389cc	**16110**
Versa		
L4		
2012-2007	1.8L 1798cc; MR18DE Desig.	**16218**
X-Trail		
L4		
2006-2005	2.5L 2500cc	**16427**
Xterra		
L4		
2004-2000	2.4L 2389cc	**16206**
V6		
2014-2005	4.0L 3954cc	**16426**
2011-2006	4.0L 3954cc	**16206**
2004-2000	3.3L 3275cc	**46338**
Oldsmobile		
88		
V6		
1999-1996	3.8L 3800cc 231 CID	**21075**
1995-1992	3.8L 3800cc 231 CID	**21050**
98		
All		
1974-1971	With A/c; With Trailer Towing Package	**41120**
V6		
1996	3.8L 3800cc 231 CID	**21075**
1995-1986	3.8L 3800cc 231 CID	**21050**
1985	3.0L 181 CID; VIN E	**31028**
1985	3.8L 3800cc 231 CID	**31018**
1985	4.3L 260 CID; DIESEL	**41100**
1983-1982	4.1L 252 CID	**31018**
V8		
1984-1982	5.0L 307 CID; GAS; With A/c	**41120**
1984-1982	5.0L 307 CID; GAS; Without A/c	**41100**
1984-1982	5.7L 350 CID; DIESEL; With A/c	**41120**
1984-1982	5.7L 350 CID; DIESEL; Without A/c	**41100**
1981-1980	5.0L 307 CID; GAS	**41100**
1981-1978	5.7L 350 CID; DIESEL	**41100**
1980-1977	5.7L 350 CID; GAS	**41100**
1979-1977	6.6L 403 CID; GAS	**41100**
1976-1975	7.5L 455 CID; GAS	**41100**
1975	6.6L 400 CID	**41975**
1974-1972	5.7L 5733cc 350 CID; Without A/c	**41100**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
98 (cont'd)		
V8		
1974-1972	7.5L 7457cc 455 CID; Without A/c	**41100**
1974-1971	7.5L 455 CID; Without A/c	**41100**
1974-1971	7.5L 7456cc 455 CID; Without A/c	**41100**
1973-1972	5.7L 350 CID; Without A/c	**41100**
1973-1972	5.7L 5737cc 350 CID; Without A/c	**41100**
Achieva		
L4		
1998-1996	2.4L 2392cc 146 CID; Pump is driven off the timing chain	**21076**
1995-1992	2.3L 138 CID	**11043**
1994-1992	2.3L 140 CID	**11043**
V6		
1998-1994	3.1L 189 CID	**11033**
1993-1992	3.3L 204 CID	**21050**
Alero		
L4		
2004-2002	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
2001-1999	2.4L 2392cc 146 CID; Pump is driven off the timing chain	**21076**
V6		
2004-1999	3.4L 207 CID	**11033**
Aurora		
V6		
2002-2001	3.5L 214 CID	**71085**
V8		
2003-2001	4.0L 244 CID	**11072**
1999-1995	4.0L 244 CID	**11072**
Bravada		
L6		
2004-2002	4.2L 256 CID	**21097**
V6		
2001-1996	4.3L 262 CID	**41077**
1994-1991	4.3L 262 CID	**41049**
Calais		
L4		
1987	2.3L 138 CID	**11043**
1987-1985	2.5L 2474cc 151 CID	**21000**
1987-1985	2.5L 2474cc 151 CID	**21067**
V6		
1987-1985	3.0L 181 CID	**21050**
Custom Cruiser		
All		
1974-1971	With A/c; With Trailer Towing Package	**41120**
L6		
1974-1971	4.1L 4097cc 250 CID; Without A/c	**41100**
V8		
1992	5.7L 350 CID	**41049**
1992-1991	5.0L 305 CID	**41049**
1990-1982	5.0L 307 CID; GAS; With A/c	**41120**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
Custom Cruiser (cont'd)		
V8		
1985-1982	5.0L 307 CID; GAS; Without A/c	**41100**
1985-1982	5.7L 350 CID; DIESEL; With A/c	**41120**
1985-1982	5.7L 350 CID; DIESEL; Without A/c	**41100**
1981-1980	5.0L 307 CID; GAS	**41100**
1981-1978	5.7L 350 CID; DIESEL	**41100**
1980-1977	5.7L 350 CID; GAS	**41100**
1979-1977	6.6L 403 CID; GAS	**41100**
1976-1975	7.5L 455 CID; GAS	**41100**
1975	6.6L 400 CID	**41975**
1974-1972	7.5L 7457cc 455 CID; Without A/c	**41100**
1974-1971	5.7L 5733cc 350 CID; Without A/c	**41100**
1974-1971	7.5L 455 CID; Without A/c	**41100**
1974-1971	7.5L 7456cc 455 CID; Without A/c	**41100**
1973	5.7L 350 CID; Without A/c	**41100**
1973	5.7L 5737cc 350 CID; Without A/c	**41100**
Cutlass		
L6		
1976-1975	4.1L 250 CID	**21107**
1974	4.1L 4097cc 250 CID; Without A/c	**21895**
1973-1968	4.1L 4097cc 250 CID	**21895**
1971-1967	4.1L 250 CID	**21895**
1971-1967	4.1L 4098cc 250 CID	**21895**
V6		
1999-1997	3.1L 189 CID	**11033**
1981-1978	3.8L 3800cc 231 CID	**31018**
1979	3.8L 231 CID	**31018**
1977	3.8L 231 CID	**31018**
V8		
1981	4.4L 267 CID	**41121**
1981-1979	5.7L 350 CID; DIESEL; With A/c	**41120**
1981-1979	5.7L 350 CID; DIESEL; With A/c Or Heavy Duty Cooling	**41120**
1981-1979	5.7L 350 CID; DIESEL; Without A/c	**41100**
1981-1977	4.3L 260 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1981-1977	4.3L 260 CID; GAS; Without A/c	**41100**
1981-1975	4.3L 260 CID; With A/c	**41120**
1980-1978	5.0L 305 CID	**41121**
1980-1978	5.0L 305 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1980-1978	5.0L 305 CID; GAS; Without A/c	**41100**
1980-1978	5.0L 305 CID; VIN H; Emission Control	**41121**
1980-1977	5.7L 350 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1980-1977	5.7L 350 CID; GAS; Without A/c	**41100**
1979-1978	5.7L 350 CID; VIN L	**41121**
1979-1978	5.7L 350 CID; VIN L; Emission Control	**41121**
1977	6.6L 403 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
Cutlass (cont'd)		
V8		
1977	6.6L 403 CID; GAS; Without A/c	**41100**
1977	6.6L 403 CID; With A/c Or Heavy Duty Cooling	**41120**
1976-1975	4.3L 260 CID; Without A/c	**41100**
1976-1973	5.7L 350 CID; Without A/c	**41100**
1976-1973	7.5L 455 CID; Without A/c	**41100**
1976-1971	5.7L 350 CID; With A/c	**41120**
1976-1971	7.5L 455 CID; With A/c	**41120**
1974-1973	5.7L 5733cc 350 CID; Without A/c	**41100**
1974-1973	5.7L 5737cc 350 CID; Without A/c	**41100**
1974-1973	7.5L 7456cc 455 CID; Without A/c	**41100**
1974-1971	5.7L 5733cc 350 CID; With A/c	**41120**
1974-1971	5.7L 5737cc 350 CID; With A/c	**41120**
1974-1971	7.5L 7456cc 455 CID; With A/c	**41120**
Cutlass Calais		
L4		
1991-1989	2.3L 140 CID	**11043**
1991-1988	2.3L 138 CID	**11043**
1991-1988	2.5L 2474cc 151 CID	**21000**
1991-1988	2.5L 2474cc 151 CID	**21067**
V6		
1991-1989	3.3L 204 CID	**21050**
1988	3.0L 181 CID	**21050**
V8		
1982	5.7L 350 CID; DIESEL; Without A/c; 1st Design	**41100**
1982	5.7L 350 CID; DIESEL; Without A/c; 2nd Design	**41120**
Cutlass Ciera		
L4		
1996-1993	2.2L 2190cc 134 CID	**11032**
1992-1987	2.5L 2474cc 151 CID	**31041**
1986-1982	2.5L 2474cc 151 CID	**21000**
V6		
1996-1994	3.1L 189 CID	**11033**
1993-1989	3.3L 204 CID	**21050**
1989-1987	2.8L 173 CID	**11033**
1988-1986	3.8L 3800cc 231 CID	**21050**
1986-1982	2.8L 173 CID	**31001**
1985-1984	3.8L 3800cc 231 CID	**31028**
1985-1982	3.0L 181 CID	**31028**
Cutlass Cruiser		
L4		
1990-1987	2.5L 2474cc 151 CID	**31041**
V6		
1994	3.1L 189 CID	**11033**
1993-1989	3.3L 204 CID	**21050**
1989-1988	2.8L 173 CID	**11033**
1988-1987	3.8L 3800cc 231 CID	**21050**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
Cutlass Cruiser (cont'd)		
V6		
1987	3.8L 3800cc 231 CID	**31018**
1983-1980	3.8L 3800cc 231 CID	**31018**
V8		
1983-1981	5.0L 307 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1983-1981	5.0L 307 CID; GAS; Without A/c	**41100**
1983-1980	5.7L 350 CID; DIESEL; With A/c Or Heavy Duty Cooling	**41120**
1983-1980	5.7L 350 CID; DIESEL; Without A/c	**41100**
1982	5.0L 305 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1982	5.0L 305 CID; GAS; Without A/c	**41100**
1982	5.0L 305 CID; VIN H; Emission Control	**41121**
1982	5.7L 350 CID; DIESEL; Without A/c; 1st Design	**41100**
1982	5.7L 350 CID; DIESEL; Without A/c; 2nd Design	**41120**
1982-1980	4.3L 260 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1982-1980	4.3L 260 CID; GAS; Without A/c	**41100**
1980	5.0L 305 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1980	5.0L 305 CID; GAS; Without A/c	**41100**
1980	5.0L 305 CID; VIN H; Emission Control	**41121**
1980	5.7L 350 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1980	5.7L 350 CID; GAS; Without A/c	**41100**
Cutlass Salon		
V6		
1987-1985	3.8L 3800cc 231 CID	**31018**
1981-1978	3.8L 3800cc 231 CID	**31018**
1979	3.8L 231 CID	**31018**
V8		
1987-1986	5.0L 307 CID	**41120**
1987-1985	5.0L 307 CID; Sold in Canada; Export	**41121**
1985	5.0L 307 CID; With A/c	**41120**
1985	5.7L 350 CID; DIESEL	**41120**
1981-1980	5.7L 350 CID; DIESEL; With A/c	**41120**
1981-1975	4.3L 260 CID; With A/c	**41120**
1980-1978	5.0L 305 CID	**41121**
1977	6.6L 403 CID; With A/c Or Heavy Duty Cooling	**41120**
1976-1975	5.7L 350 CID; With A/c	**41120**
1976-1975	7.5L 455 CID; With A/c	**41120**
Cutlass Supreme		
L4		
1991-1990	2.3L 138 CID	**11043**
1990	2.3L 140 CID	**11043**
L6		
1976-1975	4.1L 250 CID	**21107**
1974	4.1L 4097cc 250 CID; Without A/c	**21895**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
Cutlass Supreme (cont'd)		
L6		
1973-1971	4.1L 4097cc 250 CID	**21895**
V6		
1997-1989	3.1L 189 CID	**11033**
1996	3.4L 207 CID	**11145**
1996-1991	3.4L 207 CID	**11033**
1989-1988	2.8L 173 CID	**11033**
1987-1978	3.8L 3800cc 231 CID	**31018**
1984-1982	4.3L 260 CID; DIESEL; With A/c Or Heavy Duty Cooling	**41120**
1979	3.8L 231 CID	**31018**
1977	3.8L 231 CID	**31018**
V8		
1988-1982	5.0L 307 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1985-1982	5.0L 307 CID; GAS; Without A/c	**41100**
1985-1979	5.7L 350 CID; DIESEL; With A/c Or Heavy Duty Cooling	**41120**
1985-1979	5.7L 350 CID; DIESEL; Without A/c	**41100**
1982	5.7L 350 CID; DIESEL; Without A/c; 1st Design	**41100**
1982	5.7L 350 CID; DIESEL; Without A/c; 2nd Design	**41120**
1982-1977	4.3L 260 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1982-1977	4.3L 260 CID; GAS; Without A/c	**41100**
1980-1978	5.0L 305 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1980-1978	5.0L 305 CID; GAS; Without A/c	**41100**
1980-1978	5.0L 305 CID; VIN H; Emission Control	**41121**
1980-1977	5.7L 350 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1980-1977	5.7L 350 CID; GAS; Without A/c	**41100**
1979	4.3L 260 CID; DIESEL; With A/c Or Heavy Duty Cooling	**41120**
1979	4.3L 260 CID; DIESEL; Without A/c	**41100**
1978	5.7L 350 CID; VIN L; Emission Control	**41121**
1977	6.6L 403 CID; GAS; With A/c Or Heavy Duty Cooling	**41120**
1977	6.6L 403 CID; GAS; Without A/c	**41100**
1976-1975	4.3L 260 CID; With A/c	**41120**
1976-1975	4.3L 260 CID; Without A/c	**41100**
1976-1973	5.7L 350 CID; Without A/c	**41100**
1976-1973	7.5L 455 CID; Without A/c	**41100**
1976-1971	5.7L 350 CID; With A/c	**41120**
1976-1971	7.5L 455 CID; With A/c	**41120**
1974-1973	5.7L 5733cc 350 CID; Without A/c	**41100**
1974-1973	5.7L 5737cc 350 CID; Without A/c	**41100**
1974-1973	7.5L 7456cc 455 CID; Without A/c	**41100**
1974-1971	5.7L 5733cc 350 CID; With A/c	**41120**
1974-1971	5.7L 5737cc 350 CID; With A/c	**41120**
1974-1971	7.5L 7456cc 455 CID; With A/c	**41120**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
Cutlass Tiara		
V8		
1976	4.3L 260 CID; With A/c	**41120**
1976	5.7L 350 CID; With A/c	**41120**
1976	7.5L 455 CID; With A/c	**41120**
Delta 88		
All		
1974-1971	With A/c; With Trailer Towing Package	**41120**
V6		
1991-1986	3.8L 3800cc 231 CID	**21050**
1985	3.8L 3800cc 231 CID	**31028**
1985-1977	3.8L 3800cc 231 CID	**31018**
1977	3.8L 231 CID	**31018**
V8		
1985-1983	5.7L 350 CID; DIESEL	**41120**
1985-1982	5.0L 307 CID; GAS; With A/c	**41120**
1985-1982	5.0L 307 CID; GAS; Without A/c	**41100**
1985-1982	5.7L 350 CID; DIESEL; Without A/c	**41100**
1985-1981	5.7L 350 CID; DIESEL; With A/c	**41120**
1985-1980	5.0L 307 CID; With A/c	**41120**
1984-1980	5.0L 307 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1984-1978	5.7L 350 CID; DIESEL; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1982	5.7L 350 CID; DIESEL; Without A/c Second Design	**41120**
1982	5.7L 350 CID; Without A/c; 1st Design	**41100**
1982-1981	4.4L 267 CID; Emission Control	**41121**
1982-1981	4.4L 267 CID; Sold in Canada; Export	**41121**
1982-1980	5.0L 307 CID; Emission Control	**41121**
1982-1977	4.3L 260 CID; GAS	**41100**
1982-1977	4.3L 260 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1982-1977	4.3L 260 CID; With A/c	**41120**
1982-1977	5.7L 350 CID; Emission Control	**41121**
1981	5.0L 307 CID	**41121**
1981-1980	5.0L 307 CID; GAS	**41100**
1981-1978	5.7L 350 CID; DIESEL	**41100**
1980-1978	5.7L 350 CID; DIESEL; VIN N; With A/c	**41120**
1980-1977	5.7L 350 CID; Without A/c	**41100**
1980-1975	5.7L 350 CID; GAS	**41100**
1980-1975	5.7L 350 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1979	4.9L 301 CID	**41100**
1979	4.9L 301 CID	**41975**
1979-1977	6.6L 403 CID; GAS	**41100**
1979-1977	6.6L 403 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
Delta 88 (cont'd)		
V8		
1979-1977	6.6L 403 CID; With A/c Or Heavy Duty Cooling	**41120**
1978-1977	6.6L 403 CID	**41120**
1977	5.7L 350 CID; VIN L	**41121**
1977	5.7L 350 CID; VIN R; With A/c	**41120**
1976-1975	7.5L 455 CID; GAS	**41100**
1976-1975	7.5L 455 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1976-1972	7.5L 455 CID; All With A/c Or Heavy Duty Cooling	**41120**
1976-1971	5.7L 350 CID; All With A/c Or Heavy Duty Cooling	**41120**
1975	6.6L 400 CID	**41975**
1975	6.6L 400 CID; All With A/c Or Heavy Duty Cooling	**41120**
1974-1972	7.5L 7457cc 455 CID; Without A/c	**41100**
1974-1971	5.7L 350 CID; Without A/c	**41100**
1974-1971	5.7L 5733cc 350 CID; Without A/c	**41100**
1974-1971	5.7L 5737cc 350 CID; Without A/c	**41100**
1974-1971	7.5L 455 CID; Without A/c	**41100**
1974-1971	7.5L 7456cc 455 CID; Without A/c	**41100**
1971	7.5L 7456cc 455 CID; All With A/c Or Heavy Duty Cooling	**41120**
F85		
L6		
1972-1966	4.1L 4097cc 250 CID	**21895**
1971-1968	4.1L 250 CID	**21895**
1971-1966	4.1L 4098cc 250 CID	**21895**
1966	4.1L 250 CID	**21895**
V8		
1972	7.5L 455 CID; With A/c	**41120**
1972-1971	5.7L 350 CID; With A/c	**41120**
1972-1971	5.7L 5733cc 350 CID; With A/c	**41120**
1972-1971	5.7L 5737cc 350 CID; With A/c	**41120**
1972-1971	7.5L 7456cc 455 CID; With A/c	**41120**
Firenza		
L4		
1988-1987	2.0L 121 CID; VIN 1	**11032**
1988-1987	2.0L 122 CID; VIN K	**11036**
1986-1983	2.0L 122 CID; VIN P	**21007**
1986-1982	1.8L 112 CID; VIN 0	**11017**
1984-1983	2.0L 122 CID; VIN B	**21007**
1982	1.8L 112 CID; VIN G	**21007**
V6		
1987	2.8L 173 CID	**11033**
Intrigue		
V6		
2002-1999	3.5L 214 CID	**71085**
1999-1998	3.8L 3800cc 231 CID	**21075**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
LSS		
V6		
1999-1996	3.8L 3800cc 231 CID	**21075**
Omega		
L4		
1984-1980	2.5L 2474cc 151 CID	**21000**
1984-1980	2.5L 2474cc 151 CID; With Universal Triple Groove Pulley	**31000**
L6		
1976-1973	4.1L 250 CID	**21107**
V6		
1984-1980	2.8L 173 CID	**31001**
1979-1978	3.8L 3800cc 231 CID	**31018**
1977	3.8L 231 CID	**31018**
V8		
1979-1977	5.0L 305 CID	**41121**
1979-1977	5.7L 350 CID	**41121**
1976-1975	4.3L 260 CID; With A/c Or Heavy Duty Cooling	**41120**
1976-1975	5.7L 350 CID	**31018**
1974	5.7L 5733cc 350 CID; With A/c	**41120**
1973	5.7L 350 CID; With A/c	**41120**
Regency		
V6		
1998-1997	3.8L 3800cc 231 CID	**21075**
Silhouette		
V6		
2004-1996	3.4L 207 CID	**11033**
1995-1992	3.8L 3800cc 231 CID	**21050**
1994-1990	3.1L 189 CID	**11033**
Starfire		
L4		
1980	2.5L 2474cc 151 CID	**21000**
1980	2.5L 2474cc 151 CID; With Universal Triple Groove Pulley	**31000**
V6		
1980-1977	3.8L 3800cc 231 CID	**31018**
1977-1975	3.8L 231 CID	**31018**
V8		
1979-1977	5.0L 305 CID	**41121**
Toronado		
All		
1974-1971	With A/c; With Trailer Towing Package	**41120**
V6		
1992-1986	3.8L 3800cc 231 CID	**21050**
1984-1982	4.1L 252 CID	**31018**
V8		
1985-1982	5.0L 307 CID; GAS; With A/c	**41120**
1985-1982	5.0L 307 CID; GAS; Without A/c	**41100**
1985-1982	5.7L 350 CID; DIESEL; With A/c	**41120**
1985-1982	5.7L 350 CID; DIESEL; Without A/c	**41100**

YEAR	VEHICLE DETAIL	PART NO.
Oldsmobile (cont'd)		
Toronado (cont'd)		
V8		
1984-1980	5.0L 307 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1984-1979	5.7L 350 CID; DIESEL; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1982	5.7L 350 CID; Without A/c; 1st Design	**41100**
1982-1980	5.0L 307 CID; Emission Control	**41121**
1982-1979	5.7L 350 CID; Emission Control	**41121**
1981-1980	5.0L 307 CID; GAS	**41100**
1981-1979	5.7L 350 CID; DIESEL	**41100**
1980-1979	5.7L 350 CID; GAS	**41100**
1980-1979	5.7L 350 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1978-1977	6.6L 403 CID; GAS	**41100**
1978-1977	6.6L 403 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1977	5.7L 350 CID; Emission Control	**41121**
1977	5.7L 350 CID; GAS	**41100**
1977	5.7L 350 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
1976-1975	7.5L 455 CID; GAS	**41100**
1976-1975	7.5L 455 CID; GAS; With A/c Or Heavy Duty Cooling; With Trailer Towing Package	**41120**
Peugeot		
206		
L4		
2008-2006	1.4L 1360cc 83 CID; Sold in Mexico	**99125**
2005-2002	1.6L 1587cc 97 CID; CC; Sold in Mexico	**99600**
2005-2001	1.6L 1587cc 97 CID; Sold in Mexico; XS	**99600**
207		
L4		
2008	1.6L 1598cc 98 CID; CC; Sold in Mexico	**99600**
306		
L4		
2002-2000	1.8L 1762cc 108 CID	**99359**
406		
L4		
2005-2003	2.0L 1998cc 122 CID; Sold in Mexico	**99112**
407		
V6		
2008-2006	2.9L 2946cc 180 CID; Sold in Mexico	**99916**
607		
V6		
2008-2002	2.9L 2946cc 180 CID; Sold in Mexico	**99916**
Grand Raid		
L4		
2008-2007	1.6L 1587cc 97 CID; Sold in Mexico	**99600**

YEAR	VEHICLE DETAIL	PART NO.
Peugeot (cont'd)		
Partner		
All		
2005-2003	Pack; Sold in Mexico	**99600**
Plymouth		
Acclaim		
L4		
1995-1990	2.5L 2507cc 153 CID	**23127**
1989	2.5L 2507cc 153 CID	**23122**
V6		
1995-1989	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Arrow		
L4		
1980	2.6L 2555cc 156 CID; VIN F	**23120**
1980-1978	1.6L 1597cc 98 CID; VIN K	**33105**
1979	2.6L 2555cc 156 CID	**23120**
1978-1976	2.0L 1997cc 122 CID	**23120**
1977-1976	1.6L 1597cc 98 CID	**33021**
Arrow Pickup		
L4		
1980	2.0L 1997cc 122 CID; VIN U	**23120**
1980	2.6L 2555cc 156 CID; VIN W	**23120**
1979	2.0L 1997cc 122 CID	**23120**
1979	2.6L 2555cc 156 CID	**23120**
Barracuda		
L6		
1972-1967	3.7L 3687cc 225 CID	**33100**
1971-1970	3.2L 198 CID	**33100**
1971-1970	3.2L 3254cc 198 CID	**33100**
1970	3.7L 225 CID	**33100**
V8		
1974	5.9L 360 CID; With A/c	**43103**
1974	5.9L 360 CID; Without A/c	**43053**
1974	5.9L 5900cc 360 CID; With A/c	**43103**
1974	5.9L 5900cc 360 CID; Without A/c	**43053**
1974-1971	5.9L 5899cc 360 CID; With A/c	**43103**
1974-1971	5.9L 5899cc 360 CID; Without A/c	**43053**
1974-1970	5.2L 318 CID; With A/c	**43103**
1974-1970	5.2L 318 CID; Without A/c	**43053**
1974-1970	5.2L 5212cc 318 CID; With A/c	**43103**
1974-1970	5.2L 5212cc 318 CID; Without A/c	**43053**
1973-1972	5.6L 340 CID; With A/c	**43103**
1973-1972	5.6L 340 CID; Without A/c	**43053**
1973-1970	5.6L 5572cc 340 CID; With A/c	**43103**
1973-1970	5.6L 5572cc 340 CID; Without A/c	**43053**
1971-1970	6.3L 383 CID; Without A/c; With A/c	**33040**
1971-1970	6.3L 6286cc 383 CID; Without A/c; With A/c	**33040**
1971-1970	7.0L 6981cc 426 CID; Without A/c; With A/c	**33040**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Barracuda (cont'd)		
V8		
1971-1970	7.2L 7211cc 440 CID; Without A/c; With A/c	**33040**
1969-1968	5.2L 318 CID; Without A/c	**43919**
1969-1968	5.2L 5212cc 318 CID; Without A/c	**43919**
1969-1968	5.6L 340 CID; Without A/c	**43919**
1969-1968	5.6L 5572cc 340 CID; Without A/c	**43919**
1969-1968	7.0L 6981cc 426 CID; Without A/c	**33040**
1969-1967	6.3L 383 CID; Without A/c	**33040**
1969-1967	6.3L 6286cc 383 CID; Without A/c	**33040**
1968	4.5L 4473cc 273 CID; Without A/c	**43919**
1967	4.5L 4473cc 273 CID	**43919**
1967	5.2L 5212cc 318 CID	**43919**
Belvedere		
L6		
1970	3.7L 225 CID	**33100**
1970-1960	3.7L 3687cc 225 CID	**33100**
V8		
1971	5.6L 5572cc 340 CID; With A/c; W/2 Bbl Carb	**43103**
1971	5.6L 5572cc 340 CID; Without A/c; Without Air Pump	**43053**
1970	5.2L 318 CID; With A/c; W/2 Bbl Carb	**43103**
1970	5.2L 318 CID; Without A/c; Without Air Pump	**43053**
1970	5.2L 5212cc 318 CID; With A/c; W/2 Bbl Carb	**43103**
1970	5.2L 5212cc 318 CID; Without A/c; Without Air Pump	**43053**
1970-1968	6.3L 383 CID	**33040**
1970-1967	7.0L 6981cc 426 CID	**33040**
1970-1963	6.3L 6286cc 383 CID	**33040**
1969	5.2L 318 CID	**43919**
1969	5.2L 5212cc 318 CID	**43919**
1968	4.5L 273 CID; Without A/c	**43919**
1968	5.2L 318 CID; Without A/c	**43919**
1968-1967	4.5L 4473cc 273 CID; Without A/c	**43919**
1968-1967	5.2L 5212cc 318 CID; Without A/c	**43919**
1966-1964	4.5L 4473cc 273 CID; Without A/c; With A/c	**43919**
1966-1964	5.2L 5212cc 318 CID; Without A/c; With A/c	**43919**
1966-1963	5.9L 5917cc 361 CID	**33040**
1964-1963	5.2L 5212cc 318 CID; Without A/c	**43919**
1964-1963	6.7L 6769cc 413 CID	**33040**
1962-1960	6.3L 6286cc 383 CID; Without A/c; With A/c	**33040**
1962-1959	5.9L 5917cc 361 CID; Without A/c; With A/c	**33040**
1962-1958	5.2L 5212cc 318 CID; Without A/c	**33040**
1959-1958	5.2L 317 CID; Without A/c	**33040**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Belvedere (cont'd)		
V8		
1958	5.7L 5737cc 350 CID; Without A/c; With A/c	**33040**
Breeze		
All		
1997	Mechanical Tensioner; Driven off the timing belt	**23150**
L4		
2000-1997	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
2000-1996	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**
1996	2.4L 2429cc 148 CID; Hydraulic Tensioner; Driven off the timing belt	**23153**
1996	2.4L 2429cc 148 CID; Mechanical Tensioner; Driven off the timing belt	**23300**
Caravelle		
L4		
1988-1986	2.5L 2507cc 153 CID	**23110**
1986	2.2L 135 CID	**23110**
1984-1983	2.2L 135 CID; Sold in Canada	**23110**
1984-1983	2.6L 2555cc 156 CID; Sold in Canada; VIN G	**23111**
1983	2.6L 2555cc 156 CID; Sold in Canada; VIN 7	**23111**
V8		
1989-1985	5.2L 318 CID; Sold in Canada	**43103**
Champ		
L4		
1982-1981	1.4L 1410cc	**23115**
1982-1981	1.6L 1597cc 98 CID	**23108**
1980-1979	1.4L 1410cc	**23106**
1980-1979	1.6L 1597cc 98 CID	**23104**
Colt		
L4		
1995-1985	1.5L 1468cc 90 CID	**23115**
1994-1993	2.4L 2351cc	**13148**
1994-1992	1.8L 1834cc 112 CID; Driven off the timing belt	**33147**
1992	2.4L 2351cc	**26168**
1991-1984	2.0L 1997cc 122 CID	**23118**
1990-1989	1.6L 1597cc 98 CID	**23131**
Conquest		
L4		
1986-1984	2.6L 2555cc 156 CID	**23116**
Duster		
L6		
1976-1970	3.7L 3687cc 225 CID	**33100**
1974-1970	3.2L 198 CID	**33100**
1974-1970	3.2L 3254cc 198 CID	**33100**
1972-1970	3.7L 225 CID	**33100**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Duster (cont'd)		
V8		
1976-1974	5.9L 360 CID; With A/c	**43103**
1976-1974	5.9L 360 CID; Without A/c	**43053**
1976-1970	5.2L 318 CID; With A/c	**43103**
1976-1970	5.2L 318 CID; Without A/c	**43053**
1974	5.9L 5899cc 360 CID; With A/c	**43103**
1974	5.9L 5899cc 360 CID; Without A/c	**43053**
1974	5.9L 5900cc 360 CID; With A/c	**43103**
1974	5.9L 5900cc 360 CID; Without A/c	**43053**
1974-1970	5.2L 5212cc 318 CID; With A/c	**43103**
1974-1970	5.2L 5212cc 318 CID; Without A/c	**43053**
1973-1970	5.6L 340 CID; With A/c	**43103**
1973-1970	5.6L 340 CID; Without A/c	**43053**
1973-1970	5.6L 5572cc 340 CID; With A/c	**43103**
1973-1970	5.6L 5572cc 340 CID; Without A/c	**43053**
Expo		
L4		
1989	2.2L 135 CID	**23122**
1988-1987	2.2L 135 CID	**23110**
Fury		
L6		
1978-1960	3.7L 3687cc 225 CID	**33100**
1971-1970	3.7L 225 CID	**33100**
V8		
1978	5.2L 318 CID; W/4 Bbl Carb	**43103**
1978	5.9L 360 CID; W/4 Bbl Carb	**43103**
1978-1975	5.2L 318 CID; With A/c; W/2 Bbl Carb	**43103**
1978-1975	5.2L 318 CID; Without A/c; Without Air Pump	**43053**
1978-1972	6.6L 400 CID	**33040**
1978-1971	5.9L 360 CID; With A/c; W/2 Bbl Carb	**43103**
1978-1971	5.9L 360 CID; Without A/c; Without Air Pump	**43053**
1974-1972	6.6L 6555cc 400 CID	**33040**
1974-1972	6.6L 6556cc 400 CID	**33040**
1974-1971	5.9L 5899cc 360 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1971	5.9L 5899cc 360 CID; Without A/c; Without Air Pump	**43053**
1974-1971	5.9L 5900cc 360 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1971	5.9L 5900cc 360 CID; Without A/c; Without Air Pump	**43053**
1974-1970	5.2L 5212cc 318 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1970	5.2L 5212cc 318 CID; Without A/c; Without Air Pump	**43053**
1973-1970	5.2L 318 CID; With A/c; W/2 Bbl Carb	**43103**
1973-1970	5.2L 318 CID; Without A/c; Without Air Pump	**43053**
1971-1963	6.3L 383 CID	**33040**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Fury (cont'd)		
V8		
1971-1963	6.3L 6286cc 383 CID	**33040**
1969	5.2L 318 CID	**43919**
1969	5.2L 5212cc 318 CID	**43919**
1968-1967	5.2L 318 CID; Without A/c	**43919**
1968-1967	5.2L 5212cc 318 CID; Without A/c	**43919**
1966-1965	5.2L 318 CID; Without A/c; With A/c	**43919**
1966-1964	5.2L 5212cc 318 CID; Without A/c; With A/c	**43919**
1966-1963	5.9L 5917cc 361 CID	**33040**
1965	4.5L 273 CID; Without A/c; With A/c	**43919**
1965-1964	4.5L 4473cc 273 CID; Without A/c; With A/c	**43919**
1965-1963	5.9L 361 CID	**33040**
1964-1963	5.2L 5212cc 318 CID; Without A/c	**43919**
1964-1963	6.7L 6769cc 413 CID	**33040**
1962	5.9L 361 CID; Without A/c; With A/c	**33040**
1962-1960	6.3L 6286cc 383 CID; Without A/c; With A/c	**33040**
1962-1959	5.9L 5917cc 361 CID; Without A/c; With A/c	**33040**
1962-1957	5.2L 5212cc 318 CID; Without A/c	**33040**
1959	5.2L 318 CID; Without A/c	**33040**
1959	5.9L 361 CID; Without A/c; With A/c	**33040**
1959-1957	5.2L 317 CID; Without A/c	**33040**
1958	5.7L 5737cc 350 CID; Without A/c; With A/c	**33040**
GTX		
V8		
1971-1968	7.0L 426 CID	**33040**
1971-1967	6.3L 6286cc 383 CID	**33040**
1971-1967	7.0L 6981cc 426 CID	**33040**
1970	5.2L 5212cc 318 CID; With A/c; W/2 Bbl Carb	**43103**
1970	5.2L 5212cc 318 CID; Without A/c; Without Air Pump	**43053**
1969	5.2L 5212cc 318 CID	**43919**
1968	5.2L 318 CID; Without A/c	**43919**
1968	6.3L 383 CID	**33040**
1968-1967	5.2L 5212cc 318 CID; Without A/c	**43919**
1967	4.5L 4473cc 273 CID; Without A/c	**43919**
Gran Fury		
L6		
1983-1980	3.7L 3687cc 225 CID	**33100**
V8		
1989-1980	5.2L 318 CID; W/4 Bbl Carb	**43103**
1985	5.2L 5211cc 318 CID; W/4 Bbl Carb	**43103**
1980	5.2L 318 CID; With A/c; W/2 Bbl Carb	**43103**
1980	5.9L 360 CID; W/4 Bbl Carb	**43103**
1980	5.9L 360 CID; With A/c; W/2 Bbl Carb	**43103**
1977-1975	5.2L 318 CID; With A/c; W/2 Bbl Carb	**43103**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Gran Fury (cont'd)		
V8		
1977-1975	5.2L 318 CID; Without A/c; Without Air Pump	**43053**
1977-1972	5.9L 360 CID; With A/c; W/2 Bbl Carb	**43103**
1977-1972	5.9L 360 CID; Without A/c; Without Air Pump	**43053**
1977-1972	6.6L 400 CID	**33040**
1974-1972	5.2L 5212cc 318 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1972	5.2L 5212cc 318 CID; Without A/c; Without Air Pump	**43053**
1974-1972	5.9L 5899cc 360 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1972	5.9L 5899cc 360 CID; Without A/c; Without Air Pump	**43053**
1974-1972	5.9L 5900cc 360 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1972	5.9L 5900cc 360 CID; Without A/c; Without Air Pump	**43053**
1974-1972	6.6L 6555cc 400 CID	**33040**
1974-1972	6.6L 6556cc 400 CID	**33040**
1973-1972	5.2L 318 CID; With A/c; W/2 Bbl Carb	**43103**
1973-1972	5.2L 318 CID; Without A/c; Without Air Pump	**43053**
Grand Voyager		
L4		
1997	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
1996	2.4L 2429cc 148 CID; Hydraulic Tensioner; Driven off the timing belt	**23153**
1996	2.4L 2429cc 148 CID; Mechanical Tensioner; Driven off the timing belt	**23300**
1988	2.5L 2507cc 153 CID	**23110**
V6		
2000-1992	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
2000-1990	3.3L 3301cc 201 CID	**13126**
1999-1994	3.8L 230 CID	**13126**
1989-1988	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Horizon		
L4		
1990	2.2L 135 CID	**23127**
1989	2.2L 135 CID; VIN D	**23122**
1988-1985	2.2L 135 CID	**23110**
1986-1983	1.6L 1595cc 97 CID	**23113**
1983	1.6L 1597cc 98 CID	**23113**
1983-1981	2.2L 135 CID	**23110**
1983-1978	1.7L 105 CID	**23101**
Laser		
L4		
1994-1990	1.8L 1755cc 107 CID	**23108**
1994-1990	2.0L 1997cc 122 CID	**26212**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Neon		
L4		
2001-1995	2.0L 1996cc 122 CID; Driven off the timing belt	**23150**
PB100		
L6		
1980-1975	3.7L 3687cc 225 CID	**33100**
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1978	5.9L 360 CID	**43103**
1977-1976	5.9L 360 CID; With Air Pump	**43103**
1977-1976	5.9L 360 CID; Without Air Pump	**43053**
1977-1975	5.2L 5211cc 318 CID; With Air Pump	**43103**
1977-1975	5.2L 5211cc 318 CID; Without Air Pump	**43053**
PB100 Van		
L6		
1974	3.7L 3687cc 225 CID	**33100**
V8		
1974	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 318 CID; Without Air Pump	**43053**
1974	5.9L 360 CID; With Air Pump	**43103**
1974	5.9L 360 CID; Without Air Pump	**43053**
PB150		
L6		
1983-1981	3.7L 3687cc 225 CID	**33100**
V8		
1983	5.2L 5211cc 318 CID	**43103**
1981	5.2L 5211cc 318 CID	**43103**
PB200		
L6		
1980	3.7L 3687cc 225 CID	**33100**
1978-1975	3.7L 3687cc 225 CID	**33100**
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1980-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1978-1976	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; With Air Pump	**43103**
1977-1975	5.2L 5211cc 318 CID; Without Air Pump	**43053**
1977-1975	5.9L 360 CID; With Air Pump	**43103**
1977-1975	5.9L 360 CID; Without Air Pump	**43053**
PB200 Van		
L6		
1974	3.7L 3687cc 225 CID	**33100**
V8		
1974	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 318 CID; Without Air Pump	**43053**
1974	5.9L 360 CID; With Air Pump	**43103**
1974	5.9L 360 CID; Without Air Pump	**43053**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
PB250		
L6		
1983-1981	3.7L 3687cc 225 CID	**33100**
V8		
1983-1981	5.2L 5211cc 318 CID	**43103**
1981	5.9L 360 CID	**43103**
PB300		
V8		
1980-1978	5.2L 5211cc 318 CID	**43103**
1980-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1978-1976	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; With Air Pump	**43103**
1977-1975	5.2L 5211cc 318 CID; Without Air Pump	**43053**
1977-1975	5.9L 360 CID; With Air Pump	**43103**
1977-1975	5.9L 360 CID; Without Air Pump	**43053**
PB300 Van		
V8		
1974	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 318 CID; Without Air Pump	**43053**
1974	5.9L 360 CID; With Air Pump	**43103**
1974	5.9L 360 CID; Without Air Pump	**43053**
PB350		
V8		
1983-1981	5.2L 5211cc 318 CID	**43103**
1983-1981	5.9L 360 CID	**43103**
Prowler		
V6		
2001-1999	3.5L 3497cc 215 CID; Driven off the timing belt	**23162**
1997	3.5L 3497cc 215 CID; Driven off the timing belt	**13151**
Reliant		
L4		
1989	2.2L 135 CID	**23122**
1989	2.5L 2507cc 153 CID	**23122**
1988-1986	2.5L 2507cc 153 CID	**23110**
1988-1981	2.2L 135 CID	**23110**
1985-1981	2.6L 2555cc 156 CID	**23111**
Roadrunner		
V8		
1975	6.6L 400 CID	**33040**
1975-1974	5.9L 360 CID; With A/c; W/2 Bbl Carb	**43103**
1975-1974	5.9L 360 CID; Without A/c; Without Air Pump	**43053**
1975-1972	5.2L 318 CID; With A/c; W/2 Bbl Carb	**43103**
1975-1972	5.2L 318 CID; Without A/c; Without Air Pump	**43053**
1974	5.9L 5899cc 360 CID; With A/c; W/2 Bbl Carb	**43103**
1974	5.9L 5899cc 360 CID; Without A/c; Without Air Pump	**43053**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Roadrunner (cont'd)		
V8		
1974	5.9L 5900cc 360 CID; With A/c; W/2 Bbl Carb	**43103**
1974	5.9L 5900cc 360 CID; Without A/c; Without Air Pump	**43053**
1974-1972	6.6L 6555cc 400 CID	**33040**
1974-1972	6.6L 6556cc 400 CID	**33040**
1974-1970	5.2L 5212cc 318 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1970	5.2L 5212cc 318 CID; Without A/c; Without Air Pump	**43053**
1973	6.6L 400 CID	**33040**
1973-1971	5.6L 340 CID; With A/c; W/2 Bbl Carb	**43103**
1973-1971	5.6L 340 CID; Without A/c; Without Air Pump	**43053**
1973-1970	5.6L 5572cc 340 CID; With A/c; W/2 Bbl Carb	**43103**
1973-1970	5.6L 5572cc 340 CID; Without A/c; Without Air Pump	**43053**
1971-1968	6.3L 383 CID	**33040**
1971-1968	6.3L 6286cc 383 CID	**33040**
1971-1968	7.0L 426 CID	**33040**
1971-1968	7.0L 6981cc 426 CID	**33040**
1969	5.2L 5212cc 318 CID	**43919**
1969	5.6L 5572cc 340 CID	**43919**
1968	4.5L 273 CID; Without A/c	**43919**
1968	4.5L 4473cc 273 CID; Without A/c	**43919**
1968	5.2L 318 CID; Without A/c	**43919**
1968	5.2L 5212cc 318 CID; Without A/c	**43919**
1968	5.6L 5572cc 340 CID; Without A/c	**43919**
Sapporo		
L4		
1983-1978	2.6L 2555cc 156 CID	**23116**
1979-1978	1.6L 1597cc 98 CID	**33105**
Satellite		
L6		
1974-1965	3.7L 3687cc 225 CID	**33100**
1972-1971	3.7L 225 CID	**33100**
V8		
1974	5.9L 360 CID; With A/c; W/2 Bbl Carb	**43103**
1974	5.9L 360 CID; Without A/c; Without Air Pump	**43053**
1974	5.9L 5900cc 360 CID; With A/c; W/2 Bbl Carb	**43103**
1974	5.9L 5900cc 360 CID; Without A/c; Without Air Pump	**43053**
1974-1972	6.6L 400 CID	**33040**
1974-1972	6.6L 6555cc 400 CID	**33040**
1974-1972	6.6L 6556cc 400 CID	**33040**
1974-1971	5.9L 5899cc 360 CID; With A/c; W/2 Bbl Carb	**43103**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Satellite (cont'd)		
V8		
1974-1971	5.9L 5899cc 360 CID; Without A/c; Without Air Pump	**43053**
1974-1970	5.2L 318 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1970	5.2L 318 CID; Without A/c; Without Air Pump	**43053**
1974-1970	5.2L 5212cc 318 CID; With A/c; W/2 Bbl Carb	**43103**
1974-1970	5.2L 5212cc 318 CID; Without A/c; Without Air Pump	**43053**
1973-1970	5.6L 5572cc 340 CID; With A/c; W/2 Bbl Carb	**43103**
1973-1970	5.6L 5572cc 340 CID; Without A/c; Without Air Pump	**43053**
1972	5.6L 340 CID; With A/c; W/2 Bbl Carb	**43103**
1972	5.6L 340 CID; Without A/c; Without Air Pump	**43053**
1971-1968	6.3L 383 CID	**33040**
1971-1965	6.3L 6286cc 383 CID	**33040**
1969	5.2L 318 CID	**43919**
1969	5.2L 5212cc 318 CID	**43919**
1969	5.6L 5572cc 340 CID	**43919**
1968	4.5L 273 CID; Without A/c	**43919**
1968	5.2L 318 CID; Without A/c	**43919**
1968	5.6L 5572cc 340 CID; Without A/c	**43919**
1968-1967	4.5L 4473cc 273 CID; Without A/c	**43919**
1968-1967	5.2L 5212cc 318 CID; Without A/c	**43919**
1967	7.0L 6981cc 426 CID	**33040**
1966-1965	4.5L 4473cc 273 CID; Without A/c; With A/c	**43919**
1966-1965	5.2L 5212cc 318 CID; Without A/c; With A/c	**43919**
1966-1965	5.9L 5917cc 361 CID	**33040**
Scamp		
L4		
1983	2.2L 135 CID; FWD; Standard Cab Pickup	**23110**
L6		
1976-1971	3.7L 3687cc 225 CID; VIN C	**33100**
1971	3.7L 225 CID; VIN E	**33100**
Sundance		
L4		
1994-1990	2.2L 135 CID	**23127**
1994-1990	2.5L 2507cc 153 CID	**23127**
1988	2.5L 2507cc 153 CID	**23110**
1988-1987	2.2L 135 CID	**23110**
V6		
1994-1992	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
Trailduster		
L6		
1980-1975	3.7L 3687cc 225 CID	**33100**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Trailduster (cont'd)		
V8		
1981-1978	5.2L 5211cc 318 CID	**43103**
1981-1978	5.9L 360 CID	**43103**
1978-1976	6.6L 400 CID	**33040**
1978-1974	7.2L 440 CID	**33040**
1977-1975	5.2L 5211cc 318 CID; With Air Pump	**43103**
1977-1975	5.2L 5211cc 318 CID; Without Air Pump	**43053**
1977-1974	5.9L 360 CID; With Air Pump	**43103**
1977-1974	5.9L 360 CID; Without Air Pump	**43053**
1974	5.2L 318 CID; With Air Pump	**43103**
1974	5.2L 318 CID; Without Air Pump	**43053**
Turismo		
L4		
1985-1984	1.6L 1595cc 97 CID	**23113**
1983	1.6L 1597cc 98 CID	**23113**
Valiant		
L6		
1976-1961	3.7L 3687cc 225 CID	**33100**
1974-1970	3.2L 198 CID	**33100**
1974-1970	3.2L 3254cc 198 CID	**33100**
1972-1970	3.7L 225 CID	**33100**
1971-1960	2.8L 2786cc 170 CID	**33100**
1969-1968	2.8L 170 CID	**33100**
1966-1960	2.8L 170 CID	**33100**
V8		
1976	5.9L 360 CID; With A/c	**43103**
1976	5.9L 360 CID; Without A/c	**43053**
1976-1970	5.2L 318 CID; With A/c	**43103**
1976-1970	5.2L 318 CID; Without A/c	**43053**
1974-1971	5.9L 5899cc 360 CID; With A/c	**43103**
1974-1971	5.9L 5899cc 360 CID; Without A/c	**43053**
1974-1970	5.2L 5212cc 318 CID; With A/c	**43103**
1974-1970	5.2L 5212cc 318 CID; Without A/c	**43053**
1973-1970	5.6L 5572cc 340 CID; With A/c	**43103**
1973-1970	5.6L 5572cc 340 CID; Without A/c	**43053**
1969-1968	5.2L 318 CID; Without A/c	**43919**
1969-1968	5.2L 5212cc 318 CID; Without A/c	**43919**
1969-1968	5.6L 5572cc 340 CID; Without A/c	**43919**
1969-1964	4.5L 273 CID; Without A/c	**43919**
1969-1964	4.5L 4473cc 273 CID; Without A/c	**43919**
Volare		
L6		
1980-1977	3.7L 3687cc 225 CID; VIN D	**33100**
1980-1976	3.7L 3687cc 225 CID; VIN C	**33100**
V8		
1980-1976	5.2L 318 CID; With Air Pump; W/2 Bbl Carb	**43103**
1980-1976	5.9L 360 CID; W/4 Bbl Carb	**43103**

YEAR	VEHICLE DETAIL	PART NO.
Plymouth (cont'd)		
Volare (cont'd)		
V8		
1980-1976	5.9L 360 CID; With Air Pump; W/2 Bbl Carb	**43103**
1978-1976	5.2L 318 CID; Without Air Pump	**43053**
Voyager		
L4		
2000-1997	2.4L 2429cc 148 CID; Driven off the timing belt	**23300**
1996	2.4L 2429cc 148 CID; Hydraulic Tensioner; Driven off the timing belt	**23153**
1996	2.4L 2429cc 148 CID; Mechanical Tensioner; Driven off the timing belt	**23300**
1995-1990	2.5L 2507cc 153 CID; Naturally Aspirated	**23127**
1990	2.5L 2507cc 153 CID; Turbocharged	**23127**
1989	2.5L 2507cc 153 CID; Naturally Aspirated	**23122**
1989	2.5L 2507cc 153 CID; Turbocharged	**23122**
1988-1987	2.5L 2507cc 153 CID	**23110**
1987-1984	2.2L 135 CID	**23110**
V6		
2000-1991	3.3L 3301cc 201 CID	**13126**
2000-1987	3.0L 2972cc 181 CID; Driven off the timing belt	**23121**
1999-1997	3.8L 230 CID	**13126**
Pontiac		
6000		
L4		
1991-1987	2.5L 2474cc 151 CID	**31041**
1986-1982	2.5L 2474cc 151 CID	**21000**
1986-1982	2.5L 2474cc 151 CID; With Universal Triple Groove Pulley	**31000**
V6		
1991-1988	3.1L 189 CID	**11033**
1989-1987	2.8L 173 CID	**11033**
1986-1982	2.8L 173 CID	**31001**
Acadian		
L4		
1987-1976	1.6L 1606cc 98 CID	**31004**
1986-1981	1.8L 1819cc 110 CID	**31004**
1977-1976	1.4L 1393cc 85 CID	**31004**
Astre		
L4		
1977	2.5L 2474cc 151 CID	**21107**
Aztek		
V6		
2005-2001	3.4L 207 CID	**11033**
Bonneville		
V6		
2005-1996	3.8L 3800cc 231 CID	**21075**
1995-1987	3.8L 3800cc 231 CID	**21050**
1986	4.3L 262 CID; VIN Z	**41121**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Bonneville (cont'd)		
V6		
1986-1980	3.8L 3800cc 231 CID	**31018**
1982	4.1L 252 CID	**31018**
V8		
2005-2004	4.6L 281 CID; Special Tool Required	**11072**
1986-1983	5.0L 305 CID; VIN H	**41121**
1984-1983	5.7L 350 CID; DIESEL; VIN N	**41120**
1982-1980	5.7L 350 CID; With A/c	**41120**
1982-1980	5.7L 350 CID; Without A/c	**41100**
1981	5.0L 307 CID; With A/c	**41120**
1981	5.0L 307 CID; Without A/c	**41100**
1980-1978	4.9L 301 CID; VIN W	**41975**
1979-1978	5.7L 350 CID; VIN X	**31018**
1979-1977	4.9L 301 CID; VIN Y	**41975**
1979-1977	5.7L 350 CID; VIN R; With A/c	**41120**
1979-1977	5.7L 350 CID; VIN R; Without A/c	**41100**
1979-1977	6.6L 403 CID; VIN K; With A/c	**41120**
1979-1977	6.6L 403 CID; VIN K; Without A/c	**41100**
1978-1976	6.6L 400 CID; VIN Z	**41975**
1977	5.7L 350 CID; VIN P	**41975**
1976-1974	7.5L 455 CID; VIN W	**41975**
1974	6.6L 6555cc 400 CID; VIN P	**41975**
1974	7.5L 455 CID; VIN Y	**41975**
1974	7.5L 7456cc 455 CID; VIN W	**41975**
1974	7.5L 7456cc 455 CID; VIN Y	**41975**
1974	7.5L 7457cc 455 CID; VIN W	**41975**
1973	7.5L 7457cc 455 CID	**41975**
1973-1972	5.7L 5737cc 350 CID	**41975**
1973-1972	6.6L 6556cc 400 CID	**41975**
1973-1970	5.7L 5733cc 350 CID	**41975**
1973-1970	6.6L 400 CID	**41975**
1973-1970	6.6L 6555cc 400 CID	**41975**
1973-1970	7.5L 455 CID	**41975**
1973-1970	7.5L 7456cc 455 CID	**41975**
1970	5.7L 350 CID	**41975**
Catalina		
L6		
1979-1977	4.1L 250 CID; Sold in Canada; VIN D	**21107**
V6		
1981-1980	3.8L 3800cc 231 CID	**31018**
1980	3.8L 229 CID	**31018**
V8		
1981	5.0L 307 CID; GAS; VIN Y; With A/c	**41120**
1981	5.0L 307 CID; Without A/c	**41100**
1981	5.7L 350 CID; DIESEL; VIN N; With A/c	**41120**
1981-1980	5.7L 350 CID; Without A/c	**41100**
1980	5.7L 350 CID; With A/c	**41120**
1980-1979	4.9L 301 CID; VIN W	**41975**
1979-1978	5.7L 350 CID; VIN X	**31018**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Catalina (cont'd)		
V8		
1979-1977	4.9L 301 CID; VIN Y	**41975**
1979-1977	5.7L 350 CID; VIN R; With A/c	**41120**
1979-1977	5.7L 350 CID; VIN R; Without A/c	**41100**
1979-1977	6.6L 403 CID; VIN K; With A/c	**41120**
1979-1977	6.6L 403 CID; VIN K; Without A/c	**41100**
1978-1976	6.6L 400 CID; VIN Z	**41975**
1977	5.7L 350 CID; VIN P	**41975**
1976-1974	7.5L 455 CID; VIN W	**41975**
1974	6.6L 6555cc 400 CID; VIN P	**41975**
1974	7.5L 455 CID; VIN Y	**41975**
1974	7.5L 7456cc 455 CID; VIN W	**41975**
1974	7.5L 7456cc 455 CID; VIN Y	**41975**
1974	7.5L 7457cc 455 CID; VIN W	**41975**
1973-1972	5.7L 5737cc 350 CID	**41975**
1973-1972	6.6L 6556cc 400 CID	**41975**
1973-1972	7.5L 7457cc 455 CID	**41975**
1973-1970	5.7L 350 CID	**41975**
1973-1970	5.7L 5733cc 350 CID	**41975**
1973-1970	6.6L 400 CID	**41975**
1973-1970	6.6L 6555cc 400 CID	**41975**
1973-1970	7.5L 455 CID	**41975**
1973-1970	7.5L 7456cc 455 CID	**41975**
Fiero		
L4		
1988-1984	2.5L 2474cc 151 CID	**21000**
V6		
1988-1985	2.8L 173 CID	**31001**
Firebird		
L4		
1986-1985	2.5L 2474cc 151 CID	**31022**
1984-1982	2.5L 2474cc 151 CID; VIN 2	**21107**
1983-1982	2.5L 2474cc 151 CID; VIN F	**21107**
L6		
1976-1975	4.1L 250 CID; VIN D	**21107**
1974-1970	4.1L 250 CID; Without A/c	**21895**
1974-1970	4.1L 4097cc 250 CID; Without A/c	**21895**
1974-1970	4.1L 4098cc 250 CID; Without A/c	**21895**
V6		
2002-1996	3.8L 3800cc 231 CID	**21075**
1995	3.8L 3800cc 231 CID	**21050**
1995-1993	3.4L 207 CID	**31070**
1992-1990	3.1L 189 CID	**31037**
1989	3.8L 3800cc 231 CID	**31018**
1989-1987	2.8L 173 CID	**31018**
1989-1987	2.8L 173 CID	**31037**
1986-1985	2.8L 173 CID	**31001**
1984-1982	2.8L 173 CID	**41006**
1981-1978	3.8L 3800cc 231 CID	**31018**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Firebird (cont'd)		
V6		
1977	3.8L 231 CID	**31018**
V8		
2002-1998	5.7L 350 CID; GAS	**71615**
1997-1993	5.7L 350 CID	**41068**
1992-1988	5.0L 305 CID	**41049**
1992-1988	5.7L 350 CID	**41049**
1987	5.7L 350 CID	**41121**
1987-1977	5.0L 305 CID	**41121**
1981	4.4L 267 CID; VIN J	**41121**
1981-1980	4.3L 265 CID; Naturally Aspirated	**41975**
1981-1980	4.9L 301 CID; Naturally Aspirated	**41975**
1981-1980	4.9L 301 CID; Turbocharged	**41975**
1981-1979	4.9L 301 CID; Naturally Aspirated; VIN W	**41975**
1979	4.9L 301 CID; Naturally Aspirated; VIN Y	**41975**
1979-1978	5.7L 350 CID	**41121**
1979-1977	6.6L 403 CID; With A/c	**41120**
1979-1977	6.6L 403 CID; Without A/c	**41100**
1977	4.9L 301 CID; Naturally Aspirated; VIN Y	**41975**
1977	5.7L 350 CID; VIN P	**41975**
1977	5.7L 350 CID; With A/c	**41120**
1977	5.7L 350 CID; Without A/c	**41100**
1976-1971	7.5L 455 CID	**41975**
1976-1970	5.7L 350 CID	**41975**
1976-1970	6.6L 400 CID	**41975**
1974-1972	5.7L 5737cc 350 CID	**41975**
1974-1970	5.7L 5733cc 350 CID	**41975**
1974-1970	6.6L 6555cc 400 CID	**41975**
1974-1970	7.5L 7456cc 455 CID	**41975**
Firefly		
L3		
2000-1994	1.0L 993cc 61 CID; Sold in Canada; VIN 6	**11058**
1991-1989	1.0L 993cc 61 CID; Sold in Canada; VIN 2	**11058**
1991-1989	1.0L 993cc 61 CID; Sold in Canada; VIN 6	**11058**
1988-1987	1.0L 993cc 61 CID; Sold in Canada; VIN 2	**11029**
1988-1985	1.0L 993cc 61 CID; Sold in Canada; VIN 5	**11029**
L4		
2000-1998	1.3L 1295cc 79 CID; VIN 2	**11058**
1997-1994	1.3L 1295cc 79 CID; VIN 9	**11058**
G3		
L4		
2010-2009	1.6L 1598cc 98 CID	**11184**
G3 Wave		
L4		
2009	1.6L 1598cc 98 CID; Sold in Canada	**11184**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
G5		
L4		
2010-2007	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
2008	2.4L 145 CID; Pump is driven off the timing chain	**21092**
2008-2007	2.4L 2394cc 146 CID; Pump is driven off the timing chain	**21092**
2007	2.4L 2384cc 145 CID; Pump is driven off the timing chain	**21092**
G6		
L4		
2010-2006	2.4L 2384cc 145 CID; Pump is driven off the timing chain	**21092**
V6		
2010-2007	3.5L 3490cc 213 CID	**11006**
2009-2007	3.6L 217 CID	**11103**
2009-2006	3.9L 3880cc 237 CID	**11006**
2006	3.5L 214 CID	**11033**
2006-2005	3.5L 3498cc 213 CID	**11033**
2005	3.5L 211 CID	**11033**
G8		
V6		
2009-2008	3.6L 217 CID	**11103**
V8		
2009	6.2L 376 CID	**71619**
2009-2008	6.0L 5967cc 364 CID	**71618**
GTO		
V8		
2006-2005	6.0L 5967cc 364 CID; VIN U	**71615**
2004	5.7L 350 CID	**71615**
1973-1971	7.5L 7456cc 455 CID	**41975**
1973-1969	6.6L 6555cc 400 CID	**41975**
Grand Am		
L4		
2005-2002	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
2001-1996	2.4L 2392cc 146 CID; Pump is driven off the timing chain	**21076**
1991-1985	2.5L 2474cc 151 CID	**21067**
1989-1987	2.0L 122 CID; Turbocharged	**11036**
V6		
2005-1999	3.4L 207 CID	**11033**
1998-1994	3.1L 189 CID	**11033**
1993-1992	3.3L 204 CID	**21050**
1987-1985	3.0L 181 CID	**21050**
V8		
1980-1978	4.9L 301 CID	**41975**
1980-1978	5.0L 305 CID	**41121**
Grand LeMans		
L6		
1977-1975	4.1L 250 CID	**21107**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Grand LeMans (cont'd)		
V6		
1983-1982	3.8L 231 CID; Sold in Canada; VIN A	**31018**
1982	4.1L 252 CID; Sold in Canada; VIN 4	**31018**
1981-1980	3.8L 229 CID	**31018**
1981-1978	3.8L 3800cc 231 CID	**31018**
1979	3.8L 231 CID	**31018**
1979-1978	3.3L 200 CID; Sold in Canada	**41121**
1977	3.8L 231 CID	**31018**
V8		
1983-1982	5.7L 350 CID; DIESEL; Sold in Canada; With A/c	**41120**
1983-1982	5.7L 350 CID; DIESEL; Sold in Canada; Without A/c	**41100**
1982-1981	4.4L 267 CID; Sold in Canada; VIN J	**41121**
1981-1980	4.3L 265 CID; VIN S	**41975**
1981-1979	4.9L 301 CID	**41975**
1980-1979	5.0L 305 CID; VIN H	**41121**
1979-1977	5.7L 350 CID; VIN L	**41121**
1977	4.9L 301 CID	**41975**
1977	5.7L 350 CID; VIN P	**41975**
1977	5.7L 350 CID; VIN R; With A/c	**41120**
1977	5.7L 350 CID; VIN R; Without A/c	**41100**
1977	6.6L 400 CID; VIN Z	**41975**
1977	6.6L 403 CID; VIN K; With A/c	**41120**
1977	6.6L 403 CID; VIN K; Without A/c	**41100**
1976	4.3L 260 CID; With A/c	**41120**
1976	4.3L 260 CID; Without A/c	**41100**
1976-1975	5.7L 350 CID	**41975**
1976-1975	6.6L 400 CID	**41975**
1976-1975	7.5L 455 CID	**41975**
Grand Prix		
L4		
1991-1990	2.3L 138 CID	**11043**
V6		
2008-1997	3.8L 3800cc 231 CID	**21075**
2003-1989	3.1L 189 CID	**11033**
2001-1997	3.8L 3791cc 231 CID	**21075**
1997	3.1L 3136cc 191 CID	**11033**
1996	3.4L 207 CID	**11145**
1996-1991	3.4L 207 CID	**11033**
1989-1988	2.8L 173 CID	**11033**
1987-1986	3.8L 3800cc 231 CID; VIN A	**31018**
1987-1986	4.3L 262 CID	**41121**
1985-1978	3.8L 3800cc 231 CID	**31018**
1982	4.1L 252 CID	**31018**
1979	3.8L 231 CID	**31018**
V8		
1987-1983	5.0L 305 CID	**41121**
1984-1981	5.7L 350 CID; DIESEL; With A/c	**41121**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Grand Prix (cont'd)		
V8		
1982	5.7L 350 CID; DIESEL; Without A/c; 2nd Design	**41120**
1982-1981	5.7L 350 CID; Without A/c; 1st Design	**41100**
1981-1980	4.3L 265 CID	**41975**
1980-1978	5.0L 305 CID	**41121**
1980-1977	4.9L 301 CID	**41975**
1977	5.7L 350 CID; VIN P	**41975**
1977	5.7L 350 CID; VIN R; With A/c	**41120**
1977	5.7L 350 CID; VIN R; Without A/c	**41100**
1977	6.6L 400 CID; VIN Z	**41975**
1977	6.6L 403 CID; VIN K; With A/c	**41120**
1977	6.6L 403 CID; VIN K; Without A/c	**41100**
1976	5.7L 350 CID	**41975**
1976-1970	7.5L 455 CID	**41975**
1976-1969	6.6L 400 CID	**41975**
1974-1972	5.7L 5733cc 350 CID	**41975**
1974-1972	5.7L 5737cc 350 CID	**41975**
1974-1972	6.6L 6556cc 400 CID	**41975**
1974-1970	7.5L 7456cc 455 CID	**41975**
1974-1969	6.6L 6555cc 400 CID	**41975**
1973	7.5L 7457cc 455 CID	**41975**
1970	5.7L 5733cc 350 CID	**41975**
1969	7.0L 428 CID	**41975**
1969	7.0L 7014cc 428 CID	**41975**
Grand Safari		
V8		
1977	4.9L 301 CID	**41975**
1977	5.7L 350 CID; VIN R; With A/c	**41120**
1977	5.7L 350 CID; VIN R; Without A/c	**41100**
1977	6.6L 400 CID; VIN Z	**41975**
1977	6.6L 403 CID; VIN K; With A/c	**41120**
1977	6.6L 403 CID; VIN K; Without A/c	**41100**
1976-1973	6.6L 400 CID	**41975**
1976-1971	7.5L 455 CID	**41975**
1974-1973	5.7L 5737cc 350 CID	**41975**
1974-1973	6.6L 6556cc 400 CID	**41975**
1974-1972	7.5L 7457cc 455 CID	**41975**
1974-1971	5.7L 5733cc 350 CID	**41975**
1974-1971	6.6L 6555cc 400 CID	**41975**
1974-1971	7.5L 7456cc 455 CID	**41975**
1971	6.6L 400 CID	**41975**
Grandville		
V8		
1975	6.6L 400 CID	**41975**
1975-1972	7.5L 455 CID	**41975**
1973	6.6L 6555cc 400 CID	**41975**
1971	7.5L 7456cc 455 CID	**41975**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
J2000		
L4		
1986	1.8L 112 CID	**11017**
1983	2.0L 122 CID	**21007**
1983-1982	1.8L 112 CID	**11017**
J2000 Sunbird		
L4		
1985-1984	1.8L 112 CID	**11017**
1985-1984	2.0L 122 CID	**21007**
Laurentian		
L6		
1979-1977	4.1L 250 CID; Sold in Canada; VIN D	**21107**
V6		
1981	3.8L 231 CID; Sold in Canada	**31018**
1980	3.8L 229 CID; Sold in Canada	**41121**
V8		
1981	4.3L 265 CID; VIN S	**41975**
1981	5.0L 307 CID; GAS; Sold in Canada; VIN Y; With A/c	**41121**
1981	5.0L 307 CID; GAS; Sold in Canada; VIN Y; Without A/c	**41100**
1981-1980	4.4L 267 CID; VIN J	**41121**
1976	6.6L 400 CID; Sold in Canada; VIN N	**41975**
1976	6.6L 400 CID; Sold in Canada; VIN S	**41975**
1976	7.5L 455 CID; Sold in Canada; VIN W	**41975**
LeMans		
L4		
1993-1988	1.6L 1588cc 98 CID; Sold in United States	**11045**
1990	2.0L 122 CID; VIN K	**11017**
1989	2.0L 122 CID	**11036**
L6		
1977-1975	4.1L 250 CID	**21107**
1974-1970	4.1L 250 CID	**21895**
1974-1970	4.1L 4097cc 250 CID	**21895**
1974-1970	4.1L 4098cc 250 CID	**21895**
V6		
1981-1980	3.8L 229 CID	**31018**
1981-1978	3.8L 3800cc 231 CID	**31018**
1979	3.8L 231 CID	**31018**
1979-1978	3.3L 200 CID; Sold in Canada	**41121**
1977	3.8L 231 CID	**31018**
V8		
1981	4.4L 267 CID; Sold in Canada; VIN J	**41121**
1981-1980	4.3L 265 CID; VIN S	**41975**
1981-1979	4.9L 301 CID	**41975**
1980-1979	5.0L 305 CID; VIN H	**41121**
1979-1977	5.7L 350 CID; VIN L	**41121**
1977	4.9L 301 CID	**41975**
1977	5.7L 350 CID; VIN P	**41975**
1977	5.7L 350 CID; VIN R; With A/c	**41120**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
LeMans (cont'd)		
V8		
1977	5.7L 350 CID; VIN R; Without A/c	**41100**
1977	6.6L 400 CID; VIN Z	**41975**
1977	6.6L 403 CID; VIN K; With A/c	**41120**
1977	6.6L 403 CID; VIN K; Without A/c	**41100**
1976	4.3L 260 CID; With A/c	**41120**
1976	4.3L 260 CID; Without A/c	**41100**
1976	7.5L 455 CID	**41975**
1976-1971	5.7L 350 CID	**41975**
1976-1971	6.6L 400 CID	**41975**
1974	6.6L 6556cc 400 CID	**41975**
1974-1972	5.7L 5737cc 350 CID	**41975**
1974-1971	5.7L 5733cc 350 CID	**41975**
1974-1971	6.6L 6555cc 400 CID	**41975**
1974-1971	7.5L 455 CID	**41975**
1974-1971	7.5L 7456cc 455 CID	**41975**
1973-1972	7.5L 7457cc 455 CID	**41975**
1972	6.6L 6556cc 400 CID	**41975**
Matiz		
L4		
2009-2008	1.0L 995cc 61 CID; Sold in Mexico	**16503**
2006-2004	1.0L 995cc 61 CID; Sold in Mexico	**16503**
Montana		
V6		
2009-2007	3.9L 3880cc 237 CID; Sold in Canada	**11006**
2006	3.9L 3880cc 237 CID	**11006**
2006-2005	3.5L 213 CID	**11033**
2005-1999	3.4L 207 CID	**11033**
Optima		
L4		
1991	1.6L 1606cc 98 CID; Sold in Canada; Driven off the timing belt	**11057**
1990-1988	1.6L 1606cc 98 CID; Sold in Canada	**11045**
1990-1988	2.0L 122 CID; VIN K	**11036**
Parisienne		
L6		
1979-1977	4.1L 250 CID; Sold in Canada	**21107**
V6		
1986-1985	4.3L 262 CID; VIN Z	**41121**
1985	3.8L 231 CID; Sold in Canada; VIN A	**31018**
1984	3.8L 3800cc 231 CID; Sold in Canada; VIN A	**31018**
1984	3.8L 3800cc 231 CID; Sold in United States; VIN A	**31018**
1983	3.8L 231 CID	**41121**
1983-1981	3.8L 231 CID; Sold in Canada; VIN A	**31018**
1980	3.8L 229 CID; Sold in Canada; VIN K	**41121**
V8		
1986	5.0L 307 CID; VIN Y	**41120**
1986-1983	5.0L 305 CID; VIN H	**41121**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Parisienne (cont'd)		
V8		
1985-1984	5.7L 350 CID; Sold in Canada	**41121**
1985-1984	5.7L 350 CID; Sold in United States	**41121**
1985-1983	5.7L 350 CID; DIESEL; VIN N	**41120**
1982-1980	4.4L 267 CID; Sold in Canada; VIN J	**41121**
1982-1980	5.7L 350 CID; DIESEL; VIN N; With A/c	**41120**
1982-1980	5.7L 350 CID; DIESEL; VIN N; Without A/c	**41100**
1981	4.3L 265 CID; Sold in Canada; VIN S	**41975**
1981	5.0L 307 CID; GAS; VIN Y; With A/c	**41120**
1981	5.0L 307 CID; GAS; VIN Y; Without A/c	**41100**
1980	5.7L 350 CID; GAS; VIN X; With A/c	**41120**
1980	5.7L 350 CID; GAS; VIN X; Without A/c	**41100**
1979-1978	5.7L 350 CID; GAS; VIN L; With A/c	**41120**
1979-1978	5.7L 350 CID; GAS; VIN L; Without A/c	**41100**
1977	5.7L 350 CID; GAS; VIN P; With A/c	**41120**
1977	5.7L 350 CID; GAS; VIN P; Without A/c	**41100**
1976	5.7L 350 CID; GAS; VIN L; With A/c	**41120**
1976	5.7L 350 CID; GAS; VIN L; Without A/c	**41100**
1976	5.7L 350 CID; GAS; VIN V; With A/c	**41120**
1976	5.7L 350 CID; GAS; VIN V; Without A/c	**41100**
1976	6.6L 400 CID; Sold in Canada; VIN N	**41975**
1976	6.6L 400 CID; Sold in Canada; VIN S	**41975**
1976	7.5L 455 CID; Sold in Canada; VIN W	**41975**
Phoenix		
L4		
1984-1982	2.5L 2474cc 151 CID; VIN R; With Pressed On Pulley	**21000**
1984-1982	2.5L 2474cc 151 CID; VIN R; With Universal Triple Groove Pulley	**31000**
1983-1982	2.5L 2474cc 151 CID; VIN 5; With Pressed On Pulley	**21000**
1983-1982	2.5L 2474cc 151 CID; VIN 5; With Universal Triple Groove Pulley	**31000**
1981-1980	2.5L 2474cc 151 CID; With Pressed On Pulley	**21000**
1981-1980	2.5L 2474cc 151 CID; With Universal Triple Groove Pulley	**31000**
V6		
1984-1980	2.8L 173 CID	**31001**
1979-1978	3.8L 3800cc 231 CID	**31018**
1977	3.8L 231 CID	**31018**
V8		
1979-1978	5.7L 350 CID	**41121**
1979-1977	5.0L 305 CID	**41121**
1977	5.7L 350 CID; VIN R; With A/c	**41120**
1977	5.7L 350 CID; VIN R; Without A/c	**41100**
Pursuit		
L4		
2006	2.4L 2384cc 145 CID; Sold in Canada; VIN B; Pump is driven off the timing chain	**21092**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Pursuit (cont'd)		
L4		
2006-2005	2.2L 2198cc 134 CID; Sold in Canada; VIN F; Pump is driven off the timing chain	**21092**
Safari		
V8		
1989-1987	5.0L 307 CID; GAS; VIN Y	**41120**
1976	6.6L 400 CID; VIN Z	**41975**
1976	7.5L 455 CID; VIN W	**41975**
1970	5.7L 350 CID	**41975**
1970	5.7L 5733cc 350 CID	**41975**
1970	6.6L 400 CID	**41975**
1970	6.6L 6555cc 400 CID	**41975**
1970	7.5L 7456cc 455 CID	**41975**
Solstice		
L4		
2009-2007	2.0L 1998cc 122 CID; VIN X; Pump is driven off the timing chain	**21092**
2009-2006	2.4L 2384cc 145 CID; Pump is driven off the timing chain	**21092**
2008	2.4L 145 CID; Pump is driven off the timing chain	**21092**
Sunbird		
L4		
1994-1990	2.0L 122 CID	**11017**
1989-1987	2.0L 122 CID	**11036**
1986	1.8L 112 CID	**11017**
1986	2.0L 122 CID	**21007**
1980-1977	2.5L 2474cc 151 CID	**21107**
V6		
1994-1991	3.1L 189 CID	**11033**
1980-1977	3.8L 3800cc 231 CID	**31018**
1977-1976	3.8L 231 CID	**31018**
Sunburst		
L4		
1988-1987	1.5L 1471cc 92 CID; Sold in Canada; VIN 9; Driven off the timing belt	**11031**
1988-1986	1.5L 1471cc 92 CID; Sold in Canada; VIN 7; Driven off the timing belt	**11031**
1985	1.5L 1471cc 92 CID; Sold in Canada; VIN K; Driven off the timing belt	**11031**
Sunfire		
L4		
2005-2002	2.2L 2198cc 134 CID; DOHC; Pump is driven off the timing chain	**21092**
2002-1996	2.4L 2392cc 146 CID; VIN T; Pump is driven off the timing chain	**21076**
2002-1995	2.2L 2190cc 134 CID; VIN 4	**11032**
1995	2.3L 138 CID	**11043**
Sunrunner		
L4		
1997-1995	1.6L 1588cc 98 CID; Sold in Canada; VIN 6	**11048**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Sunrunner (cont'd)		
L4		
1994	1.6L 1588cc 98 CID; Sold in Canada; VIN U	**11048**
T1000		
L4		
1987-1981	1.6L 98 CID	**31004**
Tempest		
L4		
1989	2.0L 122 CID	**11036**
L6		
1970	4.1L 4097cc 250 CID	**21895**
1970	4.1L 4098cc 250 CID	**21895**
V6		
1991-1990	3.1L 189 CID; Sold in Canada	**11033**
Torrent		
V6		
2009-2008	3.6L 217 CID; VIN 7	**11103**
2009-2006	3.4L 207 CID	**11145**
2008-2006	3.4L 3350cc 204 CID	**11145**
Trans Sport		
V6		
1998-1996	3.4L 207 CID	**11033**
1995-1992	3.8L 3800cc 231 CID	**21050**
1995-1990	3.1L 189 CID	**11033**
Ventura		
L6		
1976-1975	4.1L 250 CID; VIN D	**21107**
1974-1971	4.1L 250 CID; Without A/c	**21895**
V8		
1977	4.9L 301 CID; VIN Y	**41975**
1977	5.0L 305 CID	**41121**
1977	5.7L 350 CID; VIN R; With A/c	**41120**
1977	5.7L 350 CID; VIN R; Without A/c	**41100**
1976-1975	4.3L 260 CID; With A/c	**41120**
1976-1975	5.7L 350 CID	**31018**
1975	4.3L 260 CID; Without A/c	**41100**
1974-1972	5.7L 5737cc 350 CID	**41975**
1974-1971	5.7L 5733cc 350 CID	**41975**
1973-1972	5.0L 307 CID	**41109**
1973-1971	5.0L 5031cc 307 CID	**41109**
Vibe		
L4		
2010-2009	1.8L 1798cc	**25232**
2010-2009	2.4L 2362cc	**15414**
2008-2003	1.8L 1794cc; VIN 8	**15376**
2006-2003	1.8L 1795cc; VIN L	**15405**
Wave		
L4		
2008-2005	1.6L 1598cc 98 CID; Sold in Canada	**11003**

YEAR	VEHICLE DETAIL	PART NO.
Pontiac (cont'd)		
Wave5		
L4		
2007-2005	1.6L 1598cc 98 CID	**11003**
Porsche		
924		
L4		
1982-1977	2.0L 1983cc	**28177**
Cayenne		
V6		
2006-2004	3.2L 3189cc 195 CID	**18471**
Ram		
1500		
V6		
2012-2011	3.7L 226 CID	**43163**
V8		
2013-2011	4.7L 285 CID	**43163**
2013-2011	5.7L 345 CID	**63341**
2500		
L6		
2013-2011	6.7L 408 CID	**23222**
V8		
2013-2011	5.7L 345 CID	**63341**
3500		
L6		
2013-2011	6.7L 408 CID	**23222**
V8		
2013-2011	5.7L 345 CID	**63341**
4500		
L6		
2013-2011	6.7L 408 CID	**23222**
5500		
L6		
2013-2011	6.7L 408 CID	**23222**
C/V		
V6		
2012	3.6L 3604cc 220 CID	**43369**
Dakota		
V6		
2011	3.7L 226 CID	**43163**
2011	3.7L 3701cc 226 CID	**43163**
V8		
2011	4.7L 285 CID	**43163**
Renault		
Alliance		
L4		
1987	2.0L 1965cc 120 CID; F3R Desig.; VIN V	**13408**
1986-1985	1.7L 105 CID	**13408**
Clio		
L4		
2008-2002	1.6L 1598cc 98 CID; Sold in Mexico	**26800**
2005-2002	2.0L 1998cc 122 CID	**13408**

YEAR	VEHICLE DETAIL	PART NO.
Renault (cont'd)		
Encore		
L4		
1986-1985	1.7L 105 CID	**13408**
Fuego		
L4		
1985-1984	2.2L 2152cc 131 CID; FI; VIN F	**23410**
1984	1.6L 1565cc; FI; VIN C	**23410**
Kangoo Express		
L4		
2008-2004	1.6L 1598cc 98 CID	**26800**
Megane		
L4		
2009-2004	2.0L 1998cc 122 CID; F4R Desig.; Power Steering; Sold in Mexico	**99668**
2005-2002	2.0L 1998cc 122 CID; Sold in Mexico	**13408**
R12		
L4		
1977-1975	1.6L 1647cc 100 CID; 8 Valve	**99001**
1974-1973	1.6L 1647cc 101 CID; 8 Valve	**99001**
1972-1971	1.6L 1565cc 96 CID; 8 Valve	**99001**
R15		
L4		
1976-1975	1.6L 1647cc 100 CID; 8 Valve	**99001**
1974-1972	1.6L 1647cc 101 CID; 8 Valve	**99001**
1972	1.6L 1565cc 96 CID; 8 Valve	**99001**
R18i		
L4		
1986-1984	2.2L 2152cc 131 CID; VIN F	**23410**
Scenic		
L4		
2004-2003	2.0L 1998cc 122 CID	**13408**
Saab		
9-2X		
H4		
2006	2.5L 2458cc; Turbocharged; With 2 Hose Connections	**36215**
2006-2005	2.5L 2458cc; Naturally Aspirated; With 1 Hose Connection	**26223**
9-3		
L4		
2011-2003	2.0L 1985cc; Pump is driven off the timing chain	**21092**
2003	2.0L 1985cc; Belt Driven	**28307**
2002-2000	2.3L 2290cc 140 CID	**28307**
2002-1999	2.0L 1985cc	**28307**
V6		
2009-2006	2.8L 2792cc 170 CID	**11103**
9-3X		
L4		
2011-2010	2.0L 1985cc; VIN Y; Pump is driven off the timing chain	**21092**

YEAR	VEHICLE DETAIL	PART NO.
Saab (cont'd)		
9-4X		
V6		
2011	2.8L 2792cc 170 CID	**11103**
2011	3.0L 182 CID	**11103**
9-5		
L4		
2009-1999	2.3L 2290cc 140 CID	**28307**
V6		
2011-2010	2.8L 2792cc 170 CID; Turbocharged	**11103**
2003-1999	3.0L 2961cc 181 CID	**21079**
2002	3.0L 2962cc 181 CID	**21079**
9-7x		
L6		
2009-2005	4.2L 256 CID; VIN S	**21097**
V8		
2009-2008	6.0L 364 CID; VIN H	**71617**
2009-2007	5.3L 325 CID; VIN M	**71617**
2006	5.3L 325 CID	**71616**
2005	5.3L 323 CID	**71616**
900		
L4		
1998-1994	2.0L 1985cc	**28307**
1998-1994	2.3L 2290cc 140 CID	**28307**
1993-1991	2.1L 2119cc; VIN E	**28108**
1993-1981	2.0L 1985cc; Turbocharged	**28108**
1990-1981	2.0L 1985cc; Naturally Aspirated	**28108**
1980-1979	2.0L 1985cc; With 12 Cogs for Idler Shaft	**28157**
V6		
1997-1994	2.5L 2498cc; VIN V	**21079**
9000		
L4		
1998-1991	2.3L 2290cc; Turbocharged	**38264**
1994-1990	2.3L 2290cc 140 CID; Naturally Aspirated	**38264**
1990-1987	2.0L 1985cc; Naturally Aspirated	**28107**
1990-1986	2.0L 1985cc; Turbocharged	**28107**
V6		
1997-1995	3.0L 2961cc 181 CID	**21079**
99		
L4		
1980-1977	2.0L 1985cc; With 12 Cogs for Idler Shaft	**28157**
Saturn		
Astra		
L4		
2009-2008	1.8L 1796cc 110 CID	**11184**
Aura		
L4		
2009-2007	2.4L 145 CID; VIN 5; Pump is driven off the timing chain	**21092**

YEAR	VEHICLE DETAIL	PART NO.
Saturn (cont'd)		
Aura (cont'd)		
V6		
2009-2007	3.6L 217 CID	**11103**
2008-2007	3.5L 3490cc 213 CID	**11006**
Ion		
L4		
2007-2006	2.4L 2384cc 145 CID; Pump is driven off the timing chain	**21092**
2007-2004	2.0L 122 CID; Pump is driven off the timing chain	**21092**
2007-2003	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
L100		
L4		
2002-2001	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
L200		
L4		
2003-2001	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
L300		
L4		
2004	2.2L 2198cc 134 CID; 1; Pump is driven off the timing chain	**21092**
V6		
2005	3.0L 3000cc 181 CID	**21079**
2004	3.0L 3000cc 181 CID; 2	**21079**
2003-2001	3.0L 3000cc 181 CID	**21079**
LS		
L4		
2000	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
LS1		
L4		
2000	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
LS2		
V6		
2000	3.0L 3000cc 181 CID	**21079**
LW1		
L4		
2000	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
LW2		
V6		
2000	3.0L 3000cc 181 CID	**21079**
LW200		
L4		
2003-2001	2.2L 2198cc 134 CID; Pump is driven off the timing chain	**21092**
LW300		
V6		
2003-2001	3.0L 3000cc 181 CID	**21079**

YEAR	VEHICLE DETAIL	PART NO.
Saturn (cont'd)		
Outlook		
V6		
2010-2009	3.6L 217 CID; VIN D	**11103**
2008-2007	3.6L 217 CID; VIN 7	**11103**
Relay		
V6		
2007-2006	3.9L 3880cc 237 CID	**11006**
2006-2005	3.5L 213 CID	**11033**
SC		
L4		
1992-1991	1.9L 116 CID; Coupe; DOHC; VIN 7	**11054**
SC2		
L4		
2002-1993	1.9L 116 CID; Coupe; DOHC; VIN 7	**11054**
SL		
L4		
1994-1991	1.9L 116 CID; SOHC; Sedan; VIN 9	**11055**
SL1		
L4		
1994-1991	1.9L 116 CID; SOHC; Sedan; VIN 9	**11055**
SL2		
L4		
2002-1991	1.9L 116 CID; DOHC; Sedan; VIN 7	**11054**
SW1		
L4		
1994-1993	1.9L 116 CID; SOHC; VIN 9	**11055**
SW2		
L4		
2001-1993	1.9L 116 CID; DOHC; VIN 7	**11054**
Sky		
L4		
2010-2007	2.0L 1998cc 122 CID; VIN X; Pump is driven off the timing chain	**21092**
2010-2007	2.4L 2384cc 145 CID; VIN B; Pump is driven off the timing chain	**21092**
Vue		
L4		
2010	2.4L 145 CID; Pump is driven off the timing chain	**21092**
2009-2007	2.4L 145 CID; VIN Z; Pump is driven off the timing chain	**21092**
2007-2006	2.2L 2198cc 134 CID; VIN D; Pump is driven off the timing chain	**21092**
2005-2002	2.2L 134 CID; Pump is driven off the timing chain	**21092**
V6		
2010-2008	3.5L 3490cc 213 CID	**11006**
2010-2008	3.6L 217 CID; VIN 7	**11103**
2007-2006	3.5L 3471cc; VIN 4	**26470**
2005-2004	3.5L 3474cc	**26470**
2004	3.5L 3475cc; VIN 4	**26470**
2003-2002	3.0L 3000cc 181 CID; VIN B	**21079**

YEAR	VEHICLE DETAIL	PART NO.
Scion		
tC		
L4		
2010-2005	2.4L 2398cc; 2AZFE Desig.	**15414**
xA		
L4		
2006-2004	1.5L 1497cc	**15406**
xB		
L4		
2008	2.4L 2362cc; 2AZFE Desig.	**15414**
2006-2004	1.5L 1497cc; 1NZFE Desig.	**15406**
2004	1.5L 1497cc	**15406**
xD		
L4		
2013-2008	1.8L 1798cc	**25232**
Seat		
Alhambra		
V6		
2008-2007	2.8L 2792cc; Sold in Mexico	**18262**
2005-2002	2.8L 2792cc; Sold in Mexico	**18262**
Leon		
L4		
2008	1.4L 1390cc 85 CID; Sold in Mexico	**99581**
2008	2.0L 1984cc 121 CID; Sold in Mexico	**11009**
Sterling		
825		
V6		
1988-1987	2.5L 2494cc	**36097**
827		
V6		
1990-1989	2.7L 2675cc	**36097**
Acterra 5500		
L6		
2002	5.9L 359 CID	**73158**
2001	5.9L 359 CID	**23145**
Acterra 6500		
L6		
2002	5.9L 359 CID	**73158**
2001	5.9L 359 CID	**23145**
Acterra 7500		
L6		
2002	5.9L 359 CID	**73158**
2001	5.9L 359 CID	**23145**
Bullet 45		
L6		
2010-2008	6.7L 408 CID	**73158**
Bullet 55		
L6		
2010-2008	6.7L 408 CID	**73158**
L7500		
L6		
2002	5.9L 359 CID	**73158**

YEAR	VEHICLE DETAIL	PART NO.
Sterling (cont'd)		
L7500 (cont'd)		
L6		
2001-1999	5.9L 359 CID	**23145**
SC7000 Cargo		
L6		
2002	5.9L 359 CID	**73158**
2001-1999	5.9L 359 CID	**23145**
Studebaker		
8E12		
V8		
1964	4.7L 4737cc 289 CID	**41898**
8E12D		
V8		
1964	4.7L 4737cc 289 CID	**41898**
8E13		
V8		
1964	4.7L 4737cc 289 CID	**41898**
8E14		
V8		
1964	4.7L 4737cc 289 CID	**41898**
8E15		
V8		
1964	4.7L 4737cc 289 CID	**41898**
8E7		
V8		
1964	4.7L 4737cc 289 CID	**41898**
8E7D		
V8		
1964	4.7L 4737cc 289 CID	**41898**
Avanti		
V8		
1964	4.7L 4737cc 289 CID	**41898**
Challenger		
V8		
1964	4.7L 4737cc 289 CID	**41898**
Commander		
V8		
1964	4.7L 4737cc 289 CID	**41898**
Cruiser		
V8		
1964	4.7L 4737cc 289 CID	**41898**
Daytona		
V8		
1964	4.7L 4737cc 289 CID	**41898**
Hawk		
V8		
1964	4.7L 4737cc 289 CID	**41898**
Lark		
V8		
1964	4.7L 4737cc 289 CID	**41898**

YEAR	VEHICLE DETAIL	PART NO.
Subaru		
1400		
H4		
1974-1973	1.4L 1361cc 83 CID; EA63 Desig.	**16014**
B9 Tribeca		
H6		
2007-2006	3.0L 3000cc	**16421**
Baja		
H4		
2006-2004	2.5L 2458cc; EJ255 Desig.; Turbocharged; With 3 Hose connections	**36215**
2006-2003	2.5L 2458cc; EJ253 Desig.; Naturally Aspirated; SOHC	**26223**
Brat		
H4		
1987-1985	1.8L 1781cc	**16025**
1984-1983	1.8L 1781cc; Naturally Aspirated	**16025**
1984-1983	1.8L 1781cc; Turbocharged	**26093**
1982	1.8L 1781cc	**16025**
1981	1.8L 1781cc; VIN 5	**16025**
1980	1.6L 1595cc	**16025**
1979-1978	1.6L 1595cc; 8 Valve	**16014**
Forester		
H4		
2010-2006	2.5L 2458cc; 16 Valve; EJ253 Desig.; Naturally Aspirated; SOHC; w/ Standard Trans.	**36049**
2008-2004	2.5L 2458cc; 16 Valve; DOHC; EJ255 Desig.; Turbocharged; With 3 Hose connections	**36215**
2005	2.5L 2458cc; 16 Valve; EJ253 Desig.; Naturally Aspirated; SOHC; w/ Standard Trans.	**26223**
2005	2.5L 2458cc; EJ253 Desig.; Naturally Aspirated; SOHC; w/ Automatic Trans.	**36472**
2004-2003	2.5L 2458cc; 16 Valve; EJ251 Desig.; Naturally Aspirated; SOHC; w/ Standard Trans.	**26223**
2004-2003	2.5L 2458cc; EJ251 Desig.; Naturally Aspirated; SOHC; w/ Automatic Trans.	**36472**
2002-1998	2.5L 2458cc; Naturally Aspirated	**26223**
Impreza		
H4		
2010-2006	2.5L 2458cc; 16 Valve; EJ253 Desig.; Naturally Aspirated; SOHC	**36049**
2010-2004	2.5L 2458cc; 16 Valve; DOHC; EJ257 Desig.; Turbocharged	**36215**
2005	2.0L 1994cc; 16 Valve; DOHC; EJ205 Desig.; Turbocharged	**36215**
2005	2.5L 2458cc; EJ253 Desig.; Naturally Aspirated; SOHC; With 1 Hose Connection	**26223**
2004-2003	2.5L 2458cc; EJ251 Desig.; Naturally Aspirated; SOHC; With 1 Hose Connection	**26223**
2004-2002	2.0L 1994cc; DOHC; Turbocharged; With 3 Hose connections	**36215**

YEAR	VEHICLE DETAIL	PART NO.
Subaru (cont'd)		
Impreza (cont'd)		
H4		
2002-1998	2.5L 2458cc; Naturally Aspirated	**26223**
2001-1995	2.2L 2212cc; Naturally Aspirated; SOHC	**26223**
1997-1993	1.8L 1781cc	**26223**
Legacy		
H4		
2011-2010	2.5L 2458cc; Turbocharged	**36472**
2009-2006	2.5L 2458cc; EJ253 Desig.; Naturally Aspirated; SOHC	**36049**
2009-2005	2.5L 2458cc; DOHC; EJ255 Desig.; Turbocharged	**36215**
2005	2.5L 2458cc; EJ253 Desig.; Naturally Aspirated; SOHC; With 1 Hose Connection	**26223**
2004-1996	2.5L 2458cc	**26223**
1999-1995	2.2L 2212cc	**26223**
1994-1993	2.2L 2212cc; Naturally Aspirated	**26223**
1994-1992	2.2L 2212cc; SOHC; Turbocharged	**36255**
1992	2.2L 2212cc; Naturally Aspirated; Sold in United States	**26223**
1991	2.2L 2212cc; Turbocharged; To 7-91	**36215**
1991-1990	2.2L 2212cc	**26223**
H6		
2009-2008	3.0L 3000cc; EZ30D Desig.	**16421**
Loyale		
H4		
1994-1990	1.8L 1781cc	**16161**
Outback		
H4		
2009-2006	2.5L 2458cc; EJ253 Desig.; Naturally Aspirated; SOHC	**36049**
2007-2005	2.5L 2458cc; DOHC; EJ255 Desig.; Turbocharged; With 3 Hose connections	**36215**
2005	2.5L 2458cc; EJ253 Desig.; Naturally Aspirated; With 1 Hose Connection	**26223**
2004-2001	2.5L 2458cc; EJ253 Desig.	**26223**
H6		
2009-2001	3.0L 3000cc; EZ30D Desig.	**16421**
SVX		
H6		
1997-1992	3.3L 3318cc	**36254**
XT		
H4		
1991-1985	1.8L 1781cc	**16080**
H6		
1991-1988	2.7L 2672cc	**26109**
Suzuki		
Aerio		
L4		
2007-2004	2.3L 2290cc 140 CID	**16342**
2003-2002	2.0L 2000cc	**16342**

YEAR	VEHICLE DETAIL	PART NO.
Suzuki (cont'd)		
Equator		
V6		
2009	4.0L 3954cc; VQ40DE Desig.	**16426**
Esteem		
L4		
2002-1999	1.8L 1790cc	**16342**
2001-1998	1.6L 1590cc 97 CID	**16374**
1997-1995	1.6L 1590cc 97 CID	**11048**
Forenza		
L4		
2008-2004	2.0L 2000cc	**26116**
Forsa		
L3		
1988-1985	1.0L 993cc 61 CID	**11029**
Grand Vitara		
V6		
2010-2009	3.2L 3195cc	**11103**
2009	3.2L 3195cc 195 CID	**11103**
2008-2006	2.7L 2737cc	**26385**
2005-1999	2.5L 2500cc	**26385**
2001	2.7L 2737cc	**26385**
Reno		
L4		
2008	2.0L 1998cc 122 CID	**26116**
2007-2005	2.0L 1998cc	**26116**
SX4		
L4		
2009-2007	2.0L 1995cc	**16342**
Samurai		
L4		
1995-1990	1.3L 1298cc 79 CID	**11029**
1989-1986	1.3L 1325cc 81 CID	**11029**
Sidekick		
L4		
1998-1996	1.8L 1840cc	**16342**
1998-1989	1.6L 1590cc 97 CID	**11048**
1989	1.3L 1325cc 81 CID	**11029**
Swift		
L3		
1994-1992	1.0L 993cc 61 CID	**11058**
L4		
2010-2007	1.5L 1490cc 91 CID; Sold in Mexico	**97034**
2001	1.3L 1298cc 79 CID; VIN 2	**11058**
2000-1989	1.3L 1298cc 79 CID	**11058**
Swift+		
L4		
2008-2004	1.6L 1598cc 98 CID; Sold in Canada	**11003**
Vitara		
L4		
2003-1999	2.0L 2000cc	**16342**
2002-1999	1.6L 1590cc 97 CID; SOHC	**16374**

YEAR	VEHICLE DETAIL	PART NO.
Suzuki (cont'd)		
Vitara (cont'd)		
V6		
2004	2.5L 2500cc	**26385**
X-90		
L4		
1998-1996	1.6L 1590cc 97 CID	**11048**
XL-7		
V6		
2009-2007	3.6L 3564cc	**11103**
2006-2005	2.7L 2737cc	**26385**
2004-2002	2.7L 2700cc	**26385**
Toyota		
4Runner		
L4		
2010	2.7L 2694cc	**45293**
2000-1996	2.7L 2694cc	**45293**
1995-1990	2.4L 2366cc; 22RE Desig.	**25141**
1989-1985	2.4L 2366cc; 22REC Desig.	**25141**
1988-1985	2.4L 2366cc; 22RTEC Desig.	**25141**
1984	2.4L 2366cc; 22R Desig.; VIN R	**25017**
V6		
2009-2003	4.0L 3956cc 241 CID	**35037**
2002-1996	3.4L 3378cc; 5VZFE Desig.	**25324**
1995-1994	3.0L 2959cc; VIN V; With Bypass tube on driver's end of pump	**25291**
1995-1994	3.0L 2959cc; VIN V; Without Bypass tube on driver's end of pump	**25320**
1993	3.0L 2959cc; 3VZE Desig.	**25291**
1992-1989	3.0L 2959cc; 3VZE Desig.; VIN V	**25145**
1988	3.0L 2959cc; 3VZE Desig.; VIN V	**25142**
V8		
2009-2003	4.7L 4663cc 285 CID	**45257**
Avalon		
V6		
2011-2005	3.5L 3456cc	**45047**
2004-1995	3.0L 2995cc	**25306**
Camry		
L4		
2011-2002	2.4L 2362cc	**15414**
2001-1992	2.2L 2164cc; DOHC	**25099**
1991-1989	2.0L 1998cc	**25099**
1991-1987	2.0L 1998cc 122 CID	**25099**
1986	2.0L 1974cc; DIESEL; Turbocharged	**45059**
1986-1984	1.8L 1839cc; DIESEL; Turbocharged	**45059**
1986-1983	2.0L 1995cc; 2SELC Desig.; GAS; VIN S	**25048**
V6		
2011-2007	3.5L 3456cc; 2GRFE Desig.	**45047**
2006-2005	3.3L 3300cc 202 CID	**25306**
2006-1994	3.0L 2995cc	**25306**
2004	3.3L 3300cc	**25306**
1993-1992	3.0L 2959cc; VIN V	**25258**

YEAR	VEHICLE DETAIL	PART NO.
Toyota (cont'd)		
Camry (cont'd)		
V6		
1991-1988	2.5L 2508cc; 2VZFE Desig.; VIN V	**25258**
Carina		
L4		
1973-1972	1.6L 1588cc; 2TC Desig.; 1600	**35012**
Celica		
L4		
2005-2000	1.8L 1794cc; 1ZZFE Desig.	**15376**
2005-2000	1.8L 1795cc; 2ZZGE Desig.; With Bolt on Pulley	**15405**
1999-1990	2.2L 2164cc; 5SFE Desig.	**25099**
1997-1994	1.8L 1762cc; DOHC	**15272**
1993-1990	1.6L 1587cc; 4AFE Desig.; VIN A	**15057**
1993-1990	2.0L 1998cc 122 CID; 3SGTE Desig.; Turbocharged; VIN S	**25140**
1989-1988	2.0L 1998cc 122 CID; 3SGTE Desig.; DOHC; Turbocharged; VIN S	**25140**
1989-1987	2.0L 1998cc 122 CID; 3SFE Desig.; With 23 Tooth Pulley	**25099**
1989-1986	2.0L 1998cc; 3SGELC Desig.; With 22 Tooth Pulley	**25087**
1986	2.0L 1995cc; 2SELC Desig.	**25141**
1986	2.0L 1998cc; 2SELC Desig.	**25141**
1985	2.4L 2366cc; 22REC Desig.; VIN R	**25141**
1984-1983	2.4L 2366cc; 22REC Desig.	**25017**
1983-1981	2.4L 2366cc; 22R Desig.	**25017**
1980-1978	2.2L 2189cc; 20R Desig.	**25017**
1977-1976	2.2L 2189cc; 20R Desig.; VIN R	**25027**
1975	2.2L 2189cc; 20R Desig.; VIN R	**25005**
Corolla		
L4		
2013-2009	1.8L 1798cc	**25232**
2010-2009	2.4L 2362cc; 2AZFE Desig.	**15414**
2008-1998	1.8L 1794cc; 1ZZFE Desig.	**15376**
2006-2005	1.8L 1795cc; 2ZZGE Desig.; DOHC	**15405**
1997	1.6L 1587cc; 4AFE Desig.; VIN A	**15271**
1997-1996	1.8L 1762cc; 7AFE Desig.; VIN B	**15272**
1996	1.6L 1587cc	**15271**
1995	1.8L 1762cc; 7AFE Desig.; VIN A	**15271**
1995-1993	1.6L 1587cc; 4AFE Desig.; VIN A	**15271**
1994-1993	1.8L 1762cc; 7AFE Desig.; VIN A	**15272**
1992-1990	1.6L 1587cc; 4AFE Desig.; VIN A	**15057**
1991	1.6L 1587cc; 4AGE Desig.; VIN A	**15057**
1991-1990	1.6L 1587cc; 4AGE Desig.; VIN A	**15076**
1989-1988	1.6L 1587cc; 4AF Desig.	**15057**
1989-1988	1.6L 1587cc; 4AFE Desig.	**15057**
1989-1988	1.6L 1587cc; 4AGE Desig.	**15076**
1988-1987	1.6L 1587cc; 4AGELC Desig.	**15076**
1988-1987	1.6L 1587cc; 4ALC Desig.; CARB	**15057**
1987	1.6L 1587cc; 4AC Desig.; RWD	**15046**

YEAR	VEHICLE DETAIL	PART NO.
Toyota (cont'd)		
Corolla (cont'd)		
L4		
1987-1985	1.6L 1587cc; 4AGEC Desig.	**35075**
1986	1.6L 1587cc; 4AC Desig.	**15046**
1986-1985	1.6L 1587cc; 4ALC Desig.	**15057**
1985	1.6L 1587cc; 4AC Desig.; RWD	**15046**
1984	1.6L 1587cc	**15057**
1984	1.6L 1587cc; 4AC Desig.; Naturally Aspirated; RWD	**15046**
1984	1.8L 1839cc; 1CLC Desig.; DIESEL	**45059**
1983	1.6L 1587cc; 4AC Desig.	**15046**
1982	1.8L 1770cc; 3TC Desig.	**25018**
1981-1980	1.8L 1770cc; Sold in United States; Without Fan Clutch, Use Old Fan Clutch With This Pump	**25018**
1979	1.6L 1588cc; 2TC Desig.; Without Fan Clutch, Use Old Fan Clutch With This Pump	**25018**
1979-1978	1.2L 1166cc; 3KC Desig.	**25015**
1977	1.6L 1588cc; 2TC Desig.	**25018**
1977-1975	1.2L 1166cc; 3KC Desig.	**35012**
1976	1.6L 1588cc; 2TC Desig.; From 12-75	**25016**
1974-1971	1.6L 1588cc 97 CID; 2TC Desig.	**35012**
1974-1971	1.6L 1588cc; 2TC Desig.	**35012**
Corona		
L4		
1982-1981	2.4L 2366cc	**25017**
1980-1978	2.2L 2189cc; 20R Desig.	**25017**
1977	2.2L 2189cc	**25027**
1976	2.2L 2189cc	**25005**
1976-1975	2.2L 2189cc; From 9-75	**25027**
1975	2.2L 2189cc; To 9-75	**25005**
1974-1972	2.0L 1968cc 120 CID; With Fan Clutch	**35006**
1971-1970	1.9L 1858cc 113 CID; With Fan Clutch	**35006**
1970	1.9L 1898cc; With Fan Clutch	**35006**
1970-1967	1.9L 1897cc 116 CID; With A/c; Without Fan Clutch	**15890**
Cressida		
L6		
1992-1989	3.0L 2954cc; 7MGE Desig.; VIN M	**25100**
1988-1983	2.8L 2754cc; 5MGE Desig.; VIN M	**25040**
1982-1981	2.8L 2759cc	**15039**
1980	2.6L 2563cc	**15039**
Crown		
L4		
1967-1965	1.9L 1897cc 116 CID; Without Fan Clutch, Use Old Fan Clutch With This Pump	**15890**
Echo		
L4		
2005-2000	1.5L 1497cc; 1NZFE Desig.	**15406**

YEAR	VEHICLE DETAIL	PART NO.
Toyota (cont'd)		
FJ Cruiser		
V6		
2010-2007	4.0L 3956cc 241 CID; 1GRFE Desig.	**35037**
Hi-Lux		
L4		
1973	2.0L 1968cc 120 CID; 18RC Desig.; With Fan Clutch	**35006**
1972	2.0L 1968cc 120 CID; 18RC Desig.; With Fan Clutch From 5-72	**35006**
1969	1.9L 1897cc 116 CID; Without Fan Clutch, Use Old Fan Clutch With This Pump	**15890**
Highlander		
L4		
2007-2001	2.4L 2362cc; 2AZFE Desig.	**15414**
V6		
2011-2008	3.5L 3456cc; 2GRFE Desig.	**45047**
2010-2005	3.3L 3300cc 202 CID	**25306**
2004	3.3L 3300cc	**25306**
2003-2001	3.0L 2995cc; 1MZFE Desig.	**25306**
Land Cruiser		
L6		
1997-1993	4.5L 4477cc; 1FZFE Desig.	**35269**
1992-1988	4.0L 3956cc; 3FE Desig.	**45155**
1987	4.2L 4227cc; Sold in United States	**35337**
1987-1981	4.2L 4227cc	**35337**
1986	4.2L 4228cc 258 CID	**35337**
1985	4.2L 4227cc; Sold in United States	**35337**
1984-1981	4.2L 4228cc 258 CID	**35337**
1980	4.2L 4227cc; 2F Desig.; VIN F	**45189**
1979-1978	4.2L 4227cc; 2F Desig.; VIN F; To 1-79	**45189**
1979-1978	4.2L 4227cc; With Oil Cooler	**35190**
1978-1977	4.2L 4227cc; 2F Desig.; Sport Utility	**35190**
1977	4.2L 4227cc; 2F Desig.; VIN F	**45189**
1976-1975	4.2L 4227cc; 2F Desig.	**45189**
1974-1969	3.9L 3878cc	**35078**
V8		
2007-1998	4.7L 4663cc 285 CID; 2UZFE Desig.	**45257**
MR2		
L4		
1995-1991	2.0L 1998cc 122 CID; 3SGTE Desig.; VIN S	**25140**
1995-1991	2.0L 1998cc 122 CID; Turbocharged	**25140**
1995-1991	2.2L 2164cc	**25099**
1995-1991	2.2L 2164cc; 5SFE Desig.; VIN S	**25099**
1989-1985	1.6L 1587cc	**15076**
1989-1985	1.6L 1587cc; VIN A	**15076**
MR2 Spyder		
L4		
2005-2000	1.8L 1794cc; 1ZZFE Desig.	**15376**

YEAR	VEHICLE DETAIL	PART NO.
Toyota (cont'd)		
Matrix		
L4		
2013-2009	1.8L 1798cc	**25232**
2013-2009	2.4L 2362cc; 2AZFE Desig.	**15414**
2008-2007	1.8L 1794cc	**15376**
2006-2003	1.8L 1794cc; 1ZZFE Desig.	**15376**
2006-2003	1.8L 1795cc; 2ZZGE Desig.	**15405**
Paseo		
L4		
1999-1996	1.5L 1497cc; 5EFE Desig.; VIN C	**15367**
1995-1992	1.5L 1497cc; 5EFE Desig.; DOHC; VIN E; With Bolt on Pulley	**15098**
Pickup		
L4		
1995-1989	2.4L 2366cc; 22RE Desig.; GAS	**25141**
1990-1985	2.4L 2366cc; 22R Desig.; GAS	**25141**
1988-1985	2.4L 2366cc; 22REC Desig.; GAS	**25141**
1988-1985	2.4L 2366cc; 22RTEC Desig.; GAS	**25141**
1985	2.4L 2446cc; 2LT Desig.; DIESEL	**25200**
1985-1984	2.4L 2446cc; 2L Desig.; DIESEL	**25200**
1984	2.4L 2366cc; 22REC Desig.; GAS	**35296**
1984-1981	2.4L 2366cc; 22R Desig.; GAS	**35296**
1983-1981	2.2L 2188cc; DIESEL	**25094**
1980-1979	2.2L 2189cc; 20R Desig.; GAS	**35296**
1978	2.2L 2189cc; 20R Desig.; GAS; From 2-78	**35296**
1978	2.2L 2189cc; To 2-78 Production	**25027**
1977-1976	2.2L 2189cc	**25027**
1975	2.2L 2189cc	**25005**
1974	2.0L 1968cc 120 CID; 18RC Desig.; With Fan Clutch	**35006**
1969	1.9L 1897cc 116 CID; Without Fan Clutch, Use Old Fan Clutch With This Pump	**15890**
1969	1.9L 1898cc; Without Fan Clutch, Use Old Fan Clutch With This Pump	**15890**
1966	1.9L 1897cc 116 CID; Without Fan Clutch, Use Old Fan Clutch With This Pump	**15890**
V6		
1995-1994	3.0L 2959cc; 4WD; w/ Automatic Trans.	**25291**
1995-1994	3.0L 2959cc; RWD; w/ Automatic Trans.	**25291**
1995-1994	3.0L 2959cc; RWD; w/ Standard Trans.	**25320**
1993	3.0L 2959cc	**25291**
1992-1991	3.0L 2959cc; 3VZE Desig.	**25145**
1990-1989	3.0L 2959cc; 1 Ton To 90	**25145**
1990-1989	3.0L 2959cc; 1/2 Ton To 2-90	**25142**
1988	3.0L 2959cc	**25142**
Previa		
L4		
1997-1991	2.4L 2438cc	**25216**

YEAR	VEHICLE DETAIL	PART NO.
Toyota (cont'd)		
Prius		
L4		
2009-2001	1.5L 1497cc; 1NZFXE Desig.; ELECTRIC/GAS	**15406**
RAV4		
L4		
2008-2004	2.4L 2362cc	**15414**
2003-2001	2.0L 1998cc 122 CID	**15414**
2000-1996	2.0L 1998cc 122 CID	**25099**
V6		
2011-2006	3.5L 3456cc	**45047**
Sequoia		
V8		
2009-2001	4.7L 4663cc 285 CID; 2UZFE Desig.	**45257**
Sienna		
V6		
2011-2007	3.5L 3456cc	**45047**
2009-2007	3.5L 3500cc 214 CID	**45047**
2006-2004	3.3L 3300cc 202 CID	**25306**
2003-1998	3.0L 2995cc	**25306**
Solara		
L4		
2008-2002	2.4L 2362cc; 2AZFE Desig.	**15414**
2001-1999	2.2L 2164cc	**25099**
V6		
2008-2005	3.3L 3300cc 202 CID	**25306**
2004	3.3L 3300cc	**25306**
2003-1999	3.0L 2995cc	**25306**
Starlet		
L4		
1984-1983	1.3L 1290cc	**25064**
1982-1981	1.3L 1290cc	**25015**
Supra		
L6		
1998-1994	3.0L 2997cc; 2JZGE Desig.; 10 Fastener	**35411**
1998-1994	3.0L 2997cc; 2JZGE Desig.; 11 Fastener	**35256**
1998-1994	3.0L 2997cc; 2JZGTE Desig.; Turbocharged	**35292**
1992-1986	3.0L 2954cc	**25100**
T100		
L4		
1998-1994	2.7L 2694cc; 3RZFE Desig.	**45293**
V6		
1998-1995	3.4L 3378cc; 4WD	**25324**
1998-1995	3.4L 3378cc; 4WD; 5VZFE Desig.	**25324**
1998-1995	3.4L 3378cc; 5VZFE Desig.; RWD; w/ Automatic Trans.	**25325**
1998-1995	3.4L 3378cc; RWD; w/ Automatic Trans.	**25325**
1998-1995	3.4L 3378cc; RWD; w/ Standard Trans.	**25324**
1994-1993	3.0L 2959cc; 3VZE Desig.	**25291**

YEAR	VEHICLE DETAIL	PART NO.
Toyota (cont'd)		
Tacoma		
L4		
2011-1995	2.7L 2694cc	**45293**
2004-1995	2.4L 2438cc; 2RZFE Desig.	**45293**
V6		
2012-2005	4.0L 3956cc 241 CID	**35037**
2004-2002	3.4L 3378cc; 5VZFE Desig.	**25324**
2002-1995	3.4L 3378cc; 5VZFE Desig.; RWD; w/ Automatic Trans.; Without Bypass tube	**25325**
2001	3.4L 3378cc; 4WD	**25324**
2001	3.4L 3378cc; 4WD; 5VZFE Desig.	**25324**
2000-1995	3.4L 3378cc; 4WD; With Bypass tube	**25324**
2000-1995	3.4L 3378cc; RWD; w/ Automatic Trans.; With Bypass tube	**25324**
2000-1995	3.4L 3378cc; RWD; w/ Standard Trans.	**25324**
Tercel		
L4		
1999-1995	1.5L 1497cc	**15367**
1994-1987	1.5L 1456cc	**15098**
1988	1.5L 1452cc	**15045**
1987-1981	1.5L 1452cc; 3AC Desig.	**15045**
1982-1981	1.5L 1452cc; 3AC Desig.; California	**15086**
1980	1.5L 1452cc; 1AC Desig.	**15028**
Tundra		
V6		
2011-2005	4.0L 3956cc 241 CID; 1GRFE Desig.	**35037**
2004	3.4L 3378cc; 5VZFE Desig.; w/ Automatic Trans.; With Bypass tube	**25324**
2004	3.4L 3378cc; 5VZFE Desig.; w/ Standard Trans.; Without Bypass tube	**25325**
2003-2002	3.4L 3378cc; RWD; w/ Standard Trans.	**25324**
2003-2000	3.4L 3378cc; 4WD; 5VZFE Desig.; With Bypass tube	**25324**
2003-2000	3.4L 3378cc; RWD; w/ Automatic Trans.; Without Bypass tube	**25325**
2001-2000	3.4L 3378cc; RWD; w/ Standard Trans.; With Bypass tube	**25324**
V8		
2009-2000	4.7L 4663cc 285 CID	**45257**
Van		
L4		
1989-1986	2.2L 2237cc; 4YEC Desig.	**15092**
1985-1984	2.0L 1998cc 122 CID; 3YEC Desig.	**15092**
Venza		
V6		
2010-2009	3.5L 3456cc; 2GRFE Desig.	**45047**
Yaris		
L4		
2010-2006	1.5L 1497cc; 1NZFE Desig.	**15406**
2004	1.3L 1299cc 79 CID; Sold in Mexico	**95102**

YEAR	VEHICLE DETAIL	PART NO.
Volkswagen		
Beetle		
L4		
2005-1999	1.8L 1781cc; Driven off the timing belt	**18377**
2005-1998	2.0L 1984cc 121 CID; Driven off the timing belt	**18377**
2004-1998	1.9L 1896cc 116 CID; DIESEL; Driven off the timing belt	**28378**
L5		
2013-2012	2.5L 2480cc 151 CID	**11008**
2010-2006	2.5L 2480cc 151 CID	**11008**
Bora		
L4		
2007-2006	2.0L 1984cc 121 CID; Sold in Mexico	**18978**
Cabrio		
L4		
2002-2001	2.0L 1984cc 121 CID; With 30mm Hub	**28065**
2000-1995	2.0L 1984cc 121 CID	**28065**
Cabriolet		
L4		
1993-1985	1.8L 1780cc	**28065**
Corrado		
L4		
1992-1990	1.8L 1780cc	**28065**
V6		
1995-1992	2.8L 2792cc	**18262**
Dasher		
L4		
1981	1.6L 1588cc 97 CID; DIESEL	**28066**
1980-1979	1.5L 1471cc; DIESEL	**28066**
1980-1976	1.6L 1588cc 97 CID; GAS	**28066**
1975-1974	1.5L 1471cc; GAS	**28066**
1974	1.5L 1471cc 90 CID; GAS	**28066**
Eos		
V6		
2008-2007	3.2L 3189cc 195 CID	**18471**
EuroVan		
L5		
1997-1993	2.4L 2370cc 144 CID; DIESEL; Sold in Canada	**18274**
1996-1993	2.5L 2459cc 150 CID	**18274**
V6		
2003-1999	2.8L 2792cc	**18262**
1997	2.8L 2792cc	**18262**
Fox		
L4		
1993-1987	1.8L 1780cc	**28065**
Gol		
All		
2011-2009	Sold in Mexico	**99682**
Golf		
L4		
2006-2000	1.8L 1781cc; Driven off the timing belt	**18377**

YEAR	VEHICLE DETAIL	PART NO.
Volkswagen (cont'd)		
Golf (cont'd)		
L4		
2006-2000	1.9L 1896cc 116 CID; DIESEL; Turbocharged; Driven off the timing belt	**28378**
2006-1999	2.0L 1984cc 121 CID; Driven off the timing belt	**18377**
1999	1.9L 1896cc 116 CID; DIESEL; Turbocharged; With Bolt on Pulley	**28065**
1999	1.9L 1896cc 116 CID; DIESEL; Turbocharged; With Pressed On Cogged Pulley; Driven off the timing belt	**28378**
1999	2.0L 1984cc 121 CID; With Bolt on Pulley	**28065**
1998-1990	2.0L 1984cc 121 CID; With 30mm Hub	**28065**
1992-1985	1.6L 1588cc 97 CID; With 30mm Hub	**28065**
1992-1985	1.8L 1780cc; With 30mm Hub	**28065**
L5		
2013-2010	2.5L 2480cc 151 CID	**11008**
V6		
2005-2004	2.8L 2792cc; With 8 Vane Impeller	**18262**
2005-2003	2.8L 2792cc	**18471**
2004	3.2L 3189cc	**18471**
2004	3.2L 3189cc; With 8 Vane Impeller	**18262**
2003-1995	2.8L 2792cc	**18262**
Golf City		
L4		
2008	2.0L 1984cc 121 CID; Driven off the timing belt	**18377**
Jetta		
All		
1998	DIESEL; Turbocharged	**28065**
L4		
2009-2007	1.9L 1896cc 116 CID; Sold in Mexico	**18978**
2006-2005	1.9L 1896cc 116 CID	**18212**
2006-2005	1.9L 1896cc 116 CID; Turbocharged	**28335**
2005-2000	1.8L 1781cc; Driven off the timing belt	**18377**
2005-2000	1.9L 1896cc 116 CID; DIESEL; Turbocharged; Driven off the timing belt	**28378**
2005-2000	2.0L 1984cc 121 CID; Driven off the timing belt	**18377**
1999	1.9L 1896cc 116 CID; DIESEL; Turbocharged; With Bolt on Pulley	**28065**
1999	1.9L 1896cc 116 CID; DIESEL; Turbocharged; With Pressed On Cogged Pulley; Driven off the timing belt	**28378**
1999	2.0L 1984cc 121 CID; Driven off the timing belt	**28378**
1999	2.0L 1984cc 121 CID; With Bolt on Pulley	**28065**
1998-1993	2.0L 1984cc 121 CID	**28065**
1992-1990	2.0L 1984cc 121 CID; With 30mm Hub	**28065**
1992-1990	2.0L 1984cc; With 30mm Hub	**28065**
1992-1984	1.8L 1780cc; With 30mm Hub	**28065**
1992-1983	1.6L 1588cc 97 CID; With 30mm Hub	**28065**

YEAR	VEHICLE DETAIL	PART NO.
Volkswagen (cont'd)		
Jetta (cont'd)		
L4		
1982	1.7L 1715cc	**28065**
1982-1981	1.6L 1588cc 97 CID; DIESEL; With 40mm Hub	**28066**
1981	1.7L 1715cc; EN Desig.; With A/c; With 30mm Hub	**28065**
1981	1.7L 1715cc; EN Desig.; Without A/c; With 40mm Hub	**28066**
1980	1.6L 1588cc 97 CID; GAS	**28066**
L5		
2013-2005	2.5L 2480cc 151 CID	**11008**
V6		
2004-2002	2.8L 2792cc	**18471**
2002	2.8L 2792cc; With 8 Vane Impeller	**18262**
2001-1994	2.8L 2792cc	**18262**
Lupo		
L4		
2009-2005	1.6L 1599cc 98 CID; FI; Sold in Mexico	**99682**
Passat		
L4		
2005-2004	2.0L 1967cc 120 CID; DIESEL; Driven off the timing belt	**28378**
2005-2000	1.8L 1781cc; Driven off the timing belt	**18377**
2001-1998	1.8L 1781cc; Turbocharged; With Bolt on Pulley	**28401**
1997-1996	1.9L 1896cc 116 CID; DIESEL; Turbocharged	**28065**
1996-1995	2.0L 1984cc 121 CID; With 30mm Hub	**28065**
1994	2.0L 1984cc; With 30mm Hub	**28065**
1993-1991	1.8L 1780cc	**28065**
1993-1990	2.0L 1984cc 121 CID; With 30mm Hub	**28065**
1992-1990	2.0L 1984cc; With 30mm Hub	**28065**
L5		
2013-2012	2.5L 2480cc 151 CID	**11008**
V6		
2005-1998	2.8L 2771cc	**38333**
1997-1993	2.8L 2792cc	**18262**
Phaeton		
V8		
2006-2004	4.2L 4172cc; Driven off the timing belt	**28362**
Polo		
L4		
2007-2003	1.6L 1596cc 97 CID; Sold in Mexico	**99682**
Quantum		
L4		
1985-1984	1.8L 1780cc	**28065**
1985-1982	1.6L 1588cc 97 CID	**28065**
1983-1982	1.7L 1715cc	**28065**
L5		
1988-1985	2.2L 2226cc	**18052**
1984-1983	2.2L 2144cc	**18052**

YEAR	VEHICLE DETAIL	PART NO.
Volkswagen (cont'd)		
R32		
V6		
2008	3.2L 3189cc 195 CID	**18471**
Rabbit		
L4		
1984-1983	1.7L 1715cc; GAS; Without A/c	**28066**
1984-1983	1.8L 1780cc; GAS; With A/c	**28065**
1984-1981	1.7L 1715cc; GAS; With A/c	**28065**
1982	1.6L 1588cc 97 CID; DIESEL	**28065**
1981	1.6L 1588cc 97 CID; DIESEL; With 30mm Hub	**28065**
1981	1.6L 1588cc 97 CID; With 40mm Hub	**28066**
1981	1.7L 1715cc	**28066**
1981	1.7L 1715cc; GAS; Without A/c	**28066**
1980	1.6L 1588cc 97 CID	**28066**
1980	1.6L 1588cc 97 CID; GAS; With A/c	**28065**
1980	1.6L 1588cc 97 CID; GAS; Without A/c	**28066**
1980-1979	1.5L 1457cc; GAS; With A/c	**28065**
1980-1979	1.5L 1457cc; GAS; Without A/c	**28066**
1980-1979	1.5L 1471cc; DIESEL; With A/c	**28065**
1980-1979	1.5L 1471cc; DIESEL; Without A/c	**28066**
1980-1978	1.5L 1457cc	**28066**
1980-1977	1.5L 1471cc	**28066**
1977-1976	1.6L 1588cc 97 CID	**28066**
1975	1.5L 1471cc	**28066**
L5		
2009-2006	2.5L 2480cc 151 CID	**11008**
Rabbit Convertible		
L4		
1984	1.8L 1780cc; GAS; With A/c	**28065**
1983	1.7L 1715cc; GAS; Without A/c	**28066**
1983-1981	1.7L 1715cc; GAS; With A/c	**28065**
1981	1.7L 1715cc	**28066**
1981	1.7L 1715cc; GAS; Without A/c	**28066**
1980	1.6L 1588cc 97 CID	**28066**
1980	1.6L 1588cc 97 CID; GAS; With A/c	**28065**
1980	1.6L 1588cc 97 CID; GAS; Without A/c	**28066**
Rabbit Pickup		
L4		
1983	1.7L 1715cc; GAS; Without A/c	**28066**
1983-1981	1.7L 1715cc; GAS; With A/c	**28065**
1982	1.6L 1588cc 97 CID; DIESEL	**28065**
1981	1.6L 1588cc 97 CID; DIESEL; With 30mm Hub	**28065**
1981	1.6L 1588cc 97 CID; With 40mm Hub	**28066**
1981	1.7L 1715cc	**28066**
1981	1.7L 1715cc; GAS; Without A/c	**28066**
1980	1.5L 1457cc	**28066**
1980	1.5L 1457cc; GAS; With A/c	**28065**
1980	1.5L 1457cc; GAS; Without A/c	**28066**

YEAR	VEHICLE DETAIL	PART NO.
Volkswagen (cont'd)		
Rabbit Pickup (cont'd)		
L4		
1980	1.6L 1588cc 97 CID	**28066**
1980	1.6L 1588cc 97 CID; GAS; With A/c	**28065**
1980	1.6L 1588cc 97 CID; GAS; Without A/c	**28066**
Routan		
V6		
2012-2011	3.6L 3604cc 220 CID	**43369**
2010-2009	3.8L 3778cc 231 CID	**23231**
2010-2009	4.0L 3952cc 241 CID	**23010**
Scirocco		
L4		
1989-1984	1.8L 1780cc	**28065**
1983-1982	1.7L 1715cc	**28065**
1981	1.7L 1715cc; With A/c	**28065**
1981	1.7L 1715cc; Without A/c	**28066**
1980-1979	1.6L 1588cc 97 CID	**28066**
1978	1.5L 1457cc	**28066**
1977-1976	1.6L 1588cc 97 CID	**28066**
1975	1.5L 1471cc	**28066**
Touareg		
V6		
2012-2009	3.0L 2967cc 181 CID	**28146**
2006-2004	3.2L 3189cc 195 CID	**18471**
V8		
2007-2004	4.2L 4172cc; Driven off the timing belt	**28362**
2007-2004	4.2L 4172cc; Driven off the timing belt	**38410**
Transporter		
H4		
1991-1986	2.1L 2109cc	**18150**
L5		
1994-1993	2.4L 2370cc 144 CID	**18274**
1993-1992	2.5L 2459cc 150 CID	**18274**
Vanagon		
H4		
1991-1986	2.1L 2109cc	**18150**
L4		
1984-1982	1.6L 1588cc 97 CID; DIESEL; With 40mm Hub	**28066**
Volvo		
122		
L4		
1968-1962	1.8L 1780cc 109 CID	**38013**
142		
L4		
1974-1972	2.0L 1990cc 121 CID	**38013**
1974-1969	2.0L 1990cc	**38013**
1968	1.8L 1780cc 112 CID	**38013**
1968-1967	1.8L 1780cc 109 CID	**38013**

YEAR	VEHICLE DETAIL	PART NO.
Volvo (cont'd)		
144		
L4		
1974-1972	2.0L 1990cc 121 CID	**38013**
1974-1969	2.0L 1990cc	**38013**
1973	2.0L 1986cc 121 CID	**38013**
1968	1.8L 1780cc 112 CID	**38013**
1968-1967	1.8L 1780cc 109 CID	**38013**
145		
L4		
1974-1972	2.0L 1990cc 121 CID	**38013**
1974-1969	2.0L 1990cc	**38013**
1968	1.8L 1780cc 109 CID	**38013**
1968	1.8L 1780cc 112 CID	**38013**
164		
L6		
1975-1969	3.0L 2980cc	**28077**
1974-1969	3.0L 2980cc 182 CID	**28077**
1800		
L4		
1973-1970	2.0L 1990cc 121 CID	**38013**
1973-1969	2.0L 1986cc 121 CID	**38013**
1968-1961	1.8L 1780cc 109 CID	**38013**
240		
L4		
1993-1990	2.3L 2316cc	**38068**
242		
L4		
1984-1981	2.3L 2316cc	**38049**
1984-1976	2.1L 2127cc	**38049**
244		
L4		
1989-1985	2.3L 2316cc	**38068**
1985	2.1L 2127cc	**28065**
1984-1981	2.3L 2316cc	**38049**
1984-1976	2.1L 2127cc	**38049**
L6		
1984-1982	2.4L 2383cc	**28071**
245		
L4		
1989-1985	2.3L 2316cc	**38068**
1985	2.1L 2127cc	**28065**
1984-1981	2.3L 2316cc	**38049**
1984-1976	2.1L 2127cc	**38049**
L6		
1984-1982	2.4L 2383cc	**28071**
262		
V6		
1981-1980	2.8L 2849cc	**38146**
1979	2.7L 2673cc	**38146**

YEAR	VEHICLE DETAIL	PART NO.
Volvo (cont'd)		
264		
L4		
1981	2.1L 2127cc	**38049**
L6		
1981	2.4L 2383cc; DIESEL	**28071**
V6		
1982-1980	2.8L 2849cc	**38146**
1979	2.7L 2673cc	**38146**
265		
L6		
1980	2.4L 2383cc	**28071**
V6		
1981-1980	2.8L 2849cc	**38146**
1979	2.7L 2673cc	**38146**
544		
L4		
1967-1962	1.8L 1780cc 109 CID	**38322**
740		
L4		
1992-1985	2.3L 2316cc; B230FT Desig.	**38068**
1990-1989	2.3L 2316cc; B234F Desig.	**38068**
L6		
1986-1985	2.4L 2377cc; DIESEL; Turbocharged	**28071**
745		
L4		
1985	2.3L 2316cc; B230FT Desig.	**38068**
L6		
1985	2.4L 2383cc; DIESEL; Turbocharged	**28071**
760		
L4		
1990-1985	2.3L 2316cc; B230FT Desig.; Turbocharged	**38068**
1984	2.3L 2316cc; Turbocharged	**38049**
L6		
1985	2.4L 2377cc; DIESEL; Turbocharged	**28071**
1984-1983	2.4L 2383cc; DIESEL; Turbocharged	**28071**
V6		
1990-1983	2.8L 2849cc	**38148**
780		
L4		
1991-1989	2.3L 2316cc; Turbocharged	**38068**
V6		
1990-1987	2.8L 2849cc	**38148**
850		
L5		
1997-1994	2.3L 2319cc	**18339**
1997-1993	2.4L 2435cc	**18339**
940		
L4		
1995-1991	2.3L 2316cc	**38068**

YEAR	VEHICLE DETAIL	PART NO.
Volvo (cont'd)		
960		
All		
1994-1992		**18339**
C30		
L5		
2012-2007	2.5L 2521cc	**18339**
2011-2008	2.4L 2435cc 149 CID	**18339**
2010-2007	2.4L 2435cc	**18339**
C70		
L5		
2012-2006	2.5L 2521cc; Turbocharged	**18339**
2004-1999	2.3L 2319cc; Turbocharged	**18339**
2004-1999	2.4L 2435cc; Turbocharged	**18339**
1998	2.3L 2319cc	**18339**
DL		
L4		
1984	2.1L 2127cc	**38049**
GLE		
L4		
1984	2.3L 2316cc	**38049**
S40		
L4		
2004-2000	1.9L 1948cc; Turbocharged	**18339**
L5		
2012	2.5L 2521cc	**18339**
2011-2004	2.5L 2521cc; Turbocharged	**18339**
2010-2004	2.4L 2435cc; Naturally Aspirated	**18339**
S60		
L5		
2012	2.5L 2521cc	**18339**
2009-2005	2.4L 2435cc; Turbocharged	**18339**
2009-2003	2.5L 2521cc; Turbocharged	**18339**
2006	2.4L 2401cc 147 CID; Turbocharged	**18339**
2005-2004	2.5L 2500cc 153 CID; Turbocharged	**18339**
2005-2003	2.3L 2319cc; Turbocharged	**18339**
2005-2003	2.4L 2435cc; Naturally Aspirated	**18339**
2003	2.4L 2435cc; Turbocharged	**18339**
S70		
L5		
2000-1998	2.3L 2319cc; Turbocharged	**18339**
2000-1998	2.4L 2435cc; Naturally Aspirated	**18339**
2000-1998	2.4L 2435cc; Turbocharged	**18339**
S80		
L5		
2006-2004	2.5L 2521cc	**18339**
L6		
2003	2.8L 2783cc 170 CID; Turbocharged	**18339**
2003	2.9L 2917cc; Naturally Aspirated	**18339**
2003	2.9L 2917cc; Turbocharged	**18339**
2002	2.9L 2917cc; B6294T Desig.; Turbocharged	**18382**

YEAR	VEHICLE DETAIL	PART NO.
Volvo (cont'd)		
S80 (cont'd)		
L6		
2002-2000	2.9L 2917cc; B6294S Desig.; Naturally Aspirated	**18382**
2001-1999	2.8L 2798cc; B6284T Desig.; Turbocharged	**18382**
1999	2.9L 2917cc; B6304S Desig.; Naturally Aspirated	**18382**
S90		
L6		
1998-1997	2.9L 2917cc	**18340**
V40		
L4		
2004-2000	1.9L 1948cc; Turbocharged	**18339**
V50		
L5		
2011-2005	2.4L 2435cc; Naturally Aspirated	**18339**
2011-2005	2.5L 2521cc; Turbocharged	**18339**
V70		
L5		
2007-2003	2.5L 2521cc; Turbocharged	**18339**
2007-1998	2.4L 2435cc; Naturally Aspirated	**18339**
2005	2.4L 2435cc; Turbocharged	**18339**
2004-1998	2.3L 2319cc; Turbocharged	**18339**
2003-1998	2.4L 2435cc; Turbocharged	**18339**
V90		
L6		
1998-1997	2.9L 2917cc	**18340**
XC70		
L5		
2007-2003	2.5L 2521cc	**18339**
XC90		
L5		
2006-2003	2.5L 2521cc; Turbocharged	**18339**
L6		
2004	2.9L 2922cc 178 CID; Turbocharged	**18339**
Workhorse		
FasTrack FT1061		
V8		
2005-2004	4.8L 294 CID	**71616**
FasTrack FT1261		
V8		
2005	4.8L 294 CID	**71616**
FasTrack FT1461		
V8		
2005-2004	4.8L 294 CID	**71616**
2005-2004	6.0L 5967cc 364 CID	**71616**
FasTrack FT1601		
V8		
2005-2004	4.8L 294 CID	**71616**

YEAR	VEHICLE DETAIL	PART NO.
Workhorse (cont'd)		
FasTrack FT1801		
V8		
2005-2004	6.0L 5967cc 364 CID	**71616**
2005-2002	6.5L 395 CID	**51086**
FasTrack FT1802		
V8		
2003-2002	6.5L 395 CID	**51086**
LF72		
V8		
2011-2010	6.6L 403 CID	**71053**
2008-2006	6.6L 403 CID	**71053**
2005	6.6L 403 CID	**21098**
P32		
V8		
2005-2001	8.1L 496 CID	**41090**
2003-1999	6.5L 395 CID	**51086**
2000-1999	7.4L 454 CID	**61094**
P42		
V8		
2005-1999	6.5L 395 CID	**51086**
2000-1999	7.4L 454 CID	**61094**
R26		
L6		
2009-2007	6.7L 6690cc 408 CID	**73158**
V8		
2009-2007	8.1L 496 CID	**41090**
W16		
V8		
2009-2006	8.1L 496 CID	**41090**
W18		
V8		
2009-2006	8.1L 496 CID	**41090**
W20		
V8		
2009-2001	8.1L 496 CID	**41090**
W21		
V8		
2009-2007	8.1L 496 CID	**41090**
W22		
V8		
2009-2001	8.1L 496 CID	**41090**
W24		
V8		
2009-2004	8.1L 496 CID	**41090**
W25		
V8		
2009-2005	8.1L 496 CID	**41090**
W42		
V8		
2010-2009	4.8L 294 CID	**71617**
2004	6.5L 395 CID	**51086**

YEAR	VEHICLE DETAIL	PART NO.
Workhorse (cont'd)		
W62		
V8		
2011-2007	6.0L 5967cc 364 CID	**71617**

Water Pumps

11001	11002	11003	11004
11005	**11006**	**11008**	**11017**
11020	**11029**	**11031**	**11032**
11033	**11036**	**11043**	**11045**
11048	**11054**	**11055**	**11057**
11058	**11064**	**11072**	**11076**

WATER PUMP PHOTOS

11103	11127	11145	12022
12041	**12070**	**12091**	**12106**
12115	**12124**	**12126**	**12132**
12489	**13038**	**13126**	**13140**
13141	**13148**	**13151**	**13165**
13167	**13408**	**15028**	**15039**

WATER PUMP PHOTOS

15045	15046	15057	15076
15086	**15092**	**15098**	**15271**
15272	**15367**	**15376**	**15405**
15406	**15414**	**15890**	**16009**
16010	**16011**	**16014**	**16020**
16025	**16026**	**16029**	**16034**

WATER PUMP PHOTOS

16035	16041	16043	16044
16050	**16056**	**16058**	**16063**
16069	**16074**	**16080**	**16083**
16110	**16114**	**16115**	**16116**
16129	**16130**	**16131**	**16160**
16161	**16162**	**16167**	**16206**

WATER PUMP PHOTOS

16207	16209	16213	16214
16220	**16221**	**16224**	**16232**
16237	**16250**	**16251**	**16270**
16273	**16284**	**16289**	**16300**
16309	**16321**	**16342**	**16347**
16349	**16352**	**16374**	**16375**

WATER PUMP PHOTOS

16403	16419	16421	16426
16427	**16459**	**16468**	**16494**
16503	**16504**	**16505**	**18019**
18052	**18117**	**18122**	**18150**
18261	**18262**	**18274**	**18275**
18279	**18339**	**18340**	**18377**

WATER PUMP PHOTOS

18382	18471	18496	21000
21007	**21013**	**21027**	**21030**
21040	**21050**	**21067**	**21075**
21076	**21079**	**21092**	**21097**
21098	**21099**	**21107**	**21110**
21137	**21662**	**21895**	**22002**

WATER PUMP PHOTOS

22005	22033	22040	22044
22049	**22053**	**22054**	**22056**
22065	**22068**	**22069**	**22078**
22093	**22097**	**22098**	**22104**
22107	**22960**	**22964**	**23010**
23101	**23104**	**23106**	**23108**

WATER PUMP PHOTOS

23110	23111	23113	23114
23115	**23116**	**23118**	**23120**
23121	**23122**	**23124**	**23127**
23131	**23135**	**23136**	**23139**
23145	**23150**	**23152**	**23153**
23158	**23161**	**23162**	**23300**

WATER PUMP PHOTOS

23410	23412	23713	25005
25015	**25016**	**25017**	**25018**
25027	**25040**	**25048**	**25064**
25079	**25087**	**25094**	**25099**
25100	**25141**	**25142**	**25145**
25200	**25216**	**25232**	**25258**

WATER PUMP PHOTOS

25290	25291	25298	25306
25320	**25324**	**25325**	**25334**
25395	**26056**	**26060**	**26067**
26105	**26106**	**26109**	**26111**
26116	**26133**	**26168**	**26201**
26212	**26223**	**26238**	**26259**

WATER PUMP PHOTOS

26278	26304	26305	26310
26318	**26328**	**26359**	**26360**
26364	**26365**	**26383**	**26385**
26388	**26389**	**26393**	**26399**
26415	**26416**	**26434**	**26448**
26450	**26460**	**26461**	**26462**

WATER PUMP PHOTOS

26463	26470	26473	26477
26495	**26800**	**28004**	**28065**
28066	**28067**	**28071**	**28077**
28107	**28108**	**28119**	**28149**
28152	**28153**	**28154**	**28157**
28171	**28172**	**28297**	**28307**

WATER PUMP PHOTOS

28335	28378	28401	28446
28469	**31000**	**31001**	**31004**
31009	**31015**	**31018**	**31022**
31028	**31037**	**31041**	**31046**
31070	**31310**	**31311**	**31563**
31896	**32020**	**32023**	**32030**

WATER PUMP PHOTOS

32034	32059	32061	32066
32083	**32084**	**32088**	**32089**
32094	**32101**	**32102**	**32109**
32113	**32118**	**32119**	**32121**
32122	**32123**	**32125**	**32127**
32128	**32129**	**32130**	**33000**

WATER PUMP PHOTOS

33021	33040	33052	33053
33077	**33100**	**33105**	**33117**
33129	**33137**	**33138**	**33147**
33152	**33170**	**33403**	**33404**
33414	**35006**	**35012**	**35037**
35075	**35078**	**35190**	**35256**

WATER PUMP PHOTOS

35269	35292	35296	35411
35476	**36008**	**36031**	**36049**
36097	**36132**	**36166**	**36179**
36198	**36215**	**36225**	**36239**
36254	**36255**	**36260**	**36268**
36300	**36302**	**36353**	**36394**

WATER PUMP PHOTOS

38013	38049	38068	38146
38148	**38151**	**38176**	**38195**
38202	**38228**	**38231**	**38236**
38263	**38264**	**38276**	**38322**
38323	**38333**	**38368**	**38369**
38379	**38380**	**38410**	**38440**

WATER PUMP PHOTOS

41002	41003	41006	41010
41016	41035	41038	41049
41056	41063	41066	41068
41069	41073	41077	41090
41109	41120	41121	41898
41975	41984	42008	42014

WATER PUMP PHOTOS

42016	42023	42024	42028
42035	**42038**	**42039**	**42042**
42043	**42044**	**42047**	**42050**
42051	**42052**	**42055**	**42057**
42060	**42062**	**42071**	**42072**
42087	**42090**	**42095**	**42103**

WATER PUMP PHOTOS

42105	42108	42114	42932
42953	**43053**	**43103**	**43128**
43159	**43160**	**43163**	**43169**
43401	**43918**	**43919**	**45047**
45059	**45155**	**45189**	**45257**
45293	**46104**	**46218**	**46252**

WATER PUMP PHOTOS

46338	46348	46354	48222
48311	**48313**	**48315**	**48332**
48346	**48351**	**51008**	**51062**
51074	**51086**	**51089**	**52018**
52048	**52077**	**52079**	**52081**
52086	**52099**	**52705**	**61094**

WATER PUMP PHOTOS

61861	62037	62075	62082
62083	**62093**	**62094**	**62096**
63168	**70001**	**70004**	**70032**
70034	**70041**	**70042**	**70043**
70047	**71023**	**71053**	**71078**
71084	**71085**	**71615**	**71616**

WATER PUMP PHOTOS

71617	72114	73707	73710
73716	**73717**	**76058**	**76288**
78001	**78002**	**78003**	**78007**
78008	**78175**	**78314**	**81651**
82001	**82003**	**82004**	**82065**
82078	**87022**	**87049**	**88014**

WATER PUMP PHOTOS

88027	88033	88046	90014
90025	**90026**	**90029**	**90042**
90045	**92002**	**92016**	**92024**
92026	**92033**	**92055**	**92056**
92057	**92065**	**92066**	**92067**
92069	**93006**	**93007**	**93010**

WATER PUMP PHOTOS

93029	93032	93037	93038
93045	**93047**	**93048**	**93052**
93054	**93055**	**93059**	**93062**
93065	**93068**	**93983**	**95012**
95027	**95048**	**95065**	**95072**
95075	**95078**	**95100**	**95102**

WATER PUMP PHOTOS

95105	95109	95110	95113
95115	**95116**	**95118**	**95123**
96014	**96019**	**97015**	**97020**
98006	**99001**	**99003**	**99110**
99112	**99125**	**99217**	**99239**
99364	**99366**	**99448**	**99600**

WATER PUMP PHOTOS

99668	99682

Part	Year	Cyl	Make	Application
11001	2008-2003	L4	CHEVROLET	CORSA
	2008-2005	L4	FIAT	PALIO
11002	2008-2007, 2003-2000	L4	CHEVROLET	ASTRA
11003	2008-2004	L4	CHEVROLET	AVEO, AVEO5
	2008-2005	L4	PONTIAC	WAVE, WAVE5
	2008-2004	L4	SUZUKI	SWIFT+
11006	2011-2009, 2007-2006	V6	BUICK	LUCERNE, TERRAZA
	2011-2006	V6	CHEVROLET	IMPALA, MALIBU, MONTE CARLO, UPLANDER
	2010-2006	V6	PONTIAC	G6, MONTANA
	2010-2006	V6	SATURN	AURA, RELAY, VUE
11008	2013-2005	L5	VOLKSWAGEN	BEETLE, GOLF, JETTA, PASSAT, RABBIT
11009	2008	L4	SEAT	LEON
11017	1994-1990, 1986-1982	L4	PONTIAC	J2000, J2000 SUNBIRD, LEMANS, SUNBIRD
	1986-1982	L4	BUICK	SKYHAWK
	1986-1982	L4	OLDSMOBILE	FIRENZA
11020	1986-1985	V6	CADILLAC	CIMARRON
	1986-1985	V6	CHEVROLET	CAVALIER
11029	1995-1986	L4	SUZUKI	SAMURAI, SIDEKICK
	1988-1987	L3	CHEVROLET	SPRINT
	1988-1985	L3	PONTIAC	FIREFLY
	1988-1985	L3	SUZUKI	FORSA
11031	1989	L4	GEO	SPECTRUM
	1989-1985	L4	ISUZU	I-MARK
	1988-1985	L4	CHEVROLET	SPECTRUM
	1988-1985	L4	PONTIAC	SUNBURST
11032	2003-1987	L4	CHEVROLET	BERETTA, CAVALIER, CORSICA, LUMINA, S10
	2003-1994	L4	GMC	SONOMA
	2002-1995	L4	PONTIAC	SUNFIRE
	2000-1996	L4	ISUZU	HOMBRE
	1996-1993, 1989-1987	L4	BUICK	CENTURY, SKYHAWK
	1996-1993, 1988-1987	L4	OLDSMOBILE	CUTLASS CIERA, FIRENZA
11033	2006-2000, 1998-1987	V6	BUICK	CENTURY, REGAL, RENDEZVOUS, SKYLARK, TERRAZA
	2006-1987	V6	CHEVROLET	BERETTA, CAVALIER, CELEBRITY, CORSICA, IMPALA, LUMINA, LUMINA APV, MALIBU, MONTE CARLO, UPLANDER, VENTURE
11033	2006-1987	V6	PONTIAC	6000, AZTEK, G6, GRAND AM, GRAND PRIX, MONTANA, SUNBIRD, TEMPEST, TRANS SPORT
	2006-2005	V6	SATURN	RELAY
	2004-1987	V6	OLDSMOBILE	ACHIEVA, ALERO, CUTLASS, CUTLASS CIERA, CUTLASS CRUISER, CUTLASS SUPREME, FIRENZA, SILHOUETTE
	1988-1987	V6	CADILLAC	CIMARRON
11036	1990-1987	L4	PONTIAC	GRAND AM, LEMANS, OPTIMA, SUNBIRD, TEMPEST
	1988-1987	L4	OLDSMOBILE	FIRENZA
11043	1995-1988	L4	BUICK	SKYLARK
	1995-1990	L4	CHEVROLET	BERETTA, CAVALIER
	1995-1987	L4	OLDSMOBILE	ACHIEVA, CALAIS, CUTLASS CALAIS, CUTLASS SUPREME
	1995, 1991-1990	L4	PONTIAC	GRAND PRIX, SUNFIRE
11045	1993-1988	L4	PONTIAC	LEMANS, OPTIMA
11048	1998, 1991-1989	L4	CHEVROLET	TRACKER
	1998-1989	L4	SUZUKI	ESTEEM, SIDEKICK, X-90
	1997-1989	L4	GEO	TRACKER
	1997-1994	L4	PONTIAC	SUNRUNNER
	1993-1992	L4	ASUNA	SUNRUNNER
	1991-1989	L4	GMC	TRACKER
11054	2002-1991	L4	SATURN	SC, SC2, SL2, SW2
11055	1994-1991	L4	SATURN	SL, SL1, SW1
11057	2003-1995	L4	CHEVROLET	CHEVY, CHEVY MONZA
	1991	L4	PONTIAC	OPTIMA
11058	2001-1998, 1992	L4	CHEVROLET	METRO
	2001-1989	L4	SUZUKI	SWIFT
	2000-1998	L3	CHEVROLET	METRO
	2000-1994, 1991-1989	L3	PONTIAC	FIREFLY
	2000-1994	L4	PONTIAC	FIREFLY
	1997-1989	L3	GEO	METRO
	1997-1992	L4	GEO	METRO
	1994-1992	L3	SUZUKI	SWIFT
11064	1994-1993	V8	CADILLAC	ALLANTE, DEVILLE, ELDORADO
11072	2005-1995	V8	CADILLAC	DEVILLE, ELDORADO, SEVILLE

Part	Year	Cyl	Make	Application
11072	2005-2004	V8	PONTIAC	BONNEVILLE
	2003-2001, 1999-1995	V8	OLDSMOBILE	AURORA
11076	2011-2006	V8	BUICK	LUCERNE
	2011-2006	V8	CADILLAC	DTS
11103	2014-2004	V6	BUICK	ALLURE, ENCLAVE, LACROSSE, RENDEZVOUS
	2014-2004	V6	CADILLAC	ATS, CTS, SRX, STS, XTS
	2014-2008	V6	CHEVROLET	CAMARO, CAPRICE, CAPTIVA SPORT, EQUINOX, IMPALA, MALIBU, TRAVERSE
	2014-2007	V6	GMC	ACADIA, TERRAIN
	2011-2006	V6	SAAB	9-3, 9-4X, 9-5
	2010-2007	V6	SATURN	AURA, OUTLOOK, VUE
	2010-2007	V6	SUZUKI	GRAND VITARA, XL-7
	2009-2007	V6	PONTIAC	G6, G8, TORRENT
11127	1987-1981	L4	ISUZU	I-MARK, IMPULSE, PICKUP, TROOPER
	1982-1976	L4	CHEVROLET	LUV
	1979-1976	L4	BUICK	OPEL
11145	2009-2005, 1996	V6	CHEVROLET	EQUINOX, LUMINA, MONTE CARLO
	2009-2006, 1996	V6	PONTIAC	GRAND PRIX, TORRENT
	1996	V6	OLDSMOBILE	CUTLASS SUPREME
11184	2014-2009	L4	CHEVROLET	AVEO, AVEO5, CRUZE, SONIC
	2010-2009	L4	PONTIAC	G3, G3 WAVE
	2009-2008	L4	SATURN	ASTRA
12022	1991-1988, 1986-1984	L4	FORD	TEMPO
	1991-1984	L4	MERCURY	TOPAZ
12041	1994-1992, 1989-1986	L4	FORD	TAURUS, TEMPO
	1994-1992, 1986	L4	MERCURY	SABLE, TOPAZ
12070	1994-1992	V6	FORD	TEMPO
	1994-1992	V6	MERCURY	TOPAZ
12091	2008-2002	V6	JAGUAR	X-TYPE
	2004-1995	V6	FORD	CONTOUR, ESCAPE, TAURUS
	2004-2000	V6	MAZDA	MPV, TRIBUTE
	2004-1995	V6	MERCURY	COUGAR, MYSTIQUE, SABLE
12106	1999-1996	V8	FORD	TAURUS
12115	2004-1998	L4	FORD	CONTOUR, ESCAPE, ESCORT, FOCUS
	2004-2001	L4	MAZDA	TRIBUTE
	2002-1997	L4	MERCURY	COUGAR, MYSTIQUE

Part	Year	Cyl	Make	Application
12124	2010-1997	V8	JAGUAR	S-TYPE, SUPER V8, VANDEN PLAS, XF, XJ8, XJR, XK, XK8, XKR
	2009-2005	V8	LAND ROVER	LR3, RANGE ROVER, RANGE ROVER SPORT
	2006-2000	V8	LINCOLN	LS
	2005-2002	V8	FORD	THUNDERBIRD
12126	2014-2011	L4	LINCOLN	MKT, MKZ
	2013-2001	L4	FORD	EDGE, ESCAPE, EXPLORER, FOCUS, FUSION, RANGER, TAURUS, TRANSIT CONNECT
	2013-2001	L4	MAZDA	3, 5, 6, B2300, CX-7, MX-5 MIATA, TRIBUTE
	2011-2005	L4	MERCURY	MARINER, MILAN
12132	2008, 2006-2003	V6	MAZDA	MPV, TRIBUTE
	2007-2003	V6	FORD	ESCAPE, FUSION, TAURUS
	2007-2005	V6	MERCURY	MARINER, MILAN, SABLE
12250	2012-2009	V6	FORD	ESCAPE, FUSION
	2011-2009	V6	MERCURY	MARINER, MILAN
12356	1997-1995	L6	JAGUAR	VANDEN PLAS, XJ6, XJR, XJS
12489	2009-2006	V6	FORD	ESCAPE, FUSION
	2009-2006	V6	MERCURY	MARINER, MILAN
	2008-2003	V6	MAZDA	6
	2006	V6	LINCOLN	ZEPHYR
13038	2014-2007	L4	CHRYSLER	200, SEBRING
	2014-2008	L4	MITSUBISHI	LANCER, OUTLANDER, OUTLANDER SPORT, RVR
	2013-2007	L4	DODGE	AVENGER, CALIBER, JOURNEY
	2013-2007	L4	JEEP	COMPASS, PATRIOT
13126	2000-1990	V6	CHRYSLER	GRAND VOYAGER, IMPERIAL, NEW YORKER, TOWN & COUNTRY, VOYAGER
	2000-1990	V6	DODGE	CARAVAN, DYNASTY, GRAND CARAVAN
	2000-1990	V6	PLYMOUTH	GRAND VOYAGER, VOYAGER
13140	1997-1993	V6	CHRYSLER	CONCORDE, INTREPID
	1997-1993	V6	DODGE	INTREPID
	1997-1993	V6	EAGLE	VISION
13141	1994-1993	V6	CHRYSLER	CONCORDE, LHS, NEW YORKER
	1994-1993	V6	DODGE	INTREPID
	1994-1993	V6	EAGLE	VISION

Part	Year	Cyl	Make	Application
13148	1999-1992	L4	MITSUBISHI	ECLIPSE, EXPO, EXPO LRV, GALANT
	1998-1993	L4	EAGLE	SUMMIT, TALON
	1994-1993	L4	DODGE	COLT
	1994-1993	L4	PLYMOUTH	COLT
13151	1997-1995	V6	CHRYSLER	CONCORDE, INTREPID, LHS, NEW YORKER
	1997-1995	V6	DODGE	INTREPID
	1997-1995	V6	EAGLE	VISION
	1997	V6	PLYMOUTH	PROWLER
13165	2007-2001	V6	CHRYSLER	TOWN & COUNTRY, VOYAGER
	2007-2001	V6	DODGE	CARAVAN, GRAND CARAVAN
13167	2009-2003	L4	CHRYSLER	PT CRUISER
	2005-2003	L4	DODGE	NEON
13217	2010-2008	V6	CHRYSLER	300, SEBRING
	2010-2008	V6	DODGE	AVENGER, CHARGER, MAGNUM
13408	2005-2002, 1987-1985	L4	RENAULT	ALLIANCE, CLIO, ENCORE, MEGANE, SCENIC
15028	1980	L4	TOYOTA	TERCEL
15039	1982-1980	L6	TOYOTA	CRESSIDA
15045	1988-1981	L4	TOYOTA	TERCEL
15046	1987-1983	L4	TOYOTA	COROLLA
15057	1993-1984	L4	TOYOTA	CELICA, COROLLA
	1989	L4	GEO	PRIZM
	1988-1985	L4	CHEVROLET	NOVA
15076	1992-1990	L4	GEO	PRIZM
	1991-1985	L4	TOYOTA	COROLLA, MR2
	1988	L4	CHEVROLET	NOVA
15086	1982-1981	L4	TOYOTA	TERCEL
15092	1989-1984	L4	TOYOTA	VAN
15098	1995-1987	L4	TOYOTA	PASEO, TERCEL
15271	1997-1993	L4	GEO	PRIZM
	1997-1993	L4	TOYOTA	COROLLA
15272	1997-1993	L4	GEO	PRIZM
	1997-1993	L4	TOYOTA	CELICA, COROLLA
15367	1999-1995	L4	TOYOTA	PASEO, TERCEL
15376	2008-2003	L4	PONTIAC	VIBE
	2008-1998	L4	TOYOTA	CELICA, COROLLA, MATRIX, MR2 SPYDER
	2002-1998	L4	CHEVROLET	PRIZM
15405	2006-2003	L4	PONTIAC	VIBE
	2006-2000	L4	TOYOTA	CELICA, COROLLA, MATRIX
15406	2010-2000	L4	TOYOTA	ECHO, PRIUS, YARIS
	2006-2004	L4	SCION	XA, XB

Part	Year	Cyl	Make	Application
15414	2013-2001	L4	TOYOTA	CAMRY, COROLLA, HIGHLANDER, MATRIX, RAV4, SOLARA
	2012-2010	L4	LEXUS	HS250H
	2010-2009	L4	PONTIAC	VIBE
	2010-2005	L4	SCION	TC, XB
15890	1970-1965	L4	TOYOTA	CORONA, CROWN, HI-LUX, PICKUP
16009	1982-1980, 1974-1968	L4	NISSAN	510, 521 PICKUP, 610, 620 PICKUP, 720
16010	1981-1974	L4	NISSAN	210, 310, B210, F10
16011	1984-1970	L6	NISSAN	240Z, 260Z, 280Z, 810, MAXIMA
16014	1979-1978, 1974-1973	H4	SUBARU	1400, BRAT
16020	1983-1976	L4	MAZDA	GLC, MIZER
16025	1987-1980	H4	SUBARU	BRAT
16026	1982-1975, 1973-1971	L4	NISSAN	1200, 210, B210
16029	1981-1975	L4	HONDA	ACCORD, CIVIC, PRELUDE
16033	1979-1973	L4	HONDA	CIVIC
16034	1979-1975	L4	HONDA	ACCORD, CIVIC, PRELUDE
16035	1983-1980	L4	HONDA	ACCORD, CIVIC, PRELUDE
16041	1988-1982	L4	NISSAN	310, PULSAR, PULSAR NX, SENTRA
16043	1983-1980	L4	HONDA	CIVIC
16044	1986-1983	L4	NISSAN	SENTRA
16050	1985-1981	L4	MAZDA	GLC
16056	1987-1983	L4	HONDA	ACCORD, PRELUDE
16058	1995-1984	V6	NISSAN	200SX, 300ZX, D21, PICKUP
	1992-1990	V6	INFINITI	M30
16063	1988-1984	L4	NISSAN	200SX
16069	1987-1984	L4	HONDA	CIVIC, WAGOVAN
16074	1998-1993	V6	MERCURY	VILLAGER
	1998-1985	V6	NISSAN	MAXIMA, QUEST
16080	1991-1985	H4	SUBARU	XT
16083	1989-1985	L4	HONDA	ACCORD, PRELUDE
16110	1988-1987	L4	NISSAN	VAN
16114	1986-1982	L4	NISSAN	MULTI, STANZA
16115	1989-1986	L4	ACURA	INTEGRA
16116	1989-1986	L4	NISSAN	MULTI, PULSAR NX, STANZA
16129	1991-1988	L4	HONDA	PRELUDE
16130	1995-1988	L4	HONDA	CIVIC, CIVIC DEL SOL, CRX
16131	1990-1988	L4	HONDA	PRELUDE
16160	1989	L4	ISUZU	I-MARK
16161	1994-1990	H4	SUBARU	LOYALE
16162	1995-1990	L4	NISSAN	AXXESS, STANZA

Part	Year	Cyl	Make	Application
16167	1994-1989	L4	MAZDA	B2600, MPV
16206	2011-2006	V6	NISSAN	XTERRA
	2004-1989	L4	NISSAN	240SX, D21, FRONTIER, PICKUP, XTERRA
16207	1990-1989	L4	NISSAN	PULSAR NX, SENTRA
16209	2002-1990, 1979-1976	L4	HONDA	ACCORD, ODYSSEY, PRELUDE
	1999-1997	L4	ACURA	CL
	1999-1996	L4	ISUZU	OASIS
16213	2002-1999, 1996-1991	L4	INFINITI	G20
	2001-1991	L4	NISSAN	200SX, NX, SENTRA
16214	1999-1991	L4	NISSAN	200SX, NX, SENTRA
16218	2014-2007	L4	NISSAN	CUBE, NV200, SENTRA, VERSA
16220	1992-1990	L4	ISUZU	IMPULSE, STYLUS
16221	1993-1990	L4	GEO	STORM
	1993-1991	L4	ISUZU	IMPULSE, STYLUS
16224	1995-1990	L4	ACURA	INTEGRA
16237	1992-1989	L4	DAIHATSU	CHARADE
16250	1995-1992	L4	HONDA	CIVIC, CIVIC DEL SOL
16251	1996-1992	L4	HONDA	PRELUDE
16270	2001-1993	L4	NISSAN	ALTIMA
16273	2001-1993	L4	HONDA	PRELUDE
16289	2001	L4	ACURA	INTEGRA
16300	2002-1999	V6	MERCURY	VILLAGER
	2002-1999	V6	NISSAN	QUEST
16309	2004-1995	V6	NISSAN	MAXIMA, PATHFINDER
	2003-1996	V6	INFINITI	I30, QX4
16321	1995-1994	L4	HONDA	CIVIC DEL SOL
	1993-1992	L4	ACURA	INTEGRA
16342	2009-1996	L4	SUZUKI	AERIO, ESTEEM, SIDEKICK, SX4, VITARA
	2003-1999	L4	CHEVROLET	TRACKER
16347	1998-1993	L5	ACURA	TL, VIGOR
16349	2001-1996	L4	ACURA	INTEGRA
	2001-1997	L4	HONDA	CR-V
16352	2000-1997	L4	ACURA	EL
	2000-1996	L4	HONDA	CIVIC, CIVIC DEL SOL
16374	2002-1999	L4	CHEVROLET	TRACKER
	2002-1998	L4	SUZUKI	ESTEEM, VITARA
	1992	L5	ACURA	VIGOR
16375	2007-2000	L4	CHEVROLET	ASTRA, LUV, OPTRA
	2003-1999	L4	DAEWOO	LEGANZA, NUBIRA
	2003-1998	L4	ISUZU	AMIGO, RODEO, RODEO SPORT
16403	2009-2000	L4	HONDA	S2000
16419	2005-2001	L4	ACURA	EL
	2005-2001	L4	HONDA	CIVIC
16421	2009-2001	H6	SUBARU	B9 TRIBECA, LEGACY, OUTBACK
16426	2014-2002	V6	INFINITI	EX35, EX37, FX35, FX37, G25, G35, G37, I35, JX35, M35, M35H, M37, Q50, Q60, QX50, QX60, QX70
	2014-2002	V6	NISSAN	350Z, 370Z, ALTIMA, FRONTIER, GT-R, MAXIMA, MURANO, NV1500, NV2500, NV3500, PATHFINDER, QUEST, XTERRA
	2011	V8	INFINITI	M56
	2009	V6	SUZUKI	EQUATOR
16427	2013-2002	L4	NISSAN	ALTIMA, ROGUE, SENTRA, X-TRAIL
16459	2002-1999	L4	DAEWOO	LANOS
16468	2001-1996	L4	ACURA	INTEGRA
	2000-1999, 1997-1996	L4	HONDA	CIVIC, CIVIC DEL SOL
16488	2014-2004	V8	INFINITI	FX50, M56, QX56, QX70, QX80
	2014-2004	V8	NISSAN	ARMADA, NV2500, NV3500, PATHFINDER, TITAN
16494	2006-2000	L3	HONDA	INSIGHT
16503	2009-2008, 2006-2004	L4	PONTIAC	MATIZ
16504	2009-2001	L4	DODGE	ATOS
18019	1979-1978	L5	AUDI	5000
18052	1989-1980	L5	AUDI	200, 4000, 4000 QUATTRO, 5000, 80 QUATTRO, 90, COUPE
	1988-1983	L5	VOLKSWAGEN	QUANTUM
18117	1993-1980, 1974-1968	L6	BMW	2500, 2800, 3.0CS, 3.0CSI, 3.0CSL, 3.0S, 528I, 533I, 535I, 633CSI, 635CSI, 733I, 735I, 735IL, L6, L7, M5, M6
18122	1986-1968	L6	BMW	2500, 2800, 3.0CS, 3.0CSI, 528I, 530I, 630CSI, 633CSI, 733I, 735I, BAVARIA
18150	1991-1986	H4	VOLKSWAGEN	TRANSPORTER, VANAGON
18212	2006-2005	L4	VOLKSWAGEN	JETTA
18261	2006-1991	L6	BMW	320I, 323CI, 323I, 323IS, 325CI, 325I, 325IS, 325XI, 328CI, 328I, 328IS, 330CI, 330I, 330XI, 525I, 528I, 530I, M3, X3, X5, Z3, Z4

Part	Year	Cyl	Make	Application
18262	2008-2007, 2005-2002	V6	SEAT	ALHAMBRA
	2005-1992	V6	VOLKSWAGEN	CORRADO, EUROVAN, GOLF, JETTA, PASSAT
18274	1997-1992	L5	VOLKSWAGEN	EUROVAN, TRANSPORTER
18275	1999-1991	L4	BMW	318I, 318IS, 318TI, Z3
18279	1997-1992	L5	AUDI	S4, S6
18339	2012-1993	L5	VOLVO	850, C30, C70, S40, S60, S70, S80, V50, V70, XC70, XC90
	2004-2000	L4	VOLVO	S40, V40
	2004-2003	L6	VOLVO	S80, XC90
18340	1998-1997	L6	VOLVO	S90, V90
18377	2008, 2006-1998	L4	VOLKSWAGEN	BEETLE, GOLF, GOLF CITY, JETTA, PASSAT
	2006-2000	L4	AUDI	A4, A4 QUATTRO, TT, TT QUATTRO
18382	2002-1999	L6	VOLVO	S80
18471	2009-2004	V6	AUDI	A3 QUATTRO, TT QUATTRO
	2008-2002	V6	VOLKSWAGEN	EOS, GOLF, JETTA, R32, TOUAREG
	2006-2004	V6	PORSCHE	CAYENNE
18496	2005-2002	V6	LAND ROVER	FREELANDER
18978	2009-2006	L4	VOLKSWAGEN	BORA, JETTA
	2005-2004	L4	AUDI	A3
21000	1991-1980	L4	BUICK	SKYLARK, SOMERSET, SOMERSET REGAL
	1991-1980	L4	OLDSMOBILE	CALAIS, CUTLASS CALAIS, CUTLASS CIERA, OMEGA, STARFIRE
	1988-1980	L4	PONTIAC	6000, FIERO, PHOENIX
	1986-1980	L4	CHEVROLET	CELEBRITY, CITATION, CITATION II
21007	1986-1982	L4	BUICK	SKYHAWK
	1986-1982	L4	CADILLAC	CIMARRON
	1986-1982	L4	CHEVROLET	CAVALIER
	1986-1982	L4	OLDSMOBILE	FIRENZA
	1986-1983	L4	PONTIAC	J2000, J2000 SUNBIRD, SUNBIRD
21013	1985-1982	L4	CHEVROLET	S10, S10 BLAZER
	1985-1982	L4	GMC	S15, S15 JIMMY
21027	1986-1985	L4	CHEVROLET	CHEVETTE
21030	1989-1978	L6	CHEVROLET	C10, C20, C20 SUBURBAN, C30, G20, G30, K10, K20, K20 SUBURBAN, K30, P10, P20, P30, R20, R30, V20, V30
21030	1989-1978	L6	GMC	C15, C1500, C25, C25 SUBURBAN, C2500, C2500 SUBURBAN, C35, C3500, G25, G35, K1500, K25, K25 SUBURBAN, K2500, K2500 SUBURBAN, K35, K3500, P15, P1500, P25, P2500, P35, P3500, R2500, R3500, V2500, V3500
21040	1993-1987	L4	CHEVROLET	ASTRO, LLV, S10, S10 BLAZER
	1993-1987	L4	GMC	S15, S15 JIMMY, SAFARI, SONOMA
21050	1995-1986	V6	BUICK	CENTURY, ELECTRA, LESABRE, PARK AVENUE, REATTA, REGAL, RIVIERA, SKYLARK
	1995-1992	V6	CHEVROLET	CAMARO, LUMINA APV
	1995-1985	V6	OLDSMOBILE	88, 98, ACHIEVA, CALAIS, CUTLASS CALAIS, CUTLASS CIERA, CUTLASS CRUISER, DELTA 88, SILHOUETTE, TORONADO
	1995-1985	V6	PONTIAC	BONNEVILLE, FIREBIRD, GRAND AM, TRANS SPORT
21067	1991-1985	L4	BUICK	SKYLARK, SOMERSET, SOMERSET REGAL
	1991-1985	L4	OLDSMOBILE	CALAIS, CUTLASS CALAIS
	1991-1985	L4	PONTIAC	GRAND AM
21075	2009-1996	V6	BUICK	ALLURE, LACROSSE, LESABRE, LUCERNE, PARK AVENUE, REGAL, RIVIERA
	2008-1996	V6	PONTIAC	BONNEVILLE, FIREBIRD, GRAND PRIX
	2005-1996	V6	CHEVROLET	CAMARO, IMPALA, LUMINA, MONTE CARLO
	1999-1996	V6	OLDSMOBILE	88, 98, INTRIGUE, LSS, REGENCY
21076	2002-1996	L4	CHEVROLET	CAVALIER, MALIBU
	2002-1996	L4	PONTIAC	GRAND AM, SUNFIRE
	2001-1996	L4	OLDSMOBILE	ACHIEVA, ALERO
	1998-1996	L4	BUICK	SKYLARK
21079	2005-2000	V6	SATURN	L300, LS2, LW2, LW300, VUE
	2004-2003, 2001-1997	V6	CADILLAC	CATERA, CTS

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21079	2003-1999, 1997-1994	V6	SAAB	9-5, 900, 9000
21092	2014-2010	L4	BUICK	LACROSSE, REGAL, VERANO
	2014-2003	L4	CHEVROLET	CAPTIVA SPORT, CAVALIER, CLASSIC, COBALT, EQUINOX, HHR, IMPALA, MALIBU
	2013-2010	L4	GMC	TERRAIN
	2011-2003	L4	SAAB	9-3, 9-3X
	2010-2002	L4	PONTIAC	G5, G6, GRAND AM, PURSUIT, SOLSTICE, SUNFIRE
	2010-2000	L4	SATURN	AURA, ION, L100, L200, L300, LS, LS1, LW1, LW200, SKY, VUE
	2004-2002	L4	OLDSMOBILE	ALERO
21097	2012-2007	L4	CHEVROLET	COLORADO
	2012-2004	L5	CHEVROLET	COLORADO
	2012-2004	L4	GMC	CANYON
	2012-2004	L5	GMC	CANYON
	2010-2006	L5	HUMMER	H3, H3T
	2009-2002	L6	CHEVROLET	TRAILBLAZER, TRAILBLAZER EXT
	2009-2002	L6	GMC	ENVOY, ENVOY XL, ENVOY XUV
	2009-2005	L6	SAAB	9-7X
	2008-2006	L4	ISUZU	I-280, I-290
	2008-2006	L5	ISUZU	I-350, I-370
	2008-2003	L6	ISUZU	ASCENDER
	2007-2004	L6	BUICK	RAINIER
	2004-2002	L6	OLDSMOBILE	BRAVADA
21098	2005-2001	V8	CHEVROLET	C4500 KODIAK, C5500 KODIAK, SILVERADO 2500 HD, SILVERADO 3500
	2005-2001	V8	GMC	C4500 TOPKICK, C5500 TOPKICK, SIERRA 2500 HD, SIERRA 3500
	2005	V8	WORKHORSE	LF72
21107	1984-1982, 1980-1978	L4	CHEVROLET	CAMARO, MONZA
	1984-1975	L6	CHEVROLET	C10, C10 SUBURBAN, C20, C30, CAMARO, CAPRICE, EL CAMINO, G10, G20, G30, IMPALA, K10, K10 SUBURBAN, K20, MALIBU, NOVA
21107	1984-1976	L6	GMC	C15, C15 SUBURBAN, C1500, C1500 SUBURBAN, C25, C2500, C35, C3500, G15, G1500, G25, G2500, G35, G3500, JIMMY, K15, K15 SUBURBAN, K1500, K1500 SUBURBAN, K25, K2500, SPRINT
	1984-1982, 1980-1977	L4	PONTIAC	ASTRE, FIREBIRD, SUNBIRD
	1983-1980	L4	AMERICAN MOTORS	CONCORD, EAGLE, SPIRIT
	1983-1980	L4	JEEP	CJ5, CJ7, SCRAMBLER
	1979-1978	L6	AMERICAN MOTORS	CONCORD
	1979-1975	L6	PONTIAC	CATALINA, FIREBIRD, GRAND LEMANS, LAURENTIAN, LEMANS, PARISIENNE, VENTURA
	1976-1973	L6	OLDSMOBILE	CUTLASS, CUTLASS SUPREME, OMEGA
21110	1977-1975	L6	CHEVROLET	C10, C10 SUBURBAN, C20, C30, G10, G20, G30, K10, K10 SUBURBAN, K20, P30
	1977-1975	L6	GMC	C15, C15 SUBURBAN, C25, C35, G15, JIMMY, K15, K15 SUBURBAN, K25
21137	1977-1975	L6	CHEVROLET	C10, C20, C20 SUBURBAN, C30, G20, G30, K10, K20, K20 SUBURBAN, K30, P10, P20, P30
	1977-1975	L6	GMC	C15, C25, C25 SUBURBAN, C35, G25, G35, K15, K25, K25 SUBURBAN, K35
21662	2014-2011	L4	CHEVROLET	CRUZE, SONIC
	2013	L4	BUICK	ENCORE
21895	1974-1973, 1971-1968	L6	BUICK	APOLLO, LESABRE, SKYLARK, SPECIAL

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21895	1974-1962	L6	CHEVROLET	BEL AIR, BISCAYNE, BLAZER, C10 PICKUP, C20 PICKUP, C20 SUBURBAN, C30 PICKUP, CAMARO, CAPRICE, CHEVELLE, CHEVY II, EL CAMINO, G10 VAN, G20 VAN, G30 VAN, IMPALA, K10 PICKUP, K10 SUBURBAN, K20 PANEL, K20 PICKUP, K20 SUBURBAN, MALIBU, NOVA, P10 SERIES, P10 VAN, P20 SERIES, P20 VAN, P30 SERIES, P30 VAN, SUBURBAN
	1974-1963	L6	GMC	C15/C1500 PICKUP, C15/C1500 SUBURBAN, C25/C2500 PICKUP, C25/C2500 SUBURBAN, C35/C3500 PICKUP, G15/G1500 VAN, G25/G2500 VAN, G35/G3500 VAN, JIMMY, K15/K1500 PICKUP, K15/K1500 SUBURBAN, K25/K2500 PICKUP, K25/K2500 SUBURBAN, K35/K3500 PICKUP, P15/P1500 VAN, P25/P2500 VAN, P35/P3500 VAN, PB1000 SERIES, PB15 SERIES, PB1500 SERIES, PB25 SERIES, PB2500 SERIES, SPRINT
	1974-1966	L6	OLDSMOBILE	CUTLASS, CUTLASS SUPREME, F85
	1974-1970	L6	PONTIAC	FIREBIRD, LEMANS, TEMPEST, VENTURA
	1970-1962	L4	CHEVROLET	CHEVY II, NOVA, P10 SERIES
	1965-1964	L4	GMC	PB1000 SERIES, PB1500 SERIES, PB2500 SERIES
22002	1983-1975	L6	FORD	FAIRMONT, GRANADA, LTD, MAVERICK, MUSTANG, THUNDERBIRD
	1983-1975	L6	MERCURY	CAPRI, COMET, COUGAR, MARQUIS, MONARCH, ZEPHYR
22005	1982-1974	L4	FORD	COURIER, FAIRMONT, GRANADA, MUSTANG, MUSTANG II, PINTO
	1982-1975	L4	MERCURY	BOBCAT, CAPRI, COUGAR, ZEPHYR
22033	1977-1965	L6	FORD	BRONCO, CLUB WAGON, COUNTRY SEDAN, COUNTRY SQUIRE, CUSTOM, CUSTOM 500, E-100 ECONOLINE, E-100 ECONOLINE CLUB WAGON, E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, F-100, F-100 PICKUP, F-150, F-250, F-250 PICKUP, F-350, F-350 PICKUP, GALAXIE, GALAXIE 500, P-350
22040	1990-1981	L4	FORD	ESCORT, EXP
	1987-1981	L4	MERCURY	LN7, LYNX
22044	1975-1960	L6	FORD	BRONCO, E-100 ECONOLINE, FAIRLANE, FALCON, GRANADA, MAVERICK, MUSTANG, P-100, RANCHERO, TORINO
	1975-1973, 1968-1960	L6	MERCURY	COMET, MONARCH, MONTEGO
22049	1997-1993, 1990-1988	L4	FORD	ASPIRE, FESTIVA
	1995-1994	L4	KIA	SEPHIA
	1995-1986	L4	MAZDA	323, MX-3, PROTEGE
	1989-1987	L4	MERCURY	TRACER
22053	1995	L4	KIA	SPORTAGE
	1993-1987	L4	MAZDA	626, B2200, MX-6
	1992-1989	L4	FORD	PROBE
22054	1994-1983	L4	FORD	AEROSTAR, FAIRMONT, LTD, MUSTANG, RANGER, THUNDERBIRD
	1994	L4	MAZDA	B2300
	1989-1985	L4	MERKUR	XR4TI
	1986-1983	L4	MERCURY	CAPRI, COUGAR, MARQUIS, ZEPHYR
22056	1991-1989	L4	FORD	TAURUS
22065	1991	L4	FORD	ESCORT
	1991	L4	MERCURY	TRACER
22068	1996-1991	L4	FORD	ESCORT
	1996-1991	L4	MERCURY	CAPRI, TRACER

Part	Year	Cyl	Make	Application
22068	1994-1988	L4	MAZDA	323, MIATA, PROTEGE
22069	1996-1991	L4	FORD	ESCORT
	1996-1992	L4	MERCURY	TRACER
22078	2003-1993	L4	MAZDA	626, MX-6, PROTEGE, PROTEGE5
	1997-1993	L4	FORD	PROBE
22093	2001-1995	L4	FORD	RANGER
	2001-1995	L4	MAZDA	B2300, B2500
22097	2002-1995	V8	LINCOLN	CONTINENTAL
22098	2000-1996	V6	FORD	TAURUS
	2000-1996	V6	MERCURY	SABLE
22107	2002-1997	L4	FORD	ESCORT
	1999-1997	L4	MERCURY	TRACER
	1975	L6	BUICK	APOLLO
22960	1980-1969	L6	FORD	FAIRLANE, GRANADA, MAVERICK, MUSTANG, RANCHERO, TORINO
	1980-1969	L6	MERCURY	COMET, MONARCH, MONTEGO
22964	1974-1971	L4	FORD	PINTO
	1974-1971	L4	MERCURY	CAPRI
23010	2011-2005	V6	DODGE	AVENGER, CHALLENGER, CHARGER, GRAND CARAVAN, JOURNEY, MAGNUM, NITRO
	2010-2005	V6	CHRYSLER	300, PACIFICA, SEBRING, TOWN & COUNTRY
	2010-2009	V6	VOLKSWAGEN	ROUTAN
23101	1983-1978	L4	DODGE	OMNI
	1983-1978	L4	PLYMOUTH	HORIZON
23104	1980-1979	L4	PLYMOUTH	CHAMP
	1979	L4	DODGE	COLT
23106	1980-1979	L4	DODGE	COLT
	1980-1979	L4	PLYMOUTH	CHAMP
23108	1994-1993	L4	EAGLE	TALON
	1994-1990, 1988-1985	L4	MITSUBISHI	ECLIPSE, MIRAGE
	1994-1990, 1982-1981	L4	PLYMOUTH	CHAMP, LASER
	1990-1980	L4	DODGE	COLT
23110	1988-1982	L4	CHRYSLER	E CLASS, LASER, LEBARON, NEW YORKER
23110	1988-1981	L4	DODGE	400, 600, ARIES, CARAVAN, CHARGER, DAKOTA, DAYTONA, DYNASTY, GRAND CARAVAN, LANCER, MINI RAM, OMNI, RAMPAGE, ROYAL MINI RAM, SHADOW
	1988-1981	L4	PLYMOUTH	CARAVELLE, EXPO, GRAND VOYAGER, HORIZON, RELIANT, SCAMP, SUNDANCE, VOYAGER
23111	1987-1981	L4	DODGE	400, 600, ARIES, CARAVAN, MINI RAM, ROYAL MINI RAM
	1985-1982	L4	CHRYSLER	E CLASS, LEBARON, NEW YORKER
	1985-1981	L4	PLYMOUTH	CARAVELLE, RELIANT
23113	1986-1983	L4	DODGE	CHARGER, OMNI
	1986-1983	L4	PLYMOUTH	HORIZON, TURISMO
23114	1996-1983	L4	MITSUBISHI	MIGHTY MAX, VAN
	1993-1983	L4	DODGE	POWER RAM 50, RAM 50
	1987	L4	HYUNDAI	STELLAR
23115	2003, 2001-1986	L4	HYUNDAI	ACCENT, EXCEL, SCOUPE
	1996-1993, 1991-1989	L4	EAGLE	SUMMIT
	1996-1985	L4	MITSUBISHI	MIRAGE, PRECIS
	1995-1985, 1982-1981	L4	PLYMOUTH	CHAMP, COLT
	1994-1981	L4	DODGE	COLT
23116	1986-1978	L4	PLYMOUTH	CONQUEST, SAPPORO
	1985-1976	L4	DODGE	CHALLENGER, COLT, CONQUEST, D50
	1985-1983	L4	MITSUBISHI	MIGHTY MAX, STARION
23118	1991-1984	L4	DODGE	COLT
	1991-1989	L4	EAGLE	VISTA
	1991-1989	L4	HYUNDAI	SONATA
	1991-1984	L4	PLYMOUTH	COLT
	1988-1983	L4	MITSUBISHI	CORDIA, GALANT, TREDIA
23120	1989-1985	L4	DODGE	CONQUEST, POWER RAM 50, RAIDER, RAM 50
	1989-1983	L4	MITSUBISHI	MIGHTY MAX, MONTERO, STARION
	1988-1987	L4	MAZDA	B2600

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23120	1980-1976	L4	PLYMOUTH	ARROW, ARROW PICKUP
23121	2000, 1995-1988	V6	CHRYSLER	GRAND VOYAGER, LEBARON, NEW YORKER, TC MASERATI, VOYAGER
	2000-1987	V6	DODGE	CARAVAN, DAYTONA, DYNASTY, GRAND CARAVAN, MINI RAM, RAIDER, RAM 50, ROYAL MINI RAM, SHADOW, SPIRIT, STEALTH
	2000-1987	V6	PLYMOUTH	ACCLAIM, GRAND VOYAGER, SUNDANCE, VOYAGER
	1999-1988	V6	MITSUBISHI	3000GT, DIAMANTE, GALANT, MIGHTY MAX, MONTERO, SIGMA
	1998-1990	V6	HYUNDAI	SONATA
23122	1989	L4	CHRYSLER	LEBARON, TC MASERATI
	1989	L4	DODGE	ARIES, CARAVAN, DAKOTA, DAYTONA, DYNASTY, LANCER, OMNI, SHADOW, SPIRIT
	1989	L4	PLYMOUTH	ACCLAIM, EXPO, HORIZON, RELIANT, VOYAGER
23124	1989-1988	L4	CHRYSLER	CONQUEST
	1989-1986	L4	MITSUBISHI	STARION
23127	1995-1990	L4	DODGE	CARAVAN, DAKOTA, DAYTONA, DYNASTY, OMNI, SHADOW, SPIRIT
	1995-1990	L4	PLYMOUTH	ACCLAIM, HORIZON, SUNDANCE, VOYAGER
	1993-1990	L4	CHRYSLER	LEBARON, TC MASERATI
23131	1995-1992	L4	HYUNDAI	ELANTRA
	1992-1991, 1989	L4	MITSUBISHI	MIRAGE
	1990-1989	L4	DODGE	COLT
	1990-1989	L4	EAGLE	SUMMIT
	1990-1989	L4	PLYMOUTH	COLT
23135	1993	L4	DODGE	COLT
	1993-1992	L4	EAGLE	SUMMIT
	1993-1992	L4	MITSUBISHI	EXPO LRV
23136	2002-1996	L4	DODGE	DAKOTA
	2002-1991	L4	JEEP	CHEROKEE, COMANCHE, TJ, WRANGLER
23136	1999-1991	L6	JEEP	GRAND CHEROKEE, TJ, WRANGLER
23139	1993-1992	L4	CHRYSLER	DAYTONA
	1993-1992	L4	DODGE	DAYTONA, SPIRIT
23145	2008-1989	L6	DODGE	D250, D350, RAM 2500, RAM 3500, W250, W350
	2005-1997	L4	FREIGHTLINER	FS65, MT35, MT45
	2001-1993	L6	FORD	CF7000, F600, F650, F700, F750, F800, LN7000
	2001-1991	L6	FREIGHTLINER	FC70, FC80, FL50, FL60, FL70, FL80, FS65, MT45, MT55
	2001-1999	L6	STERLING	ACTERRA 5500, ACTERRA 6500, ACTERRA 7500, L7500, SC7000 CARGO
23150	2005-1995	L4	DODGE	AVENGER, NEON, STRATUS, SX 2.0
	2002-1995	L4	CHRYSLER	CIRRUS, NEON, SEBRING
	2001-1995	L4	PLYMOUTH	BREEZE, NEON
	1999-1995	L4	MITSUBISHI	ECLIPSE
	1998-1995	L4	EAGLE	TALON
23152	2012-1997	V6	MITSUBISHI	DIAMANTE, ECLIPSE, ENDEAVOR, GALANT
	2011-2004	L4	MITSUBISHI	GALANT
	2005-1995	V6	CHRYSLER	CIRRUS, SEBRING
	2002-1995	V6	DODGE	AVENGER, STRATUS
23153	1996-1995	L4	CHRYSLER	CIRRUS, SEBRING
	1996-1995	L4	DODGE	CARAVAN, GRAND CARAVAN, STRATUS
	1996	L4	PLYMOUTH	BREEZE, GRAND VOYAGER, VOYAGER
23158	1997	V6	CHRYSLER	CONCORDE, LHS
	1997	V6	DODGE	INTREPID
	1997	V6	EAGLE	VISION
23161	2007-1998	V6	CHRYSLER	300, CONCORDE, INTREPID, SEBRING
	2007-1998	V6	DODGE	CHARGER, INTREPID, MAGNUM, STRATUS
23162	2004-1998	V6	CHRYSLER	300M, CONCORDE, INTREPID, LHS, PACIFICA, PROWLER
	2004-1998	V6	DODGE	INTREPID
	2001-1999	V6	PLYMOUTH	PROWLER
23222	2013-2011	L6	RAM	2500, 3500, 4500, 5500
	2010-2007	L6	DODGE	RAM 2500, RAM 3500, RAM 5500

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23231	2010-2008	V6	CHRYSLER	TOWN & COUNTRY
	2010-2008	V6	DODGE	GRAND CARAVAN
	2010-2009	V6	VOLKSWAGEN	ROUTAN
23300	2010-1995	L4	CHRYSLER	CIRRUS, PT CRUISER, SEBRING, VOYAGER
	2007-1995	L4	DODGE	CARAVAN, GRAND CARAVAN, NEON, STRATUS
	2007-2002	L4	JEEP	LIBERTY, TJ, WRANGLER
	2000-1996	L4	PLYMOUTH	BREEZE, GRAND VOYAGER, VOYAGER
23410	1989-1988	L4	EAGLE	MEDALLION
	1986-1984	L4	RENAULT	FUEGO, R18I
23412	2001-1987	L6	JEEP	CHEROKEE, COMANCHE, WAGONEER
	1989-1988	L4	EAGLE	PREMIER
23651	2008-2005	V6	CHRYSLER	PACIFICA
23654	2011-2007	V6	JEEP	WRANGLER
25005	1976-1975	L4	TOYOTA	CELICA, CORONA, PICKUP
25015	1982-1981, 1979-1978	L4	TOYOTA	COROLLA, STARLET
25016	1976	L4	TOYOTA	COROLLA
25017	1984-1978	L4	TOYOTA	4RUNNER, CELICA, CORONA
25018	1982-1979, 1977	L4	TOYOTA	COROLLA
25027	1978-1975	L4	TOYOTA	CELICA, CORONA, PICKUP
25040	1988-1983	L6	TOYOTA	CRESSIDA
25048	1986-1983	L4	TOYOTA	CAMRY
25064	1984-1983	L4	TOYOTA	STARLET
25087	1989-1986	L4	TOYOTA	CELICA
25094	1983-1981	L4	TOYOTA	PICKUP
25099	2001-1987	L4	TOYOTA	CAMRY, CELICA, MR2, RAV4, SOLARA
25100	1992-1986	L6	TOYOTA	CRESSIDA, SUPRA
25140	1995-1988	L4	TOYOTA	CELICA, MR2
25141	1995-1985	L4	TOYOTA	4RUNNER, CELICA, PICKUP
25142	1990-1988	V6	TOYOTA	4RUNNER, PICKUP
25145	1992-1989	V6	TOYOTA	4RUNNER, PICKUP
25200	1985-1984	L4	TOYOTA	PICKUP
25216	1997-1991	L4	TOYOTA	PREVIA
25232	2013-2008	L4	SCION	XD
	2013-2009	L4	TOYOTA	COROLLA, MATRIX
	2010-2009	L4	PONTIAC	VIBE
25258	1993-1988	V6	TOYOTA	CAMRY
	1992-1990	V6	LEXUS	ES250, ES300
25290	1993	V6	LEXUS	ES300
25291	1995-1993	V6	TOYOTA	4RUNNER, PICKUP, T100
25306	2010-1994	V6	TOYOTA	AVALON, CAMRY, HIGHLANDER, SIENNA, SOLARA
	2008-1994	V6	LEXUS	ES300, ES330, RX300, RX330, RX400H
25320	1995-1994	V6	TOYOTA	4RUNNER, PICKUP
25324	2004-1995	V6	TOYOTA	4RUNNER, T100, TACOMA, TUNDRA
25325	2004-1995	V6	TOYOTA	T100, TACOMA, TUNDRA
25395	2005-1998	L6	LEXUS	GS300, IS300
26053	1978-1974	R2	MAZDA	COSMO, ROTARY PICKUP
26056	2011-2006	L4	HONDA	CIVIC
26060	1986-1983	L4	MAZDA	626, B2000
26067	1987-1984	L4	FORD	ESCORT, TEMPO
	1987-1984	L4	MERCURY	LYNX, TOPAZ
	1985-1984	L4	MAZDA	626
26093	1984-1983	H4	SUBARU	BRAT
26105	1995-1986	L4	ISUZU	AMIGO, IMPULSE, PICKUP, TROOPER
26109	1991-1988	H6	SUBARU	XT
26111	1987-1986	L4	MAZDA	626, B2000
26116	2008-2004	L4	SUZUKI	FORENZA, RENO
26133	1997-1988	L4	ISUZU	AMIGO, PICKUP, RODEO, TROOPER
	1996-1994	L4	HONDA	PASSPORT
26168	1993-1991	L4	EAGLE	2000 GTX, SUMMIT
	1992-1989	L4	MITSUBISHI	EXPO, GALANT
	1992	L4	PLYMOUTH	COLT
	1990-1989	L4	DODGE	2000 GTX
26201	1996-1990	V6	NISSAN	300ZX
26212	1998-1992	L4	HYUNDAI	ELANTRA, SONATA
	1994-1990	L4	EAGLE	2000 GTX, TALON
	1994-1989	L4	MITSUBISHI	ECLIPSE, GALANT
	1994-1990	L4	PLYMOUTH	LASER
26216	2008-2006	L4	HONDA	CIVIC
26223	2006-2005	H4	SAAB	9-2X
	2006-1990	H4	SUBARU	BAJA, FORESTER, IMPREZA, LEGACY, OUTBACK
26233	2014-2009	L4	ACURA	TSX
	2012-2008	L4	HONDA	ACCORD, CR-V
26238	1992-1988	L3	DAIHATSU	CHARADE
26259	1994-1993	V6	FORD	PROBE
	1994-1992	V6	MAZDA	626, MX-3, MX-6
26266	1995-1993	R2	MAZDA	RX-7
26278	1997-1996	V6	ACURA	SLX
	1997-1995	V6	HONDA	PASSPORT
	1997-1992	V6	ISUZU	RODEO, TROOPER
26304	1997-1994	V8	INFINITI	Q45
26305	2005-1994	L4	MAZDA	MIATA, MX-3, PROTEGE
	1997-1995	L4	KIA	SEPHIA
26310	1996	V6	MITSUBISHI	MONTERO

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26318	2002-1992	V6	MAZDA	626, MILLENIA, MX-3, MX-6
	1997-1993	V6	FORD	PROBE
26328	2002-1995	V6	MAZDA	MILLENIA
26359	2002-1997	L4	MITSUBISHI	MIRAGE
26360	2007-1997	L4	MITSUBISHI	LANCER, MIRAGE
26364	2012-2001	L4	HYUNDAI	ACCENT
	2011-2006	L4	KIA	RIO, RIO5
26365	2004-1998	V6	ISUZU	AMIGO, AXIOM, RODEO, TROOPER, VEHICROSS
	1999-1998	V6	ACURA	SLX
26371	1998-1995	L4	MAZDA	PROTEGE
26383	2004-1998	V6	HONDA	ACCORD, ODYSSEY, PILOT
	2003-1997	V6	ACURA	CL, TL
26385	2008-1999	V6	SUZUKI	GRAND VITARA, VITARA, XL-7
	2004-2001	V6	CHEVROLET	TRACKER
	2002-1998	V6	HONDA	PASSPORT
26388	2001-1998	V8	INFINITI	Q45
26389	1999-1998	L4	MITSUBISHI	MONTERO SPORT
26393	2004-1998	L4	KIA	SEPHIA, SPECTRA, SPORTAGE
26399	2006-1999	L4	MITSUBISHI	ECLIPSE, GALANT, LANCER, OUTLANDER
	2005-2001, 1995	L4	CHRYSLER	CIRRUS, SEBRING
	2005-2001	L4	DODGE	STRATUS
	2004-2001	L4	HYUNDAI	SANTA FE, SONATA
26415	2006-2001, 1996	V6	MITSUBISHI	MONTERO
26416	2006-2000	L4	NISSAN	SENTRA
26434	2009-2002	L4	HONDA	ACCORD, CIVIC, CR-V
	2006-2002	L4	ACURA	RSX
26437	2005-2003	V6	CHRYSLER	SEBRING
	2004	V6	MITSUBISHI	DIAMANTE
26448	2006-2003	V6	KIA	SORENTO
26450	2002-1995	L4	KIA	SPORTAGE
26460	2004-1995	V6	MITSUBISHI	MONTERO, MONTERO SPORT
26461	2011-2003	L4	HONDA	ACCORD, CR-V, ELEMENT
	2009-2004	L4	ACURA	CSX, TSX
26462	2010-2001	V6	KIA	MAGENTIS, OPTIMA, SPORTAGE
	2009-1999	V6	HYUNDAI	SANTA FE, SONATA, TIBURON, TUCSON
26463	2006-2001	V6	HYUNDAI	SANTA FE, XG300, XG350
	2006-2002	V6	KIA	AMANTI, SEDONA
26470	2013-2004, 2002-2001	V6	ACURA	MDX, RDX, RL, TL, TSX, ZDX
	2012-2003	V6	HONDA	ACCORD, ACCORD CROSSTOUR, ODYSSEY, PILOT, RIDGELINE
	2011-2008	L4	AUDI	TT, TT QUATTRO
	2007-2004	V6	SATURN	VUE
26473	2005, 2001	L4	KIA	RIO
26477	2006-1999	L4	HYUNDAI	SANTA FE, SONATA
	2006-2001	L4	KIA	MAGENTIS, OPTIMA
26495	2010-2006	L4	HONDA	CIVIC
	2009-2008, 2006-2002	L4	ACURA	CSX, RSX
26800	2008-2002	L4	NISSAN	APRIO, PLATINA
	2008-2002	L4	RENAULT	CLIO, KANGOO EXPRESS
28004	1977-1975, 1971-1969	L4	AUDI	100 SERIES
28065	2002-1979	L4	VOLKSWAGEN	CABRIO, CABRIOLET, CORRADO, FOX, GOLF, JETTA, PASSAT, QUANTUM, RABBIT, RABBIT CONVERTIBLE, RABBIT PICKUP, SCIROCCO
	1990-1981	L4	AUDI	4000, 80
	1985	L4	VOLVO	244, 245
28066	1988, 1981-1973	L4	AUDI	4000, 90, FOX
	1984-1974	L4	VOLKSWAGEN	DASHER, JETTA, RABBIT, RABBIT CONVERTIBLE, RABBIT PICKUP, SCIROCCO, VANAGON
28071	1986-1980	L6	VOLVO	244, 245, 264, 265, 740, 745, 760
	1985-1979	L5	AUDI	5000
28077	1975-1969	L6	VOLVO	164
28107	1990-1986	L4	SAAB	9000
28108	1993-1981	L4	SAAB	900
28119	1988-1979	L6	BMW	325, 325E, 325ES, 325I, 325IS, 528E, 528I
28120	1995-1988	L6	BMW	325I, 325IS, 325IX, 525I, 528E
28146	2013-2005	V6	AUDI	A4, A4 QUATTRO, A6, A6 QUATTRO, Q7, S4, S5
	2012-2009	V6	VOLKSWAGEN	TOUAREG
28149	1983-1977	L4	BMW	320I
28152	1985-1984	L4	BMW	318I
28153	1976-1963	L4	BMW	1600, 1800, 2000, 2002
28154	1986-1985	L6	BMW	524TD

Part	Year	Cyl	Make	Application
28154	1985-1984	L6	LINCOLN	CONTINENTAL, MARK VII
28157	1980-1977	L4	SAAB	900, 99
28171	1992-1988	L5	AUDI	100, 100 QUATTRO, 200, 200 QUATTRO, 80, 80 QUATTRO, 90 QUATTRO, COUPE QUATTRO
28172	1985-1975	L5	MERCEDES-BENZ	300CD, 300D, 300SD, 300TD
	1983-1968	L4	MERCEDES-BENZ	220D, 230, 240D
	1981-1968	L6	MERCEDES-BENZ	250C, 280, 280C, 280CE, 280E, 280S, 280SE, 280SEL, 280SL
28177	1982-1977	L4	PORSCHE	924
28178	1968-1961	L4	MERCEDES-BENZ	190, 190B, 190C, 190SL, 200, 200D
28234	1993-1991	L6	BMW	M5
28307	2009-1994	L4	SAAB	9-3, 9-5, 900
28335	2006-2005	L4	VOLKSWAGEN	JETTA
28362	2007-2004	V8	VOLKSWAGEN	PHAETON, TOUAREG
	2006-1997	V8	AUDI	A6 QUATTRO, A8, A8 QUATTRO, RS6, S6, S8
28378	2006-1998	L4	VOLKSWAGEN	BEETLE, GOLF, JETTA, PASSAT
28401	2001-1997	L4	AUDI	A4, A4 QUATTRO
	2001-1998	L4	VOLKSWAGEN	PASSAT
28446	2005-2000	V6	AUDI	A6, A6 QUATTRO, ALLROAD QUATTRO, S4
28469	2006-2002	V6	AUDI	A4, A4 QUATTRO, A6, A6 QUATTRO
31000	1986-1980	L4	BUICK	CENTURY, SKYLARK
	1986-1980	L4	CHEVROLET	CELEBRITY, CITATION, CITATION II
	1986-1980	L4	PONTIAC	6000, PHOENIX
	1984-1980	L4	OLDSMOBILE	OMEGA, STARFIRE
31001	1988-1980	V6	PONTIAC	6000, FIERO, FIREBIRD, PHOENIX
	1986-1981	V6	BUICK	CENTURY, SKYLARK
	1986-1980	V6	CHEVROLET	CAMARO, CELEBRITY, CITATION, CITATION II
	1986-1980	V6	OLDSMOBILE	CUTLASS CIERA, OMEGA
31004	1987-1976	L4	CHEVROLET	CHEVETTE
	1987-1976	L4	PONTIAC	ACADIAN, T1000
31009	1984-1981	L4	CHEVROLET	CHEVETTE
	1983-1981	L4	ISUZU	I-MARK
31015	1984-1983	L4	CHEVROLET	S10, S10 BLAZER
	1984-1983	L4	GMC	S15, S15 JIMMY
31018	1989-1976	V6	PONTIAC	BONNEVILLE, CATALINA, FIREBIRD, GRAND LEMANS, GRAND PRIX, LAURENTIAN, LEMANS, PARISIENNE, PHOENIX, SUNBIRD
	1987-1975	V6	BUICK	CENTURY, ELECTRA, LESABRE, REGAL, RIVIERA, SKYHAWK, SKYLARK
	1987-1978	V6	CHEVROLET	CAMARO, CAPRICE, EL CAMINO, IMPALA, MALIBU, MONTE CARLO, MONZA
	1987-1975	V6	OLDSMOBILE	98, CUTLASS, CUTLASS CRUISER, CUTLASS SALON, CUTLASS SUPREME, DELTA 88, OMEGA, STARFIRE, TORONADO
	1984-1979	V6	GMC	CABALLERO
	1982-1980	V6	CADILLAC	DEVILLE, ELDORADO, FLEETWOOD, SEVILLE
	1981-1973	V8	BUICK	APOLLO, CENTURY, ELECTRA, ESTATE WAGON, LESABRE, REGAL, RIVIERA
	1979-1978, 1976-1975	V8	PONTIAC	BONNEVILLE, CATALINA, VENTURA
	1976-1975	V8	OLDSMOBILE	OMEGA
31022	1986-1985	L4	CHEVROLET	ASTRO, CAMARO, S10, S10 BLAZER
	1986-1985	L4	GMC	S15, S15 JIMMY, SAFARI
	1986-1985	L4	PONTIAC	FIREBIRD
31028	1985-1982	V6	BUICK	CENTURY, ELECTRA
	1985-1982	V6	OLDSMOBILE	98, CUTLASS CIERA, DELTA 88
31037	1992-1987	V6	CHEVROLET	CAMARO
	1992-1987	V6	PONTIAC	FIREBIRD
31041	1992-1987	L4	BUICK	CENTURY
	1992-1987	L4	CHEVROLET	CELEBRITY, LUMINA
	1992-1987	L4	OLDSMOBILE	CUTLASS CIERA, CUTLASS CRUISER
	1991-1987	L4	PONTIAC	6000
31046	1975-1972	L4	CHEVROLET	LUV, LUV PICKUP
31070	1995-1993	V6	CHEVROLET	CAMARO
	1995-1993	V6	PONTIAC	FIREBIRD

Part	Year	Cyl	Make	Application
31563	1962-1953	L6	CHEVROLET	BEL AIR, BISCAYNE, DEL RAY, IMPALA, P10 SERIES, P20 SERIES, P30 SERIES, SUBURBAN, TRUCK
31896	1974-1965	L6	CHEVROLET	BLAZER, C10 PICKUP, C10 SUBURBAN, C20 PICKUP, C20 SUBURBAN, C30 PICKUP, G20 VAN, G30 VAN, K10 PICKUP, K10 SUBURBAN, K20 PICKUP, K20 SUBURBAN, P10 SERIES, P20 SERIES, P20 VAN, P30 SERIES, P30 VAN, SUBURBAN
	1974-1967	L6	GMC	C15/C1500 PICKUP, C15/C1500 SUBURBAN, C25/C2500 PICKUP, C25/C2500 SUBURBAN, C35/C3500 PICKUP, JIMMY, K15/K1500 PICKUP, K15/K1500 SUBURBAN, K25/K2500 PICKUP, K25/K2500 SUBURBAN, K35/K3500 PICKUP
32003	1980-1978	L4	FORD	FIESTA
32020	1986-1983	L6	FORD	BRONCO, E-100 ECONOLINE, E-100 ECONOLINE CLUB WAGON, E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F-150, F-250, F-350
32023	2012-2007	V6	FORD	EDGE, FUSION, TAURUS, TAURUS X
	2012-2007	V6	LINCOLN	MKS, MKT, MKX, MKZ
	2012-2007	V6	MAZDA	6, CX-9
	2009-2008	V6	MERCURY	SABLE
32030	1982-1974	L6	FORD	BRONCO, E-100 ECONOLINE, E-100 ECONOLINE CLUB WAGON, E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F-100, F-100 PICKUP, F-150, F-250, F-250 PICKUP, F-350, F-350 PICKUP
32034	1995-1986	V6	FORD	TAURUS
	1994-1986	V6	MERCURY	SABLE
32059	1992-1990	V6	FORD	PROBE
32061	1995-1989	V6	FORD	TAURUS
32066	1997-1992	V8	FORD	CROWN VICTORIA
	1997-1991	V8	LINCOLN	TOWN CAR
	1997-1992	V8	MERCURY	GRAND MARQUIS
32082	1995-1993	V6	FORD	TAURUS
32083	1984	L6	FORD	E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F-150, F-250, F-350
32088	1997-1995	L4	FORD	CONTOUR
	1997-1995	L4	MERCURY	MYSTIQUE
32089	1995-1994	V6	FORD	TAURUS, WINDSTAR
	1995-1994	V6	MERCURY	SABLE
	1994	V6	LINCOLN	CONTINENTAL
32094	2007-1995	V6	FORD	TAURUS, WINDSTAR
	2005-1995	V6	MERCURY	SABLE
32101	2001-1996	V8	FORD	EXPLORER
	2001-1997	V8	MERCURY	MOUNTAINEER
32102	2007-1996	V6	FORD	FREESTAR, WINDSTAR
	2007-2004	V6	MERCURY	MONTEREY

Part	Year	Cyl	Make	Application
32109	2010-1997	V10	FORD	E-350, E-350 CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, E-350 SUPER DUTY, E-450 ECONOLINE SUPER DUTY, E-450 ECONOLINE SUPER DUTY STRIPPED, E-450 SUPER DUTY, E-450 SUPER DUTY STRIPPED CHASSIS, E-550 ECONOLINE SUPER DUTY, E-550 SUPER DUTY, ECONOLINE SUPER DUTY, EXCURSION, F-250 SUPER DUTY, F-350 SUPER DUTY, F-450 SUPER DUTY, F-550 SUPER DUTY, F53
32113	2002-1994	V8	FORD	CROWN VICTORIA, MUSTANG, THUNDERBIRD
	2002-1994	V8	MERCURY	COUGAR, GRAND MARQUIS
	2001-1993	V8	LINCOLN	CONTINENTAL, MARK VIII, TOWN CAR
32118	2002-2000	V6	LINCOLN	LS
	2001-2000	V6	JAGUAR	S-TYPE
32119	2009-1999	V8	FORD	CROWN VICTORIA, MUSTANG
32121	2001-1999	V8	FORD	F-150
32122	2002-1997	V8	FORD	E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, ECONOLINE SUPER DUTY, EXCURSION, EXPEDITION, F-150, F-250, F-250 SUPER DUTY, F-350 SUPER DUTY
	2002-1998	V8	LINCOLN	BLACKWOOD, NAVIGATOR
32123	2003-2000	L4	FORD	FOCUS
32125	2004-2001	V8	FORD	F-150, LOBO
32127	2010-2002	V8	FORD	EXPLORER, EXPLORER SPORT TRAC, F-150
	2010-2002	V8	MERCURY	MOUNTAINEER
32128	2011-2001	V8	FORD	CROWN VICTORIA, MUSTANG
	2011-2001	V8	LINCOLN	CONTINENTAL, TOWN CAR
	2011-2001	V8	MERCURY	GRAND MARQUIS, MARAUDER
32129	2008-2002	V6	JAGUAR	S-TYPE
32129	2005-2003	V6	LINCOLN	LS
32130	2013-2000	V8	FORD	E-150, E-150 CLUB WAGON, E-250, E-250 SUPER DUTY, E-350, E-350 CLUB WAGON, E-350 SUPER DUTY, E-450 ECONOLINE SUPER DUTY, E-450 ECONOLINE SUPER DUTY STRIPPED, E-450 SUPER DUTY STRIPPED CHASSIS, EXCURSION, EXPEDITION, F-150, F-150 HERITAGE, F-250 SUPER DUTY, F-350 SUPER DUTY
	2009, 2006-2002	V8	LINCOLN	AVIATOR, MARK LT, NAVIGATOR
33000	2006-1999	L6	JEEP	GRAND CHEROKEE, TJ, WRANGLER
33021	1977-1976	L4	PLYMOUTH	ARROW
	1974-1964	L6	JEEP	CHEROKEE, CJ5, CJ6, DJ5, GLADIATOR, J-100, J-200, J-210, J-220, J-230, J-2500, J-2600, J-2700, J-2800, J-300, J-310, J-320, J-330, J-3500, J-3600, J-3700, J-3800, J-4500, J-4600, J-4700, J-4800, J10, J20, JEEPSTER, WAGONEER
	1965	L6	AMERICAN MOTORS	AMERICAN, MARLIN
33040	1978-1959	V8	CHRYSLER	300, CORDOBA, IMPERIAL, NEW YORKER, NEWPORT

Part	Year	Cyl	Make	Application
33040	1978-1958	V8	DODGE	330, 440, 880, B200, B200 VAN, B300, CHALLENGER, CHARGER, CORONET, D100, D100 PICKUP, D100 SERIES, D150, D200, D200 PICKUP, D200 SERIES, D300, D300 PICKUP, D300 SERIES, DART, MAGNUM, MONACO, POLARA, RAMCHARGER, ROYAL, ROYAL MONACO, W100, W100 PICKUP, W100 SERIES, W150, W200, W200 PICKUP, W200 SERIES, W300, W300 PICKUP, W300 SERIES
	1978-1957	V8	PLYMOUTH	BARRACUDA, BELVEDERE, FURY, GRAN FURY, GTX, PB200, PB300, ROADRUNNER, SATELLITE, TRAILDUSTER
	1961-1959	V8	DESOTO	ADVENTURER, DESOTO, FIREDOME, FIREFLITE, FIRESWEEP
33048	2013-2006	V6	HYUNDAI	AZERA, ENTOURAGE, GENESIS, GENESIS COUPE, SANTA FE, SONATA, VERACRUZ
	2013-2006	V6	KIA	AMANTI, BORREGO, SEDONA, SORENTO
33052	1971-1966	L4	JEEP	CJ5, CJ5A, CJ6, CJ6A, DJ5, DJ6, FC150, FC170, JEEPSTER
33053	1971-1956	L4	JEEP	475, CJ3, CJ5, CJ5A, CJ6, CJ6A, DJ3, DJ5, DJ6, F-134, F4, FC150, FC170, FJ3, FJ3A, JEEPSTER
33077	1979-1975	L6	AMERICAN MOTORS	AMX, CONCORD, GREMLIN, HORNET, MATADOR, PACER, SPIRIT
	1979-1975	L6	JEEP	CHEROKEE, CJ5, CJ6, CJ7, J10, J20
33100	1992	V8	DODGE	W350
33100	1987-1960	L6	DODGE	330, 440, A100, ASPEN, B100, B100 VAN, B150, B200, B200 VAN, B250, B300, B300 VAN, CHALLENGER, CHARGER, CORONET, D100 PICKUP, D100 SERIES, DART, DIPLOMAT, MIRADA, MONACO, P100, P200, P300, POLARA, RAMCHARGER, ST. REGIS
	1983-1978	L6	CHRYSLER	CORDOBA, LEBARON, NEW YORKER, NEWPORT
	1983-1960	L6	PLYMOUTH	BARRACUDA, BELVEDERE, DUSTER, FURY, GRAN FURY, PB100, PB100 VAN, PB150, PB200, PB200 VAN, PB250, SATELLITE, SCAMP, TRAILDUSTER, VALIANT, VOLARE
33105	1980-1978	L4	PLYMOUTH	ARROW, SAPPORO
	1979-1978	L4	DODGE	CHALLENGER, COLT
33117	1985	L4	DODGE	POWER RAM 50, RAM 50
	1985-1983	L4	MITSUBISHI	MIGHTY MAX
33129	1999-1991	V6	MITSUBISHI	3000GT, DIAMANTE
	1996-1991	V6	DODGE	STEALTH
33137	1993-1992	V10	DODGE	VIPER
33138	1992-1991	V6	DODGE	MONACO
	1992-1991	V6	EAGLE	PREMIER
33147	1996-1994	L4	EAGLE	SUMMIT
	1996-1992	L4	MITSUBISHI	EXPO LRV, MIRAGE
	1994, 1992	L4	DODGE	COLT
	1994-1992	L4	PLYMOUTH	COLT
33170	2010-2005	V8	CHRYSLER	300
	2010-2005	V8	DODGE	CHALLENGER, CHARGER, MAGNUM
	2010-2005	V8	JEEP	COMMANDER, GRAND CHEROKEE
33403	1986-1980	L6	AMERICAN MOTORS	AMX, CONCORD, EAGLE, PACER, SPIRIT
	1986-1983	L4	JEEP	CHEROKEE, CJ5, CJ7, COMANCHE, SCRAMBLER, WAGONEER

Part	Year	Cyl	Make	Application
33403	1986-1980	L6	JEEP	CHEROKEE, CJ5, CJ7, GRAND WAGONEER, J10, SCRAMBLER, WAGONEER
	1984-1983	L4	AMERICAN MOTORS	EAGLE
33404	1986-1981	L6	AMERICAN MOTORS	CONCORD, EAGLE, SPIRIT
	1986-1983	L4	JEEP	CHEROKEE, CJ7, COMANCHE, SCRAMBLER, WAGONEER
	1986-1981	L6	JEEP	CHEROKEE, CJ5, CJ7, GRAND WAGONEER, J10, SCRAMBLER, WAGONEER
	1984-1983	L4	AMERICAN MOTORS	EAGLE
33409	1987-1985	L4	JEEP	CHEROKEE
33411	1991-1990	V6	DODGE	MONACO
	1991-1988	V6	EAGLE	PREMIER
33413	1996-1987	L4	JEEP	CHEROKEE, COMANCHE, WAGONEER, WRANGLER
	1990-1987	L6	JEEP	CHEROKEE, COMANCHE, J10, WAGONEER, WRANGLER
	1988-1987	L6	AMERICAN MOTORS	EAGLE
33414	1990-1987	L4	JEEP	CHEROKEE, COMANCHE, WAGONEER, WRANGLER
	1990-1987	L6	JEEP	J10, WRANGLER
	1988-1987	L6	AMERICAN MOTORS	EAGLE
33653	2013-2011	V8	CHRYSLER	300
	2013-2011	V8	DODGE	CHALLENGER, CHARGER, DURANGO
	2013-2011	V8	JEEP	GRAND CHEROKEE
33843	1970-1965	L6	AMERICAN MOTORS	AMBASSADOR, CLASSIC, MARLIN, RAMBLER, REBEL
33986	1974-1971	L6	AMERICAN MOTORS	AMBASSADOR, GREMLIN, HORNET, JAVELIN, MATADOR
	1974-1972	L6	INTERNATIONAL	100, 1010, 1110, 1210, 1310, 200, M1100, M1200, MS1210, SCOUT II
35006	1974-1970	L4	TOYOTA	CORONA, HI-LUX, PICKUP
35012	1977-1971	L4	TOYOTA	CARINA, COROLLA
35037	2012-2003	V6	TOYOTA	4RUNNER, FJ CRUISER, TACOMA, TUNDRA
35075	1987-1985	L4	TOYOTA	COROLLA
35078	1974-1969	L6	TOYOTA	LAND CRUISER
35190	1979-1977	L6	TOYOTA	LAND CRUISER
35256	2000-1992	L6	LEXUS	GS300, SC300
	1998-1994	L6	TOYOTA	SUPRA
35269	1997-1996	L6	LEXUS	LX450
	1997-1993	L6	TOYOTA	LAND CRUISER
35292	1998-1994	L6	TOYOTA	SUPRA
35296	1984-1978	L4	TOYOTA	PICKUP
35337	1987-1981	L6	TOYOTA	LAND CRUISER
35411	2000-1992	L6	LEXUS	SC300
	1998-1994	L6	TOYOTA	SUPRA
36008	1981-1978, 1976-1968	L4	NISSAN	510, 610, 710, 720
36031	1989-1974	L4	NISSAN	200SX, 510, 610, 710, 720, D21, PATHFINDER
36049	2010-2006	H4	SUBARU	FORESTER, IMPREZA, LEGACY, OUTBACK
36097	1997-1995	V6	HONDA	ACCORD
	1990-1986	V6	ACURA	LEGEND
	1990-1987	V6	STERLING	825, 827
36102	1988-1986	R2	MAZDA	RX-7
36132	1987-1981	L4	ISUZU	PICKUP, TROOPER
	1982-1981	L4	CHEVROLET	LUV
36166	1995-1988	V6	MAZDA	929, MPV
36179	1969-1965	L4	NISSAN	520 PICKUP, 521 PICKUP
36198	1986-1981	L4	NISSAN	720
36215	2010-2002, 1991	H4	SUBARU	BAJA, FORESTER, IMPREZA, LEGACY, OUTBACK
	2006	H4	SAAB	9-2X
36219	2005-1991	V6	ACURA	NSX
36225	1991-1990	V6	MAZDA	929
36239	1993-1990	V8	INFINITI	Q45
36254	1997-1992	H6	SUBARU	SVX
36255	1994-1992	H4	SUBARU	LEGACY
36260	1995-1992	V6	MAZDA	929
36268	1997-1993	V6	INFINITI	J30
36300	1977, 1974-1970	L4	MAZDA	616, 808, B1600
36353	2012-1996	L4	HYUNDAI	ELANTRA, TIBURON, TUCSON
	2011-2004	L4	KIA	SOUL, SPECTRA, SPECTRA5, SPORTAGE
36394	1998-1996	V6	MAZDA	MPV
36472	2011-2010, 2005-2003	H4	SUBARU	FORESTER, LEGACY
38013	1974-1961	L4	VOLVO	122, 142, 144, 145, 1800
38049	1984-1976	L4	VOLVO	242, 244, 245, 264, 760, DL, GLE
38068	1995-1985	L4	VOLVO	240, 244, 245, 740, 745, 760, 780, 940

Part	Year	Cyl	Make	Application
38146	1982-1979	V6	VOLVO	262, 264, 265
38148	1990-1983	V6	VOLVO	760, 780
38151	1991-1988	L4	BMW	M3
38176	1980-1968	V8	MERCEDES-BENZ	280SE, 280SEL, 300SEL, 450SE, 450SEL, 450SL, 450SLC, 600
38195	1985-1984	L4	MERCEDES-BENZ	190D
38202	1993-1986	L6	MERCEDES-BENZ	190E, 260E, 300CE, 300E, 300SE, 300SEL, 300SL, 300TE
38228	1999-1990, 1987-1986	L6	MERCEDES-BENZ	300D, 300SD, 300SDL, 300TD, 350SDL, E300, S350
	1993-1986	L5	MERCEDES-BENZ	190D, 300D
38231	1991-1986	V8	MERCEDES-BENZ	420SEL, 560SEC, 560SEL, 560SL
38236	1995-1991	V12	BMW	850CI, 850CSI, 850I
38263	1995-1992	V6	AUDI	100, 100 QUATTRO, 90, 90 QUATTRO, A6, A6 QUATTRO, CABRIOLET
38264	1998-1990	L4	SAAB	9000
38276	2000-1999, 1995-1993	V8	BMW	530I, 540I, 740I, 740IL
38322	1967-1962	L4	VOLVO	544
38333	2005-1998	V6	VOLKSWAGEN	PASSAT
	2001-1996	V6	AUDI	A4, A4 QUATTRO, A6, A6 QUATTRO, CABRIOLET
38368	1995-1987, 1974-1970	V8	LAND ROVER	DEFENDER 110, DEFENDER 90, RANGE ROVER
38369	2004-1994	V8	LAND ROVER	DEFENDER 90, DISCOVERY, RANGE ROVER
38379	2008-2004	V6	CHRYSLER	CROSSFIRE
	2008-1998	V8	MERCEDES-BENZ	C43 AMG, CL500, CLK430, CLK500, CLS500, E430, E500, G500, ML430, ML500, R500, S430, S500, SL500
	2006-1998	V6	MERCEDES-BENZ	C240, C280, C320, CLK320, E320, ML320, S350, SLK320
	2005	L6	MERCEDES-BENZ	E320
38380	2008-1998	V8	MERCEDES-BENZ	C43 AMG, C55 AMG, CL500, CL55 AMG, CLK430, CLK55 AMG, E430, E55 AMG, G500, G55 AMG, ML430, ML500, ML55 AMG, S430, S55 AMG
	2005-1998	V6	MERCEDES-BENZ	C280, CLK320, E320, SLK320
38410	2007-2004	V8	VOLKSWAGEN	TOUAREG
38410	2006-2000	V8	AUDI	A6 QUATTRO, A8 QUATTRO, S4, S6
	1994-1992	L5	AUDI	S4
38440	2004-1999, 1997	L4	MERCEDES-BENZ	C230, SLK230
41002	1997-1969	V8	CHEVROLET	BEL AIR, BISCAYNE, BLAZER, C10, C10 PICKUP, C10 SUBURBAN, C20, C20 PICKUP, C20 SUBURBAN, C30, C30 PICKUP, CAMARO, CAPRICE, CHEVELLE, EL CAMINO, IMPALA, K10, K10 PICKUP, K20, K20 PICKUP, K20 SUBURBAN, K30, LAGUNA, MALIBU, MONTE CARLO, NOVA, P10 VAN, P20, P20 VAN, P30, P30 VAN, R20, R20 SUBURBAN, R2500, R30, R3500, V20 SUBURBAN, V30, V3500
	1997-1971	V8	GMC	C15, C15 SUBURBAN, C15/C1500 PICKUP, C15/C1500 SUBURBAN, C1500, C1500 SUBURBAN, C25, C25 SUBURBAN, C25/C2500 PICKUP, C25/C2500 SUBURBAN, C2500, C2500 SUBURBAN, C35, C35/C3500 PICKUP, C3500, G25, G35, JIMMY, K15, K15/K1500 SUBURBAN, K1500, K25, K25 SUBURBAN, K25/K2500 PICKUP, K25/K2500 SUBURBAN, K35/K3500 PICKUP, K3500, P1500, P35, P35/P3500 VAN, P3500, R2500, R2500 SUBURBAN, R3500, SPRINT, V3500
41003	1984-1973	V8	CADILLAC	DEVILLE, ELDORADO, FLEETWOOD, SEVILLE
41006	1986-1982	V6	CHEVROLET	CAMARO, S10, S10 BLAZER
	1986-1982	V6	GMC	S15, S15 JIMMY
	1986-1984	V6	JEEP	CHEROKEE, COMANCHE, WAGONEER
	1984-1982	V6	PONTIAC	FIREBIRD

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41010	1985-1982	V8	CADILLAC	DEVILLE, ELDORADO, FLEETWOOD, SEVILLE
41016	1991-1984	V8	CHEVROLET	CORVETTE
41035	1994-1989	V6	ISUZU	PICKUP, RODEO, TROOPER
	1993-1987	V6	CHEVROLET	S10, S10 BLAZER
	1993-1987	V6	GMC	S15, S15 JIMMY, SONOMA
41038	2012-2006	L4	MAZDA	3
	2000-1987	V8	CHEVROLET	C1500, C2500, C2500 SUBURBAN, C3500, EXPRESS 3500, G30, K2500, K2500 SUBURBAN, K3500, P30, R20 SUBURBAN, R2500 SUBURBAN, R30, V20 SUBURBAN, V2500 SUBURBAN
	2000-1988	V8	GMC	C2500, C2500 SUBURBAN, C3500, G3500, K2500, K2500 SUBURBAN, K3500, P3500, R2500 SUBURBAN, SAVANA 3500
	1991-1990	L4	ACURA	INTEGRA
	1990-1988	L4	AUDI	80
	1984-1983	L4	CADILLAC	CIMARRON
	1983-1980	V6	CHEVROLET	MALIBU
	1976-1960	L6	DODGE	DART
	1976-1960	V8	DODGE	DART
41049	1996-1995	V8	AM GENERAL	HUMMER
	1996-1987	V6	CHEVROLET	ASTRO, BLAZER, C1500, C2500, CAPRICE, G10, G20, G30, K1500, K2500, S10, S10 BLAZER
	1996-1987	V8	CHEVROLET	BLAZER, C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, CAMARO, CAPRICE, G10, G20, G30, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, R1500 SUBURBAN, R2500 SUBURBAN, SUBURBAN 1500, TAHOE, V1500 SUBURBAN, V2500 SUBURBAN
41049	1996-1987	V8	GMC	C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, G1500, G2500, G3500, JIMMY, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, YUKON
	1995-1987	V6	GMC	C1500, C2500, G1500, G2500, G3500, K1500, K2500, S15, SAFARI, SONOMA, SYCLONE, TYPHOON
	1994-1991	V6	OLDSMOBILE	BRAVADA
	1993-1991	V8	BUICK	COMMERCIAL CHASSIS, ROADMASTER
	1993-1990	V8	CADILLAC	BROUGHAM, COMMERCIAL CHASSIS, FLEETWOOD
	1992-1991	V8	OLDSMOBILE	CUSTOM CRUISER
	1992-1988	V8	PONTIAC	FIREBIRD
41056	1995-1990	V8	CHEVROLET	CORVETTE
41063	1992	V8	CHEVROLET	CORVETTE
41066	1996-1993	V8	CHEVROLET	CORVETTE
41068	1997-1993	V8	CHEVROLET	CAMARO
	1997-1993	V8	PONTIAC	FIREBIRD
41069	1996-1994	V8	BUICK	COMMERCIAL CHASSIS, ROADMASTER
	1996-1993	V8	CADILLAC	COMMERCIAL CHASSIS, FLEETWOOD, SEVILLE
	1996-1991	V8	CHEVROLET	CAPRICE, COMMERCIAL CHASSIS, IMPALA
41073	1996-1992	V8	ISUZU	NPR
	1995-1992	V8	CHEVROLET	C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, C3500HD, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500
	1995-1992	V8	GMC	C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, C3500HD, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500

Part	Year	Cyl	Make	Application
41077	2014-1996	V6	CHEVROLET	ASTRO, BLAZER, C1500, EXPRESS 1500, EXPRESS 2500, G30, K1500, P30, S10, SILVERADO 1500
	2012-1996	V6	GMC	C1500, JIMMY, K1500, P3500, SAFARI, SAVANA 1500, SAVANA 2500, SIERRA 1500, SONOMA
	2004-1996	V8	CHEVROLET	C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, EXPRESS 1500, EXPRESS 2500, EXPRESS 3500, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, P30, SUBURBAN 1500, TAHOE, W3500 TILTMASTER, W4500 TILTMASTER
	2002-1996	V8	GMC	C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, G3500, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, P3500, SAVANA 1500, SAVANA 2500, SAVANA 3500, YUKON
	2001-1996	V6	OLDSMOBILE	BRAVADA
	2000-1999	V8	CADILLAC	ESCALADE
	2000-1997	V6	ISUZU	HOMBRE
41090	2009-2001	V8	CHEVROLET	B7, C3500, C4500 KODIAK, C5500 KODIAK, C6500 KODIAK, C7500 KODIAK, EXPRESS 3500
	2009-2001	V8	GMC	B7, C4500 TOPKICK, C5500 TOPKICK, C6500 TOPKICK, C7500 TOPKICK, SAVANA 2500, SAVANA 3500
	2009-2001	V8	WORKHORSE	P32, R26, W16, W18, W20, W21, W22, W24, W25
41100	1985-1975	V8	BUICK	APOLLO, CENTURY, ELECTRA, ESTATE WAGON, LESABRE, REGAL, RIVIERA, SKYLARK
	1985	V6	OLDSMOBILE	98
41100	1985-1971	V8	OLDSMOBILE	98, CUSTOM CRUISER, CUTLASS, CUTLASS CALAIS, CUTLASS CRUISER, CUTLASS SUPREME, DELTA 88, TORONADO
	1983-1975	V8	PONTIAC	BONNEVILLE, CATALINA, FIREBIRD, GRAND LEMANS, GRAND PRIX, GRAND SAFARI, LAURENTIAN, LEMANS, PARISIENNE, PHOENIX, VENTURA
	1982-1980	V8	CHEVROLET	C10, C10 SUBURBAN, CAPRICE, IMPALA, MALIBU, MONTE CARLO
	1981-1980	V8	GMC	C1500, C1500 SUBURBAN, C2500 SUBURBAN
	1974-1971	L6	OLDSMOBILE	CUSTOM CRUISER
41109	1976-1973	V8	AVANTI	II
	1976-1969	V8	CHEVROLET	BEL AIR, BISCAYNE, BLAZER, C10, C10 PICKUP, C10 SUBURBAN, C20, C20 PICKUP, C20 SUBURBAN, C30, C30 PICKUP, CAMARO, CAPRICE, CHEVELLE, EL CAMINO, IMPALA, K10, K10 PICKUP, K10 SUBURBAN, K20, K20 PICKUP, K20 SUBURBAN, LAGUNA, MALIBU, MONTE CARLO, NOVA, P10, P10 VAN, P20, P20 VAN, P30, P30 VAN

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41109	1976-1971	V8	GMC	C15, C15 SUBURBAN, C15/C1500 PICKUP, C15/C1500 SUBURBAN, C25, C25 SUBURBAN, C25/C2500 PICKUP, C25/C2500 SUBURBAN, C35, C35/C3500 PICKUP, G15, G15/G1500 VAN, G25, G25/G2500 VAN, G35, G35/G3500 VAN, JIMMY, K15, K15 SUBURBAN, K15/K1500 PICKUP, K15/K1500 SUBURBAN, K25, K25 SUBURBAN, K25/K2500 PICKUP, K25/K2500 SUBURBAN, K35/K3500 PICKUP, P15/P1500 VAN, P25, P25/P2500 VAN, P35, P35/P3500 VAN, SPRINT
	1973-1971	V8	PONTIAC	VENTURA
41120	1990-1975	V8	BUICK	APOLLO, CENTURY, ELECTRA, ESTATE WAGON, LESABRE, REGAL, RIVIERA, SKYLARK
	1990-1978	V8	CHEVROLET	C10, C10 SUBURBAN, C30, CAPRICE, EL CAMINO, IMPALA, MALIBU, MONTE CARLO
	1990-1971	V8	OLDSMOBILE	98, CUSTOM CRUISER, CUTLASS, CUTLASS CALAIS, CUTLASS CRUISER, CUTLASS SALON, CUTLASS SUPREME, CUTLASS TIARA, DELTA 88, F85, OMEGA, TORONADO
	1989-1975	V8	PONTIAC	BONNEVILLE, CATALINA, FIREBIRD, GRAND LEMANS, GRAND PRIX, GRAND SAFARI, LEMANS, PARISIENNE, PHOENIX, SAFARI, VENTURA
	1986-1976	V8	CADILLAC	DEVILLE, ELDORADO, FLEETWOOD, SEVILLE
	1984-1982	V6	OLDSMOBILE	CUTLASS SUPREME
	1978	V8	GMC	C15, C15 SUBURBAN
41121	1996-1977	V8	CHEVROLET	BEL AIR, BLAZER, C10, C10 SUBURBAN, C20, C20 SUBURBAN, C30, CAMARO, CAPRICE, EL CAMINO, G10, G20, G30, IMPALA, K10, K10 SUBURBAN, K20, K20 SUBURBAN, K30, MALIBU, MONTE CARLO, NOVA, P10, P20, P30, R10, R10 SUBURBAN, R20, R20 SUBURBAN, R30, R3500, V10, V10 SUBURBAN, V20, V20 SUBURBAN, V30, V3500
	1996-1990, 1987-1978	V6	GMC	C1500, C2500, CABALLERO, G1500, G2500, G3500, K1500, K2500, P3500, R1500, R2500, SAFARI, V1500
	1995-1990, 1988-1978	V6	CHEVROLET	ASTRO, C10, C20, CAPRICE, EL CAMINO, G10, G20, G30, IMPALA, K10, K20, MALIBU, MONTE CARLO, P30, R10, R20, V10
	1995-1977, 1972	V8	GMC	C15, C15 SUBURBAN, C1500, C1500 SUBURBAN, C25, C25 SUBURBAN, C2500, C2500 SUBURBAN, C35, C3500, CABALLERO, G15, G15/G1500 VAN, G1500, G25, G25/G2500 VAN, G2500, G35, G35/G3500 VAN, G3500, JIMMY, K15, K15 SUBURBAN, K1500, K1500 SUBURBAN, K25, K25 SUBURBAN, K2500, K2500 SUBURBAN, K35, K3500, P25, P2500, P35, P3500, R1500, R1500 SUBURBAN, R2500, R2500 SUBURBAN, R3500, SPRINT, V1500, V1500 SUBURBAN, V2500, V2500 SUBURBAN, V3500

Part	Year	Cyl	Make	Application
41121	1987-1985, 1982-1977	V8	OLDSMOBILE	CUTLASS, CUTLASS CRUISER, CUTLASS SALON, CUTLASS SUPREME, DELTA 88, OMEGA, STARFIRE, TORONADO
	1987-1985, 1983, 1980-1978	V6	PONTIAC	BONNEVILLE, GRAND LEMANS, GRAND PRIX, LAURENTIAN, LEMANS, PARISIENNE
	1987-1977	V8	PONTIAC	BONNEVILLE, FIREBIRD, GRAND AM, GRAND LEMANS, GRAND PRIX, LAURENTIAN, LEMANS, PARISIENNE, PHOENIX, VENTURA
	1982-1977	V8	BUICK	CENTURY, LESABRE, REGAL, RIVIERA, SKYLARK
41898	1972-1968	V8	AVANTI	II
	1972-1955	V8	CHEVROLET	BEL AIR, BISCAYNE, BLAZER, C10 PICKUP, C10 SUBURBAN, C20 PICKUP, C20 SUBURBAN, C30 PICKUP, CAPRICE, CHEVELLE, CHEVY II, CORVETTE, DEL RAY, EL CAMINO, G10 VAN, G20 VAN, G30 VAN, IMPALA, K10 PICKUP, K10 SUBURBAN, K20 PANEL, K20 PICKUP, K20 SUBURBAN, MALIBU, P10 SERIES, P20 SERIES, P20 VAN, P30 SERIES, P30 VAN, SUBURBAN
	1972-1967	V8	GMC	C15/C1500 PICKUP, C15/C1500 SUBURBAN, C25/C2500 PICKUP, C25/C2500 SUBURBAN, C35/C3500 PICKUP, G15/G1500 VAN, G25/G2500 VAN, G35/G3500 VAN, JIMMY, K15/K1500 PICKUP, K15/K1500 SUBURBAN, K25/K2500 PICKUP, K25/K2500 SUBURBAN, K35/K3500 PICKUP, P15/P1500 VAN, P25/P2500 VAN, P35/P3500 VAN

Part	Year	Cyl	Make	Application
41898	1964	V8	STUDEBAKER	8E12, 8E12D, 8E13, 8E14, 8E15, 8E7, 8E7D, AVANTI, CHALLENGER, COMMANDER, CRUISER, DAYTONA, HAWK, LARK
41975	1981-1977	V8	BUICK	CENTURY, ELECTRA, ESTATE WAGON, LESABRE, REGAL, SKYLARK
	1981-1969	V8	PONTIAC	BONNEVILLE, CATALINA, FIREBIRD, GRAND AM, GRAND LEMANS, GRAND PRIX, GRAND SAFARI, GRANDVILLE, GTO, LAURENTIAN, LEMANS, PARISIENNE, SAFARI, VENTURA
	1979, 1975	V8	OLDSMOBILE	98, CUSTOM CRUISER, DELTA 88
41984	1982-1971	V8	CHEVROLET	CORVETTE
	1980-1977	V8	AVANTI	II
42014	1991-1980	V8	FORD	COUNTRY SQUIRE, LTD, LTD CROWN VICTORIA, THUNDERBIRD
	1989-1980	V8	MERCURY	COLONY PARK, COUGAR, GRAND MARQUIS, MARQUIS
	1988-1984	V8	LINCOLN	MARK VII, TOWN CAR
42016	1987-1982	V6	FORD	F-100, GRANADA, LTD, MUSTANG, THUNDERBIRD
	1987-1982	V6	MERCURY	CAPRI, COUGAR, MARQUIS
	1982	V6	LINCOLN	CONTINENTAL
42023	1986-1983	V6	FORD	AEROSTAR, BRONCO II, RANGER
42024	1985-1979	V8	FORD	LTD, MUSTANG
	1985	V8	LINCOLN	CONTINENTAL, MARK VII
	1985-1979	V8	MERCURY	CAPRI
42028	1977-1964	V8	FORD	BRONCO, COUNTRY SQUIRE, CUSTOM, CUSTOM 500, E-100 ECONOLINE, FAIRLANE, FALCON, GALAXIE, GALAXIE 500, LTD, MUSTANG, RANCHERO, TORINO
	1969-1965	V8	MERCURY	COMET, COUGAR, MONTEGO

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42035	1985-1984	V8	FORD	MUSTANG
	1985-1984	V8	MERCURY	CAPRI
42038	1993-1986	V8	FORD	MUSTANG, THUNDERBIRD
	1992-1986	V8	LINCOLN	CONTINENTAL, MARK VII
	1988-1986	V8	MERCURY	CAPRI, COUGAR
42039	1994-1986	V6	FORD	AEROSTAR, RANGER
	1994	V6	MAZDA	B3000
42042	1992-1986	V6	FORD	BRONCO II, RANGER
	1989-1988	V6	MERKUR	SCORPIO
42043	1985-1983	V6	FORD	RANGER
	1984-1977	L4	MAZDA	626, B1800, B2000
	1982-1972	L4	FORD	COURIER
42044	1997-1987	V8	FORD	BRONCO, E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, ECONOLINE SUPER DUTY, F-150, F-250, F-350
42047	1979-1974	V6	FORD	MUSTANG, MUSTANG II, PINTO
	1979-1973	V6	MERCURY	BOBCAT, CAPRI
42050	1993-1988	V6	FORD	THUNDERBIRD
	1993-1988	V6	MERCURY	COUGAR
42051	1993-1988	V6	FORD	TAURUS
	1993-1988	V6	LINCOLN	CONTINENTAL
	1993-1988	V6	MERCURY	SABLE
42052	1991-1988, 1985-1979	V8	FORD	COUNTRY SQUIRE, LTD, LTD CROWN VICTORIA, THUNDERBIRD
	1991-1988, 1985-1977	V8	MERCURY	COLONY PARK, COUGAR, GRAND MARQUIS, MARQUIS
	1984-1980	V8	LINCOLN	CONTINENTAL, MARK VI, MARK VII, TOWN CAR
42055	1995-1989	V6	FORD	THUNDERBIRD
	1990-1989	V6	MERCURY	COUGAR
42057	1993-1991	V8	FORD	THUNDERBIRD
	1993-1991	V8	MERCURY	COUGAR
42060	2000-1990	V6	FORD	AEROSTAR, EXPLORER, RANGER
	2000-1991	V6	MAZDA	B4000, NAVAJO
42062	1991-1986	L6	FORD	B600, B700, CF6000, CF7000, CF8000, F600, F700, F800, LN7000, LN8000
42071	1993-1992	L6	FORD	CF7000, F600
42072	1993-1991	L6	FORD	CF7000, CF8000, F600, F700, LN7000, LN8000
42087	1995-1994	V8	FORD	MUSTANG
42090	1995-1994	V6	FORD	MUSTANG, THUNDERBIRD
	1995-1994	V6	MERCURY	COUGAR
42095	2008-1995	V6	FORD	AEROSTAR, RANGER
	2008-1995	V6	MAZDA	B3000
42103	2004-1996	V6	FORD	MUSTANG, THUNDERBIRD
	1997-1996	V6	MERCURY	COUGAR
42105	2008-1997	V6	FORD	E-150, E-150 CLUB WAGON, E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250, E-250 ECONOLINE, F-150, F-150 HERITAGE
42108	2011-1997	V6	FORD	EXPLORER, EXPLORER SPORT TRAC, MUSTANG, RANGER
	2010-2001	V6	MAZDA	B4000
	2010-1998	V6	MERCURY	MOUNTAINEER
42114	1992-1970	V8	FORD	COUNTRY SQUIRE, CUSTOM, CUSTOM 500, E-100 ECONOLINE, E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, ELITE, F SUPER DUTY, F-100, F-100 PICKUP, F-150, F-250, F-250 PICKUP, F-350, F-350 PICKUP, F53, FAIRLANE, GALAXIE 500, LTD, MUSTANG, RANCHERO, THUNDERBIRD, TORINO
	1978-1970	V8	LINCOLN	CONTINENTAL, MARK III, MARK IV, MARK V
	1978-1970	V8	MERCURY	COLONY PARK, COUGAR, GRAND MARQUIS, MARAUDER, MARQUIS, MONTEGO, MONTEREY
42144	2007-2005	V6	FORD	FIVE HUNDRED, FREESTYLE
	2007-2005	V6	MERCURY	MONTEGO

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42157	2010-2008	V8	FORD	F-250 SUPER DUTY, F-350 SUPER DUTY, F-450 SUPER DUTY, F-550 SUPER DUTY
42932	1982-1970	V8	FORD	BRONCO, COUNTRY SQUIRE, CUSTOM, CUSTOM 500, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, ELITE, F-100, F-150, F-250, F-350, FAIRLANE, GALAXIE 500, LTD, LTD II, MUSTANG, RANCHERO, THUNDERBIRD, TORINO
	1979-1977	V8	LINCOLN	CONTINENTAL, MARK V
	1979-1970	V8	MERCURY	COLONY PARK, COUGAR, CYCLONE, GRAND MARQUIS, MARQUIS, MONTEGO, MONTEREY
42953	1987-1969	V8	FORD	BRONCO, COUNTRY SQUIRE, CUSTOM, CUSTOM 500, E-100 ECONOLINE, E-100 ECONOLINE CLUB WAGON, E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, ELITE, F-100, F-100 PICKUP, F-150, F-250, F-250 PICKUP, F-350, F-350 PICKUP, FAIRLANE, FAIRMONT, GALAXIE 500, GRANADA, LTD, LTD II, MAVERICK, MUSTANG, MUSTANG II, RANCHERO, THUNDERBIRD, TORINO
	1982-1970	V8	MERCURY	COLONY PARK, COMET, COUGAR, CYCLONE, MARQUIS, MONARCH, MONTEGO, MONTEREY, ZEPHYR
	1980-1977	V8	LINCOLN	VERSAILLES

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43053	1985-1984	V8	FORD	LTD
	1978-1975	V8	CHRYSLER	CORDOBA, LEBARON
	1978-1970	V8	DODGE	B100, B100 VAN, B200, B200 VAN, B300, B300 VAN, CHALLENGER, CHARGER, CORONET, D100, D100 PICKUP, D150, D200, D200 PICKUP, D300, D300 PICKUP, DART, DIPLOMAT, MAGNUM, MONACO, POLARA, RAMCHARGER, W100, W100 PICKUP, W150, W200, W200 PICKUP, W300, W300 PICKUP
	1978-1970	V8	PLYMOUTH	BARRACUDA, BELVEDERE, DUSTER, FURY, GRAN FURY, GTX, PB100, PB100 VAN, PB200, PB200 VAN, PB300, PB300 VAN, ROADRUNNER, SATELLITE, TRAILDUSTER, VALIANT, VOLARE
43103	1992-1970	V8	DODGE	ASPEN, B100, B100 VAN, B150, B200, B200 VAN, B250, B300, B300 VAN, B350, CHALLENGER, CHARGER, CORONET, D100, D100 PICKUP, D150, D200, D200 PICKUP, D250, D300, D300 PICKUP, D350, DAKOTA, DART, DIPLOMAT, MAGNUM, MIRADA, MONACO, POLARA, RAMCHARGER, ROYAL MONACO, ST. REGIS, W100, W100 PICKUP, W150, W200, W200 PICKUP, W250, W300, W300 PICKUP, W350
	1991-1987	V6	DODGE	B150, B250, D100, D150, D250, DAKOTA, W100, W150
	1989-1974, 1972-1971	V8	CHRYSLER	CORDOBA, FIFTH AVENUE, IMPERIAL, LEBARON, NEW YORKER, NEWPORT

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43103	1989-1970	V8	PLYMOUTH	BARRACUDA, BELVEDERE, CARAVELLE, DUSTER, FURY, GRAN FURY, GTX, PB100, PB100 VAN, PB150, PB200, PB200 VAN, PB250, PB300, PB300 VAN, PB350, ROADRUNNER, SATELLITE, TRAILDUSTER, VALIANT, VOLARE
43128	1991-1990	V8	DODGE	DAKOTA
43159	1992	V6	DODGE	B150, B250, D150, D250, DAKOTA, W150
	1992	V8	DODGE	B250, B350, D150, D250, DAKOTA, RAMCHARGER, W150, W250
43160	2004-1993	V6	DODGE	B150, B1500, B250, B2500, D150, D250, DAKOTA, DURANGO, RAM 1500, RAM 1500 VAN, RAM 2500 VAN, W150
	2003-1993	V8	DODGE	B150, B1500, B250, B2500, B350, B3500, D150, D250, D350, DAKOTA, DURANGO, RAM 1500, RAM 1500 VAN, RAM 2500, RAM 2500 VAN, RAM 3500, RAM 3500 VAN, RAMCHARGER, W150, W250, W350
	1998-1993	V8	JEEP	GRAND CHEROKEE
43163	2013-2011	V8	RAM	1500, DAKOTA
	2012-2002	V6	JEEP	COMMANDER, GRAND CHEROKEE, LIBERTY
	2012-2011	V6	RAM	1500, DAKOTA
	2011-2002	V6	DODGE	DAKOTA, DURANGO, NITRO, RAM 1500
	2010-2000	V8	DODGE	DAKOTA, DURANGO, RAM 1500
	2009-2007	V8	CHRYSLER	ASPEN
	2009-1999	V8	JEEP	COMMANDER, GRAND CHEROKEE
	2009-2006	V6	MITSUBISHI	RAIDER
	2007-2006	V8	MITSUBISHI	RAIDER
43169	2003-1994	V10	DODGE	RAM 2500, RAM 3500
43369	2013-2011	V6	CHRYSLER	200, 300, TOWN & COUNTRY
43369	2013-2011	V6	DODGE	AVENGER, CHALLENGER, CHARGER, DURANGO, GRAND CARAVAN, JOURNEY
	2013-2011	V6	JEEP	GRAND CHEROKEE
	2012	V6	RAM	C/V
	2012-2011	V6	VOLKSWAGEN	ROUTAN
43401	1991-1973	V8	JEEP	CHEROKEE, CJ5, CJ6, CJ7, GRAND WAGONEER, J-2500, J-2600, J-4500, J-4600, J-4700, J-4800, J10, J20, JEEPSTER, WAGONEER
	1979-1973	V8	AMERICAN MOTORS	AMBASSADOR, AMX, CONCORD, GREMLIN, HORNET, JAVELIN, MATADOR, PACER, SPIRIT
43918	1971-1969, 1960	V8	DODGE	TRUCK
43919	1970-1960	V8	DODGE	330, 440, A100, CHARGER, CORONET, D100 PICKUP, D100 SERIES, D200 PICKUP, D200 SERIES, D300 PICKUP, D300 SERIES, DART, MONACO, POLARA, W100 PICKUP, W100 SERIES, W200 PICKUP, W200 SERIES, W300 PICKUP, W300 SERIES
	1969-1963	V8	PLYMOUTH	BARRACUDA, BELVEDERE, FURY, GTX, ROADRUNNER, SATELLITE, VALIANT
45047	2011-2007	V6	LEXUS	ES350, RX350, RX450H
	2011-2005	V6	TOYOTA	AVALON, CAMRY, HIGHLANDER, RAV4, SIENNA, VENZA
45059	1986-1984	L4	TOYOTA	CAMRY, COROLLA
45155	1992-1988	L6	TOYOTA	LAND CRUISER
45189	1980-1975	L6	TOYOTA	LAND CRUISER
45257	2010-1990	V8	LEXUS	GS400, GS430, GX470, LS400, LS430, LX470, SC400, SC430
	2009-1998	V8	TOYOTA	4RUNNER, LAND CRUISER, SEQUOIA, TUNDRA
45293	2011-1994	L4	TOYOTA	4RUNNER, T100, TACOMA

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46104	1996-1986	V6	NISSAN	D21, PATHFINDER, PICKUP
46218	1995-1991	V6	ACURA	LEGEND
46252	1994-1992	V6	NISSAN	MAXIMA
46338	2004-1996	V6	NISSAN	FRONTIER, PATHFINDER, XTERRA
	2000-1997	V6	INFINITI	QX4
46348	1998-1996	V6	ACURA	TL
46354	2004-1996	V6	ACURA	RL
48222	1993-1990	L6	MERCEDES-BENZ	300CE, 300SL
48313	1996-1993	L6	MERCEDES-BENZ	300CE, 300E, 300TE, C280, C36 AMG, E320, SL320
48315	1995-1990	V8	MERCEDES-BENZ	400E, 400SE, 400SEL, 500E, 500SEC, 500SEL, 500SL, E420, E500, S420, S500, SL500
48332	1995-1994	V8	BMW	740I, 740IL, 840CI
48345	1997-1993	L6	MERCEDES-BENZ	300CE, 300E, 300TE, C280, C36 AMG, E320, SL320
48346	1999-1994	V8	MERCEDES-BENZ	CL500, E420, E500, S420, S500, SL500
48351	1999, 1997-1996, 1994-1992	L6	MERCEDES-BENZ	300SE, E320, S320
48465	2003-1999	V8	BMW	540I, 740I, 740IL, X5, Z8
51008	1993-1982	V8	CHEVROLET	BLAZER, C10, C10 SUBURBAN, C20, C20 SUBURBAN, C30, G20, G30, K10, K10 SUBURBAN, K20, K20 SUBURBAN, K30, P20, P30, R10, R10 SUBURBAN, R20, R20 SUBURBAN, R2500, R30, R3500, V10, V10 SUBURBAN, V20, V20 SUBURBAN, V30, V3500
	1993-1982	V8	GMC	G2500, G3500, JIMMY, P2500, P3500, R1500, R1500 SUBURBAN, R2500, R2500 SUBURBAN, R3500, V1500, V1500 SUBURBAN, V2500, V2500 SUBURBAN, V3500
51062	1996-1994	V8	AM GENERAL	HUMMER
51062	1996-1988	V8	CHEVROLET	BLAZER, C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, EXPRESS 2500, EXPRESS 3500, G20, G30, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, P30, R10 SUBURBAN, R1500 SUBURBAN, R20 SUBURBAN, R2500 SUBURBAN, TAHOE, V10 SUBURBAN, V1500 SUBURBAN, V20 SUBURBAN, V2500 SUBURBAN
	1996-1988, 1986-1982	V8	GMC	C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, G2500, G3500, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, YUKON
51074	2000-1996	V8	GMC	B7, C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, C6500 TOPKICK, C7500 TOPKICK, G3500, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, P3500, SAVANA 2500, SAVANA 3500, YUKON
	1999-1996	V8	CHEVROLET	B7, C1500, C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, C3500HD, EXPRESS 2500, EXPRESS 3500, G30, K1500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, P30, TAHOE
51086	2005-1999	V8	WORKHORSE	FASTRACK FT1801, FASTRACK FT1802, P32, P42, W42
	2004-2002	V8	HUMMER	H1

Part	Year	Cyl	Make	Application
51086	2002-1999	V8	CHEVROLET	C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, EXPRESS 2500, EXPRESS 3500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, P30
	2002-1999	V8	GMC	C1500 SUBURBAN, C2500, C2500 SUBURBAN, C3500, K1500 SUBURBAN, K2500, K2500 SUBURBAN, K3500, P3500, SAVANA 2500, SAVANA 3500
	2001-1999	V8	AM GENERAL	HUMMER
51089	2007-2001	V8	CHEVROLET	AVALANCHE 2500, SILVERADO 2500 HD, SILVERADO 3500, SUBURBAN 2500
	2007-2001	V8	GMC	SIERRA 2500 HD, SIERRA 3500, YUKON XL 2500
51981	1968	V8	CHEVROLET	CHEVY II
52018	1994-1983	V8	FORD	E-150 ECONOLINE, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F SUPER DUTY, F-150, F-250, F-350, F59
52048	1992-1987	L6	FORD	BRONCO, E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F-150, F-250, F-350
52077	1994-1992	V8	FORD	E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F SUPER DUTY, F-250, F-350, F53
52079	1992	L6	FORD	E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON
52081	1989-1988	V8	FORD	E-250 ECONOLINE CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F SUPER DUTY, F-250, F-350, F53
52086	1997-1995	V8	FORD	E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F SUPER DUTY, F-250, F-350, F53
52099	1996-1993	L6	FORD	E-150 ECONOLINE, E-150 ECONOLINE CLUB WAGON, E-250 ECONOLINE, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F-150, F-250, F-350
61094	2000-1999	V8	CHEVROLET	B7, C6500 KODIAK, C7500 KODIAK
	2000-1999	V8	GMC	B7, C6500 TOPKICK, C7500 TOPKICK
	2000-1999	V8	WORKHORSE	P32, P42
62037	1998-1980	V8	FORD	B600, B700, C600, C700, C800, F600, F700, F800, FT800, L800, LN600, LN700, LN800
62075	1976-1964	V8	FORD	COUNTRY SQUIRE, CUSTOM, CUSTOM 500, F-100, F-100 PICKUP, F-150, F-250, F-250 PICKUP, F-350, F-350 PICKUP, FAIRLANE, GALAXIE, GALAXIE 500, LTD, MUSTANG, P-350, RANCHERO, THUNDERBIRD, TORINO
	1970-1965	V8	MERCURY	BROUGHAM, COLONY PARK, COMET, COUGAR, MARAUDER, MARQUIS, MONTCLAIR, MONTEGO, MONTEREY
63168	2008-2007	V8	CHRYSLER	ASPEN
	2008-2003	V8	DODGE	DURANGO, RAM 1500, RAM 2500, RAM 3500
63341	2013-2011	V8	RAM	1500, 2500, 3500
	2010-2009	V8	DODGE	DURANGO, RAM 1500, RAM 2500, RAM 3500
	2009	V8	CHRYSLER	ASPEN
70047	1998-1992	L6	FORD	CF8000, F800, LN8000
	1998-1992	L6	FREIGHTLINER	FL50, FL60, FL70, FL80, FS65
70133	2005-2003	V8	FORD	EXCURSION, F-250 SUPER DUTY, F-350 SUPER DUTY, F-450 SUPER DUTY, F-550 SUPER DUTY

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71023	1995-1985	V8	CADILLAC	ALLANTE, COMMERCIAL CHASSIS, DEVILLE, ELDORADO, FLEETWOOD, SEVILLE
71053	2013-2006	V8	CHEVROLET	C4500 KODIAK, C5500 KODIAK, EXPRESS 2500, EXPRESS 3500, EXPRESS 4500, SILVERADO 2500 HD, SILVERADO 3500
	2013-2006	V8	GMC	C4500 TOPKICK, C5500 TOPKICK, SAVANA 2500, SAVANA 3500, SAVANA 4500, SIERRA 2500 HD, SIERRA 3500, SIERRA 3500 HD
	2011-2010, 2008-2006	V8	WORKHORSE	LF72
71078	1998-1990	V8	CHEVROLET	B60, B7, C5500 KODIAK, C60 KODIAK, C6500 KODIAK, C70 KODIAK, C7500 KODIAK, P6000, T6500, T7500
	1998-1990	V8	GMC	B6000, B7, C5000 TOPKICK, C6000, C6000 TOPKICK, C6500 TOPKICK, C7000, C7000 TOPKICK, C7500 TOPKICK, P6500, T6500, T7500
71084	1990-1980	V8	CHEVROLET	B60, C5500 KODIAK, C60, C70, C70 KODIAK
	1989-1980	V8	GMC	B6000, C6000, C7000
71085	2002-1999	V6	OLDSMOBILE	AURORA, INTRIGUE
71099	1980-1961	L4	INTERNATIONAL	C900, D900, M SERIES VAN, SCOUT, SCOUT II
	1980-1968	V8	INTERNATIONAL	M1100, M1200, MA1200, MS1210, SCOUT, SCOUT II, TRAVELALL
71615	2006-2004, 2002-1998	V8	PONTIAC	FIREBIRD, GTO
	2004-2001	V8	AVANTI	II
	2004-1997	V8	CHEVROLET	CAMARO, CORVETTE
71616	2006-2004	V8	BUICK	RAINIER
	2006-2002	V8	CADILLAC	ESCALADE, ESCALADE ESV, ESCALADE EXT
71616	2006-1999	V8	CHEVROLET	AVALANCHE 1500, EXPRESS 1500, EXPRESS 2500, EXPRESS 3500, SILVERADO 1500, SILVERADO 1500 HD, SILVERADO 2500, SILVERADO 2500 HD, SILVERADO 3500, SSR, SUBURBAN 1500, SUBURBAN 2500, TAHOE, TRAILBLAZER, TRAILBLAZER EXT, W3500 TILTMASTER, W4500 TILTMASTER
	2006-1999	V8	GMC	ENVOY, ENVOY XL, ENVOY XUV, SAVANA 1500, SAVANA 2500, SAVANA 3500, SIERRA 1500, SIERRA 1500 HD, SIERRA 2500, SIERRA 2500 HD, SIERRA 3500, SIERRA C3, W3500 FORWARD, W4500 FORWARD, YUKON, YUKON XL 1500, YUKON XL 2500
	2006-2003	V8	HUMMER	H2
	2006-2003	V8	ISUZU	ASCENDER, NPR, NPR-HD
	2006-2005	V8	SAAB	9-7X
	2005-2004	V8	WORKHORSE	FASTRACK FT1061, FASTRACK FT1261, FASTRACK FT1461, FASTRACK FT1601, FASTRACK FT1801
71617	2014-2007	V8	CADILLAC	ESCALADE, ESCALADE ESV, ESCALADE EXT
	2014-2007	V8	CHEVROLET	AVALANCHE, COLORADO, EXPRESS 1500, EXPRESS 2500, EXPRESS 3500, EXPRESS 4500, SILVERADO 1500, SILVERADO 1500 HD, SILVERADO 3500, SILVERADO 3500 HD, SUBURBAN 1500, SUBURBAN 2500, TAHOE, TRAILBLAZER, W3500 TILTMASTER, W4500 TILTMASTER

Part	Year	Cyl	Make	Application
71617	2013-2007	V8	GMC	CANYON, ENVOY, SAVANA 1500, SAVANA 2500, SAVANA 3500, SIERRA, SIERRA 1500, SIERRA 1500 HD, SIERRA 2500 HD, SIERRA 3500, SIERRA 3500 HD, W3500 FORWARD, W4500 FORWARD, YUKON, YUKON XL 1500, YUKON XL 2500
	2012-2007	V8	ISUZU	NPR, NPR-HD
	2011-2007	V8	WORKHORSE	W42, W62
	2010-2007	V8	HUMMER	H2, H3, H3T
	2009-2007	V8	SAAB	9-7X
	2007	V8	BUICK	RAINIER
71618	2009-2008	V8	PONTIAC	G8
	2008-2005	V8	CHEVROLET	CORVETTE
	2007-2004	V8	CADILLAC	CTS
71619	2011-2009	V8	CADILLAC	CTS
	2011-2009	V8	CHEVROLET	CAPRICE, CORVETTE
	2009	V8	PONTIAC	G8
72096	1995-1994	V8	FORD	E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, F SUPER DUTY, F-250, F-350, F59
72114	2003-1996	V8	FORD	E-350, E-350 CLUB WAGON, E-350 ECONOLINE, E-350 ECONOLINE CLUB WAGON, E-450 ECONOLINE SUPER DUTY, E-450 ECONOLINE SUPER DUTY STRIPPED, E-450 SUPER DUTY, E-450 SUPER DUTY STRIPPED CHASSIS, E-550 ECONOLINE SUPER DUTY, E-550 SUPER DUTY, ECONOLINE SUPER DUTY, EXCURSION, F SUPER DUTY, F-250, F-250 SUPER DUTY, F-350, F-350 SUPER DUTY, F-450 SUPER DUTY, F-550 SUPER DUTY, F59
73158	2013-2002	L6	FORD	F650, F750
	2013-2002	L6	FREIGHTLINER	108SD, BUSINESS CLASS M2, FC70, FC80, FL50, FL60, FL70, FL80, FS65, M2 106, MT35, MT45, MT55, XC
73158	2010-2008, 2002	L6	STERLING	ACTERRA 5500, ACTERRA 6500, ACTERRA 7500, BULLET 45, BULLET 55, L7500, SC7000 CARGO
	2009-2002	L6	DODGE	RAM 2500, RAM 3500
	2009-2007	L6	WORKHORSE	R26
73712	2013-1988, 1985-1980	L6	INTERNATIONAL	3000, 3000FE, 3000IC, 3000RE, 3200, 3600, 3700, 3800, 3900FC, 4300, 4300LP, 4400, 4400LP, 4700, 4700LP, 7300, CARGOSTAR, DURASTAR, GENESIS RE, S1753, S1853, S1854, S1924, S1925, S1954, S1955, S2125, S2155, S2524, S2554
73716	2005-1994	V8	INTERNATIONAL	1652SC, 1652UPS, 3000, 3000IC, 3400, 3600, 3700, 3800, 4600LP, 4700LP, 4700LPX, GENESIS RE
	2003-2000	V8	FORD	F650, F750
76058	2010-2004	V8	FORD	E-350 CLUB WAGON, E-350 SUPER DUTY, E-450 SUPER DUTY, EXCURSION, F-250 SUPER DUTY, F-350 SUPER DUTY, F-450 SUPER DUTY, F-550 SUPER DUTY
76288	1995-1993	V6	ACURA	LEGEND
78007	2007-2004	L5	DODGE	SPRINTER 2500, SPRINTER 3500
	2006-2004	L5	FREIGHTLINER	SPRINTER 2500, SPRINTER 3500
78008	2003	L5	DODGE	SPRINTER 2500, SPRINTER 3500
	2003-2002	L5	FREIGHTLINER	SPRINTER 2500, SPRINTER 3500
78173	1984	L4	MERCEDES-BENZ	190E
78175	1993-1991, 1988-1985	L4	MERCEDES-BENZ	190E
78314	1998	L4	MERCEDES-BENZ	C230, SLK230
82001	2005-2002	L4	FORD	FIESTA, FIESTA IKON, KA
82003	2000-1998	L4	FORD	FIESTA
87057	2012	L4	MAZDA	2
91047	2008-2007	L4	HONDA	FIT
93007	2014-2005	L4	NISSAN	FRONTIER
93044	2007-2006	L4	NISSAN	MICRA
93084	2008	L4	NISSAN	CABSTAR, CABSTAR E

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95102	2004	L4	TOYOTA	YARIS
97034	2010-2007	L4	SUZUKI	SWIFT
99001	1977-1971	L4	RENAULT	R12, R15
99112	2005-2003	L4	PEUGEOT	406
99125	2008-2006	L4	PEUGEOT	206
99359	2002-2000	L4	PEUGEOT	306
99448	2006-2004	L4	CHEVROLET	ASTRA
99581	2008	L4	SEAT	LEON
99600	2008-2007, 2005-2001	L4	PEUGEOT	206, 207, GRAND RAID
99668	2009-2004	L4	RENAULT	MEGANE
99682	2009-2003	L4	VOLKSWAGEN	LUPO, POLO
99916	2008-2002	V6	PEUGEOT	407, 607

AC DELCO		AC DELCO		AC DELCO		AC DELCO	
251-50	31563	251-314	31000	251-412	42008	251-507	41069
251-106	38013	251-315	31001	251-414	52018	251-509	71023
251-111	33021	251-323	31004	251-415	32020	251-511	71084
251-116	43918	251-324	43401	251-416	12022	251-512	61047
251-121	61861	251-326	42014	251-417	42023	251-512	71078
251-142	31896	251-327	22040	251-420	31015	251-513	22069
251-146	33100	251-328	41002	251-422	23111	251-514	42038
251-147	43919	251-329	23104	251-424	15039	251-515	32034
251-150	62893	251-330	23106	251-425	25040	251-516	42039
251-154	42953	251-331	33105	251-426	28065	251-517	52048
251-155	42932	251-333	41006	251-427	15045	251-518	42044
251-159	22964	251-334	21007	251-428	15046	251-519	42057
251-166	41898	251-335	51008	251-429	38049	251-520	42035
251-167	41002	251-336	23108	251-430	52705	251-521	22053
251-172	23012	251-337	23115	251-431	31022	251-522	32059
251-174	31018	251-338	21007	251-432	31028	251-523	23121
251-175	16131	251-339	31028	251-433	18019	251-524	23127
251-178	35006	251-340	41010	251-435	16034	251-525	23122
251-182	41100	251-342	31009	251-436	11017	251-526	43159
251-184	42028	251-343	11036	251-437	16050	251-527	23120
251-185	41984	251-346	36132	251-438	18052	251-528	23118
251-188	22044	251-347	21013	251-439	26053	251-529	23114
251-190	41003	251-348	42043	251-440	26060	251-530	12041
251-192	33040	251-349	21000	251-441	25064	251-531	22049
251-195	22005	251-350	31001	251-442	16069	251-532	42051
251-196	42047	251-351	31004	251-443	15092	251-534	42060
251-199	43053	251-352	25005	251-444	11043	251-535	22056
251-203	43401	251-353	25016	251-447	71023	251-536	13126
251-204	21895	251-354	25017	251-448	51062	251-537	41063
251-205	33077	251-355	25018	251-449	51008	251-538	41068
251-207	21110	251-356	16020	251-451	11048	251-539	41066
251-208	21137	251-357	16026	251-453	11043	251-540	41069
251-210	22960	251-358	25027	251-454	31041	251-541	21030
251-212	22002	251-362	12022	251-455	11033	251-542	11072
251-213	22033	251-363	32030	251-456	11045	251-544	41121
251-214	32030	251-365	16014	251-456	11057	251-545	21050
251-215	32083	251-366	36031	251-458	11020	251-546	21050
251-216	42953	251-367	16025	251-459	21040	251-549	71078
251-217	62075	251-368	16041	251-460	21040	251-551	31041
251-218	62082	251-369	62037	251-461	41049	251-552	21000
251-219	62094	251-371	42016	251-462	21050	251-553	21107
251-222	28066	251-372	51008	251-463	21000	251-554	41066
251-224	41109	251-374	16034	251-466	31022	251-555	41069
251-225	21107	251-375	16035	251-467	41010	251-556	41068
251-226	43401	251-376	23110	251-468	11036	251-557	41038
251-230	41121	251-377	16035	251-469	41049	251-560	21076
251-231	41120	251-378	21050	251-470	11057	251-561	71056
251-232	41975	251-380	32030	251-471	11045	251-562	21075
251-233	41975	251-381	32083	251-472	11054	251-564	71023
251-234	16009	251-382	71023	251-473	41063	251-566	41077
251-235	16010	251-383	11033	251-474	11045	251-567	71078
251-236	16011	251-384	11032	251-475	11057	251-569	71084
251-237	36008	251-385	41035	251-476	11017	251-570	41049
251-239	35012	251-386	31037	251-476	11036	251-572	41069
251-240	35006	251-387	21040	251-477	11036	251-573	51074
251-241	23116	251-388	41049	251-478	11036	251-574	11058
251-241	23120	251-389	41038	251-479	51062	251-575	15272
251-247	11127	251-390	51062	251-481	28065	251-578	15271
251-248	16034	251-391	11036	251-482	42052	251-579	41077
251-249	42043	251-392	16043	251-486	41038	251-580	41049
251-250	16033	251-393	42024	251-488	11064	251-581	41049
251-260	21040	251-394	21030	251-489	41066	251-583	11032
251-262	21050	251-395	41035	251-490	11033	251-584	71615
251-275	62094	251-396	31037	251-491	11032	251-586	15076
251-301	32003	251-397	41016	251-492	41068	251-587	16220
251-302	42114	251-398	28066	251-493	31070	251-588	16221
251-303	22002	251-399	22040	251-494	41002	251-589	51062
251-304	33100	251-400	31028	251-495	41049	251-590	51074
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P-2382	36166
P-2384	26168
P-2385	16116
P-2394	36255
P-2395	35296
P-2396	35256
P-2397	18262
P-2399	36268
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P-2416	23152
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P-2438	45257
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P-2446	18340
P-2447	48351
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P-2453	16270
P-2455	26383
P-2459	16352
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P-2466	38333
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P-2469	48345
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P-4123	32123
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P-4126	12126
P-4128	32128
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P-9101	32122
P-9107	21079
P-9139	26364
P-9150	45293
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P-9173	15376

BORG WAGNER	
P-9173	21099
P-9176	16300
P-9182	51089
P-9187	15406
P-9189	71615
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P-9342	16342
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P-9361	11103
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P-9366	18471
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P-9374	16374
P-9377	33170
P-9378	28378
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P-9390	26300
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P-9409	71616
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P-9416	16110
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P-9427	16427
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55-11123	21040
55-11124	41049
55-11129	51062
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55-11146	51981
55-11147	41984
55-11148	21030
55-11150	41100
55-11151	41010
55-11153	31022
55-11154	41073
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55-11165	41010	55-21118	41120	55-23319	32101	55-33511	33411
55-11167	41898	55-21119	22002	55-23320	42105	55-33512	23111
55-11311	41077	55-21121	42014	55-23321	42108	55-33513	33138
55-11312	71078	55-21122	42043	55-23323	72114	55-33611	33147
55-11313	51089	55-21123	32030	55-23324	32122	55-33612	33147
55-11314	41090	55-21124	22033	55-23325	32127	55-33613	23150
55-11315	61094	55-21125	62037	55-23327	72096	55-33614	23153
55-11411	51086	55-21126	22054	55-23327	72114	55-33615	23300
55-13111	31018	55-21128	52077	55-23411	22098	55-33616	13167
55-13113	31046	55-21130	52086	55-23412	32118	55-33711	23161
55-13114	31001	55-21133	42932	55-23511	12070	55-41111	35078
55-13115	31004	55-21134	42953	55-23512	12091	55-43103	15092
55-13116	41006	55-21135	22960	55-23513	12106	55-43112	25005
55-13117	21007	55-21137	22964	55-23514	12132	55-43113	35012
55-13118	31009	55-21139	42047	55-23611	22053	55-43114	25015
55-13119	21013	55-21140	32083	55-23612	22065	55-43115	25016
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55-21113	62075	55-23314	42057	55-33415	26437	55-53112	16033
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55-53119	16034	55-71114	36300	55-83131	78175	57-1009	25018
55-53120	16034	55-73111	16020	55-83132	38176	57-1012	35006
55-53411	36097	55-73112	16050	55-83134	38195	57-1013	35170
55-53412	46218	55-73113	16080	55-83135	38202	57-1014	15045
55-53413	36219	55-73114	26105	55-83136	48222	57-1016	16011
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55-53415	76288	55-73116	26109	55-83138	38231	57-1019	16009
55-53416	25324	55-73117	36132	55-83139	18262	57-1021	16026
55-53417	25325	55-73118	26133	55-83140	38264	57-1023	36031
55-53418	46348	55-73119	16161	55-83143	99001	57-1025	16041
55-53419	46354	55-73120	36166	55-83144	48313	57-1026	36198
55-53420	26365	55-73121	16167	55-83147	48315	57-1027	16114
55-53421	26383	55-73122	26212	55-83149	48346	57-1028	36008
55-53422	26434	55-73123	36225	55-83150	28401	57-1029	16034
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55-53621	16273	55-73140	26399	55-83324	28065	57-1053	38013
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55-53623	16321	55-73141	26399	55-83325	38368	57-1071	28153
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55-63137	16300	55-83117	28066	57-14	11032	57-1176	36097
55-63138	16270	55-83118	38068	57-15	21000	57-1178	23116
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57-1192	16116	57-1337	11045	57-1485	36353	57-1591	15405
57-1193	16058	57-1338	42042	57-1486	25324	57-1592	26385
57-1194	16074	57-1340	32059	57-1487	25325	57-1593	18382
57-1195	16110	57-1341	28066	57-1488	25142	57-1594	38380
57-1198	36179	57-1342	16034	57-1489	45257	57-1595	38379
57-1199	46104	57-1343	16033	57-1493	16352	57-1597	16419
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57-1201	22053	57-1346	38236	57-1496	38276	57-1602	16403
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57-1203	22068	57-1348	11058	57-1498	25334	57-1604	26434
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57-1208	36102	57-1350	78175	57-1502	21079	57-1607	26463
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CARDONE SELECT	
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58-180	43919
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58-393	11036
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58-415	32066
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58-445	41063
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58-499	52086
58-503	32088

CARDONE SELECT	
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58-505	42090
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58-507	32094
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58-510	12091
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58-522	23150
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58-529	32102
58-530	42103
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58-533	42105
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58-564	23158
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58-572	43163
58-574	32122
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58-597	70133
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CARDONE SELECT	
58-623	63168
58-624	71615
58-626	71616
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58-653	71617
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58-674	32023
58-679	41077
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58-695	13038
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CATERPILLAR	
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2W1227	70043
4P3683	70353
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OR3007	70353
OR0781	70020

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CHRYSLER	
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MD030863	23115
MD034152	23108
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7050X	70001
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3000886	70000
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3027174	70001
3045943	70032
3052836	70062
3062928	70062
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3913432	23145
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CUMMINS	
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4089908	70151
4089910	70152
4089952	70661
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AR4283	70042
AR4284	70042
AR45090	70000
AR45090RX	70000
AR45184	70001
AR45184RX	70001
AR45217	70032
CRXAR45090RX	70000
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RCWP1448	23127
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RCWP1617	23150
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RCWP1669	43160
RCWP7161	23161
RCWP7162	23162
RCWP7163	43163
RCWP7164	33000
RCWP7171	13165
RCWP163103	13151
RCWP163106	23158

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96352	16459
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92064250	16375
92065969	16375
96352652	16459
96518977	16503

DAIHATSU	
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16100-87108	16237
16100-87182	16237
16100-87184	16237
16100-87244	88036
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DAIHATSU	
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16100-87587	88031
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DETRIOT DIESEL	
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8922302	70034
8928672	70034
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23517027	70131
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23520136	70131
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23532543	70130
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23535018	70130
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89284814	22054
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R3518216	70131
R3520136	70131
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R23526039	70131
R23530427	70129
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R23535017	70129
R23535018	70130
R235218215	70131

EASTERN	
18-100	28172
18-130	28157
18-132	16014
18-133	16025
18-148	35078
18-149	45189
18-152	35006
18-152D	35006
18-162	25005
18-164	25027
18-171	25015
18-172	35012
18-173	25016
18-175	25018
18-177	15028
18-193	38013
18-197	28077
18-198	38049

EASTERN	
18-202	23110
18-203	23111
18-205	31001
18-206	15039
18-207	16041
18-208	21007
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18-210	31004
18-211	21107
18-212	23115
18-213	23108
18-215	41006
18-216	42016
18-217	22054
18-222	41010
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90BX8591AA	32003
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95VW8591AA	18262
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96MX8591AA	22104
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1518087	22964	C5AZ-8501L	42028	D4TZ-8501J	62075	E3TZ-8501G	22033
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1822823C1	72096	C5AZ-8501T	42028	D5DE-8505AB	22002	E4TZ-8501E	42114
1831005C2	72114	C5AZ-8501U	62075	D5VE-8505AA	42114	E4ZZ-8501A	42024
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38115010	42043	C9AZ-8501A	42028	D8TZ-8501B	42114	E7TZ-8501A	42044
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AJ0315010B	12091	D2VY-8501C	42114	D0ZZ-8501B	42953	E9JY-8501BA	22068
AJ0315010G	12132	D2AZ-8501A	22033	E1AE-8505AA	42014	E9BZ-8501A	22049
AJTM15010	12489	D2DZ-8501A	22960	E1ZE-8505AA	42024	E9BZ-8501AA	22049
AJTM-15-010	12489	D2SZ-8501A	42932	E1AZ-8501A	42014	E9DZ-8501A	32061
AJY1-15-010	12091	D2TZ-8501A	32083	E1FZ-8501B	22040	E9DZ-8501B	22056

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E9TZ-8501C	52048	F4BZ-8501B	22049	F32Z-8501A	26259	PW261	32030
E9TZ-8501D	42044	F4CZ-8501A	22069	F32Z-8501B	22078	PW264	42052
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E43Z-8501B	26067	F4DZ-8501B	32034	F49Z-8501A	42039	PW275	12070
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E87EAA	22054	F4TZ-8501ARM	72096	F57-8501A	12091	PW291	42038
E87EAB	22054	F4TZ-8501B	52086	F57Z-8501A	22093	PW292	42051
E92Z-8501A	22053	F4TZ-8504ARM	72096	F59Z-8501-B	42039	PW301	32089
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E93Z-8501B	12022	F4ZZ-8501B	42087	F59Z-8501B	42039	PW312	42090
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E0ZZ-8501A	42024	F5DZ-8501-CL	22098	F65Z-8501AC	42105	PW397	22093
EF8501KT	82078	F5DZ-8501A	32094	F65Z-8501BA	32122	PW406	22098
EP9Z-8501D	32030	F5DZ-8501CL	22098	F67E-8505BA	32101	PW430	32129
EPW7	22964	F5HZ-8501AA	62037	F68Z-8501A	32102	PW431	32118
EPW40	82089	F5RZ-8501A	12091	F77Z-8501AD	42108	PW449	12091
EPW55	32084	F5RZ-8501B	32088	F80Z-8501AA	22097	QCP2673	82089
EPW63	22964	F5TZ-8501A	52099	F81Z-8501ARM	72114	RFAE-8505AC2	32034
EPW67	22964	F5TZ-8501A	72096	F81Z-8501BRM	72096	RFE7DE-8505	42051
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EPW80	22104	F5TZ-8501B	72096	F81Z-8501DA	32109	RFE8EE-8505BA	22040
EPW97	22040	F5TZ-8501BRM	72096	F81Z-8501FA	72114	RFE8SE-8505	42050
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US9166	36166	US9292	35411	US9410	38410	06B-121-011C	11009
US9167	16167	US9293	45293	US9414	15414	06B-121-011CV	11009
US9168	26168	US9295	31009	US9416	26416	06B-121-011CX	11009
US9171	28171	US9296	35296	US9419	16419	06B-121-011E	11009
US9172	28172	US9297	28297	US9421	16421	06B-121-011EV	11009
US9175	78175	US9298	25298	US9426	16426	06B-121-011EX	11009
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US9194	16194	US9305	26305	US9446	28446	021-121-004	18262
US9195	38195	US9306	25306	US3803605	70090	021-121-004A	18262
US9198	36198	US9307	28307	US4089908	70151	021-121-004AX	18262
US9200	25200	US9309	16309	US4089910	70152	021-121-004X	18262
US9201	26201	US9310	26310	US0060P	70131	021-121-019A	18262
US9202	38202	US9311	48311	US0061	70133	021-121-019B	18262
US9206	16206	US9313	48313	US0063	21098	022-121-011V	18471
US9207	16207	US9314	78314	US0064	71616	022-121-011X	18471
US9208	36208	US9315	48315	US0065	71618	025-121-010C	18150
US9209	16209	US9318	26318	US0066	73716	025-121-010CV	18150
US9212	26212	US9320	25320	US0067	76058	025-121-010CX	18150
US9213	16213	US9321	16321	US0069NX	70661	025-121-019A	18150
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US9215	36215	US9323	38323	US0079	71619	026-121-005C	28065
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NOTES

Warranty

All products are warranted to be manufactured free from defects in materials and workmanship provided they are properly installed in the vehicles for which they are intended,. This warranty is void for items disassembled or tampered in any manner, THIS WARRANTY DOES NOT COVER ANY FAILURE DUE TO ACCIDENT, ABUSE, NEGLECT OR AS A RESULT OF NORMAL WEAR AND TEAR.

Under the terms of this warranty, the manufacturer shall have the option of repairing or replacing a defective product. This product must be promptly sent to the manufacturer along with proof of purchase

The warranty is nontransferable and redeemable only by the original purchaser. This warranty does not apply to commercial vehicles.

The sole responsibility of the manufacturer pursuant to the terms of this warranty, if any shall be the repair or replacement of defective products as indicated above. THE LIABILITY OF THE MANUFACTURER SHALL IN NO EVENT EXCEED THE ORIGINAL PURCHASE PRICE, AND THE MANUFACTURER SHALL NOT BE RESPONSIBLE FOR ANY CONSEQUENTIAL DAMAGES FOR PERSONAL INJURIES OR DAMAGE TO PROPERTY. THIS STATEMENT CONSTITUTES THE EXCLUSIVE EXPRESSION OF WARRANTIES BY THE MANUFACTURER AND IS IN LIEU OF ANY AND OTHER WARRANTY, WHETHER EXPRESSED OR IMPLIED, NO MODIFICATIONS OF THIS WARRANTY ARE AUTHORIZED. THERE ARE NO PROMISES, TERMS, CONDITIONS OR WARRANTIES OTHER THAN THOSE CONTAINED HEREIN.

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SECTION ACC

ACCELERATOR CONTROL SYSTEM

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ACCELERATOR CONTROL SYSTEM

PFP:18005

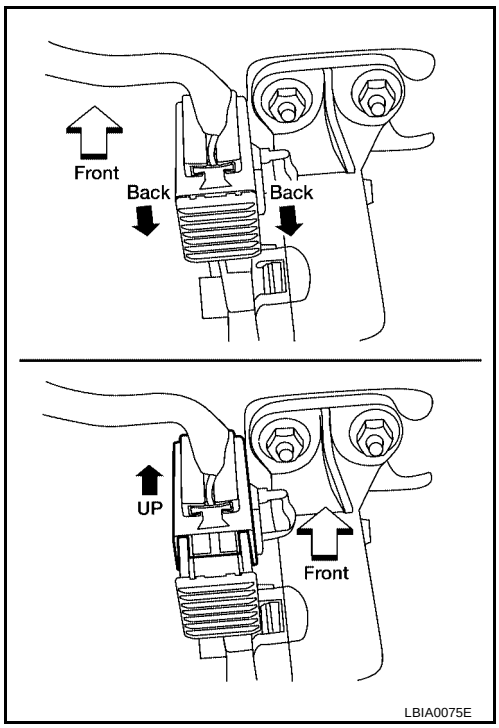
Removal and Installation

EBS00DTP

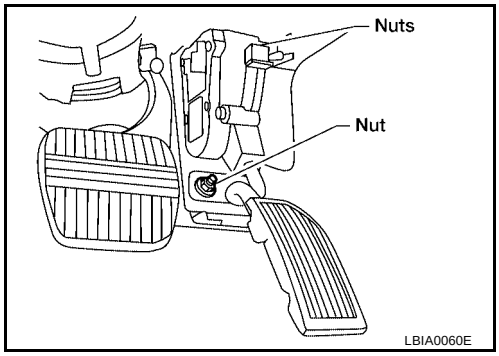
1. Disconnect the accelerator pedal position sensor electrical connector.

a. Pull the connector lock back to unlock the connector from the accelerator pedal position sensor.

b. Pull up on the connector to disconnect it from the accelerator pedal position sensor.



2. Remove the upper and lower pedal assembly nuts.



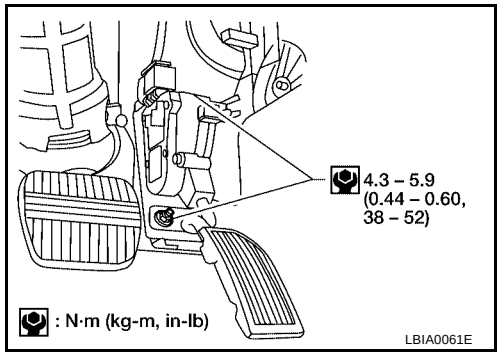
3. Remove the pedal assembly.

- For electrical inspection of the accelerator pedal position sensor. Refer to EC-503, "DTC P2122, P2123 APP SENSOR" (QG18DE ULEV), EC-1125, "DTC P2122, P2123 APP SENSOR" (QG18DE SULEV) or EC-1751, "DTC P2122, P2123 APP SENSOR" (QR25DE).

CAUTION:

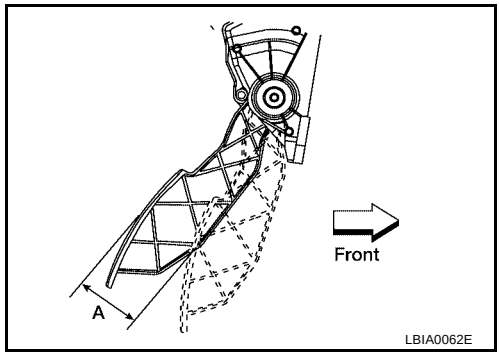
- **Do not disassemble the pedal assembly. Do not remove the accelerator pedal position sensor from the pedal assembly.**
- **Avoid impact from dropping during handling.**
- **Keep the pedal assembly away from water.**

4. Installation is in the reverse order of removal.
   - Check the accelerator pedal for smooth operation. There should be no binding or sticking when applying or releasing the accelerator pedal.



   - Check that the accelerator pedal moves through the full specified distance of pedal travel.

     Pedal Travel "A" : 52.6 - 58.2 mm (2.07 - 2.29 in)



CAUTION:
When the harness connector of the accelerator pedal position sensor is disconnected, perform the "Accelerator Pedal Released Position Learning". Refer to EC-1255, "Accelerator Pedal Released Position Learning" .

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Accelerator Control

EBS00EWA

PEDAL TRAVEL

Accelerator control pedal - total travel	52.6 - 58.2 mm (2.07 - 2.29 in)

SECTION AT
AUTOMATIC TRANSAXLE

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TROUBLE DIAGNOSIS - INDEX

PFP:00000

Alphabetical & P No. Index for DTC

ECS005VU

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A/T 4TH GR FNCTN	P0734	AT-151
A/T TCC S/V FNCTN	P0744	AT-164
ATF TEMP SEN/CIRC	P0710	AT-121
ENGINE SPEED SIG	P0725	AT-132
L/PRESS SOL/CIRC	P0745	AT-174
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PNP SW/CIRC	P0705	AT-116
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CAN COMM CIRCUIT	U1000	AT-209

- *1: These numbers are prescribed by SAE J2012.
- *2: When the fail-safe operation occurs, the MIL illuminates.
- *3: The MIL illuminates when both the “Revolution sensor signal” and the “Vehicle speed sensor signal” meet the fail-safe condition at the same time.

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P0710	ATF TEMP SEN/CIRC	AT-121
P0720	VEH SPD SEN/CIR AT*3	AT-127
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P1705	TP SEN/CIRC A/T*2	AT-188
P1760	O/R CLTCH SOL/CIRC	AT-194
U1000	CAN COMM CIRCUIT	AT-209

- *1: These numbers are prescribed by SAE J2012.
- *2: When the fail-safe operation occurs, the MIL illuminates.
- *3: The MIL illuminates when both the “Revolution sensor signal” and the “Vehicle speed sensor signal” meet the fail-safe condition at the same time.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

ECS005VV

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Precautions for On Board Diagnostic (OBD) System of A/T and Engine

ECS005VW

The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

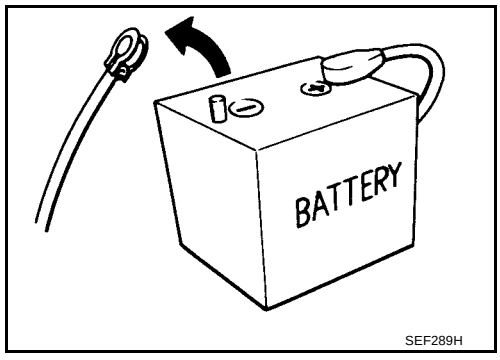
CAUTION:

- **Be sure to turn the ignition switch “OFF” and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to an open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Be sure to route and secure the harnesses properly after work. Interference of the harness with a bracket, etc. may cause the MIL to light up due to a short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to a malfunction of the EGR system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the TCM and ECM before returning the vehicle to the customer.**

Precautions

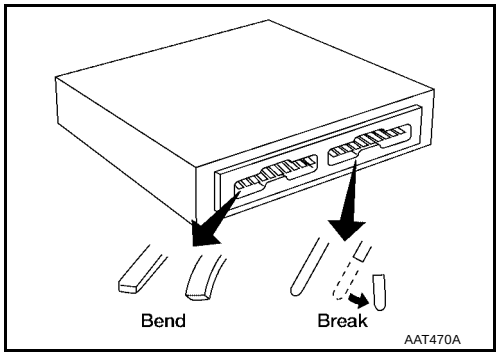
ECS005VX

- **Before connecting or disconnecting the TCM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the TCM. Because battery voltage is applied to TCM even if ignition switch is turned off.**

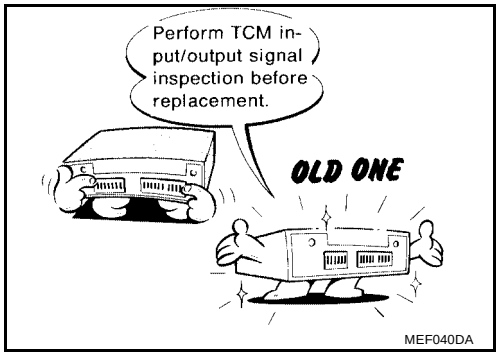


SEF289H

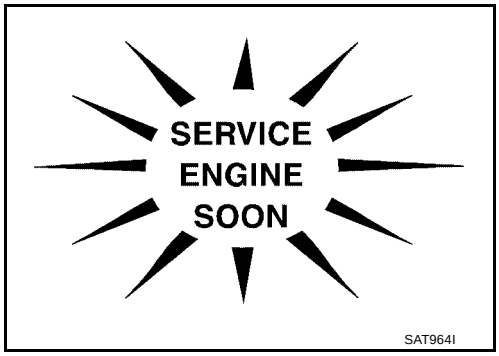
- **When connecting or disconnecting pin connectors into or from TCM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on TCM pin terminal, when connecting pin connectors.



- **Before replacing TCM, perform TCM input/output signal inspection and make sure whether TCM functions properly or not. See page AT-110 .**



- **After performing each TROUBLE DIAGNOSIS, perform "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".**
  The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed.
- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.



- Place disassembled parts in order for easier and proper assembly.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transaxle is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place disassembled valve body parts in order for easier and proper assembly. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along bores in valve body under their own weight.
- Before assembly, apply a coat of recommended ATF to all parts. Apply petroleum jelly to protect O-rings and seals, or hold bearings and washers in place during assembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- Replace ATF cooler if excessive foreign material is found in oil pan or clogging strainer. Refer to AT-11, "ATF COOLER SERVICE" .
- After overhaul, refill the transaxle with new ATF.
- When the A/T drain plug is removed, only some of the fluid is drained. Old A/T fluid will remain in torque converter and ATF cooling system.
  Always follow the procedures under "Changing A/T Fluid" in the MA section when changing A/T fluid. Refer to MA-31, "Changing A/T Fluid" .

Service Notice or Precautions

ECS005VY

FAIL-SAFE

The TCM has an electronic Fail-Safe (limp home mode). This allows the vehicle to be driven even if a major electrical input/output device circuit is damaged.
Under Fail-Safe, the vehicle always runs in third gear, even with a shift lever position of “1”, “2” or “D”. The customer may complain of sluggish or poor acceleration.
When the ignition key is turned “ON” following Fail-Safe operation, O/D OFF indicator lamp blinks for about 8 seconds. [For “TCM Self-diagnostic Procedure (No Tools)”, refer to AT-52, "TCM Self-diagnostic Procedure (No Tools)" .]
The blinking of the O/D OFF indicator lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions.
Always follow the “Work Flow”. Refer to AT-61, "Work Flow" .
The SELF-DIAGNOSIS results will be as follows:

- The first SELF-DIAGNOSIS will indicate damage to the vehicle speed sensor or the revolution sensor.
- During the next SELF-DIAGNOSIS, performed after checking the sensor, no damages will be indicated.

TORQUE CONVERTER SERVICE

The torque converter should be replaced under any of the following conditions:

- External leaks in the hub weld area.
- Converter hub is scored or damaged.
- Converter pilot is broken, damaged or fits poorly into crankshaft.
- Steel particles are found after flushing the cooler and cooler lines.
- Pump is damaged or steel particles are found in the converter.
- Vehicle has TCC shudder and/or no TCC apply. Replace only after all hydraulic and electrical diagnoses have been made. (Converter clutch material may be glazed.)
- Converter is contaminated with engine coolant containing antifreeze.
- Internal failure of stator roller clutch.
- Heavy clutch debris due to overheating (blue converter).
- Steel particles or clutch lining material found in fluid filter or on magnet when no internal parts in unit are worn or damaged — indicates that lining material came from converter.

The torque converter should not be replaced if:

- The fluid has an odor, is discolored, and there is no evidence of metal or clutch facing particles.
- The threads in one or more of the converter bolt holes are damaged.
- Transaxle failure did not display evidence of damaged or worn internal parts, steel particles or clutch plate lining material in unit and inside the fluid filter.
- Vehicle has been exposed to high mileage (only). The exception may be where the torque converter clutch dampener plate lining has seen excess wear by vehicles operated in heavy and/or constant traffic, such as taxi, delivery or police use.

ATF COOLER SERVICE

Replace ATF cooler if excessive foreign material is found in oil pan or clogging strainer.
Replace radiator lower tank (which includes ATF cooler) with a new one and flush cooler line using cleaning solvent and compressed air.
Refer to CO-13, "RADIATOR" .

OBD-II SELF-DIAGNOSIS

- A/T self-diagnosis is performed by the TCM in combination with the ECM. The results can be read through the blinking pattern of the O/D OFF indicator or the malfunction indicator lamp (MIL). Refer to the table on AT-55, "Judgement of Self-diagnosis Code" for the indicator used to display each self-diagnostic result.
- The self-diagnostic results indicated by the MIL are automatically stored in the ECM and TCM memories. **Always perform the procedure “HOW TO ERASE DTC” on page AT-40 to complete the repair and avoid unnecessary blinking of the MIL.**
- The following self-diagnostic items can be detected using ECM self-diagnostic results mode* only when the O/D OFF indicator lamp does not indicate any malfunctions.

– PNP switch

*: For details of OBD-II, refer to EC-58, "ON BOARD DIAGNOSTIC (OBD) SYSTEM" [QG18DE (ULEV)] or EC-639, "ON BOARD DIAGNOSTIC (OBD) SYSTEM" [QG18DE (SULEV)].

- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector.**
  For description and how to disconnect, refer to PG-47, "HARNESS CONNECTOR (SLIDE-LOCKING TYPE)" .

Wiring Diagrams and Trouble Diagnosis

ECS005VZ

When you read wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams".
- PG-2, "POWER SUPPLY ROUTING".

When you perform trouble diagnosis, refer to the following:

- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES".
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident".

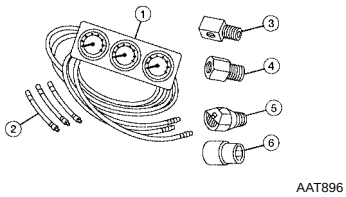
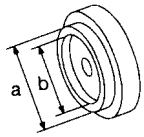
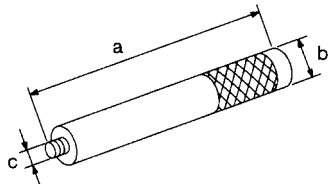
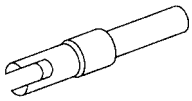
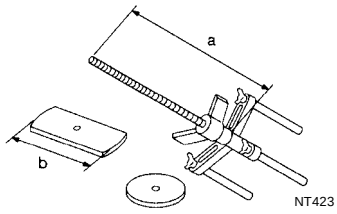
PREPARATION

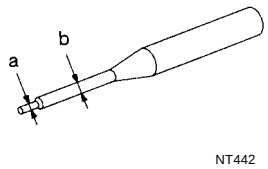
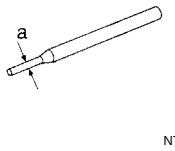
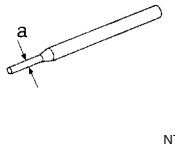
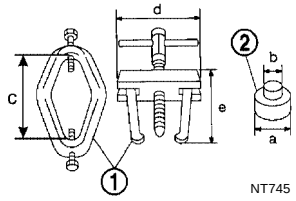
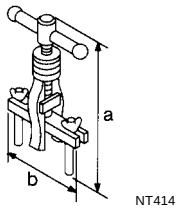
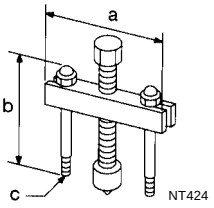
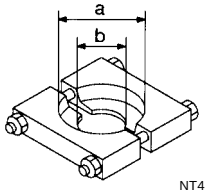
PFP:00002

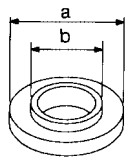
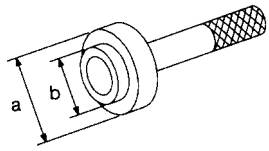
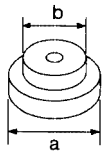
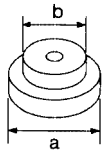
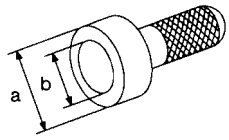
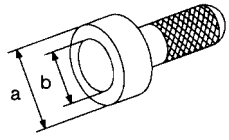
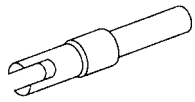
Special Service Tools

ECS005W0

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

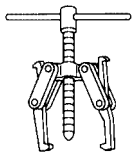
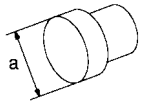
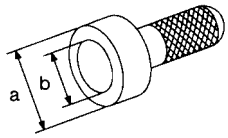
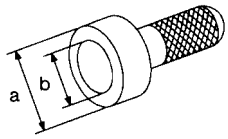
Tool number (Kent-Moore No.) Tool name	Description
(J34301-C) Oil pressure gauge set 1 (J34301-1) Oil pressure gauge 2 (J34301-2) Hoses 3 (J34298) Adapter 4 (J34282) Adapter 5 (790-301-1230-A) 60° Adapter 6 (J34301-15) Square socket  AAT896	Measuring line pressure
KV31103000 (J38982) Drift  NT105	Installing differential oil seal (Use with ST35325000.) **a: 59 mm (2.32 in) dia.** **b: 49 mm (1.93 in) dia.**
ST35325000 (—) Drift  NT417	Installing differential oil seal (Use with KV31103000.) **a: 215 mm (8.46 in)** **b: 25 mm (0.98 in) dia.** **c: M12 x 1.5P**
KV38107700 (J39027) Preload adapter  NT087	● Measuring turning torque of final drive assembly ● Measuring clearance between side gear and differential case with washer ● Selecting differential side bearing adjusting shim
KV31103200 (J34285-A and J34285-87) Clutch spring compressor  NT423	Removing and installing clutch return spring **a: 320 mm (12.60 in)** **b: 174 mm (6.85 in)**

Tool number (Kent-Moore No.) Tool name	Description
ST23540000 (J25689-A) Pin punch 	Removing and installing parking rod plate, manual plate and differential pinion mate shaft retaining pins **a: 2.3 mm (0.091 in) dia.** **b: 4 mm (0.16 in) dia.**
KV32101000 (J25689-A) Pin punch 	Installing throttle lever and manual shaft retaining pins **a: 4 mm (0.16 in) dia.**
ST25710000 (—) Pin punch 	Aligning groove of manual shaft and hole of transmission case **a: 2 mm (0.08 in) dia.**
ST3306S001 (J22888-D) Differential side bearing puller set 1 ST33051001 (J22888-D) Puller 2 ST33061000 (J8107-2) Adapter 	Removing differential side bearing inner race **a: 39 mm (1.54 in) dia.** **b: 29.5 mm (1.161 in) dia.** **c: 130 mm (5.12 in)** **d: 135 mm (5.31 in)** **e: 120 mm (4.72 in)**
KV381054S0 (J34286) Puller 	● Removing idler gear bearing outer race ● Removing differential side oil seals ● Removing differential side bearing outer race ● Removing needle bearing from bearing retainer **a: 250 mm (9.84 in)** **b: 160 mm (6.30 in)**
ST27180001 (J25726-B) Puller 	● Removing idler gear **a: 100 mm (3.94 in)** **b: 110 mm (4.33 in)** **c: M8 x 1.25P**
ST30031000 (J22912-O1) Puller 	Removing reduction gear bearing inner race **a: 90 mm (3.54 in) dia.** **b: 50 mm (1.97 in) dia.**

Tool number (Kent-Moore No.) Tool name		Description
ST35272000 (J26092) Drift	 NT426	● Installing reduction gear bearing inner race ● Installing idler gear bearing inner race **a: 72 mm (2.83 in) dia.** **b: 35.5 mm (1.398 in) dia.**
ST37830000 (—) Drift	 NT427	Installing idler gear bearing outer race **a: 62 mm (2.44 in) dia.** **b: 39 mm (1.54 in) dia.**
ST35321000 (—) Drift	 NT073	Installing output shaft bearing **a: 49 mm (1.93 in) dia.** **b: 41 mm (1.61 in) dia.**
ST30633000 (—) Drift	 NT073	Installing differential side bearing outer race **a: 67 mm (2.64 in) dia.** **b: 49 mm (1.93 in) dia.**
ST35271000 (J26091) Drift	 NT115	● Installing idler gear **a: 72 mm (2.83 in) dia.** **b: 63 mm (2.48 in) dia.**
ST33400001 (J26082) Drift	 NT115	● Installing oil pump housing oil seal **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**
KV38105710 (—)	 NT087	● Measuring clearance between side gear and differential case

Commercial Service Tools

ECS005W1

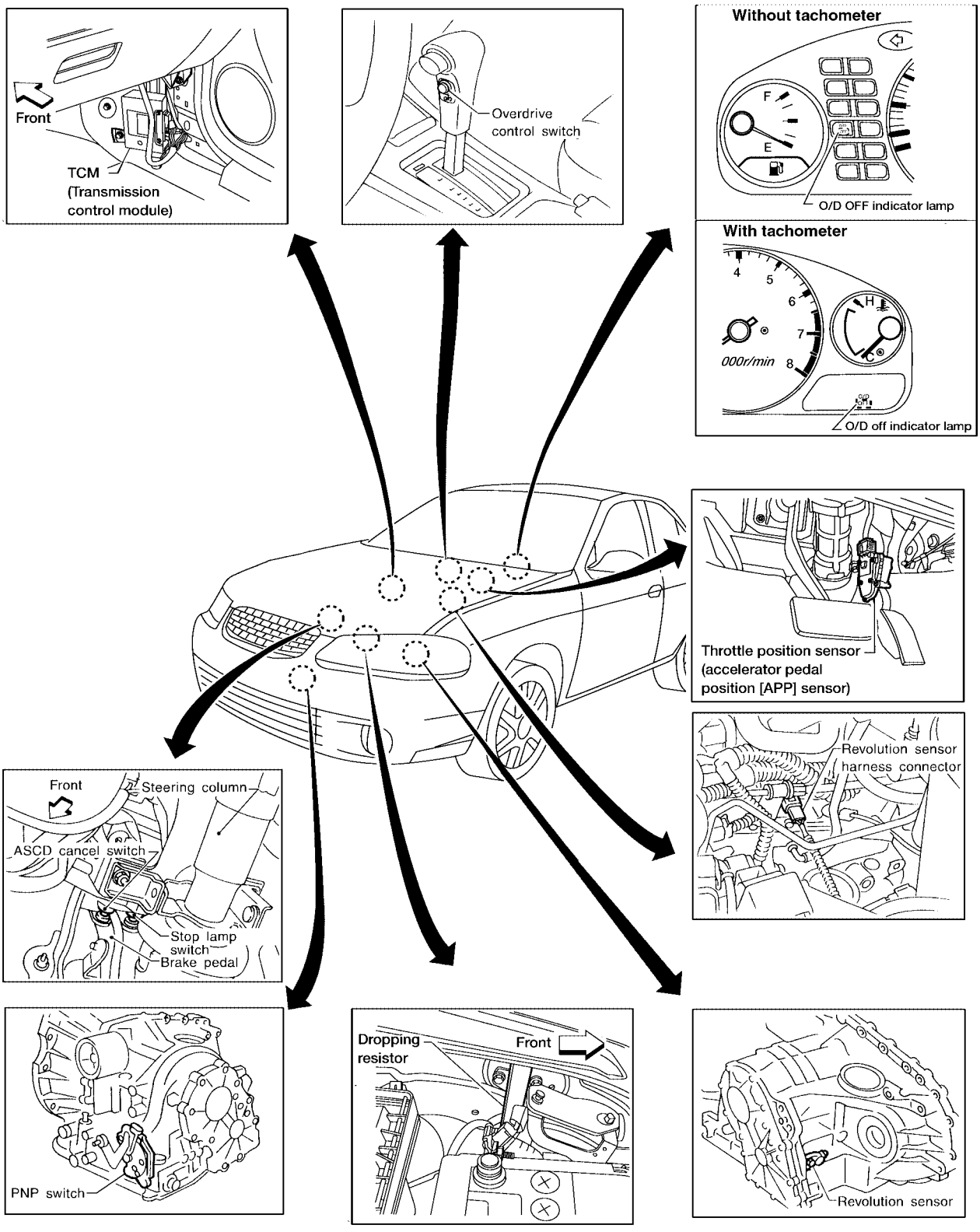
Tool name	Description
Puller  NT077	● Removing idler gear bearing inner race ● Removing and installing band servo piston snap ring
Drift  NT109	Removing idler gear bearing inner race **a: 34 mm (1.34 in) dia.**
Drift  NT115	Installing differential left side bearing **a: 86 mm (3.39 in) dia.** **b: 80 mm (3.15 in) dia.**
Drift  NT115	Installing differential right side bearing **a: 46 mm (1.81 in) dia.** **b: 40 mm (1.57 in) dia.**

OVERALL SYSTEM

PFP:00000

A/T Electrical Parts Location

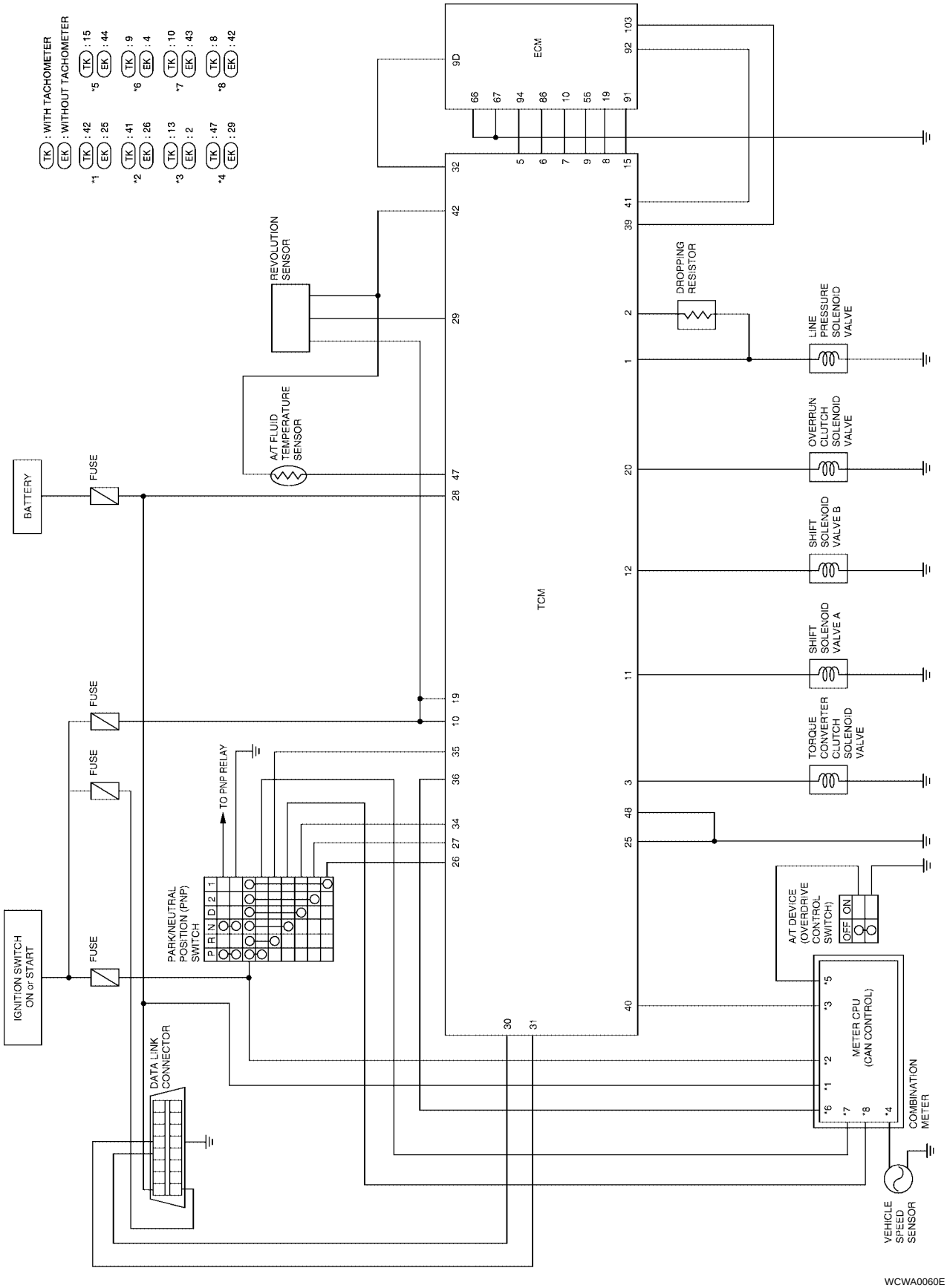
ECS005W2



WCIA0162E

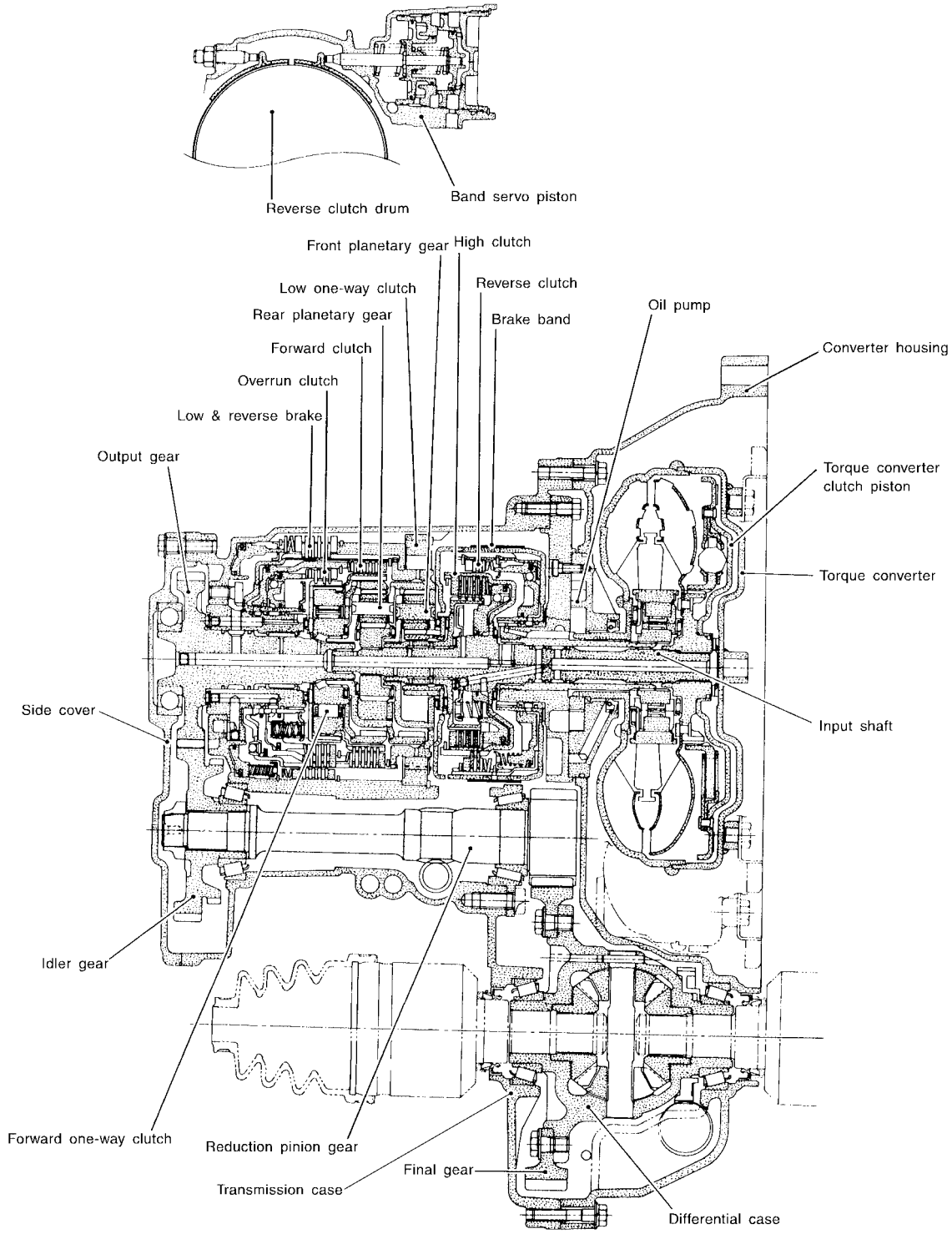
Circuit Diagram

ECS005W3



Cross-sectional View

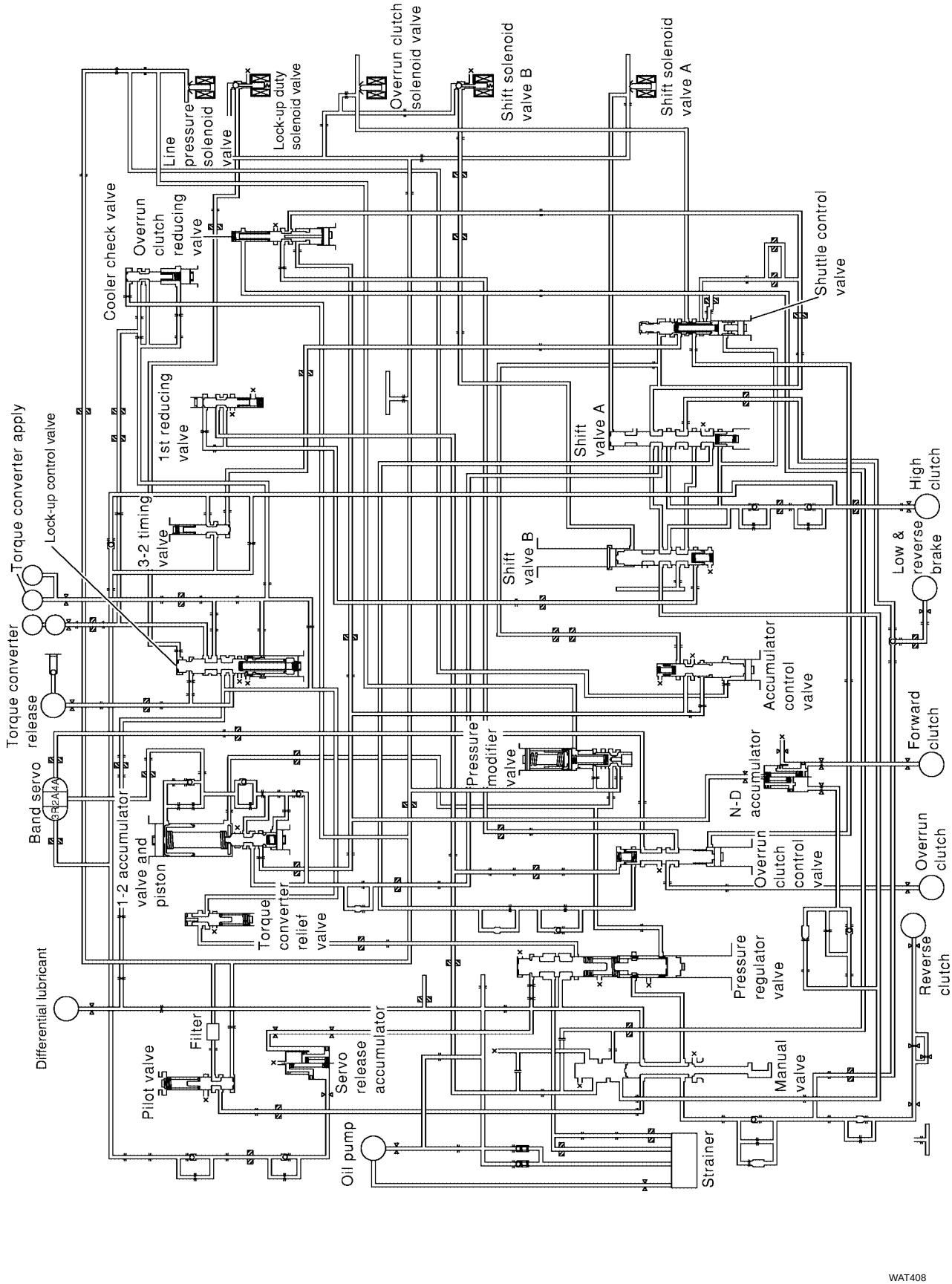
ECS005W4



SAT842J

Hydraulic Control Circuit

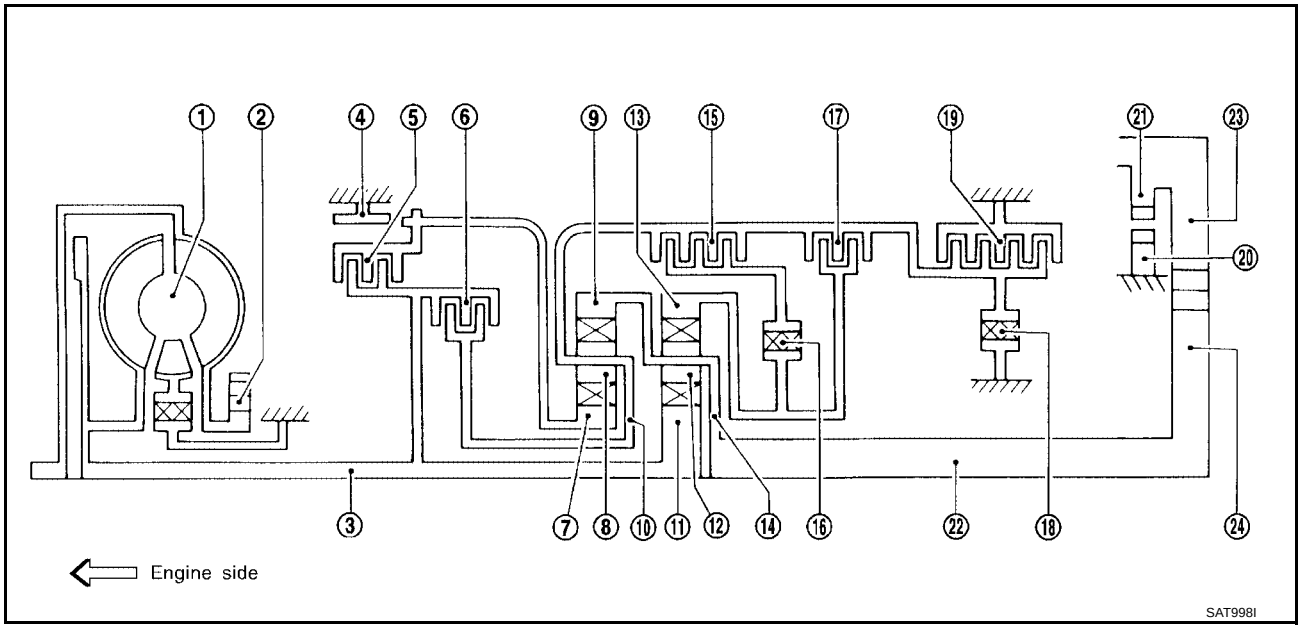
ECS005W5



Shift Mechanism

ECS005W6

CONSTRUCTION



1. Torque converter	2. Oil pump	3. Input shaft
4. Brake band	5. Reverse clutch	6. High clutch
7. Front sun gear	8. Front pinion gear	9. Front internal gear
10. Front planetary carrier	11. Rear sun gear	12. Rear pinion gear
13. Rear internal gear	14. Rear planetary carrier	15. Forward clutch
16. Forward one-way clutch	17. Overrun clutch	18. Low one-way clutch
19. Low & reverse brake	20. Parking pawl	21. Parking gear
22. Output shaft	23. Idle gear	24. Output gear

FUNCTION OF CLUTCH AND BRAKE

Clutch and brake components	Abbr.	Function
5 Reverse clutch	R/C	To transmit input power to front sun gear **7** .
6 High clutch	H/C	To transmit input power to front planetary carrier **10** .
15 Forward clutch	F/C	To connect front planetary carrier **10** with forward one-way clutch **16** .
17 Overrun clutch	O/C	To connect front planetary carrier **10** with rear internal gear **13** .
4 Brake band	B/B	To lock front sun gear **7** .
16 Forward one-way clutch	F/O.C	When forward clutch **15** is engaged, to stop rear internal gear **13** from rotating in opposite direction against engine revolution.
18 Low one-way clutch	L/O.C	To stop front planetary carrier **10** from rotating in opposite direction against engine revolution.
19 Low & reverse brake	L & R/B	To lock front planetary carrier **10** .

CLUTCH AND BAND CHART

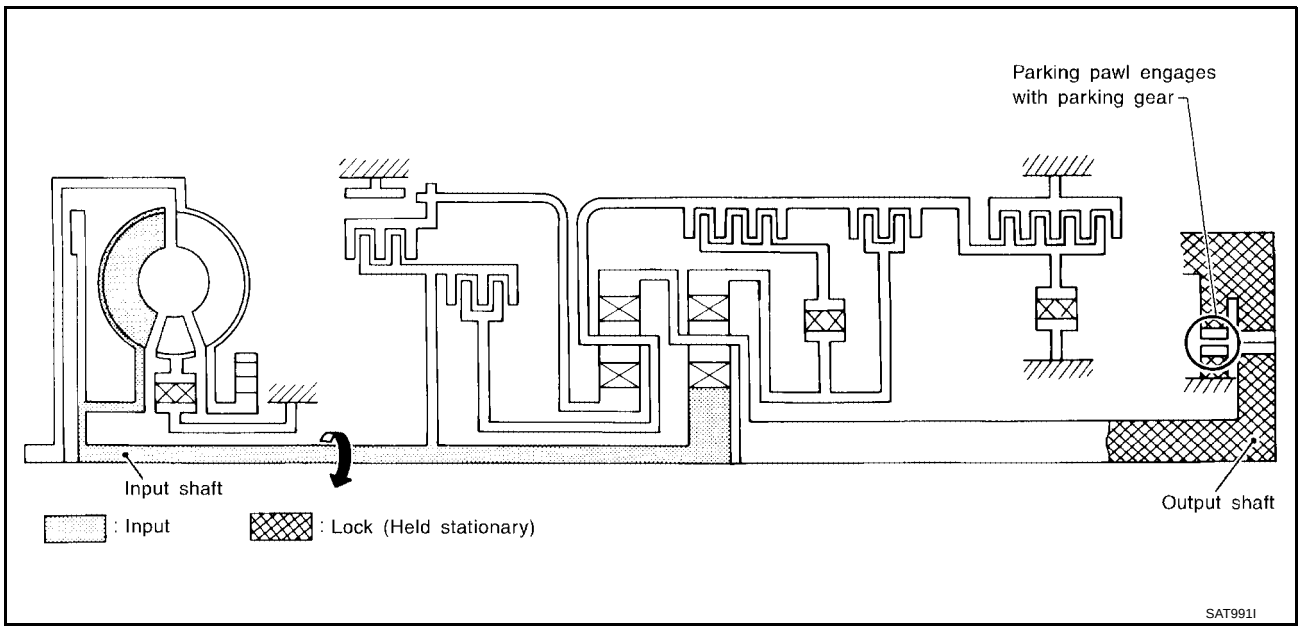
Shift position		Reverse clutch **5**	High clutch **6**	For-ward clutch **15**	Over-run clutch **17**	Band servo			Forward one-way clutch **16**	Low one-way clutch **18**	Low & reverse brake **19**	Lock-up	Remarks
						2nd apply	3rd release	4th apply					
P													PARK POSITION
R		O									O		REVERSE POSITION
N													NEUTRAL POSITION
D *4	1st			O	*1 D				B	B			Automatic shift 1 ⇔ 2 ⇔ 3 ⇔ 4
	2nd			O	*1 A	O			B				
	3rd		O	O	*1 A	*2 C	C		B			*1 O	
	4th		O	C		*3 C	C	O				O	
2	1st			O	O	*2 C			B	B			Automatic shift 1 ⇔ 2 ⇐ 3
	2nd			O	O	O			B				
	3rd			O	O	*2 C			B				
1	1st			O	O				B		O		Locks (held stationary) in 1st speed 1 ⇐ 2 ⇐ 3
	2nd			O	O	O			B				
	3rd			O	O	*2 C			B				

- *1: Operates when overdrive control switch is set in “OFF” position.
- *2: Oil pressure is applied to both 2nd “apply” side and 3rd “release” side of band servo piston. However, brake band does not contract because oil pressure area on the “release” side is greater than that on the “apply” side.
- *3: Oil pressure is applied to 4th “apply” side in condition *2 above, and brake band contracts.
- *4: A/T will not shift to 4th when overdrive control switch is set in “OFF” position.
- O: Operates.
- A: Operates when throttle opening is less than 3/16, activating engine brake.
- B: Operates during “progressive” acceleration.
- C: Operates but does not affect power transmission.
- D: Operates when throttle opening is less than 3/16, but does not affect engine brake.

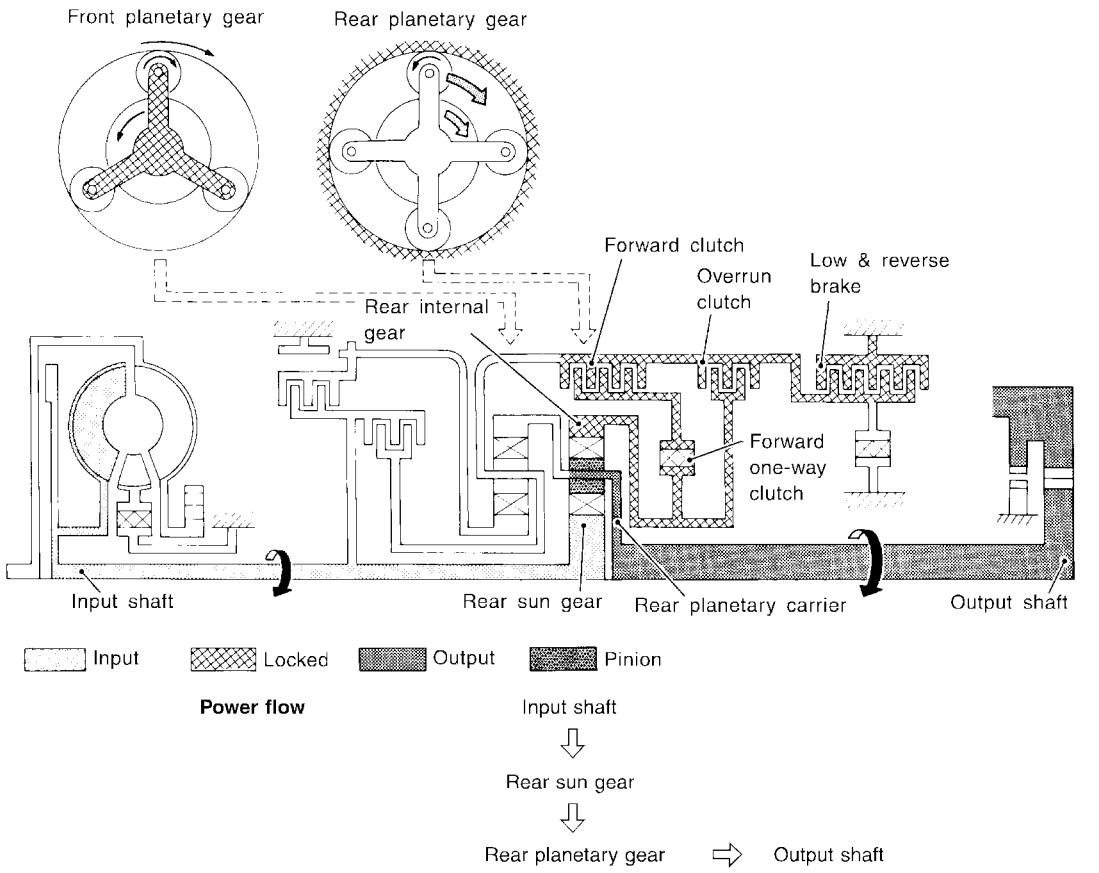
POWER TRANSMISSION

“N” and “P” Positions

- “N” position
  Power from the input shaft is not transmitted to the output shaft because the clutches do not operate.
- “P” position
  Similar to the “N” position, the clutches do not operate. The parking pawl engages with the parking gear to mechanically hold the output shaft so that the powertrain is locked.

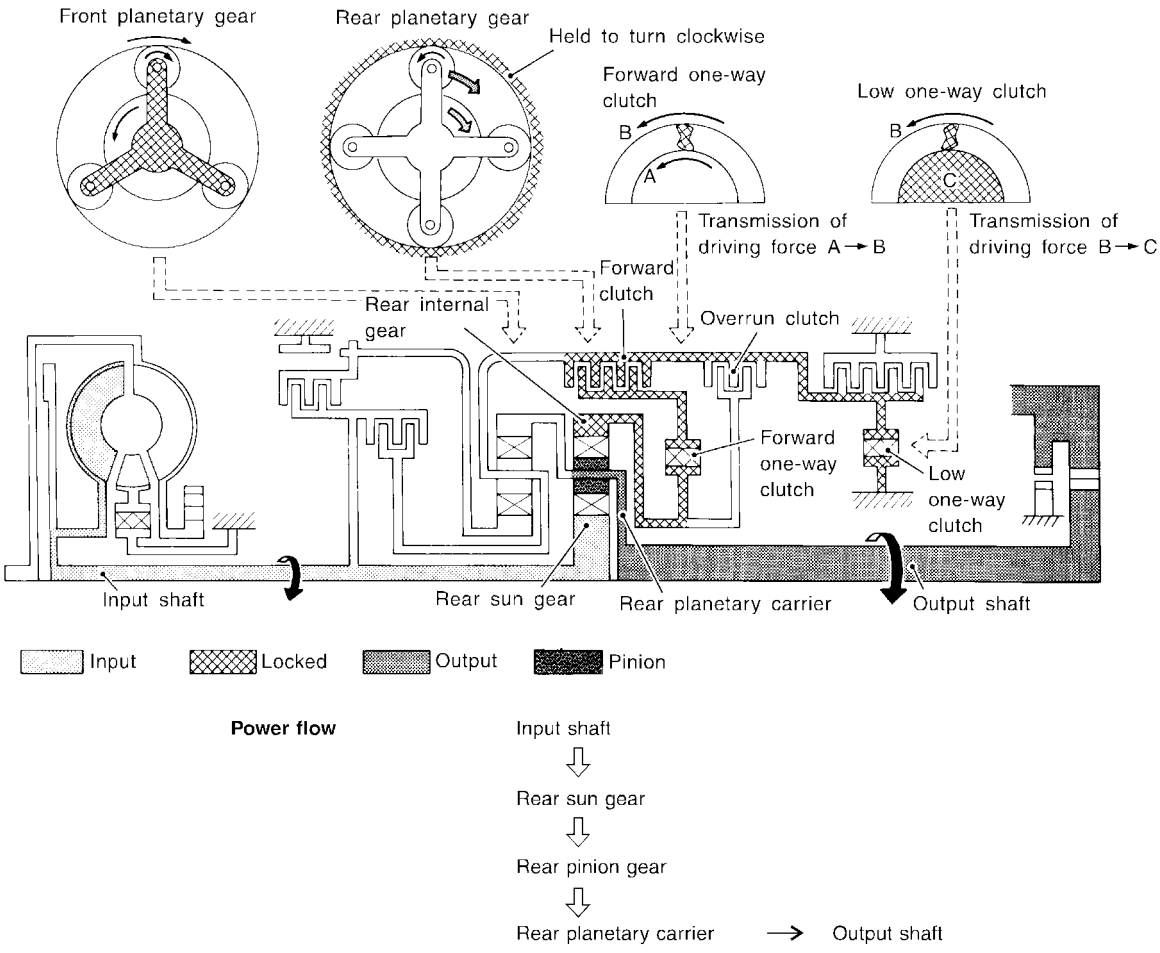


"1₁ " Position



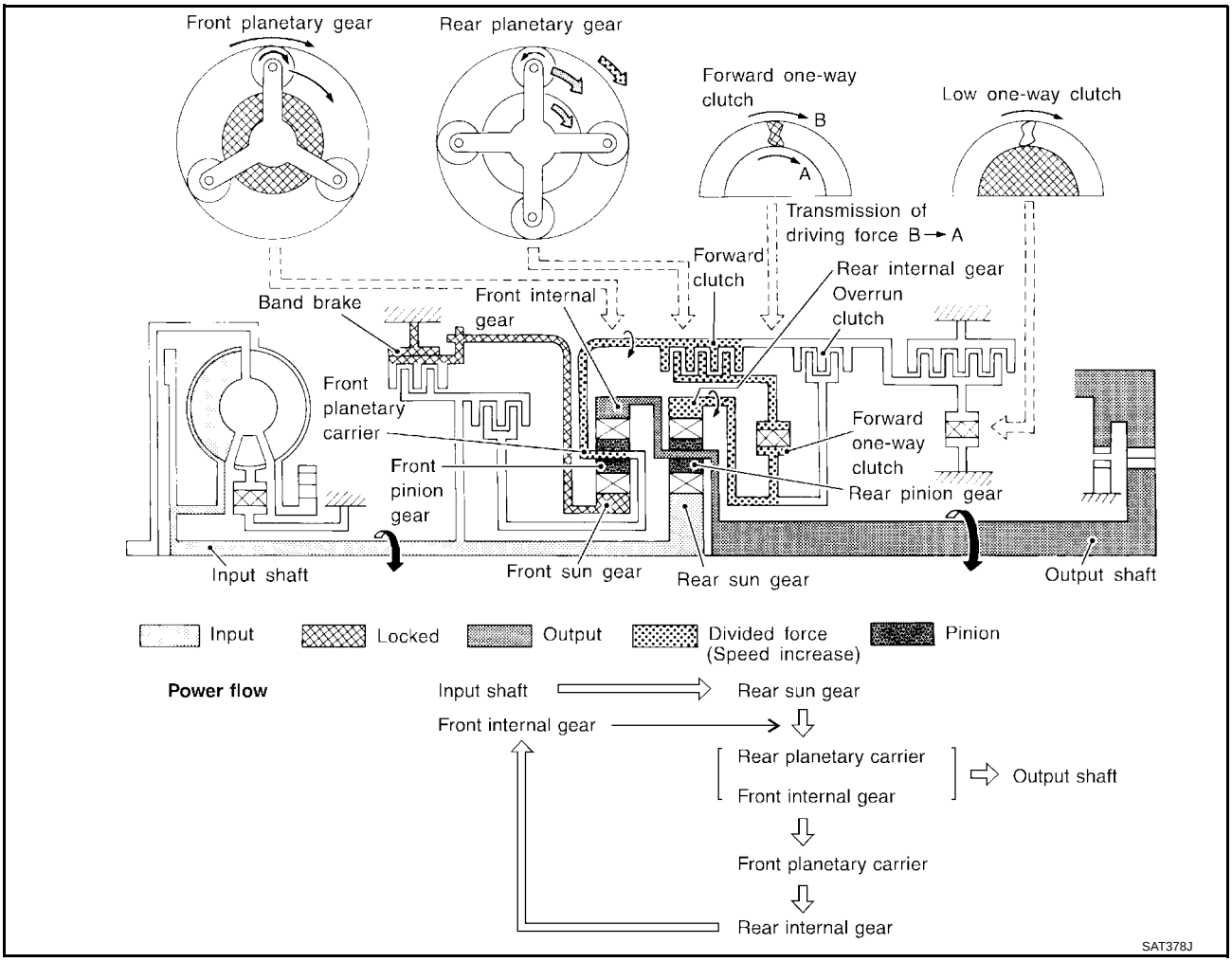
● **Forward clutch** ● **Forward one-way clutch** ● **Overrun clutch** ● **Low and reverse brake**	As overrun clutch engages, rear internal gear is locked by the operation of low and reverse brake. This is different from that of D1 and 2₁ .
Engine brake	Overrun clutch always engages, therefore engine brake can be obtained when decelerating.

"D1 " and "21 " Positions



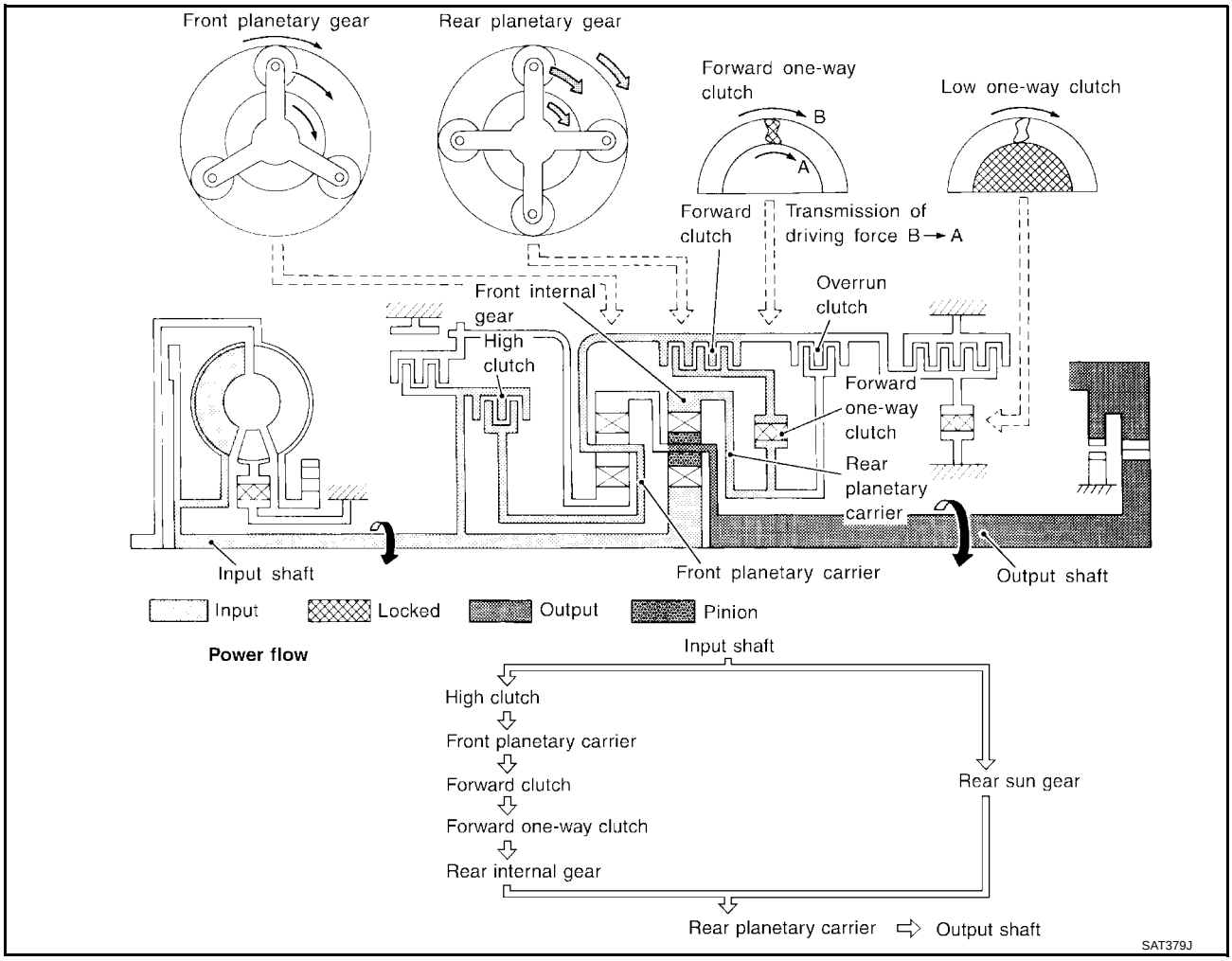
● **Forward one-way clutch** ● **Forward clutch** ● **Low one-way clutch**	Rear internal gear is locked to rotate counterclockwise because of the functioning of these three clutches.
Overrun clutch engagement conditions (Engine brake)	D1 : Overdrive control switch "OFF" and throttle opening is less than 3/16 21 : Always engaged At D1 and 21 positions, engine brake is not activated due to free turning of low one-way clutch.

"D2 ", "22 " and "12 " Positions



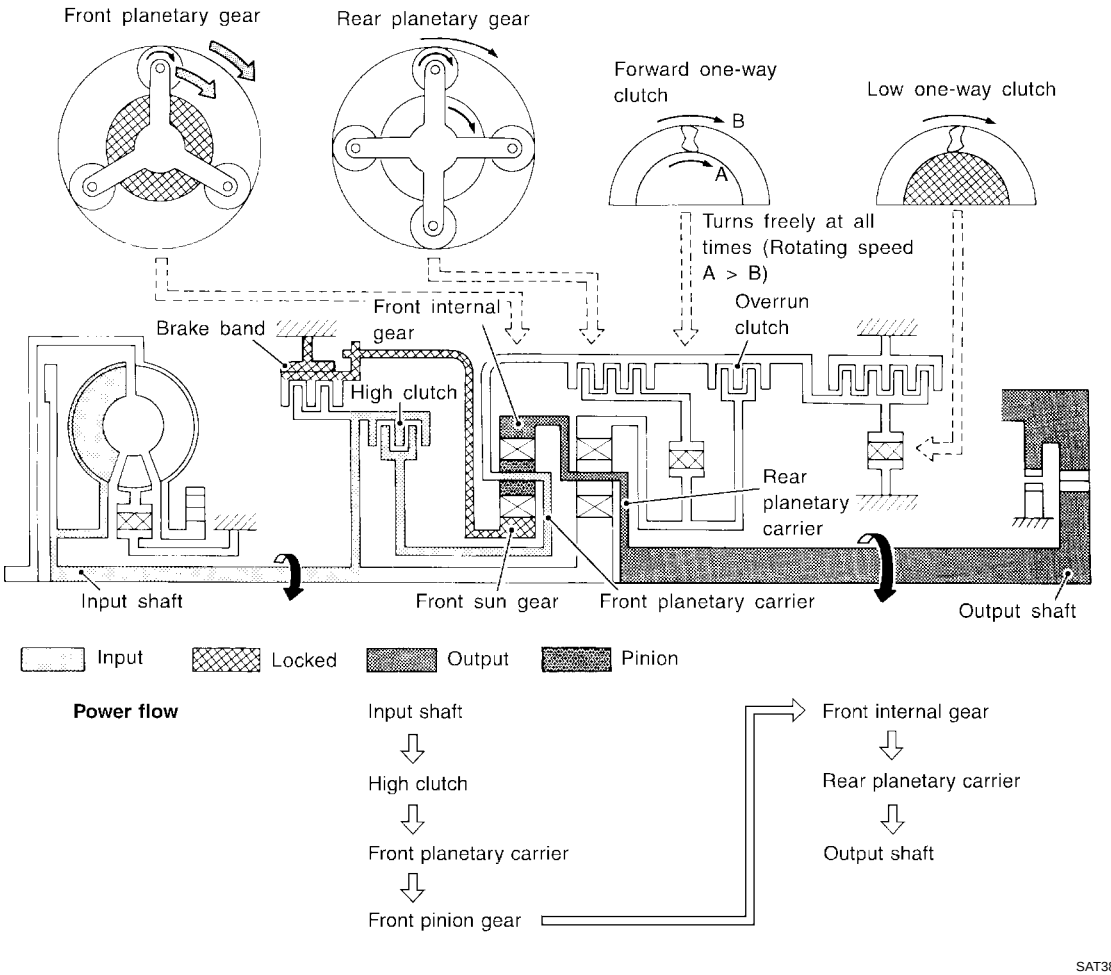
● **Forward clutch** ● **Forward one-way clutch** ● **Brake band**	Rear sun gear drives rear planetary carrier and combined front internal gear. Front internal gear now rotates around front sun gear accompanying front planetary carrier. As front planetary carrier transfers the power to rear internal gear through forward clutch and forward one-way clutch, this rotation of rear internal gear increases the speed of rear planetary carrier compared with that of the 1st speed.
Overrun clutch engagement conditions	D2 : Overdrive control switch "OFF" and throttle opening is less than 3/16 22 and 12 : Always engaged

"D3 " "23 " and "13 " Positions



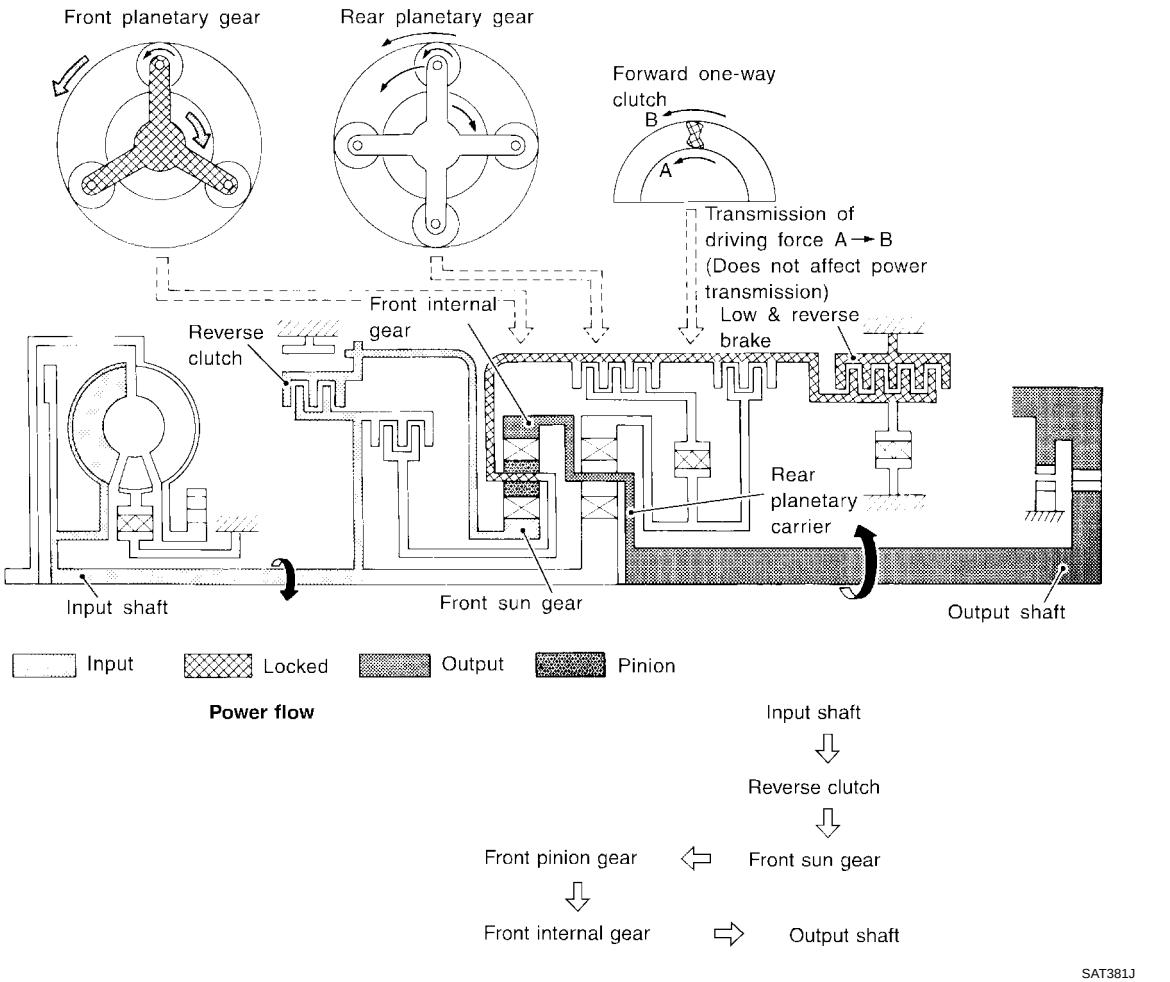
● **High clutch** ● **Forward clutch** ● **Forward one-way clutch**	Input power is transmitted to front planetary carrier through high clutch. And front planetary carrier is connected to rear internal gear by operation of forward clutch and forward one-way clutch. This rear internal gear rotation and another input (the rear sun gear) accompany rear planetary carrier to turn at the same speed.
Overrun clutch engagement conditions	D3 : Overdrive control switch "OFF" and throttle opening is less than 3/16 23 and 13 : Always engaged

"D4 " (OD) Position



● **High clutch** ● **Brake band** ● **Forward clutch** (Does not affect power transmission)	Input power is transmitted to front carrier through high clutch. This front carrier turns around the sun gear which is fixed by brake band and makes front internal gear (output) turn faster.
Engine brake	At D4 position, there is no one-way clutch in the power transmission line and engine brake can be obtained when decelerating.

"R" Position



● **Reverse clutch** ● **Low and reverse brake**	Front planetary carrier is stationary because of the operation of low and reverse brake. Input power is transmitted to front sun gear through reverse clutch, which drives front internal gear in the opposite direction.
Engine brake	As there is no one-way clutch in the power transmission line, engine brake can be obtained when decelerating.

Control System

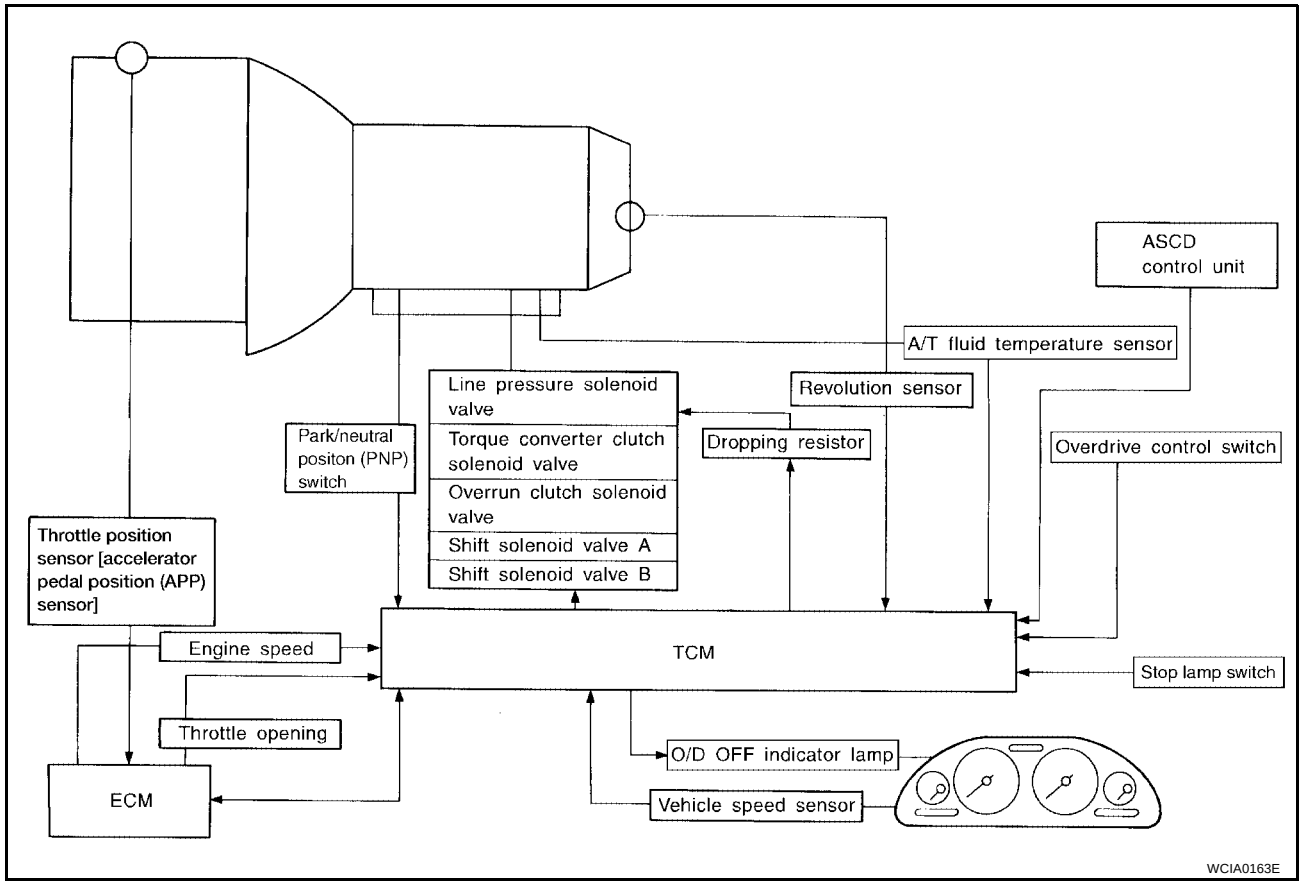
ECS005W7

OUTLINE

The automatic transaxle senses vehicle operating conditions through various switches and sensors. It always controls the optimum shift position and reduces shifting and lock-up shocks.

SWITCHES & SENSORS		TCM		ACTUATORS
Park/neutral position (PNP) switch Throttle position sensor [accelerator pedal position (APP) sensor] Engine speed signal A/T fluid temperature sensor Revolution sensor Vehicle speed sensor Overdrive control switch ASCD control unit Stop lamp switch Turbine revolution sensor		Shift control Line pressure solenoid Lock-up control Overrun clutch control Timing control Fail-safe control Self-diagnosis CONSULT-II communication line control		Shift solenoid valve A Shift solenoid valve B Overrun clutch solenoid valve Torque converter clutch solenoid valve Line pressure solenoid valve O/D OFF indicator lamp

CONTROL SYSTEM



TCM FUNCTION

The function of the TCM is to:

- Receive input signals sent from various switches and sensors.
- Determine required line pressure, shifting point, lock-up operation, and engine brake operation.
- Send required output signals to the respective solenoids.

INPUT/OUTPUT SIGNAL OF TCM

	Sensors, switches and solenoid valves	Function
Input	PNP switch	Detects select lever position and sends a signal to TCM.
	Throttle position sensor [accelerator pedal position (APP) sensor]	Detects accelerator pedal position and requested throttle opening and sends a signal to TCM.
	Engine speed signal	From ECM.
	A/T fluid temperature sensor	Detects transmission fluid temperature and sends a signal to TCM.
	Revolution sensor	Detects output shaft rpm and sends a signal to TCM.
	Vehicle speed sensor	Used as an auxiliary vehicle speed sensor. Sends a signal when revolution sensor (installed on transmission) malfunctions.
	Overdrive control switch	Sends a signal, which prohibits a shift to “D4 ” (overdrive) position, to the TCM.
	ASCD control unit	Sends the cruise signal and “D4 ” (overdrive) cancellation signal from ASCD control unit to TCM.
	Stop lamp switch	Releases lock-up system when depressing pedal in lock-up condition.
Output	Shift solenoid valve A/B	Selects shifting point suited to driving conditions in relation to a signal sent from TCM.
	Line pressure solenoid valve	Regulates (or decreases) line pressure suited to driving conditions in relation to a signal sent from TCM.
	Torque converter clutch solenoid valve	Regulates (or decreases) lock-up pressure suited to driving conditions in relation to a signal sent from TCM.
	Overrun clutch solenoid valve	Controls an “engine brake” effect suited to driving conditions in relation to a signal sent from TCM.
	O/D OFF indicator lamp	Shows TCM faults, when A/T control components malfunction.

CAN Communication

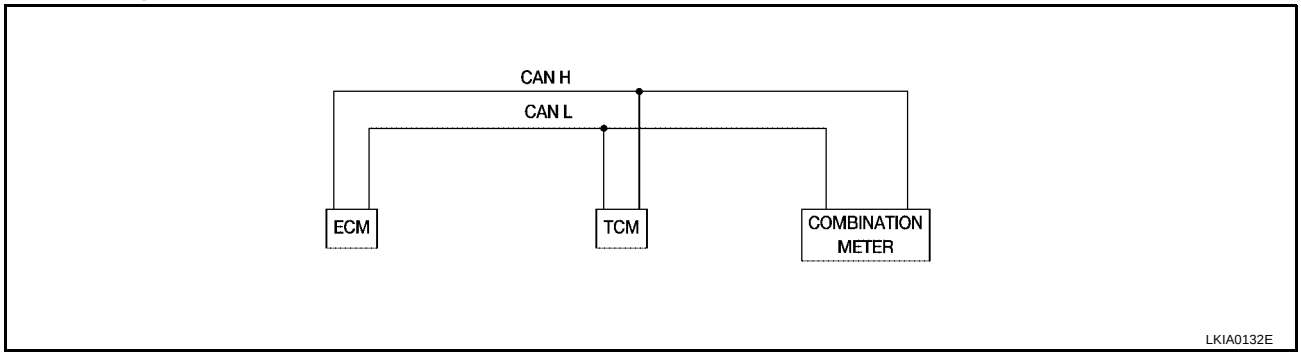
ECS006H7

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

CAN COMMUNICATION UNIT

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	TCM	Combination Meter
Accelerator pedal position signal	T	R	
Output shaft revolution signal	R	T	
A/T self-diagnosis signal	R	T	
Closed throttle position signal	T	R	
Wide open throttle position signal	T	R	
Stop lamp switch signal		R	T
Overdrive control switch signal		R	T
O/D OFF indicator signal		T	R
Engine speed signal	T		R
Engine coolant temperature signal	T		R
Vehicle speed signal	R		T
Fuel level sensor signal	R		T
Malfunction indicator lamp signal	T		R
ASCD SET lamp signal	T		R
ASCD CRUISE lamp signal	T		R

Control Mechanism

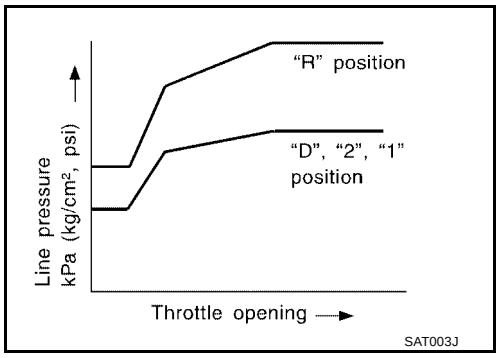
ECS005W8

LINE PRESSURE CONTROL

TCM has various line pressure control characteristics to match the driving conditions.
An ON-OFF duty signal is sent to the line pressure solenoid valve based on TCM characteristics.
Hydraulic pressure on the clutch and brake is electronically controlled through the line pressure solenoid valve to accommodate engine torque. This results in smooth shift operation.

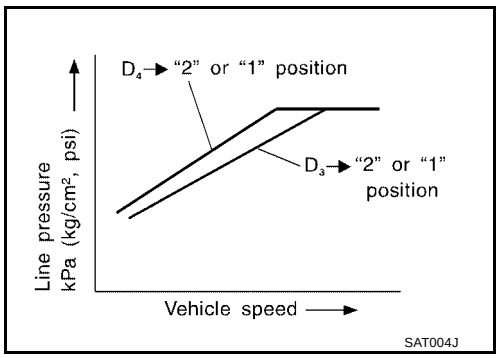
Normal Control

The line pressure to throttle opening characteristics is set for suitable clutch operation.



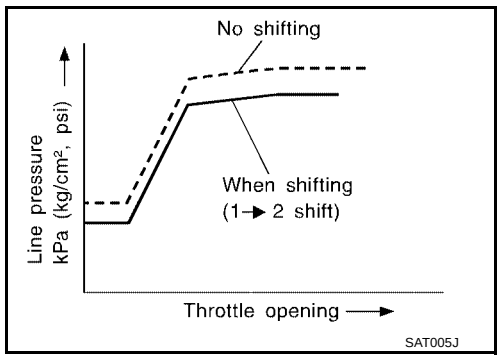
Back-up Control (Engine brake)

If the selector lever is shifted to "2" position while driving in D_4 (OD) or D_3 , great driving force is applied to the clutch inside the transmission. Clutch operating pressure (line pressure) must be increased to deal with this driving force.



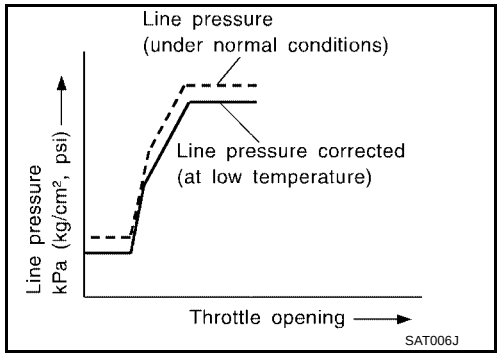
During Shift Change

The line pressure is temporarily reduced corresponding to a change in engine torque when shifting gears (that is, when the shift solenoid valve is switched for clutch operation) to reduce shifting shock.

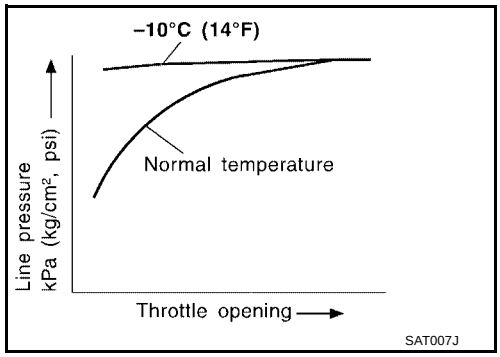


At Low Fluid Temperature

- Fluid viscosity and frictional characteristics of the clutch facing change with fluid temperature. Clutch engaging or band-contacting pressure is compensated for, according to fluid temperature, to stabilize shifting quality.
- The line pressure is reduced below 60°C (140°F) to prevent shifting shock due to low viscosity of automatic transmission fluid when temperature is low.



- Line pressure is increased to a maximum, irrespective of the throttle opening, when fluid temperature drops to −10°C (14°F). This pressure rise is adopted to prevent a delay in clutch and brake operation due to extreme drop of fluid viscosity at low temperature.

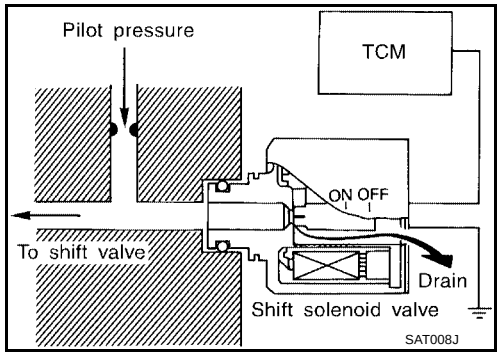


SHIFT CONTROL

The shift is regulated entirely by electronic control to accommodate vehicle speed and varying engine operations. This is accomplished by electrical signals transmitted by the revolution sensor and throttle position sensor [accelerator pedal position (APP) sensor]. This results in improved acceleration performance and fuel economy.

Control of Shift Solenoid Valves A and B

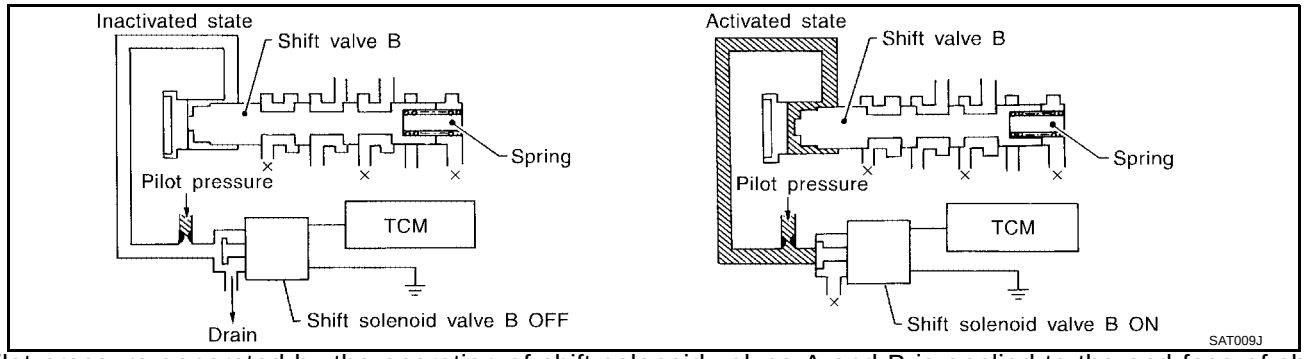
The TCM activates shift solenoid valves A and B according to signals from the throttle position sensor [accelerator pedal position (APP) sensor] and revolution sensor to select the optimum gear position on the basis of the shift schedule memorized in the TCM.
The shift solenoid valve performs simple ON-OFF operation. When set to “ON”, the drain circuit closes and pilot pressure is applied to the shift valve.



Relation Between Shift Solenoid Valves A and B and Gear Positions

Shift solenoid valve	Gear position				
	D_1 , 2_1 , 1_1	D_2 , 2_2 , 1_2	D_3	D_4 (OD)	N-P
A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)	ON (Closed)
B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)

Control of Shift Valves A and B



Pilot pressure generated by the operation of shift solenoid valves A and B is applied to the end face of shift valves A and B.
The drawing above shows the operation of shift valve B. When the shift solenoid valve is “ON”, pilot pressure applied to the end face of the shift valve overcomes spring force, moving the valve upward.

LOCK-UP CONTROL

The torque converter clutch piston in the torque converter is locked to eliminate torque converter slip to increase power transmission efficiency. The solenoid valve is controlled by an ON-OFF duty signal sent from the TCM. The signal is converted to an oil pressure signal which controls the torque converter clutch piston.

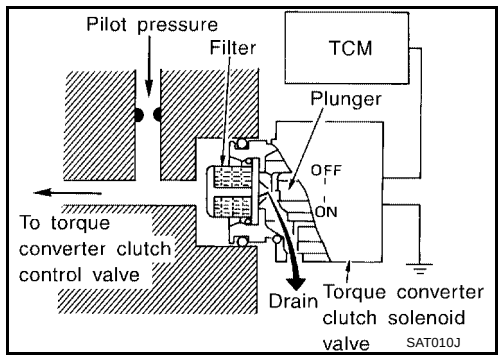
Conditions for Lock-up Operation

When vehicle is driven in 3rd and 4th gear position, vehicle speed and throttle opening are detected. If the detected values fall within the lock-up zone memorized in the TCM, lock-up is performed.

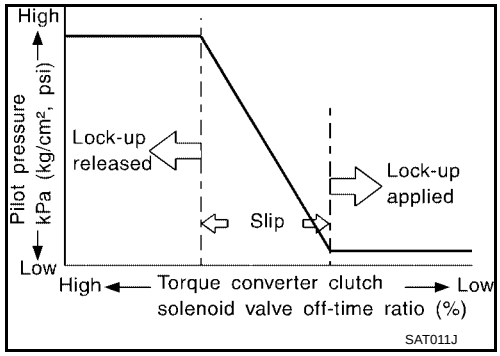
Overdrive control switch	ON	OFF
Selector lever	“D” position	
Gear position	D_4	D_3
Vehicle speed sensor	More than set value	
Throttle position sensor [accelerator pedal position (APP) sensor]	Less than set opening	
A/T fluid temperature sensor	More than 40°C (104°F)	

Torque Converter Clutch Solenoid Valve Control

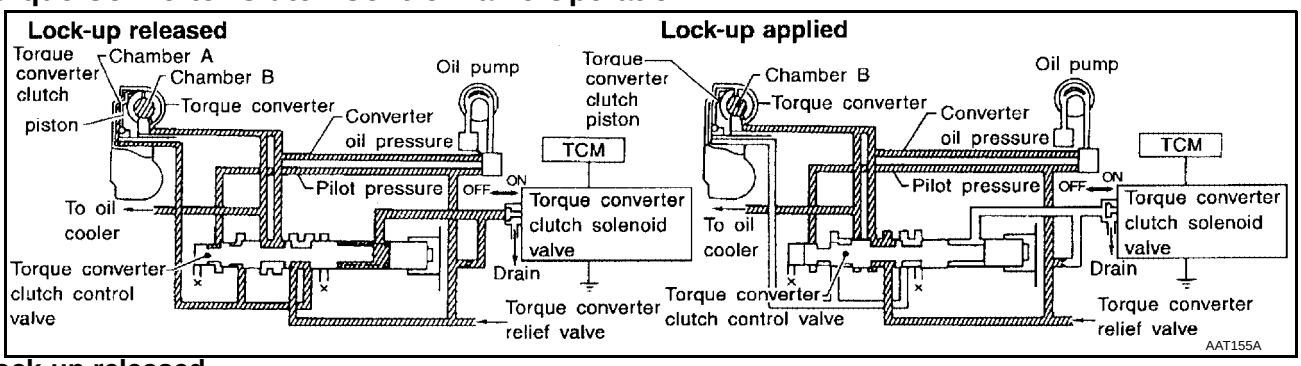
The torque converter clutch solenoid valve is controlled by the TCM. The plunger closes the drain circuit during the “OFF” period, and opens the circuit during the “ON” period. If the percentage of OFF-time increases in one cycle, the pilot pressure drain time is reduced and pilot pressure remains high.



The torque converter clutch piston is designed to slip to adjust the ratio of ON-OFF, thereby reducing lock-up shock.
OFF-time INCREASING
↓
Amount of drain DECREASING
↓
Pilot pressure HIGH
↓
Lock-up RELEASING



Torque Converter Clutch Control Valve Operation



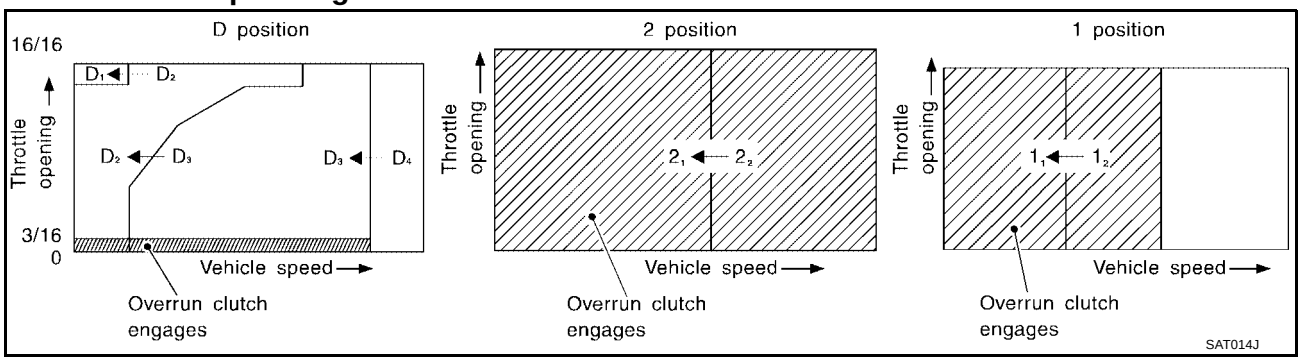
Lock-up released
The OFF-duration of the torque converter clutch solenoid valve is long, and pilot pressure is high. The pilot pressure pushes the end face of the torque converter clutch control valve in combination with spring force to move the valve to the left. As a result, converter pressure is applied to chamber A (torque converter clutch piston release side). Accordingly, the torque converter clutch piston remains unlocked.

Lock-up applied
When the OFF-duration of the torque converter clutch solenoid valve is short, pilot pressure drains and becomes low. Accordingly, the control valve moves to the right by the pilot pressure of the other circuit and converter pressure. As a result, converter pressure is applied to chamber B, keeping the torque converter clutch piston applied.
Also smooth lock-up is provided by transient application and release of the lock-up.

OVERRUN CLUTCH CONTROL (ENGINE BRAKE CONTROL)

Forward one-way clutch is used to reduce shifting shocks in downshifting operations. This clutch transmits engine torque to the wheels. However, drive force from the wheels is not transmitted to the engine because the one-way clutch rotates idle. This means the engine brake is not effective.
The overrun clutch operates when the engine brake is needed.

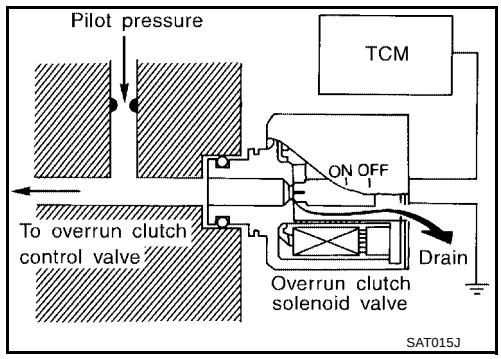
Overrun Clutch Operating Conditions



Selector lever position	Gear position	Throttle opening
"D" position	D1 , D2 , D3 gear position	Less than 3/16
"2" position	21 , 22 gear position	
"1" position	11 , 12 gear position	At any position

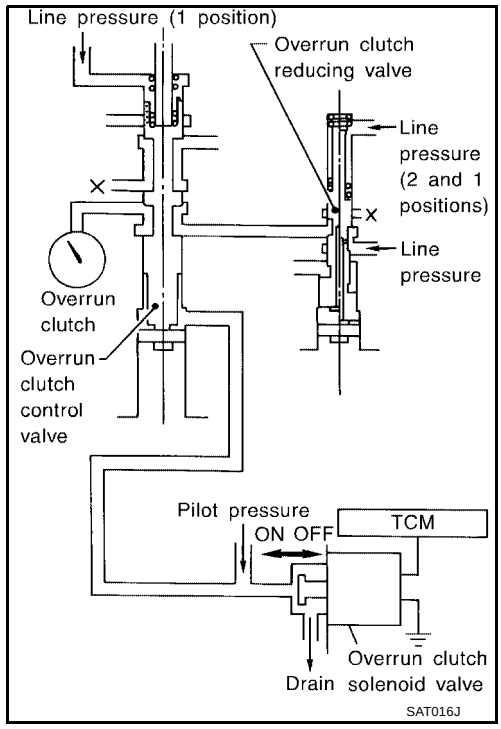
Overrun Clutch Solenoid Valve Control

The overrun clutch solenoid valve is operated by an ON-OFF signal transmitted by the TCM to provide overrun clutch control (engine brake control).
When this solenoid valve is “ON”, the pilot pressure drain port closes. When it is “OFF”, the drain port opens.
During the solenoid valve “ON”, pilot pressure is applied to the end face of the overrun clutch control valve.



Overrun Clutch Control Valve Operation

When the solenoid valve is “ON”, pilot pressure is applied to the overrun clutch control valve. This pushes up the overrun clutch control valve. The line pressure is then shut off so that the clutch does not engage.
When the solenoid valve is “OFF”, pilot pressure is not generated. At this point, the overrun clutch control valve moves downward by spring force. As a result, overrun clutch operation pressure is provided by the overrun clutch reducing valve. This causes the overrun clutch to engage.
In the 1 position, the overrun clutch control valve remains pushed down so that the overrun clutch is engaged at all times.



Control Valve

ECS005W9

FUNCTION OF CONTROL VALVES

Valve name	Function
Pressure regulator valve, plug and sleeve	Regulates oil discharged from the oil pump to provide optimum line pressure for all driving conditions.
Pressure modifier valve and sleeve	Used as a signal supplementary valve to the pressure regulator valve. Regulates pressure-modifier pressure (signal pressure) which controls optimum line pressure for all driving conditions.
Pilot valve	Regulates line pressure to maintain a constant pilot pressure level which controls lock-up mechanism, overrun clutch, shift timing.
Accumulator control valve	Regulates accumulator back-pressure to pressure suited to driving conditions.
Manual valve	Directs line pressure to oil circuits corresponding to select positions. Hydraulic pressure drains when the shift lever is in Neutral.
Shift valve A	Simultaneously switches four oil circuits using output pressure of shift solenoid valve A to meet driving conditions (vehicle speed, throttle opening, etc.). Provides automatic downshifting and up-shifting (1st → 2nd → 3rd → 4th gears/4th → 3rd → 2nd → 1st gears) in combination with shift valve B.
Shift valve B	Simultaneously switches three oil circuits using output pressure of shift solenoid valve B in relation to driving conditions (vehicle speed, throttle opening, etc.). Provides automatic downshifting and up-shifting (1st → 2nd → 3rd → 4th gears/4th → 3rd → 2nd → 1st gears) in combination with shift valve A.

Valve name	Function
Overrun clutch control valve	Switches hydraulic circuits to prevent engagement of the overrun clutch simultaneously with application of the brake band in D_4 . (Interlocking occurs if the overrun clutch engages during D_4 .)
1st reducing valve	Reduces low & reverse brake pressure to dampen engine-brake shock when down-shifting from the “1” position 1_2 to 1_1 .
Overrun clutch reducing valve	Reduces oil pressure directed to the overrun clutch and prevents engine-brake shock. In “1” and “2” positions, line pressure acts on the overrun clutch reducing valve to increase the pressure-regulating point, with resultant engine brake capability.
Torque converter relief valve	Prevents an excessive rise in torque converter pressure.
Torque converter clutch control valve, plug and sleeve	Activates or inactivates the lock-up function. Also provides smooth lock-up through transient application and release of the lock-up system.
1-2 accumulator valve and piston	Dampens the shock encountered when 2nd gear band servo contracts, and provides smooth shifting.
3-2 timing valve	Switches oil pressure with 3-2 timing valve according to throttle opening.
Shuttle control valve	Reduces shock when down-shifting from 3rd to 2nd and regulates overrun clutch.
Cooler check valve	Regulates oil pressure which causes lock-up when driving at low speeds.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

PFP:00000

Introduction

ECS005WA

The A/T system has two self-diagnostic systems.
The first is the emission-related on board diagnostic system (OBD-II) performed by the TCM in combination with the ECM. The malfunction is indicated by the MIL (malfunction indicator lamp) and is stored as a DTC in the ECM memory but not the TCM memory.
The second is the TCM original self-diagnosis indicated by the O/D OFF indicator lamp. The malfunction is stored in the TCM memory. The detected items are overlapped with OBD-II self-diagnostic items. For detail, refer to AT-43, "SELF-DIAGNOSTIC RESULT TEST MODE" .

OBD-II Function for A/T System

ECS005WB

The ECM provides emission-related on board diagnostic (OBD-II) functions for the A/T system. One function is to receive a signal from the TCM used with OBD-related parts of the A/T system. The signal is sent to the ECM when a malfunction occurs in the corresponding OBD-related part. The other function is to indicate a diagnostic result by means of the MIL (malfunction indicator lamp) on the instrument panel. Sensors, switches and solenoid valves are used as sensing elements.
The MIL automatically illuminates in One or Two Trip Detection Logic when a malfunction is sensed in relation to A/T system parts.

One or Two Trip Detection Logic of OBD-II

ECS005WC

ONE TRIP DETECTION LOGIC

If a malfunction is sensed during the first test drive, the MIL will illuminate and the malfunction will be stored in the ECM memory as a DTC. The TCM is not provided with such a memory function.

TWO TRIP DETECTION LOGIC

When a malfunction is sensed during the first test drive, it is stored in the ECM memory as a 1st trip DTC (diagnostic trouble code) or 1st trip freeze frame data. At this point, the MIL will not illuminate. — First Trip
If the same malfunction as that experienced during the first test drive is sensed during the second test drive, the MIL will illuminate. — Second Trip
A/T-related parts for which the MIL illuminates during the first or second test drive are listed below.

Items	MIL	
	One trip detection	Two trip detection
Shift solenoid valve A — DTC: P0750	X	
Shift solenoid valve B — DTC: P0755	X	
Throttle position sensor [accelerator pedal position (APP) sensor] or switch — DTC: P1705	X	
Except above		X

The “trip” in the “One or Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation.

OBD-II Diagnostic Trouble Code (DTC)

ECS005WD

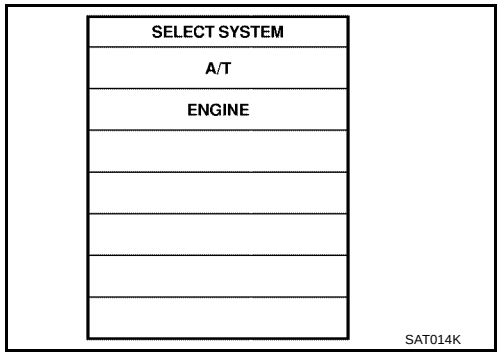
HOW TO READ DTC AND 1ST TRIP DTC

DTC and 1st trip DTC can be read by the following methods.

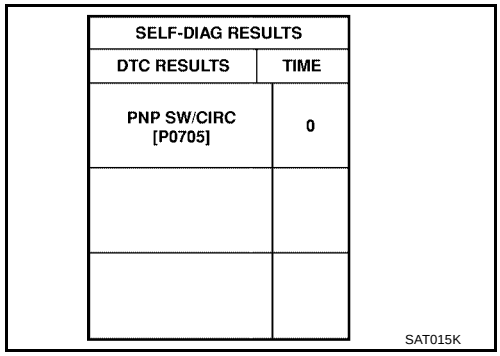
(with CONSULT-II or GST GST) CONSULT-II or GST (Generic Scan Tool) Examples: P0705, P0710, P0720, P0725, etc.
These DTCs are prescribed by SAE J2012.
(CONSULT-II also displays the malfunctioning component or system.)

- **1st trip DTC No. is the same as DTC No.**
- **Output of the diagnostic trouble code indicates that the indicated circuit has a malfunction. However, in case of the Mode II and GST they do not indicate whether the malfunction is still occurring or occurred in the past and returned to normal.**
  CONSULT-II can identify them as shown below. Therefore, using CONSULT-II (if available) is recommended.

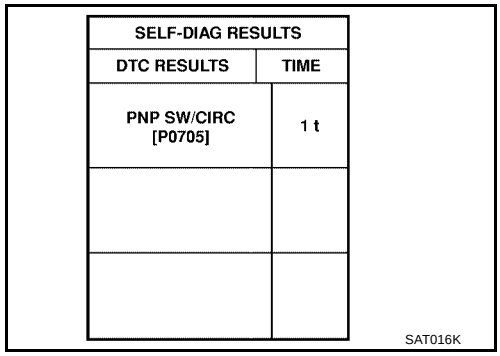
A sample of CONSULT-II display for DTC and 1st trip DTC is shown. DTC or 1st trip DTC of a malfunction is displayed in SELF DIAGNOSIS mode for “ENGINE” with CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.



If the DTC is being detected currently, the time data will be “0”.



If a 1st trip DTC is stored in the ECM, the time data will be “1t”.



Freeze Frame Data and 1st Trip Freeze Frame Data

The ECM has a memory function, which stores the driving condition such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed and vehicle speed at the moment the ECM detects a malfunction.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data, and the data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For detail, refer to EC-62, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" [QG18DE (ULEV Model) or EC-643, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" (SULEV Model)].
Only one set of freeze frame data (either 1st trip freeze frame data of freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM.
The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

HOW TO ERASE DTC

The diagnostic trouble code can be erased by CONSULT-II, GST or ECM DIAGNOSTIC TEST MODE as follows.

- **If the battery terminal is disconnected, the diagnostic trouble code will be lost within 24 hours.**
- **When you erase the DTC, using CONSULT-II or GST is easier and quicker than switching the mode selector on the ECM.**

The following emission-related diagnostic information is cleared from the ECM memory when erasing DTC related to OBD-II. For details, refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" [QG18DE (ULEV)] or EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" [QG18DE (SULEV)].

- **Diagnostic trouble codes (DTC)**
- **1st trip diagnostic trouble codes (1st trip DTC)**
- **Freeze frame data**
- **1st trip freeze frame data**
- **System readiness test (SRT) codes**
- **Test values**

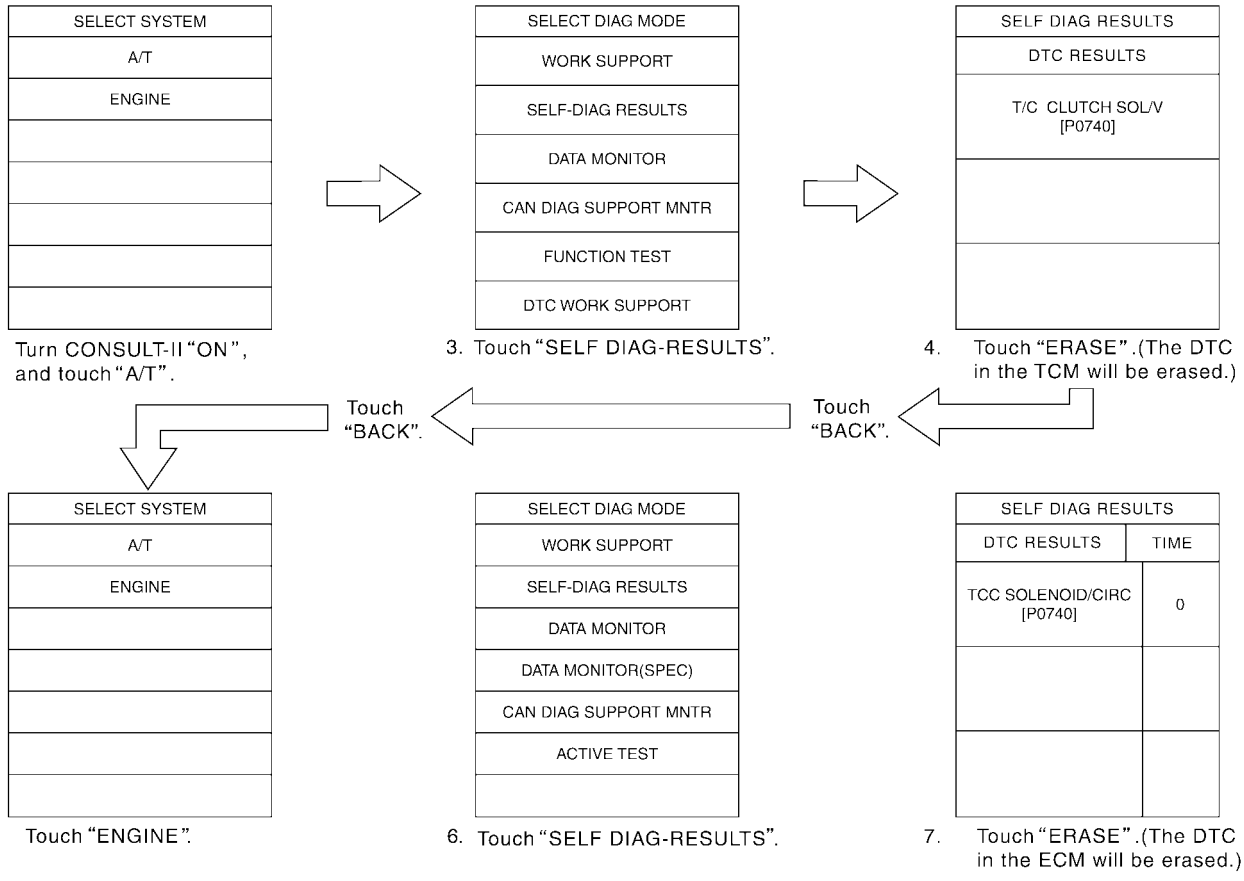
HOW TO ERASE DTC (WITH CONSULT-II)

- **If a DTC is displayed for both ECM and TCM, it needs to be erased for both ECM and TCM.**

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “A/T”.
3. Touch “SELF DIAGNOSIS”.
4. Touch “ERASE”. (The DTC in the TCM will be erased.) Then touch “BACK” twice.
5. Touch “ENGINE”.
6. Touch “SELF DIAGNOSIS”.
7. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.



HOW TO ERASE DTC (WITH GST)

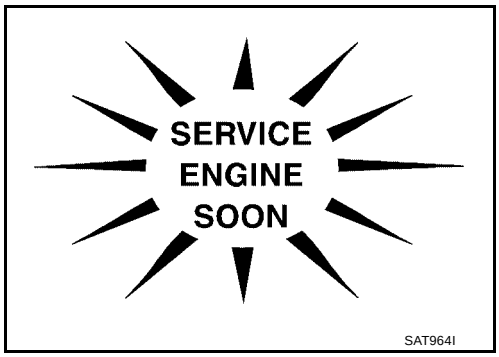
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Perform TCM Self-diagnostic Procedure. Refer to AT-52, "TCM Self-diagnostic Procedure (No Tools)" . (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with Generic Scan Tool (GST). For details, refer to EC-71, "How to Erase DTC (With GST)" [QG18DE (ULEV)] or EC-652, "How to Erase DTC (With GST)" [QG18DE (SULEV)].

HOW TO ERASE DTC (NO TOOLS)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Perform TCM Self-diagnostic Procedure. Refer to AT-52, "TCM Self-diagnostic Procedure (No Tools)" . (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Perform OBD-II Self-diagnostic Procedure. Refer to AT-52, "TCM Self-diagnostic Procedure (No Tools)" .

Malfunction Indicator Lamp (MIL)

ECS005WE



1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is for checking the lamp.
   - If the malfunction indicator lamp does not light up, refer to DI-27, "WARNING LAMPS" .
     (Or see MIL & CONSULT-II in EC section. Refer to EC-72, "Malfunction Indicator Lamp (MIL)" [QG18DE (ULEV)] or EC-653, "Malfunction Indicator Lamp (MIL)" [QG18DE (SULEV)], and EC-113, "CONSULT-II Function" [QG18DE (ULEV)] or EC-694, "CONSULT-II Function" [QG18DE (SULEV)].
2. When the engine is started, the malfunction indicator lamp should go off.
   If the lamp remains on, the on board diagnostic system has detected an emission-related (OBD-II) malfunction. For detail, refer to EC-59, "Emission-related Diagnostic Information" [QG18DE (ULEV)] or EC-640, "Emission-related Diagnostic Information" [QG18DE (SULEV)].

CONSULT-II

ECS005WF

After performing “SELF-DIAGNOSTIC PROCEDURE (WITH CONSULT-II)” (AT-43, "SELF-DIAGNOSTIC PROCEDURE (WITH CONSULT-II)"), place check marks for results on the “DIAGNOSTIC WORKSHEET”, (AT-58, "DIAGNOSTIC WORKSHEET"). Reference pages are provided following the items.

NOTICE:

1. The CONSULT-II electrically displays shift timing and lock-up timing (that is, operation timing of each solenoid).
   Check for time difference between actual shift timing and the CONSULT-II display. If the difference is noticeable, mechanical parts (except solenoids, sensors, etc.) may be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
2. Shift schedule (which implies gear position) displayed on CONSULT-II and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:

- Actual shift schedule has more or less tolerance or allowance,
- Shift schedule indicated in Service Manual refers to the point where shifts start, and
- Gear position displayed on CONSULT-II indicates the point where shifts are completed.

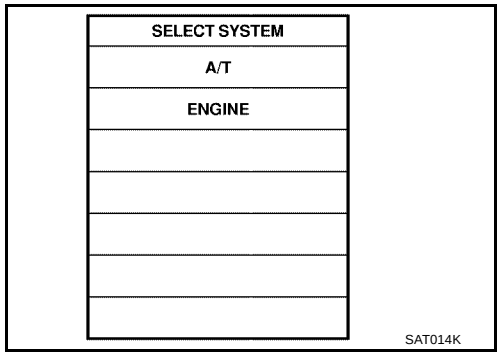
3. Shift solenoid valve “A” or “B” is displayed on CONSULT-II at the start of shifting. Gear position is displayed upon completion of shifting (which is computed by TCM).
4. Additional CONSULT-II information can be found in the Operation Manual supplied with the CONSULT-II unit.

FUNCTION

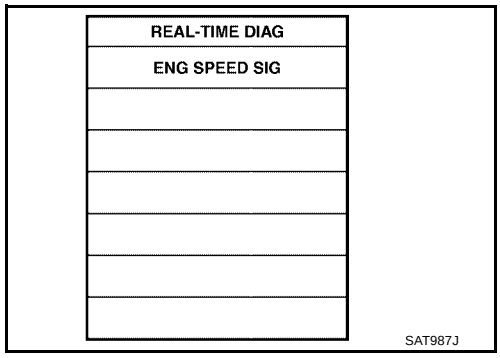
Diagnostic test mode	Function	Reference Page
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT-II.	—
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	AT-43
Data monitor	Input/Output data in the ECM can be read.	AT-45
CAN diagnostic support monitor	The results of transmit/receive diagnosis of CAN communication can be read.	AT-43
Function test	Performed by CONSULT-II instead of a technician to determine whether each system is “OK” or “NG”.	—
DTC work support	Select the operating condition to confirm Diagnosis Trouble Codes.	—
TCM part number	TCM part number can be read.	—

SELF-DIAGNOSTIC PROCEDURE (WITH CONSULT-II)

1. Turn on CONSULT-II and touch “ENGINE” for OBD-II detected items or touch “A/T” for TCM self-diagnosis.
   If A/T is not displayed, check TCM power supply and ground circuit. Refer to AT-113, "TROUBLE DIAGNOSIS FOR POWER SUPPLY" . If result is NG, refer to PG-2, "POWER SUPPLY ROUTING" .



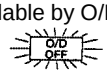
2. Touch “SELF DIAG RESULTS”.
   Display shows malfunction experienced since the last erasing operation.
   CONSULT-II performs “REAL TIME DIAG”.
   Also, any malfunction detected while in this mode will be displayed at real time.



SELF-DIAGNOSTIC RESULT TEST MODE

Detected items (Screen terms for CONSULT-II, “SELF DIAGNOSIS” test mode)		Malfunction is detected when ...	TCM self-diagnosis	OBD-II (DTC)
“A/T”	“ENGINE”		Available by O/D OFF indicator lamp or “A/T” on CONSULT-II	Available by malfunction indicator lamp *2, “ENGINE” on CONSULT-II or GST
PNP switch circuit		● TCM does not receive the correct voltage signal (based on the gear position) from the switch.	—	P0705
—	PNP SW/CIRC			
Revolution sensor		● TCM does not receive the proper voltage signal from the sensor.	X	P0720
VHCL SPEED SEN·A/T	VEH SPD SEN/CIR AT			

Detected items (Screen terms for CONSULT-II, "SELF DIAGNOSIS" test mode)		Malfunction is detected when ...	TCM self-diagnosis	OBD-II (DTC)
"A/T"	"ENGINE"		Available by O/D OFF indicator lamp or "A/T" on CONSULT-II	SERVICE ENGINE SOON Available by malfunction indicator lamp *2, "ENGINE" on CONSULT-II or GST
Vehicle speed sensor (Meter)		● TCM does not receive the proper voltage signal from the sensor.	X	—
VHCL SPEED SEN·MTR	—			
A/T 1st gear function		● A/T cannot be shifted to the 1st gear position even if electrical circuit is good.	—	P0731*1
A/T 1ST GR FNCTN	A/T 1ST GR FNCTN			
A/T 2nd gear function		● A/T cannot be shifted to the 2nd gear position even if electrical circuit is good.	—	P0732*1
A/T 2ND GR FNCTN	A/T 2ND GR FNCTN			
A/T 3rd gear function		● A/T cannot be shifted to the 3rd gear position even if electrical circuit is good.	—	P0733*1
A/T 3RD GR FNCTN	A/T 3RD GR FNCTN			
A/T 4th gear function		● A/T cannot be shifted to the 4th gear position even if electrical circuit is good.	—	P0734*1
A/T 4TH GR FNCTN	A/T 4TH GR FNCTN			
A/T TCC S/V function (lock-up)		● A/T cannot perform lock-up even if electrical circuit is good.	—	P0744*1
A/T TCC S/V FNCTN	A/T TCC S/V FNCTN			
Shift solenoid valve A		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P0750
SHIFT SOLENOID/V A	SFT SOL A/CIRC			
Shift solenoid valve B		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P0755
SHIFT SOLENOID/V B	SFT SOL B/CIRC			
Overrun clutch solenoid valve		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P1760
OVERRUN CLUTCH S/V	O/R CLUCH SOL/ CIRC			
T/C clutch solenoid valve		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P0740
T/C CLUTCH SOL/V	TCC SOLENOID/ CIRC			
Line pressure solenoid valve		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P0745
LINE PRESSURE S/V	L/PRESS SOL/CIRC			
Throttle position sensor, Throttle position switch		● TCM receives an excessively low or high voltage from the sensor.	X	P1705
THROTTLE POSI SEN	TP SEN/CIRC A/T			
Engine speed signal		● TCM does not receive the proper voltage signal from the ECM.	X	P0725
ENGINE SPEED SIG				
A/T fluid temperature sensor		● TCM receives an excessively low or high voltage from the sensor.	X	P0710
BATT/FLUID TEMP SEN	ATF TEMP SEN/ CIRC			
TCM (RAM)		● TCM memory (RAM) is malfunctioning.	—	—
CONTROL UNIT (RAM)	—			

Detected items (Screen terms for CONSULT-II, "SELF DIAGNOSIS" test mode)		Malfunction is detected when ...	TCM self-diagnosis	OBD-II (DTC)
"A/T"	"ENGINE"		Available by O/D OFF  indicator lamp or "A/T" on CONSULT-II	Available by malfunction indicator lamp *2, "ENGINE" on CONSULT-II or GST
TCM (ROM)		● TCM memory (ROM) is malfunctioning.	—	—
CONTROL UNIT (ROM)	—			
TCM (EEP ROM)		● TCM memory (EEP ROM) is malfunctioning.	—	—
CONT UNIT (EEP ROM)	—			
Initial start		● This is not a malfunction message (Whenever shutting off a power supply to the TCM, this message appears on the screen.)	X	—
INITIAL START	—			
No failure (NO SELF DIAGNOSTIC FAILURE INDICATED FURTHER TESTING MAY BE REQUIRED**)		● No failure has been detected.	X	X

X: Applicable
—: Not applicable

*1: These malfunctions cannot be displayed by MIL if another malfunction is assigned to MIL.
*2: Refer to EC-72, "Malfunction Indicator Lamp (MIL)" [QG18DE (ULEV)] or EC-653, "Malfunction Indicator Lamp (MIL)" [QG18DE (SULEV)].

DATA MONITOR MODE (A/T)

Item	Display	Monitor item		Description	Remarks
		TCM input signals	Main signals		
Vehicle speed sensor 1 (A/T) (Revolution sensor)	VHCL/S SE·A/T [km/h] or [mph]	X	—	● Vehicle speed computed from signal of revolution sensor is displayed.	When racing engine in "N" or "P" position with vehicle stationary, CONSULT-II data may not indicate 0 km/h (0 mph).
Vehicle speed sensor 2 (Meter)	VHCL/S SE·MTR [km/h] or [mph]	X	—	● Vehicle speed computed from signal of vehicle speed sensor is displayed.	Vehicle speed display may not be accurate under approx. 10 km/h (6 mph). It may not indicate 0 km/h (0 mph) when vehicle is stationary.
Throttle position sensor [accelerator pedal position (APP) sensor]	THRTL POS SEN [V]	X	—	● Throttle position sensor [accelerator pedal position (APP) sensor] signal voltage is displayed.	
A/T fluid temperature sensor	FLUID TEMP SE [V]	X	—	● A/T fluid temperature sensor signal voltage is displayed. ● Signal voltage lowers as fluid temperature rises.	
Battery voltage	BATTERY VOLT [V]	X	—	● Source voltage of TCM is displayed.	

Item	Display	Monitor item		Description	Remarks
		TCM input signals	Main signals		
Engine speed	ENGINE SPEED [rpm]	X	X	● Engine speed, computed from engine speed signal, is displayed.	Engine speed display may not be accurate under approx. 800 rpm. It may not indicate 0 rpm even when engine is not running.
Overdrive control switch	OVERDRIVE SW [ON/OFF]	X	—	● ON/OFF state computed from signal of overdrive control SW is displayed.	
PN position switch	PN POSI SW [ON/OFF]	X	—	● ON/OFF state computed from signal of PN position SW is displayed.	
R position switch	R POSITION SW [ON/OFF]	X	—	● ON/OFF state computed from signal of R position SW is displayed.	
D position switch	D POSITION SW [ON/OFF]	X	—	● ON/OFF state computed from signal of D position SW is displayed.	
2 position switch	2 POSITION SW [ON/OFF]	X	—	● ON/OFF status, computed from signal of 2 position SW, is displayed.	
1 position switch	1 POSITION SW [ON/OFF]	X	—	● ON/OFF status, computed from signal of 1 position SW, is displayed.	
ASCD cruise signal	ASCD CRUISE [ON/OFF]	X	—	● Status of ASCD cruise signal is displayed. ON ... Cruising state OFF ... Normal running state	● This is displayed even when no ASCD is mounted.
ASCD OD cut signal	ASCD OD CUT [ON/OFF]	X	—	● Status of ASCD OD release signal is displayed. ON ... OD released OFF ... OD not released	● This is displayed even when no ASCD is mounted.
Kickdown switch	KICKDOWN SW [ON/OFF]	X	—	● ON/OFF status, computed from signal of kickdown SW, is displayed.	● This is displayed even when no kickdown switch is equipped.
Gear position	GEAR	—	X	● Gear position data used for computation by TCM, is displayed.	
Selector lever position	SLCT LVR POSI	—	X	● Selector lever position data, used for computation by TCM, is displayed.	● A specific value used for control is displayed if fail-safe is activated due to error.
Vehicle speed	VEHICLE SPEED [km/h] or [mph]	—	X	● Vehicle speed data, used for computation by TCM, is displayed.	
Stop lamp switch	BRAKE SW [ON/OFF]	X	—	● ON/OFF status are displayed. ON: Brake pedal is depressed. OFF: Brake pedal is released.	

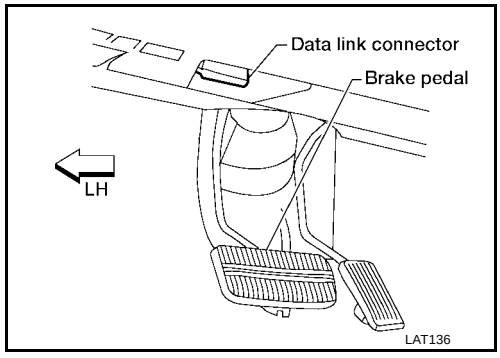
Item	Display	Monitor item		Description	Remarks
		TCM input signals	Main signals		
Throttle position	THROTTLE POSI [/8]	—	X	● Throttle position data, used for computation by TCM, is displayed.	● A specific value used for control is displayed if fail-safe is activated due to error.
Line pressure duty	LINE PRES DTY [%]	—	X	● Control value of line pressure solenoid valve, computed by TCM from each input signal, is displayed.	
Torque converter clutch solenoid valve duty	TCC S/V DUTY [%]	—	X	● Control value of torque converter clutch solenoid valve, computed by TCM from each input signal, is displayed.	
Shift solenoid valve A	SHIFT S/V A [ON/OFF]	—	X	● Control value of shift solenoid valve A, computed by TCM from each input signal, is displayed.	Control value of solenoid is displayed even if solenoid circuit is disconnected. The “OFF” signal is displayed if solenoid circuit is shorted.
Shift solenoid valve B	SHIFT S/V B [ON/OFF]	—	X	● Control value of shift solenoid valve B, computed by TCM from each input signal, is displayed.	
Overrun clutch solenoid valve	OVERRUN/C S/V [ON/OFF]	—	X	● Control value of overrun clutch solenoid valve computed by TCM from each input signal is displayed.	
Self-diagnosis display lamp (O/D OFF indicator lamp)	SELF-D DP LMP [ON/OFF]	—	X	● Control status of O/D OFF indicator lamp is displayed.	

X: Applicable
—: Not applicable

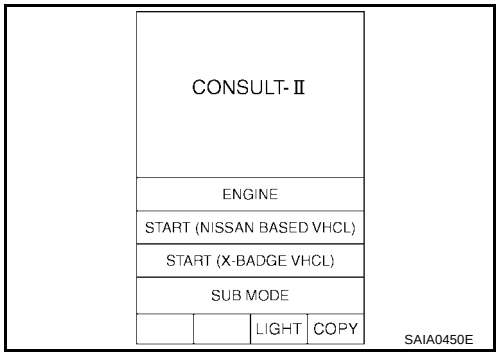
DTC WORK SUPPORT MODE WITH CONSULT-II

CONSULT-II Setting Procedure

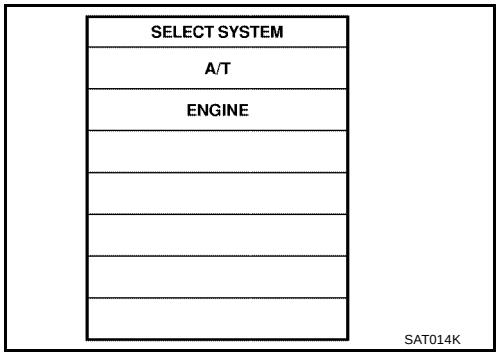
1. Turn ignition switch “OFF”.
2. Connect CONSULT-II to Data link connector which is located in left side lower dash panel.



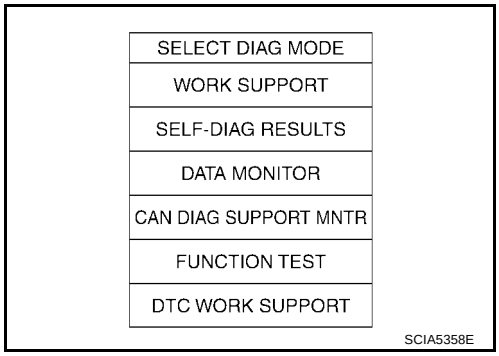
3. Turn ignition switch “ON”.
4. Touch “START (NISSAN BASED VHCL)”.



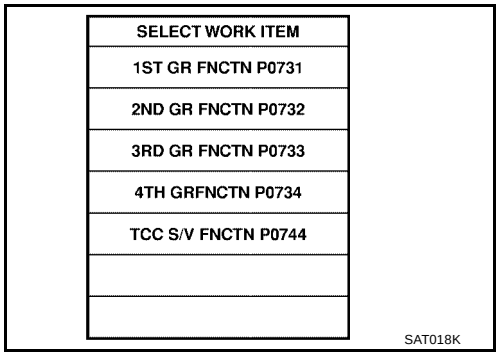
5. Touch “A/T”.



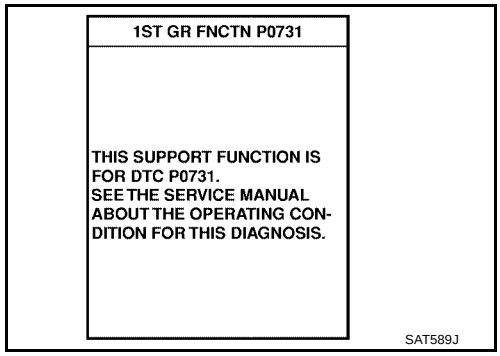
6. Touch “DTC WORK SUPPORT”.



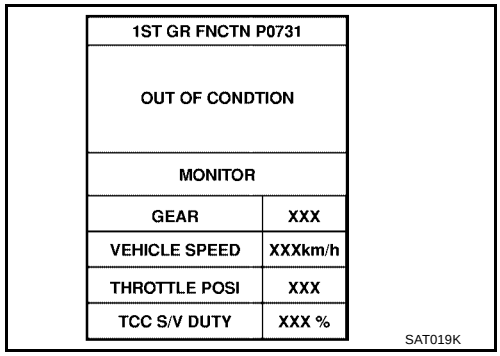
7. Touch select item menu (1ST, 2ND, etc.).



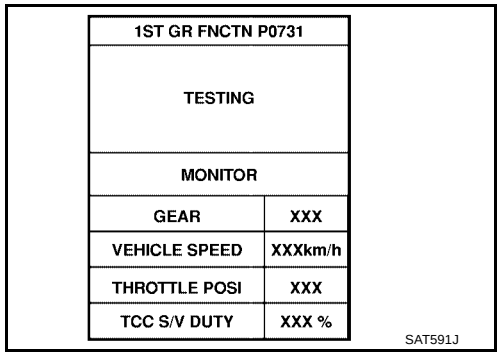
8. Touch “START”.



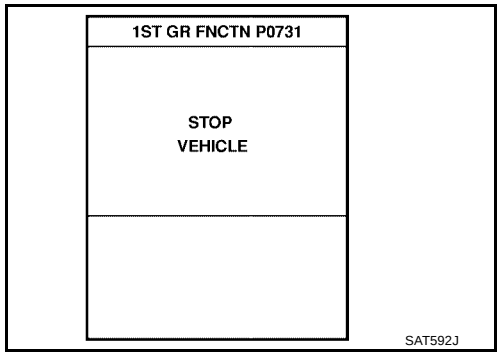
9. Perform driving test according to “DTC CONFIRMATION PROCEDURE” in “TROUBLE DIAGNOSIS FOR DTC”.

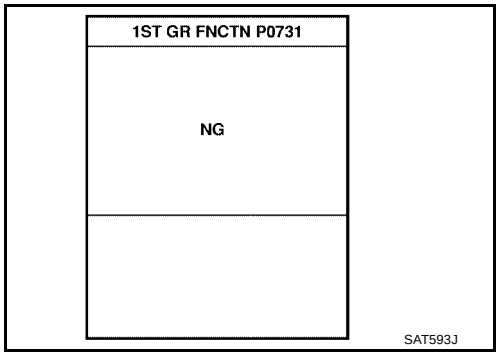


- **When testing conditions are satisfied, CONSULT-II screen changes from “OUT OF CONDITION” to “TESTING”.**

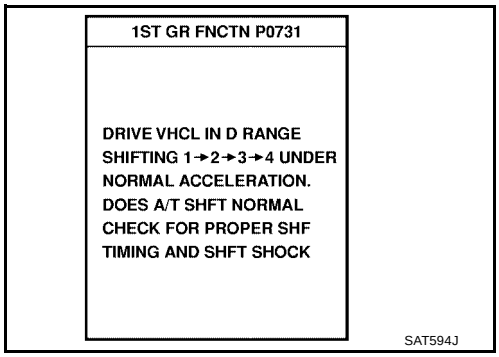


10. Stop vehicle. If “NG” appears on the screen, malfunction may exist. Go to “DIAGNOSTIC PROCEDURE”.

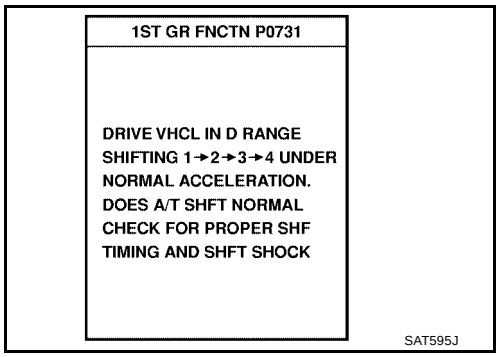




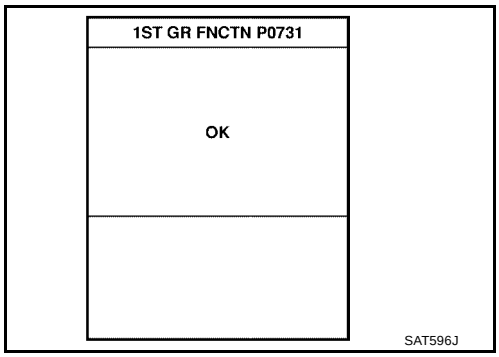
11. Perform test drive to check gear shift feeling in accordance with instructions displayed.

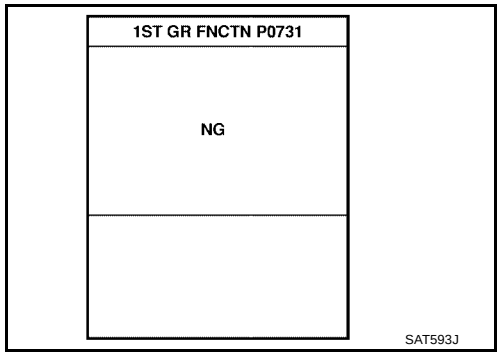


12. Touch “YES” or “NO”.



13. CONSULT-II procedure ended.





If “NG” appears on the screen, a malfunction may exist. Go to “DIAGNOSTIC PROCEDURE”.

DTC WORK SUPPORT MODE

DTC work support item	Description	Check items (Possible cause)
1ST GR FNCTN P0731	Following items for “A/T 1st gear function (P0731)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Shift solenoid valve A ● Shift solenoid valve B ● Each clutch ● Hydraulic control circuit
2ND GR FNCTN P0732	Following items for “A/T 2nd gear function (P0732)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Shift solenoid valve B ● Each clutch ● Hydraulic control circuit
3RD GR FNCTN P0733	Following items for “A/T 3rd gear function (P0733)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Shift solenoid valve A ● Each clutch ● Hydraulic control circuit
4TH GR FNCTN P0734	Following items for “A/T 4th gear function (P0734)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Shift solenoid valve A ● Shift solenoid valve B ● Line pressure solenoid valve ● Each clutch ● Hydraulic control circuit
TCC S/V FNCTN P0744	Following items for “A/T TCC S/V function (lock-up) (P0744)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Torque converter clutch solenoid valve ● Each clutch ● Hydraulic control circuit

DIAGNOSTIC PROCEDURE WITHOUT CONSULT-II

OBD-II Self-diagnostic Procedure (With GST)

Refer to EC-125, "Generic Scan Tool (GST) Function" [QG18DE (ULEV)], EC-709, "Generic Scan Tool (GST)" [QG18DE (SULEV)].

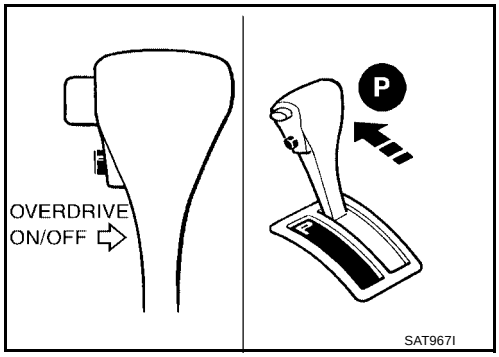
OBD-II Self-diagnostic Procedure (No Tools)

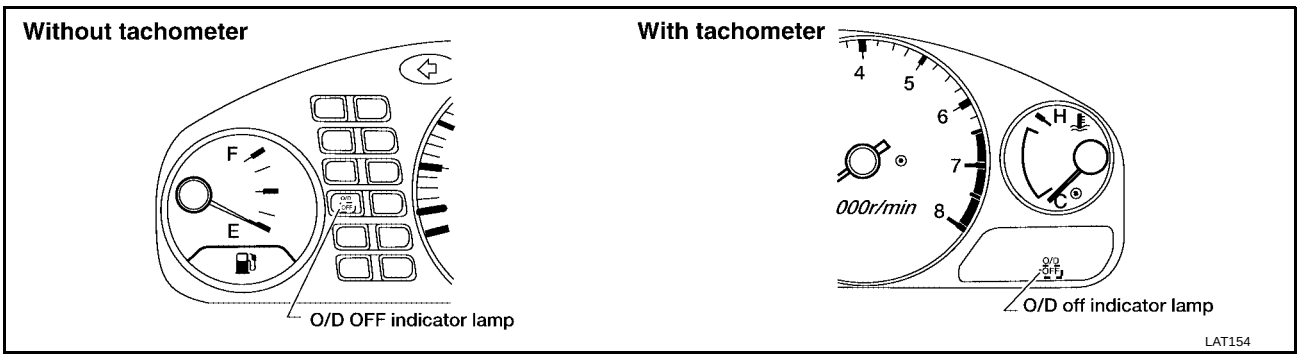
Refer to EC-72, "Malfunction Indicator Lamp (MIL)" [QG18DE (ULEV)] or EC-653, "Malfunction Indicator Lamp (MIL)" [QG18DE (SULEV)].

TCM Self-diagnostic Procedure (No Tools)

1. CHECK O/D OFF INDICATOR LAMP

1. Move A/T selector lever to “P” position.
   Start the engine.
   Warm engine to normal operating temperature.
2. Turn ignition switch to “OFF” position.
3. Wait 5 seconds.
4. Turn ignition switch to “ON” position.
   (Do not start engine.)
5. Does O/D OFF indicator lamp come on for about 2 seconds?



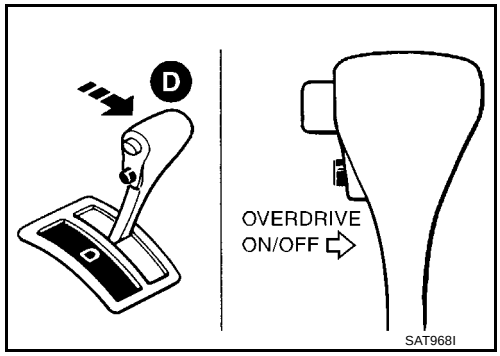


Yes or No

Yes >> GO TO 2.
No >> GO TO AT-221, "1. O/D OFF Indicator Lamp Does Not Come On" .

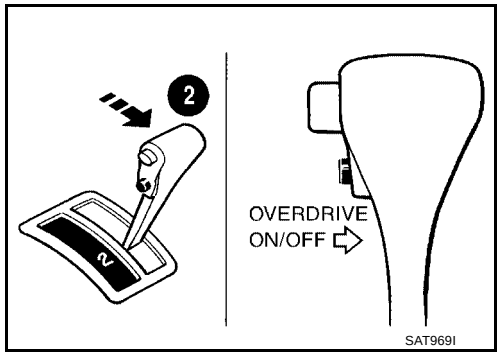
2. JUDGEMENT PROCEDURE STEP 1

1. Turn ignition switch to “OFF” position.
2. Turn ignition switch to “ACC” position.
3. Move A/T selector lever from “P” to “D” position.
4. Turn ignition switch to “ON” position.
   (Do not start engine.)
5. Depress and hold overdrive control switch (the O/D OFF indicator lamp will be “ON”) until directed to release the switch.
   If O/D OFF indicator lamp does not come on, go to AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}" .
6. Turn ignition switch to “OFF” position.
7. Turn ignition switch to “ON” position.
   (Do not start engine.)
8. Release the overdrive control switch (the O/D OFF indicator lamp will be “OFF”).
9. Wait 2 seconds.
10. Move A/T selector lever to “2” position.
11. Depress and release the overdrive control switch (the O/D OFF indicator lamp will be “ON”).



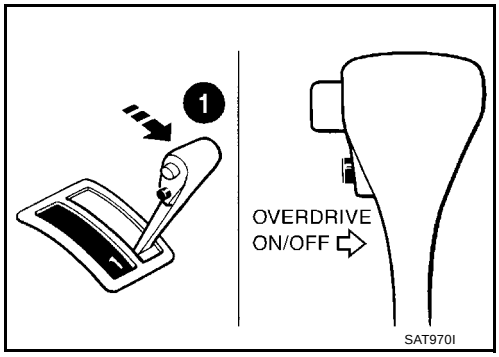
12. Depress and hold the overdrive control switch (the O/D OFF indicator lamp will be “OFF”) until directed to release the switch.

    >> GO TO 3.



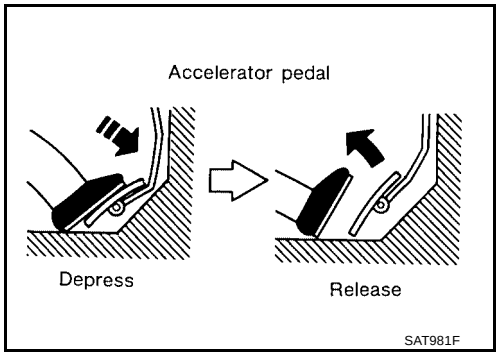
3. JUDGEMENT PROCEDURE STEP 2

1. Move A/T selector lever to “1” position.
2. Release the overdrive control switch.
3. Depress and release the overdrive control switch (the O/D OFF indicator lamp will be “ON”).
4. Depress and release the overdrive control switch (the O/D OFF indicator lamp will be “OFF”).
5. Depress and hold the overdrive control switch (the O/D OFF indicator lamp will be “ON”) until directed to release the switch.



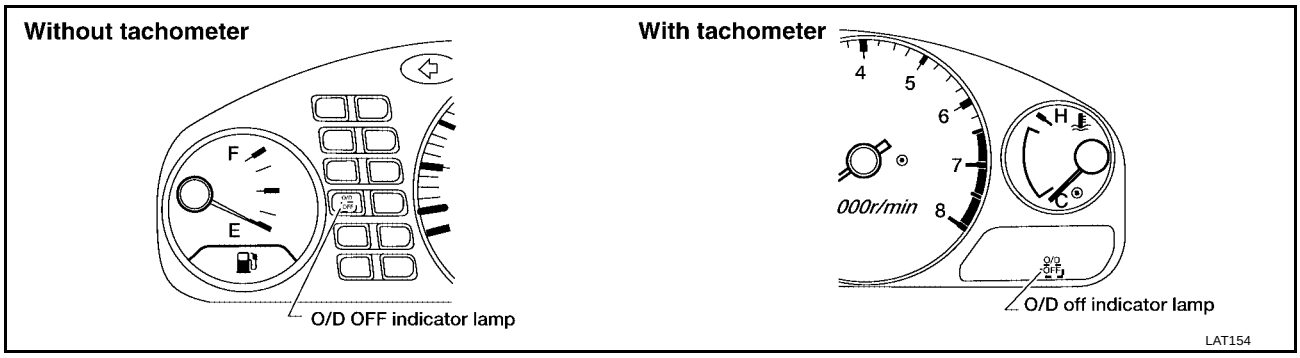
6. Depress accelerator pedal fully and release.
7. Release the overdrive control switch (the O/D OFF indicator lamp will begin to flash “ON” and “OFF”).

>> GO TO 4.



4. CHECK SELF-DIAGNOSIS CODE

Check O/D OFF indicator lamp. Refer to AT-55, "Judgement of Self-diagnosis Code" .

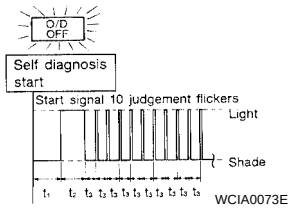


>> **DIAGNOSIS END**

Judgement of Self-diagnosis Code

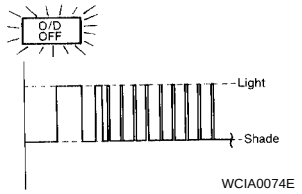
O/D OFF indicator lamp:

All judgement flickers are the same.



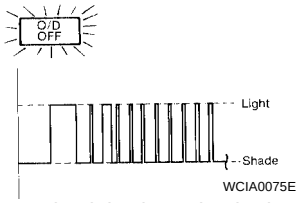
All circuits that can be confirmed by self-diagnosis are OK.

1st judgement flicker is longer than others.



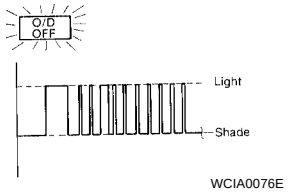
Revolution sensor circuit is short-circuited or disconnected.
⇒ **Go to** AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" **.**

2nd judgement flicker is longer than others.



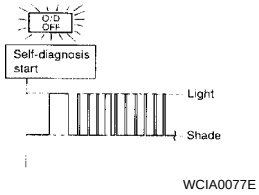
Vehicle speed sensor circuit is short-circuited or disconnected.
⇒ **Go to** AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" **.**

3rd judgement flicker is longer than others.



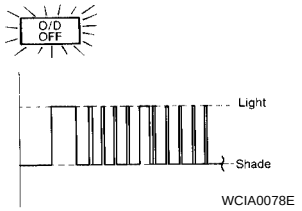
Throttle position sensor [accelerator pedal position (APP) sensor] circuit is short-circuited or disconnected.
⇒ **Go to** AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]" **.**

4th judgement flicker is longer than others.



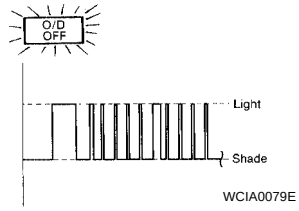
Shift solenoid valve A circuit is short-circuited or disconnected.
⇒ **Go to** AT-180, "DTC P0750 SHIFT SOLENOID VALVE A" **.**

5th judgement flicker is longer than others.



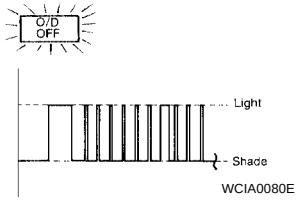
Shift solenoid valve B circuit is short-circuited or disconnected.
⇒ **Go to** AT-184, "DTC P0755 SHIFT SOLENOID VALVE B" **.**

6th judgement flicker is longer than others.



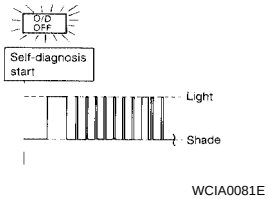
Overrun clutch solenoid valve circuit is short-circuited or disconnected.
⇒ **Go to** AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE" **.**

7th judgement flicker is longer than others.



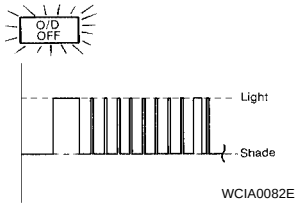
Torque converter clutch solenoid valve circuit is short-circuited or disconnected.
⇒ **Go to** AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE" **.**

8th judgement flicker is longer than others.

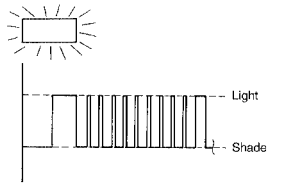
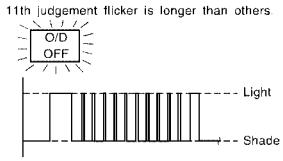
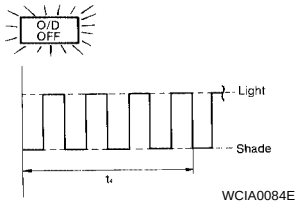
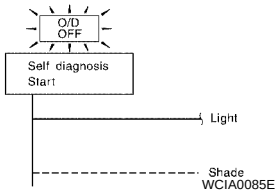


A/T fluid temperature sensor is disconnected or TCM power source circuit is damaged.
⇒ **Go to** AT-198, "DTC BATT/FLUID TEMP SEN (A/T FLUID TEMP SENSOR CIRCUIT AND TCM POWER SOURCE)" **.**

9th judgement flicker is longer than others.



Engine speed signal circuit is short-circuited or disconnected.
⇒ **Go to** AT-132, "DTC P0725 ENGINE SPEED SIGNAL" **.**

O/D OFF indicator lamp:	
10th judgement flicker is longer than others.  WCIA0083E Line pressure solenoid valve circuit is short-circuited or disconnected. ⇒ **Go to** AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE" **.**	11th judgement flicker is longer than others.  SAT599J The ECM-A/T communication line is open or shorted. ⇒ **Go to** AT-209, "DTC U1000 CAN COMMUNICATION LINE" **.**
Flickers as shown below.  WCIA0084E Battery power is low. Battery has been disconnected for a long time. Battery is connected conversely. (When reconnecting TCM connectors. — This is not a problem.)	Lamp comes on.  WCIA0085E PNP switch, overdrive control switch or throttle position switch circuit is disconnected or TCM is damaged. ⇒ **Go to** AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}" **.**

t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second t_4 = 1.0 second

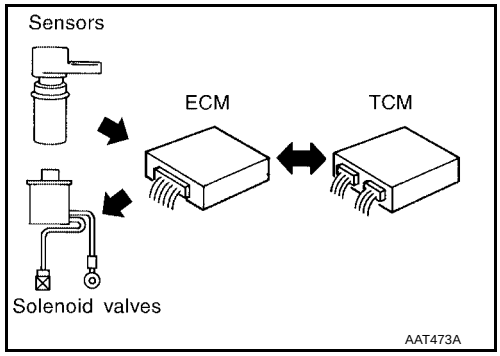
TROUBLE DIAGNOSIS — INTRODUCTION

PFP:00000

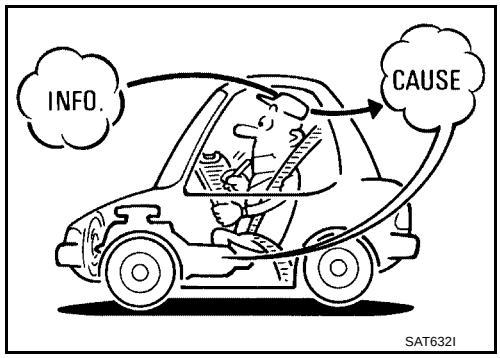
Introduction

ECS005WG

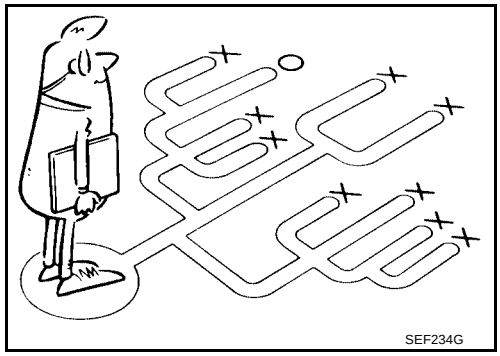
The TCM receives a signal from the vehicle speed sensor, throttle position sensor [accelerator pedal position (APP) sensor] or PNP switch and provides shift control or lock-up control via A/T solenoid valves.
The TCM also communicates with the ECM by means of a signal sent from sensing elements used with the OBD-related parts of the A/T system for malfunction-diagnostic purposes. The TCM is capable of diagnosing malfunctioning parts while the ECM can store malfunctions in its memory.
Input and output signals must always be correct and stable in the operation of the A/T system. The A/T system must be in good operating condition and be free of valve seizure, solenoid valve malfunction, etc.



It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.
A visual check only may not find the cause of the problems. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow”. Refer to AT-61, "Work Flow" .



Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example (AT-59, "Diagnostic Worksheet") should be used.
Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.
Also check related Service bulletins for information.



DIAGNOSTIC WORKSHEET

Information from Customer

KEY POINTS

- **WHAT** ..... Vehicle & A/T model
- **WHEN**..... Date, Frequencies
- **WHERE**..... Road conditions
- **HOW**..... Operating conditions, Symptoms

Customer name MR/MS	Model & Year	VIN
Trans. model	Engine	Mileage
Incident Date	Manuf. Date	In Service Date
Frequency	❑ Continuous ❑ Intermittent (times a day)	
Symptoms	❑ Vehicle does not move. (❑ Any position ❑ Particular position)	
	❑ No up-shift (❑ 1st → 2nd ❑ 2nd → 3rd ❑ 3rd → O/D)	
	❑ No down-shift (❑ O/D → 3rd ❑ 3rd → 2nd ❑ 2nd → 1st)	
	❑ Lockup malfunction	
	❑ Shift point too high or too low.	
	❑ Shift shock or slip (❑ N → D ❑ Lockup ❑ Any drive position)	
	❑ Noise or vibration	
	❑ No kickdown	
	❑ No pattern select	
	❑ Others ( )	
O/D OFF indicator lamp	Blinks for about 8 seconds.	
	❑ Continuously lit	❑ Not lit
Malfunction indicator lamp (MIL)	❑ Continuously lit	❑ Not lit

Diagnostic Worksheet

1.	❑ Read the “FAIL-SAFE” and listen to customer complaints.		AT-11, "FAIL-SAFE"
2.	❑ CHECK A/T FLUID		AT-64, "A/T Fluid Check"
	❑ Leakage (Follow specified procedure) ❑ Fluid condition ❑ Fluid level		
3.	❑ Perform STALL TEST and LINE PRESSURE TEST.		AT-64, "Stall Test", AT-68, "Line Pressure Test"
	❑ Stall test — Mark possible damaged components/others.		
	❑ Torque converter one-way clutch ❑ Reverse clutch ❑ Forward clutch ❑ Overrun clutch ❑ Forward one-way clutch	❑ Low & reverse brake ❑ Low one-way clutch ❑ Engine ❑ Line pressure is low ❑ Clutches and brakes except high clutch and brake band are OK
	❑ Line Pressure test — Suspected parts:		
4.	❑ Perform all ROAD TEST and mark required procedures.		AT-69, "Road Test"
4-1.	Check before engine is started.		AT-71, "1. CHECK BEFORE ENGINE IS STARTED"
	❑ SELF-DIAGNOSTIC PROCEDURE — Mark detected items.		
	❑ PNP switch, AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" . ❑ A/T fluid temperature sensor, AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" . ❑ Vehicle speed sensor·A/T (Revolution sensor), AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" . ❑ Engine speed signal, AT-132, "DTC P0725 ENGINE SPEED SIGNAL" . ❑ Torque converter clutch solenoid valve, . ❑ Line pressure solenoid valve, AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE" . ❑ Shift solenoid valve A, AT-180, "DTC P0750 SHIFT SOLENOID VALVE A" . ❑ Shift solenoid valve B, AT-184, "DTC P0755 SHIFT SOLENOID VALVE B" . ❑ Throttle position sensor [accelerator pedal position (APP) sensor], AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]" . ❑ Overrun clutch solenoid valve, AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE" . ❑ PNP, overdrive control and throttle position sensor [accelerator pedal position (APP) sensor], AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}" . ❑ A/T fluid temperature sensor and TCM power source, AT-198, "DTC BATT/FLUID TEMP SEN (A/T FLUID TEMP SENSOR CIRCUIT AND TCM POWER SOURCE)" . ❑ Vehicle speed sensor·MTR, AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" . ❑ Control unit (RAM), control unit (ROM), AT-212, "DTC CONTROL UNIT (RAM), CONTROL UNIT (ROM)" . ❑ Control unit (EEP ROM), AT-214, "DTC CONTROL UNIT (EEP ROM)" . ❑ Battery ❑ Others		
4-2.	Check at idle		AT-72, "2. CHECK AT IDLE"
	❑ 1. O/D OFF Indicator Lamp Does Not Come On, AT-221, "1. O/D OFF Indicator Lamp Does Not Come On" . ❑ 2. Engine Cannot Be Started In “P” And “N” Position, AT-223, "2. Engine Cannot Be Started In “P” and “N” Position" . ❑ 3. In “P” Position, Vehicle Moves Forward Or Backward When Pushed, AT-224, "3. In “P” Position, Vehicle Moves Forward Or Backward When Pushed" . ❑ 4. In “N” Position, Vehicle Moves, AT-225, "4. In “N” Position, Vehicle Moves" . ❑ 5. Large Shock. “N” → “R” Position, AT-226, "5. Large Shock. “N” → “R” Position" . ❑ 6. Vehicle Does Not Creep Backward In “R” Position, AT-227, "6. Vehicle Does Not Creep Backward In “R” Position" . ❑ 7. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position, AT-229, "7. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position" .		

4. (cont'd)	4-3 (cont'd)	Cruise test	AT-74, "3. CRUISE TEST" AT-78, "Cruise Test — Part 1"
		Part-1	
		❑ 8. Vehicle Cannot Be Started From D1 , AT-231, "8. Vehicle Cannot Be Started From D1" . ❑ 9. A/T Does Not Shift: D1 → D2 Or Does Not Kickdown: D4 → D2 , AT-234, "9. A/T Does Not Shift: D1 → D2 Or Does Not Kickdown: D4 → D2" . ❑ 10. A/T Does Not Shift: D2 →D3 , AT-236, "10. A/T Does Not Shift: D2 → D3" . ❑ 11. A/T Does Not Shift: D3 →D4 , AT-238, "11. A/T Does Not Shift: D3 → D4" . ❑ 12. A/T Does Not Perform Lock-up, AT-240, "12. A/T Does Not Perform Lock-up" . ❑ 13. A/T Does Not Hold Lock-up Condition, AT-241, "13. A/T Does Not Hold Lock-up Condition" . ❑ 14. Lock-up Is Not Released, AT-243, "14. Lock-up Is Not Released" . ❑ 15. Engine Speed Does Not Return To Idle (Light Braking D4 → D3), AT-244, "15. Engine Speed Does Not Return To Idle (Light Braking D4 → D3)" .	
		Part-2	AT-81, "Cruise Test — Part 2"
		❑ 16. Vehicle Does Not Start From D1 , AT-245, "16. Vehicle Does Not Start From D1" . ❑ 9. A/T Does Not Shift: D1 → D2 Or Does Not Kickdown: D4 → D2 , AT-234, "9. A/T Does Not Shift: D1 → D2 Or Does Not Kickdown: D4 → D2" . ❑ 10. A/T Does Not Shift: D2 →D3 , AT-236, "10. A/T Does Not Shift: D2 → D3" . ❑ 11. A/T Does Not Shift: D3 →D4 , AT-238, "11. A/T Does Not Shift: D3 → D4" .	
4. (cont'd)	4-3 . (cont'd)	Part-3	AT-83, "Cruise Test — Part 3"
		❑ 17. A/T Does Not Shift: D4 →D3 When Overdrive Control Switch “ON” → “OFF”, AT-247, "17. A/T Does Not Shift: D4 → D3 , When Overdrive Control Switch “ON” → “OFF”" . ❑ 15. Engine Speed Does Not Return To Idle (Engine Brake In D3), AT-244, "15. Engine Speed Does Not Return To Idle (Light Braking D4 → D3)" . ❑ 18. A/T Does Not Shift: D3 →22 , When Selector Lever “D” → “2” Position, AT-248, "18. A/T Does Not Shift: D3 → 22 , When Selector Lever “D” → “2” Position" . ❑ 15. Engine Speed Does Not Return To Idle (Light Braking D4 → D2), AT-244, "15. Engine Speed Does Not Return To Idle (Light Braking D4 → D3)" . ❑ 19. A/T Does Not Shift: 22 →11 , When Selector Lever “2” → “1” Position, AT-249, "19. A/T Does Not Shift: 22 → 11 , When Selector Lever “2” → “1” Position" . ❑ 20. Vehicle Does Not Decelerate By Engine Brake, AT-250, "20. Vehicle Does Not Decelerate By Engine Brake" . ❑ SELF-DIAGNOSTIC PROCEDURE — Mark detected items.	
		❑ PNP switch, AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" . ❑ A/T fluid temperature sensor, AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" . ❑ Vehicle speed sensor·A/T (Revolution sensor), AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" . ❑ Engine speed signal, AT-132, "DTC P0725 ENGINE SPEED SIGNAL" . ❑ Torque converter clutch solenoid valve, AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE" . ❑ Line pressure solenoid valve, AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE" . ❑ Shift solenoid valve A, AT-180, "DTC P0750 SHIFT SOLENOID VALVE A" . ❑ Shift solenoid valve B, AT-184, "DTC P0755 SHIFT SOLENOID VALVE B" . ❑ Throttle position sensor [accelerator pedal position (APP) sensor], AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]" . ❑ Overrun clutch solenoid valve, AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE" . ❑ PNP, overdrive control and throttle position sensor [accelerator pedal position (APP) sensor], AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}" . ❑ A/T fluid temperature sensor and TCM power source, AT-198, "DTC BATT/FLUID TEMP SEN (A/T FLUID TEMP SENSOR CIRCUIT AND TCM POWER SOURCE)" . ❑ Vehicle speed sensor·MTR, AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" . ❑ Control unit (RAM), control unit (ROM), AT-212, "DTC CONTROL UNIT (RAM), CONTROL UNIT (ROM)" . ❑ Control unit (EEP ROM), AT-214, "DTC CONTROL UNIT (EEP ROM)" . ❑ Battery ❑ Others	

5.	❑ For self-diagnosis NG items, inspect each component. Repair or replace the damaged parts.	AT-43, "SELF-DIAGNOSTIC RESULT TEST MODE"
6.	❑ Perform all ROAD TEST and re-mark required procedures.	AT-69, "Road Test"
7.	❑ Perform DTC CONFIRMATION PROCEDURE for following MIL indicating items and check out NG items. Refer to EC-123, "DTC & SRT CONFIRMATION MODE" [QG18DE (ULEV)] or EC-706, "DTC & SRT CONFIRMATION MODE" [QG18DE (SULEV)].	EC section
	❑ DTC (P0731), AT-136, "DTC P0731 A/T 1ST GEAR FUNCTION" . ❑ DTC (P0732), AT-141, "DTC P0732 A/T 2ND GEAR FUNCTION" . ❑ DTC (P0733), AT-146, "DTC P0733 A/T 3RD GEAR FUNCTION" . ❑ DTC (P0734), AT-151, "DTC P0734 A/T 4TH GEAR FUNCTION" . ❑ DTC (P0744), AT-164, "DTC P0744 A/T TCC S/V FUNCTION (LOCK-UP)" .	
8.	❑ Perform the Diagnostic Procedures for all remaining items marked NG. Repair or replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)	AT-43, "SELF-DIAGNOSTIC RESULT TEST MODE" AT-85, "Symptom Chart"
9.	❑ Erase DTC from TCM and ECM memories.	AT-40, "HOW TO ERASE DTC"

Work Flow

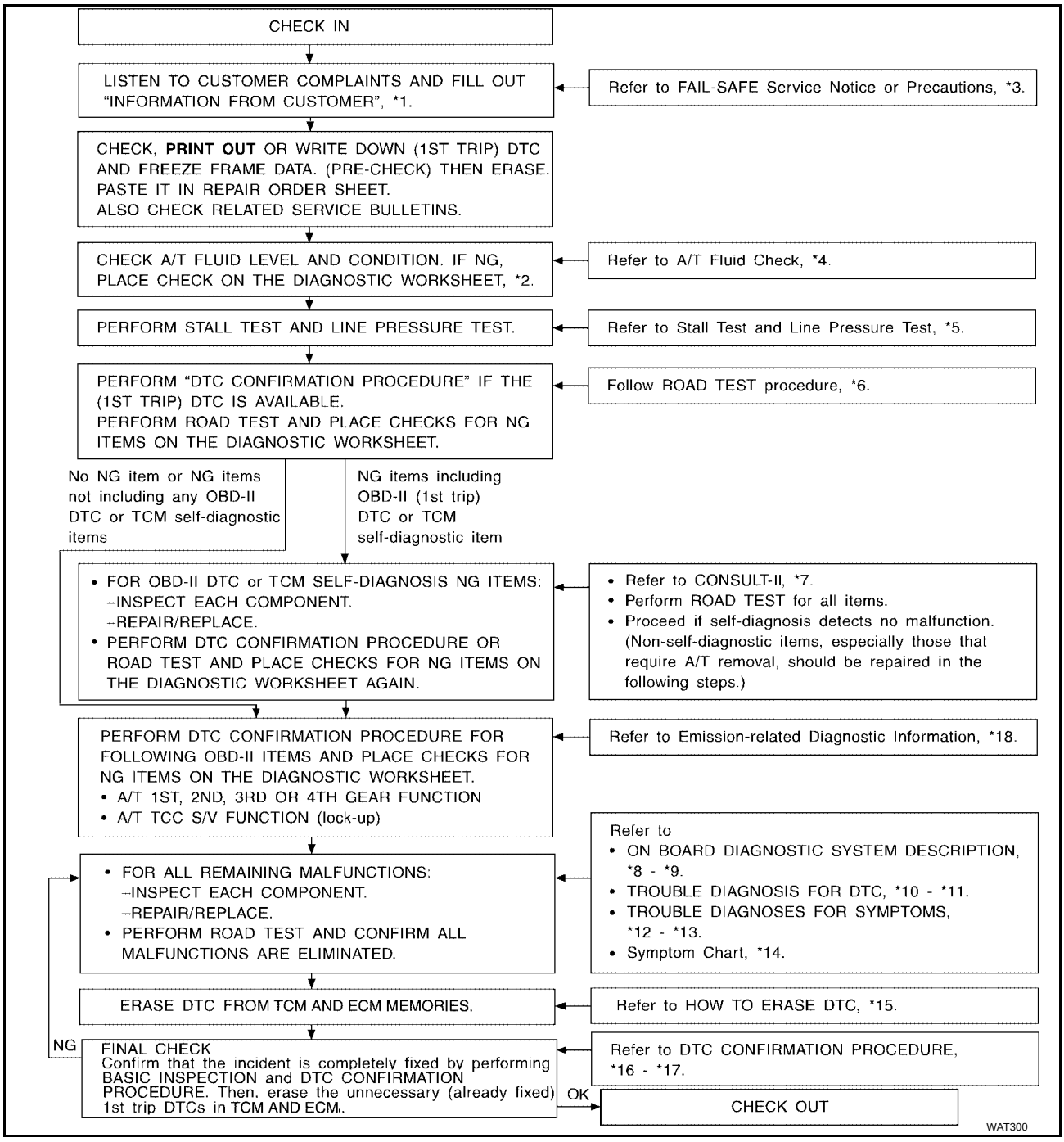
ECS005WH

HOW TO PERFORM TROUBLE DIAGNOSES FOR QUICK AND ACCURATE REPAIR

A good understanding of the malfunction conditions can make troubleshooting faster and more accurate. In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Make good use of the two sheets provided, “Information from Customer” (AT-58, "Information from Customer") and “Diagnostic Worksheet” (AT-59, "Diagnostic Worksheet"), to perform the best troubleshooting possible.

WORK FLOW CHART



*1	AT-58, "Information from Customer"	*2	AT-59, "Diagnostic Worksheet"	*3	AT-11, "FAIL-SAFE"
*4	AT-64, "A/T Fluid Check"	*5	AT-64, "Stall Test", AT-68, "Line Pressure Test"	*6	AT-69, "Road Test"
*7	AT-42, "CONSULT-II"	*8	AT-38, "Introduction"	*9	AT-55, "Judgement of Self-diagnosis Code"
*10	AT-116, "Description"	*11	AT-214, "Description"	*12	AT-221, "1. O/D OFF Indicator Lamp Does Not Come On"

*13	AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}"	*14	AT-85, "Symptom Chart"	*15	AT-40, "HOW TO ERASE DTC"
*16	AT-116, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE"	*17	AT-214, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE"	*18	EC-59, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" [QG18DE (ULEV)] or EC-640, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" [QG18DE (SULEV)].

TROUBLE DIAGNOSIS — BASIC INSPECTION

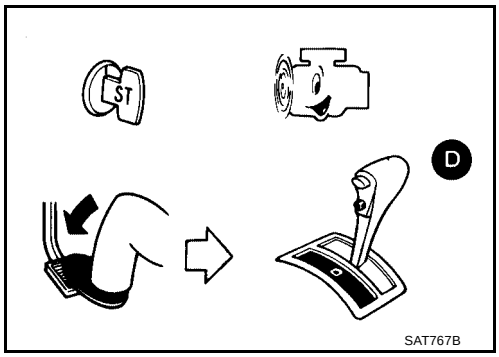
PFP:00000

A/T Fluid Check

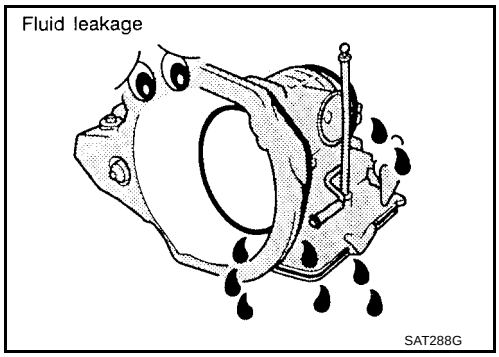
ECS005WI

FLUID LEAKAGE CHECK

1. Clean area suspected of leaking, for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in “D” position and wait a few minutes.
3. Stop engine.

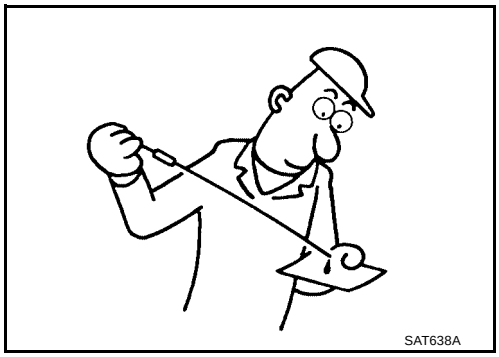


4. Check for fresh leakage.



FLUID CONDITION CHECK

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling, — Overheating



FLUID LEVEL CHECK

Refer to MA-30, "Checking A/T Fluid" .

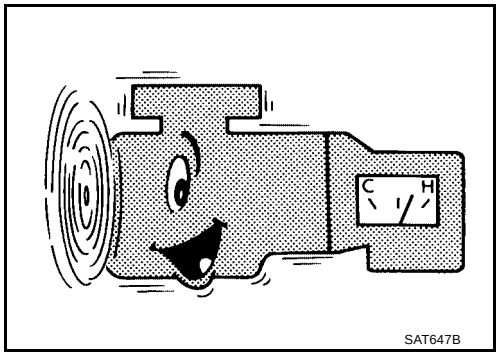
Stall Test

ECS005WJ

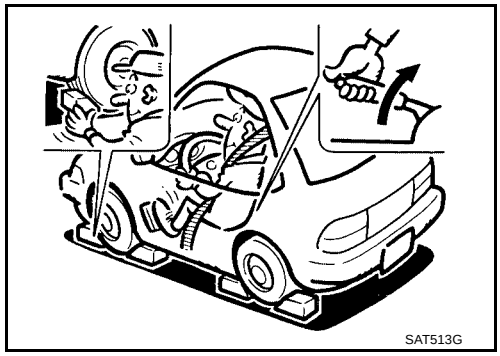
STALL TEST PROCEDURE

1. Check A/T fluid and engine oil levels. If necessary, add.
2. Drive vehicle for approx. 10 minutes or until fluid and oil reach operating temperature.

ATF operating temperature : 50 - 80°C (122 - 176°F)



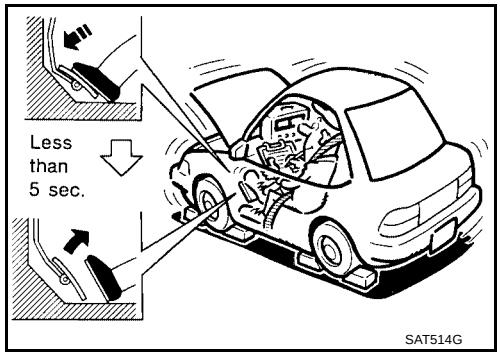
3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.
   - **It is good practice to mark the point of specified engine rpm on indicator.**


SAT513G

5. Start engine, apply foot brake, and place selector lever in "D" position.
6. Accelerate to wide open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.
   - **During test, never hold throttle wide open for more than 5 seconds.**

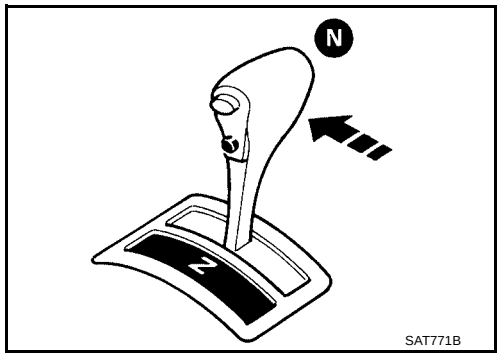
Stall revolution

QG18DE : 2,350 - 2,800 rpm



SAT514G

8. Move selector lever to “N” position.
9. Cool off ATF.
   - **Run engine at idle for at least one minute.**
10. Repeat steps 5 through 9 with selector lever in “2”, “1” and “R” positions.



SAT771B

JUDGEMENT OF STALL TEST

The test result and possible damaged components relating to each result are shown in the illustrations that follow.

In order to pinpoint the possible damaged components, follow the “Work Flow” shown in AT-61, "Work Flow" .

NOTE:

Stall revolution is too high in “D”, “2” or “1” position:

- Slippage occurs in 1st gear but not in 2nd and 3rd gears..... Low one-way clutch slippage
- Slippage occurs in the following gears:
  1st through 3rd gears in “D” position and engine brake functions with overdrive control switch set to “OFF”.
  1st and 2nd gears in “2” position and engine brake functions with accelerator pedal released (fully closed throttle)..... Forward clutch or forward one-way clutch slippage

Stall revolution is too high in R position:

- Engine brake does not function in “1” position..... Low & reverse brake slippage
- Engine brake functions in “1” position..... Reverse clutch slippage

Stall revolution within specifications:

- Vehicle does not achieve speed of more than 80 km/h (50 MPH)..... One-way clutch seizure in torque converter housing

CAUTION:

Be careful since automatic fluid temperature increases abnormally.

- Slippage occurs in 3rd and 4th gears in “D” position..... High clutch slippage

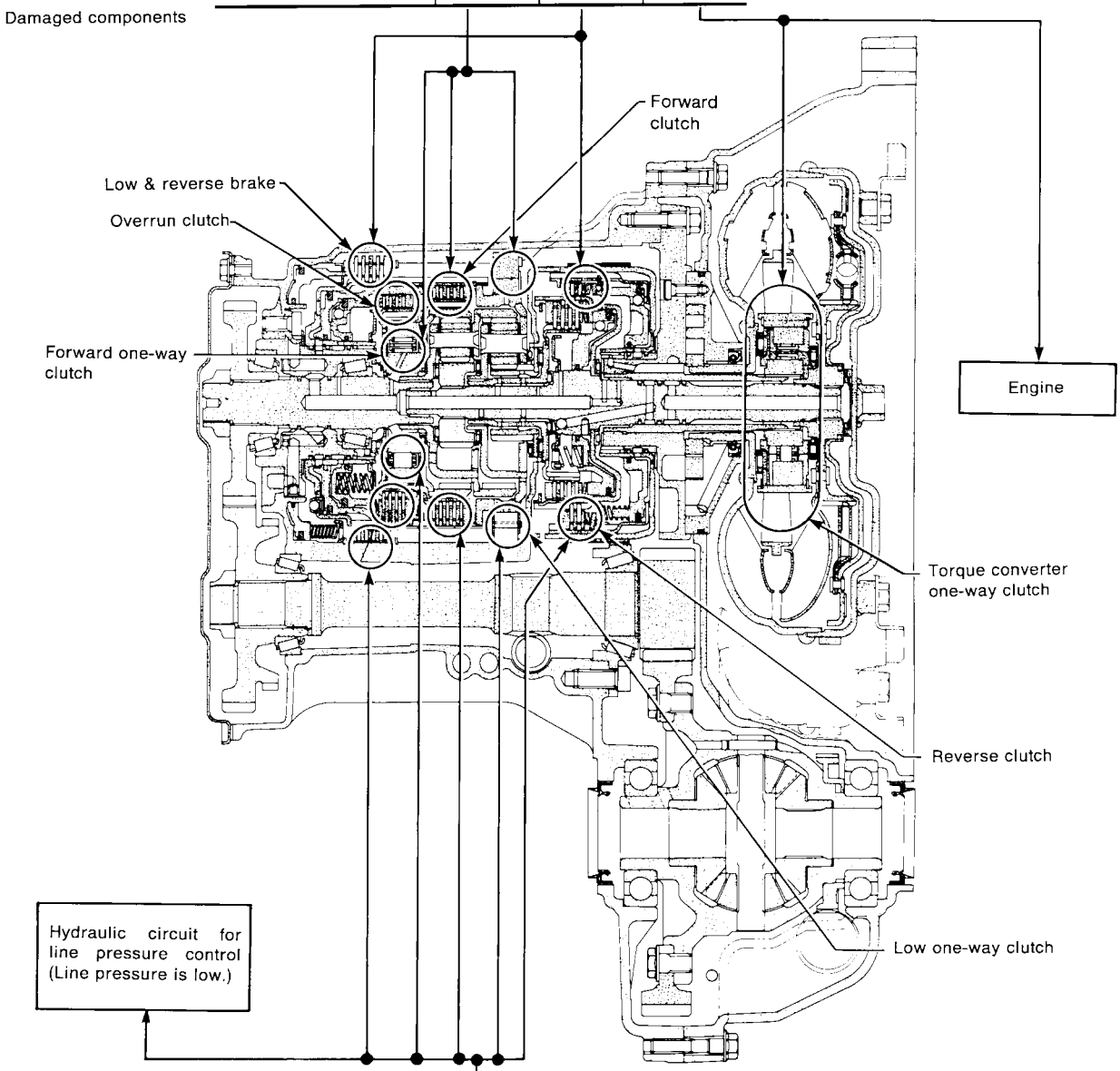
- Slippage occurs in 2nd and 4th gear in “D” position..... Brake band slippage
- Engine brake does not function in 2nd and 3rd gears in “D” position, 2nd gear in “2” position, and 1st gear in “1” position with overdrive control switch set to “OFF”..... Overrun clutch slippage

Stall revolution less than specifications:

- Poor acceleration during starts..... One-way clutch slippage in torque converter

Selector lever position	Judgement		
D	H	O	L
2	H	O	L
1	H	O	L
R	O	H	L

O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.



Selector lever position	Judgement	
D	H	O
2	H	O
1	H	O
R	H	O

Clutches and brakes except high clutch and brake band are OK. (Condition of high clutch and brake band cannot be confirmed by stall test.)

SAT871HA

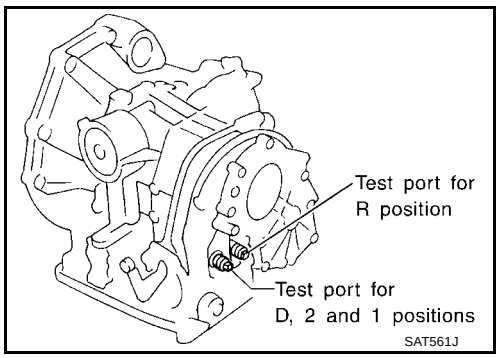
Line Pressure Test

ECS005WK

LINE PRESSURE TEST PORTS

Location of line pressure test ports are shown in the illustration.

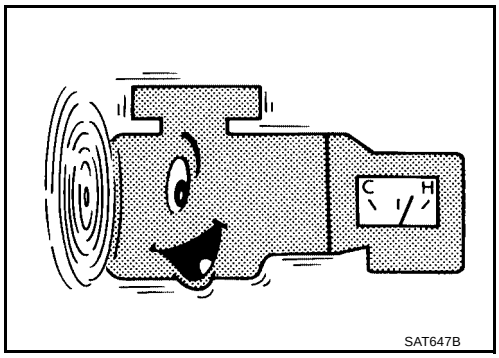
- **Always replace pressure plugs as they are self-sealing bolts.**



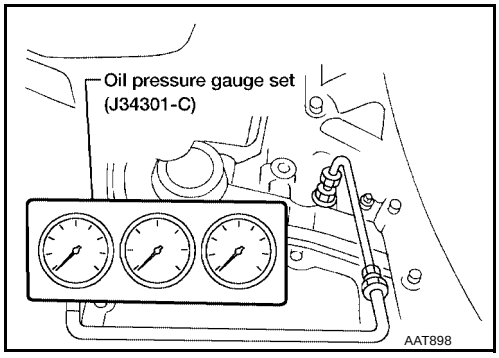
LINE PRESSURE TEST PROCEDURE

1. Check A/T fluid and engine oil levels. If necessary, add fluid or oil.
2. Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.

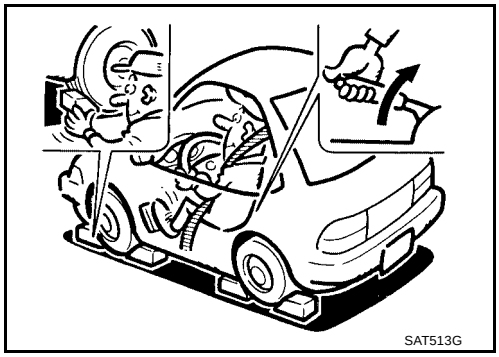
   ATF operating temperature : 50 - 80°C (122 - 176°F)



3. Install pressure gauge to corresponding line pressure port.

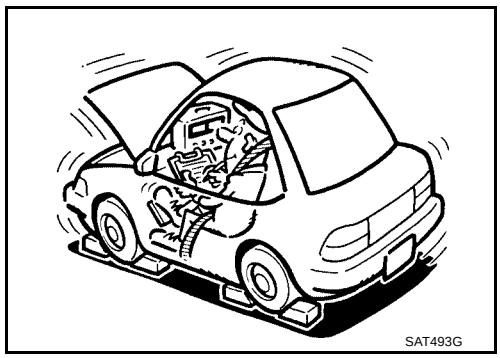


4. Set parking brake and block wheels.
   - **Continue to depress brake pedal fully while line pressure test is being performed at stall speed.**



5. Start engine and measure line pressure at idle and stall speed.
   - **When measuring line pressure at stall speed, follow the stall test procedure.**

Refer to AT-68, "Line Pressure Test" .


SAT493G

JUDGEMENT OF LINE PRESSURE TEST

Judgement		Suspected parts
At idle	Line pressure is low in all positions.	● Oil pump wear ● Control piston damage ● Pressure regulator valve or plug sticking ● Spring for pressure regulator valve damaged ● Fluid pressure leakage between oil strainer and pressure regulator valve ● Clogged strainer
	Line pressure is low in particular position.	● Fluid pressure leakage between manual valve and particular clutch ● For example, line pressure is: – Low in “R” and “1” positions, but – Normal in “D” and “2” positions. Therefore, fluid leakage exists at or around low and reverse brake circuit. Refer to AT-22, "CLUTCH AND BAND CHART" .
	Line pressure is high.	● Maladjustment of throttle position sensor [accelerator pedal position (APP) sensor] ● A/T fluid temperature sensor damaged ● Line pressure solenoid valve sticking ● Short circuit of line pressure solenoid valve circuit ● Pressure modifier valve sticking ● Pressure regulator valve or plug sticking ● Open in dropping resistor circuit
At stall speed	Line pressure is low.	● Maladjustment of throttle position sensor [accelerator pedal position (APP) sensor] ● Line pressure solenoid valve sticking ● Short circuit of line pressure solenoid valve circuit ● Pressure regulator valve or plug sticking ● Pressure modifier valve sticking ● Pilot valve sticking

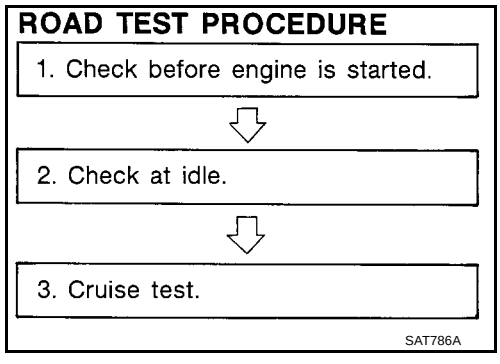
Road Test

ECS005WL

DESCRIPTION

- The purpose of the test is to determine overall performance of the transmission and analyze causes of problems.
- The road test consists of the following three parts:

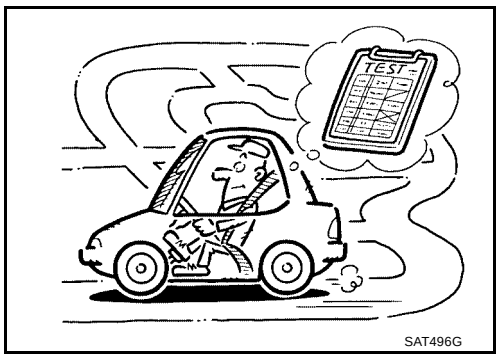
1. Check before engine is started
2. Check at idle



SAT786A

3. Cruise test

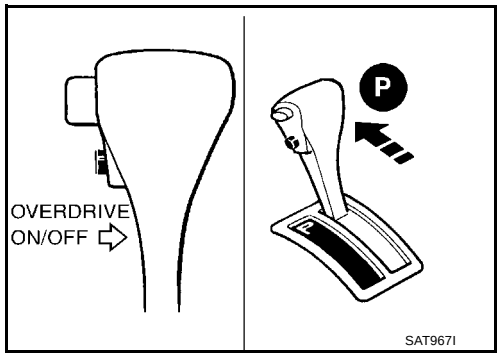
- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items until specified symptom is found. Troubleshoot items which check out No Good after road test. Refer to AT-38, "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" and AT-216, "TROUBLE DIAGNOSES FOR SYMPTOMS" .

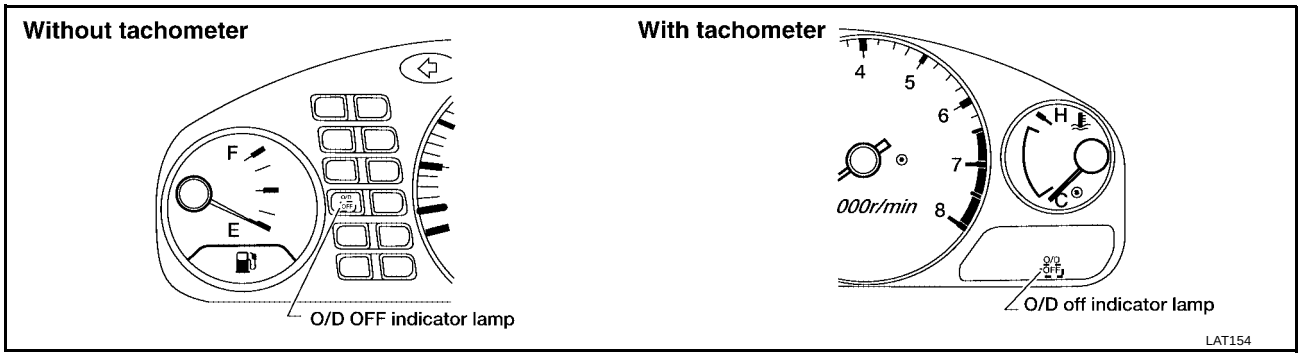


1. CHECK BEFORE ENGINE IS STARTED

1. CHECK O/D OFF INDICATOR LAMP

1. Park vehicle on flat surface.
2. Move A/T selector lever to “P” position.
3. Turn ignition switch to “OFF” position. Wait at least 5 seconds.
4. Turn ignition switch to “ON” position. (Do not start engine.)
5. Does O/D OFF indicator lamp come on for about 2 seconds?





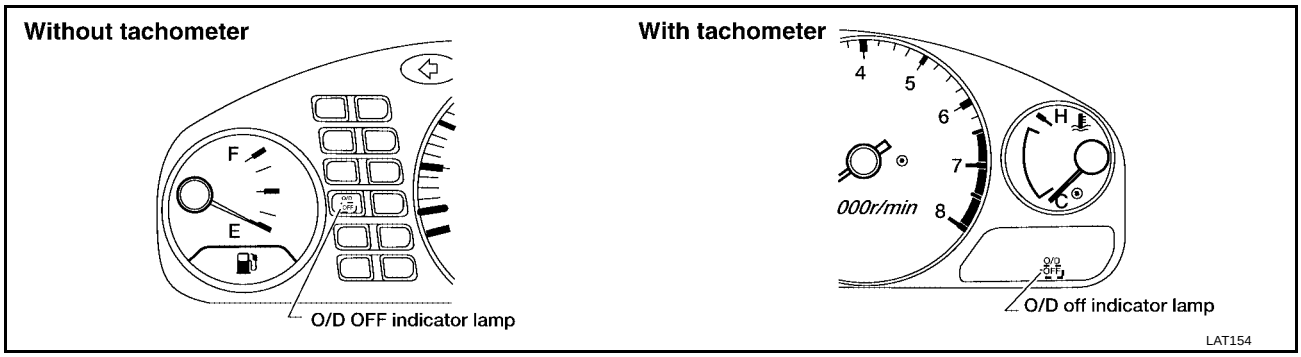
Yes or No

Yes >> GO TO 2.

No >> Stop ROAD TEST. Go to AT-221, "1. O/D OFF Indicator Lamp Does Not Come On" .

2. CHECK O/D OFF INDICATOR LAMP

Does O/D OFF indicator lamp flicker for about 8 seconds?



Yes or No

Yes >> TCM is in fail-safe mode. Perform self-diagnosis and check NG items on the AT-59, "Diagnostic Worksheet" . Refer to AT-52, "TCM Self-diagnostic Procedure (No Tools)" .

No >> 1. Turn ignition switch to “OFF” position.
2. Perform self-diagnosis and note NG items.
Refer to AT-52, "TCM Self-diagnostic Procedure (No Tools)" .
3. Go to AT-72, "2. CHECK AT IDLE" .

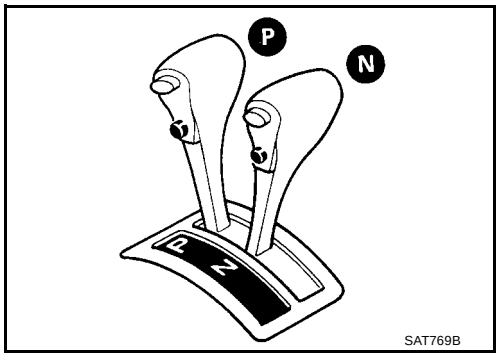
2. CHECK AT IDLE

1. CHECK ENGINE START

1. Park vehicle on flat surface.
2. Move A/T selector lever to “P” position.
3. Turn ignition switch to “OFF” position.
4. Turn ignition switch to “START” position.
5. Is engine started?

Yes or No

Yes >> GO TO 2.
No >> Stop ROAD TEST. Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-223, "2. Engine Cannot Be Started In “P” and “N” Position" .

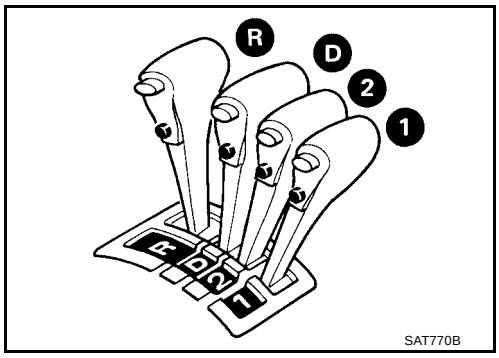


2. CHECK ENGINE START

1. Turn ignition switch to “ACC” position.
2. Move A/T selector lever to “D”, “1”, “2” or “R” position.
3. Turn ignition switch to “START” position.
4. Is engine started?

Yes or No

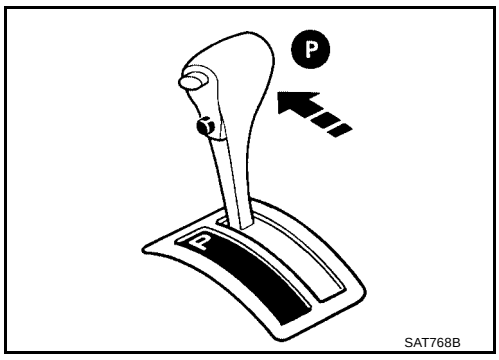
Yes >> Stop ROAD TEST. Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-223, "2. Engine Cannot Be Started In “P” and “N” Position" .
No >> GO TO 3.



3. CHECK VEHICLE MOVE

1. Move A/T selector lever to “P” position.
2. Turn ignition switch to “OFF” position.
3. Release parking brake.

>> GO TO 4.



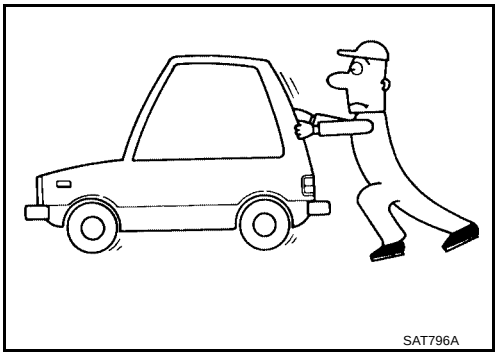
4. CHECK VEHICLE MOVE

1. Push vehicle forward or backward.
2. Does vehicle move when it is pushed forward or backward?
3. Apply parking brake.

Yes or No

Yes >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-224, "3. In “P” Position, Vehicle Moves Forward Or Backward When Pushed" . Continue ROAD TEST.

No >> GO TO 5.



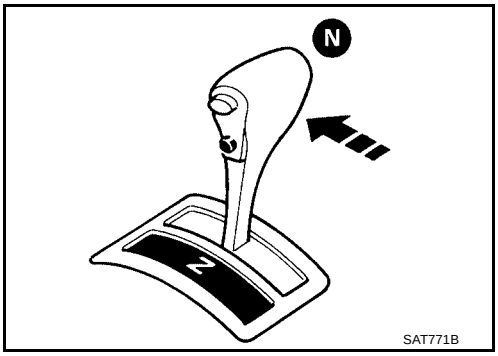
5. CHECK VEHICLE MOVE

1. Start engine.
2. Move A/T selector lever to “N” position.
3. Release parking brake.
4. Does vehicle move forward or backward?

Yes or No

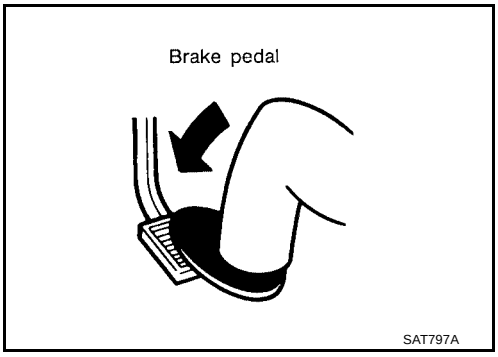
Yes >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-225, "4. In “N” Position, Vehicle Moves" . Continue ROAD TEST.

No >> GO TO 6.



6. CHECK SHIFT SHOCK

1. Apply foot brake.

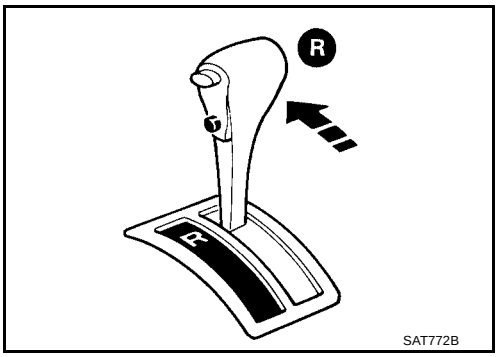


2. Move A/T selector lever to “R” position.
3. Is there large shock when changing from “N” to “R” position?

Yes or No

Yes >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-226, "5. Large Shock. “N” → “R” Position" . Continue ROAD TEST.

No >> GO TO 7.

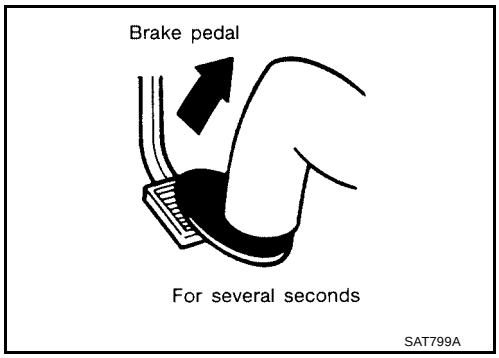


7. CHECK VEHICLE MOVE

1. Release foot brake for several seconds.
2. Does vehicle creep backward when foot brake is released?

Yes or No

Yes >> GO TO 8.
No >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-227, "6. Vehicle Does Not Creep Backward In “R” Position" . Continue ROAD TEST.

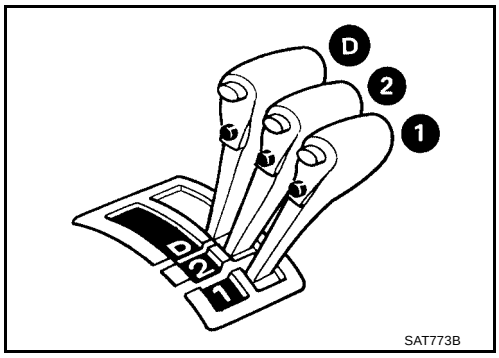


8. CHECK VEHICLE MOVE

1. Move A/T selector lever to “D”, “2” and “1” positions and check if vehicle creeps forward.
2. Does vehicle creep forward in all three positions?

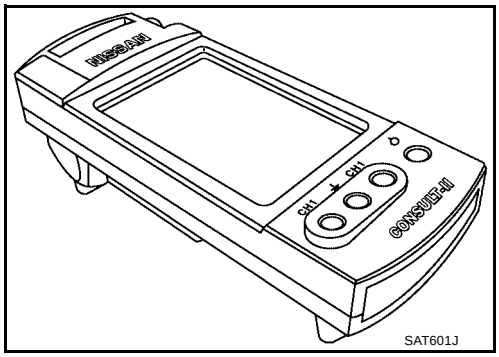
Yes or No

Yes >> Go to AT-74, "3. CRUISE TEST" .
No >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-229, "7. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position" . Continue ROAD TEST.



3. CRUISE TEST

- Check all items listed in Parts 1 through 3 of Diagnostic Worksheet.

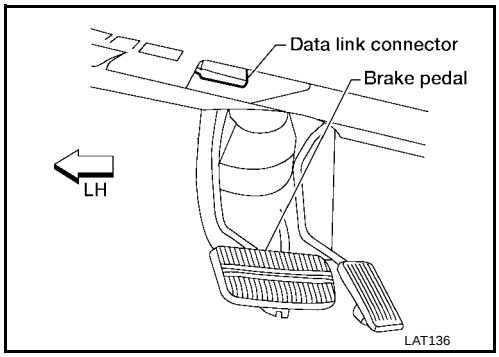


With CONSULT-II

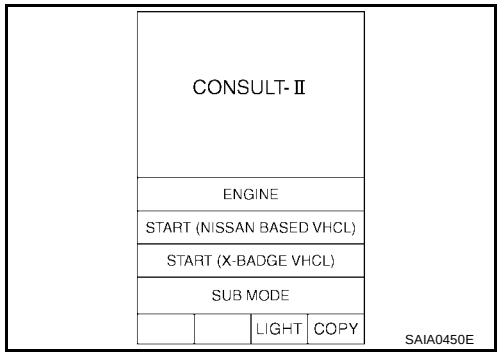
- Using CONSULT-II, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per Shift Schedule.

CONSULT-II Setting Procedure

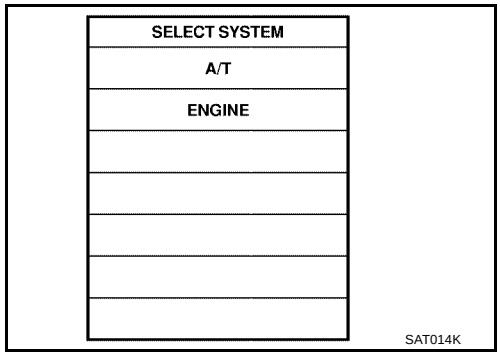
1. Turn ignition switch “OFF”.
2. Connect CONSULT-II to Data link connector which is located in left side lower dash panel.



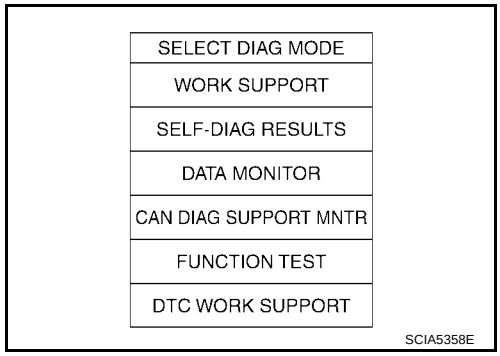
3. Turn ignition switch “ON”.
4. Touch “START (NISSAN BASED VHCL)”.



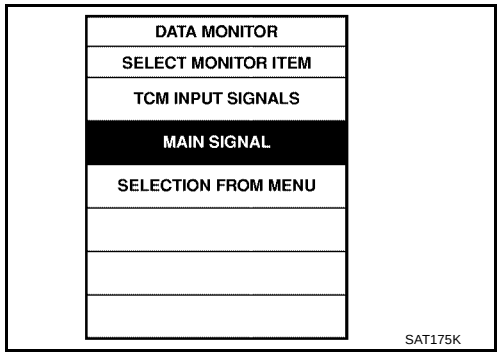
5. Touch “A/T”.



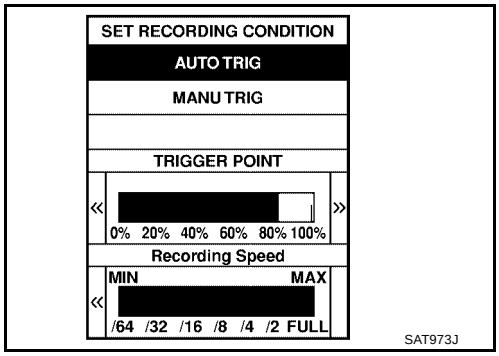
6. Touch “DATA MONITOR”.



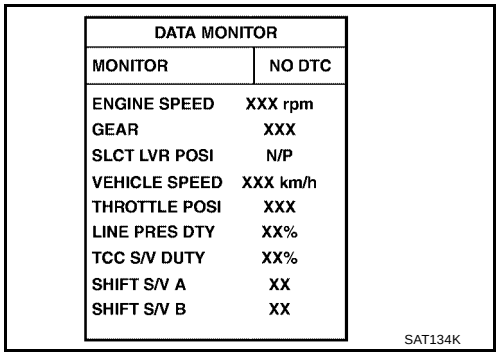
7. Touch “MAIN SIGNALS” or “TCM INPUT SIGNALS”.
8. See “Numerical Display”, “Barchart Display” or “Line Graph Display”.



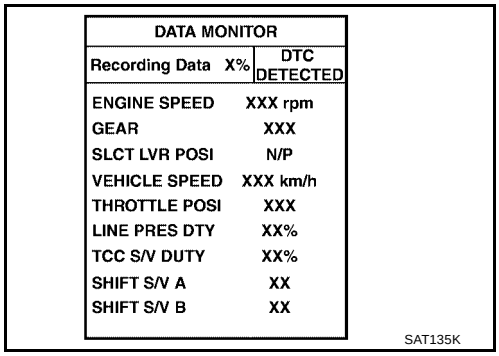
9. Touch “SETTING” to recording condition (“AUTO TRIG” or “MANU TRIG”) and touch “BACK”.
10. Touch “START”.



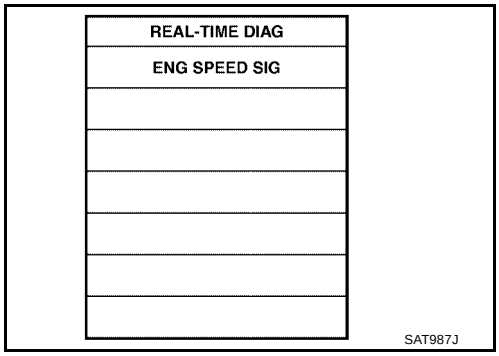
11. When performing cruise test, touch “RECORD”.

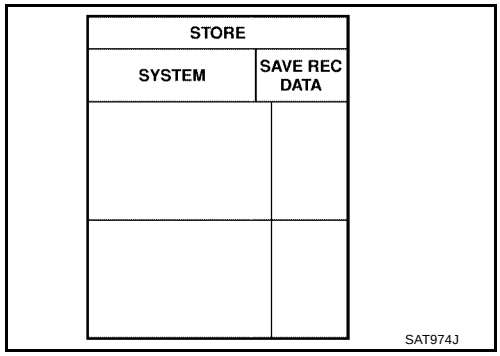


12. After finishing cruise test part 1, touch “STOP”.

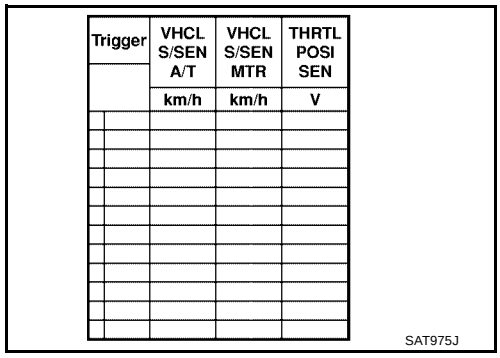


13. Touch “STORE” and touch “BACK”.



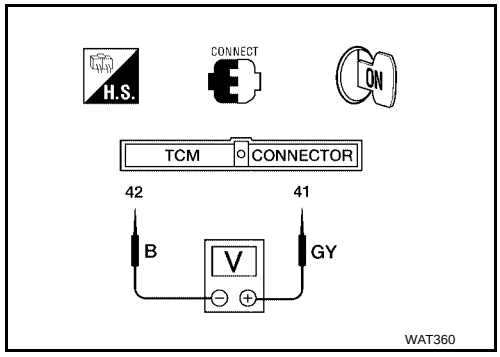


14. Touch “DISPLAY”.
15. Touch “PRINT”.
16. Check the monitor data printed out.
17. Continue cruise test part 2 and 3.



Without CONSULT-II

- Throttle position sensor can be checked by voltage across terminals 41 and 42 of TCM.



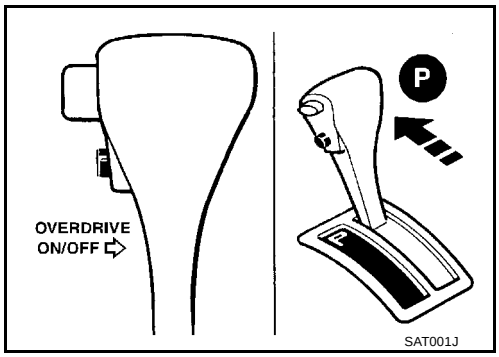
Cruise Test — Part 1

1. CHECK STARTING GEAR (D_1) POSITION

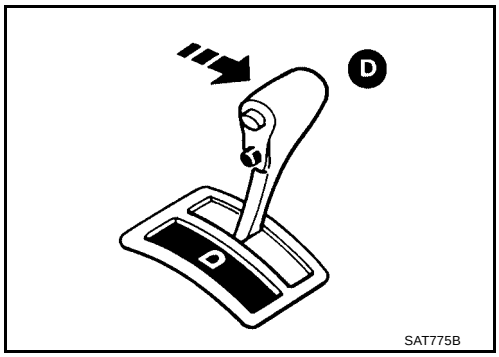
1. Drive vehicle for approx. 10 minutes to warm engine oil and ATF up to operating temperature.

   ATF operating temperature : 50 - 80°C (122 - 176°F)

2. Park vehicle on flat surface.
3. Set overdrive control switch to “ON” position.
4. Move A/T selector lever to “P” position.
5. Start engine.



6. Move A/T selector lever to “D” position.

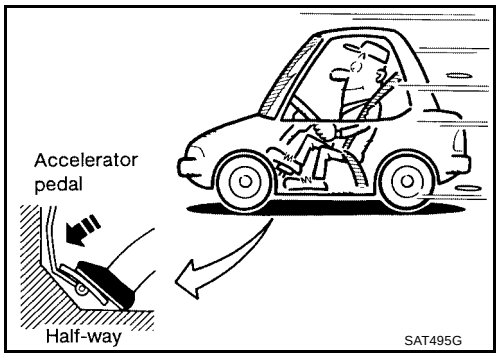


7. Accelerate vehicle by constantly depressing accelerator pedal halfway.
8. Does vehicle start from D_1 ?

   Read gear position.

Yes or No

Yes >> GO TO 2.
No >> Go to AT-231, "8. Vehicle Cannot Be Started From D_1" . Continue ROAD TEST.

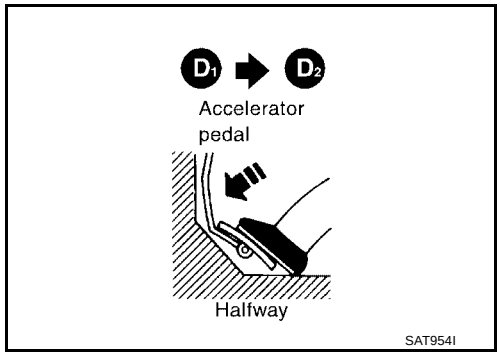


2. CHECK SHIFT UP (D_1 TO D_2)

Does A/T shift from D_1 to D_2 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_1 to D_2 **: Refer to AT-386, "Shift Schedule" .**



Yes or No

Yes >> GO TO 3.

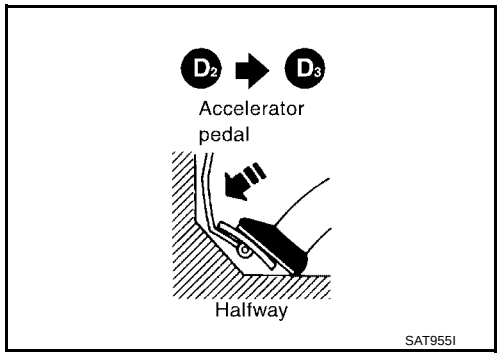
No >> Go to AT-234, "9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$" . Continue ROAD TEST.

3. CHECK SHIFT UP (D_2 TO D_3)

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle position and vehicle speed.

Specified speed when shifting from D_2 to D_3 **: Refer to AT-386, "Shift Schedule" .**



Yes or No

Yes >> GO TO 4.

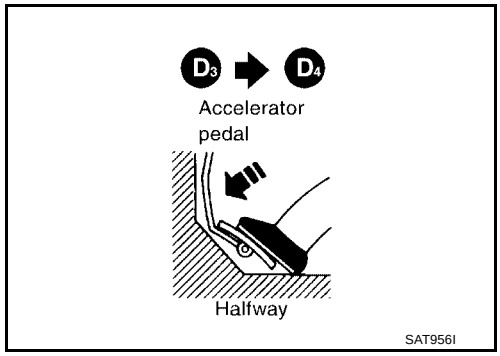
No >> Go to AT-236, "10. A/T Does Not Shift: $D_2 \rightarrow D_3$" . Continue ROAD TEST.

4. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Read gear position, throttle position and vehicle speed.

Specified speed when shifting from D_3 to D_4 **: Refer to AT-386, "Shift Schedule" .**



Yes or No

Yes >> GO TO 5.

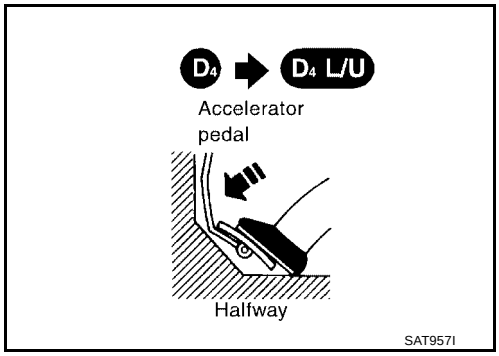
No >> Go to AT-238, "11. A/T Does Not Shift: $D_3 \rightarrow D_4$" . Continue ROAD TEST.

5. CHECK LOCK-UP (D4 TO D4 L/U)

Does A/T perform lock-up at the specified speed?

Read vehicle speed, throttle position when lock-up duty becomes 94%.

Specified speed when lock-up occurs : Refer to AT-386, "Shift Schedule" .



Yes or No

Yes >> GO TO 6.
No >> Go to AT-240, "12. A/T Does Not Perform Lock-up" . Continue ROAD TEST.

6. CHECK HOLD LOCK-UP

Does A/T hold lock-up condition for more than 30 seconds?

Yes or No

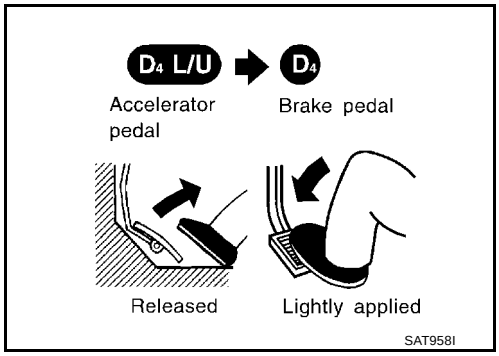
Yes >> GO TO 7.
No >> Go to AT-241, "13. A/T Does Not Hold Lock-up Condition" .

7. CHECK SHIFT DOWN (D4 L/U TO D4)

1. Release accelerator pedal.
2. Is lock-up released when accelerator pedal is released?

Yes or No

Yes >> GO TO 8.
No >> Go to AT-243, "14. Lock-up Is Not Released" . Continue ROAD TEST.



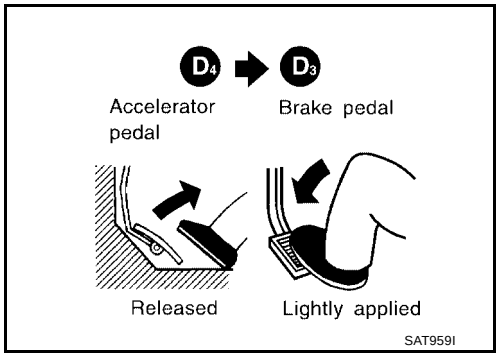
8. CHECK SHIFT DOWN (D4 TO D3)

1. Decelerate vehicle by applying foot brake lightly.
2. Does engine speed return to idle smoothly when A/T is shifted from D4 to D3 ?

Read gear position and engine speed.

Yes or No

Yes >> 1. Stop vehicle.
2. Go toAT-81, "Cruise Test — Part 2" .
No >> Go to AT-244, "15. Engine Speed Does Not Return To Idle (Light Braking D4 → D3)" . Continue ROAD TEST.



Cruise Test — Part 2

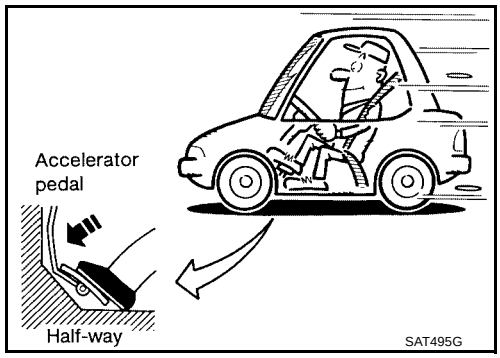
1. CHECK STARTING GEAR (D_1) POSITION

1. Confirm overdrive control switch is in “ON” position.
2. Confirm A/T selector lever is in “D” position.
3. Accelerate vehicle by half throttle again.
4. Does vehicle start from D_1 ?

Read gear position.

Yes or No

Yes >> GO TO 2.
No >> Go to AT-245, "16. Vehicle Does Not Start From D_1" . Continue ROAD TEST.



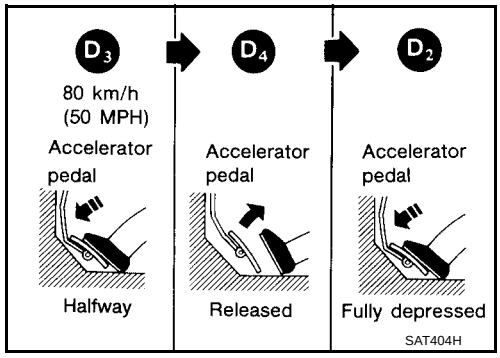
2. CHECK SHIFT UP AND SHIFT DOWN (D_3 TO D_4 TO D_2)

1. Accelerate vehicle to 80 km/h (50 MPH) as shown in illustration.
2. Release accelerator pedal and then quickly depress it fully.
3. Does A/T shift from D_4 to D_2 as soon as accelerator pedal is depressed fully?

Read gear position and throttle position.

Yes or No

Yes >> GO TO 3.
No >> Go to AT-234, "9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$" . Continue ROAD TEST.



3. CHECK SHIFT UP (D_2 TO D_3)

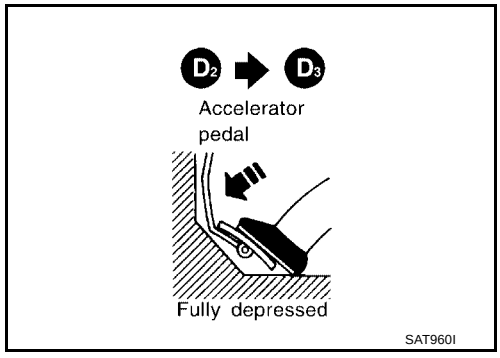
Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle position and vehicle speed.

Specified speed when shifting from D_2 to D_3 : Refer to **AT-386, "Shift Schedule"** .

Yes or No

Yes >> GO TO 4.
No >> Go to AT-236, "10. A/T Does Not Shift: $D_2 \rightarrow D_3$" . Continue ROAD TEST.



4. CHECK SHIFT UP (D_3 TO D_4) AND ENGINE BRAKE

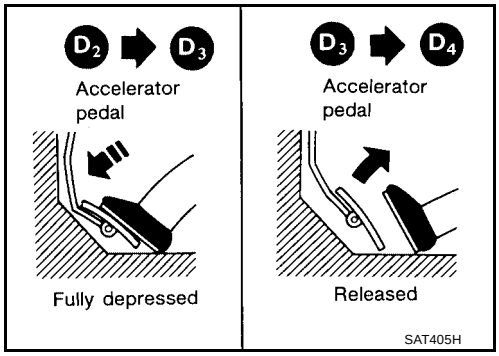
Release accelerator pedal after shifting from D_2 to D_3.
Does A/T shift from D_3 to D_4 and does vehicle decelerate by engine brake?

Read gear position, throttle position and vehicle speed.

Yes or No

Yes >> 1. Stop vehicle.
2. Go to AT-83, "Cruise Test — Part 3" .

No >> Go to AT-238, "11. A/T Does Not Shift: $D_3 \rightarrow D_4$" . Continue ROAD TEST.

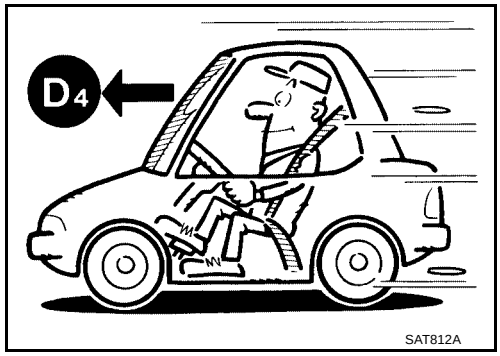


Cruise Test — Part 3

1. VEHICLE SPEED D_4 POSITION

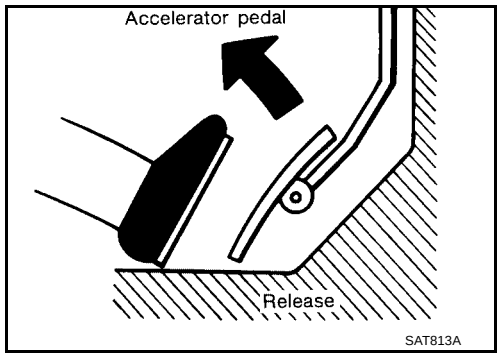
1. Confirm overdrive control switch is in “ON” position.
2. Confirm selector lever is in “D” position.
3. Accelerate vehicle using half-throttle to D_4 .

>> GO TO 2.



2. CHECK SHIFT DOWN (D_4 TO D_3)

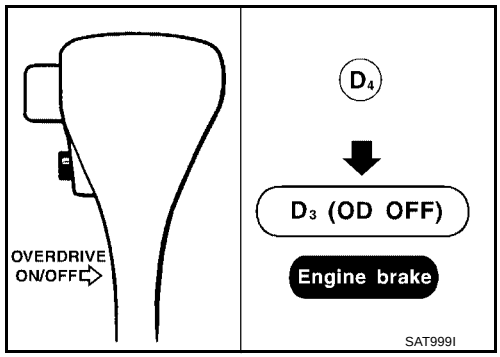
1. Release accelerator pedal.
2. Set overdrive control switch to “OFF” position while driving in D_4 .
3. Does A/T shift from D_4 to D_3 (O/D OFF)?



Read gear position and vehicle speed.

Yes or No

Yes >> GO TO 3.
No >> Go to AT-247, "17. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch “ON” → “OFF”" . Continue ROAD TEST.

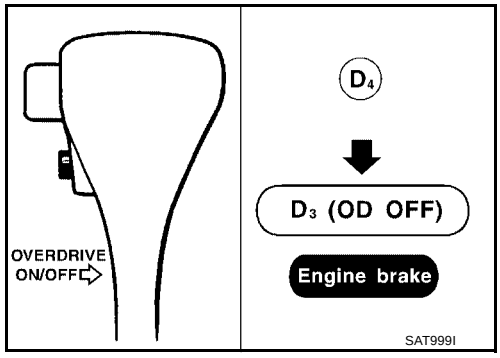


3. CHECK ENGINE BRAKE

Does vehicle decelerate by engine brake?

Yes or No

Yes >> GO TO 4.
No >> Go to AT-244, "15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)" . Continue ROAD TEST.



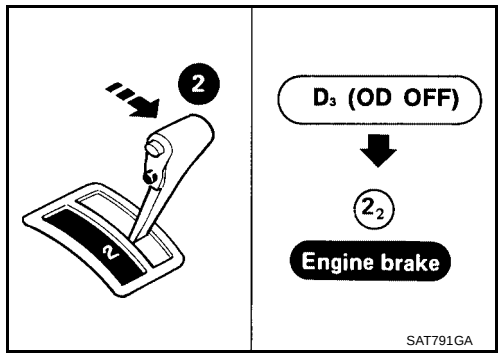
4. CHECK SHIFT DOWN (D_3 TO D_2)

1. Move A/T selector lever from “D” to “2” position while driving in D_3 (O/D OFF).
2. Does A/T shift from D_3 (O/D OFF) to D_2 ?

Read gear position.

Yes or No

Yes >> GO TO 5.
No >> Go to AT-248, "18. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever “D” → “2” Position" . Continue ROAD TEST.

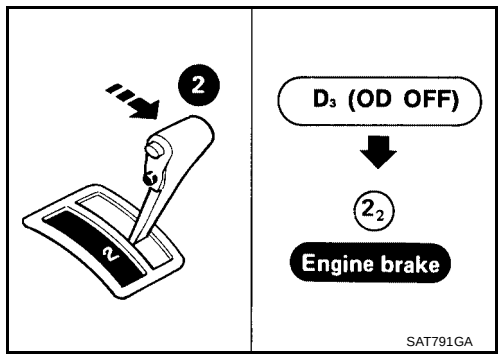


5. CHECK ENGINE BRAKE

Does vehicle decelerate by engine brake?

Yes or No

Yes >> GO TO 6.
No >> Go to AT-244, "15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)" . Continue ROAD TEST.



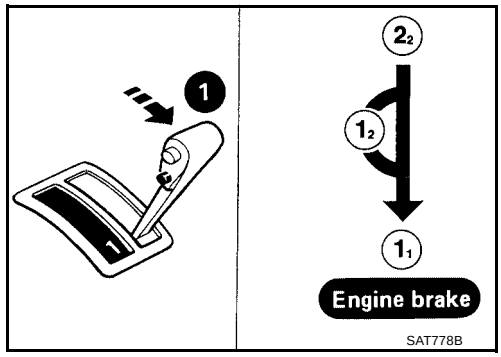
6. CHECK SHIFT DOWN

1. Move A/T selector lever from “2” to “1” position while driving in 2_2 .
2. Does A/T shift from 2_2 to 1_1 position?

Read gear position.

Yes or No

Yes >> GO TO 7.
No >> Go to AT-249, "19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever “2” → “1” Position" . Continue ROAD TEST.



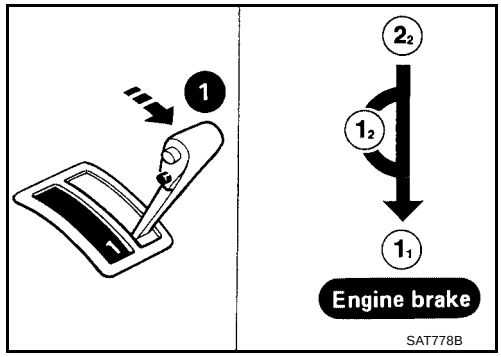
7. CHECK ENGINE BRAKE

Does vehicle decelerate by engine brake?

Yes or No

Yes >> 1. Stop vehicle.
2. Perform self-diagnosis. Refer to AT-52, "TCM Self-diagnostic Procedure (No Tools)" .

No >> Go to AT-250, "20. Vehicle Does Not Decelerate By Engine Brake" . Continue ROAD TEST.



TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

PFP:00000

Symptom Chart

ECS005WM

Numbers are arranged in order of inspection.
Perform inspections starting with number one and work up.

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Not Used	Engine cannot start in “P” and “N” positions. AT-223, "2. Engine Cannot Be Started In “P” and “N” Position"	ON vehicle	1. Ignition switch and starter	PG-2, "POWER SUPPLY ROUTING" and SC-9, "STARTING SYSTEM"	
			2. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			3. PNP switch adjustment	AT-263, "Park/Neutral Position (PNP) Switch Adjustment"	
	Engine starts in position other than “N” and “P” positions. AT-223, "2. Engine Cannot Be Started In “P” and “N” Position"	ON vehicle	1. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			2. PNP switch adjustment	AT-263, "Park/Neutral Position (PNP) Switch Adjustment"	
Not Used	Transaxle noise in “P” and “N” positions.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Line pressure test	AT-68, "Line Pressure Test"	
			3. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			4. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
		OFF vehicle	5. Oil pump	AT-293, "Components"	
			6. Torque converter	AT-273, "Disassembly"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Not Used	Vehicle moves when changing into “P” position, or parking gear does not disengage when shifted out of “P” position. AT-224, "3. In “P” Position, Vehicle Moves Forward Or Backward When Pushed"	ON vehicle	1. Control cable adjustment	AT-263, "Control Cable Adjustment"	
		OFF vehicle	2. Parking components	AT-268, "Components"	
	Vehicle moves in “N” position. AT-225, "4. In “N” Position, Vehicle Moves"	ON vehicle	1. Control cable adjustment	AT-263, "Control Cable Adjustment"	
		OFF vehicle	2. Forward clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			3. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			4. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
Slips/Will Not Engage	Vehicle will not run in “R” position (but runs in “D”, “2” and “1” positions). Clutch slips. Very poor acceleration. AT-227, "6. Vehicle Does Not Creep Backward In “R” Position"	ON vehicle	1. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			2. Stall test	AT-64, "Stall Test"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			5. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	6. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			7. High clutch	AT-319, "HIGH CLUTCH"	
			8. Forward clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			9. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			10. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Not Used	Vehicle braked when shifting into “R” position.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Line pressure test	AT-68, "Line Pressure Test"	
			3. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			4. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	5. High clutch	AT-319, "HIGH CLUTCH"	
			6. Brake band	AT-349, "Components"	
			7. Forward clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			8. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
Shift Shock	Sharp shock in shifting from “N” to “D” position.	ON vehicle	1. Engine idling rpm	EC-624, "Idle Speed/ Ignition Timing/ Idle Mixture Ratio Adjustment"	EC-43, "Idle Speed/ Ignition Timing/Idle Mixture Ratio Adjustment"
			2.Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. A/T fluid temperature sensor	AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT"	
			5. Engine speed signal	AT-132, "DTC P0725 ENGINE SPEED SIGNAL"	
			6. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			7. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			8. Accumulator N-D	AT-298, "Components"	
		OFF vehicle	9. Forward clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Slips/Will Not Engage	Vehicle will not run in “D” and “2” positions (but runs in “1” and “R” positions).	ON vehicle	1. Control cable adjustment	AT-263, "Control Cable Adjustment"	
		OFF vehicle	2. Low one-way clutch	AT-268, "Components"	
	Vehicle will not run in “D”, “1”, “2” positions (but runs in “R” position). Clutch slips. Very poor acceleration.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Stall test	AT-64, "Stall Test"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			5. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			6. Accumulator N-D	AT-298, "Components"	
		OFF vehicle	7. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			8. High clutch	AT-319, "HIGH CLUTCH"	
			9. Forward clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			10. Forward one-way clutch	AT-338, "Components"	
			11. Low one-way clutch	AT-268, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Slips/Will Not Engage	Clutches or brakes slip somewhat in starting.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			3. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			4. Line pressure test	AT-68, "Line Pressure Test"	
			5. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			6. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			7. Accumulator N-D	AT-298, "Components"	
			8. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			9. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
			10. Overrun clutch solenoid	AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE"	
			11. Torque converter clutch solenoid valve	AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE"	
		OFF vehicle	12. Forward clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	
			13. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			14. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	
			15. Oil pump	AT-293, "OIL PUMP"	
			16. Torque converter	AT-268, "Components"	
Not Used	Excessive creep.	ON vehicle	1. Engine idling rpm	EC-624, "Idle Speed/ Ignition Timing/ Idle Mixture Ratio Adjustment"	EC-43, "Idle Speed/ Ignition Timing/Idle Mixture Ratio Adjustment"

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Slips/Will Not Engage	No creep at all. AT-227, "6. Vehicle Does Not Creep Backward In “R” Position", AT-229, "7. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position"	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Line pressure test	AT-68, "Line Pressure Test"	
			3. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	4. Forward clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			5. Oil pump	AT-293, "OIL PUMP"	
			6. Torque converter	AT-268, "Components"	
No Up Shift	Failure to change gear from “D_1 ” to “D_2 ”.	ON vehicle	1. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			2. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			3. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			4. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			5. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
		OFF vehicle	6. Brake band	AT-349, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
No Up Shift	Failure to change gear from “D_2 ” to “D_3 ”.	ON vehicle	1. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			2. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
			3. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			4. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			5. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
		OFF vehicle	6. High clutch	AT-319, "HIGH CLUTCH"	
			7. Brake band	AT-349, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
No Up Shift	Failure to change gear from “D3 ” to “D4 ".	ON vehicle	1. PNP switch adjustment	AT-263, "Park/Neutral Position (PNP) Switch Adjustment"	
			2. Overdrive control switch	AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Over-drive Control and Throt-tle Position Sensor [Accelerator Pedal Posi-tion (APP) Sensor] Switches Circuit Checks}"	
			3. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			4. Vehicle speed sensor·A/T (Revolution sensor) and vehi-cle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SEN-SOR·A/T (REVOLU-TION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SEN-SOR·MTR"	
			5. A/T fluid temperature sen-sor	AT-121, "DTC P0710 A/T FLUID TEMPERA-TURE SENSOR CIR-CUIT"	
			6. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERA-TOR PEDAL POSI-TION (APP) SENSOR]"	
		OFF vehicle	7. Brake band	AT-349, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Improper Shift Timing	Too high a gear change point from “D1 ” to “D2 ”, from “D2 ” to “D3 ”, from “D3 ” to “D4 ”. AT-234, "9. A/T Does Not Shift: D1 → D2 Or Does Not Kickdown: D4 → D2", AT-236, "10. A/T Does Not Shift: D2 → D3" , AT-238, "11. A/T Does Not Shift: D3 → D4"	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" or AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)"	
			3. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			4. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
	Gear change directly from “D1 ” to “D3 ” occurs.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Accumulator servo release	AT-298, "Components"	
		OFF vehicle	3. Brake band	AT-349, "Components"	
Not Used	Engine stops when shifting lever into “R”, “D”, “2” and “1”.	ON vehicle	1. Engine idling rpm	EC-624, "Idle Speed/ Ignition Timing/ Idle Mixture Ratio Adjustment"	EC-43, "Idle Speed/ Ignition Timing/Idle Mixture Ratio Adjustment"
			2. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			3. Torque converter clutch solenoid valve	AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE"	
			4. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	5. Torque converter	AT-268, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Shift Shock	Too sharp a shock in change from “D_1 ” to “D_2 ”.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Line pressure test	AT-68, "Line Pressure Test"	
			3. Accumulator servo release	AT-298, "Components"	
			4. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			5. A/T fluid temperature sensor	AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT"	
		OFF vehicle	6. Brake band	AT-349, "Components"	
Shift Shock	Too sharp a shock in change from “D_2 ” to “D_3 ”.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Line pressure test	AT-68, "Line Pressure Test"	
			3. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			4. A/T fluid temperature sensor	AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT"	
		OFF vehicle	5. High clutch	AT-319, "HIGH CLUTCH"	
			6. Brake band	AT-349, "Components"	
Shift Shock	Too sharp a shock in change from “D_3 ” to “D_4 ”.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Line pressure test	AT-68, "Line Pressure Test"	
			3. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			4. A/T fluid temperature sensor	AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT"	
		OFF vehicle	5. Brake band	AT-349, "Components"	
			6. Forward one-way clutch	AT-325, "Components"	
			7. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Slips/Will Not Engage	Almost no shock or clutches slipping in change from “D_1 ” to “D_2 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Accumulator servo release	AT-298, "Components"	
			5. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	6. Brake band	AT-349, "Components"	
	Almost no shock or slipping in change from “D_2 ” to “D_3 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	5. High clutch	AT-319, "HIGH CLUTCH"	
			6. Brake band	AT-349, "Components"	
Slips/Will Not Engage	Almost no shock or slipping in change from “D_3 ” to “D_4 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2.Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	5. Brake band	AT-349, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Not Used	Vehicle braked by gear change from “D_1 ” to “D_2 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
		OFF vehicle	2. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			3. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	
			4. High clutch	AT-319, "HIGH CLUTCH"	
			5. Low one-way clutch	AT-268, "Components"	
	Vehicle braked by gear change from “D_2 ” to “D_3 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
		OFF vehicle	2. Brake band	AT-349, "Components"	
	Vehicle braked by gear change from “D_3 ” to “D_4 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
		OFF vehicle	2. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			3. Forward one-way clutch	AT-338, "Components"	
			4. Reverse clutch	AT-314, "REVERSE CLUTCH"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Not Used	Maximum speed not attained. Acceleration poor.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. PNP switch adjustment	AT-263, "Park/Neutral Position (PNP) Switch Adjustment"	
			3. Overdrive control switch	AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}"	
			4. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			5. Vehicle speed sensor · A/T (revolution sensor) and vehicle speed sensor · MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)"	
			6. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			7. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
			8. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	9. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			10. High clutch	AT-319, "HIGH CLUTCH"	
			11. Brake band	AT-349, "Components"	
			12. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	
			13. Oil pump	AT-293, "OIL PUMP"	
			14. Torque converter	AT-268, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
No Down Shift	Failure to change gear from “D4 ” to “D3 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2.Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Overrun clutch solenoid valve	AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE"	
			4. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			5. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			6. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	7. Brake band	AT-349, "Components"	
			8. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	
	Failure to change gear from “D3 ” to “D2 ” or from “D4 ” to “D2 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			4. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
			5. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	6. High clutch	AT-319, "HIGH CLUTCH"	
			7. Brake band	AT-349, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
No Down Shift	Failure to change gear from “D_2 ” to “D_1 ” or from “D_3 ” to “D_1 ”.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			4. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
			5. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	6. Low one-way clutch	AT-268, "Components"	
			7. High clutch	AT-319, "HIGH CLUTCH"	
			8. Brake band	AT-349, "Components"	
Shift Shock	Gear change shock felt during deceleration by releasing accelerator pedal.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Line pressure test	AT-68, "Line Pressure Test"	
			3. Overrun clutch solenoid valve	AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE"	
			4. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
Improper Shift Timing	Too high a change point from “D_4 ” to “D_3 ”, from “D_3 " to “D_2 ”, from “D_2 ” to “D_1 ”.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Improper Shift Timing	Kickdown does not operate when depressing pedal in “D4 ” within kickdown vehicle speed.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Revolution sensor and vehicle speed sensor	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			3. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			4. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
	Kickdown operates or engine overruns when depressing pedal in “D4 ” beyond kickdown vehicle speed limit.	ON vehicle	1. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			4. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Slips/Will Not Engage	Races extremely fast or slips in changing from “D4 ” to “D3 ” when depressing pedal.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			5. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			6. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	7. Brake band	AT-349, "Components"	
			8. Forward clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	
	Races extremely fast or slips in changing from “D4 ” to “D2 ” when depressing pedal.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			5. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			6. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
			7. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	8. Brake band	AT-349, "Components"	
			9. High clutch	AT-319, "HIGH CLUTCH"	
			10. Forward clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Slips/Will Not Engage	Races extremely fast or slips in changing from “D3 ” to “D2 ” when depressing pedal.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			5. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			6. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
		OFF vehicle	7. Brake band	AT-349, "Components"	
			8. High clutch	AT-319, "HIGH CLUTCH"	
	Races extremely fast or slips in changing from “D4 ” or “D3 ” to “D1 ” when depressing pedal.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			5. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			6. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
			7. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	8. Forward clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	
			9. Forward one-way clutch	AT-338, "Components"	
			10. Low one-way clutch	AT-268, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Slips/Will Not Engage	Vehicle will not run in any position.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
		OFF vehicle	5. Oil pump	AT-293, "OIL PUMP"	
			6. High clutch	AT-319, "HIGH CLUTCH"	
			7. Brake band	AT-349, "Components"	
			8. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	
			9. Torque converter	AT-268, "Components"	
			10. Parking components	AT-268, "Components"	
Not Used	Transmission noise in “D”, “2”, “1” and “R” positions.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
		OFF vehicle	2. Torque converter	AT-268, "Components"	
No Down Shift	Failure to change from “D_3” to “2_2” when changing lever into “2” position. AT-248, "18. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever “D” → “2” Position"	OFF vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Shift solenoid valve B	AT-184, "DTC P0755 SHIFT SOLENOID VALVE B"	
			3. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			4. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			5. Brake band	AT-349, "Components"	
Improper Shift Timing	Gear change from “2_2” to “2_3” in “2” position.	ON vehicle	1. PNP switch adjustment	AT-263, "Park/Neutral Position (PNP) Switch Adjustment"	
			2. Control cable adjustment	AT-263, "Control Cable Adjustment"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Not Used	Engine brake does not operate in “1” position. AT-249, "19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever “2” → “1” Position"	ON vehicle	1. PNP switch adjustment	AT-263, "Park/Neutral Position (PNP) Switch Adjustment"	
			2. Control cable adjustment	AT-263, "Control Cable Adjustment"	
			3. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			4. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
Not Used	Engine brake does not operate in “1” position. AT-249, "19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever “2” → “1” Position"	ON vehicle	5. Overrun clutch solenoid valve	AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE"	
		OFF vehicle	6. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	
			7. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	
Improper Shift Timing	Gear change from “1_1” to “1_2” in “1” position.	ON vehicle	1. PNP switch adjustment	AT-263, "Park/Neutral Position (PNP) Switch Adjustment"	
			2. Control cable adjustment	AT-263, "Control Cable Adjustment"	
No Down Shift	Does not change from “1_2” to “1_1” in “1” position.	ON vehicle	1. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			2. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			3. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	4. Low one-way clutch	AT-268, "Components"	
			5. Brake band	AT-349, "Components"	
			6. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	
Shift Shock	Large shock changing from “1_2” to “1_1” in “1” position.	ON vehicle	1. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	2. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Not used	Transaxle overheats.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Engine idling rpm	EC-624, "Idle Speed/ Ignition Timing/ Idle Mixture Ratio Adjustment"	EC-43, "Idle Speed/ Ignition Timing/Idle Mixture Ratio Adjustment"
			3. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			4. Line pressure test	AT-68, "Line Pressure Test"	
			5. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			6. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	7. Oil pump	AT-293, "OIL PUMP"	
			8. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			9. High clutch	AT-319, "HIGH CLUTCH"	
			10. Brake band	AT-349, "Components"	
			11. Forward clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	
			12. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	
			13. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	
			14. Torque converter	AT-268, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
Not Used	ATF shoots out during operation. White smoke emitted from exhaust pipe during operation.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
		OFF vehicle	2. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			3. High clutch	AT-319, "HIGH CLUTCH"	
			4. Brake band	AT-349, "Components"	
			5. Forward clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			6. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			7. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	
	Offensive smell at fluid charging pipe.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
		OFF vehicle	2. Torque converter	AT-268, "Components"	
			3. Oil pump	AT-293, "OIL PUMP"	
			4. Reverse clutch	AT-314, "REVERSE CLUTCH"	
			5. High clutch	AT-319, "HIGH CLUTCH"	
			6. Brake band	AT-349, "Components"	
			7. Forward clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			8. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVER-RUN CLUTCH"	
			9. Low & reverse brake	AT-333, "LOW & REVERSE BRAKE"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
No Lockup Engagement/ TCC Inoperative	Torque converter is not locked up.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			3. Engine speed signal	AT-132, "DTC P0725 ENGINE SPEED SIGNAL"	
			4. A/T fluid temperature sensor	AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT"	
			5. Line pressure test	AT-68, "Line Pressure Test"	
			6. Torque converter clutch solenoid valve	AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE"	
			7. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	8. Torque converter	AT-268, "Components"	

Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
No Lockup Engagement/ TCC Inoperative	Torque converter clutch piston slip.	ON vehicle	1. Fluid level	AT-64, "FLUID LEVEL CHECK"	
			2. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			3. Line pressure test	AT-68, "Line Pressure Test"	
			4. Torque converter clutch solenoid valve	AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE"	
			5. Line pressure solenoid valve	AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE"	
			6. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
		OFF vehicle	7. Torque converter	AT-268, "Components"	
	Lock-up point is extremely high or low.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			3. Torque converter clutch solenoid valve	AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE"	
			4. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	

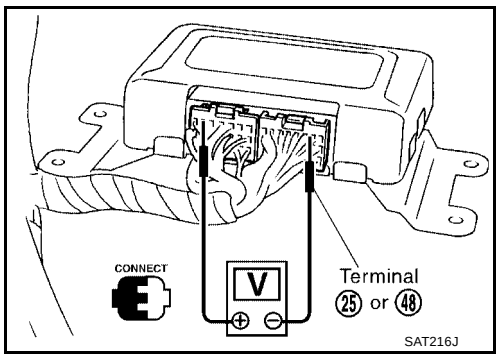
Items	Symptom	Condition	Diagnostic Item	Reference Page	
				QG18DE (SULEV)	QG18DE (ULEV)
No Up Shift	A/T does not shift to “D4 ” when driving with overdrive control switch “ON”.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"	
			2. PNP switch adjustment	AT-263, "Park/Neutral Position (PNP) Switch Adjustment"	
			3. Overdrive control switch	AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}"	
			4. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)", AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR"	
			5. Shift solenoid valve A	AT-180, "DTC P0750 SHIFT SOLENOID VALVE A"	
			6. Overrun clutch solenoid valve	AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE"	
			7. Control valve assembly	AT-298, "CONTROL VALVE ASSEMBLY"	
			8. A/T fluid temperature sensor	AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT"	
			9. Line pressure test	AT-68, "Line Pressure Test"	
		OFF vehicle	10. Brake band	AT-349, "Components"	
			11. Overrun clutch	AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH"	

TCM Terminals and Reference Value

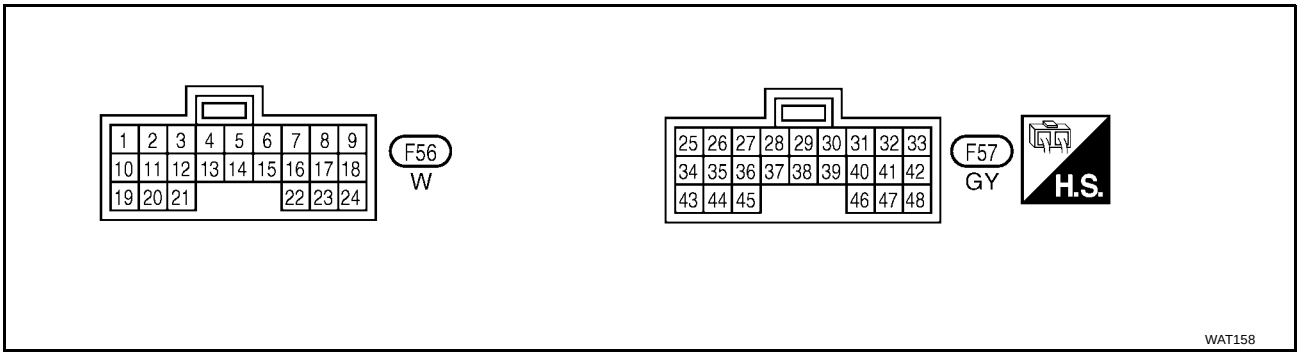
ECS005WN

PREPARATION

- Measure voltage between each terminal and terminal 25 or 48 by following “TCM INSPECTION TABLE”.

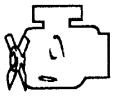


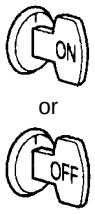
TCM HARNESS CONNECTOR TERMINAL LAYOUT

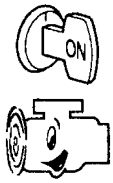


TCM INSPECTION TABLE

(Data are reference values.)

Terminal No.	Wire color	Item	Condition		Judgement standard (Approx.)
1	R/W	Line pressure solenoid valve		When releasing accelerator pedal after warming up engine.	1.5 - 3.0V
				When depressing accelerator pedal fully after warming up engine.	0V
2	P/B	Line pressure solenoid valve (with dropping resistor)		When releasing accelerator pedal after warming up engine.	4 - 14V
				When depressing accelerator pedal fully after warming up engine.	0V
3	Y/G	Torque converter clutch solenoid valve		When A/T performs lock-up.	8 - 15V
				When A/T does not perform lock-up.	0V
5	L	CAN-H		—	—
6	Y	CAN-L		—	—
10	BR/R	Power source		When turning ignition switch to “ON”.	Battery voltage
				When turning ignition switch to “OFF”.	0V

Terminal No.	Wire color	Item	Condition		Judgement standard (Approx.)
11	L/W	Shift solenoid valve A		When shift solenoid valve A operates. (When driving in "D_1 " or "D_4 ".)	Battery voltage
				When shift solenoid valve A does not operate. (When driving in "D_2 " or "D_3 ".)	0V
12	L/Y	Shift solenoid valve B		When shift solenoid valve B operates. (When driving in "D_1 " or "D_2 ".)	Battery voltage
				When shift solenoid valve B does not operate. (When driving in "D_3 " or "D_4 ".)	0V
19	PU	OBD-II		When turning ignition switch to "ON".	Battery voltage
				When turning ignition switch to "OFF".	0V
20	L/B	Overrun clutch solenoid valve		When overrun clutch solenoid valve operates.	Battery voltage
				When overrun clutch solenoid valve does not operate.	0V
25	B	Ground		—	0V
26	BR/Y	PNP switch "1" position		When setting selector lever to "1" position.	Battery voltage
				When setting selector lever to other positions.	0V
27	B/R	PNP switch "2" position		When setting selector lever to "2" position.	Battery voltage
				When setting selector lever to other positions.	0V
28	R/B	Power source (Memory back-up)		When turning ignition switch to "OFF".	Battery voltage
				When turning ignition switch to "ON".	Battery voltage
29	W	Revolution sensor		When moving at 20 km/h (12 MPH), use the CONSULT-II pulse frequency measuring function.*1 **CAUTION:** **Connect the diagnosis data link cable to the vehicle diagnosis connector.** *1: A circuit tester cannot be used to test this item.	150Hz
				When vehicle parks.	Under 1.3V or over 4.5V

Terminal No.	Wire color	Item	Condition		Judgement standard (Approx.)
30 **	G/B	Data link connector		—	—
31 **	GY/L	Data link connector		—	—
32	R	Throttle position sensor (Power source)		When turning ignition switch to "ON".	4.5 - 5.5V
				When turning ignition switch to "OFF".	0V
34	W/G	PNP switch “D” position		When setting selector lever to “D” position.	Battery voltage
				When setting selector lever to other positions.	0V
35	G/Y	PNP switch “R” position		When setting selector lever to “R” position.	Battery voltage
				When setting selector lever to other positions.	0V
36	LG	PNP switch “N” or “P” position		When setting selector lever to “N” or “P” position.	Battery voltage
				When setting selector lever to other positions.	0V
39 *	L/OR	Engine speed signal		Refer to EC-105, "ECM INSPECTION TABLE" [QG18DE (ULEV)] or EC-686, "ECM INSPECTION TABLE" [QG18DE (SULEV)].	—
40	PU/R	Vehicle speed sensor		When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.	Voltage varies between less than 1V and more than 4.5V
41 *	GY	Throttle position sensor		When depressing accelerator pedal slowly after warming up engine. (Voltage rises gradually in response to throttle position.)	Fully-closed throttle: 0.5 - 0.7V Fully-open throttle: 4V
42	B/W	Throttle position sensor (Ground)		—	0V
47	BR	A/T fluid temperature sensor		When ATF temperature is 20°C (68°F).	1.5V
				When ATF temperature is 80°C (176°F).	0.5V
48	B	Ground		—	0V

* : This terminal is connected to the ECM.
** : These terminals are connected to the Data link connector.

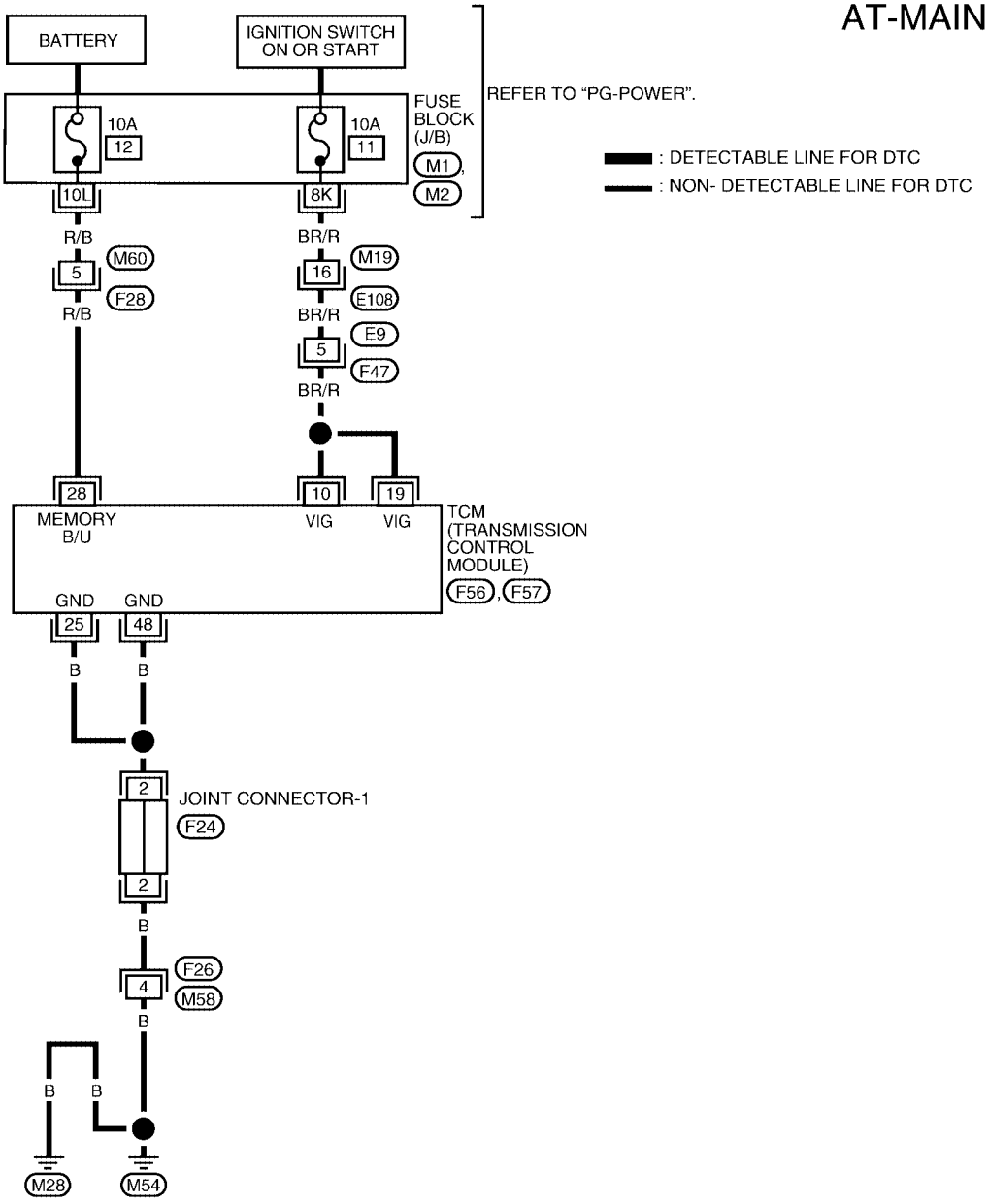
TROUBLE DIAGNOSIS FOR POWER SUPPLY

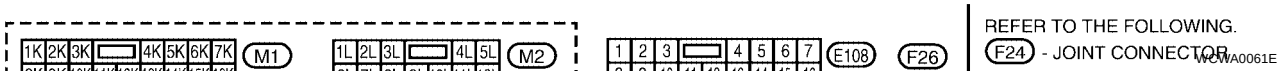
PFP:00000

Wiring Diagram — AT — MAIN

ECS005WO

AT-MAIN-01





TRANSMISSION CONTROL MODULE TERMINALS AND REFERENCE VALUE BETWEEN TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC) (Approx.)
10	BR/R	POWER SOURCE	WHEN TURNING IGNITION SWITCH TO "ON"	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO "OFF"	0V
19	BR/R	POWER SOURCE	WHEN TURNING IGNITION SWITCH TO "ON"	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO "OFF"	0V
25	B	GROUND	—	0C
28	R/B	POWER SOURCE (MEMORY BACKUP)	WHEN TURNING IGNITION SWITCH TO "OFF"	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO "ON"	BATTERY VOLTAGE
48	B	GROUND	—	0V

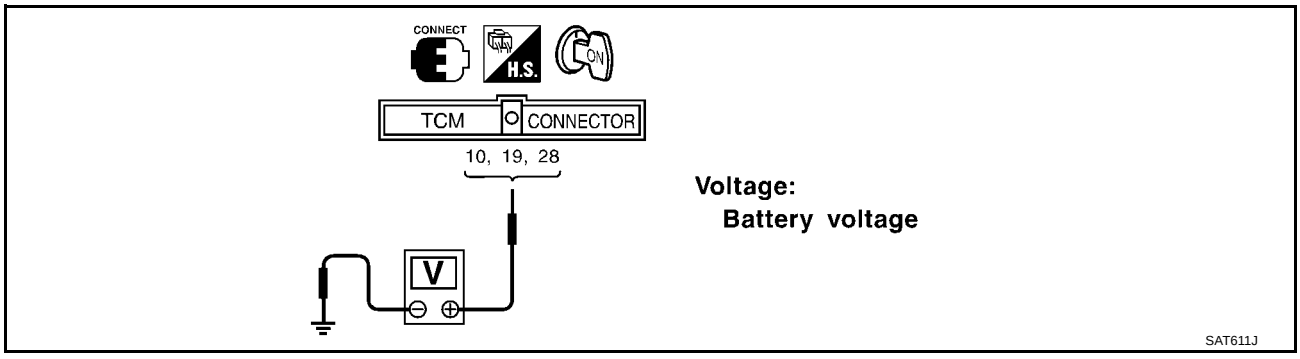
WAT338

Diagnostic Procedure

ECS005WP

1. CHECK TCM POWER SOURCE STEP 1

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Check voltage between TCM terminals 10, 19, 28 and ground.

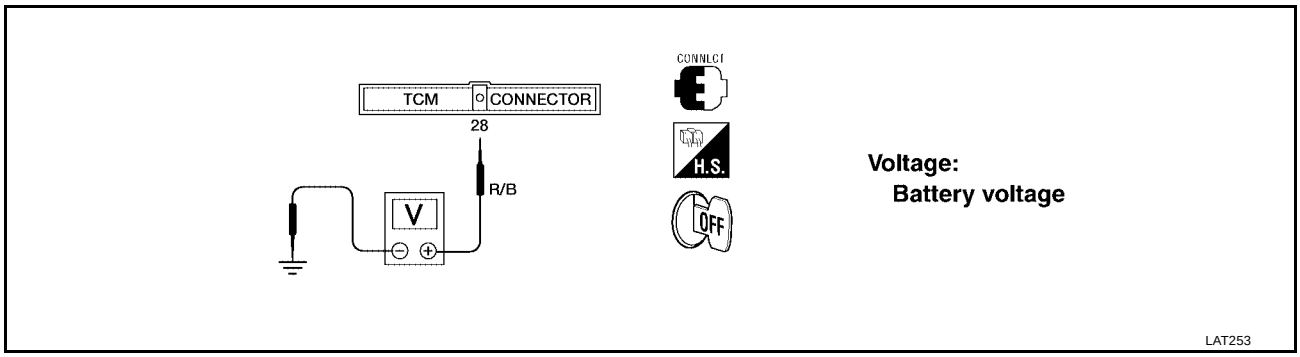


OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK TCM POWER SOURCE STEP 2

1. Turn ignition switch to OFF position.
2. Check voltage between TCM terminal 28 and ground.



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING ITEM

- Check the following items:
  - Harness for short or open between ignition switch and TCM terminals 10, 19 and 28 (Main harness)
  - Fuse
  - Ignition switch
    Refer to PG-2, "POWER SUPPLY ROUTING" .

OK or NG

OK >> GO TO 4.
NG >> Repair or replace damaged parts.

4. CHECK TCM GROUND CIRCUIT

1. Turn ignition switch to OFF position.
2. Disconnect TCM harness connector.
3. Check continuity between TCM terminals 25, 48 and ground. Refer to AT-113, "Wiring Diagram — AT — MAIN" .

Continuity should exist.

If OK, check harness for short to ground and short to power.

OK or NG

OK >> **INSPECTION END**
NG >> Repair open circuit or short to ground or short to power in harness connectors.

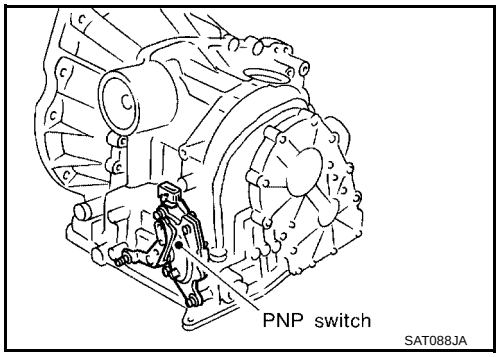
DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH

PFP:32006

Description

ECS005WQ

- The PNP switch assembly includes a transmission range switch.
- The transmission range switch detects the selector lever position and sends a signal to the TCM.



ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: PNP SW/CIRC : P0705	TCM does not receive the correct voltage signal from the switch based on the gear position.	● Harness or connectors (The PNP switch circuit is open or shorted.) ● PNP switch

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

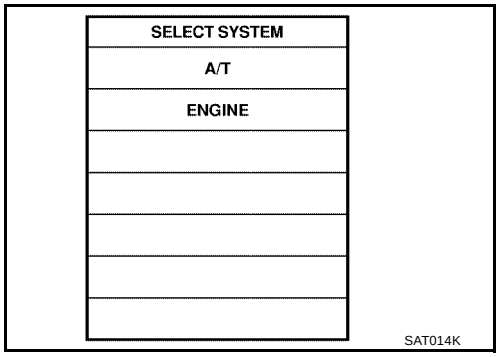
NOTE:

If “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.

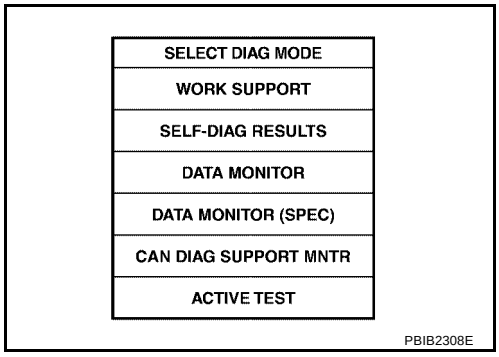
After the repair, perform the following procedure to confirm the malfunction is eliminated.

With CONSULT-II

1. Turn ignition switch “ON”.



2. Select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
3. Start engine and maintain the following conditions for at least 5 consecutive seconds.
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   THRTL POS SEN: More than 1.3V
   Selector lever: D position (OD “ON” or “OFF”)

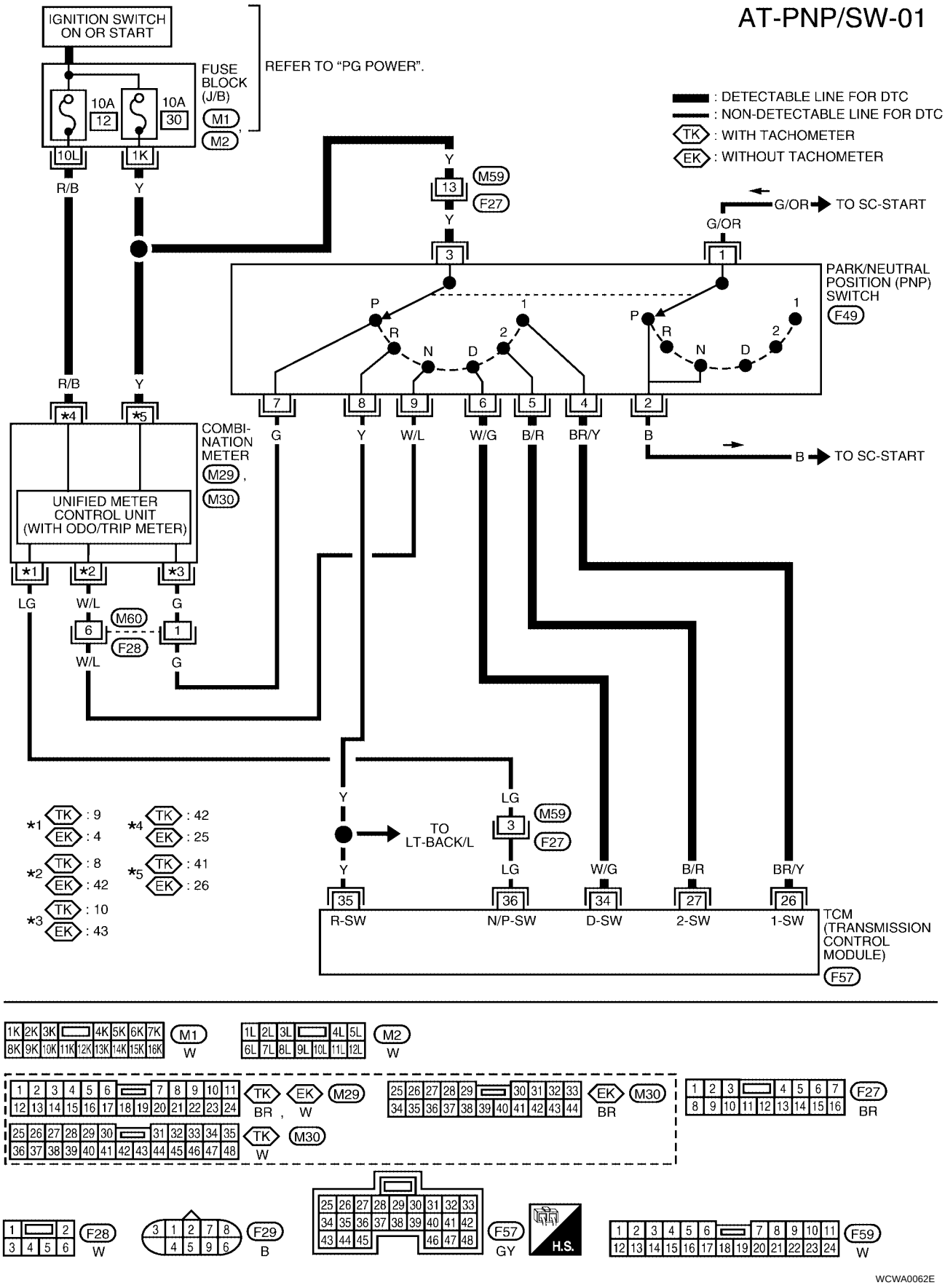


With GST

Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — PNP/SW

ECS005WR



WCWA0062E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
26	BR/Y	PNP SWITCH "1" POSITION	WHEN SETTING SELECTOR LEVER TO "1" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V
27	B/R	PNP SWITCH "2" POSITION	WHEN SETTING SELECTOR LEVER TO "2" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V
34	W/G	PNP SWITCH "D" POSITION	WHEN SETTING SELECTOR LEVER TO "D" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V
35	G/Y	PNP SWITCH "R" POSITION	WHEN SETTING SELECTOR LEVER TO "R" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V
36	LG	PNP SWITCH "N" OR "P" POSITION	WHEN SETTING SELECTOR LEVER TO "N" OR "P" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V

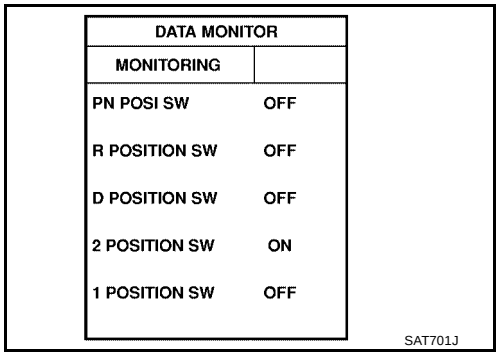
Diagnostic Procedure

ECS005WS

1. CHECK PNP SWITCH CIRCUIT (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch to “ON” position.
   (Do not start engine.)
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out “P/N”, “R”, “D”, “2” and “1” position switches moving selector lever to each position.
   Check the signal of the selector lever position is indicated properly.



OK or NG

OK >> GO TO 3.
NG >> Check the following items:

- PNP switch
  Refer toAT-120, "Component Inspection" .
- Harness for short or open between ignition switch and PNP switch (Main harness)
- Harness for short or open between PNP switch and TCM (Main harness)
- Ignition switch and fuse
  Refer to PG-2, "POWER SUPPLY ROUTING" .

2. CHECK PNP SWITCH CIRCUIT (WITHOUT CONSULT-II)

Without CONSULT-II

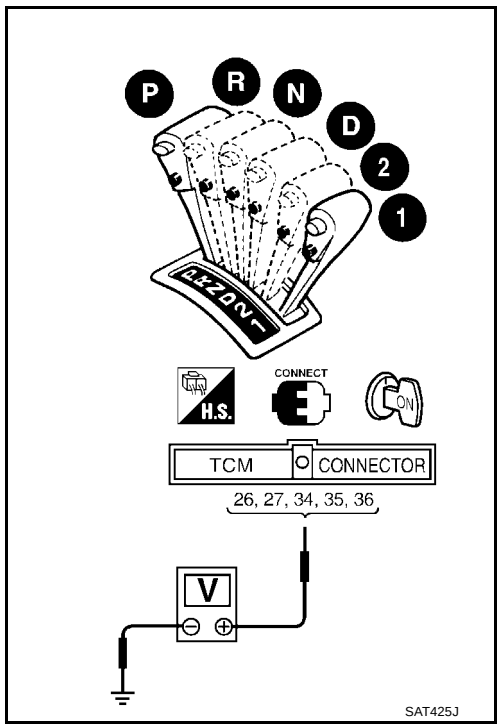
1. Turn ignition switch to “ON” position.
   (Do not start engine.)
2. Check voltage between TCM terminals 26, 27, 34, 35, 36 and ground while moving selector lever through each position.

Lever position	Terminal No.				
	36	35	34	27	26
P, N	B	0	0	0	0
R	0	B	0	0	0
D	0	0	B	0	0
2	0	0	0	B	0
1	0	0	0	0	B

Voltage

B : Battery voltage

0 : 0V



OK or NG

OK >> GO TO 3.

NG >> Check the following items:

- PNP switch
  Refer to AT-120, "Component Inspection" .
- Harness for short or open between ignition switch and PNP switch (Main harness)
- Harness for short or open between PNP switch and TCM (Main harness)
- Ignition switch and fuse
  Refer to PG-2, "POWER SUPPLY ROUTING" .

3. CHECK DTC

Perform AT-116, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**

NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

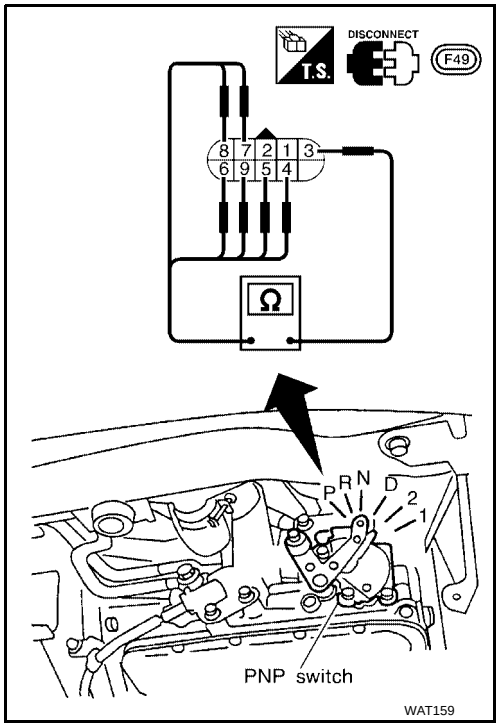
Component Inspection

ECS005WT

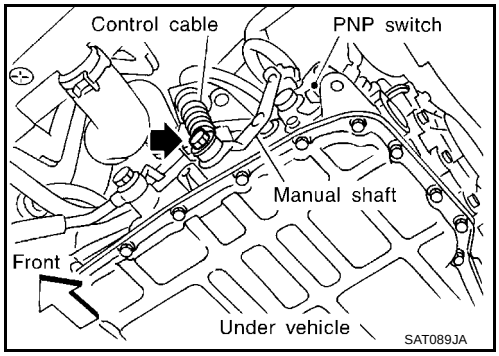
PARK/NEUTRAL POSITION SWITCH

1. Check continuity between terminals 1 and 2 and between terminals 3 and 4, 5, 6, 7, 8, 9 while moving manual shaft through each position.

Lever position	Terminal No.	
P	3 — 7	1 — 2
R	3 — 8	
N	3 — 9	1 — 2
D	3 — 6	
2	3 — 5	
1	3 — 4	



2. If NG, check again with control cable disconnected from manual shaft of A/T assembly. Refer to step 1.
3. If OK on step 2, adjust control cable. Refer to AT-263, "Control Cable Adjustment" .
4. If NG on step 2, remove PNP switch from A/T and check continuity of PNP switch terminals. Refer to step 1.
5. If OK on step 4, adjust PNP switch. Refer to AT-263, "Park/Neutral Position (PNP) Switch Adjustment" .
6. If NG on step 4, replace PNP switch.



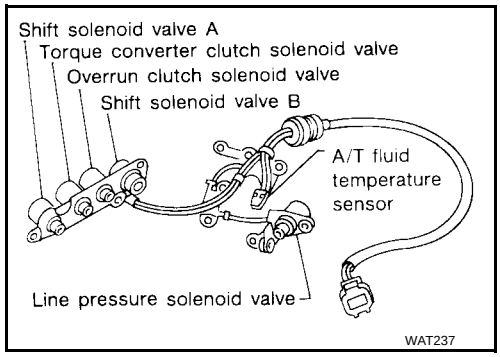
DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT

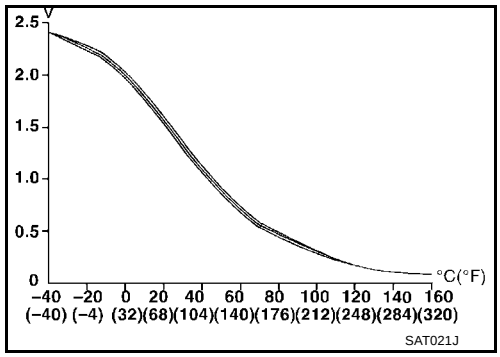
PFP:31940

Description

ECS005WU

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the TCM.





CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approx.)	
A/T fluid temperature sensor	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]	1.5V ↓ 0.5V	2.5 kΩ ↓ 0.3 kΩ

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: ATF TEMP SEN/CIRC : P0710	TCM receives an excessively low or high voltage from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● A/T fluid temperature sensor

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

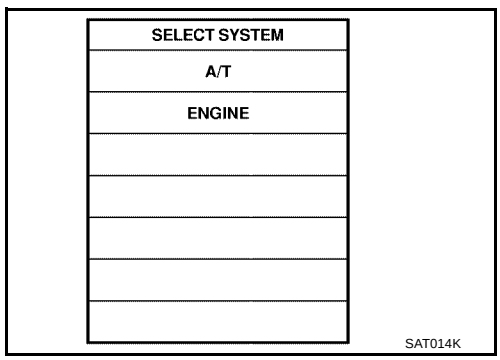
CAUTION:

Always drive vehicle at a safe speed.

NOTE:

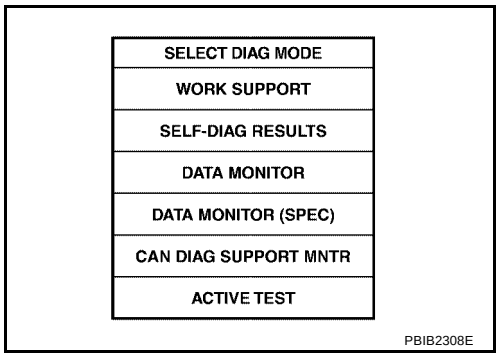
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.



With CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
2. Start engine and maintain the following conditions for at least 10 minutes (Total). (It is not necessary to maintain continuously.)
   CMPS·RPM (REF): 450 rpm or more
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   THRTL POS SEN: More than 1.2V
   Selector lever: D position (OD “ON”)



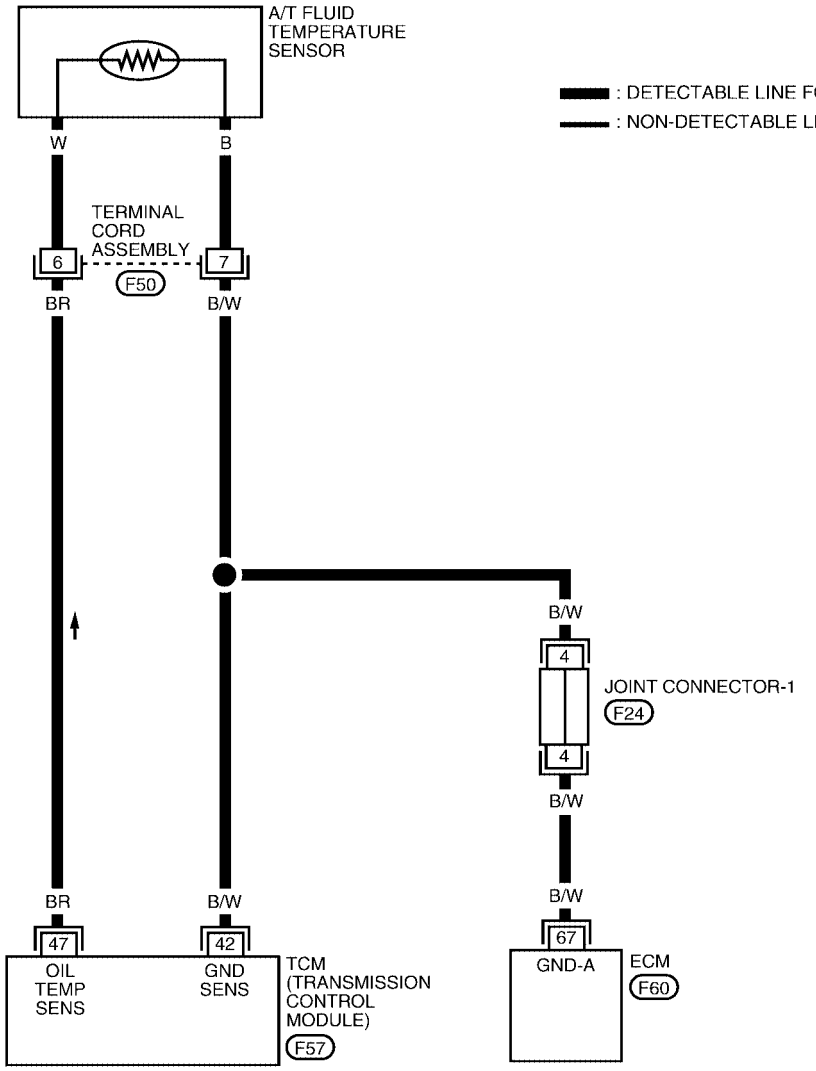
With GST

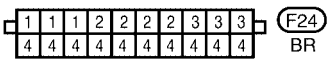
Follow the procedure “With CONSULT-II”.

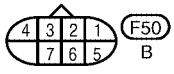
Wiring Diagram — AT — FTS

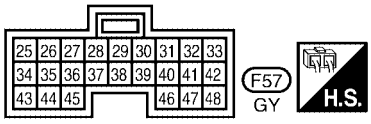
ECS005WV

AT-FTS-01









REFER TO THE FOLLOWING.
F60 - ELECTRICAL UNITS

WCWA0059E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
42	B/W	SENSOR (GROUND)	—	0V
47	BR	A/T FLUID TEMPERATURE SENSOR	WHEN ATF FLUID TEMPERATURE IS 20°C (68°F)	1.5V
			WHEN ATF FLUID TEMPERATURE IS 80°C (176°F)	0.5V

Diagnostic Procedure

ECS005WW

1. INSPECTION START

Do you have CONSULT-II?

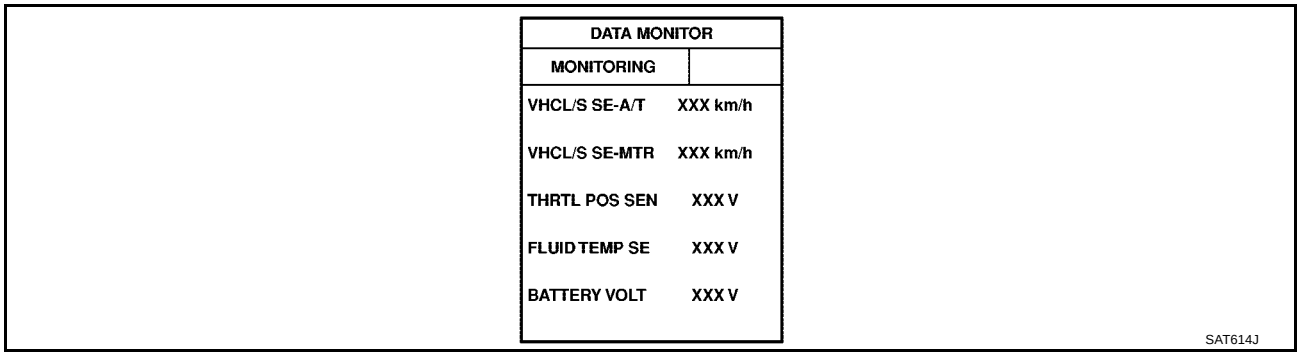
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR (WITH CONSULT-II)

With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “FLUID TEMP SE”.



Voltage

Cold [20°C (68°F)] → : Approximately 1.5V →
Hot [80°C (176°F)] 0.5V

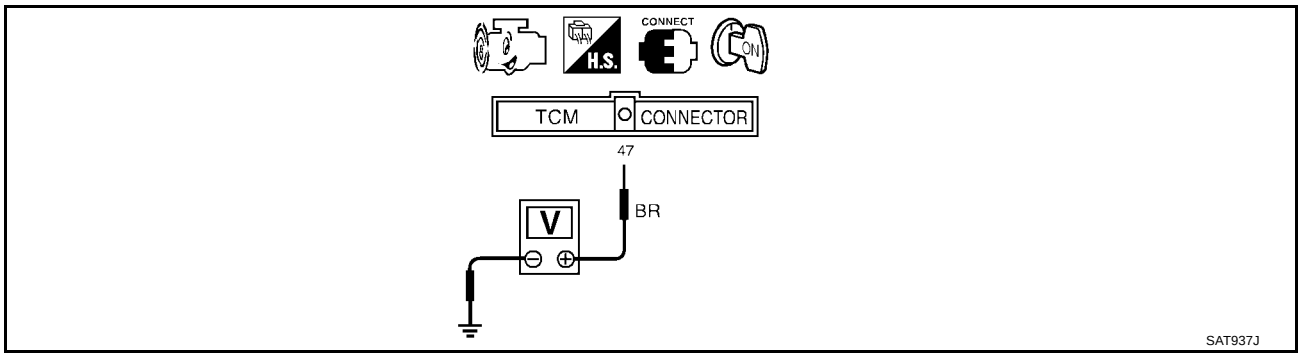
OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

3. CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR (WITHOUT CONSULT-II)

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM terminal 47 and ground while warming up A/T.



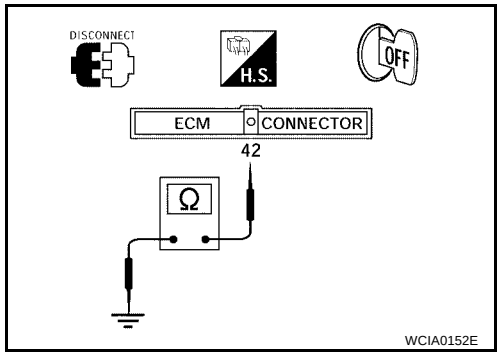
Voltage

Cold [20°C (68°F)] → : Approximately 1.5V →
Hot [80°C (176°F)] 0.5V

3. Turn ignition switch to “OFF” position.
4. Disconnect TCM harness connector.
5. Check continuity between TCM harness connector F57 terminal 42 (B/W) and ground.

Continuity should exist.

If OK, check harness for short to ground and short to power.



OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK DTC

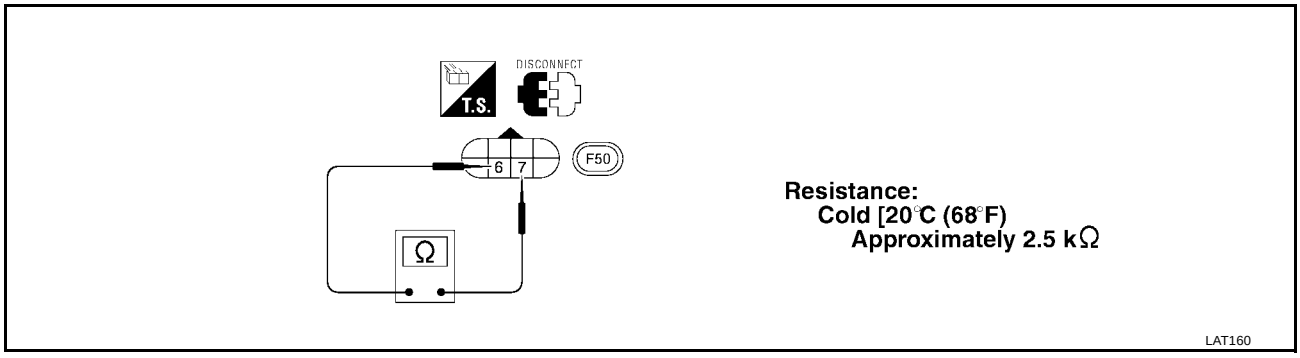
Perform AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" .

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

5. CHECK A/T FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY

1. Turn ignition switch to “OFF” position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals 6 and 7 when A/T is cold.



4. Reinstall any part removed.

OK or NG

OK (With CONSULT-II)>> GO TO 2.
OK (Without CONSULT-II)>> GO TO 3.
NG >> 1. Remove oil pan.
2. Check the following items:
- A/T fluid temperature sensor
  Refer to AT-126, "Component Inspection" .
- Harness of terminal cord assembly for short or open

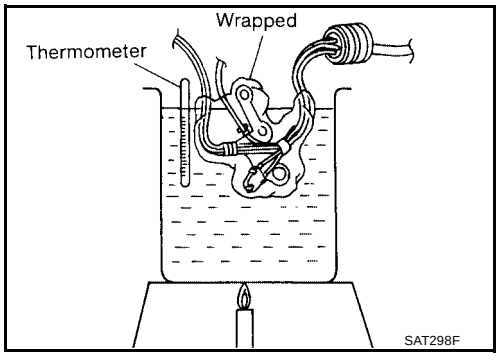
Component Inspection

ECS005WX

A/T FLUID TEMPERATURE SENSOR

- For removal, refer to AT-260, "Control Valve Assembly and Accumulators" .
- Check resistance between two terminals while changing temperature as shown at left.

Temperature °C (°F)	Resistance (Approx.)
20 (68)	2.5 kΩ
80 (176)	0.3 kΩ



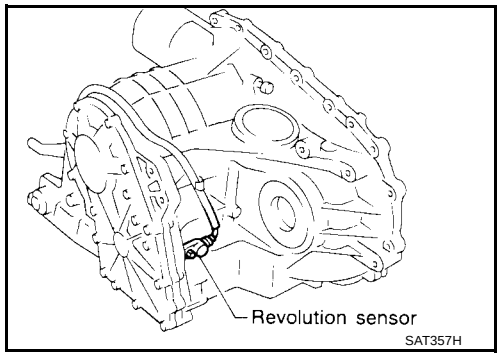
DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)

PFP:32702

Description

ECS005WY

The revolution sensor detects the revolution of the idler gear parking pawl lock gear and emits a pulse signal. The pulse signal is sent to the TCM which converts it into vehicle speed.



ON BOARD DIAGNOSIS LOGIC

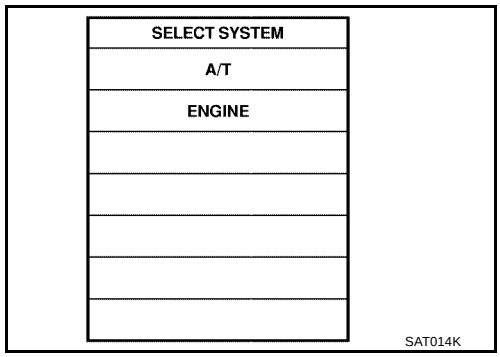
Diagnostic trouble code	Malfunction is detected when...	Check items (Possible cause)
: VEH SPD SEN/CIR AT	TCM does not receive the proper voltage signal from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Revolution sensor
: P0720		

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

CAUTION:

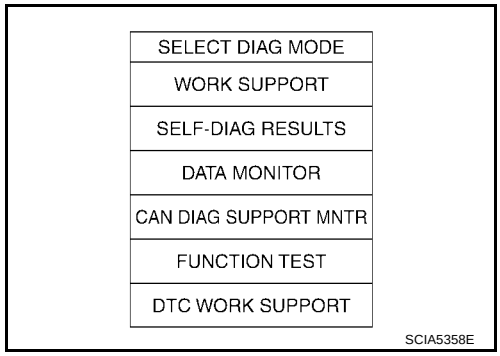
- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

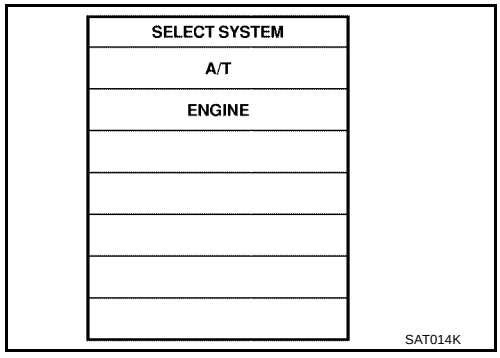
NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.



With CONSULT-II

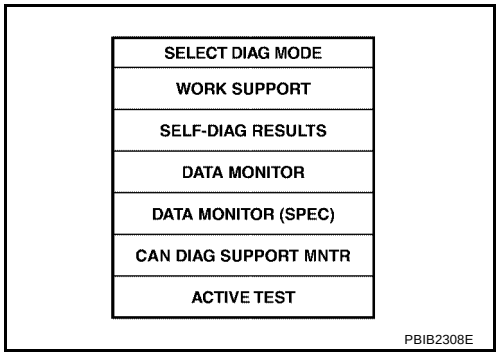
1. Turn ignition switch "ON" and select "DATA MONITOR" mode for "A/T" with CONSULT-II.
2. Drive vehicle and check for an increase of "VHCL/S SE·MTR" value increase.
   If the check result is NG, go to AT-127, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .
   If the check result is OK, go to following step.
3. Select "DATA MONITOR" mode for "ENGINE" with CONSULT-II.
4. Start engine and maintain the following conditions for at least 5 consecutive seconds.
   VHCL SPEED SE: 30 km/h (19 MPH) or more
   THRTL POS SEN: More than 1.2V
   Selector lever: D position (OD "ON")
   Driving location: Driving the vehicle uphill (increased engine load) will help maintain the driving conditions required for this test.
   If the check result is NG, go to AT-130, "Diagnostic Procedure" .





If the check result is OK, go to following step.

5. Maintain the following conditions for at least 5 consecutive seconds.
   CMPS·RPM (REF): 3,500 rpm or more
   THRTL POS SEN: More than 1.2V
   Selector lever: D position (OD "ON")
   Driving location: Driving the vehicle uphill (increased engine load) will help maintain the driving conditions required for this test.



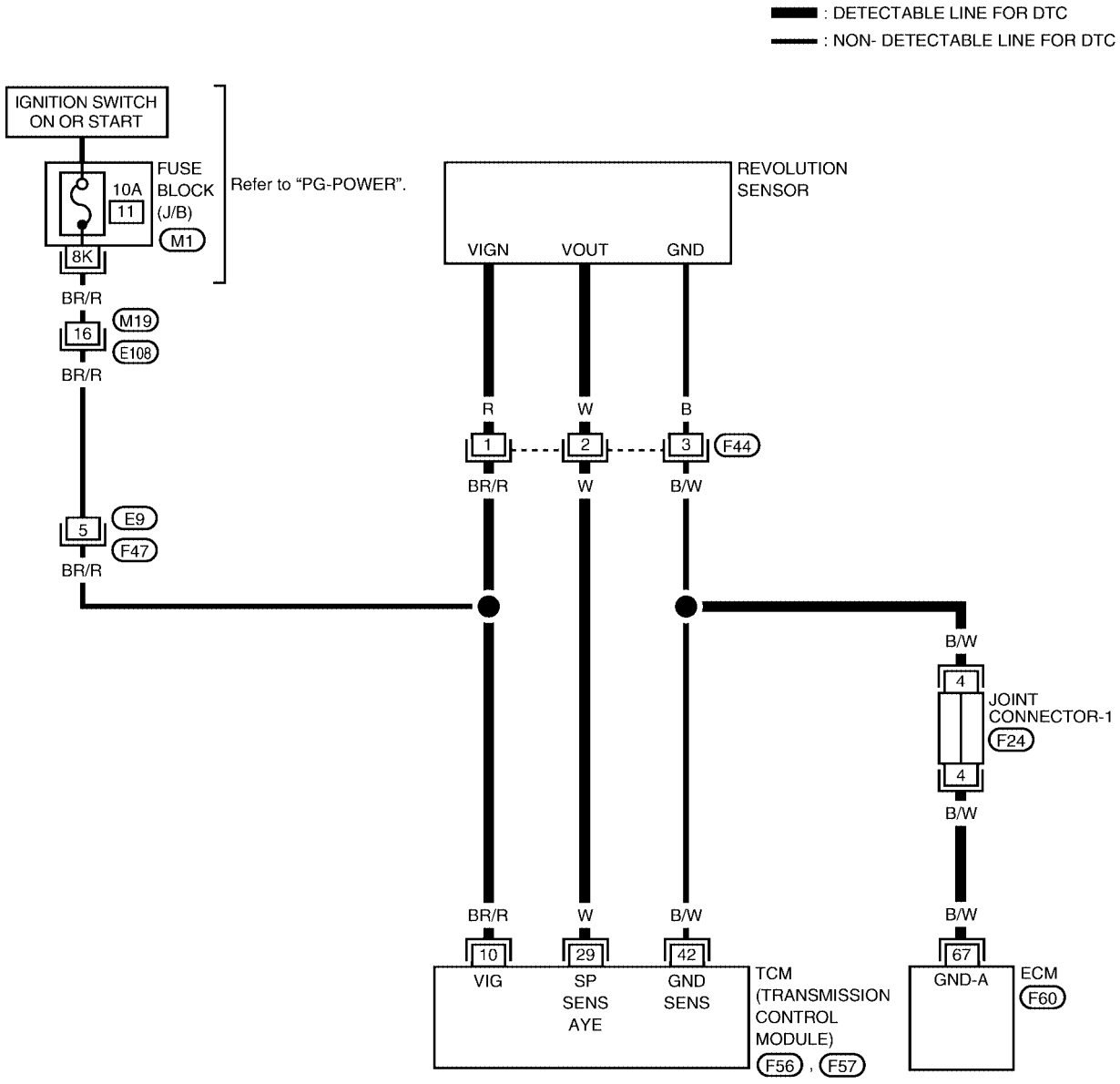
With GST

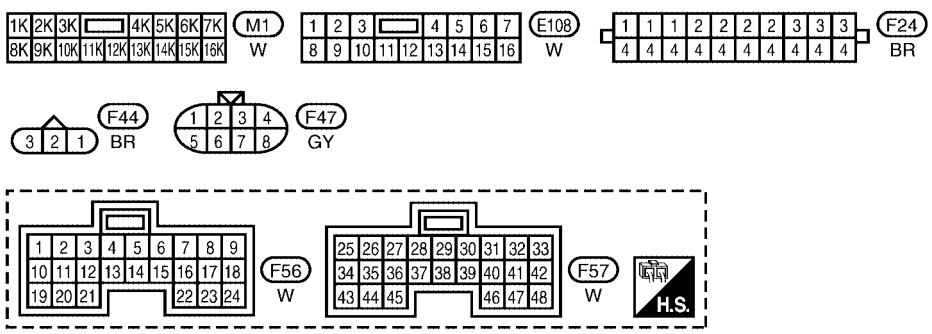
Follow the procedure "With CONSULT-II".

Wiring Diagram — AT — VSSA/T

ECS005WZ

AT-VSSA/T-01





Refer to the following.
F60 - ELECTRICAL UNITS

WCWA0063E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	BR/R	POWER SOURCE	WHEN TURNING IGNITION SWITCH TO "ON"	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO "OFF"	0V
29	W	REVOLUTION SENSOR	WHEN MOVING AT 20 KM/H (12 MPH). USE CONSULT-II PULSE FREQUENCY MEASURING FUNCTION	150 Hz
42	B/W	THROTTLE POSITION SENSOR (GROUND)	—	0V

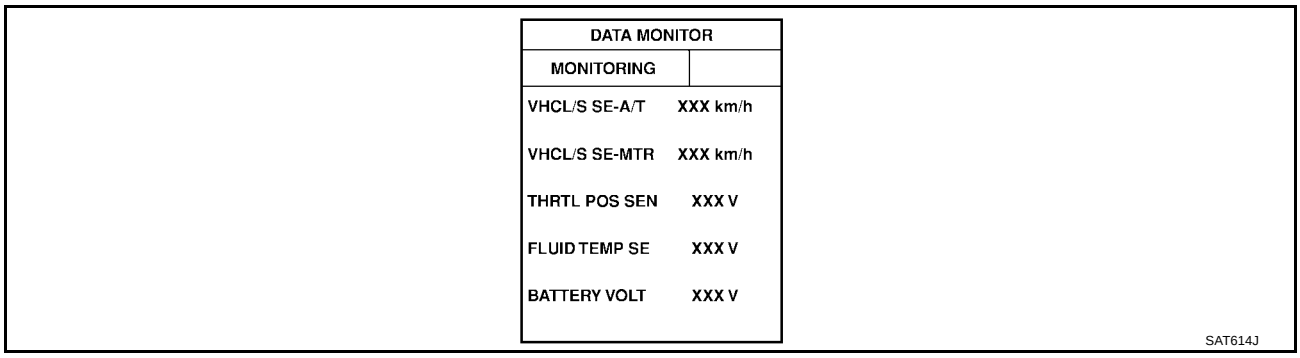
Diagnostic Procedure

ECS005X0

1. CHECK INPUT SIGNAL (WITH CONSULT-II)

With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “VHCL/S SE·A/T” while driving.
   Check the value changes according to driving speed.



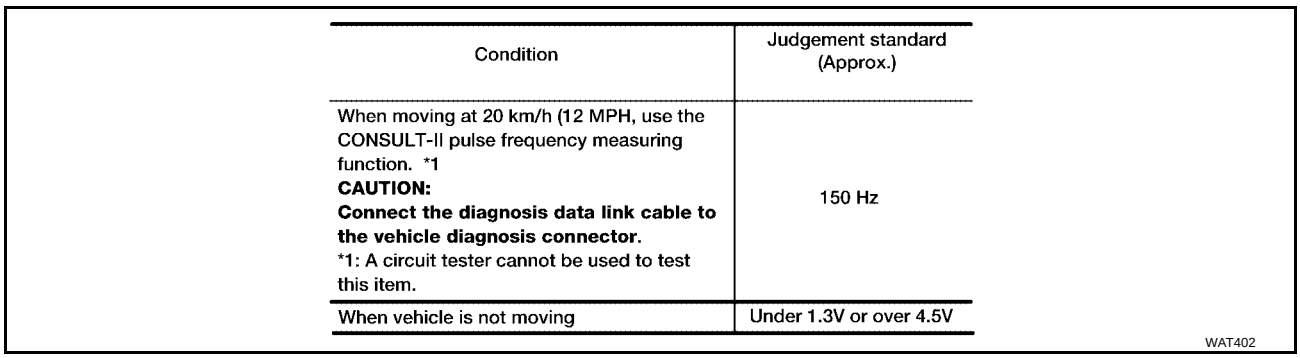
OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. CHECK REVOLUTION SENSOR (WITH CONSULT-II)

With CONSULT-II

1. Start engine.



- Check harness for short or open between TCM, ECM and revolution sensor. Refer to AT-129, "Wiring Diagram — AT — VSSA/T" .
- Check harness for short or open between ignition switch and revolution sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK DTC

Perform AT-127, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

DTC P0725 ENGINE SPEED SIGNAL

PFP:24825

Description

ECS005X1

The engine speed signal is sent from the ECM to the TCM.

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
: ENGINE SPEED SIG : P0725	TCM does not receive the proper voltage signal from ECM.	● Harness or connectors (The sensor circuit is open or shorted.)

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

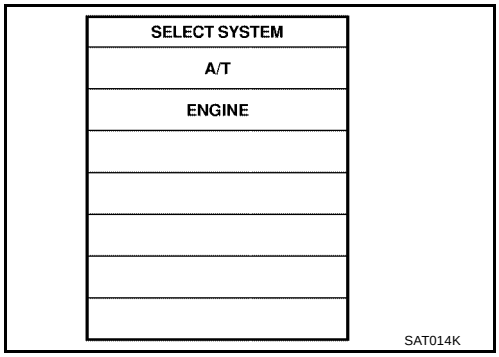
NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.

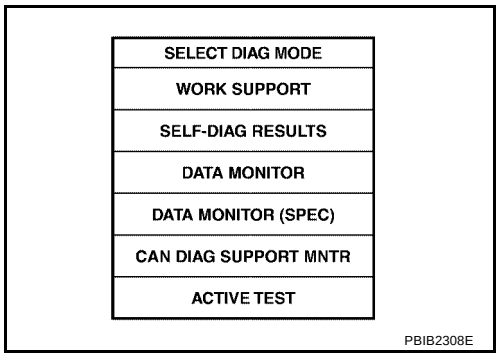
With CONSULT-II

1. Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT-II.
2. Start engine and maintain the following conditions for at least 10 consecutive seconds.
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   THRTL POS SEN: More than 1.2V
   Selector lever: D position (OD "ON")



With GST

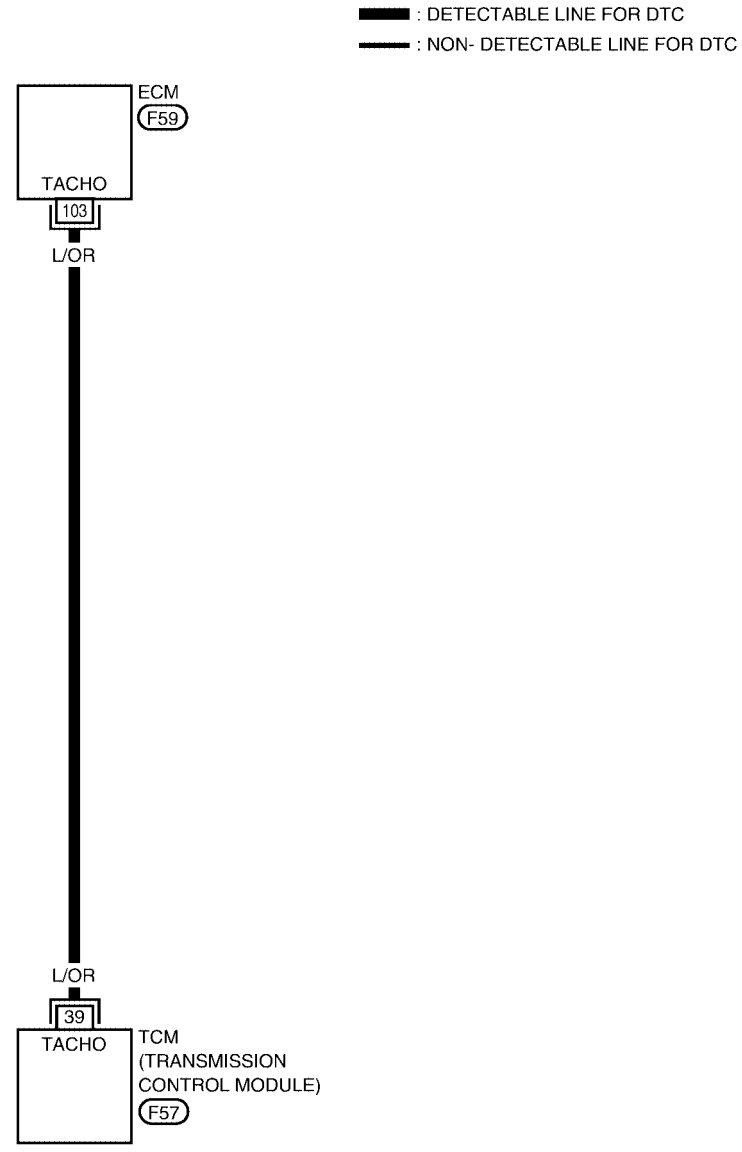
Follow the procedure "With CONSULT-II".

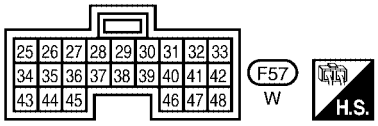


Wiring Diagram — AT — ENGSS

ECS005X2

AT-ENGSS-01





Refer to the following.
F29 - ELECTRICAL UNITS

WCWA0064E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
39	L/OR	ENGINE SPEED SIGNAL	REFER TO ECM TABLE	—

Diagnostic Procedure

ECS005X3

1. CHECK DTC WITH ECM

Perform diagnostic test mode II (self-diagnostic results) for engine control. Check ignition signal circuit condition.

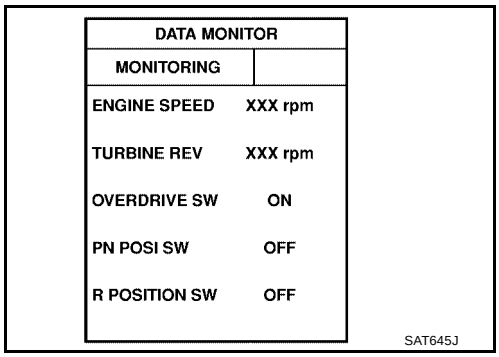
OK or NG

OK (With CONSULT-II)>> GO TO 2.
OK (Without CONSULT-II)>> GO TO 3.
NG >> Check ignition signal circuit for engine control. Refer to EC-38, "INPUT/OUTPUT SIGNAL CHART" [QG18DE (ULEV)] or EC-619, "INPUT/OUTPUT SIGNAL CHART" [QG18DE (SULEV)].

2. CHECK INPUT SIGNAL (WITH CONSULT-II)

With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “ENGINE SPEED”.
   Check engine speed changes according to throttle position.



OK or NG

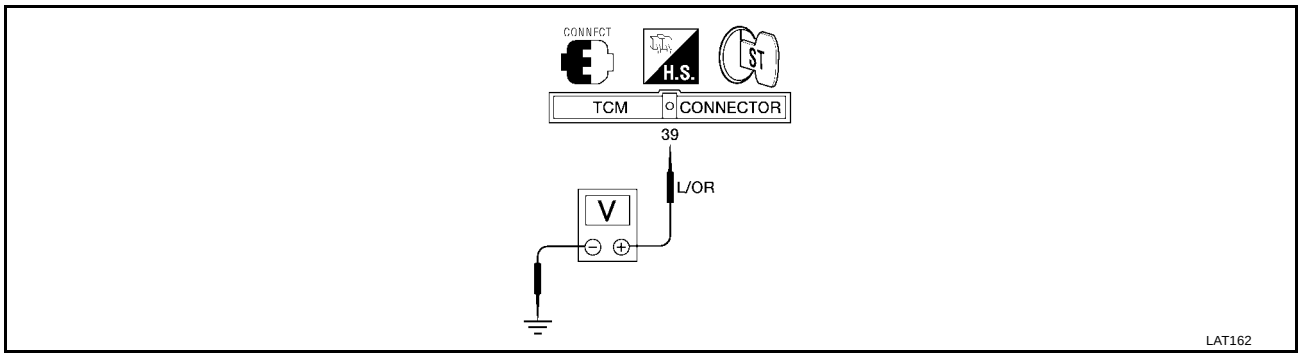
OK >> GO TO 4.
NG >> Check the following items:

- Harness for short or open between TCM and ECM
- Resistor and ignition coil
  Refer to EC-38, "SYSTEM DESCRIPTION" [QG18DE (ULEV) or EC-619, "SYSTEM DESCRIPTION" [QG18DE (SULEV)].

3. CHECK INPUT SIGNAL (WITHOUT CONSULT-II)

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM terminal 39 and ground.



Voltage (Idle speed) **: Refer to AT-110, "TCM Terminals and Reference Value" .**

OK or NG

OK >> GO TO 4.
NG >> Check the following items:

- Harness for short or open between TCM and ECM
- Resistor and ignition coil
  Refer to EC-38, "SYSTEM DESCRIPTION" [QG18DE (ULEV)] or EC-619, "SYSTEM DESCRIPTION" [QG18DE (SULEV)].

4. CHECK DTC

Perform AT-132, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

DTC P0731 A/T 1ST GEAR FUNCTION

PFP:31940

Description

ECS005X4

- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into first gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, etc.

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

ON BOARD DIAGNOSTIC LOGIC

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (1st) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when either shift solenoid valve A is stuck open or shift solenoid valve B is stuck open.

Gear position supposed by TCM	1	2	3	4
In case of gear position with no malfunctions	1	2	3	4
In case of gear position with shift solenoid valve A stuck open	2*	2	3	3
In case of gear position with shift solenoid valve B stuck open	4*	3	3	4

*: P0731 is detected.

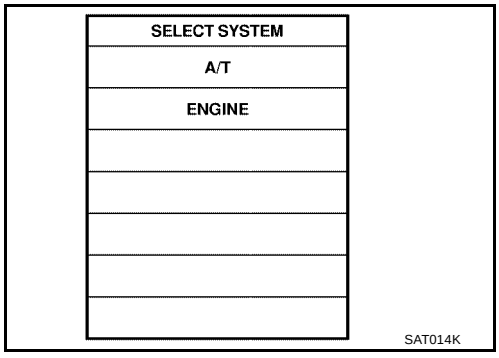
Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: A/T 1ST GR FNCTN : P0731	A/T cannot be shifted to the 1st gear position even if electrical circuit is good.	● Shift solenoid valve A ● Shift solenoid valve B ● Each clutch ● Hydraulic control circuit

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

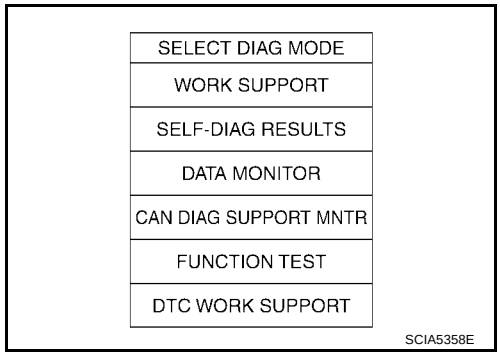
CAUTION:

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
TESTING CONDITION:
Always drive vehicle on a level road to improve the accuracy of test.

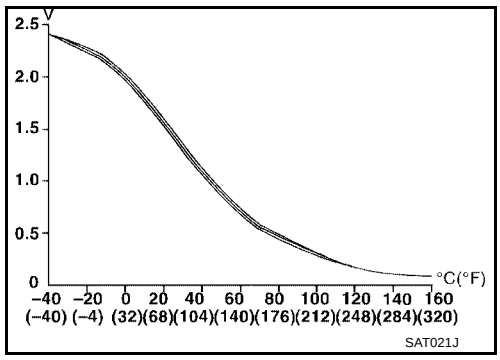


After the repair, perform the following procedure to confirm the malfunction is eliminated.



With CONSULT-II

1. Start engine and select “DATA MONITOR” mode for “A/T” with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3. Select “1ST GR FNCTN P0731” of “DTC WORK SUPPORT” mode for “A/T” with CONSULT-II and touch “START”.
4. Accelerate vehicle to 20 to 25 km/h (12 to 16 MPH) under the following condition and release the accelerator pedal completely.
   THROTTLE POSI: Less than 1.0/8 (at all times during step 4)
   Selector lever: D position (OD “ON”)
   - **Check that “GEAR” shows “2” after releasing pedal.**
5. Depress accelerator pedal to WOT (more than 7.0/8 of “THROTTLE POSI”) quickly from a speed of 20 to 25 km/h (12 to 16 MPH) until “TESTING” changes to “STOP VEHICLE” or “COMPLETED”. (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT-II screen, go to AT-139, "Diagnostic Procedure" .
   If “STOP VEHICLE” appears on CONSULT-II screen, go to the following step.
   - **Check that “GEAR” shows “1” when depressing accelerator pedal to WOT.**
   - **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAGNOSIS” for “ENGINE”. In case a 1st trip DTC other than P0731 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**
6. Stop vehicle.
7. Follow the instruction displayed. (Check for normal shifting referring to the table below.)



Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists	1 → 2 → 3 → 4
Malfunction for P0731 exists.	2 → 2 → 3 → 3
	4 → 3 → 3 → 4

8. Make sure that “OK” is displayed. (If “NG” is displayed, refer to “Diagnostic Procedure”.)
   Refer to AT-139, "Diagnostic Procedure" .
   Refer to AT-386, "Shift Schedule" .

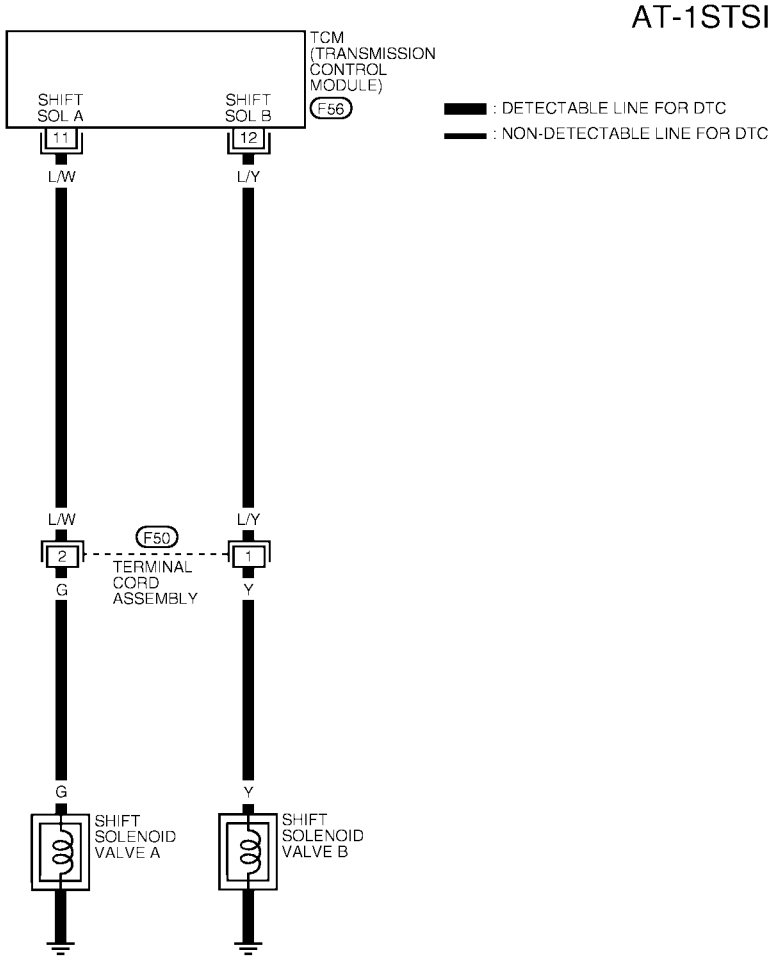
With GST

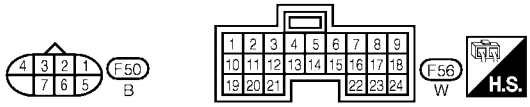
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — 1ST

ECS005X5

AT-1STSIG-01





WAT118

TRANSMISSION CONTROL MODULE TERMINALS AND REFERENCE VALUE

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC) (Approx.)
11	L/W	SHIFT SOLENOID VALVE A	WHEN SHIFT SOLENOID VALVE A OPERATES	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE A DOES NOT OPERATE	0V
12	L/Y	SHIFT SOLENOID VALVE B	WHEN SHIFT SOLENOID VALVE B OPERATES	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE B DOES NOT OPERATE	0V

WAT343

Diagnostic Procedure

ECS005X6

1. CHECK SHIFT SOLENOID VALVE

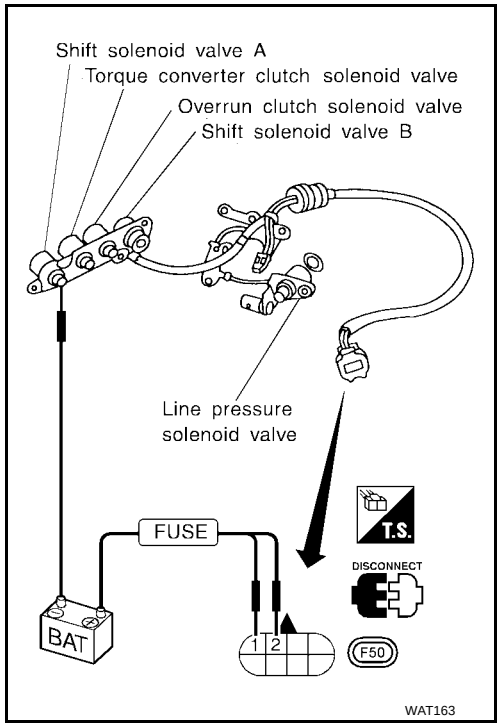
1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check shift solenoid valve operation.

- Shift solenoid valve A
- Shift solenoid valve B

Refer to AT-140, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Repair or replace shift solenoid valve assembly.



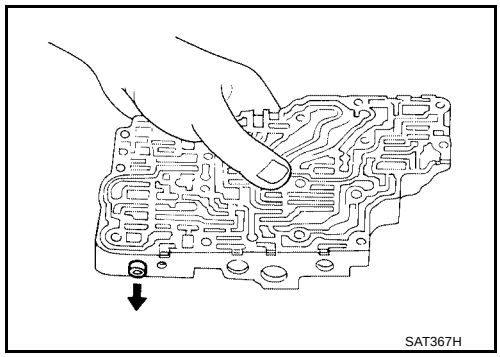
2. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-299, "Disassembly" .
2. Check to ensure that:

- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.

OK or NG

OK >> GO TO 3.
NG >> Repair control valve assembly.



3. CHECK DTC

Perform AT-136, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> Check transaxle internal components (clutch, brake, etc.).

Component Inspection

ECS005X7

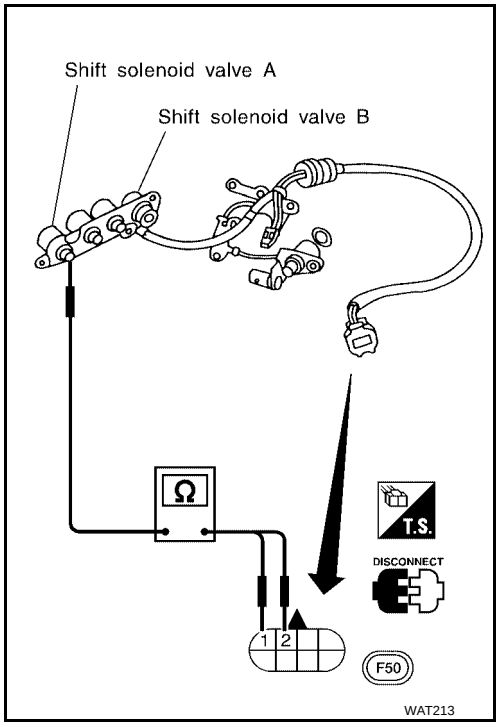
SHIFT SOLENOID VALVE A AND B

- Refer to AT-260, "Control Valve Assembly and Accumulators" .

Resistance Check

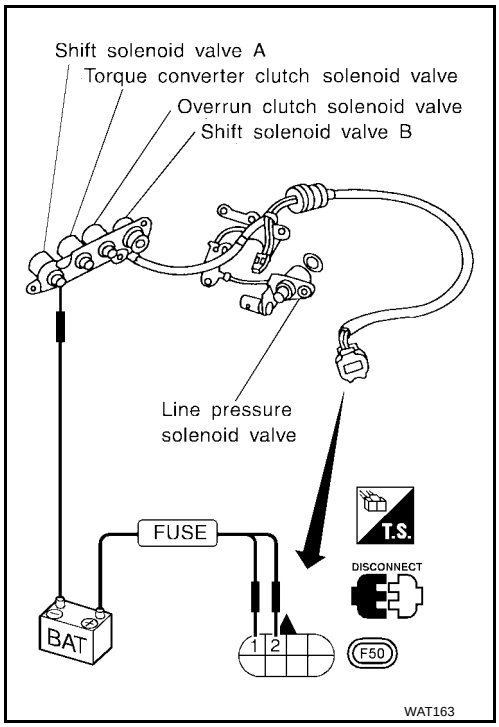
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	2	Ground	20 - 30Ω
Shift solenoid valve B	1		5 - 20Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



DTC P0732 A/T 2ND GEAR FUNCTION

PFP:31940

Description

ECS005X8

- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into second gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, etc.

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

ON BOARD DIAGNOSTIC LOGIC

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (2nd) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when shift solenoid valve B is stuck open.

Gear position supposed by TCM	1	2	3	4
In case of gear position with no malfunctions	1	2	3	4
In case of gear position with shift solenoid valve B stuck open	4	3*	3	4

*: P0732 is detected.

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: A/T 2ND GR FNCTN	A/T cannot be shifted to the 2nd gear position even if electrical circuit is good.	● Shift solenoid valve B ● Each clutch ● Hydraulic control circuit
GST : P0732		

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

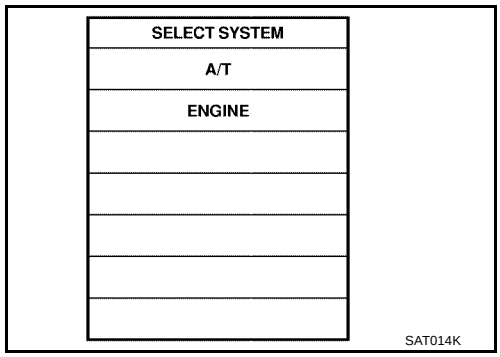
CAUTION:

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

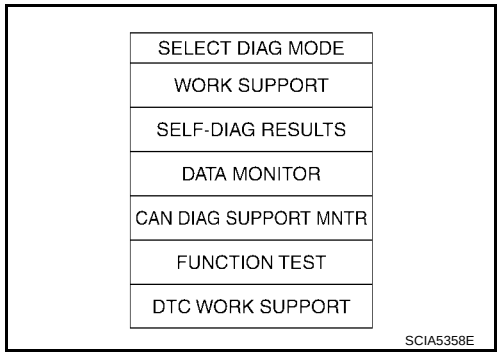
NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
TESTING CONDITION:
Always drive vehicle on a level road to improve the accuracy of test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

With CONSULT-II

1. Start engine and select "DATA MONITOR" mode for "A/T" with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V



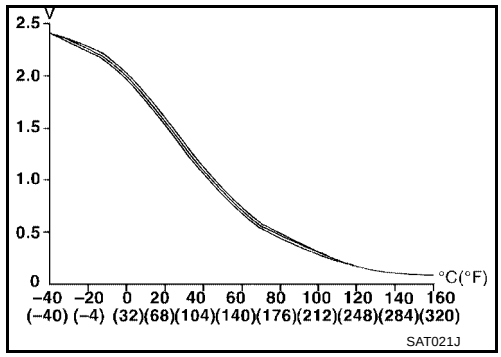
SAT014K



SCIA5358E

If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).

3. Select “2ND GR FNCTN P0732” of “DTC WORK SUPPORT” mode for “A/T” with CONSULT-II and touch “START”.
4. Accelerate vehicle to 50 to 55 km/h (31 to 34 MPH) under the following condition and release the accelerator pedal completely.
   THROTTLE POSI: Less than 1.0/8 (at all times during step 4)
   Selector lever: D position (OD “ON”)
   - **Check that “GEAR” shows “3” or “4” after releasing pedal.**
5. Depress accelerator pedal to WOT (more than 7.0/8 of “THROTTLE POSI”) quickly from a speed of 50 to 55 km/h (31 to 34 MPH) until “TESTING” changes to “STOP VEHICLE” or “COMPLETED”. (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT-II screen, go to AT-144, "Diagnostic Procedure" .
   If “STOP VEHICLE” appears on CONSULT-II screen, go to following step.
   - **Check that “GEAR” shows “2” when depressing accelerator pedal to WOT.**
   - **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAGNOSIS” for “ENGINE”. In case a 1st trip DTC other than P0732 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**
6. Stop vehicle.
7. Follow the instruction displayed. (Check for normal shifting referring to the table below.)



Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists	1 → 2 → 3 → 4
Malfunction for P0732 exists.	4 → 3 → 3 → 4

8. Make sure that “OK” is displayed. (If “NG” is displayed, refer to “DIAGNOSTIC PROCEDURE”.)
   Refer to AT-144, "Diagnostic Procedure" .
   Refer to AT-386, "Shift Schedule" .

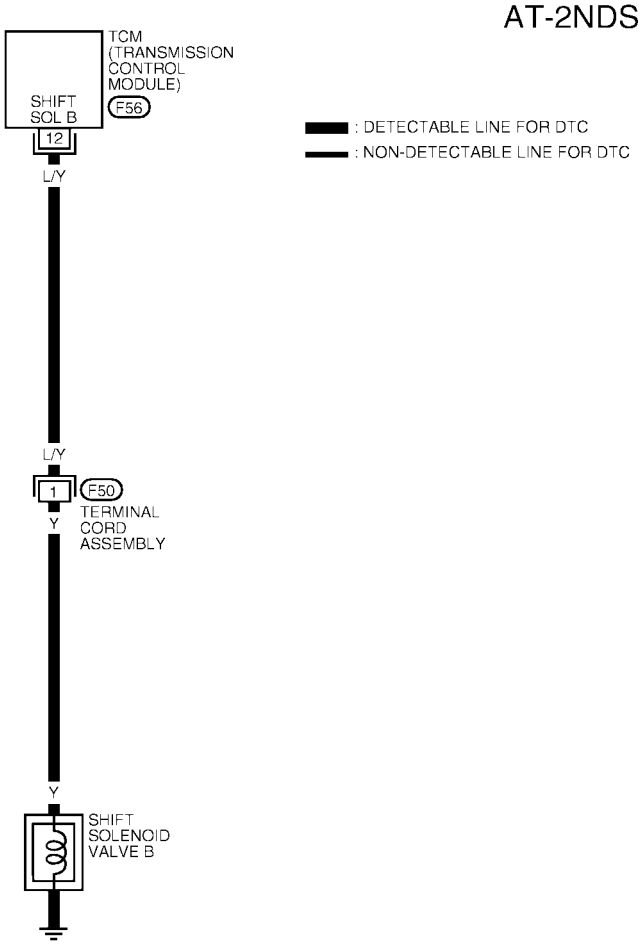
With GST

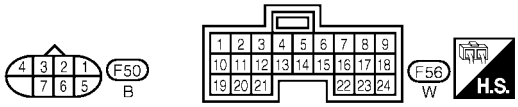
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — 2ND

ECS005X9

AT-2NDSIG-01





WAT119

TRANSMISSION CONTROL MODULE TERMINALS AND REFERENCE VALUE BETWEEN TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC) (Approx.)
12	L/Y	SHIFT SOLENOID VALVE B	WHEN SHIFT SOLENOID VALVE B OPERATES	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE B DOES NOT OPERATE	0V

WAT344

Diagnostic Procedure

ECS005XA

1. CHECK SHIFT SOLENOID VALVE

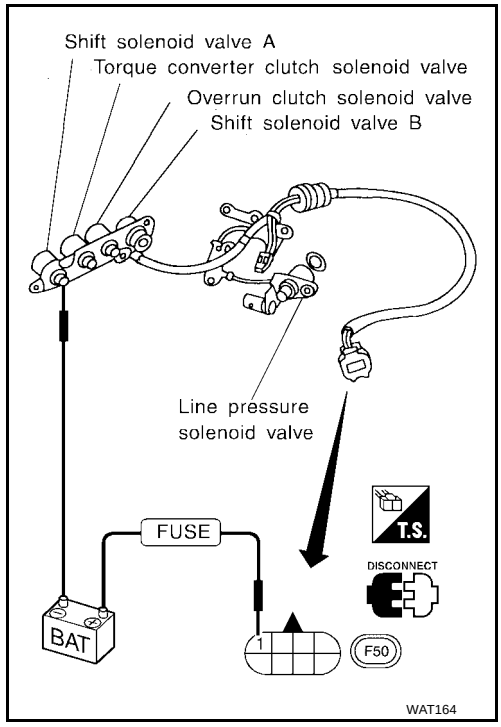
1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check shift solenoid valve operation.

- Shift solenoid valve B

Refer to AT-145, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Repair or replace shift solenoid valve assembly.



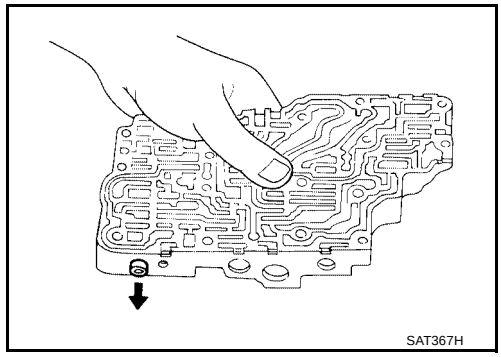
2. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-299, "Disassembly" .
2. Check to ensure that:

- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.

OK or NG

OK >> GO TO 3.
NG >> Repair control valve assembly.



3. CHECK DTC

Perform AT-141, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> Check transaxle internal components (clutch, brake, etc.).

Component Inspection

ECS005XB

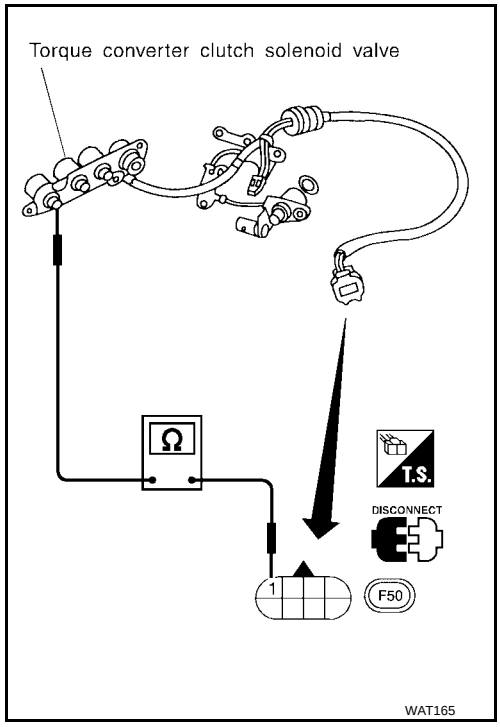
SHIFT SOLENOID VALVE B

- Refer to AT-260, "Control Valve Assembly and Accumulators" .

Resistance Check

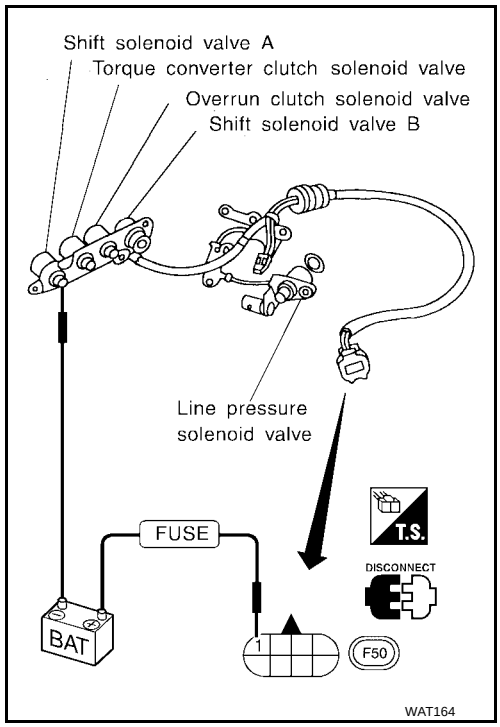
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve B	1	Ground	5 - 20Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



DTC P0733 A/T 3RD GEAR FUNCTION

PFP:31940

Description

ECS005XC

- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into third gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning servo piston or brake band, etc.

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

ON BOARD DIAGNOSTIC LOGIC

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (3rd) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when shift solenoid valve A is stuck closed.

Gear position supposed by TCM	1	2	3	4
In case of gear position with no malfunctions	1	2	3	4
In case of gear position with shift solenoid valve A stuck closed	1	1	4*	4

*: P0733 is detected.

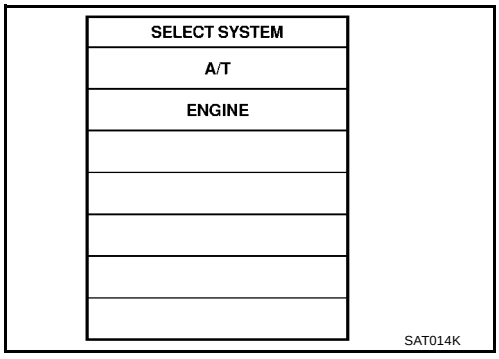
Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: A/T 3RD GR FNCTN	A/T cannot be shifted to the 3rd gear position even if electrical circuit is good.	● Shift solenoid valve A ● Each clutch ● Hydraulic control circuit
: P0733		

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

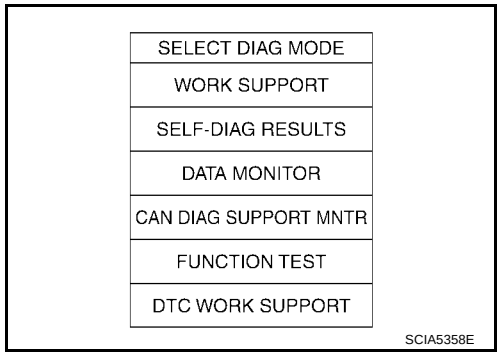
CAUTION:

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
TESTING CONDITION:
Always drive vehicle on a level road to improve the accuracy of test.

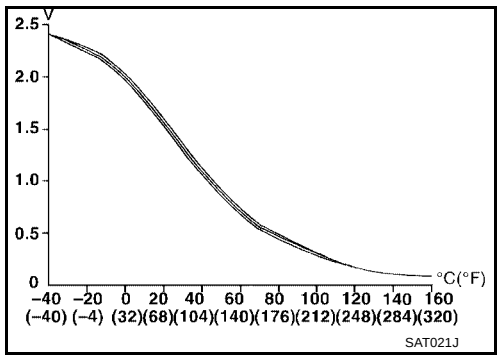


After the repair, perform the following procedure to confirm the malfunction is eliminated.



With CONSULT-II

1. Start engine and select “DATA MONITOR” mode for “A/T” with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3. Select “3RD GR FNCTN P0733” of “DTC WORK SUPPORT” mode for “A/T” with CONSULT-II and touch “START”.
4. Accelerate vehicle to 70 to 85 km/h (43 to 53 MPH) under the following condition and release the accelerator pedal completely.
   THROTTLE POSI: Less than 1.0/8 (at all times during step 4)
   Selector lever: D position (OD “ON”)
   - **Check that “GEAR” shows “4” after releasing pedal.**
5. Depress accelerator pedal steadily with 3.5/8 - 4.5/8 of “THROTTLE POSI” from a speed of 70 to 85 km/h (43 to 53 MPH) until “TESTING” changes to “STOP VEHICLE” or “COMPLETED”. (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT-II screen, go to AT-149, "Diagnostic Procedure" .
   If “STOP VEHICLE” appears on CONSULT-II screen, go to following step.
   - **Check that “GEAR” shows “3” when depressing accelerator pedal with 3.5/8 - 4.5/8 of “THROTTLE POSI”.**
   - **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAGNOSIS” for “ENGINE”. In case a 1st trip DTC other than P0733 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**
6. Stop vehicle.
7. Follow the instruction displayed. (Check for normal shifting referring to the table below.)



Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists.	1 → 2 → 3 → 4
Malfunction for P0733 exists.	1 → 1 → 4 → 4

8. Make sure that “OK” is displayed. (If “NG” is displayed, refer to “DIAGNOSTIC PROCEDURE”.)
   Refer to AT-149, "Diagnostic Procedure" .
   Refer to AT-386, "Shift Schedule" .

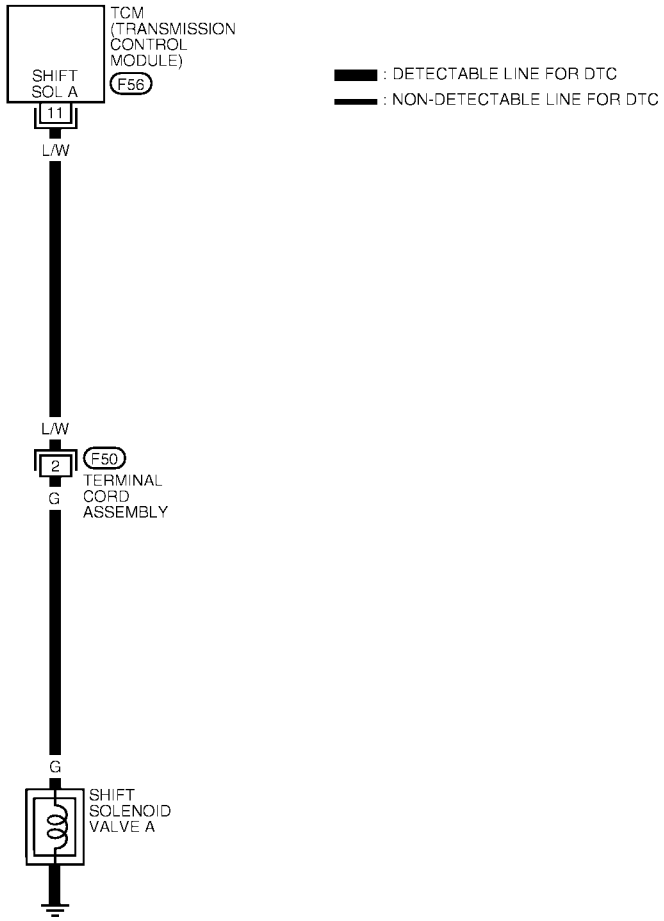
With GST

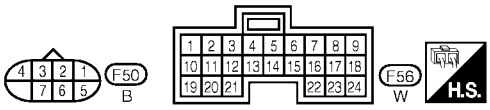
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — 3RD

ECS005XD

AT-3RDSIG-01





WAT120

TRANSMISSION CONTROL MODULE TERMINALS AND REFERENCE VALUE BETWEEN TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC) (Approx.)
11	L/W	SHIFT SOLENOID VALVE A	WHEN SHIFT SOLENOID VALVE A OPERATES	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE A DOES NOT OPERATE	0V

WAT345

Diagnostic Procedure

ECS005XE

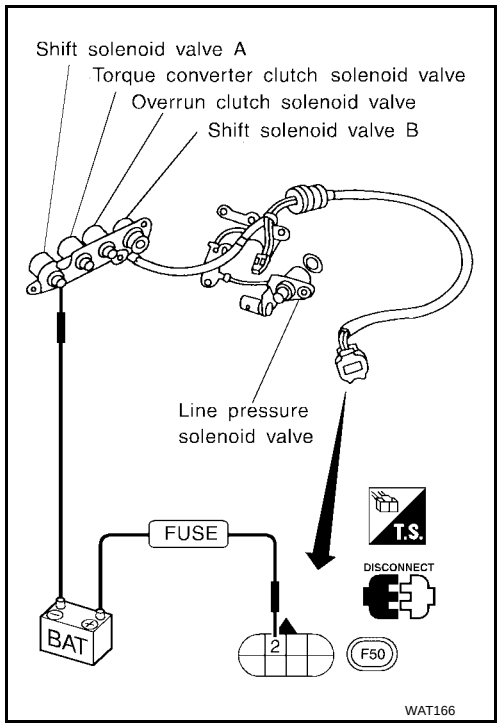
1. CHECK SHIFT SOLENOID VALVE

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check shift solenoid valve operation.

– Shift solenoid valve A
Refer to “Component Inspection”.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace shift solenoid valve assembly.



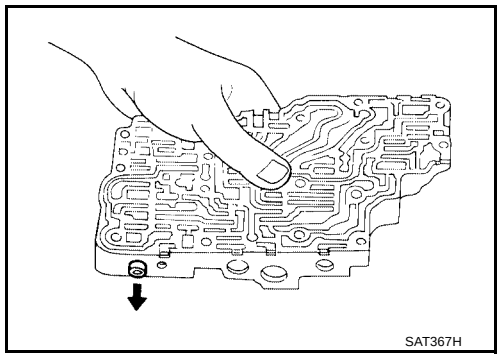
2. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-299, "Disassembly" .
2. Check to ensure that:

– Valve, sleeve and plug slide along valve bore under their own weight.
– Valve, sleeve and plug are free from burrs, dents and scratches.
– Control valve springs are free from damage, deformation and fatigue.
– Hydraulic line is free from obstacles.

OK or NG

OK >> GO TO 3.
NG >> Repair control valve assembly.



3. CHECK DTC

Perform AT-146, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> Check transaxle internal components (clutch, brake, etc.).

Component Inspection

ECS005XF

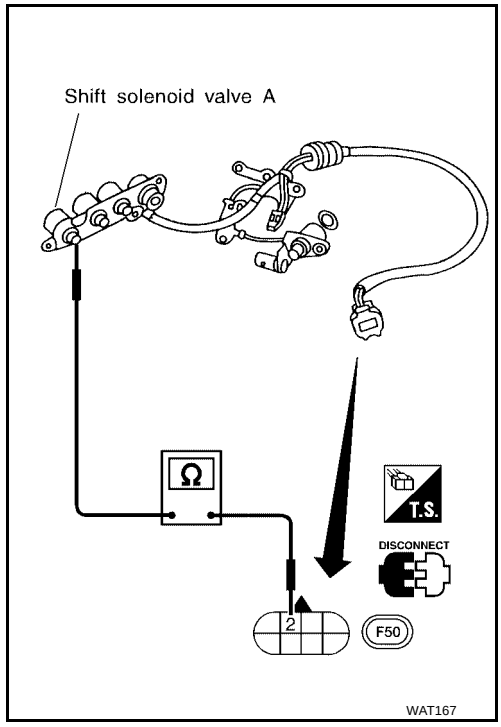
SHIFT SOLENOID VALVE A

- Refer to AT-260, "REMOVAL" .

Resistance Check

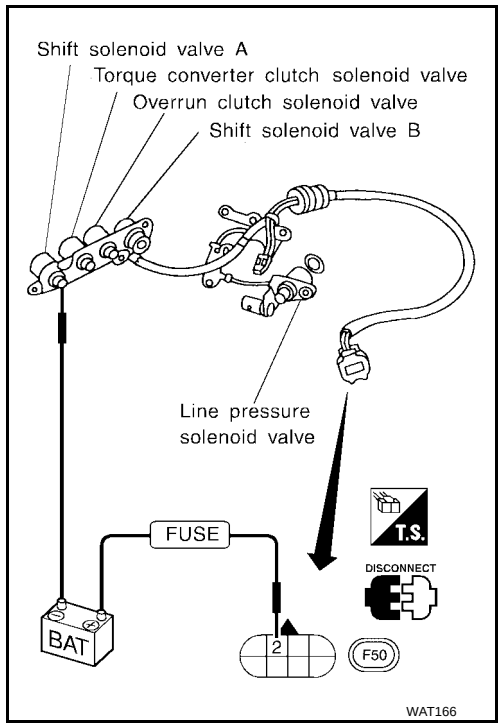
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	2	Ground	20 - 30Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



DTC P0734 A/T 4TH GEAR FUNCTION

PFP:31940

Description

ECS005XG

- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into fourth gear position or when the line pressure is low. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning oil pump or torque converter clutch, etc.

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approx.)
Line pressure solenoid valve duty	Small throttle opening (Low line pressure) ↓ Large throttle opening (High line pressure)	24% ↓ 95%

ON BOARD DIAGNOSTIC LOGIC

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is much lower than the position (4th) supposed by TCM, the slip ratio will be much less than normal. In case the ratio does not reach the specified value, TCM judges this diagnosis malfunction. This malfunction will be caused when shift solenoid valve B is stuck closed.

Gear position supposed by TCM	1	2	3	4
In case of gear position with no malfunctions	1	2	3	4
In case of gear position with shift solenoid valve B stuck closed	1	2	2	1*

*: P0734 is detected.

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: A/T 4TH GR FNCTN : P0734	A/T cannot be shifted to the 4th gear position even if electrical circuit is good.	● Shift solenoid valve A ● Shift solenoid valve B ● Line pressure solenoid valve ● Each clutch ● Hydraulic control circuit

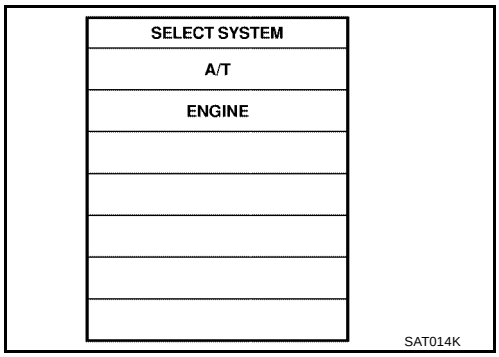
DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

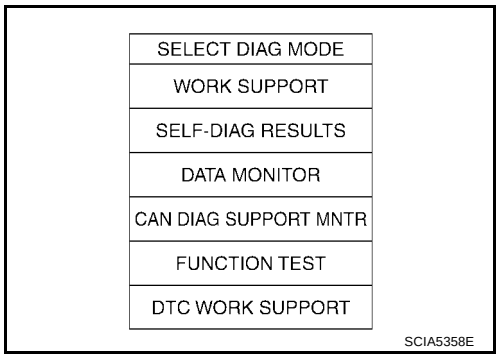
CAUTION:

- **Always drive vehicle at a safe speed.**
- **If conducting this "DTC CONFIRMATION PROCEDURE" again, always turn ignition switch "OFF" and wait at least 5 seconds before continuing.**
- **Be careful not to rev engine into the red zone on the tachometer.**

NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

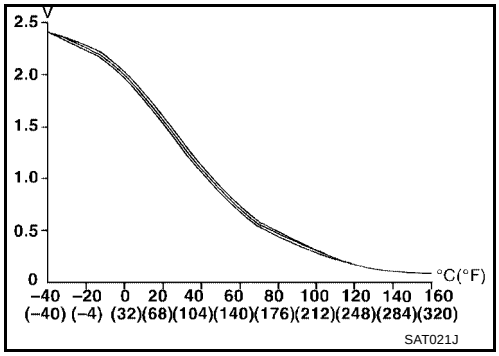
TESTING CONDITION:
Always drive vehicle on a level road to improve the accuracy of test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.





With CONSULT-II

1. Start engine and select "DATA MONITOR" mode for "A/T" with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3. Select "4TH GR FNCTN P0734" of "DTC WORK SUPPORT" mode for "A/T" with CONSULT-II and touch "START".
4. Accelerate vehicle to 45 to 55 km/h (28 to 34 MPH) under the following condition and release the accelerator pedal completely.
   THROTTLE POSI: Less than 5.5/8 (at all times during step 4)
   Selector lever: D position (OD "ON")
   - **Check that "GEAR" shows "3" after releasing pedal.**



5. Depress accelerator pedal steadily with 1.0/8 - 2.0/8 of "THROTTLE POSI" from a speed of 45 to 55 km/h (28 to 34 MPH) until "TESTING" has turned to "STOP VEHICLE" or "COMPLETED". (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT-II screen, go to AT-155, "Diagnostic Procedure" .
   If "STOP VEHICLE" appears on CONSULT-II screen, go to following step.
   - **Check that "GEAR" shows "4" when depressing accelerator pedal with 1.0/8 - 2.0/8 of "THROTTLE POSI".**
   - **If "TESTING" does not appear on CONSULT-II for a long time, select "SELF-DIAGNOSIS" for "ENGINE". In case a 1st trip DTC other than P0734 is shown, refer to applicable "TROUBLE DIAGNOSIS FOR DTC".**
6. Stop vehicle.
7. Follow the instruction displayed. (Check for normal shifting referring to the table below.)

Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists	1 → 2 → 3 → 4
Malfunction for P0734 exists.	1 → 2 → 2 → 1

8. Make sure that "OK" is displayed. (If "NG" is displayed, refer to "Diagnostic Procedure".)
   Refer to AT-155, "Diagnostic Procedure" .
   Refer to AT-386, "Shift Schedule" .

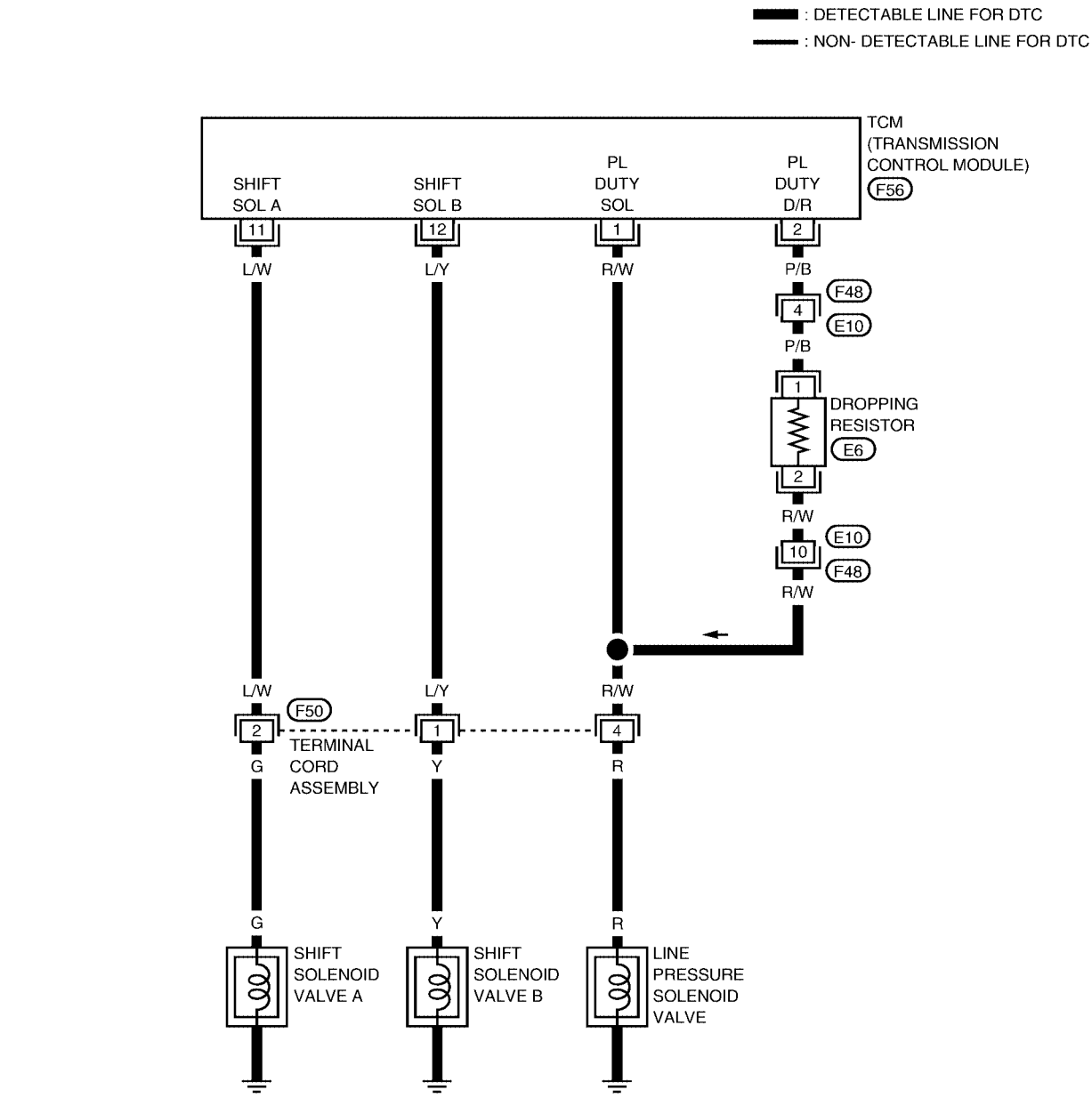
With GST

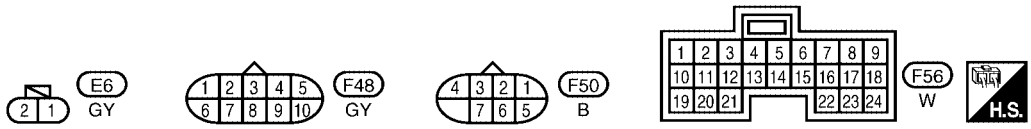
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — 4TH

ECS005XH

AT-4THSIG-01





WCWA0065E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	R/W	LINE PRESSURE SOLENOID VALVE	WHEN RELEASING ACCELERATOR PEDAL (ENGINE WARM)	1.5 - 2.5V
			WHEN DEPRESSING ACCELERATOR PEDAL (ENGINE WARM)	0V
2	P/B	LINE PRESSURE SOLENOID VALVE (WITH DROPPING RESISTOR)	WHEN RELEASING ACCELERATOR PEDAL (ENGINE WARM)	5 - 14V
			WHEN DEPRESSING ACCELERATOR PEDAL (ENGINE WARM)	0.5V OR LESS
11	L/W	SHIFT SOLENOID VALVE A	WHEN SHIFT SOLENOID VALVE A OPERATES	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE A DOES NOT OPERATES	0V
12	L/Y	SHIFT SOLENOID VALVE B	WHEN SHIFT SOLENOID VALVE B OPERATES	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE B DOES NOT OPERATES	0V

Diagnostic Procedure

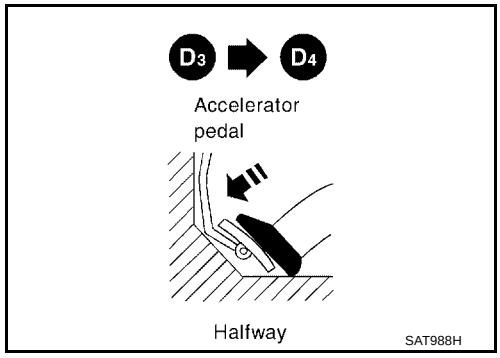
ECS005XI

1. CHECK SHIFT UP (D_3 TO D_4)

During “Cruise Test – Part 1” (AT-78, "Cruise Test — Part 1"), does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 9.
No >> GO TO 2.



2. CHECK LINE PRESSURE

Perform line pressure test.
Refer to AT-68, "Line Pressure Test" .

Engine speed rpm	Line pressure kPa (kg/cm², psi)	
	D, 2 and 1 positions	R position
Idle	500 (5.1, 73)	778 (7.9, 113)
Stall	1,167 (11.9, 169)	1,816 (18.5, 263)

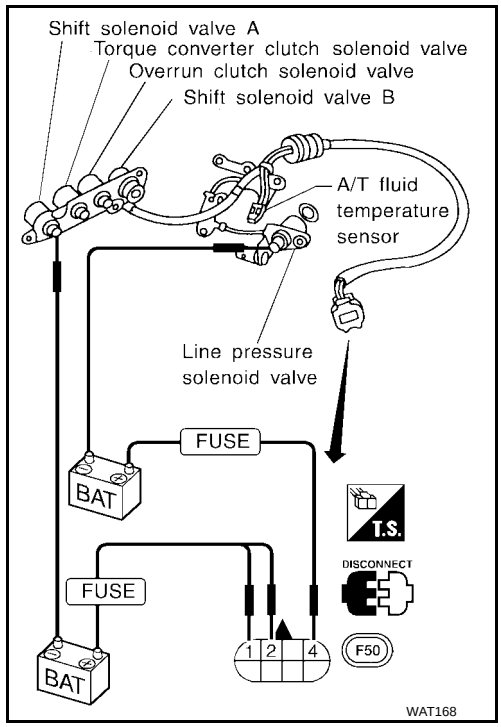
LAT236

OK or NG

OK >> GO TO 3.
NG >> GO TO 6.

3. CHECK SOLENOID VALVES

1. Remove control valve assembly.
   Refer to AT-260, "REMOVAL" .
2. Refer to AT-159, "SOLENOID VALVES" .



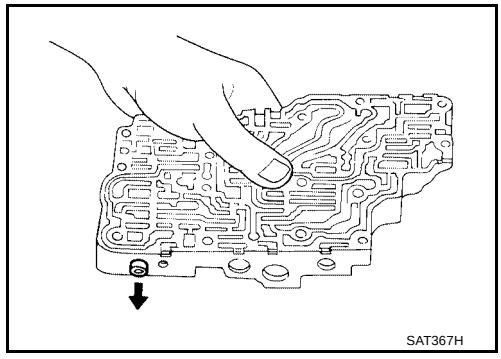
OK or NG

OK >> GO TO 4.
NG >> Replace solenoid valve assembly.

4. CHECK CONTROL VALVE

1. Disassemble control valve assembly.
   Refer to AT-299, "Disassembly" .
2. Check to ensure that:

- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.



OK or NG

OK >> GO TO 5.
NG >> Repair control valve.

5. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

OK or NG

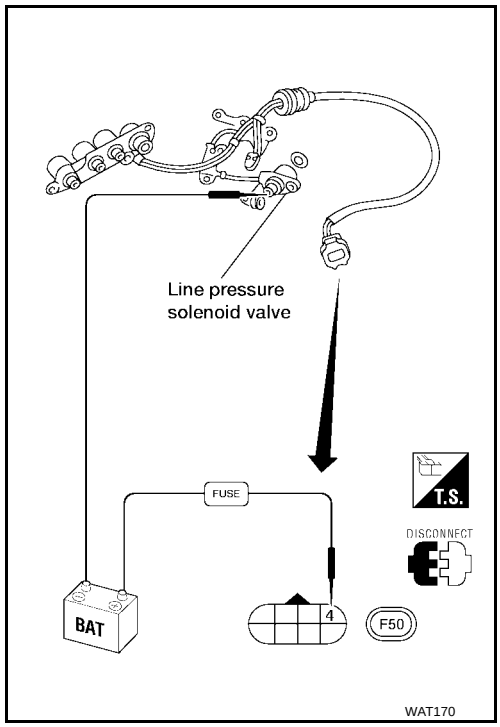
OK >> GO TO 9.
NG >> Check transaxle internal components (clutch, brake, etc.).

6. CHECK LINE PRESSURE SOLENOID VALVE

1. Remove control valve assembly.
   Refer to AT-260, "REMOVAL" .
2. Refer to AT-159, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace solenoid valve assembly.



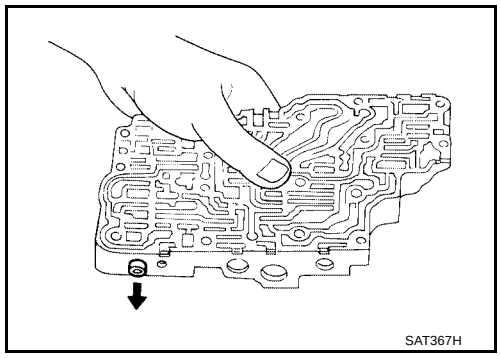
7. CHECK CONTROL VALVE

1. Disassemble control valve assembly.
   Refer to AT-299, "Disassembly" .
2. Check line pressure circuit valves for sticking.

- Pressure regulator valve
- Pilot valve
- Pressure modifier valve

OK or NG

OK >> GO TO 8.
NG >> Repair control valve.



8. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 9.
No >> Check transaxle internal components (clutch, brake, etc.).

9. CHECK DTC

Perform AT-152, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> Perform “Cruise Test — Part 1” (AT-78, "Cruise Test — Part 1") again and return to the start point of this test group.

Component Inspection

ECS005XJ

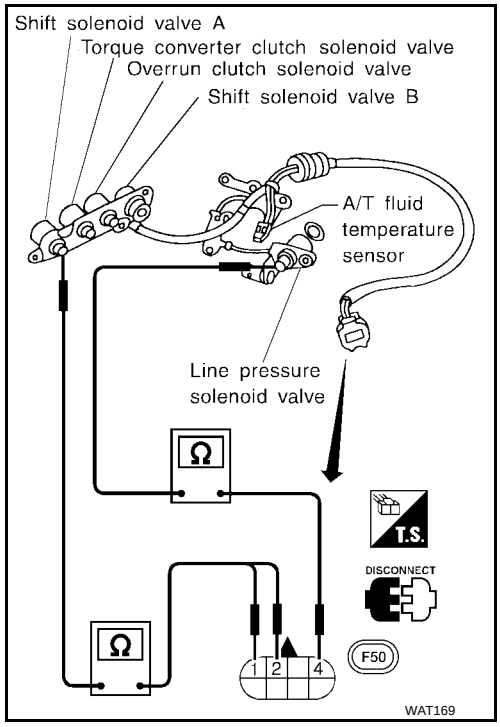
SOLENOID VALVES

- Refer to AT-260, "REMOVAL" .

Resistance Check

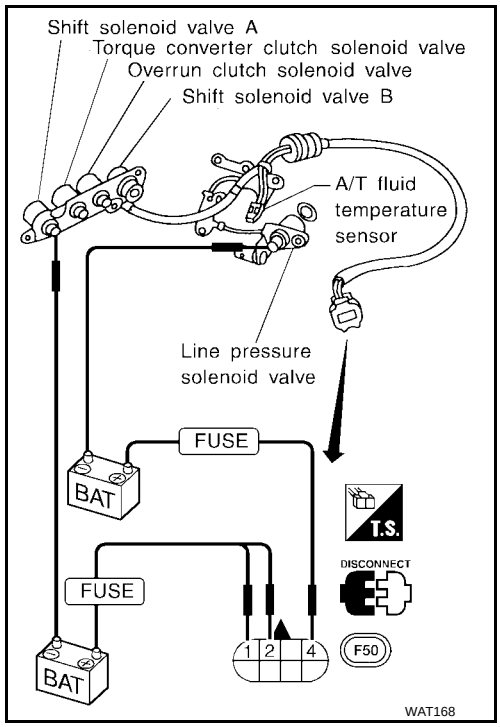
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	2	Ground	20 - 30Ω
Shift solenoid valve B	1		5 - 20Ω
Line pressure solenoid valve	4		2.5 - 5Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



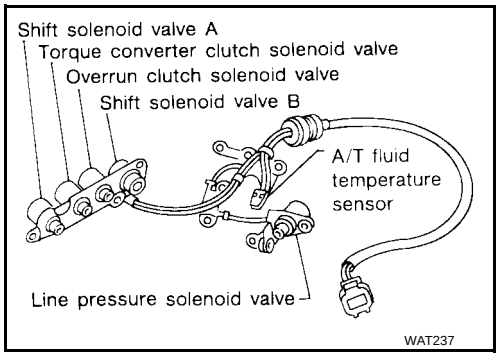
DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE

PFP:31940

Description

ECS005XK

The torque converter clutch solenoid valve is activated, with the gear in "D4 ", by the TCM in response to signals sent from the vehicle speed sensor and throttle position sensor [accelerator pedal position (APP) sensor]s. Lock-up piston operation will then be controlled.
Lock-up operation, however, is prohibited when A/T fluid temperature is too low.
When the accelerator pedal is depressed (less than 2/8) in lock-up condition, the engine speed should not change abruptly. If there is a big jump in engine speed, there is no lock-up.



CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approx.)
Torque converter clutch solenoid valve duty	Lock-up "OFF" ↓ Lock-up "ON"	4% ↓ 94%

ON BOARD DIAGNOSIS LOGIC

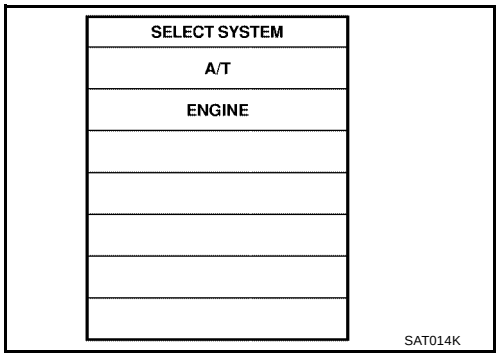
Diagnostic trouble code	Malfunction is detected when...	Check items (Possible cause)
: TCC SOLENOID/CIRC : P0740	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● T/C clutch solenoid valve

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

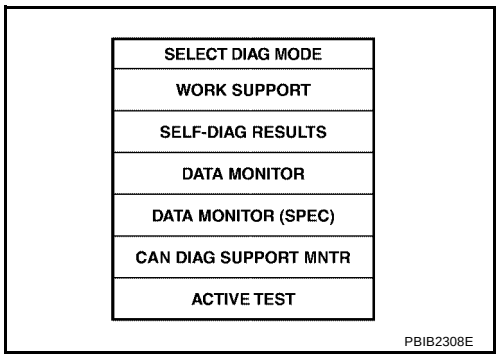
With CONSULT-II

1. Turn ignition switch "ON".



2. Select "DATA MONITOR" mode for "ENGINE" with CONSULT-II and wait at least 1 second.

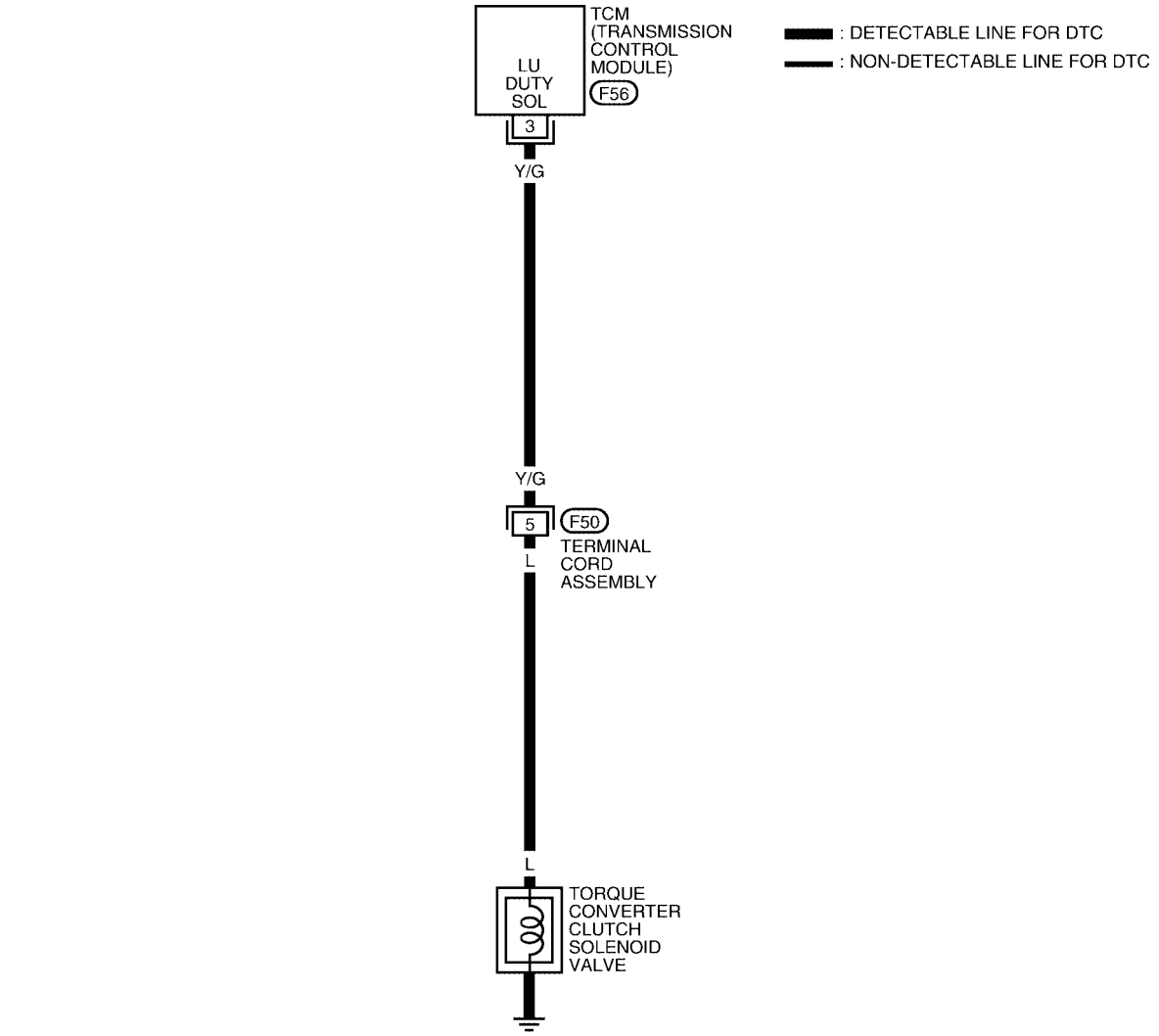
With GST
Follow the procedure "With CONSULT-II".

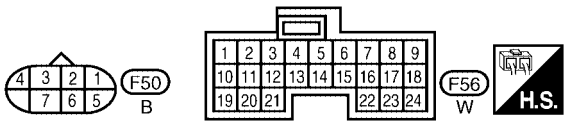


Wiring Diagram — AT — TCV

ECS005XL

AT-TCV-01





WCWA0066E

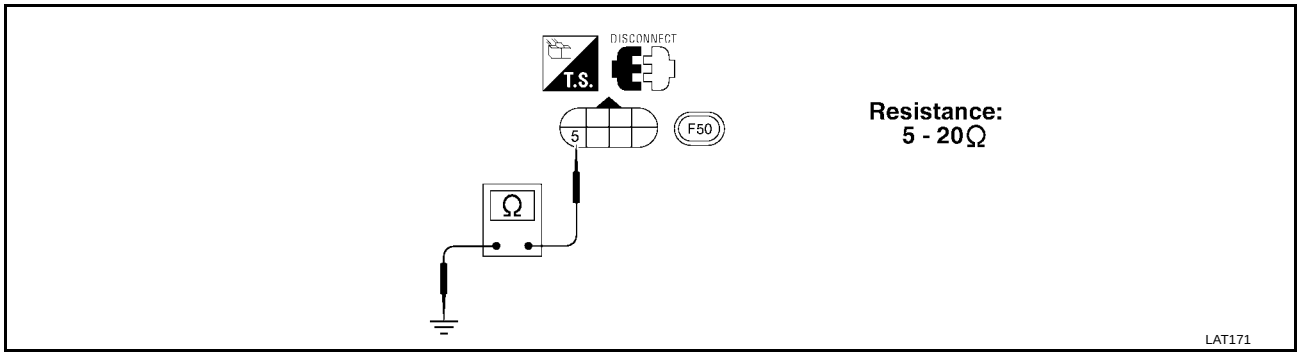
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
3	Y/G	TORQUE CONVERTER CLUTCH SOLENOID VALVE	WHEN A/T PERFORMS LOCK-UP	8 - 15V
			WHEN A/T DOES NOT PERFORM LOCK-UP	0V

Diagnostic Procedure

ECS005XM

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to “OFF” position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal 5 and ground.



OK or NG

OK >> GO TO 2.
NG >> 1. Remove oil pan. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Torque converter clutch solenoid valve
Refer to AT-163, "TORQUE CONVERTER CLUTCH SOLENOID VALVE" .
- Harness of terminal cord assembly for short or open

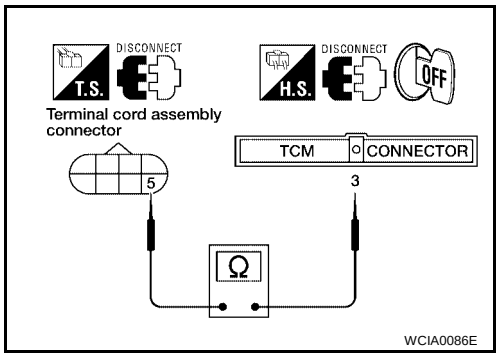
2. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to “OFF” position.
2. Disconnect TCM harness connector F56.
3. Check continuity between terminal cord assembly F50 terminal 5 (Y/G) and TCM harness connector terminal 3 (Y/G).

Continuity should exist.

If OK, check harness for short to ground and short to power.

4. Reinstall any part removed.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK DTC

Perform AT-160, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

Component Inspection

ECS005XN

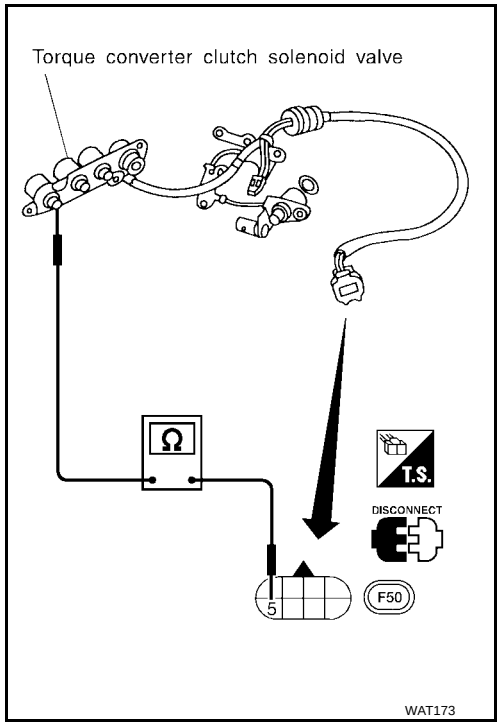
TORQUE CONVERTER CLUTCH SOLENOID VALVE

- Refer to AT-260, "REMOVAL" .

Resistance Check

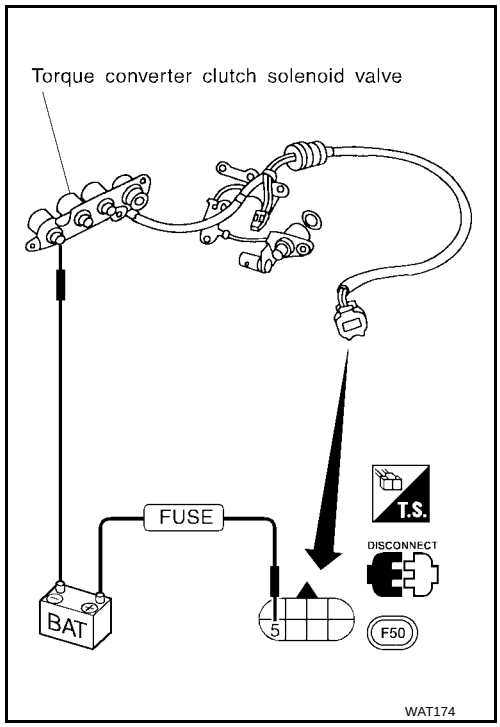
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Torque converter clutch solenoid valve	5	Ground	5 - 20Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



DTC P0744 A/T TCC S/V FUNCTION (LOCK-UP)

PFP:31940

Description

ECS005XO

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into fourth gear position or the torque converter clutch does not lock up as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning oil pump or torque converter clutch, etc.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approx.)
Torque converter clutch solenoid valve duty	Lock-up “OFF” ↓ Lock-up “ON”	4% ↓ 94%

ON BOARD DIAGNOSTIC LOGIC

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is much lower than the position (4th) supposed by TCM, the slip ratio will be much less than normal. In case the ratio does not reach the specified value, TCM judges this diagnosis malfunction. This malfunction will be caused when shift solenoid valve B is stuck closed.

Gear position supposed by TCM	1	2	3	4
In case of gear position with no malfunctions	1	2	3	4
In case of gear position with shift solenoid valve B stuck closed	1	2	2	1*

*: P0744 is detected.

Diagnostic trouble code	Malfunction is detected when...	Check items (Possible cause)
: A/T TCC S/V FNCTN : P0744	A/T cannot perform lock-up even if electrical circuit is good.	● Torque converter clutch solenoid valve ● Line pressure solenoid valve ● Each clutch ● Hydraulic control circuit

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

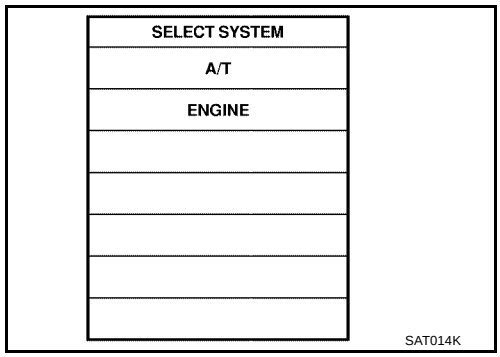
CAUTION:
Always drive vehicle at a safe speed.

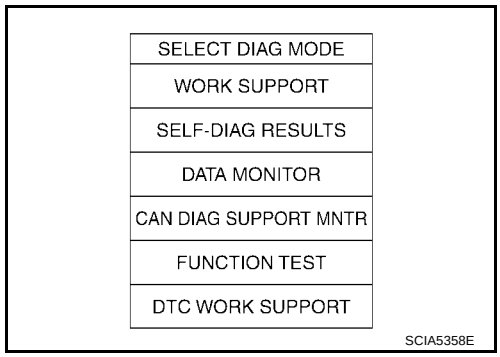
NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.

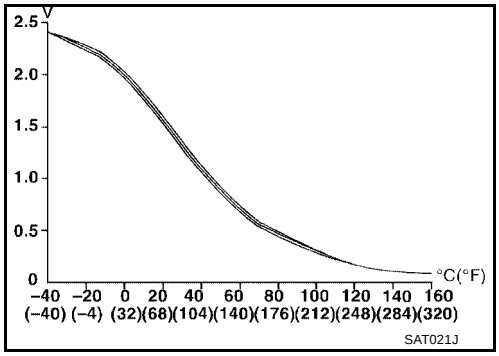
With CONSULT-II

1. Start engine and select "DATA MONITOR" mode for "A/T" with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3. Select "TCC S/V FNCTN P0744" of "DTC WORK SUPPORT" mode for "A/T" with CONSULT-II and touch "START".





4. Accelerate vehicle to more than 80 km/h (50 MPH) and maintain the following condition continuously until “TESTING” has turned to “COMPLETE”. (It will take approximately 30 seconds after “TESTING” shows.)
   THROTTLE POSI: 1.0/8 - 2.0/8 (at all times during step 4)
   Selector lever: D position (OD “ON”)
   TCC S/V DUTY: More than 94%
   VHCL/S SE·A/T: Constant speed of more than 80 km/h (50 MPH)



- **Check that “GEAR” shows “4”.**
- **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAGNOSIS”. In case a 1st trip DTC other than P0744 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**

5. Make sure that “OK” is displayed. (If “NG” is displayed, refer to AT-168, "Diagnostic Procedure" .)
   Refer to AT-168, "Diagnostic Procedure" .
   Refer to AT-386, "Shift Schedule" .

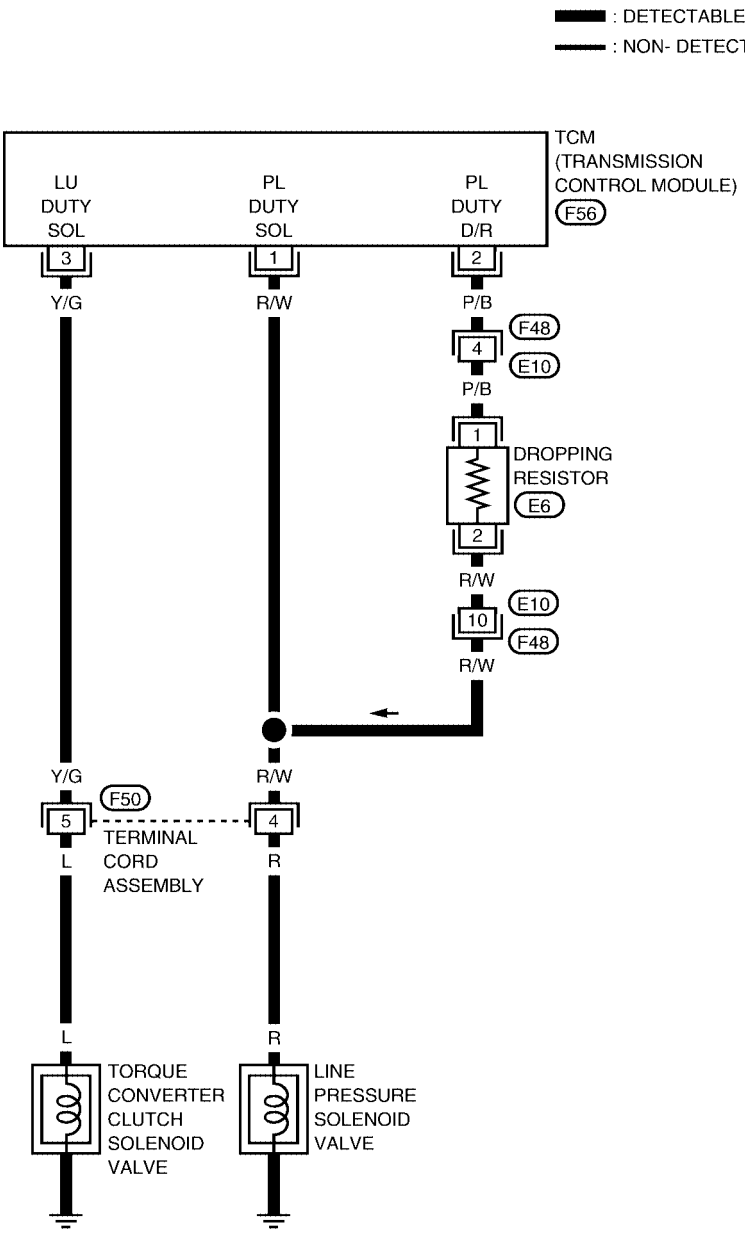
With GST

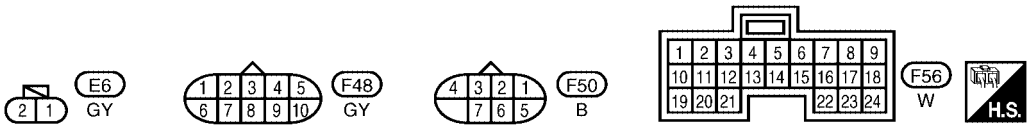
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — TCCSIG

ECS005XP

AT-TCCSIG-01





WCWA0067E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	R/W	LINE PRESSURE SOLENOID VALVE	WHEN RELEASING ACCELERATOR PEDAL (ENGINE WARM)	1.5 - 2.5V
			WHEN DEPRESSING ACCELERATOR PEDAL (ENGINE WARM)	0.5V OR LESS
2	P/B	LINE PRESSURE SOLENOID VALVE (WITH DROPPING RESISTOR)	WHEN RELEASING ACCELERATOR PEDAL (ENGINE WARM)	5 - 14V
			WHEN DEPRESSING ACCELERATOR PEDAL (ENGINE WARM)	0.5V OR LESS
3	Y/G	TORQUE CONVERTER CLUTCH SOLENOID VALVE	WHEN A/T PERFORMS LOCK-UP	8 - 14V
			WHEN A/T DOES NOT PERFORM LOCK-UP	0V

Diagnostic Procedure

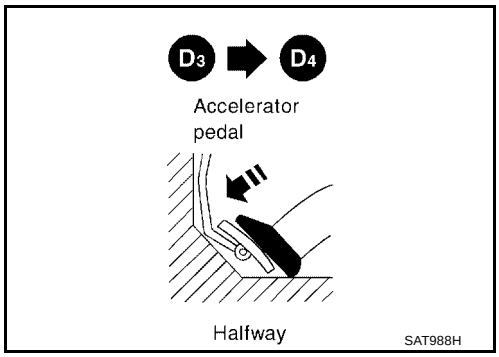
ECS005XQ

1. CHECK SHIFT UP (D_3 TO D_4)

During “Cruise Test – Part 1” (AT-78, "Cruise Test — Part 1"), does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 10.
No >> GO TO 2.



2. CHECK LINE PRESSURE

Perform line pressure test.
Refer to AT-68, "Line Pressure Test" .

Engine speed rpm	Line pressure kPa (kg/cm², psi)	
	D, 2 and 1 positions	R position
Idle	500 (5.1, 73)	778 (7.9, 113)
Stall	1,167 (11.9, 169)	1,816 (18.5, 263)

LAT236

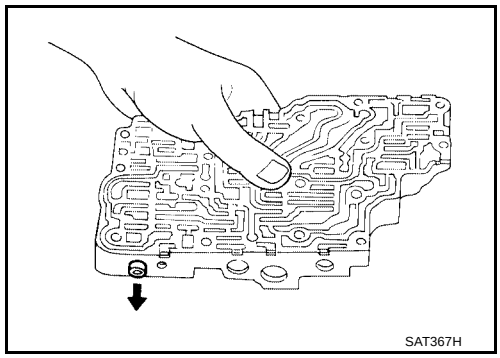
OK or NG

OK >> GO TO 3.
NG >> GO TO 6.

3. CHECK CONTROL VALVE

1. Disassemble control valve assembly.
   Refer to AT-299, "Disassembly" .
2. Check to ensure that:

- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.



OK or NG

OK >> GO TO 4.
NG >> Repair control valve.

4. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 5.
No >> Check transaxle internal components (clutch, brake, etc.).

5. CHECK DTC

Perform AT-165, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

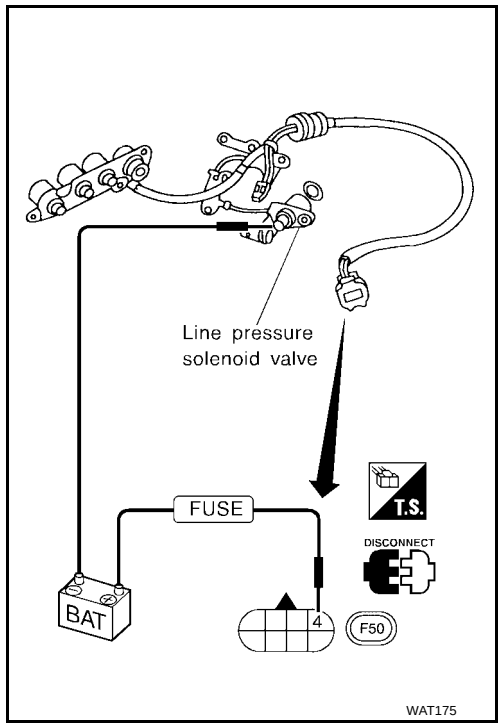
OK >> **INSPECTION END**
NG >> GO TO 10. Check lock-up condition.

6. CHECK LINE PRESSURE SOLENOID VALVE

1. Remove control valve assembly.
   Refer to AT-260, "REMOVAL" .
2. Check line pressure solenoid valve operation.
   Refer to AT-178, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace solenoid valve assembly.



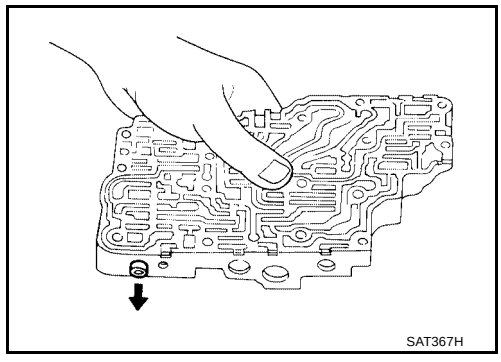
7. CHECK CONTROL VALVE

1. Disassemble control valve assembly.
   Refer to AT-299, "Disassembly" .
2. Check line pressure circuit valves for sticking.

- Pressure regulator valve
- Pilot valve
- Pressure modifier valve

OK or NG

OK >> GO TO 8.
NG >> Repair control valve.



8. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 9.
No >> Check transaxle internal components (clutch, brake, etc.).

9. CHECK DTC

Perform AT-165, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

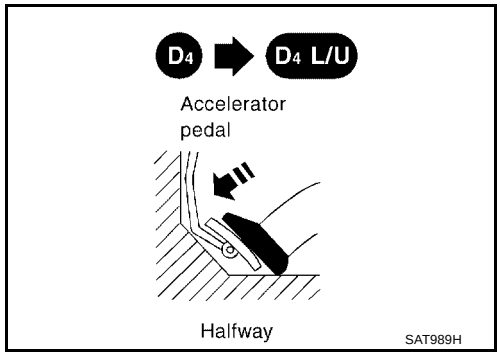
OK >> **INSPECTION END**
NG >> GO TO 10. Check for proper lock-up.

10. CHECK LOCK-UP CONDITION

During “Cruise Test – Part 1” (AT-78, "Cruise Test — Part 1"), does A/T perform lock-up at the specified speed?

Yes or No

Yes >> Perform “Cruise Test – Part 1” (AT-78, "Cruise Test — Part 1") again and return to the start point of this test group.
No >> GO TO 11.

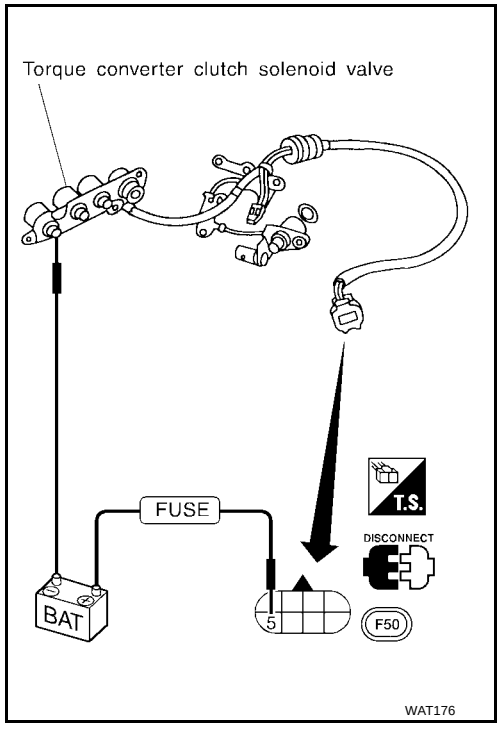


11. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE

1. Remove control valve assembly.
   Refer to AT-260, "REMOVAL" .
2. Check torque converter clutch solenoid valve operation. Refer to AT-163, "TORQUE CONVERTER CLUTCH SOLENOID VALVE" .

OK or NG

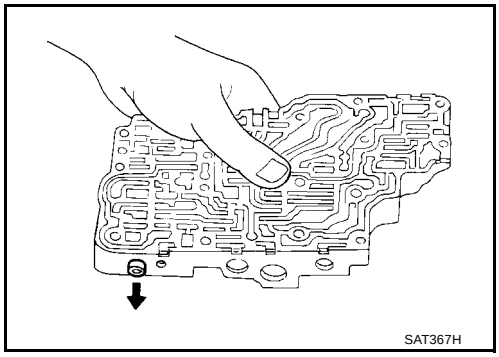
OK >> GO TO 12.
NG >> Replace solenoid valve assembly.



12. CHECK CONTROL VALVE

1. Disassemble control valve assembly.
   Refer to AT-299, "Disassembly" .
2. Check control valves for sticking.

- Torque converter clutch control valve
- Torque converter clutch relief valve



OK or NG

OK >> GO TO 13.
NG >> Repair control valve.

13. CHECK LOCK-UP CONDITION

Does A/T perform lock-up at the specified speed?

Yes or No

Yes >> GO TO 14.
No >> Check transaxle internal components (clutch, brake, etc.).

14. CHECK DTC

Perform AT-165, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> Perform “Cruise Test — Part 1” (AT-78, "Cruise Test — Part 1") again and return to the start point of this test group.

Component Inspection

ECS005XR

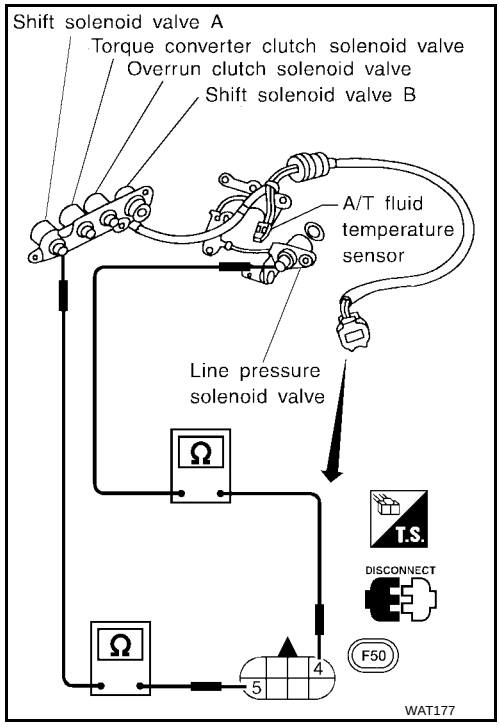
SOLENOID VALVES

- Refer to AT-260, "REMOVAL" .

Resistance Check

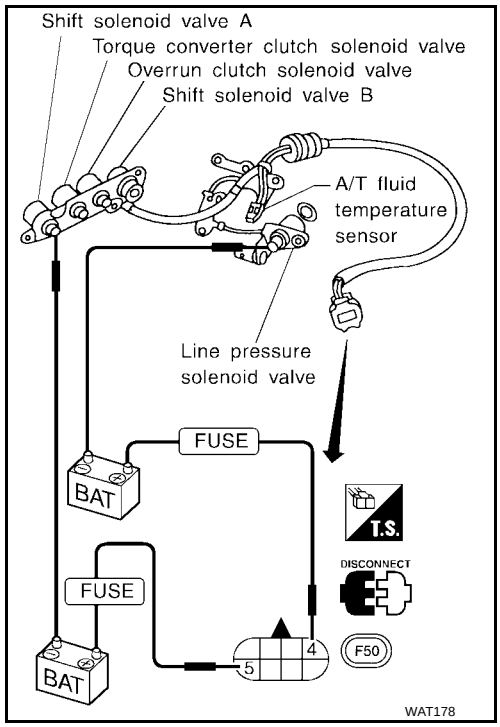
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Line pressure solenoid valve	4	Ground	2.5 - 5Ω
Torque converter clutch solenoid valve	5		5 - 20Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



DTC P0745 LINE PRESSURE SOLENOID VALVE

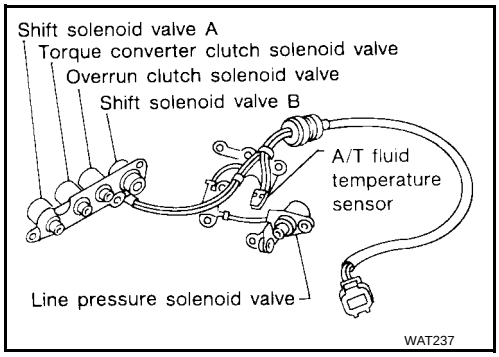
PFP:31940

Description

ECS005XS

The line pressure solenoid valve regulates the oil pump discharge pressure to suit the driving condition in response to a signal sent from the TCM.

The line pressure duty cycle value is not consistent when the closed throttle position switch is "ON". To confirm the line pressure duty cycle at low pressure, the accelerator (throttle) should be open until the closed throttle position switch is "OFF".



CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approx.)
Line pressure solenoid valve duty	Small throttle opening (Low line pressure) ↓ Large throttle opening (High line pressure)	24% ↓ 95%

NOTE:

The line pressure duty cycle value is not consistent when the closed throttle position switch is "ON". To confirm the line pressure duty cycle at low pressure, the accelerator (throttle) should be open until the closed throttle position switch is "OFF".

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: L/PRESS SOL/CIRC	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Line pressure solenoid valve
: P0745		

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

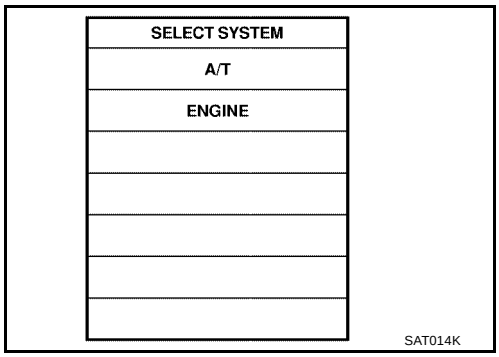
NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.

With CONSULT-II

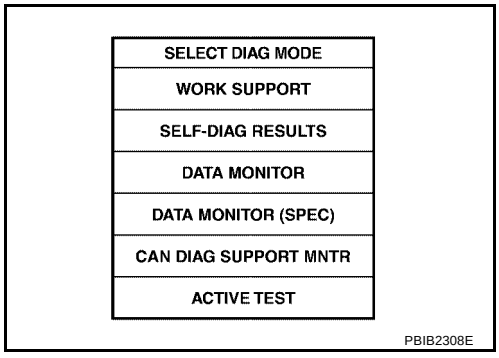
1. Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT-II.



2. Depress accelerator pedal completely and wait at least 5 seconds.

With GST

Follow the procedure "With CONSULT-II".

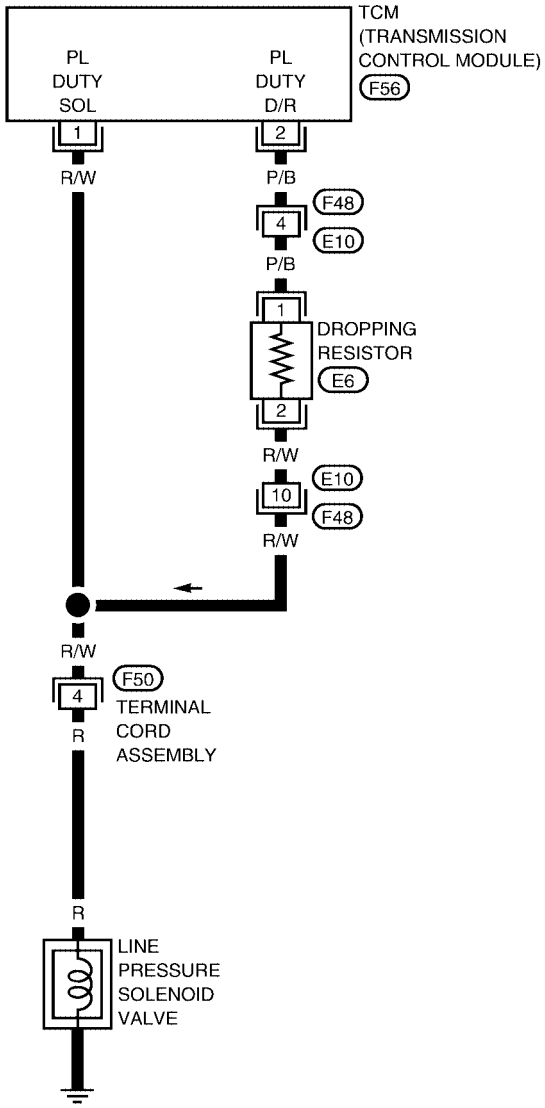


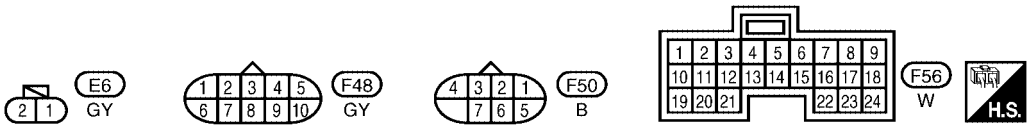
Wiring Diagram — AT — LPSV

ECS005XT

AT-LPSV-01

: DETECTABLE LINE FOR DTC
: NON- DETECTABLE LINE FOR DTC





WCWA0068E

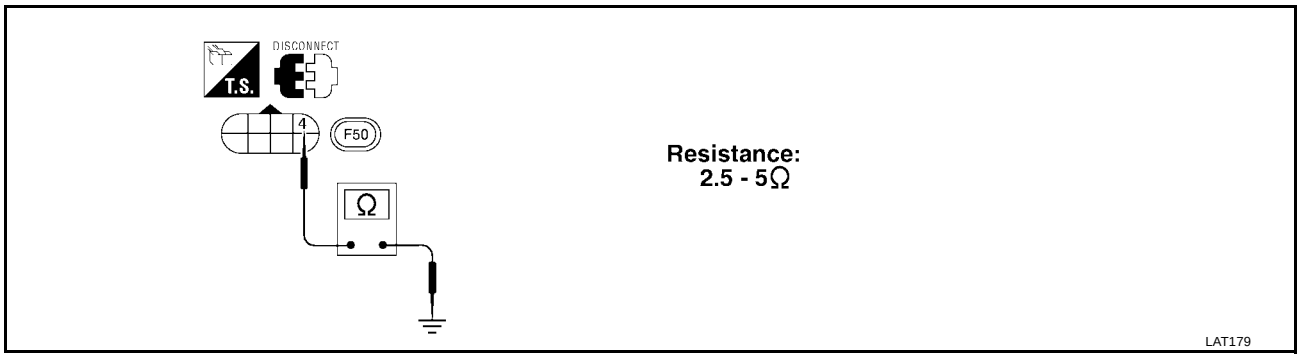
TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	R/W	LINE PRESSURE SOLENOID VALVE	WHEN RELEASING ACCELERATOR PEDAL (ENGINE WARM)	1.5 - 3.0V
			WHEN DEPRESSING ACCELERATOR PEDAL (ENGINE WARM)	0.5V OR LESS
2	P/B	LINE PRESSURE SOLENOID VALVE (WITH DROPPING RESISTOR)	WHEN RELEASING ACCELERATOR PEDAL (ENGINE WARM)	5 - 14v
			WHEN DEPRESSING ACCELERATOR PEDAL (ENGINE WARM)	0.5V OR LESS

Diagnostic Procedure

ECS005XU

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to “OFF” position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal 4 and ground.



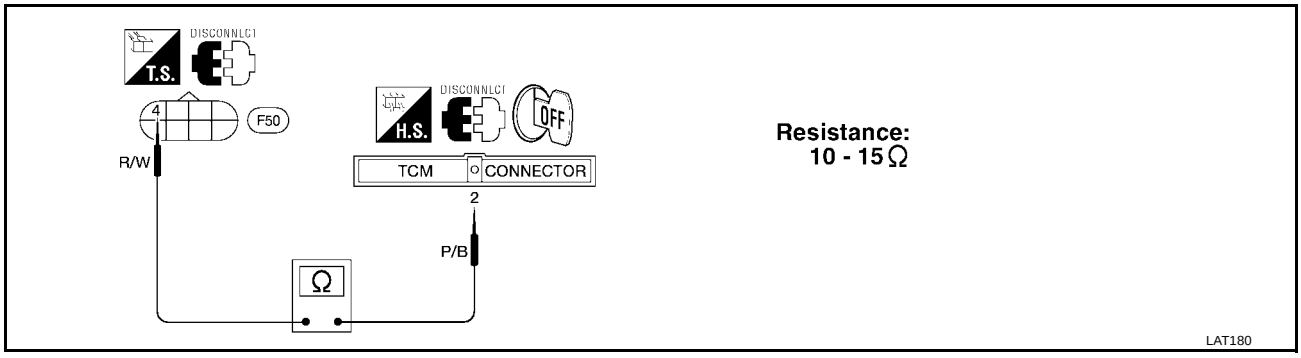
OK or NG

OK >> GO TO 2.

NG >> 1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Line pressure solenoid valve
  Refer to AT-178, "Component Inspection" .
- Harness of terminal cord assembly for short or open

2. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to “OFF” position.
2. Disconnect TCM harness connector.
3. Check resistance between terminal 4 and TCM harness connector terminal 2.



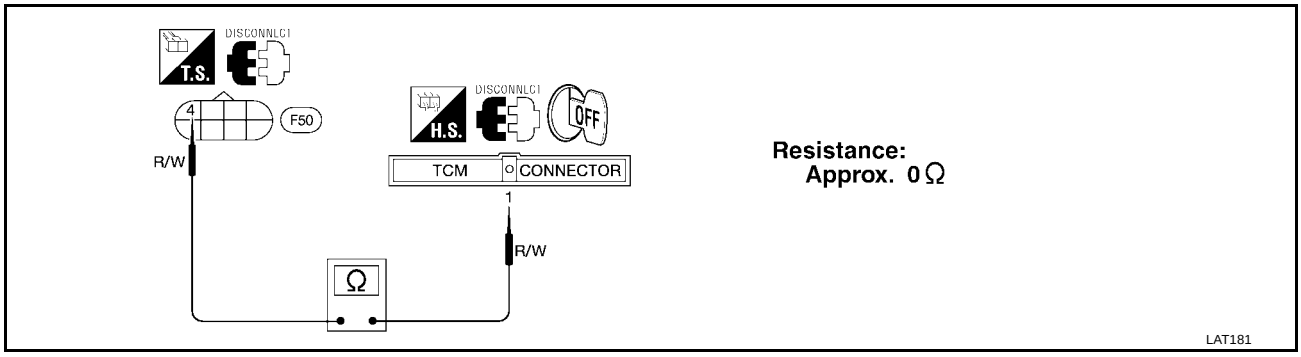
OK or NG

OK >> GO TO 3.
NG >> Check the following items:

- Dropping resistor
  Refer to AT-179, "DROPPING RESISTOR" .
- Harness for short or open between TCM terminal 2 and terminal cord assembly (Main harness)

3. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to “OFF” position.
2. Check resistance between terminal 4 and TCM harness connector terminal 1.



If OK, check harness for short to ground and short to power.

3. Reinstall any part removed.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK DTC

Perform AT-174, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

Component Inspection

ECS005XV

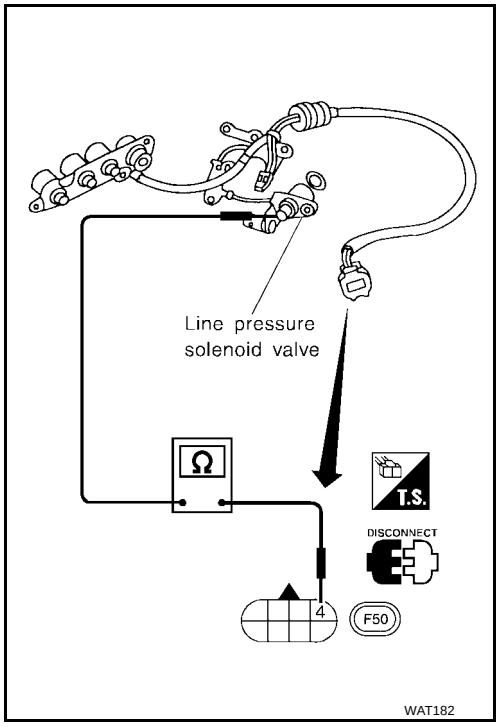
LINE PRESSURE SOLENOID VALVE

- Refer to AT-260, "REMOVAL" .

Resistance Check

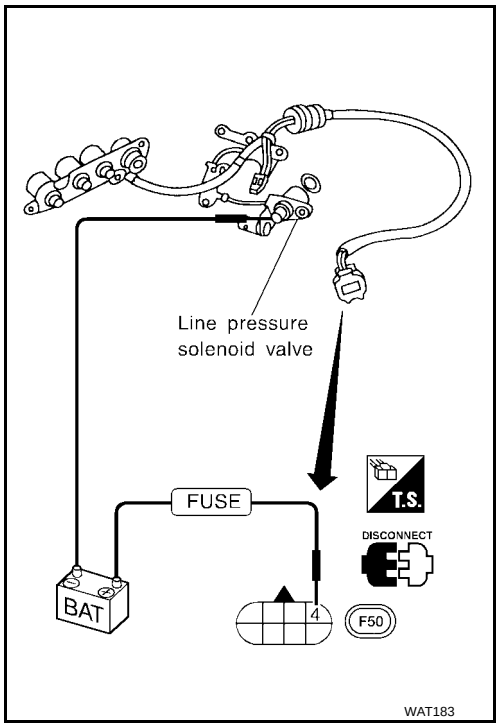
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Line pressure solenoid valve	4	Ground	2.5 - 5Ω



Operation Check

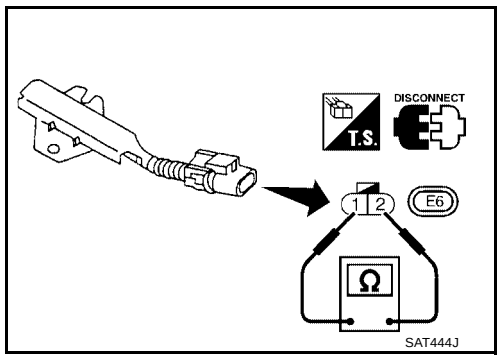
- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



DROPPING RESISTOR

- Check resistance between two terminals.

Resistance : 10 - 15Ω



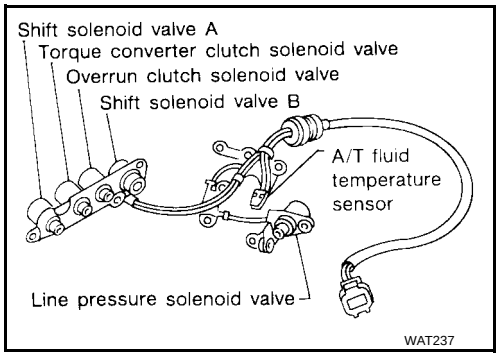
DTC P0750 SHIFT SOLENOID VALVE A

PFP:31940

Description

ECS005XW

Shift solenoid valves A and B are turned “ON” or “OFF” by the TCM in response to signals sent from the PNP switch, vehicle speed sensor and throttle position sensor [accelerator pedal position (APP) sensor]. Gears will then be shifted to the optimum position.



Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: SFT SOL A/CIRC : P0750	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Shift solenoid valve A

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

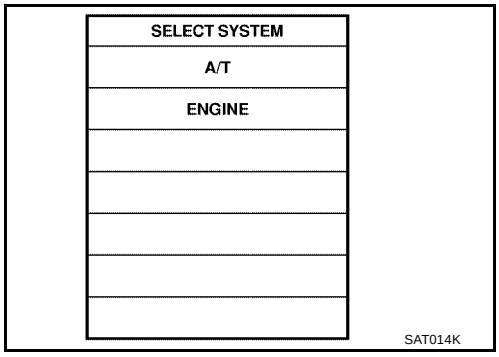
NOTE:

If “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.

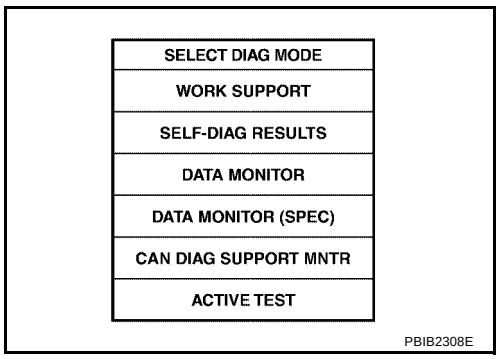
With CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
2. Start engine.
3. Drive vehicle in D position and allow the transmission to shift “1” → “2” (“GEAR”).



With GST

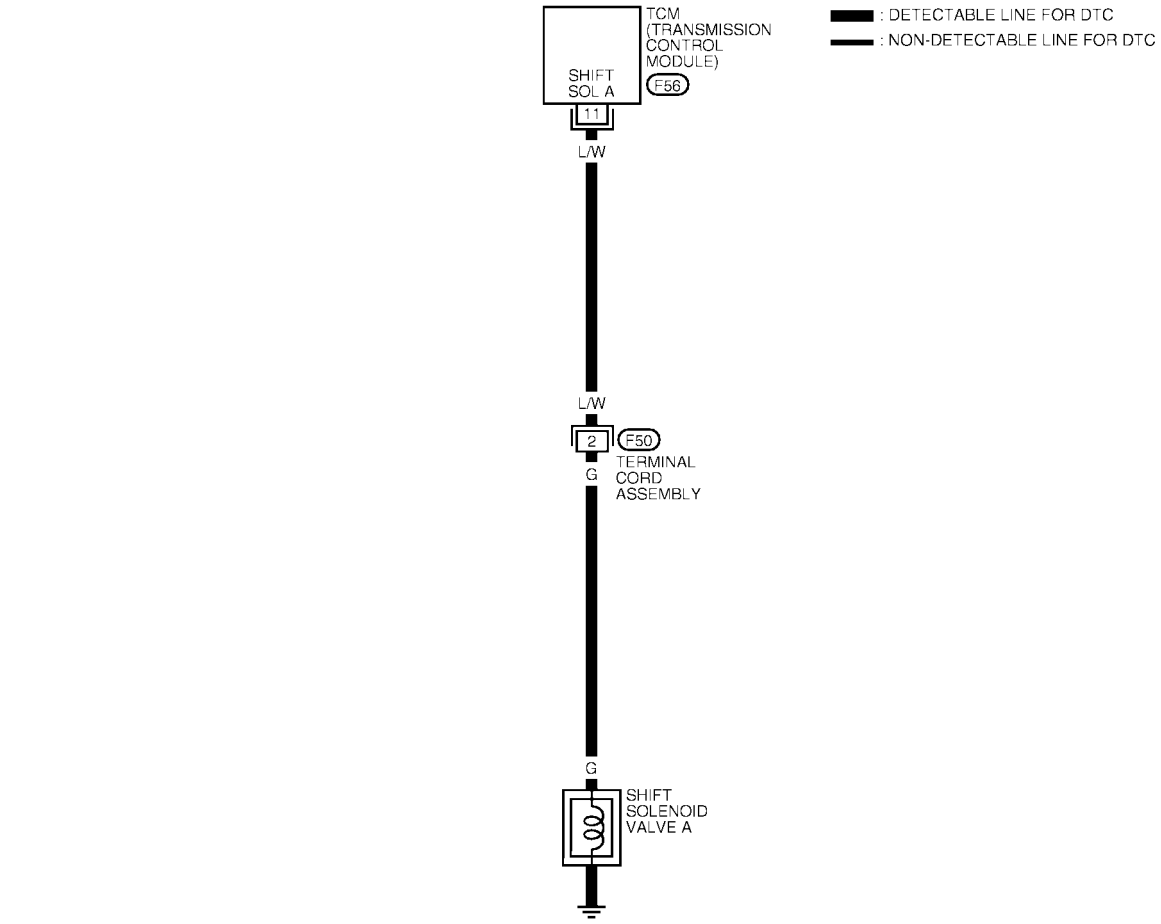
Follow the procedure “With CONSULT-II”.

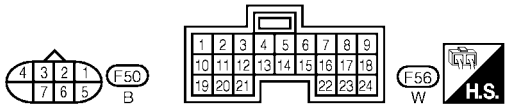


Wiring Diagram — AT — SSV/A

ECS005XX

AT-SSV/A-01





WAT125

TRANSMISSION CONTROL MODULE TERMINALS AND REFERENCE VALUE BETWEEN TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC) (Approx.)
11	L/W	SHIFT SOLENOID VALVE A	WHEN SHIFT SOLENOID VALVE A OPERATES	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE A DOES NOT OPERATE	0V

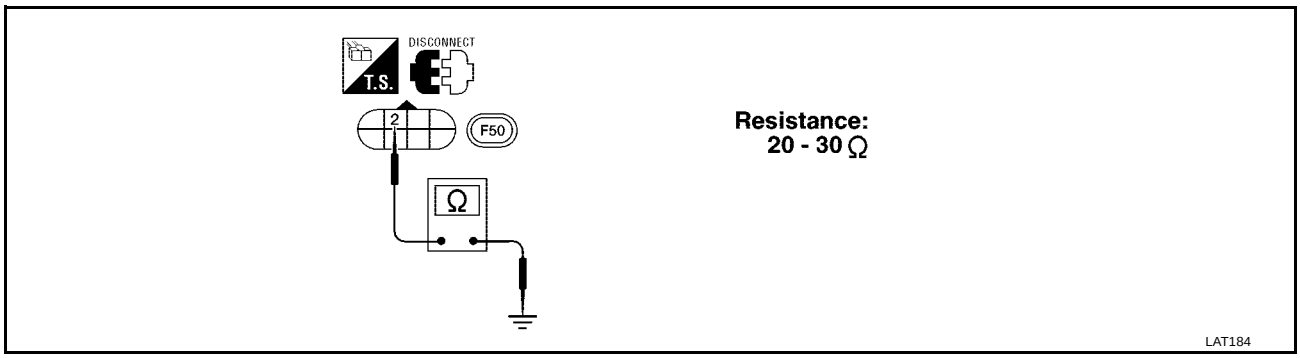
WAT345

Diagnostic Procedure

ECS005XY

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to “OFF” position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal 2 and ground.

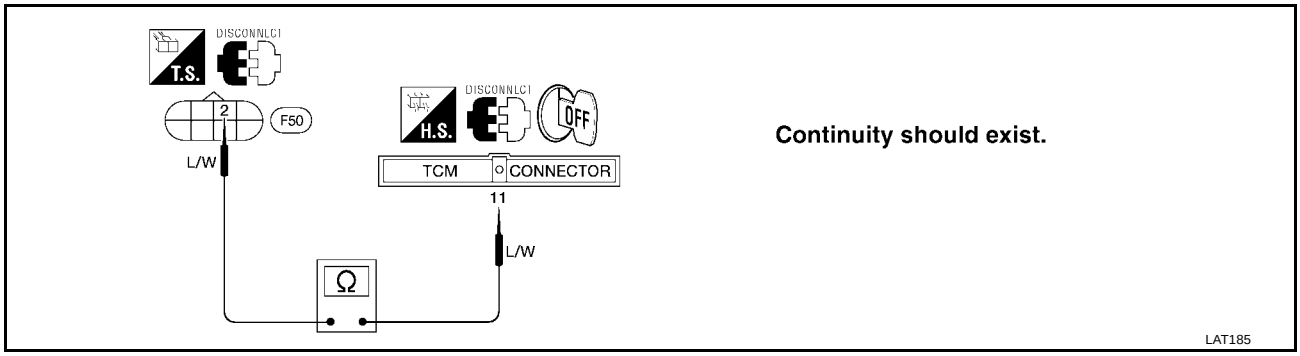


OK or NG

OK >> GO TO 2.
NG >> 1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Shift solenoid valve A
  Refer to AT-183, "Component Inspection" .
- Harness of terminal cord assembly for short or open

2. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to “OFF” position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal 2 and TCM harness connector terminal 11.



If OK, check harness for short to ground and short to power.

4. Reinstall any part removed.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK DTC

Perform AT-180, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

Component Inspection

ECS005XZ

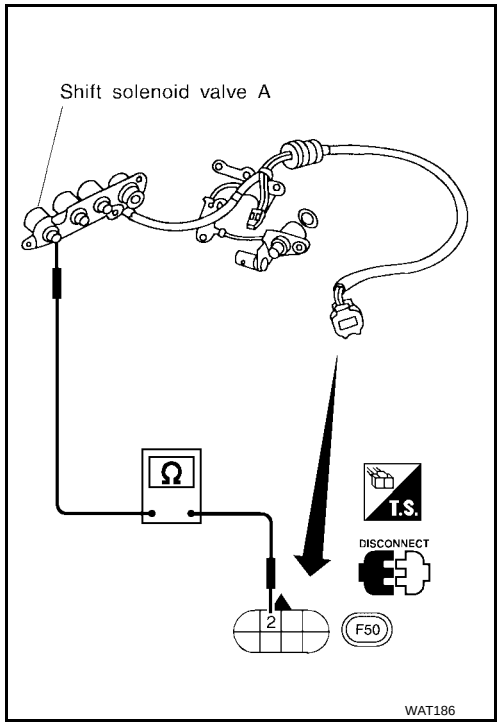
SHIFT SOLENOID VALVE A

- Refer to AT-183, "Component Inspection" .

Resistance Check

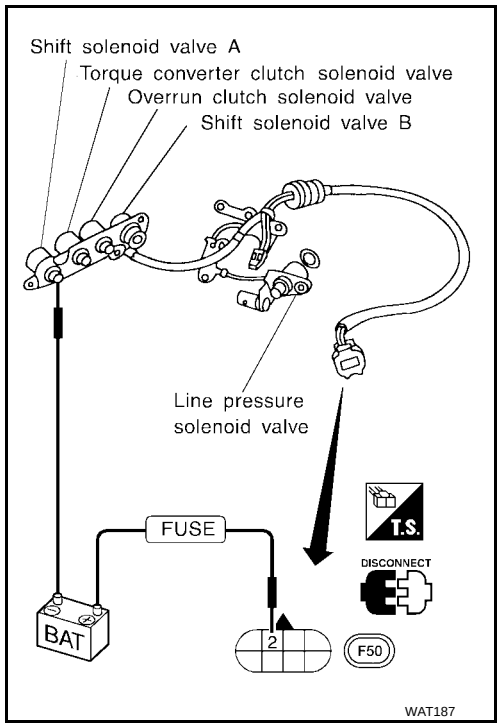
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	2	Ground	20 - 30Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



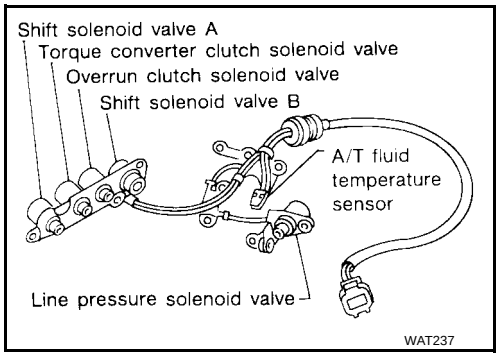
DTC P0755 SHIFT SOLENOID VALVE B

PFP:31940

Description

ECS005Y0

Shift solenoid valves A and B are turned “ON” or “OFF” by the TCM in response to signals sent from the PNP switch, vehicle speed and throttle position sensors. Gears will then be shifted to the optimum position.



Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: SFT SOL B/CIRC : P0755	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Shift solenoid valve B

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

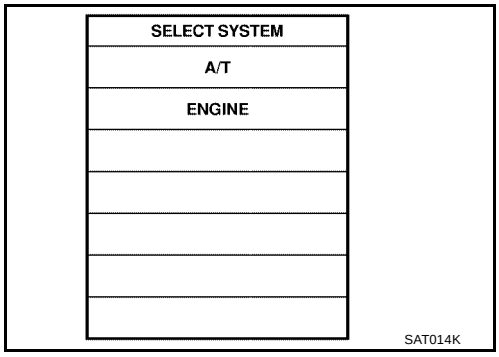
CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.

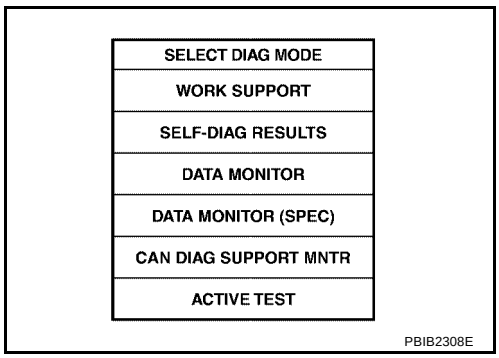


With CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
2. Start engine.
3. Drive vehicle in D position and allow the transmission to shift 1 → 2 → 3 (“GEAR”).

With GST

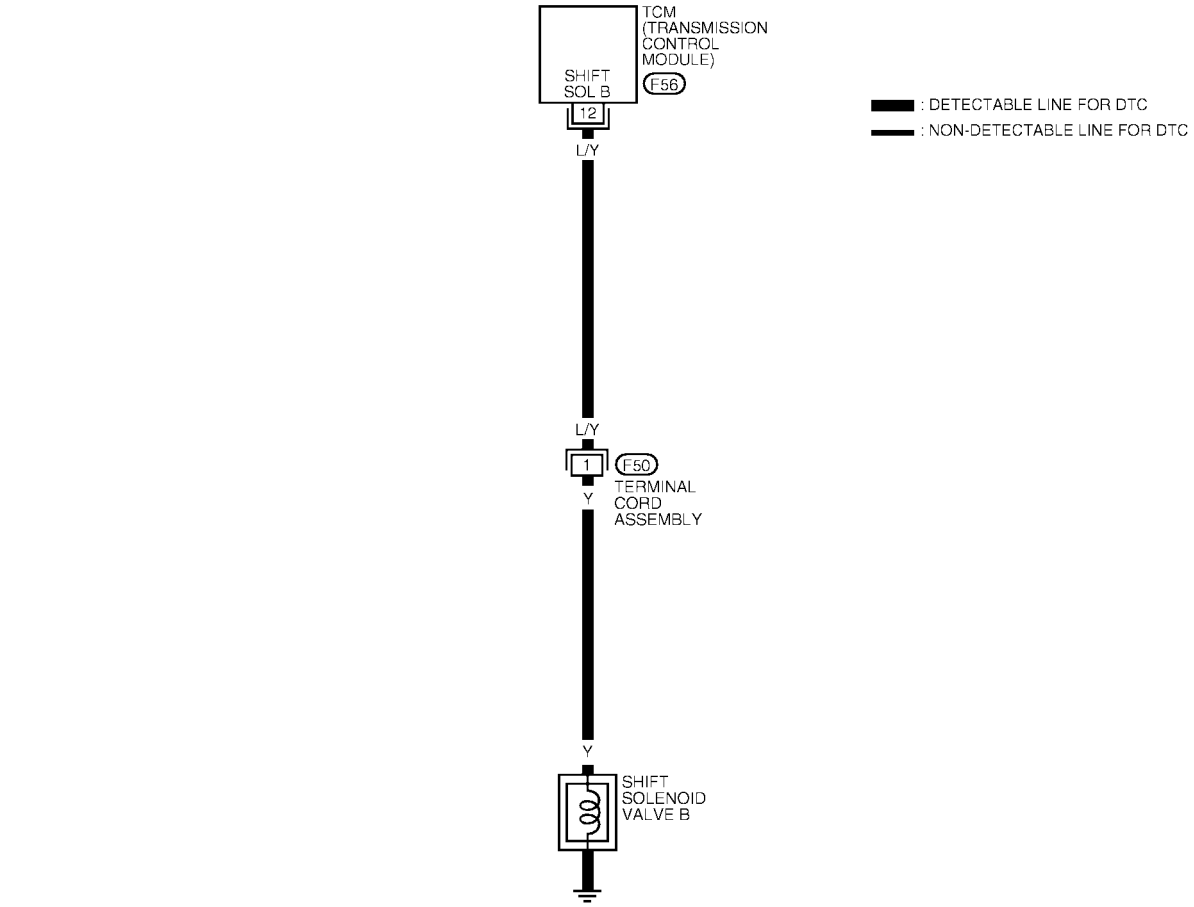
Follow the procedure “With CONSULT-II”.

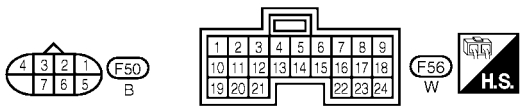


Wiring Diagram — AT — SSV/B

ECS005Y1

AT-SSV/B-01





WAT126

TRANSMISSION CONTROL MODULE TERMINALS AND REFERENCE VALUE BETWEEN TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC) (Approx.)
12	L/Y	SHIFT SOLENOID VALVE B	WHEN SHIFT SOLENOID VALVE B OPERATES	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE B DOES NOT OPERATE	0V

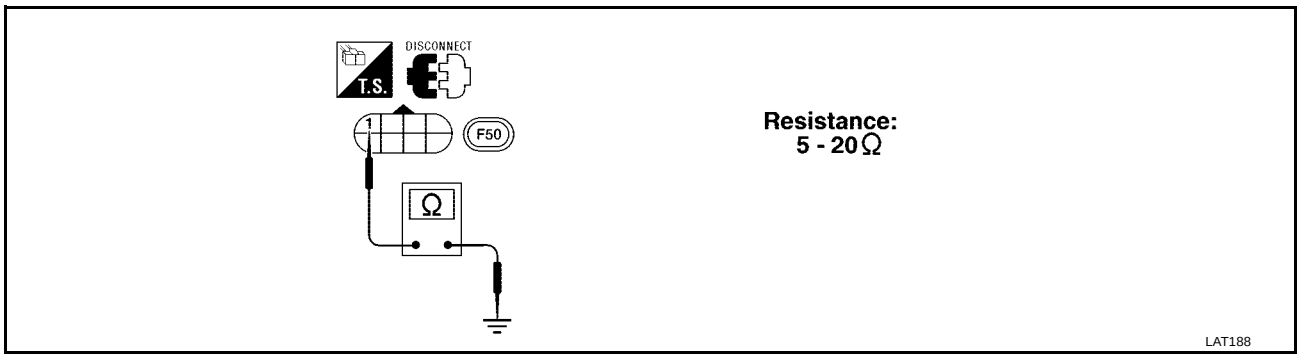
WAT344

Diagnostic Procedure

ECS005Y2

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to “OFF” position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal 1 and ground.

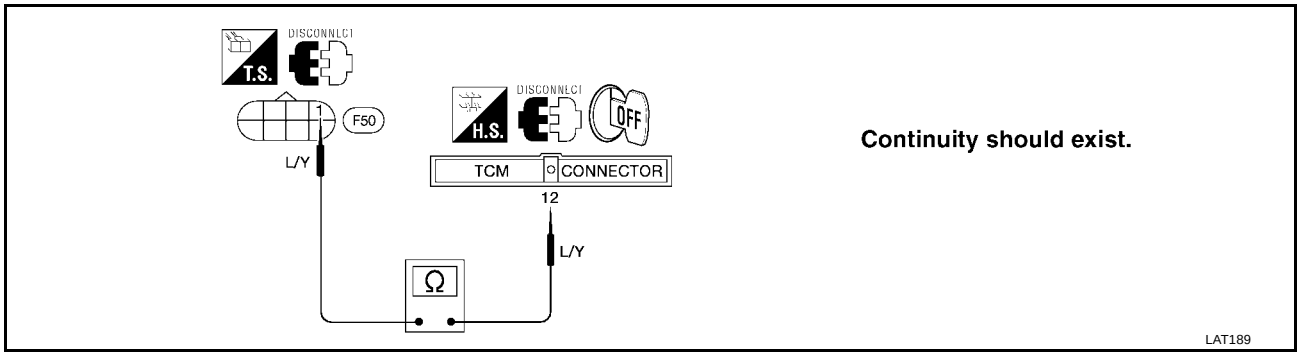


OK or NG

OK >> GO TO 2.
NG >> 1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Shift solenoid valve B
  Refer to AT-187, "Component Inspection" .
- Harness of terminal cord assembly for short or open

2. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to “OFF” position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal 1 and TCM harness connector terminal 12.



If OK, check harness for short to ground and short to power.

4. Reinstall any part removed.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK DTC

Perform AT-184, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

Component Inspection

ECS005Y3

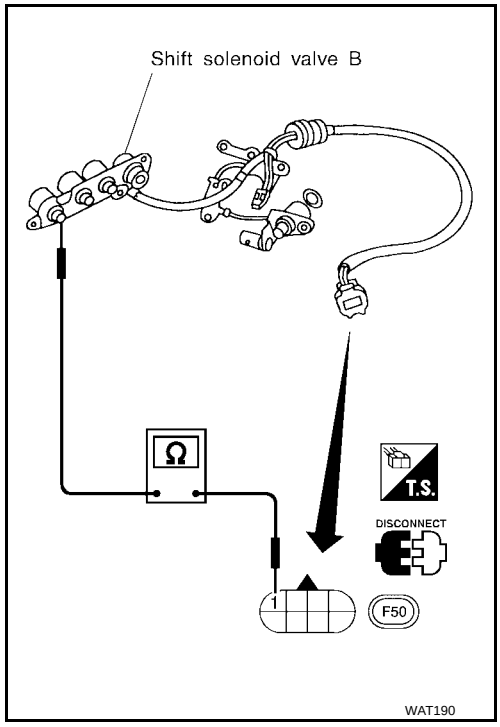
SHIFT SOLENOID VALVE B

- Refer to AT-260, "REMOVAL" .

Resistance Check

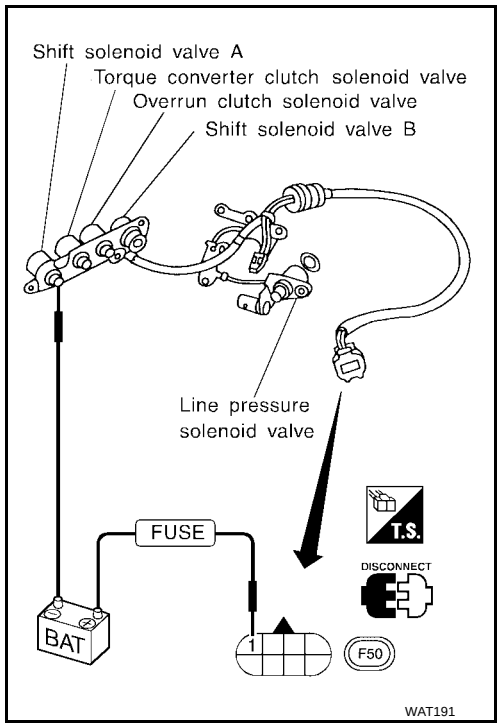
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve B	1	Ground	5 - 20Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

PFP:22560

Description

ECS006GS

The throttle position sensor [accelerator pedal position (APP) sensor] is part of the system that controls throttle position. This system also uses an electric throttle control actuator which consists of a throttle control motor and throttle position sensors. Accelerator pedal position signal is sent to the ECM.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Throttle position sensor [accelerator pedal position (APP) sensor]	Fully-closed throttle	Approximately 0.5V
	Fully-open throttle	Approximately 4V

On Board Diagnosis Logic

ECS006GT

Diagnostic trouble code TP SEN/CIRC A/T with CONSULT-II or P1705 without CONSULT-II is detected when TCM receives an excessively low or high voltage from the ECM.

Possible Cause

ECS006GU

Check the following items.

- Harness or connectors
  (The sensor circuit is open or shorted.)

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS006GV

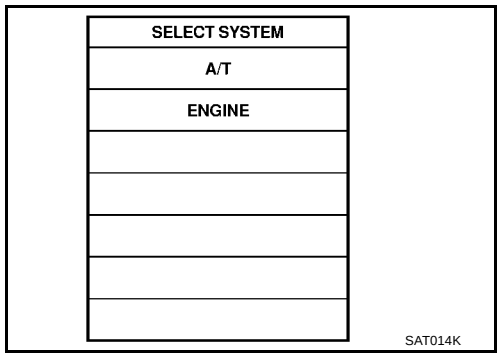
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

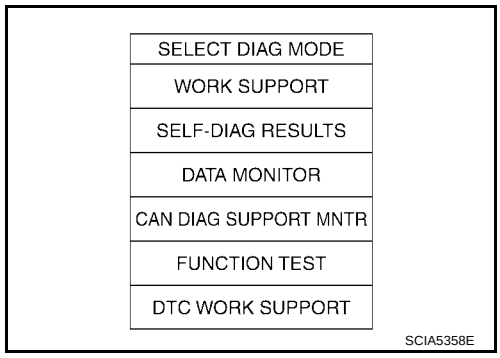
WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode for “A/T” with CONSULT-II.

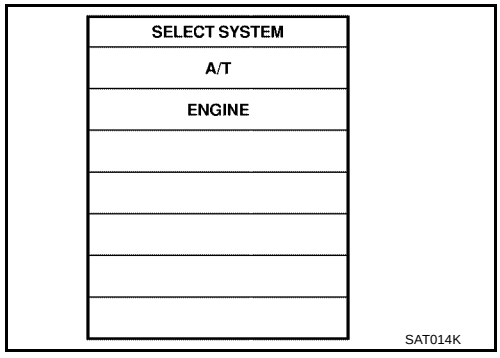
Accelerator pedal condition	THRTL POS SEN	CLOSED THL/SW	W/O THRL/P·SW
Fully released	Less than 4.7V	ON	OFF
Partially depressed	0.1 - 4.6V	OFF	OFF
Fully depressed	1.9 - 4.6V	OFF	ON

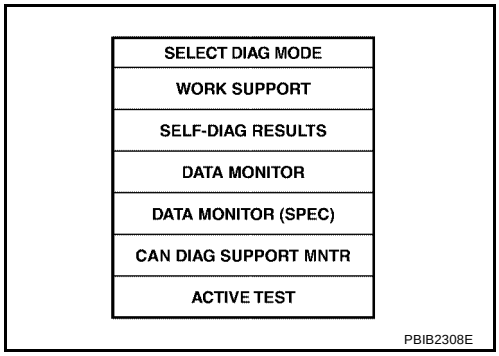


   If the check result is NG, go to AT-192, "Diagnostic Procedure" .
   If the check result is OK, go to following step.
2. Turn ignition switch ON and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
3. Start engine and maintain the following conditions for at least 3 consecutive seconds. Then release accelerator pedal completely.
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   THRTL POS SEN: Approximately 3V or less
   Selector lever: D position (O/D ON)
   If the check result is NG, go to AT-192, "Diagnostic Procedure" .
   If the check result is OK, go to following step.



4. Maintain the following conditions for at least 3 consecutive seconds. Then release accelerator pedal completely.
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   Accelerator pedal: Wide open throttle
   Selector lever: D position (O/D ON)





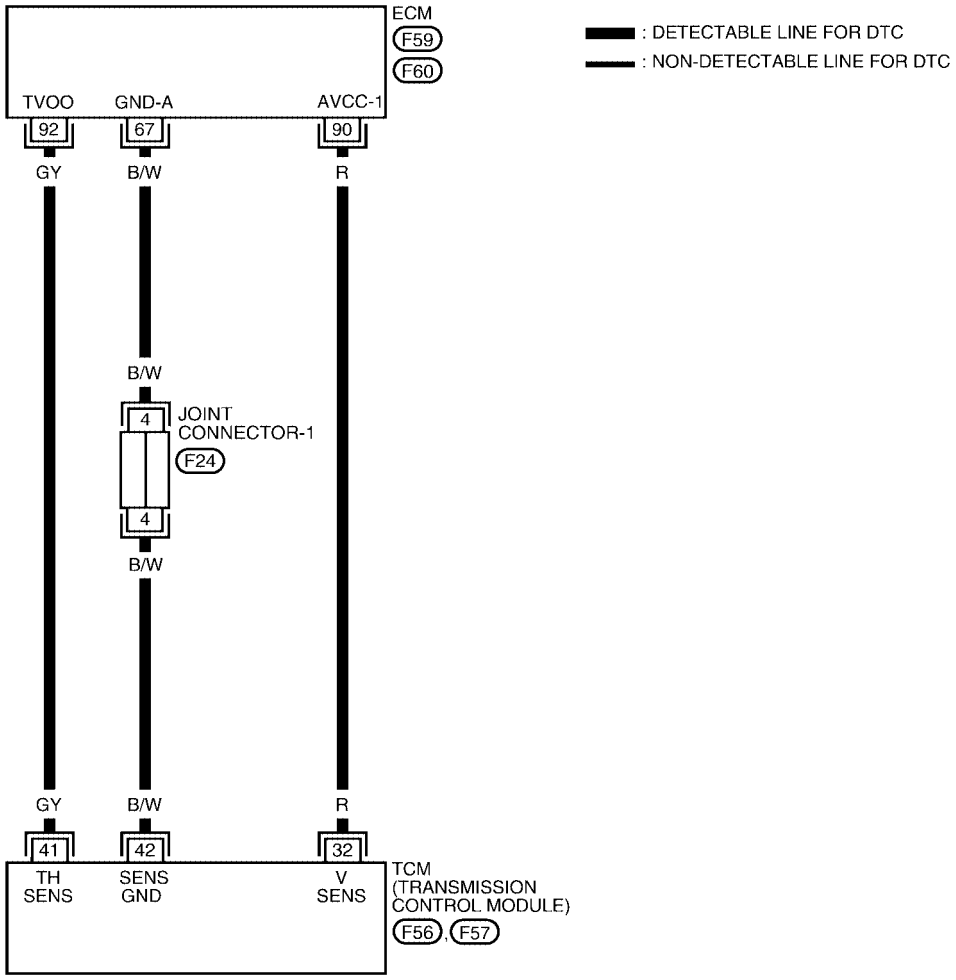
WITH GST

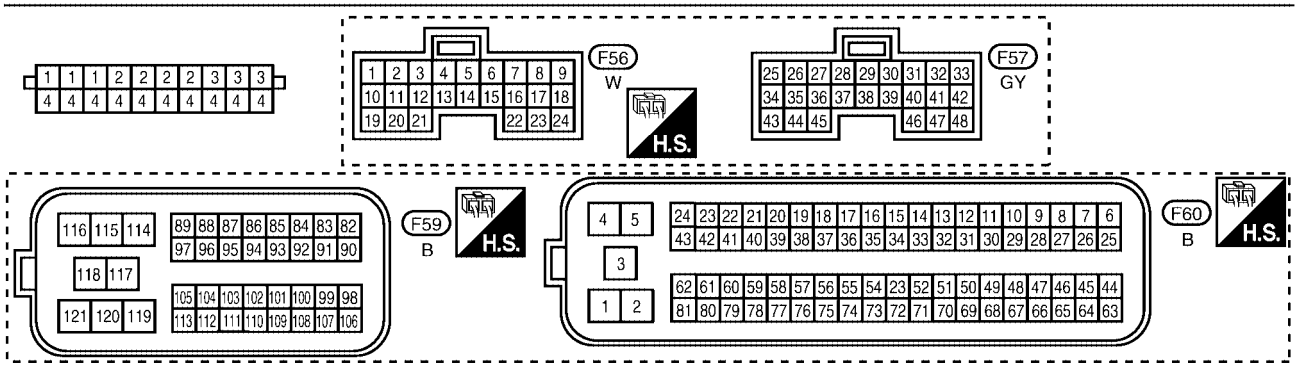
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — TPS

ECS006GW

AT-TPS-01





WCWA0069E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
32	R	SENSOR POWER	IGNITION SWITCH ON	4.5 - 5.5V
			IGNITION SWITCH OFF	0V
41	GY	THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]	IGNITION ON AND ACCELERATOR PEDAL IS DEPRESSED SLOWLY AFTER WARMING UP ENGINE	FULLY CLOSED THROTTLE: 0.5V
				WIDE OPEN THROTTLE: 4.0V
42	B/W	SENSOR GROUND	—	—

Diagnostic Procedure

ECS006GX

1. CHECK DTC WITH ECM

- Check P code with CONSULT-II “ENGINE”.
  Turn ignition switch ON and select “SELF DIAGNOSTIC RESULTS” mode for “ENGINE” with CONSULT-II.

Refer to EC-72, "Malfunction Indicator Lamp (MIL)" [QG18DE (ULEV)] or EC-653, "Malfunction Indicator Lamp (MIL)" [QG18DE (SULEV)].

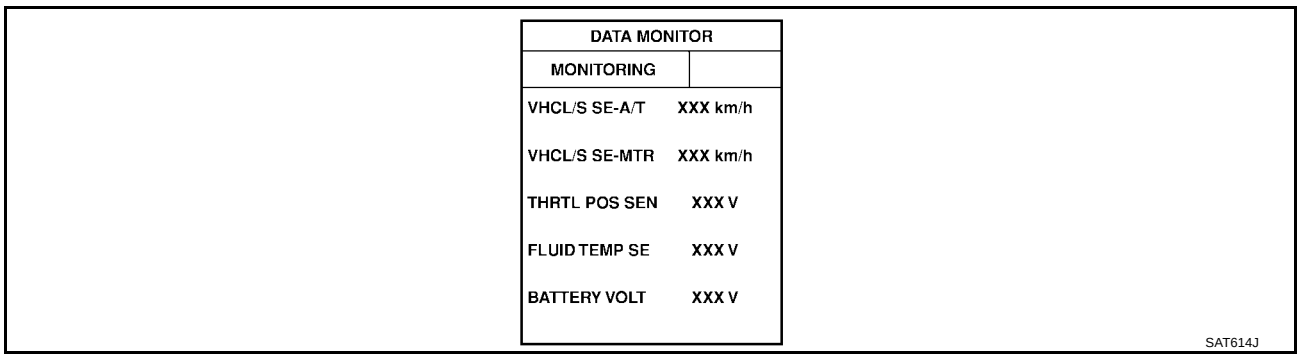
OK or NG

OK (with CONSULT-II)>>GO TO 2.
OK (without CONSULT-II)>>GO TO 3.
NG >> Check throttle position sensor [accelerator pedal position (APP) sensor] circuit for engine control. Refer to EC-260, "DTC P0222, P0223 TP SENSOR" [QG18DE (ULEV)] or EC-818, "DTC P0222, P0223 TP SENSOR" [QG18DE (SULEV)] and EC-503, "DTC P2122, P2123 APP SENSOR" [QG18DE (ULEV)] or EC-1125, "DTC P2122, P2123 APP SENSOR" [QG18DE (SULEV)].

2. CHECK INPUT SIGNAL (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “THRTL POS SEN”.



Voltage:
Fully-closed throttle :Approximately 0.5V
Fully-open throttle :Approximately 4V

OK or NG

OK >> GO TO 4.
NG >> Check harness for short or open between ECM and TCM regarding throttle position sensor [accelerator pedal position (APP) sensor] circuit. (Main harness)

3. CHECK INPUT SIGNAL (WITHOUT CONSULT-II)

Without CONSULT-II

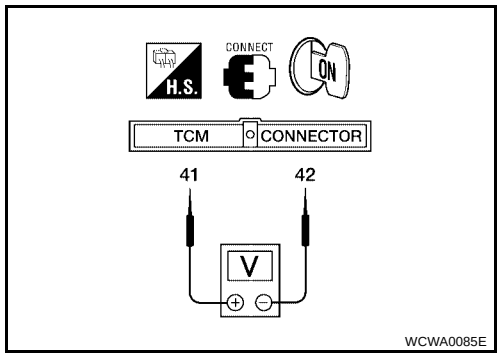
1. Turn ignition switch to ON position. (Do not start engine.)
2. Check voltage between TCM terminals 41 (GY) and 42 (B/W) while accelerator pedal is depressed slowly.

Voltage:

Fully-closed throttle valve **:Approximately 0.5V**

Fully-open throttle valve **:Approximately 4V**

(Voltage rises gradually in response to throttle position.)



OK or NG

OK >> GO TO 4.
NG >> Check harness for short or open between ECM and TCM regarding throttle position sensor [accelerator pedal position (APP) sensor] circuit. (Main harness)

4. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

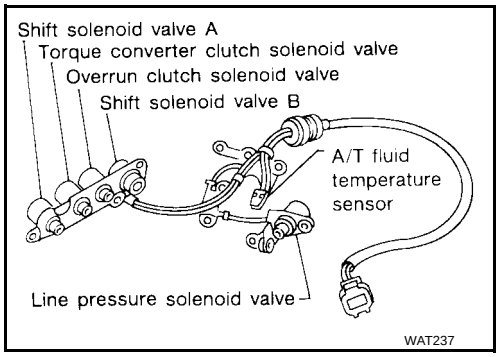
DTC P1760 OVERRUN CLUTCH SOLENOID VALVE

PFP:31940

Description

ECS005Y8

The overrun clutch solenoid valve is activated by the TCM in response to signals sent from the inhibitor switch, overdrive control switch, vehicle speed and throttle position sensors. The overrun clutch operation will then be controlled.



ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: O/R CLTCH SOL/CIRC : P1760	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Overrun clutch solenoid valve

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

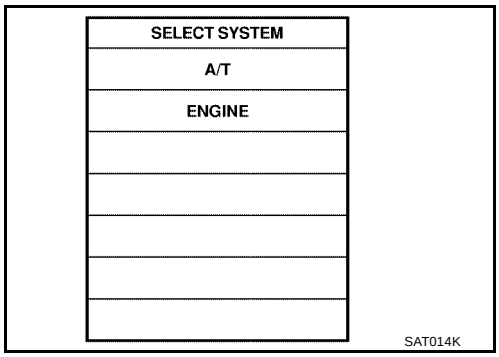
NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

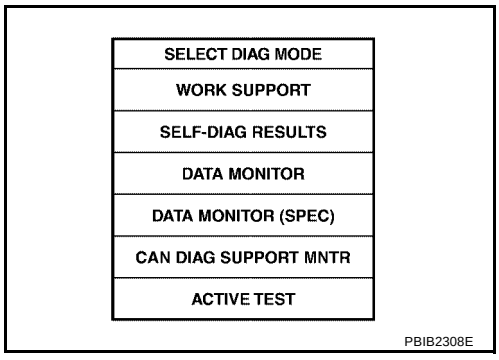
Always drive vehicle on a level road to improve accuracy of test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.



With CONSULT-II

1. Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT-II.
2. Start engine.
3. Accelerate vehicle to a speed of more than 10 km/h (6 MPH) with "D" position (OD "ON").
4. Release accelerator pedal completely with "D" position (OD "OFF").



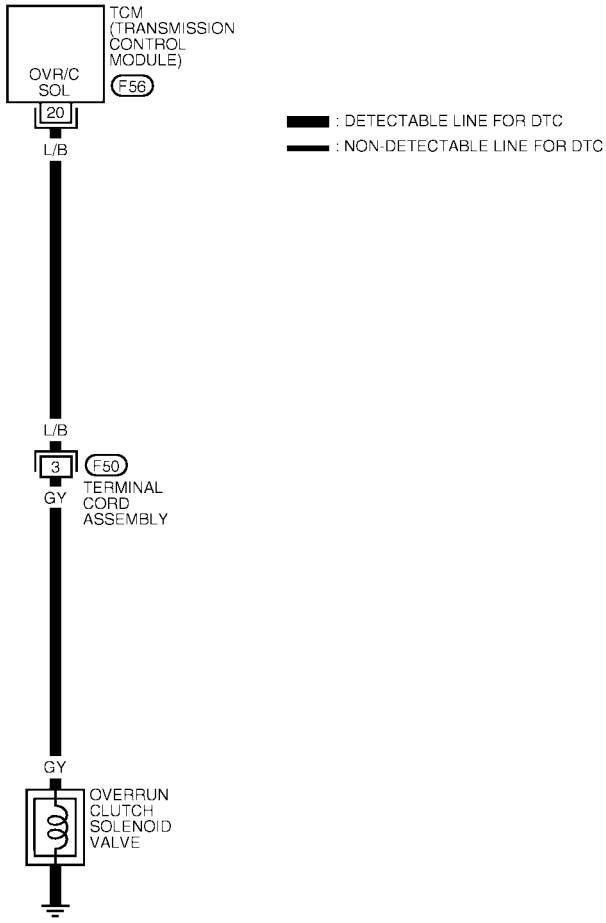
With GST

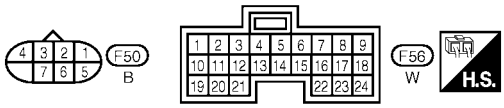
Follow the procedure "With CONSULT-II".

Wiring Diagram — AT — OVRCSV

ECS005Y9

AT-OVRCSV-01





WAT128

TRANSMISSION CONTROL MODULE TERMINALS AND REFERENCE VALUE BETWEEN TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC) (Approx.
20	L/B	OVERRUN CLUTCH SOLENOID VALVE	WHEN OVERRUN CLUTCH SOLENOID VALVE OPERATES	BATTERY VOLTAGE
			WHEN OVERRUN CLUTCH SOLENOID VALVE DOES NOT OPERATE	0V

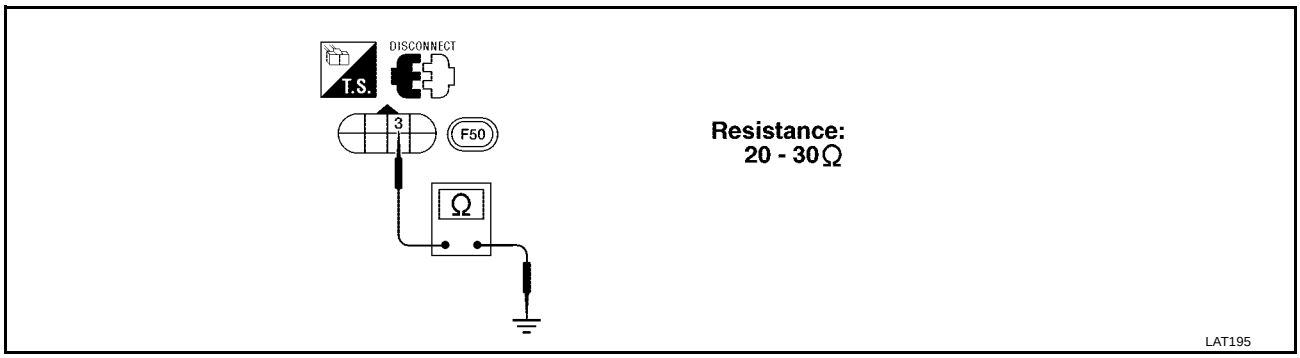
WAT351

Diagnostic Procedure

ECS005YA

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to “OFF” position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal 3 and ground.

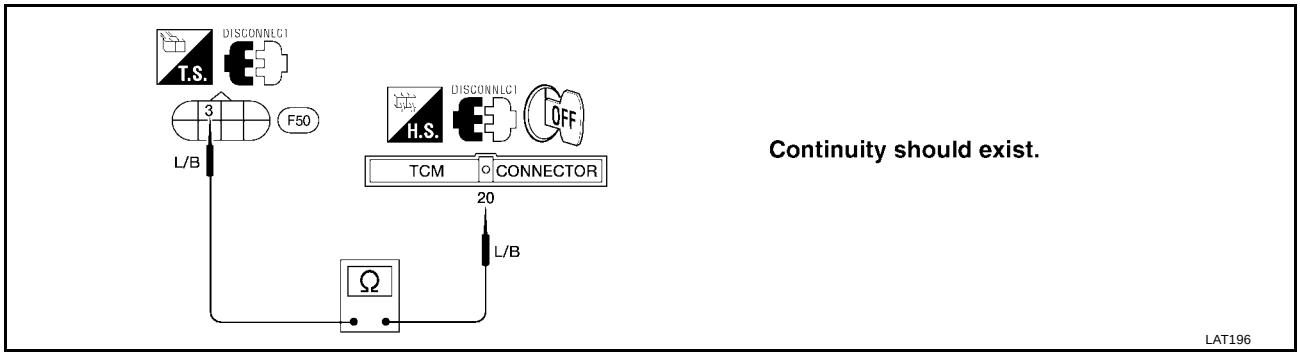


OK or NG

OK >> GO TO 2.
NG >> 1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Overrun clutch solenoid valve
  Refer to AT-197, "Component Inspection" .
- Harness of terminal cord assembly for short or open

2. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to “OFF” position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal 3 and TCM harness connector terminal 20.



If OK, check harness for short to ground and short to power.

4. Reinstall any part removed.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK DTC

Perform AT-194, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

Component Inspection

ECS005YB

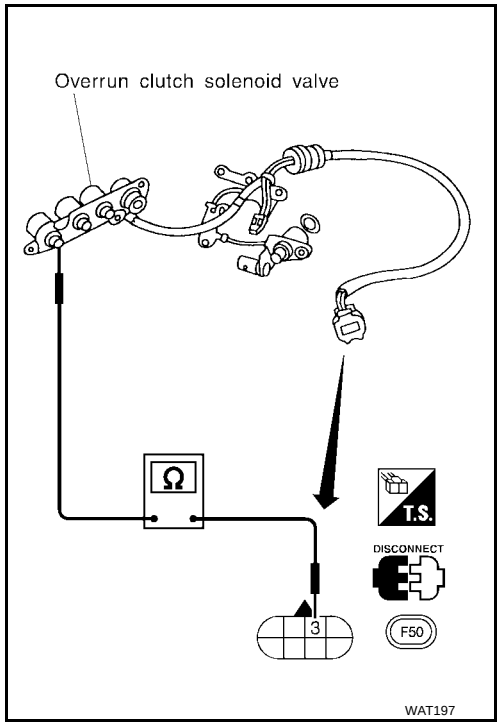
OVERRUN CLUTCH SOLENOID VALVE

- Refer to AT-197, "Component Inspection" .

Resistance Check

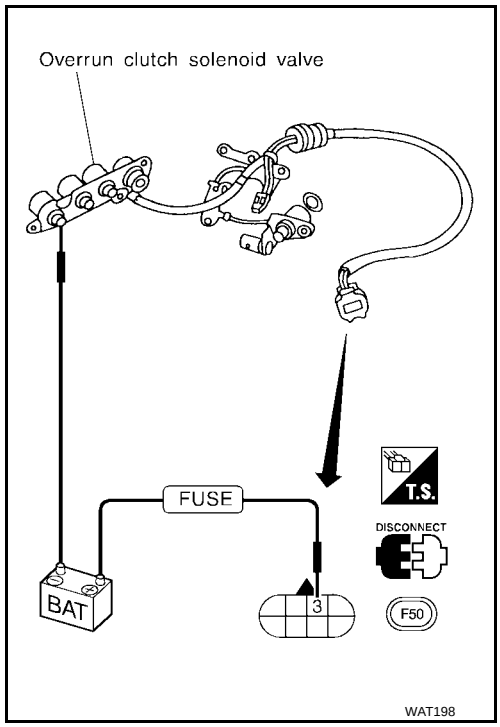
- Check resistance between two terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Overrun clutch solenoid valve	3	Ground	20 - 30Ω



Operation Check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



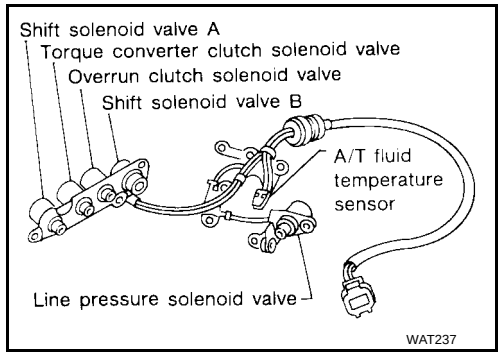
DTC BATT/FLUID TEMP SEN (A/T FLUID TEMP SENSOR CIRCUIT AND TCM POWER SOURCE)

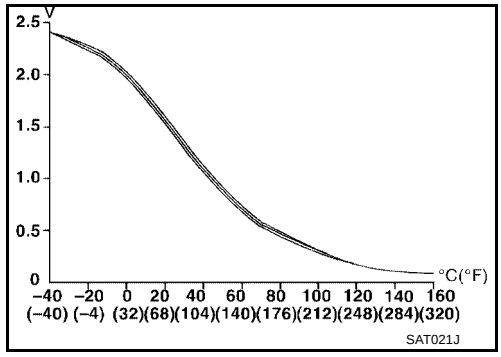
PFP:31940

Description

ECS005YC

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the TCM.





CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approx.)	
A/T fluid temperature sensor	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]	1.5V ↓ 0.5V	2.5 kΩ ↓ 0.3 kΩ

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: BATT/FLUID TEMP SEN	TCM receives an excessively low or high voltage from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● A/T fluid temperature sensor
: 8th judgement flicker		

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

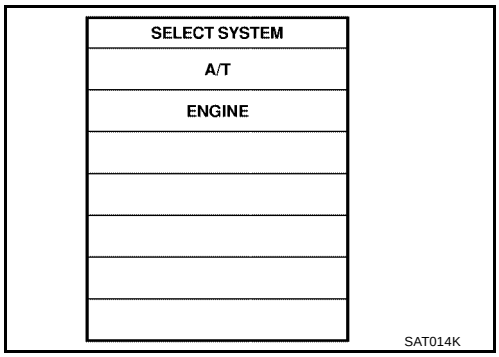
After the repair, perform the following procedure to confirm the malfunction is eliminated.

With CONSULT-II

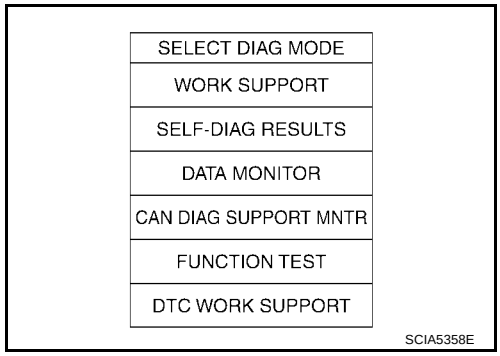
1. Start engine.
2. Select “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Drive vehicle under the following conditions:
   Selector lever in “D”, vehicle speed higher than 20 km/h (12 MPH).

Without CONSULT-II

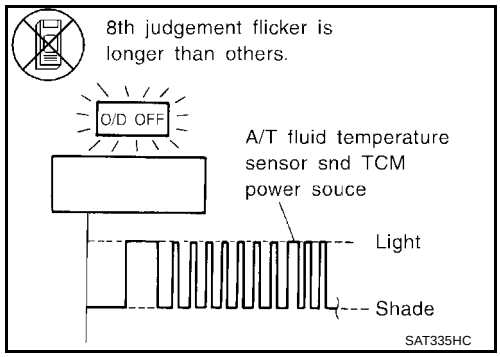
1. Start engine.



2. Drive vehicle under the following conditions:
Selector lever in “D”, vehicle speed higher than 20 km/h (12 MPH).

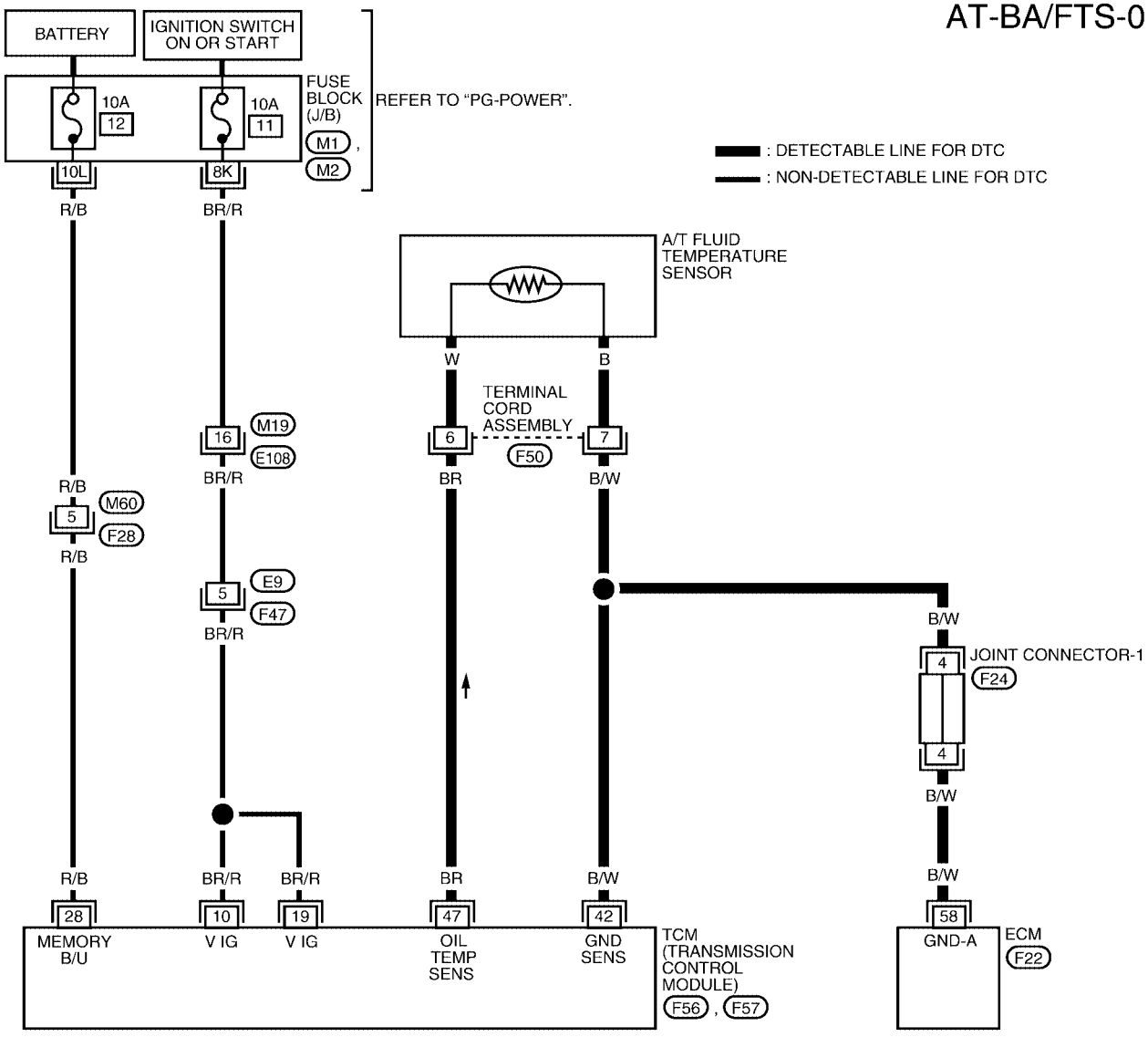


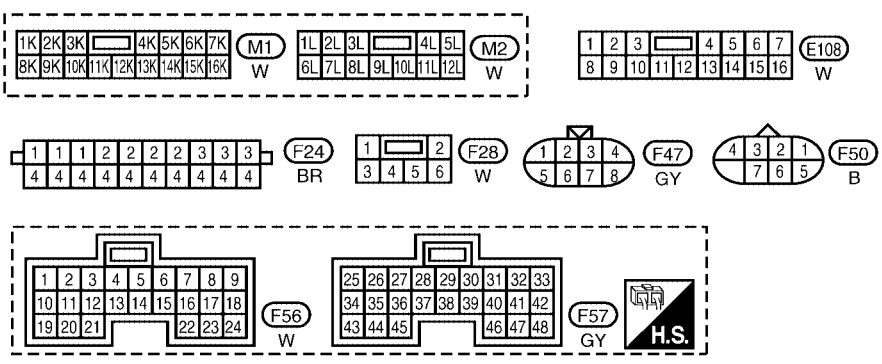
3. Perform self-diagnosis.
Refer to TCM Self-diagnostic Procedure (No Tools), AT-52, "TCM Self-diagnostic Procedure (No Tools)" .



Wiring Diagram — AT — BA/FTS

ECS005YD





REFER TO THE FOLLOWING.
F60 - ELECTRICAL UNITS

WCWA0070E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	BR/R	POWER SOURCE	WHEN TURNING IGNITION SWITCH TO "ON"	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO "OFF"	0V
19	BR/R	POWER SOURCE	WHEN TURNING IGNITION SWITCH TO "ON"	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO "OFF"	0V
28	R/B	POWER SOURCE (MEMORY BACK UP)	WHEN TURNING IGNITION SWITCH TO "OFF"	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO "ON"	BATTERY VOLTAGE
42	B/W	GROUND (A/T FLUID TEMPERATURE SENSOR)	—	0V
47	BR	A/T FLUID TEMPERATURE SENSOR	WHEN ATF TEMPERATURE IS 20°C (68°F)	APPROX. 1.5V
			WHEN ATF TEMPERATURE IS 80°C (176°F)	APPROX. 0.5V

Diagnostic Procedure

ECS005YE

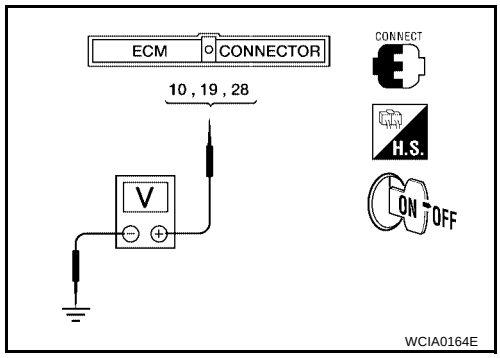
1. CHECK TCM POWER SOURCE

1. Turn ignition switch to “ON” position.
   (Do not start engine.)
2. Check voltage between TCM terminals 10, 19, 28 and ground.

Voltage : Battery voltage

3. Turn ignition switch to “OFF” position.
4. Check voltage between TCM terminal 28 and ground.

Voltage : Battery voltage



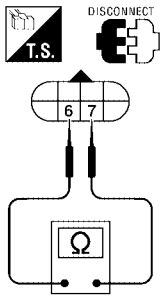
OK or NG

OK >> GO TO 2.
NG >> Check the following items:

- Harness for short or open between ignition switch and TCM (Main harness)
- Harness for short or open between battery and TCM (Main harness)
- Ignition switch and fuse
  Refer to PG-2, "POWER SUPPLY ROUTING" .

2. CHECK A/T FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY

1. Turn ignition switch to “OFF” position.
2. Disconnect terminal cord assembly connector F50 in engine compartment.
3. Check resistance between terminal cord assembly F50 terminals 6 and 7 when A/T is cold.



Resistance:
Cold 20°C (68°F)
Approximately 2.5 kΩ

LCIA0027E

4. Reinstall any part removed.

OK or NG

OK (With CONSULT-II)>> GO TO 3.
OK (Without CONSULT-II)>> GO TO 4.
NG >> 1. Remove oil pan.
2. Check the following items:
- A/T fluid temperature sensor
  Refer to AT-203, "Component Inspection" .
- Harness of terminal cord assembly for short or open

3. CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR (WITH CONSULT-II)

With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “FLUID TEMP SE”.

DATA MONITOR	
MONITORING	
VHCL/S SE-A/T	XXX km/h
VHCL/S SE-MTR	XXX km/h
THRTL POS SEN	XXX V
FLUID TEMP SE	XXX V
BATTERY VOLT	XXX V

SAT614J

Voltage

Cold [20°C (68°F)] → : Approximately 1.5V →
Hot [80°C (176°F)] 0.5V

OK or NG

OK >> GO TO 5.
NG >> Check the following items:
- Harness for short or open between TCM, ECM and terminal cord assembly (Main harness)
- Ground circuit for ECM
  Refer to EC-138, "Wiring Diagram" [QG18DE (ULEV)] or EC-721, "Wiring Diagram" [QG18DE (SULEV].

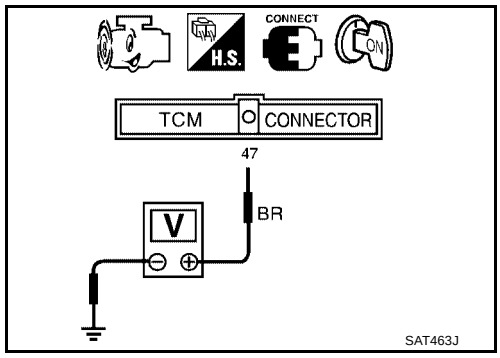
4. CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR (WITHOUT CONSULT-II)

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM terminal 47 and ground while warming up A/T.

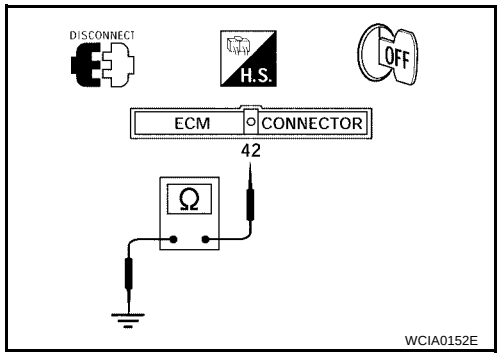
Voltage

Cold [20°C (68°F)] → Hot [80°C (176°F)] : **Approximately 1.5V → 0.5V**



3. Turn ignition switch to “OFF” position.
4. Disconnect TCM harness connector.
5. Check resistance between terminal 42 (B/W) and ground.

Continuity should exist.



OK or NG

OK >> GO TO 5.

NG >> Check the following items:

- Harness for short or open between TCM, ECM and terminal cord assembly (Main harness)
- Ground circuit for ECM
  Refer to EC-138, "Wiring Diagram" [QG18DE (ULEV)] or EC-721, "Wiring Diagram" [QG18DE (SULEV)].

5. CHECK DTC

Perform AT-198, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**

NG >> 1. Perform TCM input/output signal inspection.

2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

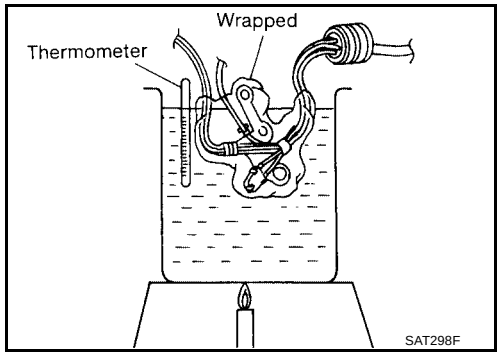
Component Inspection

ECS005YF

A/T FLUID TEMPERATURE SENSOR

- Refer to AT-260, "REMOVAL" .
- Check resistance between two terminals while changing temperature as shown.

Temperature °C (°F)	Resistance (approx.)
20 (68)	2.5 kΩ
80 (176)	0.3 kΩ



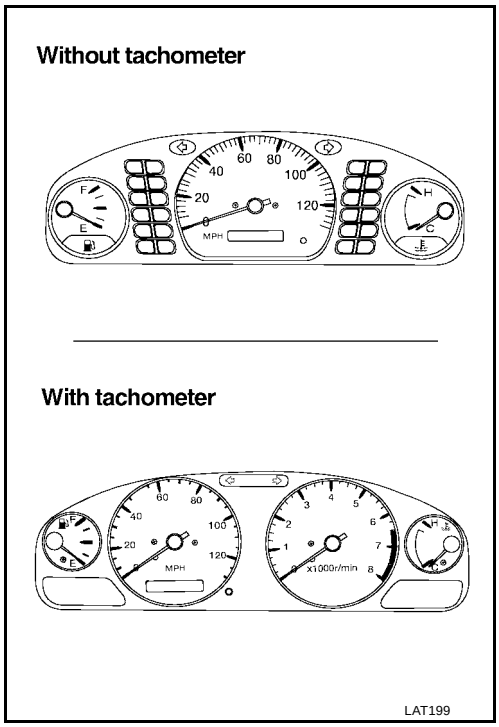
DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR

PFP:24814

Description

ECS005YG

The vehicle speed sensor·MTR is built into the speedometer assembly. The sensor functions as an auxiliary device to the revolution sensor when it is malfunctioning. The TCM will then use a signal sent from the vehicle speed sensor·MTR.



ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: VHCL SPEED SEN·MTR	TCM does not receive the proper voltage signal from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Vehicle speed sensor
: 2nd judgement flicker		

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

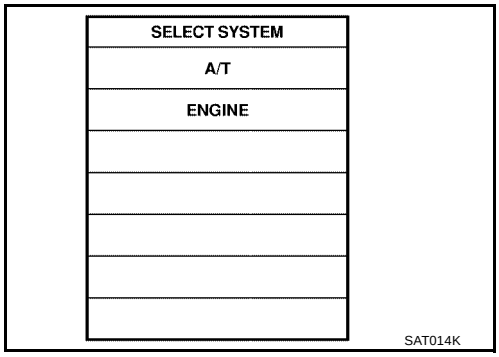
CAUTION:

- **Always drive vehicle at a safe speed.**
- **If conducting this "DTC CONFIRMATION PROCEDURE" again, always turn ignition switch "OFF" and wait at least 5 seconds before continuing.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

With CONSULT-II

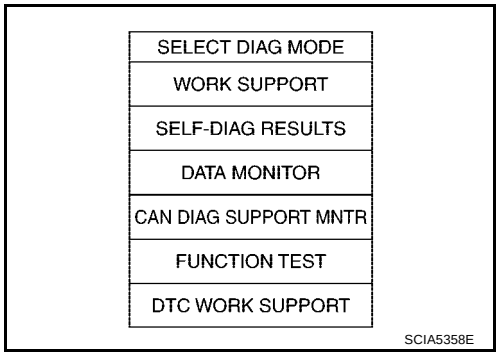
1. Turn ignition switch "ON" and select "DATA MONITOR" mode for "A/T" with CONSULT-II.



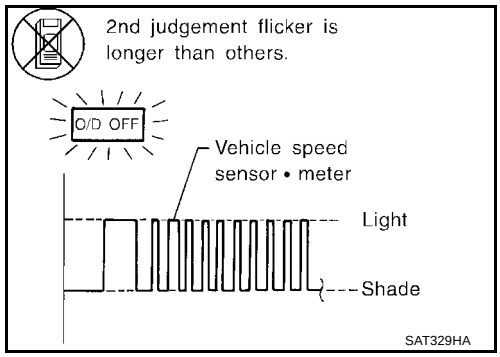
2. Start engine and accelerate vehicle from 0 to 25 km/h (0 to 16 MPH).

Without CONSULT-II

1. Start engine.
2. Drive vehicle under the following conditions:
   Selector lever in "D" and vehicle speed higher than 25 km/h (16 MPH).

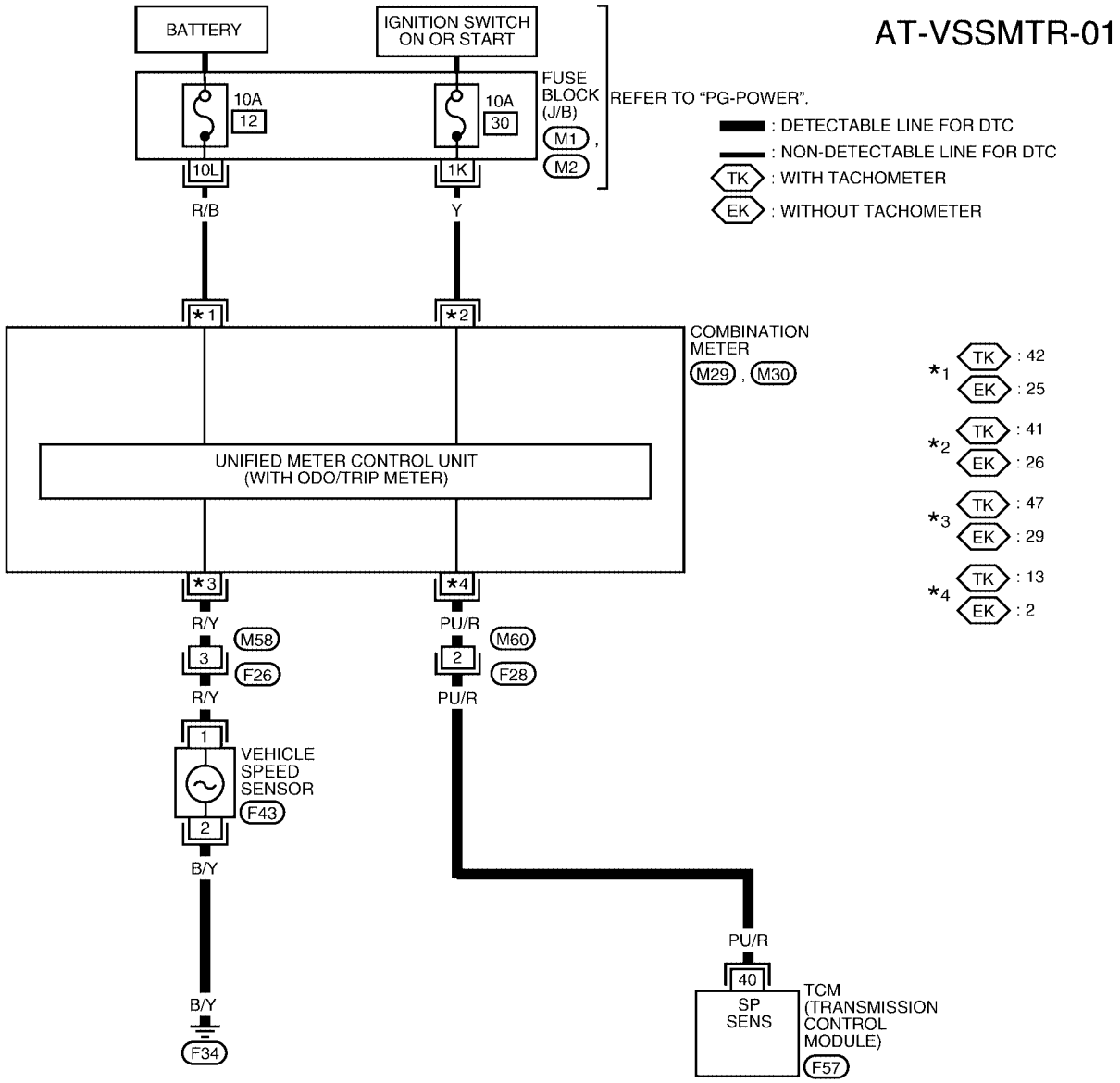


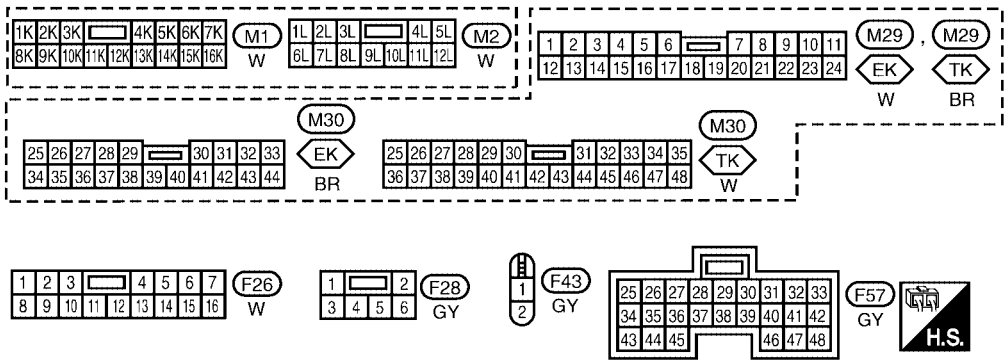
3. Perform self-diagnosis.
Refer to “TCM Self-diagnostic Procedure (No Tools)”, AT-52, "TCM Self-diagnostic Procedure (No Tools)" .



Wiring Diagram — AT — VSSMTR

ECS005YH





WCWA0071E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
40	PU/R	VEHICLE SPEED SENSOR	WHEN MOVING VEHICLE AT 2 TO 3 KM/H (1 TO 2 MPH) FOR 1 m (3ft) OR MORE	VOLTAGE VARIES FROM GREATER THAN 1V TO LESS THAN 4.5 V

Diagnostic Procedure

ECS005YI

1. CHECK INPUT SIGNAL

With CONSULT-II

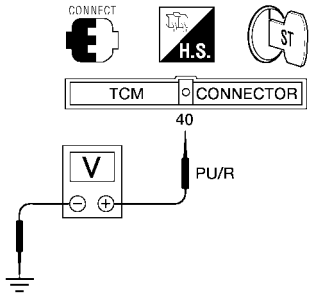
1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “VHCL/S SE·MTR” while driving.
   Check the value changes according to driving speed.

DATA MONITOR	
MONITORING	
VHCL/S SE-A/T	XXX km/h
VHCL/S SE-MTR	XXX km/h
THRTL POS SEN	XXX V
FLUID TEMP SE	XXX V
BATTERY VOLT	XXX V

SAT614J

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM terminal 40 and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.



Voltage:
Voltage varies between less than 1V and more than 4.5V.

LAT201

OK or NG

OK >> GO TO 2.
NG >> Check the following items:

- Vehicle speed sensor and ground circuit for vehicle speed sensor
  Refer to DI-26, "VEHICLE SPEED SENSOR SIGNAL CHECK" .
- Harness for short or open between TCM and vehicle speed sensor (Main harness)

2. CHECK DTC

Perform AT-204, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

DTC U1000 CAN COMMUNICATION LINE

PFP:23710

Description

ECS006GM

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

ECS006GN

- This is an OBD-II self-diagnostic item.
- Diagnostic trouble code “CAN COMM CIRCUIT” with CONSULT-II or U1000 without CONSULT-II is detected when TCM cannot communicate to other control unit.

Possible Cause

ECS006GO

Harness or connectors
(CAN communication line is open or shorted.)

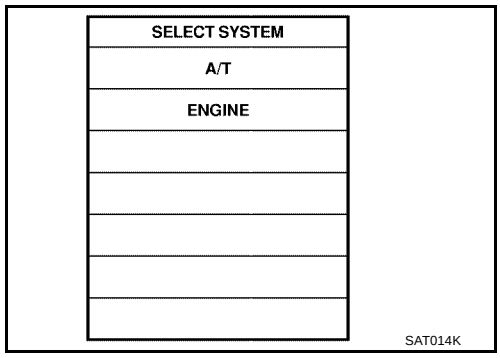
DTC Confirmation Procedure

ECS006GP

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch to ON position. (Do not start engine.)
2. Select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
3. Start engine and wait for at least 6 seconds.
4. If DTC is detected, go to AT-211, "Diagnostic Procedure" .



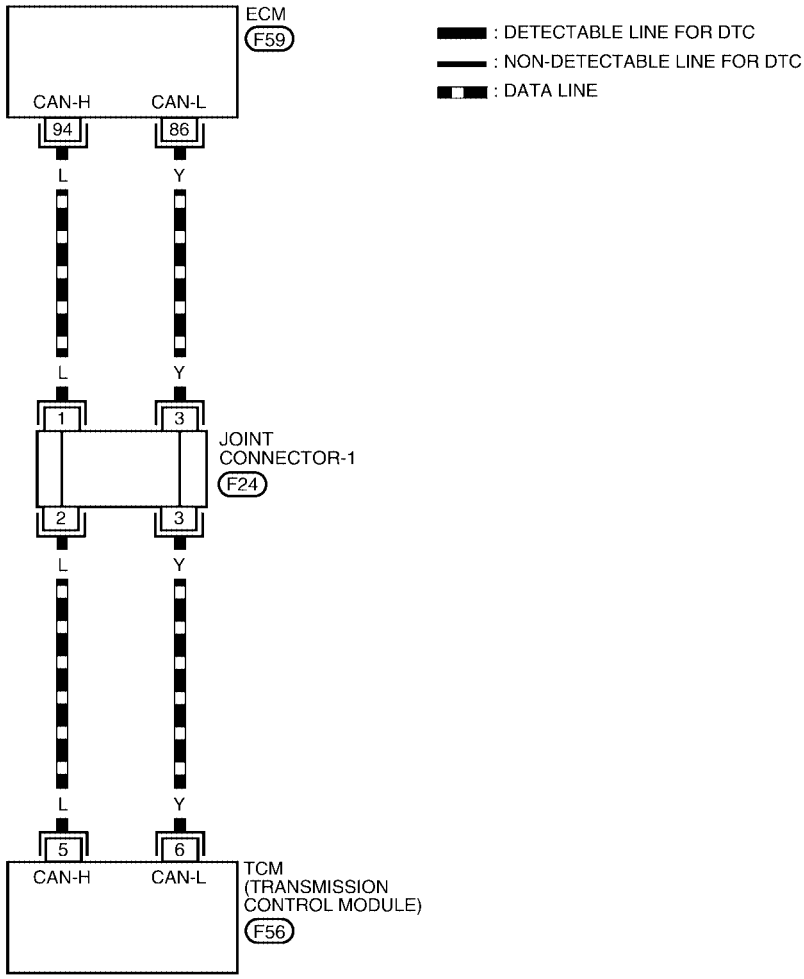
WITH GST

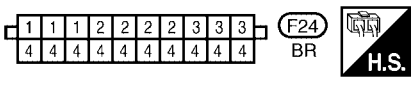
Follow the procedure “WITH CONSULT-II”.

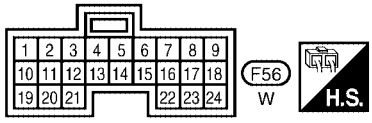
Wiring Diagram — AT — CAN

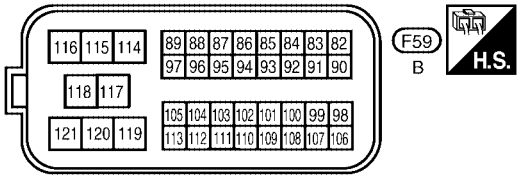
ECS006GQ

AT-CAN-01









WCWA0072E

Diagnostic Procedure

ECS006GR

1. CHECK CAN COMMUNICATION CIRCUIT

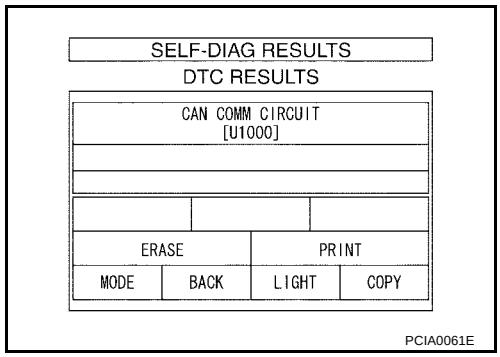
With CONSULT-II

1. Turn ignition switch "ON" and start engine.
2. Select “SELF-DIAG RESULTS” mode for “A/T” with CONSULT-II.

Is any malfunction of the "CAN COMM CIRCUIT" indicated?

Yes >> Print out CONSULT-II screen, GO TO LAN section. Refer to LAN-3, "CAN Communication Unit" .

No >> Inspection End.



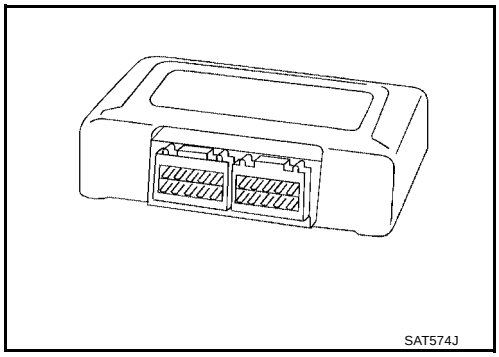
DTC CONTROL UNIT (RAM), CONTROL UNIT (ROM)

PFP:31036

Description

ECS005YJ

The TCM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the A/T.


SAT574J

ON BOARD DIAGNOSIS LOGIC

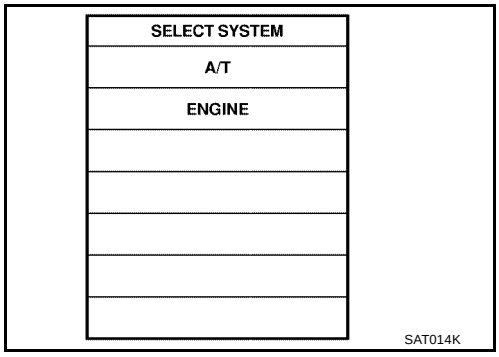
Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
: CONTROL UNIT (RAM), CONTROL UNIT (ROM)	TCM memory (RAM) or (ROM) is malfunctioning.	● TCM

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

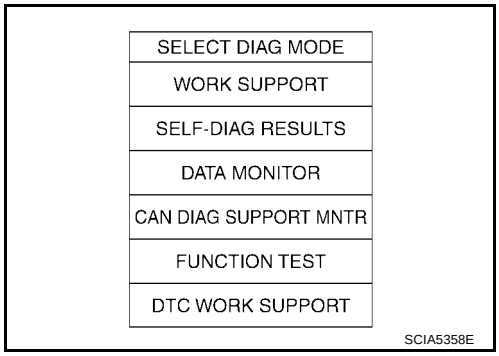
With CONSULT-II

1. Turn ignition switch "ON" and select "DATA MONITOR" mode for A/T with CONSULT-II.
2. Start engine.



SAT014K

3. Run engine for at least 2 seconds at idle speed.



SCIA5358E

Diagnostic Procedure

ECS005YK

1. INSPECTION START (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch "ON" and select "SELF DIAGNOSIS" mode for A/T with CONSULT-II.
2. Touch "ERASE".

>> GO TO 2.

2. CHECK DTC

Perform AT-212, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

>> GO TO 3.

3. CHECK DTC AGAIN

Is the “CONTROL UNIT (RAM)” or “CONTROL UNIT (ROM)” displayed again?

Yes or No

Yes >> Replace TCM.
No >> **INSPECTION END**

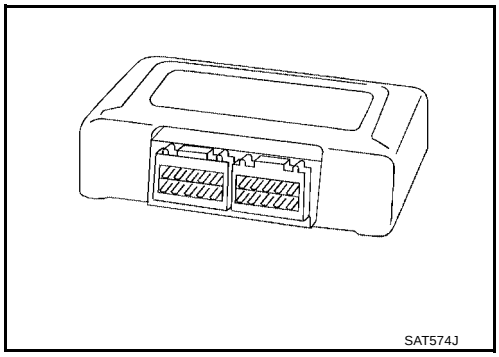
DTC CONTROL UNIT (EEP ROM)

PFP:31036

Description

ECS005YL

The TCM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the A/T.



ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
: CONT UNIT (EEP ROM)	TCM memory (EEP ROM) is malfunctioning.	● TCM

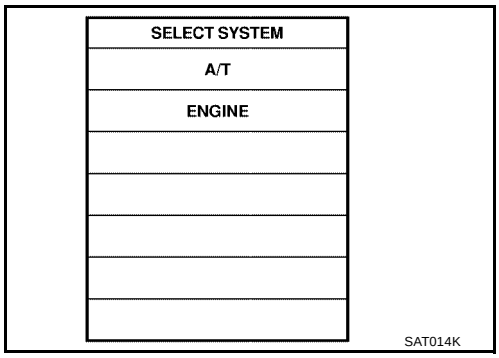
DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

NOTE:

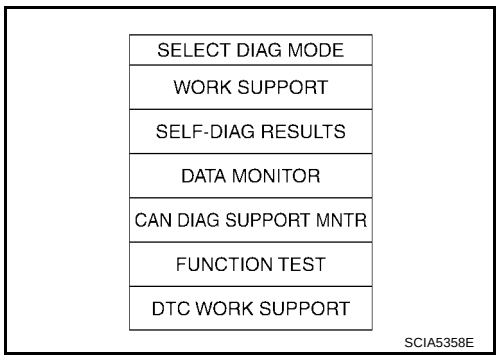
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

With CONSULT-II

1. Turn ignition switch "ON" and select "DATA MONITOR" mode for A/T with CONSULT-II.
2. Start engine.



3. Run engine for at least 2 seconds at idle speed.



Diagnostic Procedure

ECS005YM

1. CHECK DTC

With CONSULT-II

1. Turn ignition switch “ON” and select “SELF DIAGNOSIS” mode for A/T with CONSULT-II.
2. Move selector lever to “R” position.
3. Depress accelerator pedal (Full throttle position).
4. Touch “ERASE”.
5. Turn ignition switch “OFF” position for 10 seconds.

Perform AT-214, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

Is the “CONT UNIT (EEP ROM)” displayed again?

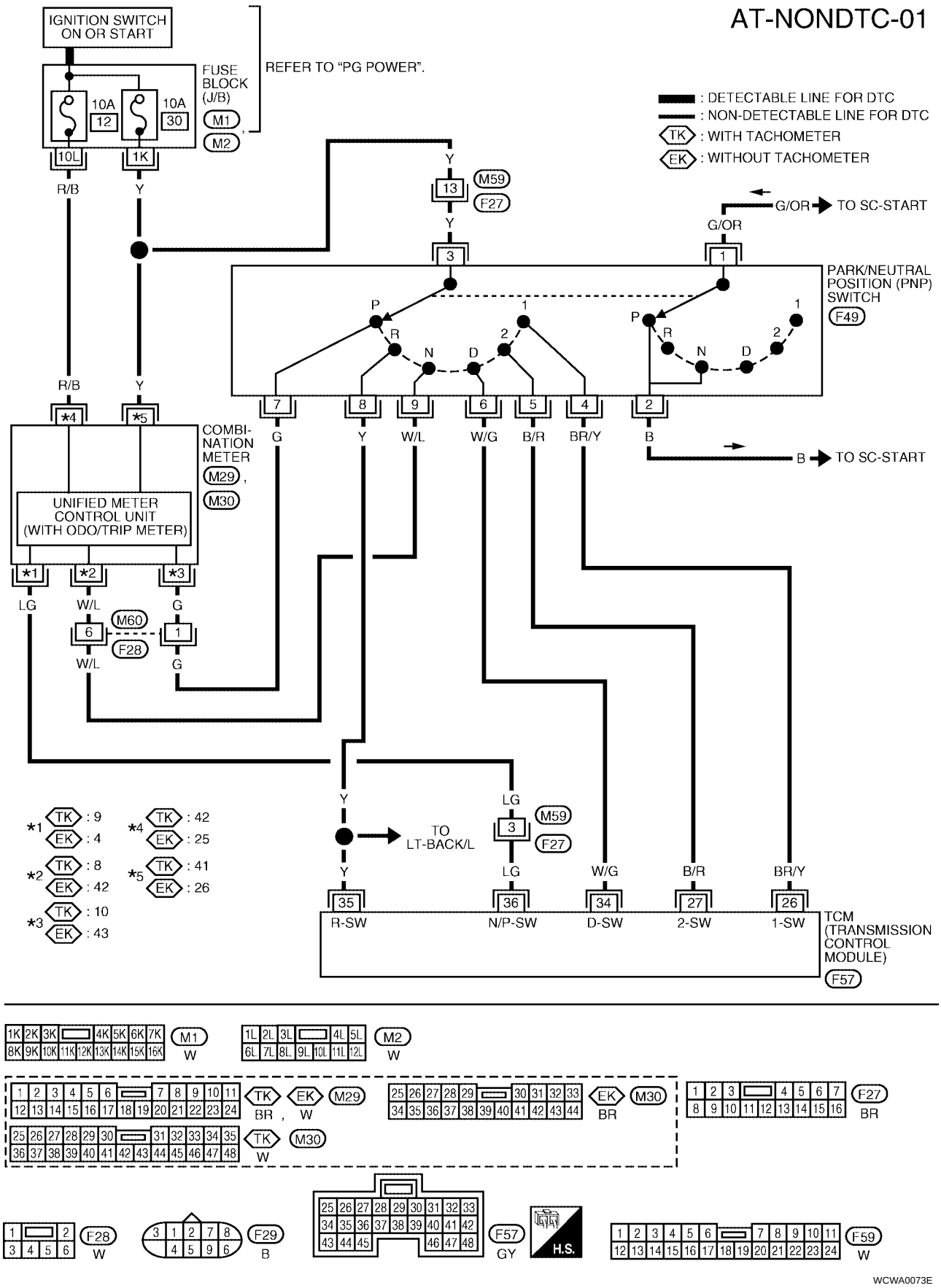
Yes >> Replace TCM.
No >> **INSPECTION END**

TROUBLE DIAGNOSES FOR SYMPTOMS

PFP:00007

Wiring Diagram — AT — NONDTC

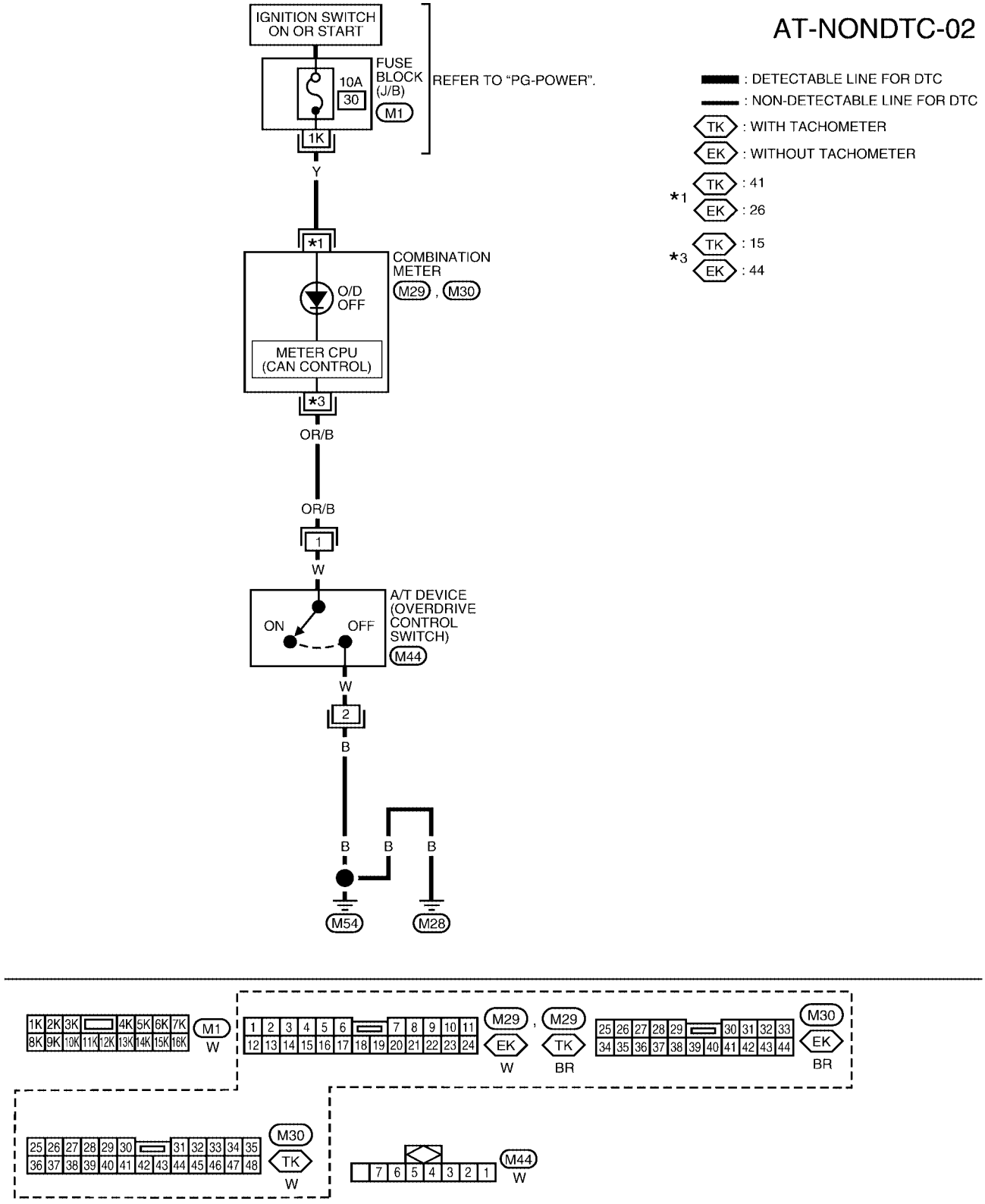
ECS005YN



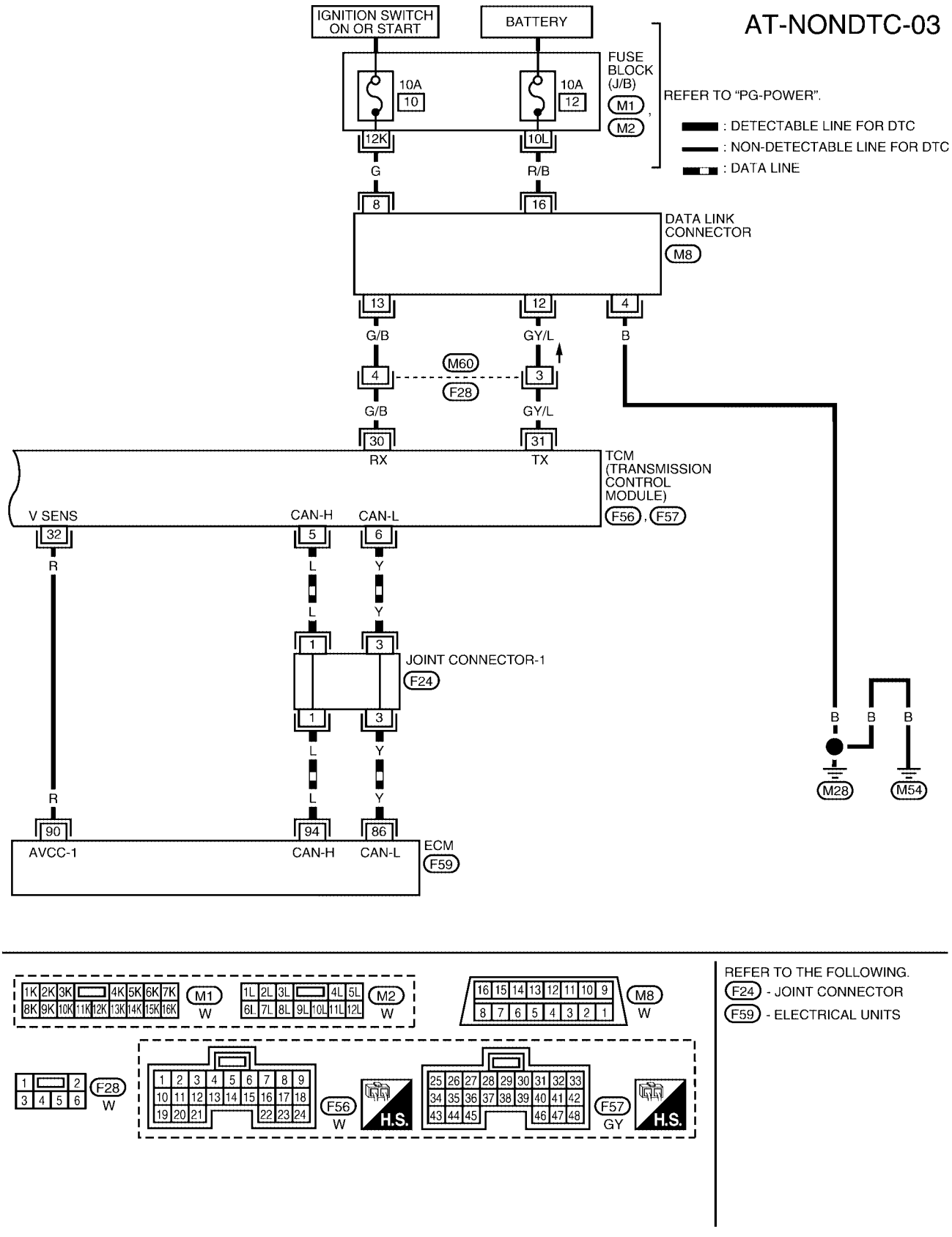
WCWA0073E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
26	BR/Y	PNP SWITCH "1" POSITION	WHEN SETTING SELECTOR LEVER TO "1" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V
27	B/R	PNP SWITCH "2" POSITION	WHEN SETTING SELECTOR LEVER TO "2" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V
34	W/G	PNP SWITCH "D" POSITION	WHEN SETTING SELECTOR LEVER TO "D" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V
35	G/Y	PNP SWITCH "R" POSITION	WHEN SETTING SELECTOR LEVER TO "R" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V
36	LG	PNP SWITCH "N" OR "P" POSITION	WHEN SETTING SELECTOR LEVER TO "N" OR "P" POSITION	BATTERY VOLTAGE
			WHEN SETTING SELECTOR LEVER TO OTHER POSITIONS	0V


AT-NONDTC-02
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
TK : WITH TACHOMETER
EK : WITHOUT TACHOMETER
*1 TK : 41
EK : 26
*3 TK : 15
EK : 44
IGNITION SWITCH ON OR START
FUSE BLOCK (J/B)
10A
30
M1
1K
REFER TO "PG-POWER".
Y
*1
COMBINATION METER
M29 , M30
O/D OFF
METER CPU (CAN CONTROL)
*3
OR/B
OR/B
1
W
A/T DEVICE (OVERDRIVE CONTROL SWITCH)
ON
OFF
M44
W
2
B
B B B
M54
M28
M1
W
M29 , M29
EK TK
W BR
M30
EK
BR
M30
TK
W
M44
W

WCWA0074E



WCWA0075E

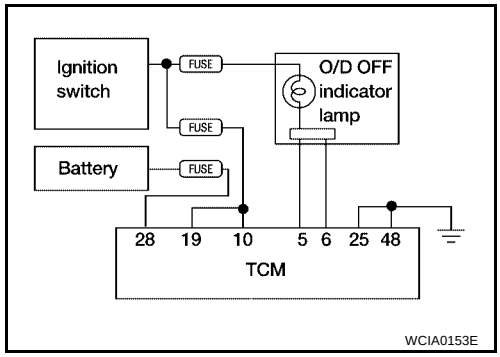
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
5	L	CAN-H	—	—
6	Y	CAN-L	—	—
30	G/B	DATA LINK CONNECTOR (RX)	—	—
31	GY/L	DATA LINK CONNECTOR (TX)	—	—
32	R	SENSOR POWER	IGNITION SWITCH ON	APPROX. 4.5 - 5.5V
			IGNITION SWITCH OFF	APPROX. 0V

1. O/D OFF Indicator Lamp Does Not Come On

ECS005YO

SYMPTOM:
O/D OFF indicator lamp does not come on for about 2 seconds when turning ignition switch to “ON”.



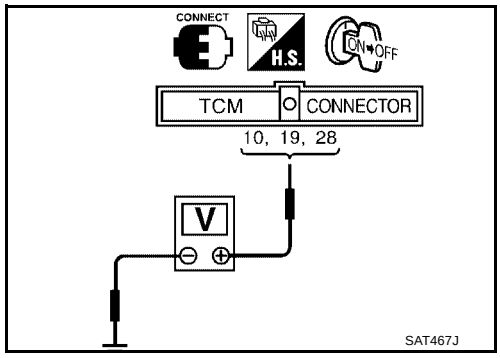
1. CHECK TCM POWER SOURCE

1. Turn ignition switch to “ON” position.
   (Do not start engine.)
2. Check voltage between TCM terminals 10, 19, 28 and ground.

   Voltage : Battery voltage

3. Turn ignition switch to “OFF” position.
4. Check voltage between TCM terminal 28 and ground.

   Voltage : Battery voltage



OK or NG

OK >> GO TO 2.
NG >> Check the following items:

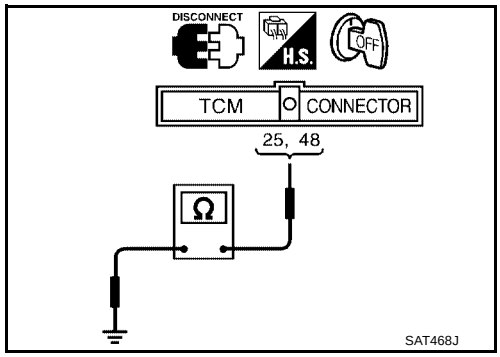
- Harness for short or open between ignition switch and TCM (Main harness). Refer to AT-113, "Wiring Diagram — AT — MAIN" .
- Harness for short or open between battery and TCM (Main harness) Refer to AT-113, "Wiring Diagram — AT — MAIN" .
- Ignition switch and fuse. Refer to PG-2, "POWER SUPPLY ROUTING" .

2. CHECK TCM GROUND CIRCUIT

1. Turn ignition switch to “OFF” position.
2. Disconnect TCM harness connector.
3. Check continuity between TCM terminals 25, 48 and ground.

   Continuity should exist.

   If OK, check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors. Refer to AT-113, "Wiring Diagram — AT — MAIN" .

3. CHECK SELF-DIAGNOSIS RESULTS

With CONSULT-II
Does "SELECTION FORM MENU" in "DATA MONITOR" show damage to O/D OFF indicator lamp (SELF D DP LMP) signal circuit?

No Tools
Execute the self-diagnosis. Is a malfunction in the CAN communication indicated in the results?

YES or NO

YES >> Check the CAN communication line. Refer to AT-209, "DTC U1000 CAN COMMUNICATION LINE" .
NO >> GO TO 4.

4. CHECK O/D OFF INDICATOR LAMP CIRCUIT

1. Turn ignition switch to "OFF" position.
2. Check the combination meter.
   Refer to DI-8, "Combination Meter"

OK or NG

OK >> GO TO 5.
NG >> Replace the combination meter.

5. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

2. Engine Cannot Be Started In “P” and “N” Position

ECS005YP

SYMPTOM:

- **Engine cannot be started with selector lever in “P” or “N” position.**
- **Engine can be started with selector lever in “D”, “2”, “1” or “R” position.**

1. CHECK PNP SWITCH CIRCUIT

With CONSULT-II

Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to PNP switch circuit?

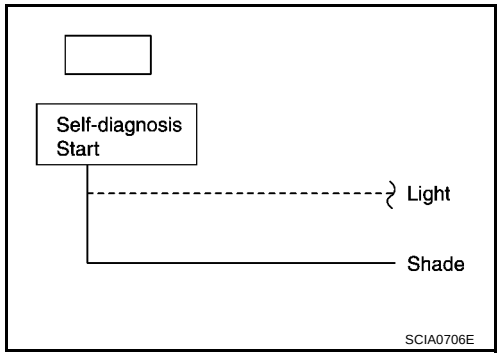
Without CONSULT-II

Does self-diagnosis show damage to PNP switch circuit?

Yes or No

Yes >> Check PNP switch circuit. Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" .

No >> GO TO 2.



2. CHECK PNP SWITCH INSPECTION

Check for short or open of PNP switch harness connector terminals 1 and 2.
Refer to AT-118, "Diagnostic Procedure" .

OK or NG

OK >> GO TO 3.

NG >> Repair or replace PNP switch.

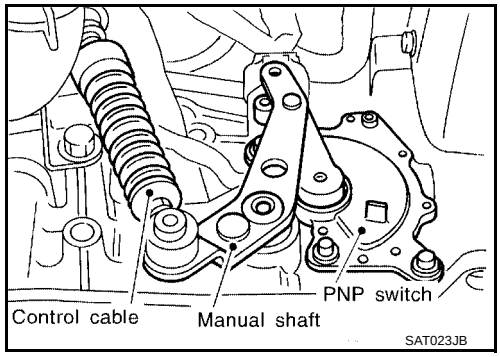
3. CHECK CONTROL CABLE

Check control cable. Refer to AT-263, "Control Cable Adjustment"

OK or NG

OK >> GO TO 4.

NG >> Adjust control cable. Refer to AT-263, "Control Cable Adjustment" .



4. CHECK STARTING SYSTEM

Check starting system. Refer to SC-9, "STARTING SYSTEM" .

OK or NG

OK >> **INSPECTION END**

NG >> Repair or replace damaged parts.

3. In “P” Position, Vehicle Moves Forward Or Backward When Pushed

ECS005YQ

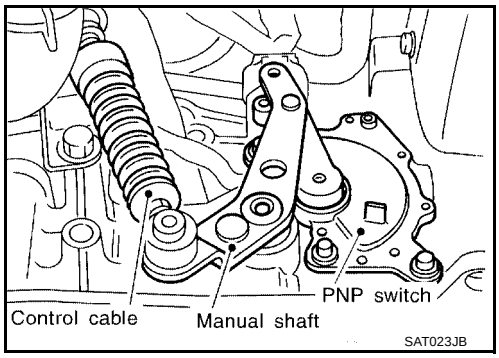
SYMPTOM:
Vehicle moves when it is pushed forward or backward with selector lever in “P” position.

1. CHECK CONTROL CABLE

Check control cable. Refer to AT-263, "Control Cable Adjustment"

OK or NG

OK >> GO TO 2.
NG >> Adjust control cable. Refer to AT-263, "Control Cable Adjustment" .

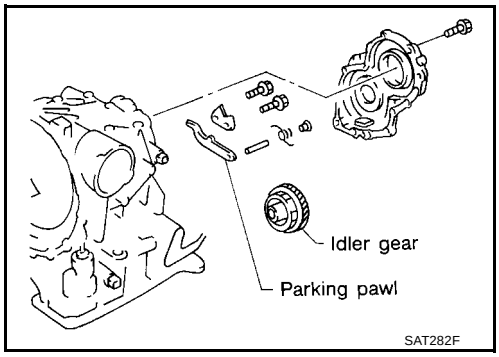


2. CHECK PARKING COMPONENTS

Check parking components. Refer to AT-268, "Components" .

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.



4. In “N” Position, Vehicle Moves

ECS005YR

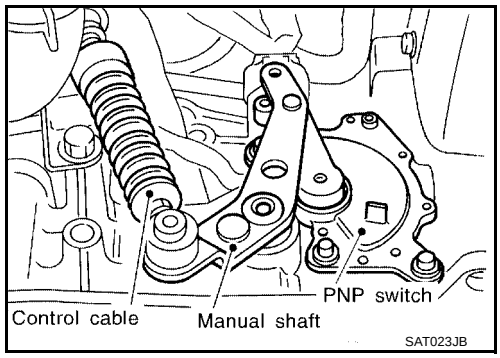
SYMPTOM:
Vehicle moves forward or backward when selecting “N” position.

1. CHECK CONTROL CABLE

Check control cable. Refer to AT-263, "Control Cable Adjustment" .

OK or NG

OK >> GO TO 2.
NG >> Adjust control cable. Refer to AT-263, "Control Cable Adjustment" .

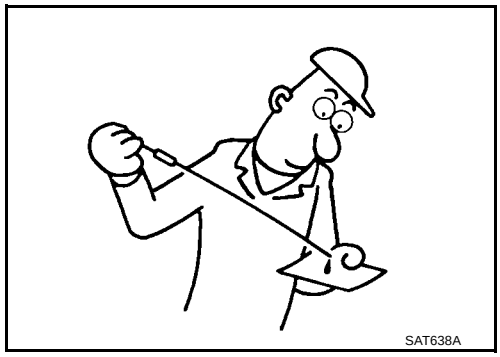


2. CHECK A/T FLUID LEVEL

Check A/T fluid level again.

OK or NG

OK >> GO TO 3.
NG >> Refill ATF.

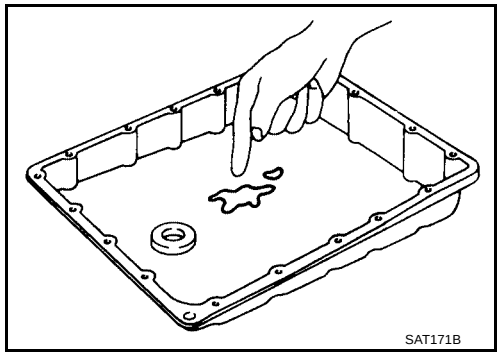


3. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.

OK or NG

OK >> GO TO 4.
NG >> 1. Disassemble A/T.
2. Check the following items:
- Forward clutch assembly
- Overrun clutch assembly
- Reverse clutch assembly



4. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

5. Large Shock. “N” → “R” Position

ECS005YS

SYMPTOM:
There is large shock when changing from “N” to “R” position.

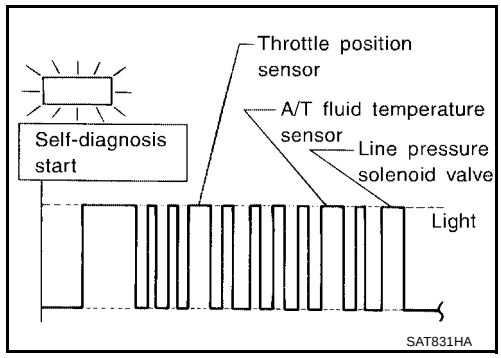
1. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to A/T fluid temperature sensor, line pressure solenoid valve or throttle position sensor [accelerator pedal position (APP) sensor] circuit?

Yes or No

Yes >> Check damaged circuit. Refer to AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" , AT-174, "DTC P0745 LINE PRESSURE SOLENOID VALVE" or AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]" .

No >> GO TO 2.



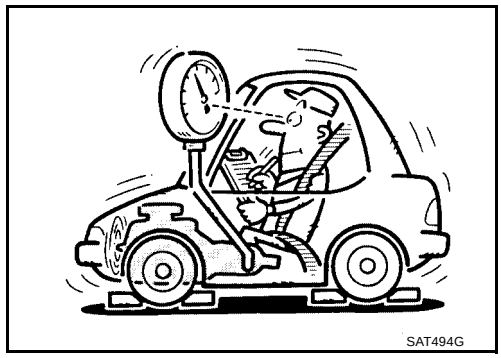
2. CHECK LINE PRESSURE

Check line pressure at idle with selector lever in “D” position. Refer to AT-68, "Line Pressure Test" .

OK or NG

OK >> GO TO 3.

NG >> 1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
- Oil pump assembly



3. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**

NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

6. Vehicle Does Not Creep Backward In “R” Position

ECS005YT

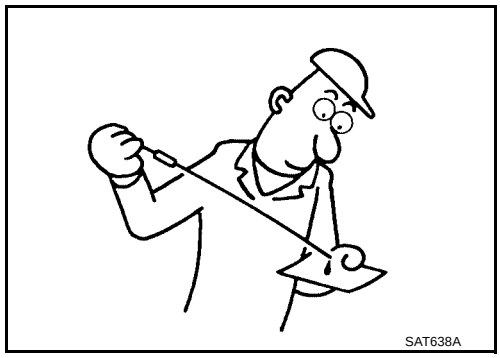
SYMPTOM:
Vehicle does not creep backward when selecting “R” position.

1. CHECK A/T FLUID LEVEL

Check A/T fluid level again.

OK or NG

OK >> GO TO 2.
NG >> Refill ATF.

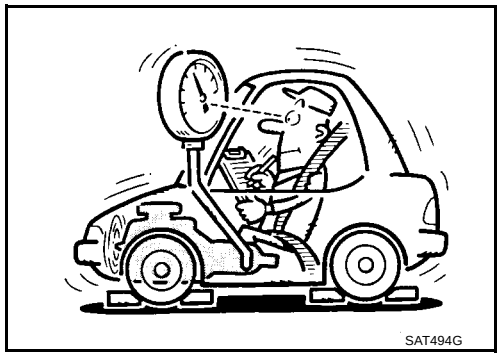

SAT638A

2. CHECK LINE PRESSURE

Check line pressure at idle with selector lever in “R” position. Refer to AT-68, "Line Pressure Test" .

OK or NG

OK >> GO TO 3.
NG >> 1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following item:
- Oil pump assembly


SAT494G

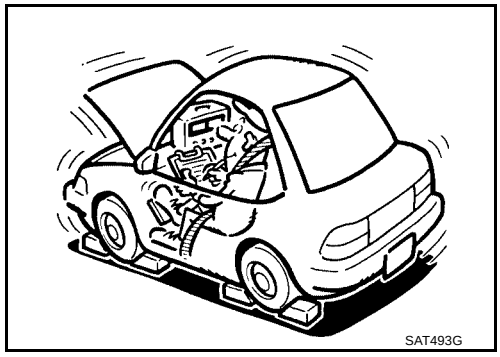
3. CHECK STALL TEST

Check stall revolution with selector lever in “1” and “R” positions.

OK or NG

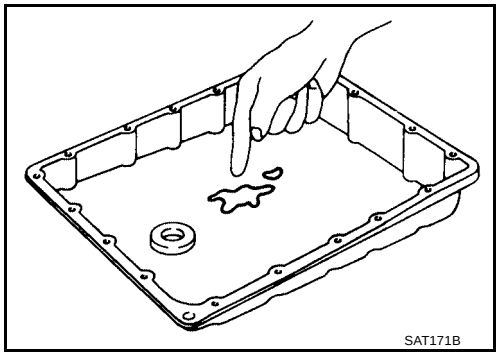
OK >> GO TO 4.
OK in “1” position, NG in “R” position>>1.Disassemble A/T.
2. Check the following items:
- Reverse clutch assembly

NG in both “1” and “R” positions>> GO TO 6.


SAT493G

4. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 5.
NG >> GO TO 6.

5. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

6. DETECT MALFUNCTIONING ITEM

1. Disassemble A/T.
2. Check the following items:

- Reverse clutch assembly
- High clutch assembly
- Low & reverse brake assembly
- Forward clutch assembly
- Overrun clutch assembly

OK or NG

OK >> GO TO 4.
NG >> Repair or replace damaged parts.

7. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position

ECS005YU

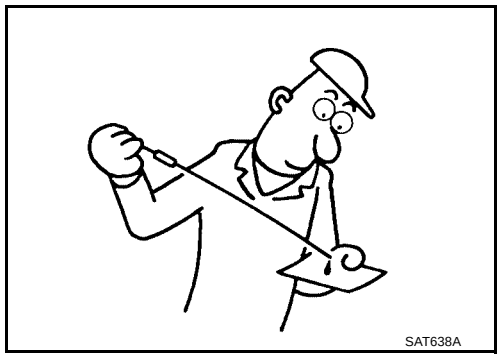
SYMPTOM:
Vehicle does not creep forward when selecting “D”, “2” or “1” position.

1. CHECK A/T FLUID LEVEL

Check A/T fluid level again.

OK or NG

OK >> GO TO 2.
NG >> Refill ATF.

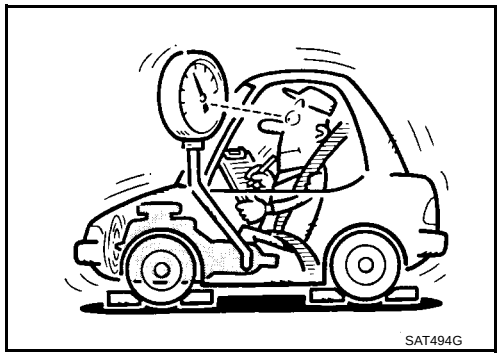

SAT638A

2. CHECK LINE PRESSURE

Check line pressure at idle with selector lever in “D” position. Refer to AT-68, "Line Pressure Test" .

OK or NG

OK >> GO TO 3.
NG >> 1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following item:
- Oil pump assembly

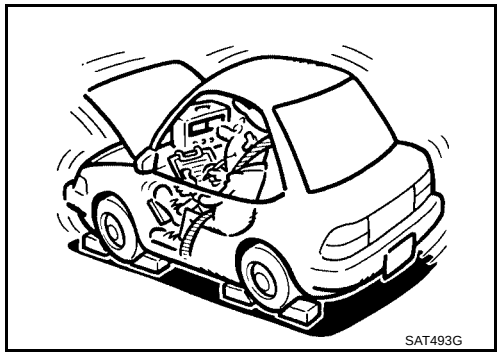

SAT494G

3. CHECK STALL TEST

Check stall revolution with selector lever in “D” position. Refer to AT-64, "Stall Test" .

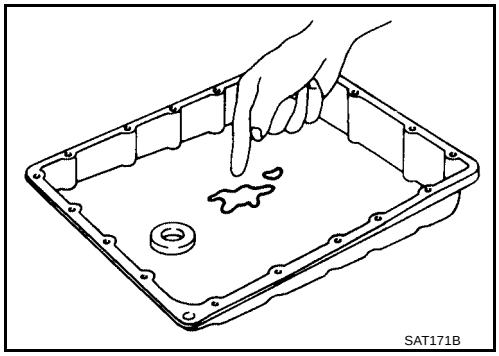
OK or NG

OK >> GO TO 4.
NG >> GO TO 6.


SAT493G

4. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 5.
NG >> GO TO 6.

5. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

6. DETECT MALFUNCTIONING ITEM

1. Disassemble A/T.
2. Check the following items:

- Forward clutch assembly
- Forward one-way clutch
- Low one-way clutch
- Reverse clutch assembly
- High clutch assembly

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

8. Vehicle Cannot Be Started From D1

ECS005YV

SYMPTOM:
Vehicle cannot be started from D1 on Cruise Test — Part 1.

1. CHECK SYMPTOM

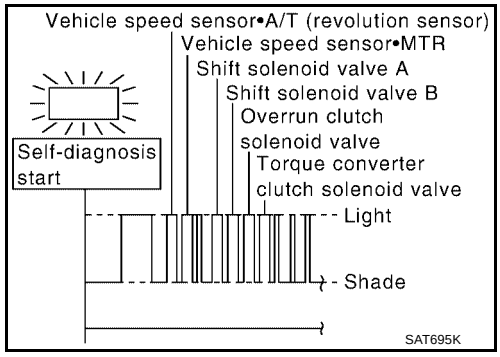
Is “6. Vehicle Does Not Creep Backward In R Position” OK?

Yes or No

Yes >> GO TO 2.
No >> Go to AT-227, "6. Vehicle Does Not Creep Backward In “R” Position" .

2. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to vehicle speed sensor·A/T (revolution sensor), overrun clutch solenoid valve, torque converter clutch solenoid valve, shift solenoid valve A, B or vehicle speed sensor·MTR after cruise test?

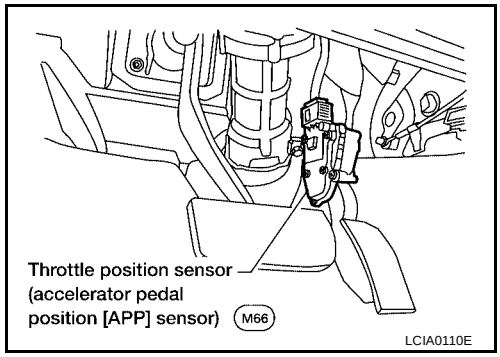


Yes or No

Yes >> Check damaged circuit. Refer to AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" , AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE" , AT-180, "DTC P0750 SHIFT SOLENOID VALVE A" , AT-184, "DTC P0755 SHIFT SOLENOID VALVE B" , AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE" or AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" .
No >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-186, "DTC P0122, P0123 TP SENSOR" [QG18DE (ULEV)] or EC-818, "DTC P0222, P0223 TP SENSOR" [QG18DE (SULEV)].

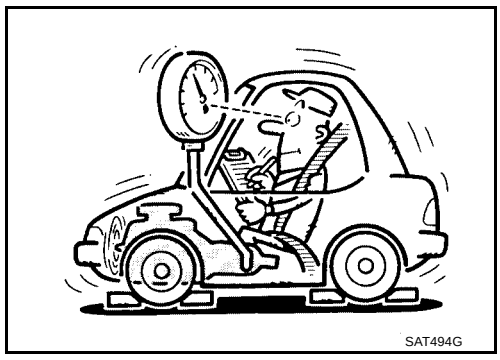


OK or NG

OK >> GO TO 4.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].

4. CHECK LINE PRESSURE

Check line pressure at stall point with selector lever in “D” position. Refer to AT-68, "Line Pressure Test" .

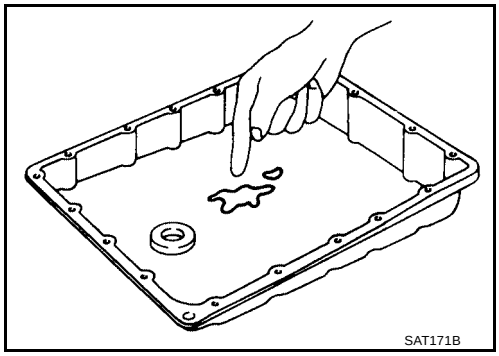


OK or NG

OK >> GO TO 5.
NG >> GO TO 8.

5. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 6.
NG >> GO TO 8.

6. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

7. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

8. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- High clutch assembly
- Torque converter
- Oil pump assembly
- Reverse clutch assembly
- Low and reverse brake assembly

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$

ECS005YW

SYMPTOM:
A/T does not shift from D_1 to D_2 at the specified speed.
A/T does not shift from D_4 to D_2 when depressing accelerator pedal fully at the specified speed.

1. CHECK SYMPTOM

Are “7. Vehicle Does Not Creep Forward In D, 2 Or 1 Position” and “8. Vehicle Cannot Be Started From D_1 ” OK?

Yes or No

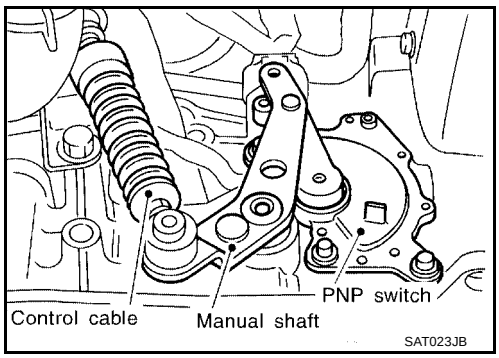
Yes >> GO TO 2.
No >> Go to AT-229, "7. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position" , AT-231, "8. Vehicle Cannot Be Started From D_1" .

2. CHECK CONTROL CABLE

Check control cable. Refer to AT-263, "Control Cable Adjustment"

OK or NG

OK >> GO TO 3.
NG >> Adjust control cable. Refer to AT-263, "Control Cable Adjustment" .



3. CHECK VEHICLE SPEED SENSOR·A/T AND CHECK VEHICLE SPEED SENSOR·MTR CIRCUIT

Check vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR circuit. Refer to AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" , AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" .

OK or NG

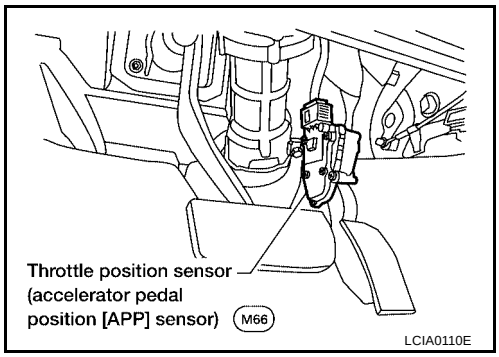
OK >> GO TO 4.
NG >> Repair or replace vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR circuits.

4. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-186, "DTC P0122, P0123 TP SENSOR" [QG18DE (ULEV)] or EC-765, "DTC P0122, P0123 TP SENSOR" [QG18DE (SULEV)].

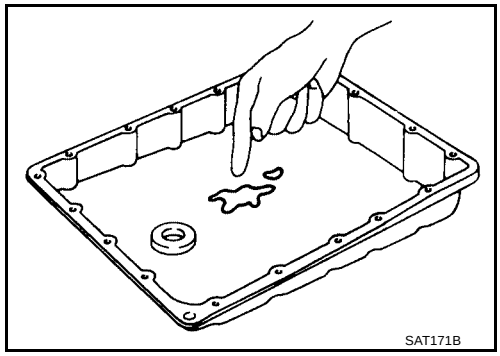
OK or NG

OK >> GO TO 5.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].



5. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 6.
NG >> GO TO 8.

6. DETECT MALFUNCTIONING ITEM

1. Remove control valve. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

7. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

8. DETECT MALFUNCTIONING ITEM

1. Remove control valve. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter

3. Disassemble A/T.
4. Check the following items:

- Servo piston assembly
- Brake band

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

10. A/T Does Not Shift: $D_2 \rightarrow D_3$

ECS005YX

SYMPTOM:
A/T does not shift from D_2 to D_3 at the specified speed.

1. CHECK SYMPTOM

Are “7. Vehicle Does Not Creep Forward In D, 2 Or 1 Position” and “8. Vehicle Cannot Be Started From D_1 ” OK?

Yes or No

Yes >> GO TO 2.
No >> Go to AT-229, "7. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position" , AT-231, "8. Vehicle Cannot Be Started From D_1" .

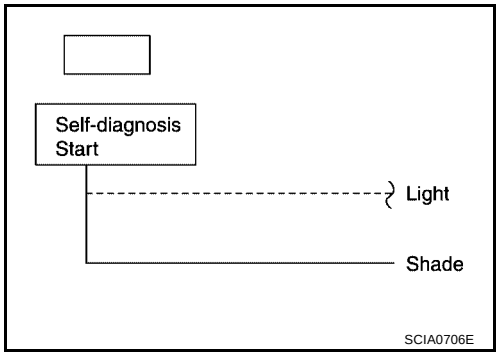
2. CHECK PNP SWITCH CIRCUIT

With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to PNP switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to PNP switch circuit?

Yes or No

Yes >> Check PNP switch circuit. Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" .
No >> GO TO 3.

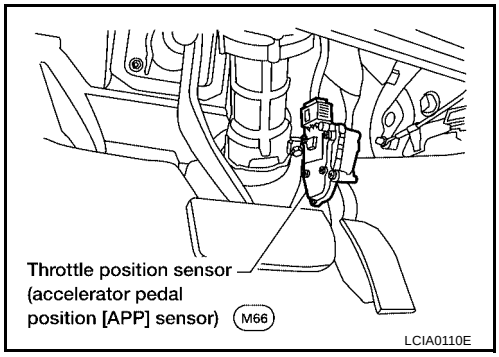


3. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-765, "DTC P0122, P0123 TP SENSOR" [QG18DE (ULEV)] or EC-186, "DTC P0122, P0123 TP SENSOR" [QG18DE (SULEV)].

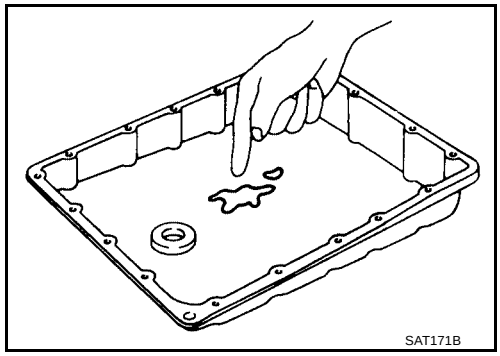
OK or NG

OK >> GO TO 4.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].



4. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 5.
NG >> GO TO 7.

5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

6. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

7. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter

3. Disassemble A/T.
4. Check the following items:

- Servo piston assembly
- High clutch assembly
- Brake band

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

11. A/T Does Not Shift: $D_3 \rightarrow D_4$

ECS005YY

SYMPTOM:

- **A/T does not shift from D_3 to D_4 at the specified speed.**
- **A/T must be warm before D_3 to D_4 shift will occur.**

1. CHECK SYMPTOM

Are “7. Vehicle Does Not Creep Forward In D, 2 Or 1 Position” and “8. Vehicle Cannot Be Started From D_1 ” OK?

Yes or No

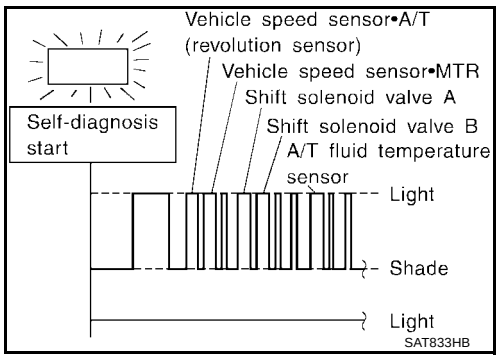
Yes >> GO TO 2.
No >> Go to AT-229, "7. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position" , AT-231, "8. Vehicle Cannot Be Started From D_1" .

2. CHECK SELF-DIAGNOSTIC RESULTS

With CONSULT-II

Does self-diagnosis, after cruise test, show damage to any of the following circuits?

- PNP switch
- Overdrive control switch
- A/T fluid temperature sensor
- Vehicle speed sensor·A/T (revolution sensor)
- Shift solenoid valve A or B
- Vehicle speed sensor·MTR

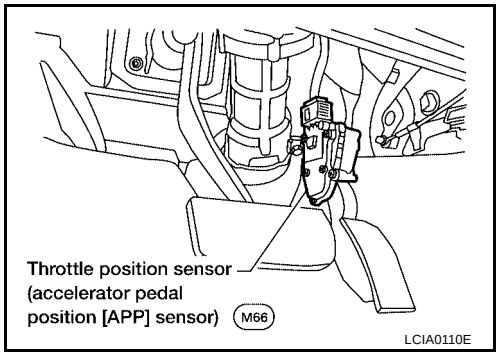


Yes or No

Yes >> Check damaged circuit. Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" , AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" , AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" , AT-180, "DTC P0750 SHIFT SOLENOID VALVE A" , AT-184, "DTC P0755 SHIFT SOLENOID VALVE B" , AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" .
No >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-186, "DTC P0122, P0123 TP SENSOR" [QG18DE (ULEV)] or EC-765, "DTC P0122, P0123 TP SENSOR" [QG18DE (SULEV)].

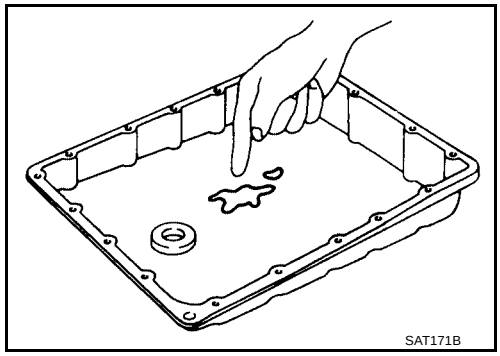


OK or NG

OK >> GO TO 4.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].

4. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 5.
NG >> GO TO 7.

5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Shift valve A
- Overrun clutch control valve
- Shift solenoid valve A
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

6. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

7. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Shift valve A
- Overrun clutch control valve
- Shift solenoid valve A
- Pilot valve
- Pilot filter

3. Disassemble A/T.
4. Check the following items:

- Servo piston assembly
- Brake band

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

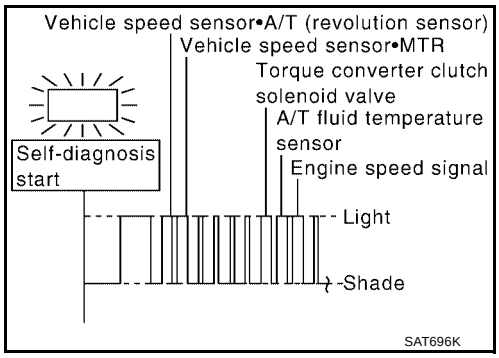
12. A/T Does Not Perform Lock-up

ECS005YZ

SYMPTOM:
A/T does not perform lock-up at the specified speed.

1. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to A/T fluid temperature sensor, vehicle speed sensor·A/T (revolution sensor), engine speed signal, torque converter clutch solenoid valve, or vehicle speed sensor·MTR circuit after cruise test?



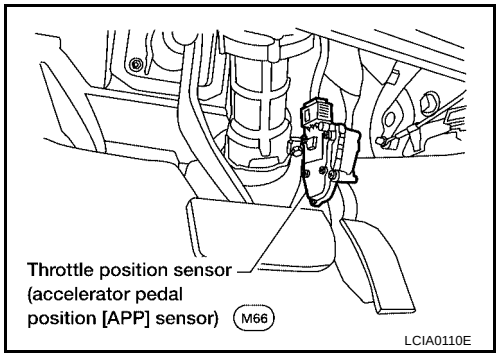
Yes or No

Yes >> Check torque converter clutch solenoid valve circuit. Refer to AT-121, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" , AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" , AT-132, "DTC P0725 ENGINE SPEED SIGNAL" , AT-160, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE" , and AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" .

No >> GO TO 2.

2. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-186, "DTC P0122, P0123 TP SENSOR" [QG18DE (ULEV)] or EC-765, "DTC P0122, P0123 TP SENSOR" [QG18DE (SULEV)].



OK or NG

OK >> GO TO 3.

NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].

3. DETECT MALFUNCTIONING ITEM

1. Remove control valve. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Torque converter clutch control valve
- Torque converter relief valve
- Pilot valve
- Pilot filter

3. Remove A/T.
4. Check torque converter.

OK or NG

OK >> GO TO 4.

NG >> Repair or replace damaged parts.

4. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**

NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

13. A/T Does Not Hold Lock-up Condition

ECS005Z0

SYMPTOM:
A/T does not hold lock-up condition for more than 30 seconds.

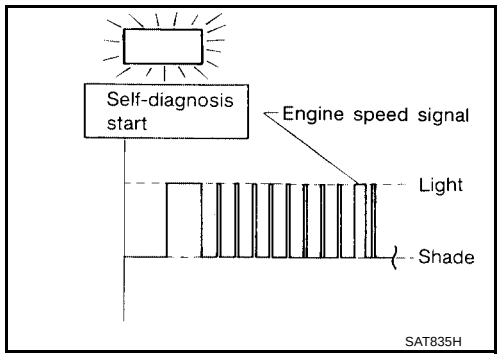
1. CHECK DIAGNOSTIC RESULTS

Does self-diagnosis show damage to engine speed signal circuit after cruise test?

Yes or No

Yes >> Check engine speed signal circuit. Refer to AT-132, "DTC P0725 ENGINE SPEED SIGNAL" .

No >> GO TO 2.



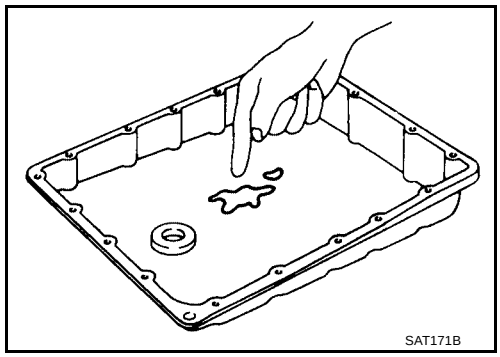
2. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.

OK or NG

OK >> GO TO 3.

NG >> GO TO 5.



3. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Torque converter clutch control valve
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 4.

NG >> Repair or replace damaged parts.

4. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**

NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check torque converter and oil pump assembly.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace damaged parts.

14. Lock-up Is Not Released

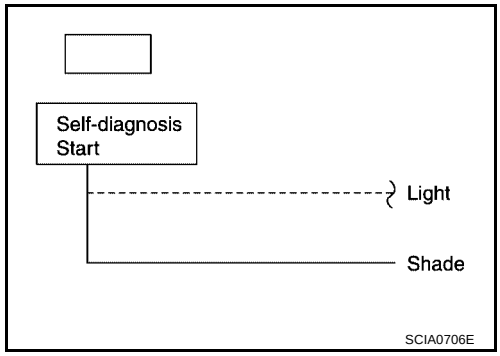
ECS005Z1

SYMPTOM:
Lock-up is not released when accelerator pedal is released.

1. CHECK THROTTLE POSITION SWITCH CIRCUIT

With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to closed throttle position switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to closed throttle position switch circuit?



Yes or No

Yes >> Check closed throttle position switch circuit. Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" .
No >> GO TO 2.

2. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

15. Engine Speed Does Not Return To Idle (Light Braking D4 → D3)

ECS005Z2

SYMPTOM:

- **Engine speed does not smoothly return to idle when A/T shifts from D4 to D3 .**
- **Vehicle does not decelerate by engine brake when turning overdrive control switch OFF.**
- **Vehicle does not decelerate by engine brake when shifting A/T from "D" to "2" position.**

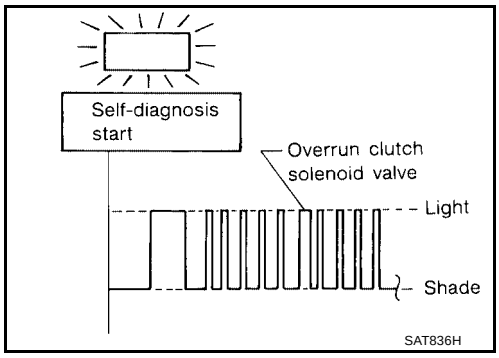
1. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to overrun clutch solenoid valve circuit after cruise test?

Yes or No

Yes >> Check overrun clutch solenoid valve circuit. Refer to AT-194, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE" .

No >> GO TO 2.



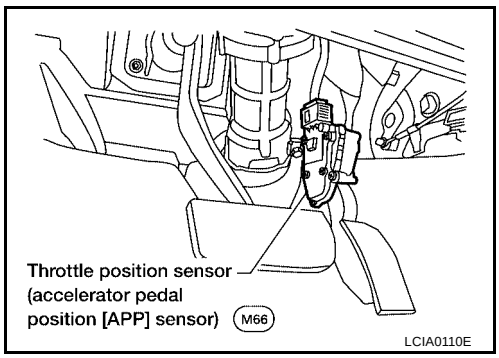
2. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-186, "DTC P0122, P0123 TP SENSOR" [QG18DE (ULEV)] or EC-765, "DTC P0122, P0123 TP SENSOR" [QG18DE (SULEV)].

OK or NG

OK >> GO TO 3.

NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].



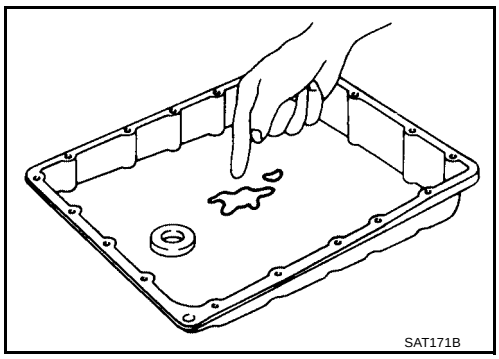
3. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.

OK or NG

OK >> GO TO 4.

NG >> GO TO 6.



4. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Overrun clutch control valve
- Overrun clutch reducing valve
- Overrun clutch solenoid valve

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

5. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

6. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-260, "REMOVAL" .
2. Check the following items:

- Overrun clutch control valve
- Overrun clutch reducing valve
- Overrun clutch solenoid valve

3. Disassemble A/T.
4. Check the following items:

- Overrun clutch assembly

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

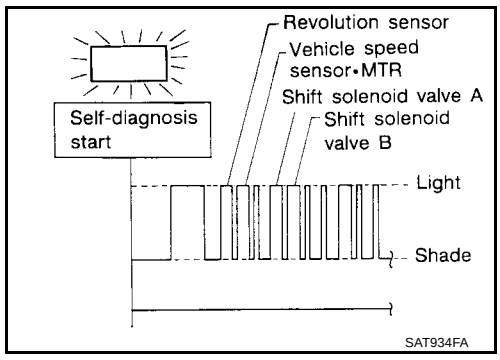
16. Vehicle Does Not Start From D1

ECS005Z3

SYMPTOM:
Vehicle does not start from D1 on Cruise test — Part 2.

1. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to vehicle speed sensor·A/T (revolution sensor), shift solenoid valve A, B or vehicle speed sensor·MTR after cruise test?



Yes or No

Yes >> Check damaged circuit. Refer to AT-127, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" , AT-180, "DTC P0750 SHIFT SOLENOID VALVE A" , AT-184, "DTC P0755 SHIFT SOLENOID VALVE B" , AT-204, "DTC VHCL SPEED SEN·MTR VEHICLE SPEED SENSOR·MTR" .
No >> GO TO 2.

2. CHECK SYMPTOM

Check again.

OK or NG

OK >> Go to AT-231, "8. Vehicle Cannot Be Started From D1" .
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

17. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch “ON” → “OFF”

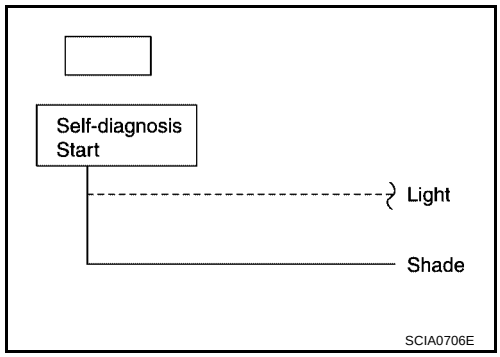
ECS005Z4

SYMPTOM:
A/T does not shift from D_4 to D_3 when changing overdrive control switch to “OFF” position.

1. CHECK OVERDRIVE CONTROL SWITCH CIRCUIT

With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to overdrive control switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to overdrive control switch circuit?



Yes or No

Yes >> Check overdrive control switch circuit. Refer to AT-250, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}" .

No >> Go to AT-236, "10. A/T Does Not Shift: $D_2 \rightarrow D_3$" .

18. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever “D” → “2” Position

ECS005Z5

SYMPTOM:
A/T does not shift from D_3 to 2_2 when changing selector lever from “D” to “2” position.

1. CHECK PNP SWITCH CIRCUIT

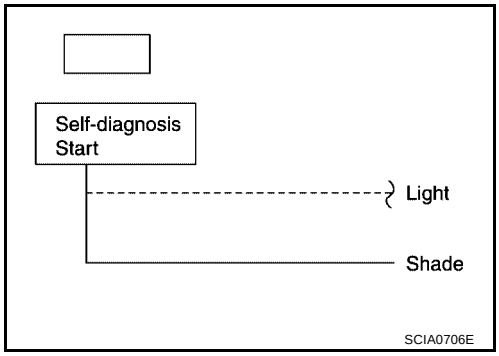
With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to PNP switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to PNP switch circuit?

Yes or No

Yes >> Check PNP switch circuit. Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH"

No >> Go to AT-234, "9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$" .



19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever “2” → “1” Position

ECS005Z6

SYMPTOM:
A/T does not shift from 2_2 to 1_1 when changing selector lever from “2” to “1” position.

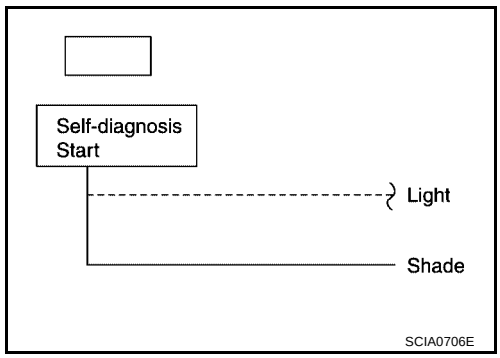
1. CHECK PNP SWITCH CIRCUIT

With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to PNP switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to PNP switch circuit?

Yes or No

Yes >> Check PNP switch circuit. Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" .
No >> GO TO 2.

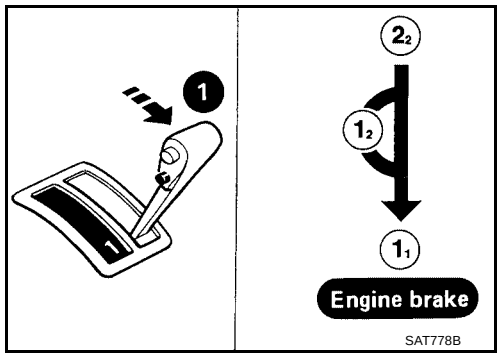


2. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.



20. Vehicle Does Not Decelerate By Engine Brake

ECS005Z7

SYMPTOM:
Vehicle does not decelerate by engine brake when shifting from 2$_2$ (1$_2$) to 1$_1$.

1. CHECK SYMPTOM

Is “6. Vehicle Does Not Creep Backward In R Position” OK?

Yes or No

Yes >> Go to AT-244, "15. Engine Speed Does Not Return To Idle (Light Braking D$_4$ → D$_3$)" .
No >> Go to AT-227, "6. Vehicle Does Not Creep Backward In “R” Position" .

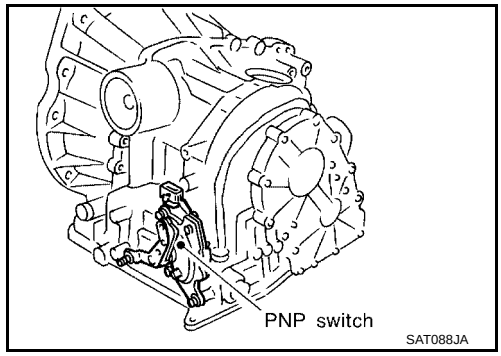
21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}

ECS006GY

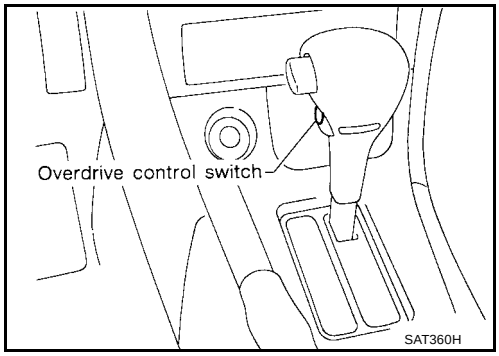
SYMPTOM:
O/D OFF indicator lamp does not come on in TCM self-diagnostic procedure even if the lamp circuit is good.

DESCRIPTION

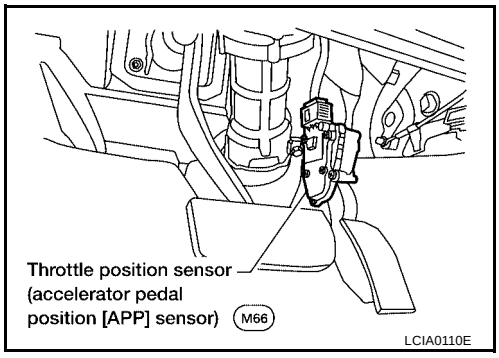
- Park/neutral position (PNP) switch
  The park/neutral (PNP) switch assembly includes a transmission range switch. The transmission range switch detects the selector lever position and sends a signal to the TCM.



- Overdrive control switch
  Detects the overdrive control switch position (ON or OFF) and sends a signal to the TCM.



- Throttle position sensor [accelerator pedal position (APP) sensor]
  The throttle position sensor [accelerator pedal position (APP) sensor] is part of the system that controls the throttle position. This system also uses an electric throttle control actuator, which consists of a throttle control motor and throttle position sensors. Accelerator pedal position signal is sent to the ECM.



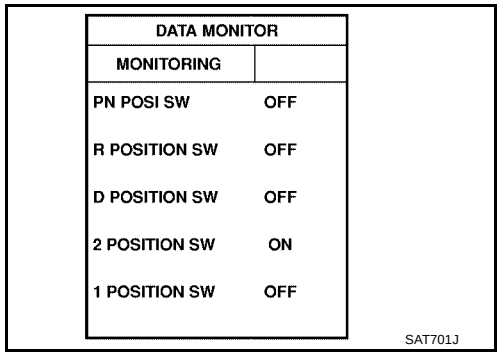
DIAGNOSTIC PROCEDURE

NOTE:
The diagnostic procedure includes inspections for the overdrive control switch circuits.

1. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out P/N, R, D, 2 and 1 position switches moving selector lever to each position.
   Check that the signal of the selector lever position is indicated properly.



OK or NG

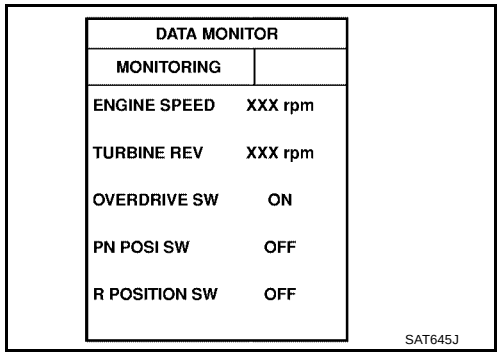
OK >> GO TO 2.
NG >> Check the following items:

- PNP switch (Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH"
- Harness for short or open between ignition switch and PNP switch
- Harness for short or open between PNP switch and TCM

2. CHECK OVERDRIVE CONTROL SWITCH CIRCUIT (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out “OVERDRIVE SW”.
   Check the signal of the overdrive control switch is indicated properly.
   (Overdrive control switch “ON” displayed on CONSULT-II means overdrive “OFF”.)



OK or NG

OK >> GO TO 3.
NG >> Check the following items:

- Overdrive control switch (Refer to AT-252, "Overdrive Control Switch"
- Harness for short or open between TCM and overdrive control switch
- Harness of ground for overdrive control switch for short or open

3. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

- Perform throttle position sensor [accelerator pedal position (APP) sensor] inspection. Refer to AT-188, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]" .

OK or NG

OK >> GO TO 4.
NG >> Repair or replace damaged parts.

4. CHECK TCM INSPECTION

1. Perform AT-251, "DIAGNOSTIC PROCEDURE"

OK or NG

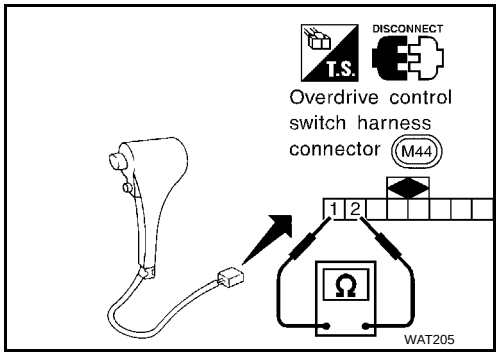
OK >> INSPECTION END.
NG >> ● Perform TCM input/output signal inspection.
● If NG, recheck TCM pin terminals for damage or loose connections with harness connector.

COMPONENT INSPECTION

Overdrive Control Switch

● Check continuity between terminals 1 and 2.

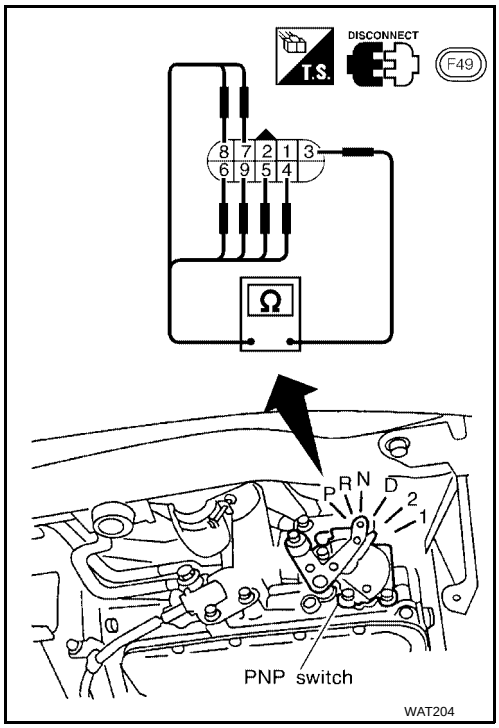
Switch position	Continuity
RELEASED	No
DEPRESSED	Yes



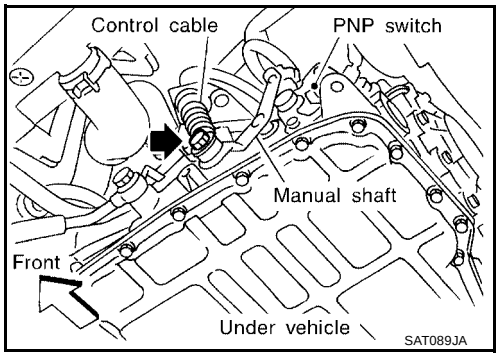
PNP Switch

1. Check continuity between terminals 1 and 2 and between terminals 3 and 4, 5, 6, 7, 8, 9 while moving manual shaft through each position.

Lever position	Terminal No.	
P	3 — 7	1 — 2
R	3 — 8	
N	3 — 9	1 — 2
D	3 — 6	
2	3 — 5	
1	3 — 4	



2. If NG, check again with manual control cable disconnected from manual shaft of A/T assembly. Refer to step 1.
3. If OK on step 2, adjust manual control cable. Refer to AT-263, "Control Cable Adjustment" .
4. If NG on step 2, remove PNP switch from A/T and check continuity of PNP switch terminals. Refer to step 1.
5. If OK on step 4, adjust PNP switch. Refer to AT-263, "Park/Neutral Position (PNP) Switch Adjustment" .
6. If NG on step 4, replace PNP switch.



A/T SHIFT LOCK SYSTEM

PFP:34950

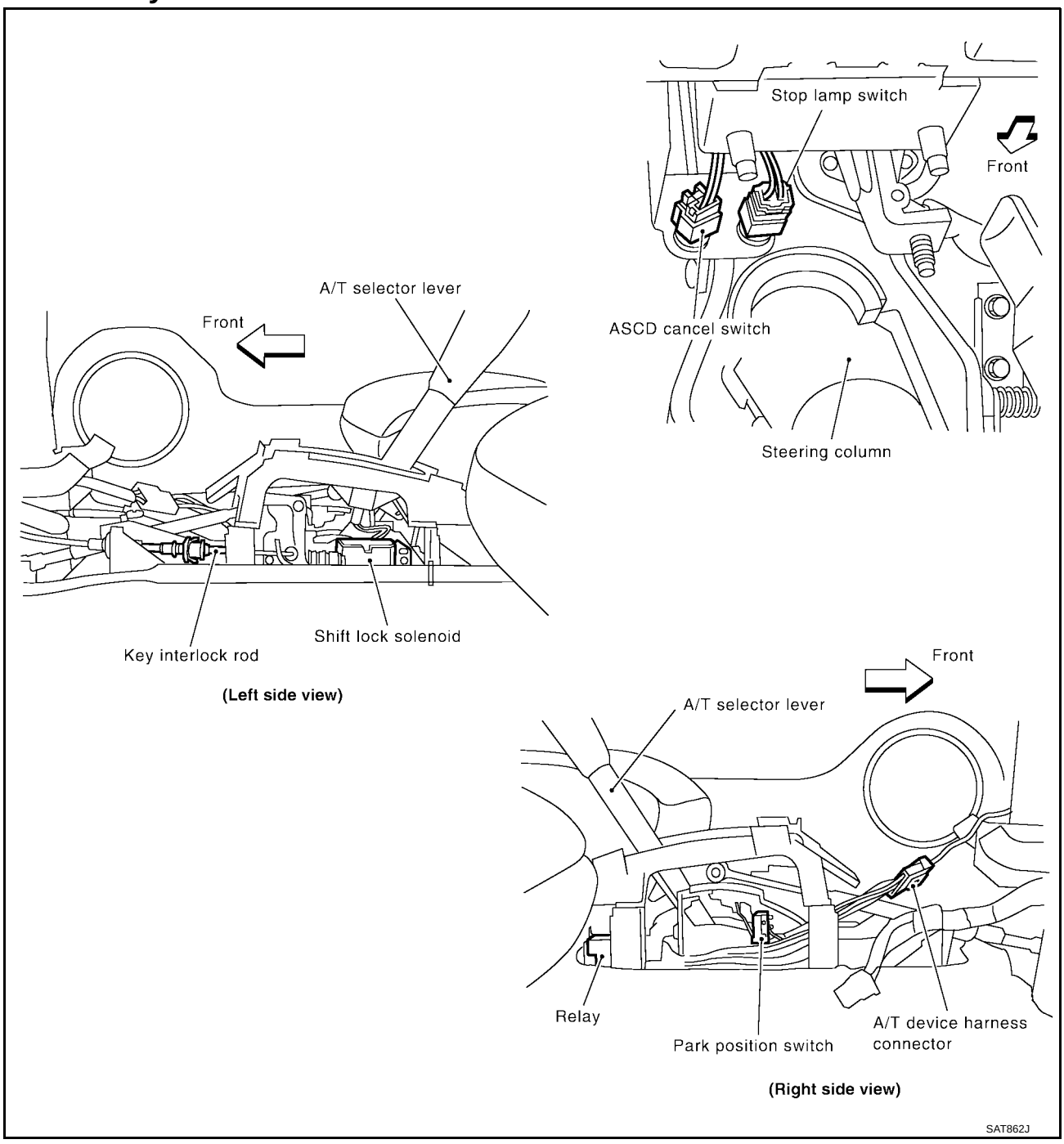
Description

ECS006H0

- The mechanical key interlock mechanism also operates as a shift lock:
  With the key switch turned to ON, the selector lever cannot be shifted from “P” (parking) to any other position unless the brake pedal is depressed.
  With the key removed, the selector lever cannot be shifted from “P” to any other position.
  The key cannot be removed unless the selector lever is placed in “P”.
- The shift lock and key interlock mechanisms are controlled by the ON-OFF operation of the shift lock solenoid and by the operation of the rotator and slider located inside the key cylinder.

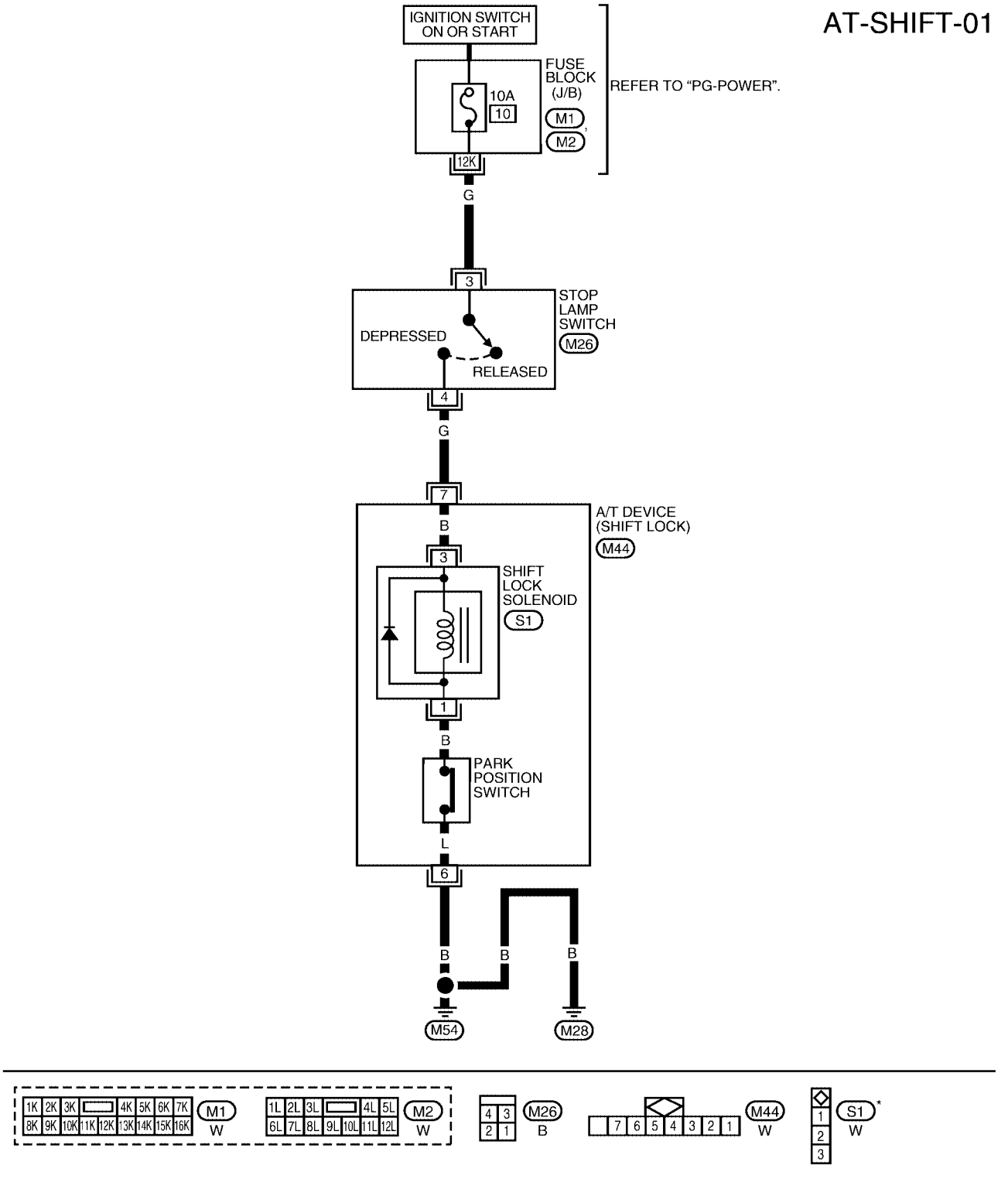
Shift Lock System Electrical Parts Location

ECS006H1



Wiring Diagram — SHIFT —

ECS006H2



★: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" OF PG SECTION.

WCWA0076E

Diagnostic Procedure

ECS006H3

SYMPTOM 1:

- **Selector lever cannot be moved from “P” position with key in ON position and brake pedal applied.**
- **Selector lever can be moved from “P” position with key in ON position and brake pedal released.**
- **Selector lever can be moved from “P” position when key is removed from key cylinder.**

SYMPTOM 2:

Ignition key cannot be removed when selector lever is set to “P” position. It can be removed when selector lever is set to any position except “P”.

1. CHECK KEY INTERLOCK CABLE

Check key interlock cable for damage.

OK or NG

OK >> GO TO 2.
NG >> Repair key interlock cable. Refer to AT-642, "Components" .

2. CHECK SELECTOR LEVER POSITION

Check selector lever position for damage.

OK or NG

OK >> GO TO 3.
NG >> Check selector lever. Refer to AT-647, "Control Cable Adjustment" .

3. CHECK POWER SOURCE

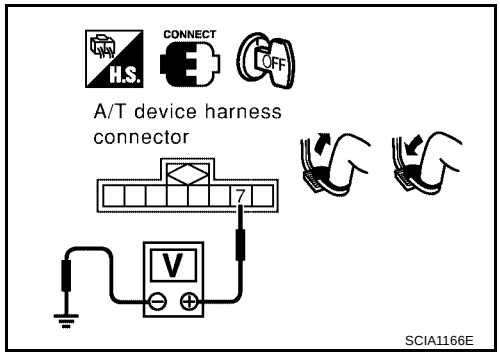
Turn ignition switch to “OFF” position.
(Do not start engine.)

- Check voltage between A/T device harness connector M44 terminal 7 (G) and ground.

Voltage:

Brake pedal depressed: Battery voltage

Brake pedal released: 0V



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

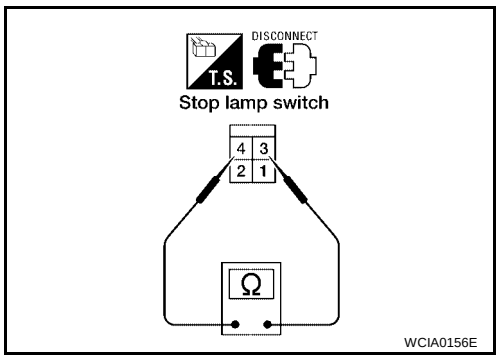
4. DETECT MALFUNCTIONING ITEM

Check the following items.

1. Harness for open or short between fuse block (J/B) connector M1 terminal 12K and stop lamp switch harness connector M26 terminal 3.
2. Harness for open or short stop lamp switch harness connector M26 terminal 4 and A/T device harness connector M44 terminal 7 (G).
3. 10A fuse [10, located in the fuse block (J/B)].
4. Check continuity between stop lamp switch harness connector M26 terminals 3 (G) and 4 (G).

Condition	Continuity
When brake pedal is depressed	Yes
When brake pedal is released	No

Check stop lamp switch after adjusting brake pedal —refer to BR-12, "STOP LAMP SWITCH AND ASCD CANCEL SWITCH CLEARANCE"



OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

5. CHECK GROUND CIRCUIT

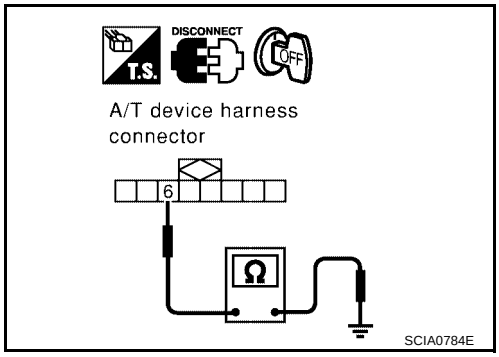
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T device harness connector.
3. Check continuity between A/T device harness M44 terminal 6 (B) and ground.

Continuity should exist

Continuity should exist.
If OK, check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit in harness.



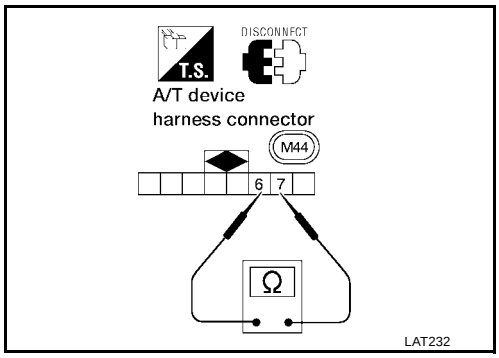
6. CHECK PARK POSITION SWITCH

Check continuity between A/T device harness conector M44 terminals 6 (B) and 7 (G).

Brake pedal	Operation sound
Depressed	No
Released	Yes

OK or NG

OK >> GO TO 7.
NG >> Replace park position switch.



7. CHECK SHIFT LOCK SOLENOID

1. Connect A/T device harness connector.
2. Turn ignition switch to "ON" position.
3. Check operation sound.

Condition	Brake pedal	Operation sound
When ignition switch is turned to "ON" position and selector lever is in the "P" position.	Depressed	Yes
	Released	No

OK or NG

OK >> GO TO 8.
NG >> Replace shift lock solenoid.

8. CHECK SHIFT LOCK OPERATION

1. Reconnect shift lock harness connector.
2. Turn ignition switch from “OFF” to “ON” position. (Do not start engine.)
3. Recheck shift lock operation.

OK or NG

OK >> INSPECTION END
NG >> GO TO .9

9. CHECK A/T DEVICE INSPECTION

1. Perform A/T device input/output signal inspection test.
2. If NG, recheck harness connector connection.

OK or NG

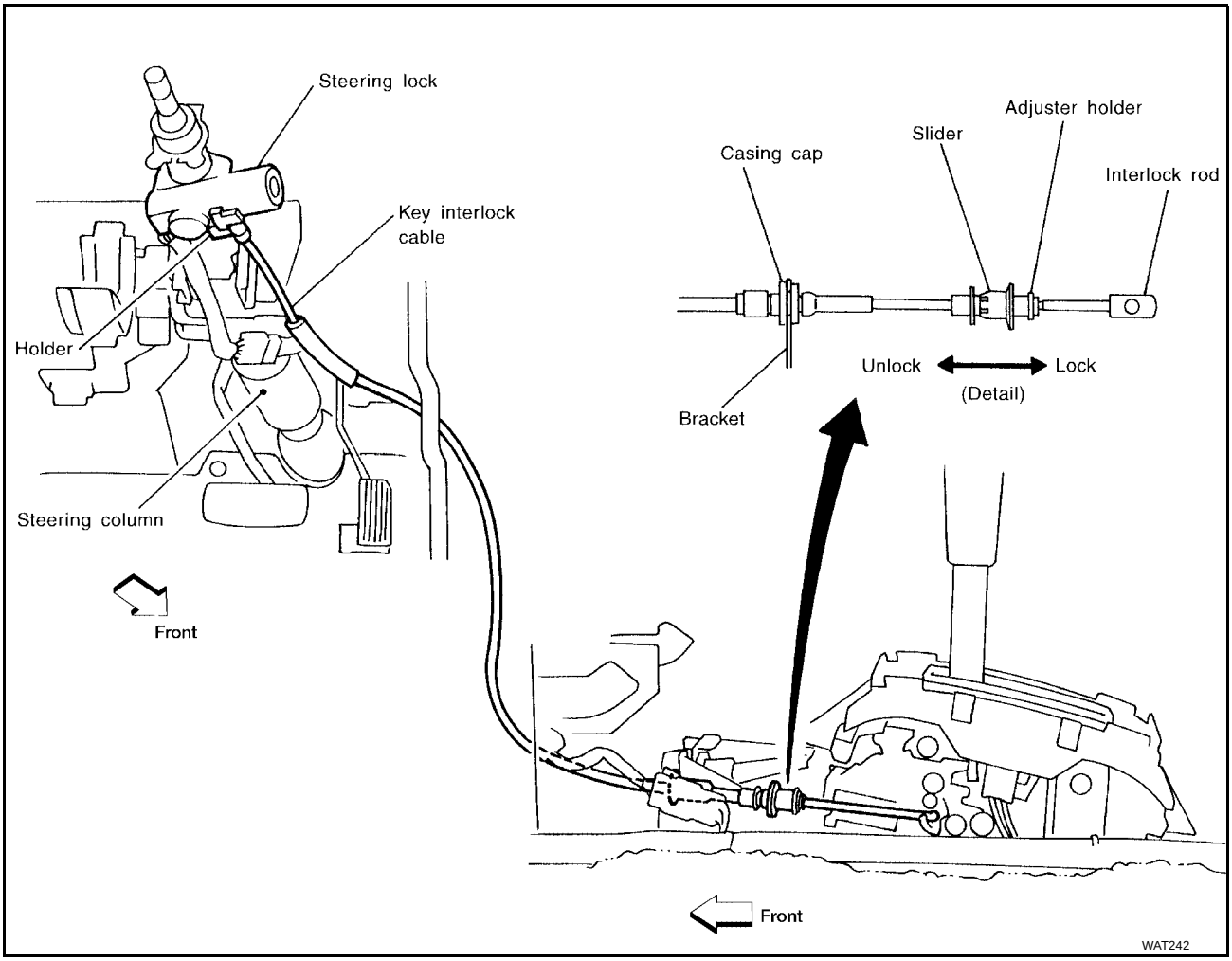
OK >> INSPECTION END
NG >> Repair or replace damaged parts.

KEY INTERLOCK CABLE

PFP:34908

Components

ECS005ZD



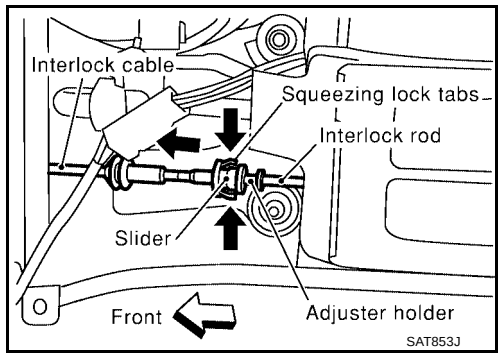
CAUTION:

- **Install key interlock cable in such a way that it will not be damaged by sharp bends, twists or interference with adjacent parts.**
- **After installing key interlock cable to control device, make sure that casing cap and bracket are firmly secured in their positions.**

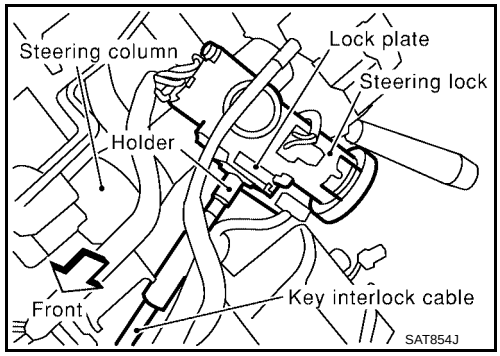
Removal

ECS005ZE

1. Unlock slider by squeezing lock tabs on slider from adjuster holder and remove interlock rod from cable.



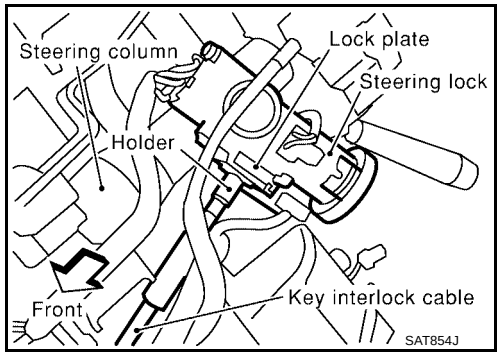
2. Remove lock plate from steering lock assembly and remove key interlock cable.



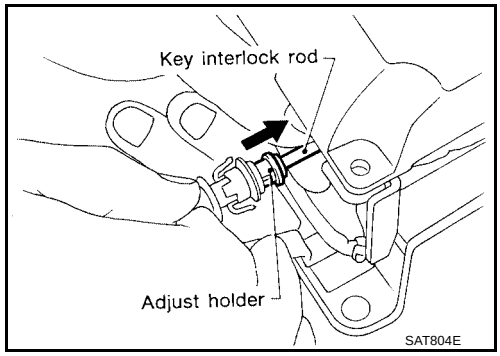
Installation

ECS005ZF

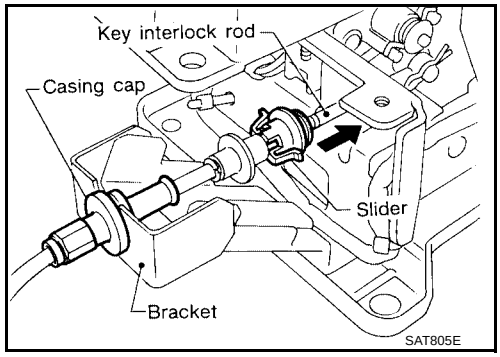
1. Turn ignition key to lock position.
2. Set A/T selector lever to "P" position.
3. Set key interlock cable to steering lock assembly and install lock plate.
4. Clamp cable to steering column and attach to control cable with band.



5. Insert interlock rod into adjuster holder.



6. Install casing cap to bracket.
7. Move slider in order to connect adjuster holder to interlock rod.



ON-VEHICLE SERVICE

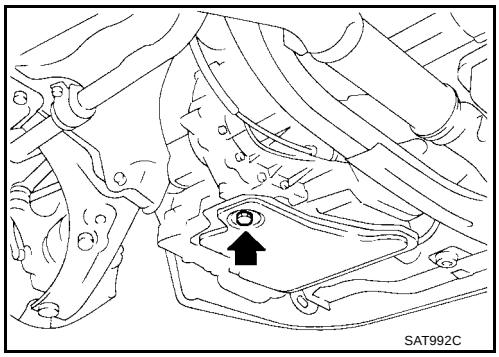
PFP:00000

Control Valve Assembly and Accumulators

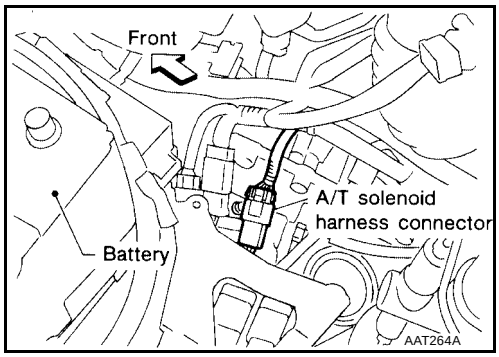
ECS005ZG

REMOVAL

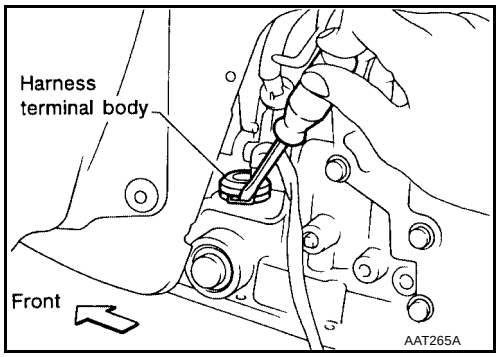
1. Drain ATF from transaxle.
2. Remove oil pan and gasket.
   - **Always replace oil pan bolts as they are self-sealing bolts.**



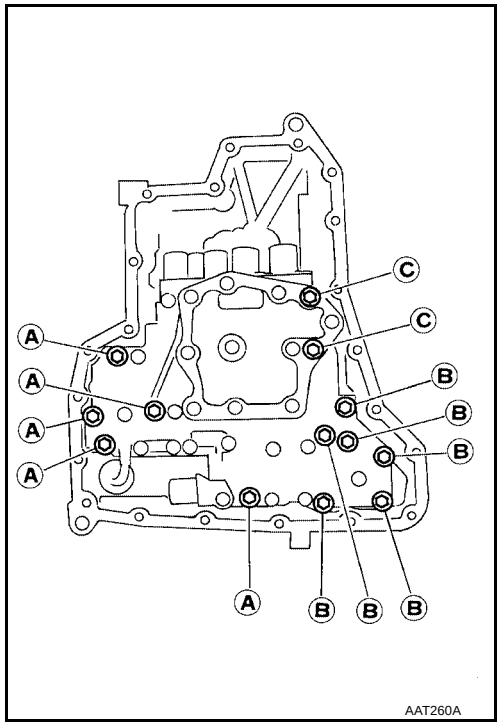
3. Disconnect A/T solenoid valve harness connector.



4. Remove stopper ring from A/T solenoid harness terminal body.
5. Remove A/T solenoid harness by pushing terminal body into transmission case.



6. Remove control valve assembly mounting bolts A, B and C.

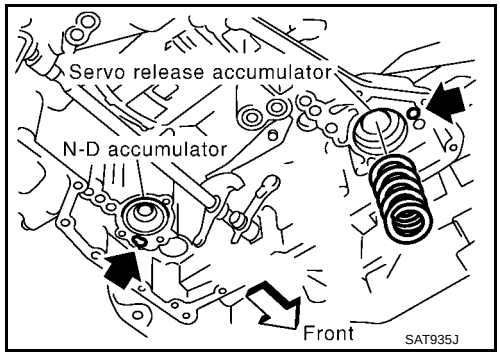


Bolt length, number and location:

Bolt symbol	A	B	C
Bolt length "l"	40.0 mm (1.575 in)	33.0 mm (1.299 in)	43.5 mm (1.713 in)
Number of bolts	5	6	2

- **Be careful not to drop manual valve and servo release accumulator return springs.**

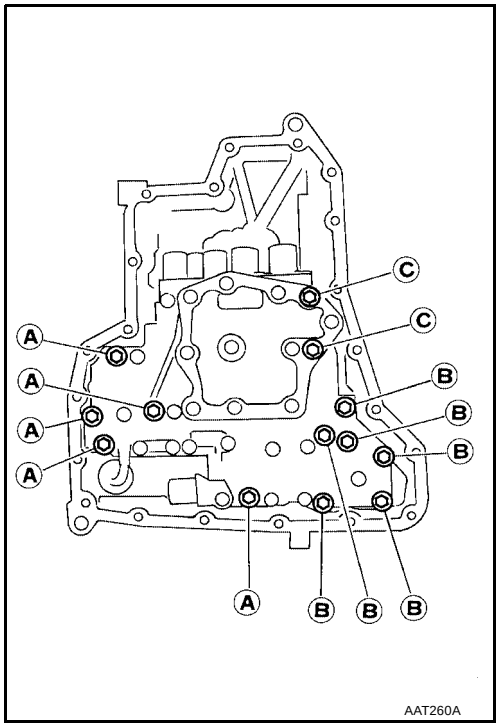
7. Disassemble and inspect control valve assembly if necessary. Refer to AT-298, "Components" .
8. Remove servo release and N-D accumulators by applying compressed air if necessary.
   - **Hold each piston with a clean, lint-free towel.**



INSTALLATION

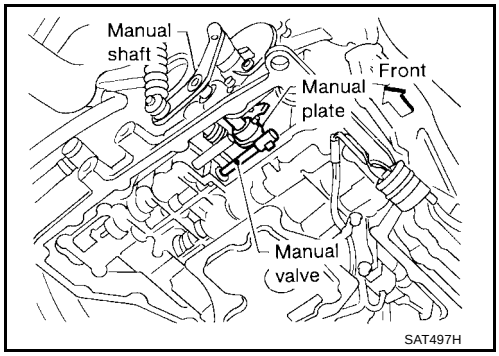
- **Tighten mounting bolts A, B and C to specification.**

  : 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)



AAT260A

- **Set manual shaft in Neutral position, then align manual plate with groove in manual valve.**
- **After installing control valve assembly to transmission case, make sure that selector lever can be moved to all positions.**



SAT497H

Control Cable Adjustment

ECS005ZH

Move selector lever from the “P” position to the “1” position. You should be able to feel the detents in each position. If the detents cannot be felt or if the pointer indicating the position is improperly aligned, the control cable needs adjustment.

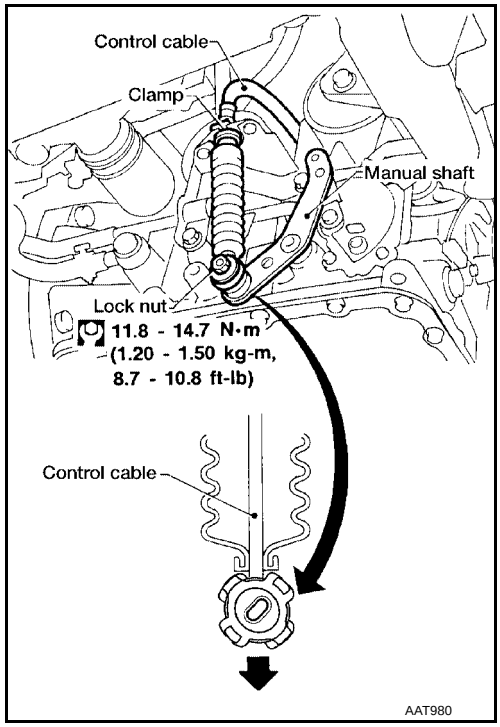
1. Place selector lever in “P” position.
2. Loosen control cable lock nut and place manual shaft in “P” position.
3. Push control cable, by specified force, in the direction of the arrow shown in the illustration.

Specified force : 9.8 N (1.0 kg, 2.2 lb)

4. Release control cable in the opposite direction of the arrow for 1.0 mm (0.039 in).
5. Tighten control cable lock nut by hand.
6. Tighten control cable lock nut.

: 11.8 - 14.7 N·m (1.20 - 1.50 kg-m, 8.7 - 10.8 ft-lb)

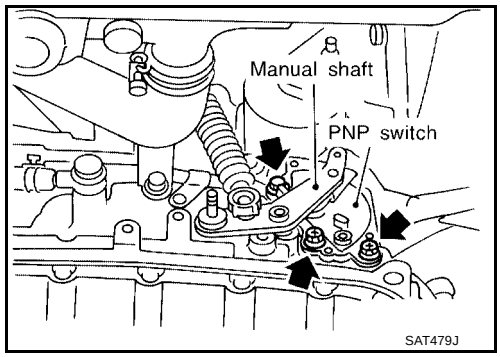
7. Move selector lever from “P” to “1” position again. Make sure that selector lever moves smoothly.
8. Apply grease to contacting areas of selector lever and control cable. Install any part removed.



Park/Neutral Position (PNP) Switch Adjustment

ECS005ZI

1. Remove control cable end from manual shaft.
2. Set manual shaft in “N” position.
3. Loosen PNP switch fixing bolts.

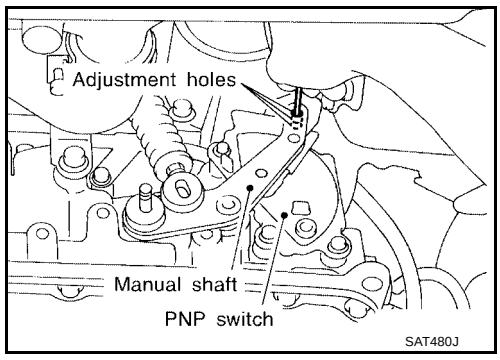


4. Use a 4 mm (0.157 in) pin for this adjustment.

a. Insert the pin straight into the manual shaft adjustment hole.

b. Rotate PNP switch until the pin can also be inserted straight into hole in PNP switch.

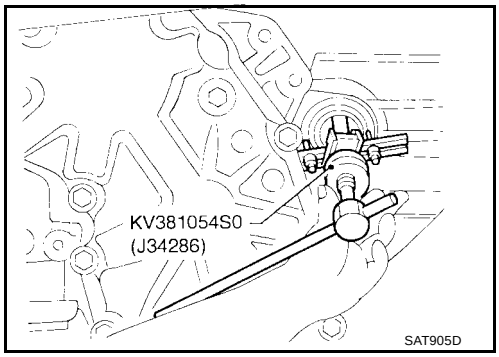
5. Tighten PNP switch fixing bolts.
6. Remove pin from adjustment hole after adjusting PNP switch.
7. Reinstall any part removed.
8. Adjust control cable. Refer to AT-263, "Control Cable Adjustment" .
9. Check continuity of PNP switch. Refer to AT-120, "Component Inspection" .



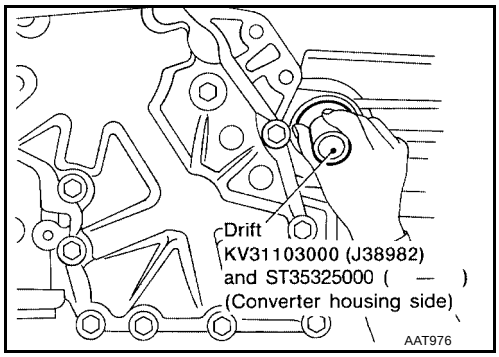
Differential Side Oil Seal Replacement

ECS005ZJ

1. Remove drive shaft assemblies using Tool. Refer to FAX-14, "Removal" .
2. Remove oil seals.



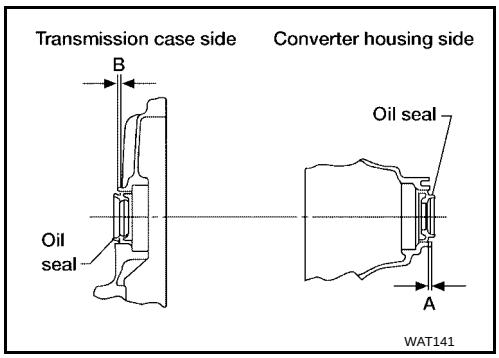
3. Install oil seals using Tool.
   - **Apply ATF to oil seal surface before installing.**



   - **Install oil seals so that dimensions “A” and “B” are within specifications.**

Unit: mm (in)

A	B
5.5 - 6.5 (0.217 - 0.256)	–0.5 to 0.5 (–0.020 to 0.020)



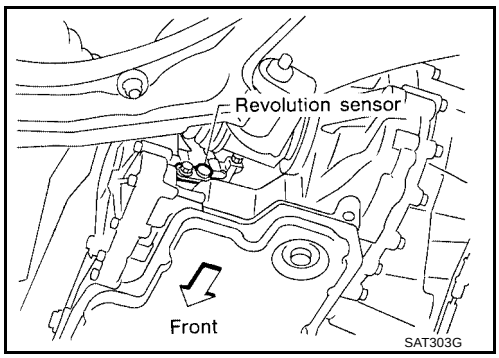
4. Reinstall any part removed.

Revolution Sensor Replacement

ECS005ZK

1. Disconnect revolution sensor harness connector.
2. Remove harness bracket from A/T.
3. Remove revolution sensor from A/T.
4. Reinstall any part removed.

Always use new sealing parts.



REMOVAL AND INSTALLATION

PFP:00000

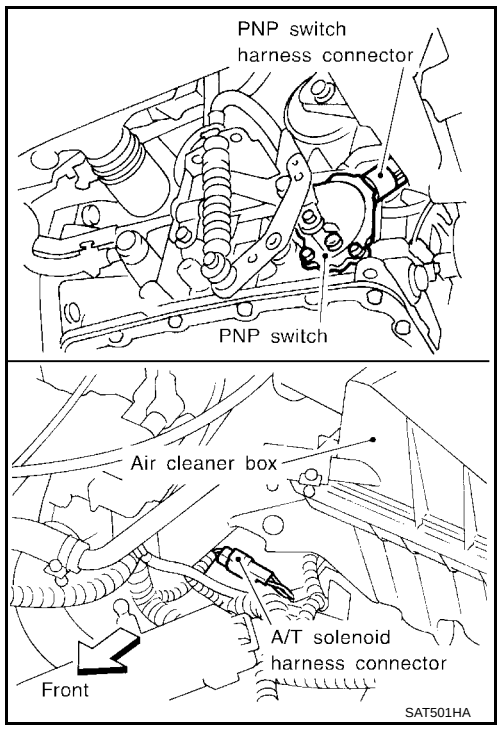
Removal

ECS005ZL

CAUTION:

Before separating transaxle from engine, remove the crankshaft position sensor (OBD) from transaxle. Be careful not to damage sensor.

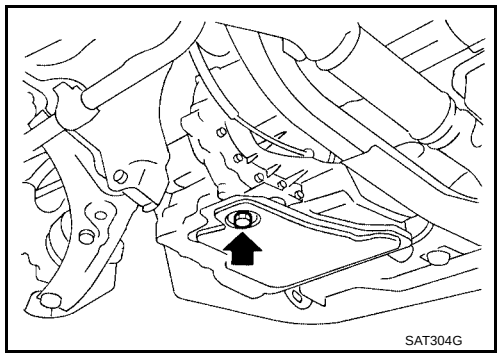
1. Remove battery and bracket.
2. Remove air duct between throttle body and air cleaner.
3. Disconnect terminal cord assembly, PNP switch harness connector and revolution sensor harness connector.



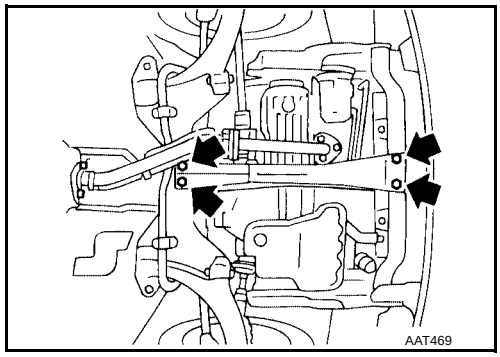
4. Drain ATF from transaxle.
5. Disconnect control cable from transaxle.
6. Disconnect oil cooler hoses.
7. Remove drive shafts. Refer to FAX-14, "Removal" .
8. Remove the intake manifold support bracket. Refer to EM-12, "Removal and Installation" .
9. Remove starter motor from transaxle.

Tighten bolts to specified torque.

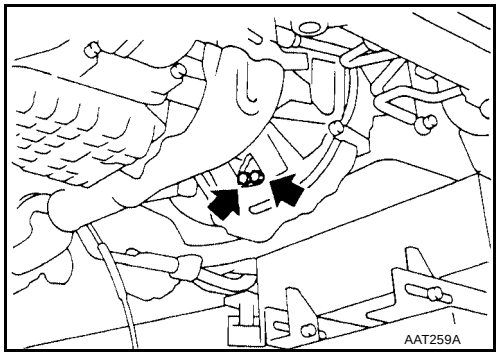
: 33.3 - 46.1 N·m (3.4 - 4.7 kg-m, 25 - 34 ft-lb)



10. Remove upper bolts fixing transaxle to engine.
11. Support transaxle with a jack.
12. Remove center member.
    - Tighten center member fixing bolts to specified torque, Refer to EM-66, "INSTALLATION" .



13. Remove rear plate cover.
14. Remove torque converter bolts.
    Rotate crankshaft to gain access to securing bolts.
15. Remove rear transaxle to engine bracket. Refer to EM-64, "REMOVAL" .
16. Support engine with a jack.
17. Remove rear transaxle mount. Refer to EM-63 .
18. Remove lower bolts fixing transaxle to engine.
19. Lower transaxle while supporting it with a jack.



Installation

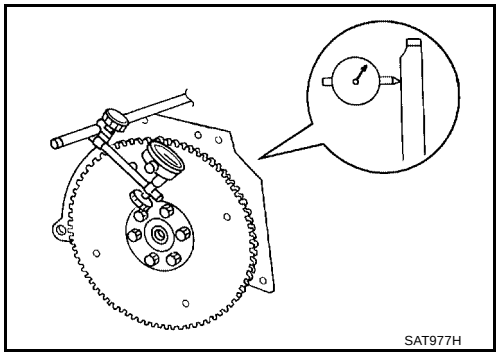
ECS005ZM

1. Check drive plate runout.

   CAUTION:
   Do not allow any magnetic materials to contact the ring gear teeth.

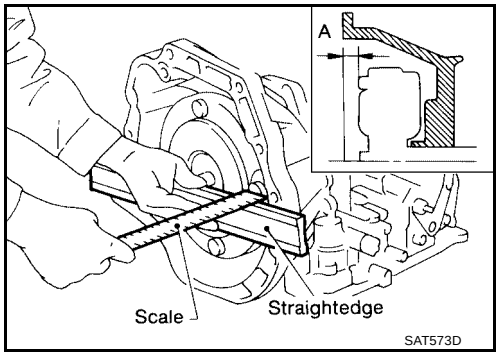
   Maximum allowable runout : **EM-77, "Flywheel Runout" .**

   - If this runout is out of allowance, replace drive plate with ring gear.

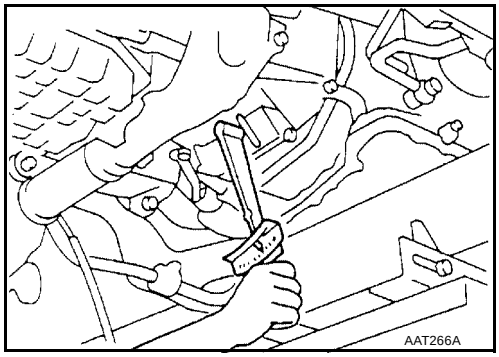


2. When connecting torque converter to transaxle, measure distance “A” to be certain that they are correctly assembled.

   Distance “A” : 21.1 mm (0.831 in)

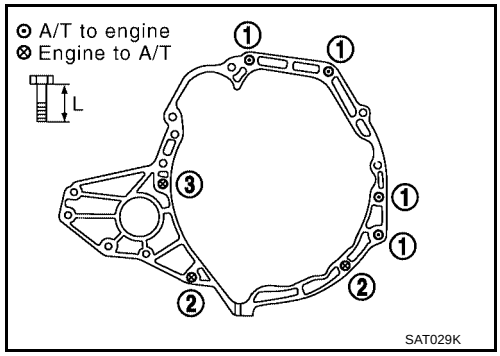


3. Install torque converter to drive plate.
   - **With converter installed, rotate crankshaft several turns to check that transaxle rotates freely without binding.**

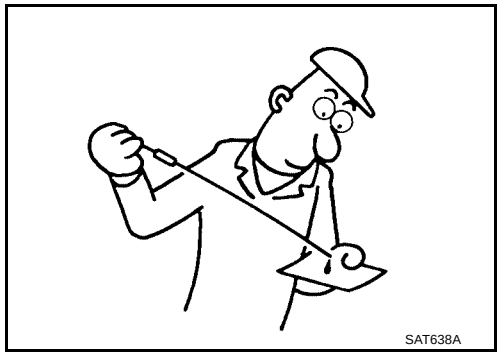


4. Tighten bolts fixing transaxle.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length “l ” mm (in)
1	30 - 40 (3.1 - 4.1, 23 - 29)	50 (1.97)
2	16 - 20 (1.6 - 2.1, 12 - 15)	25 (0.98)
3	31 - 40 (3.1 - 4.1, 23 - 29)	30 (1.18)



5. Reinstall any part removed.
6. Adjust control cable. Refer to AT-263, "Control Cable Adjustment" .
7. Check continuity of PNP switch. Refer to AT-120, "PARK/NEUTRAL POSITION SWITCH" .
8. Refill transaxle with ATF and check fluid level.
9. Move selector lever through all positions to be sure that transaxle operates correctly. With parking brake applied, idle engine. Move selector lever through “N” to “D”, to “2”, to “1” and “R” positions. A slight shock should be felt through the hand gripping the selector each time the transaxle is shifted.
10. Perform road test. Refer to AT-69, "Road Test" .



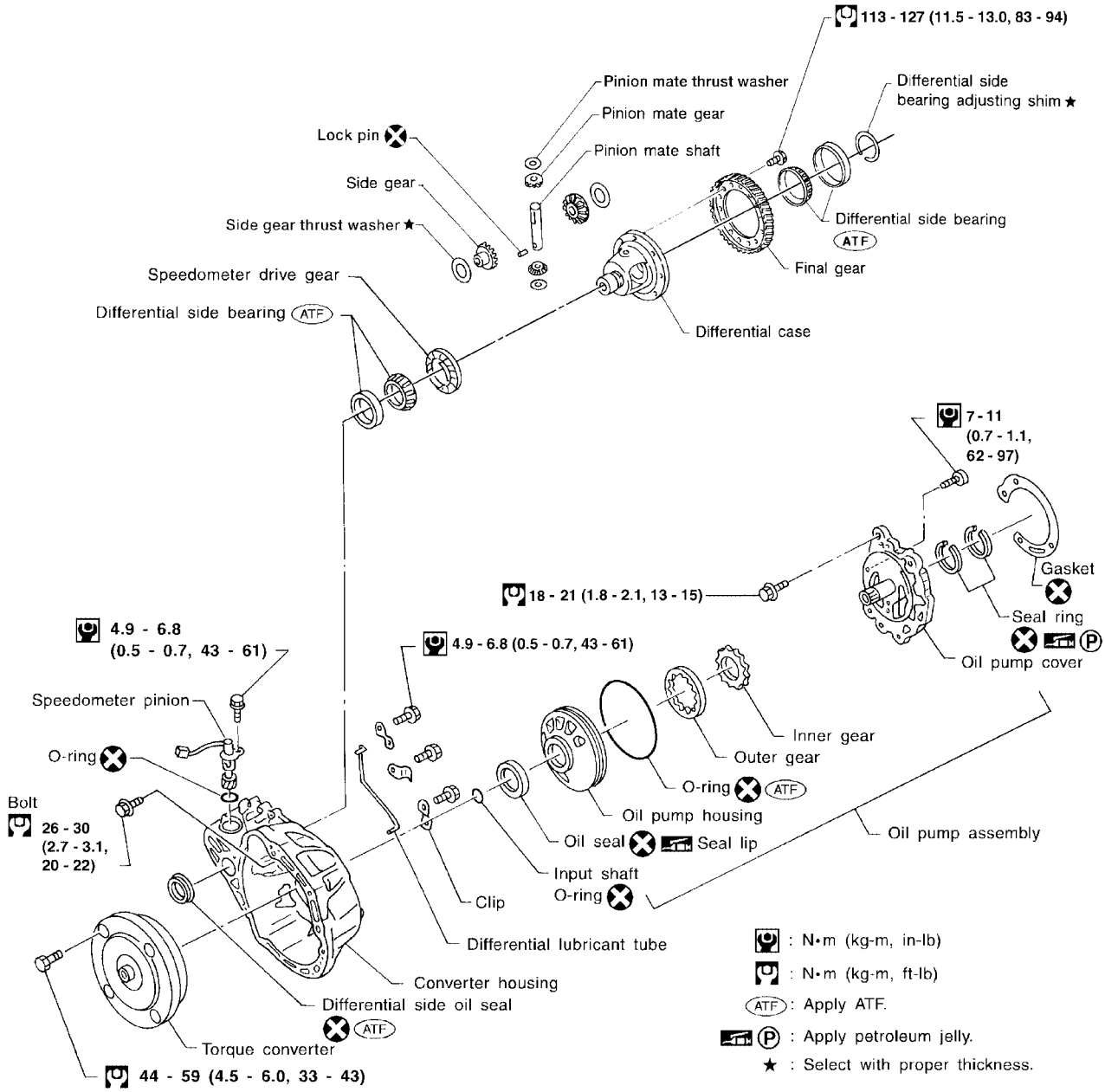
OVERHAUL

PFP:00000

Components

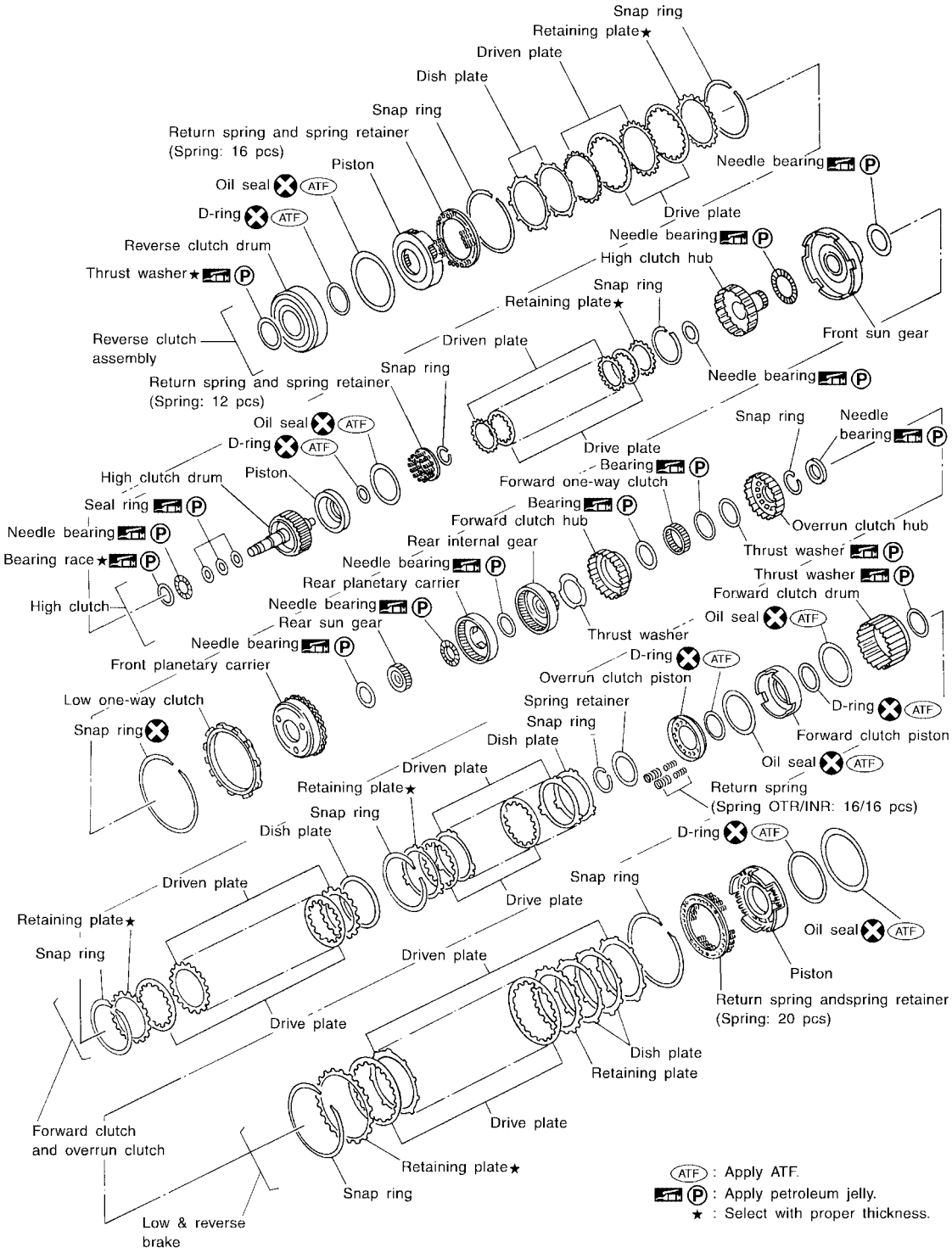
ECS005ZN

SEC. 311•313•327•381



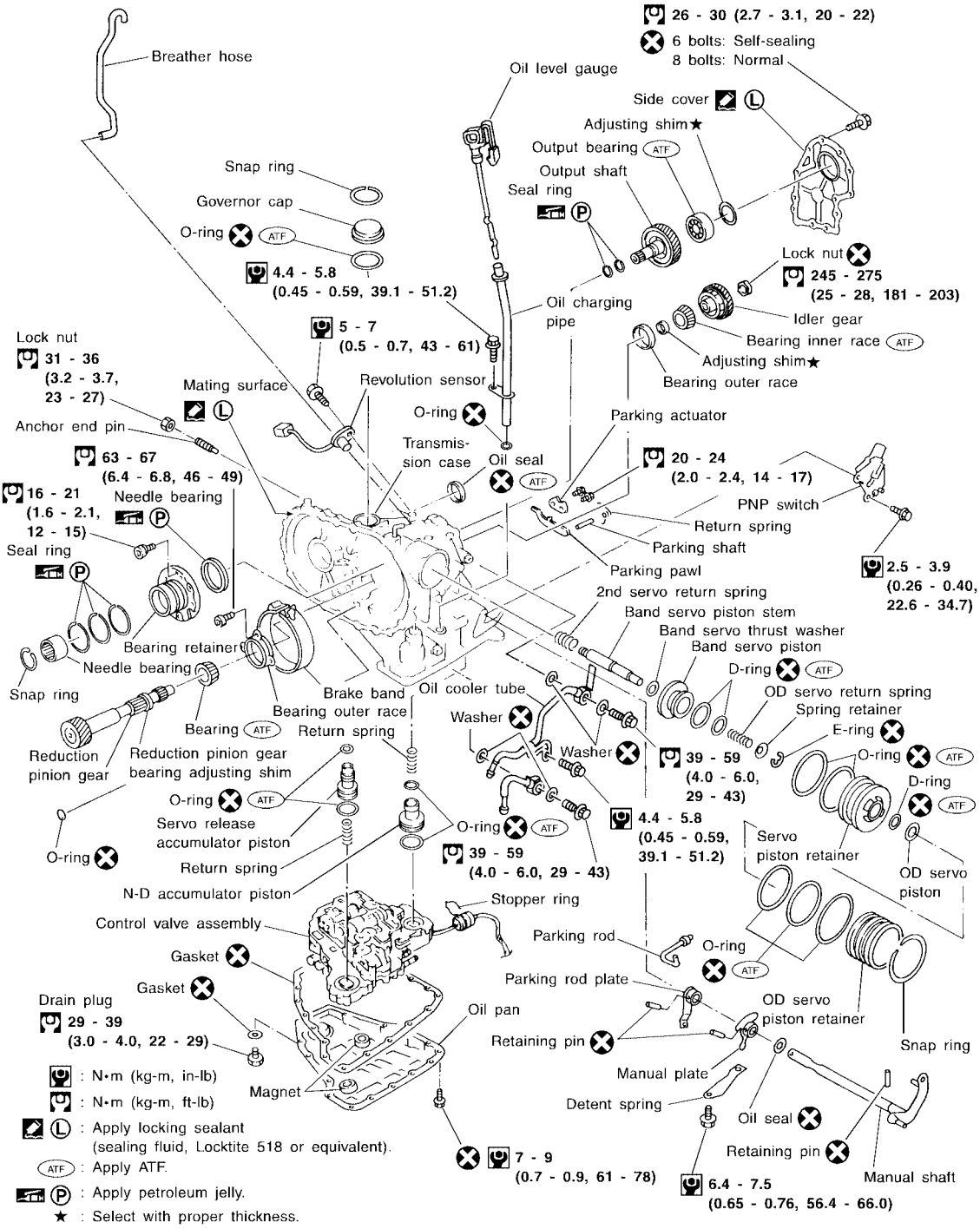
WAT404

SEC. 315



WCIA0218E

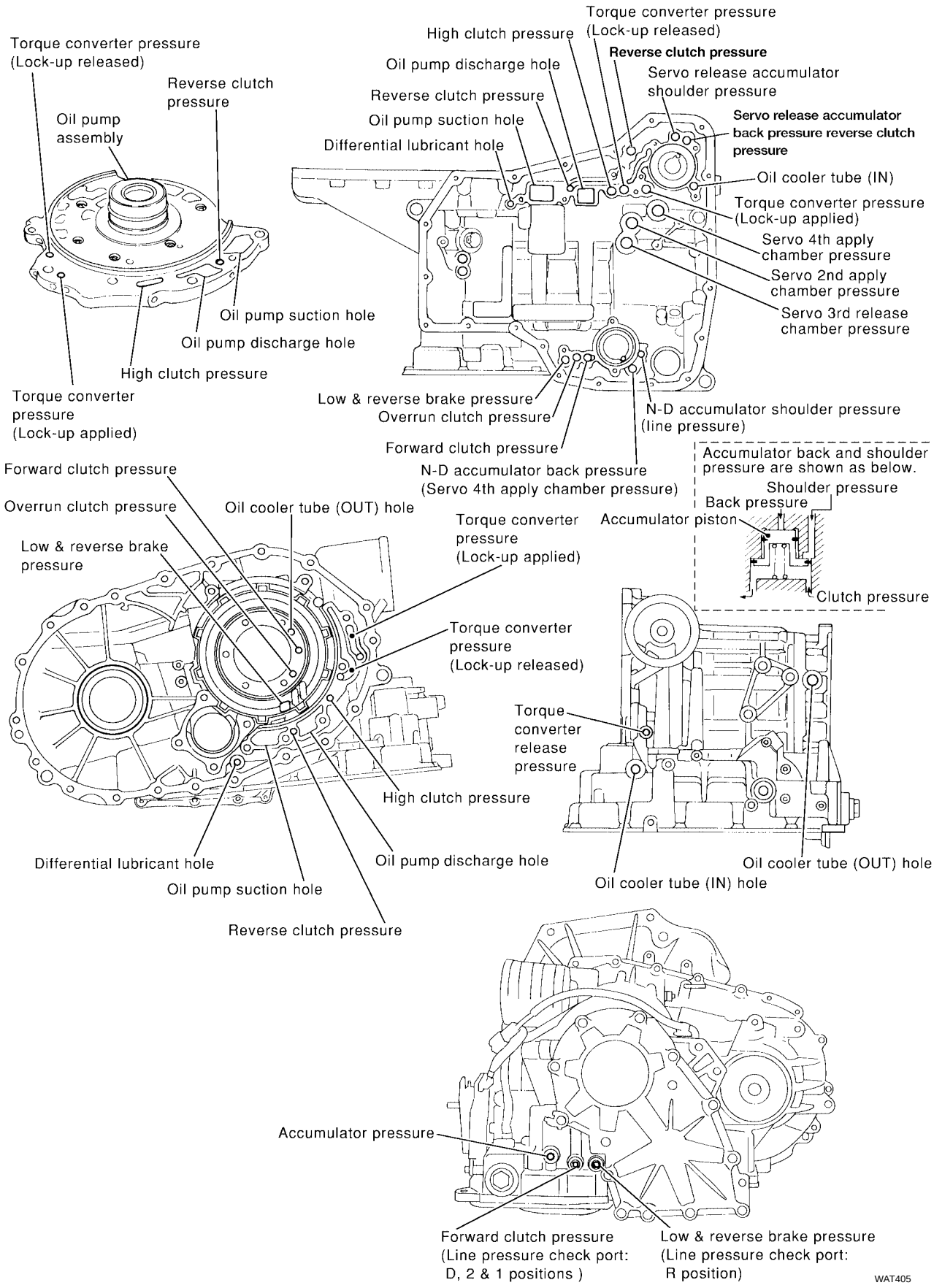
SEC. 310•315•317•319



WCIA0219E

Oil Channel

ECS005ZO



Locations of Adjusting Shims, Needle Bearings, Thrust Washers and Snap Rings

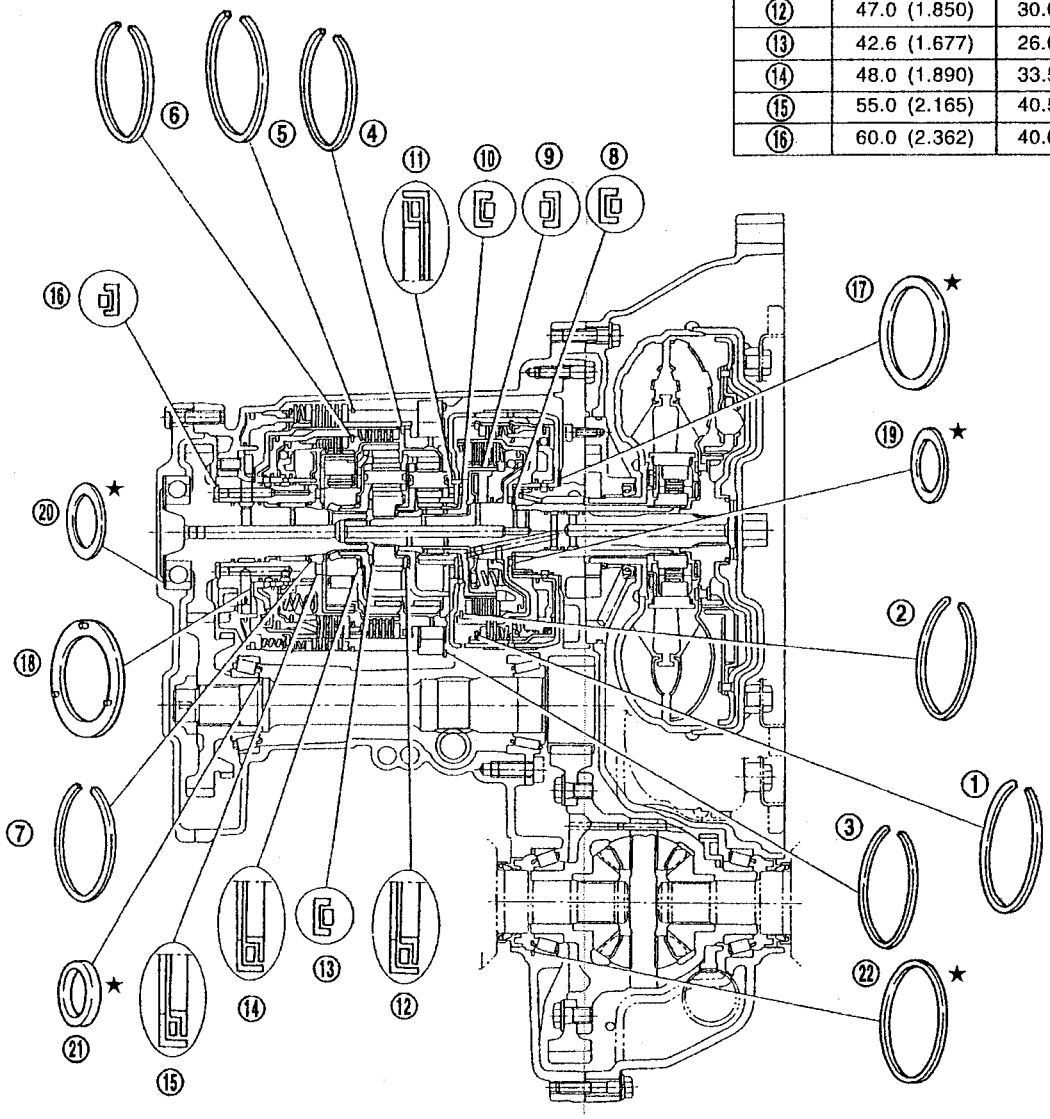
ECS005ZP

Outer diameter and color of thrust washers

Item number	Outer diameter mm (in)	Color
⑰	72.0 (2.835)	Black
⑱	78.5 (3.091)	

Outer and inner diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑧	47.0 (1.850)	32.0 (1.260)
⑨	35.0 (1.378)	20.1 (0.791)
⑩	60.0 (2.362)	42.0 (1.657)
⑪	60.0 (2.362)	45.0 (1.772)
⑫	47.0 (1.850)	30.0 (1.181)
⑬	42.6 (1.677)	26.0 (1.024)
⑭	48.0 (1.890)	33.5 (1.319)
⑮	55.0 (2.165)	40.5 (1.594)
⑯	60.0 (2.362)	40.0 (1.579)



★ : Select proper thickness.

Outer and inner diameter of bearing race and adjusting shims

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑲	48.0 (1.890)	33.0 (1.299)
⑳	72.0 (2.835)	61.0 (2.402)
㉑	34.5 (1.358)	26.1 (1.028)
㉒	68.0 (2.677)	60.0 (2.362)

Outer diameter of snap rings

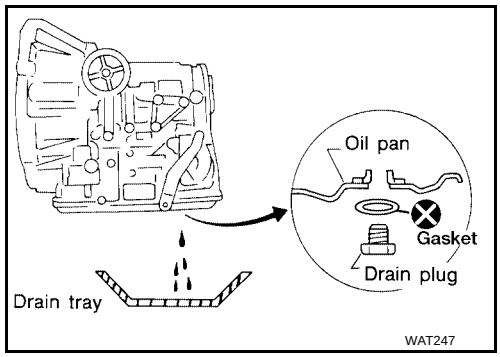
Item number	Outer diameter mm (in)
①	142.0 (5.59)
②	113.0 (4.45)
③	162.4 (6.39)
④	135.4 (5.33)
⑤	162.3 (6.39)
⑥	126.0 (4.96)
⑦	40.5 (1.594)

WAT246

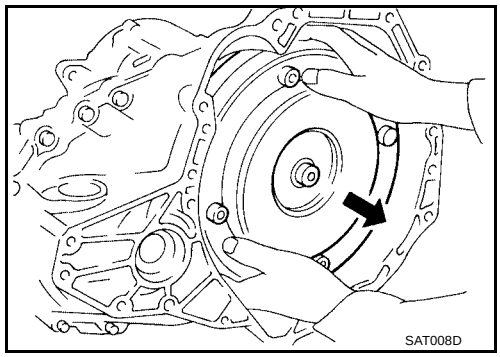
Disassembly

ECS005ZQ

1. Drain ATF through drain plug.



2. Remove torque converter.

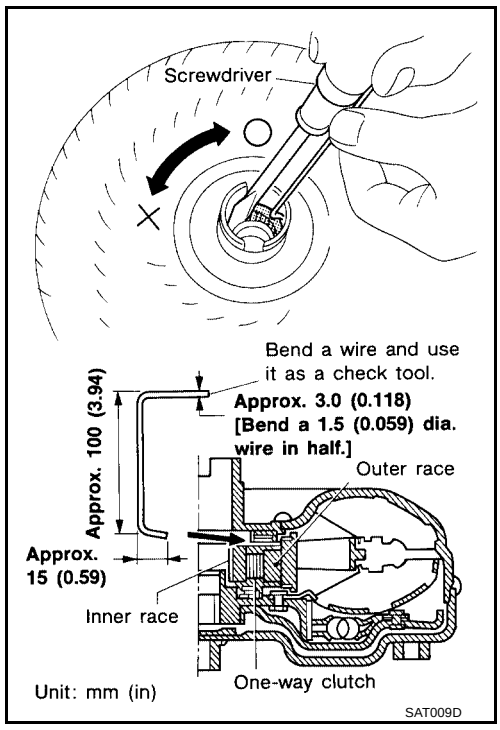


3. Check torque converter one-way clutch using check tool as shown.

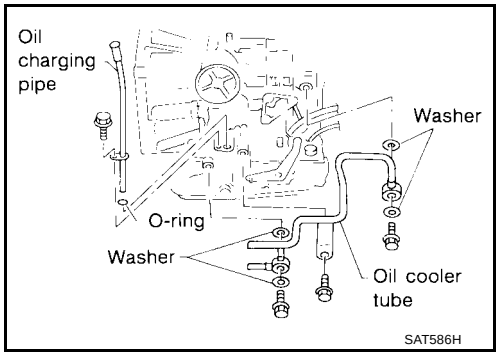
a. Insert check tool into the groove of bearing support built into one-way clutch outer race.

b. While fixing bearing support with check tool, rotate one-way clutch spline using flat-bladed screwdriver.

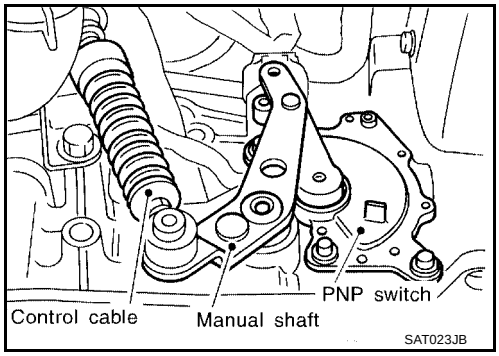
c. Check to make sure the inner race rotates clockwise only. If not, replace torque converter assembly.



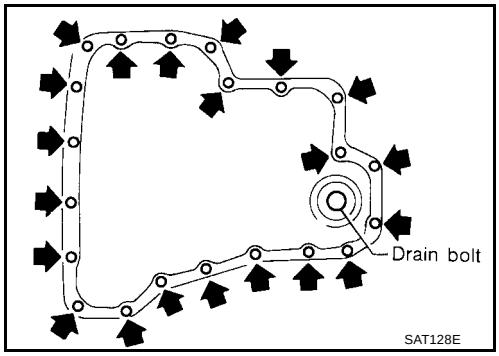
4. Remove oil charging pipe and oil cooler tube.



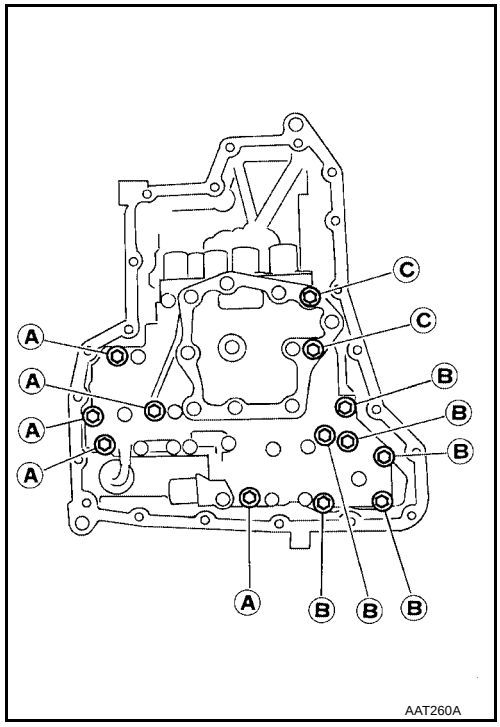
5. Set manual shaft to “P” position.
6. Remove PNP switch.



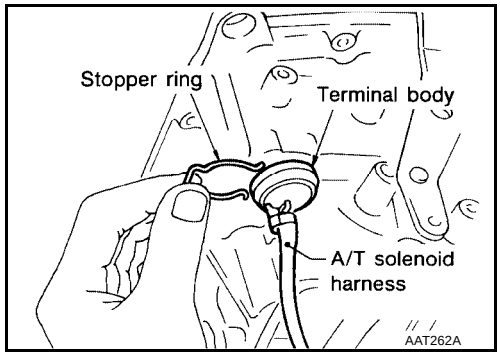
7. Remove oil pan and oil pan gasket.
   - **Always replace oil pan bolts as they are self-sealing bolts.**
8. Check foreign materials in oil pan to help determine cause of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up. Varnish can cause valves, servo, and clutches to stick and may inhibit pump pressure.
   - **If frictional material is detected, replace radiator after repair of A/T. Refer to CO-13, "Removal and Installation" .**
9. Remove control valve assembly according to the following procedures.



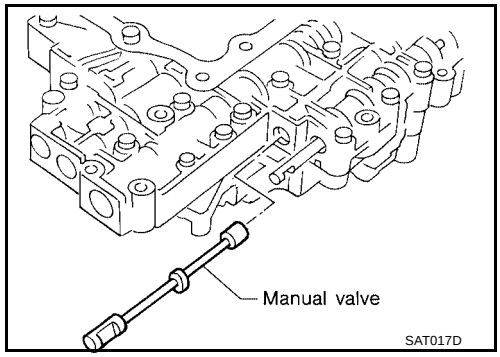
a. Remove control valve assembly mounting bolts A, B and C.



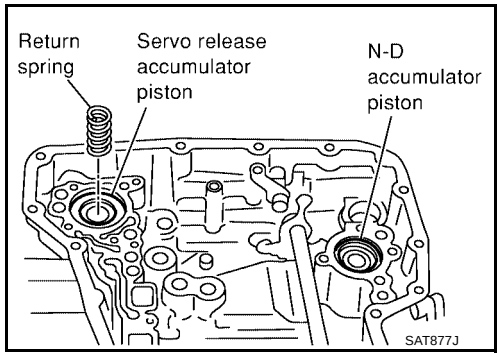
b. Remove stopper ring from terminal body.
c. Push terminal body into transmission case and draw out solenoid harness.



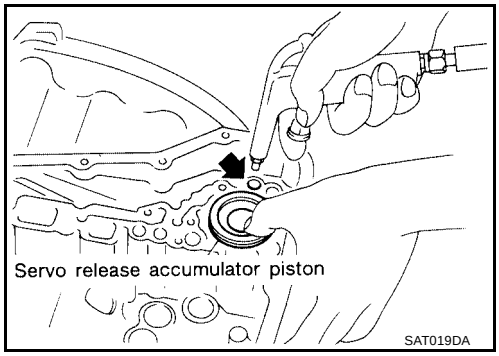
10. Remove manual valve from control valve assembly as a precaution.



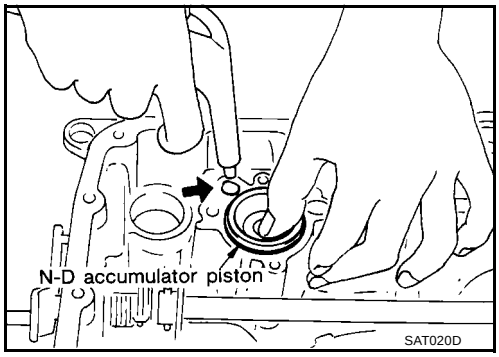
11. Remove return spring from servo release accumulator piston.



12. Remove servo release accumulator piston with compressed air.
13. Remove O-rings from servo release accumulator piston.

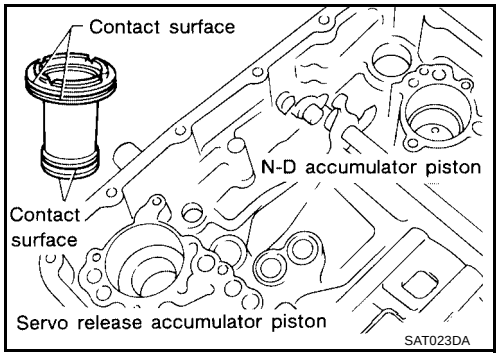


14. Remove N-D accumulator piston and return spring with compressed air.
15. Remove O-rings from N-D accumulator piston.

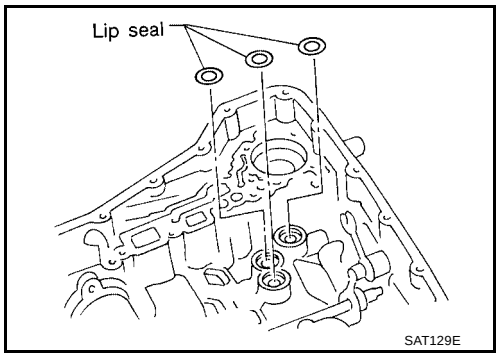


16. Check accumulator pistons and contact surface of transmission case for damage.
17. Check accumulator return springs for damage and free length.

Return springs : Refer to AT-394, "RETURN SPRING".

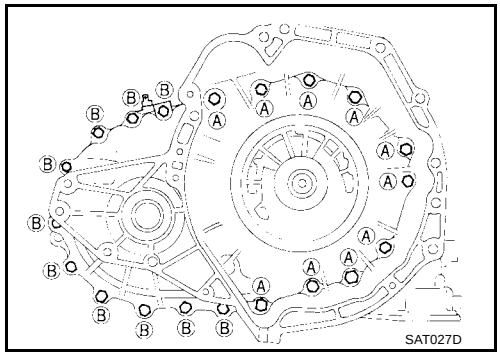


18. Remove lip seals from band servo oil port.

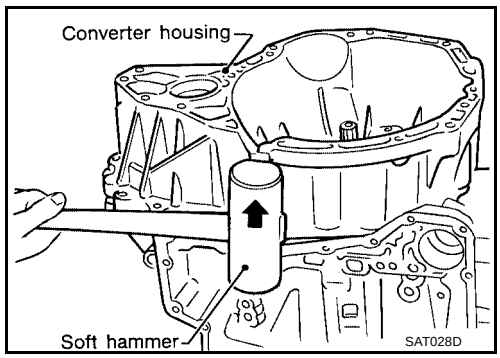


19. Remove converter housing according to the following procedures.

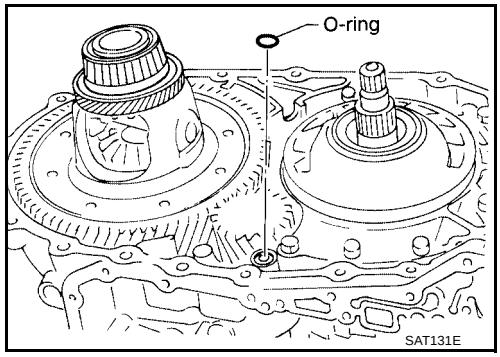
a. Remove converter housing mounting bolts A and B.



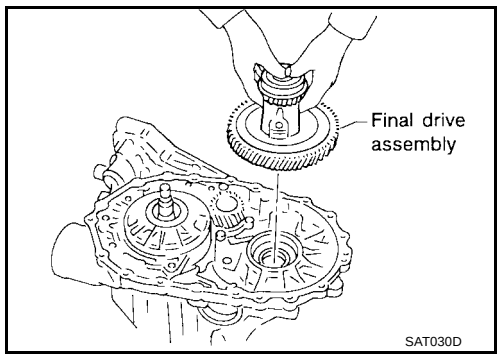
b. Remove converter housing.



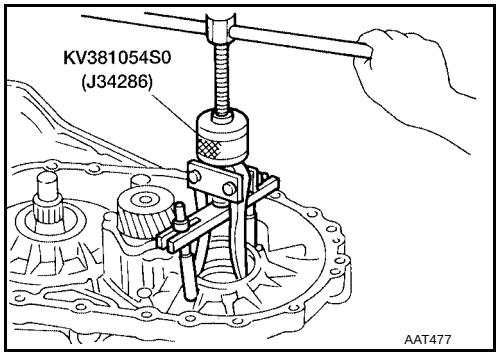
c. Remove O-ring from differential oil port.



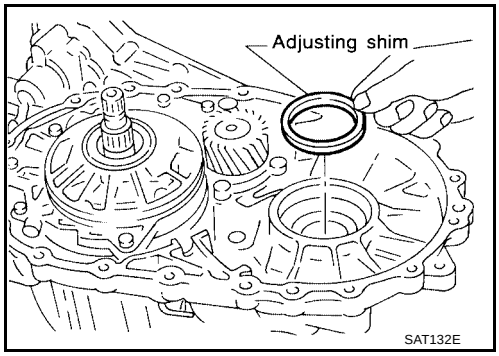
20. Remove final drive assembly from transmission case.



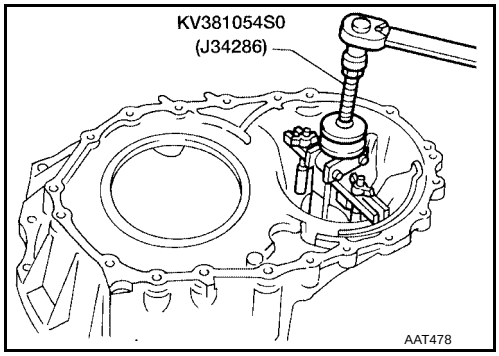
21. Remove differential side bearing outer race from transmission case using Tool.



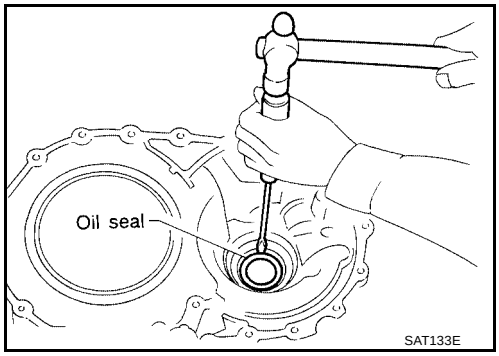
22. Remove differential side bearing adjusting shim from transmission case.



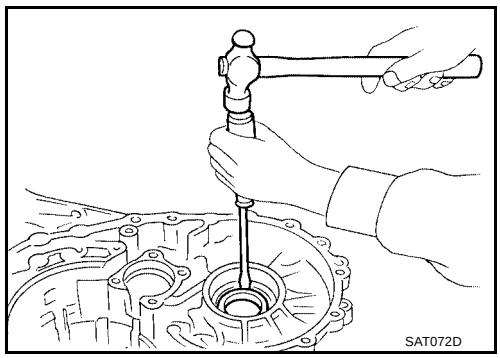
23. Remove differential side bearing outer race from converter housing using Tool.



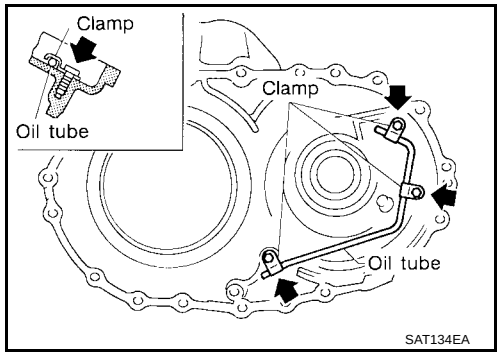
24. Remove oil seal from converter housing using a screwdriver.
    - **Be careful not to damage case.**



25. Remove side oil seal from transmission case using a screwdriver.

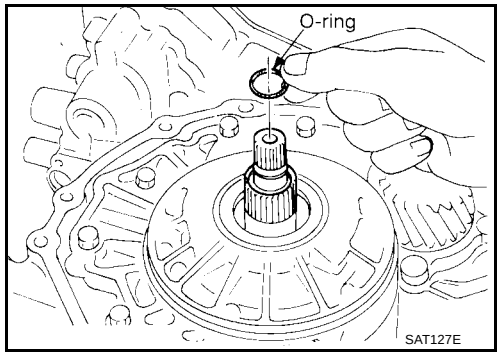


26. Remove oil tube from converter housing.

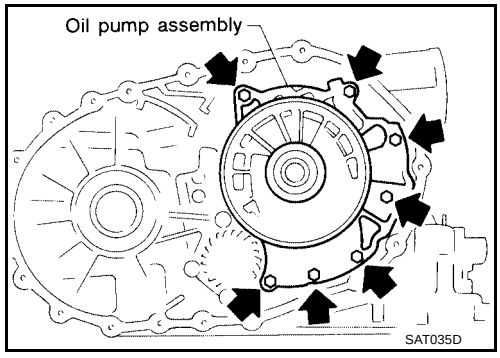


27. Remove oil pump according to the following procedures.

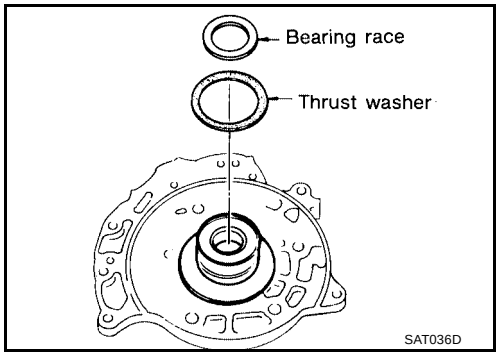
a. Remove O-ring from input shaft.



Remove oil pump assembly from transmission case.



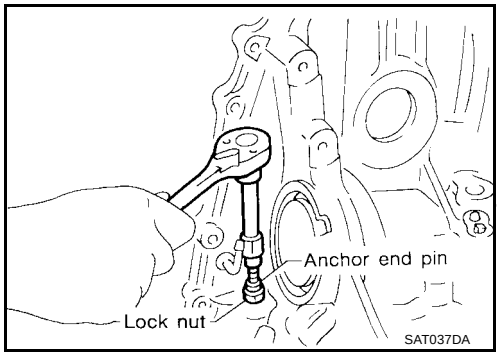
c. Remove thrust washer and bearing race from oil pump assembly.



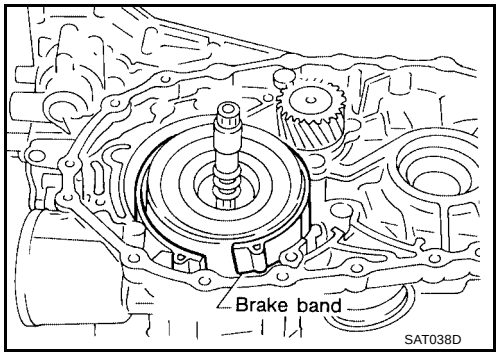
28. Remove brake band according to the following procedures.

a. Loosen lock nut, then back off anchor end pin.

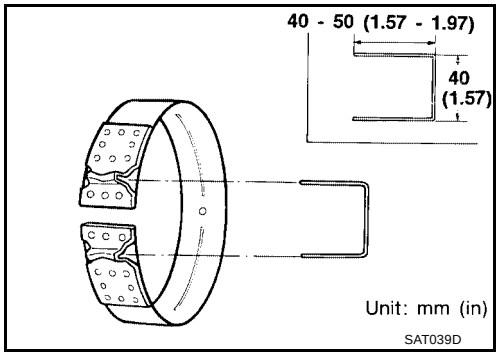
- **Do not reuse anchor end pin.**



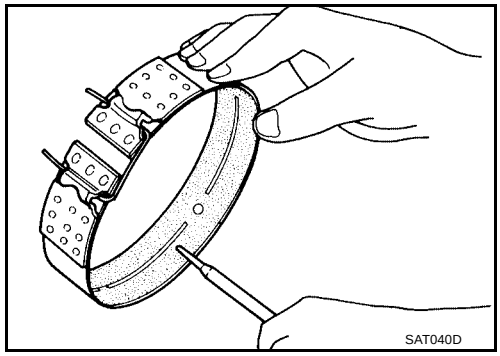
b. Remove brake band from transmission case.



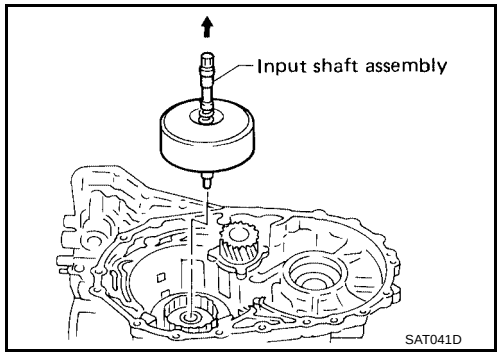
- **To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When removing the brake band, always secure it with a clip as shown. Leave the clip in position after removing the brake band.**



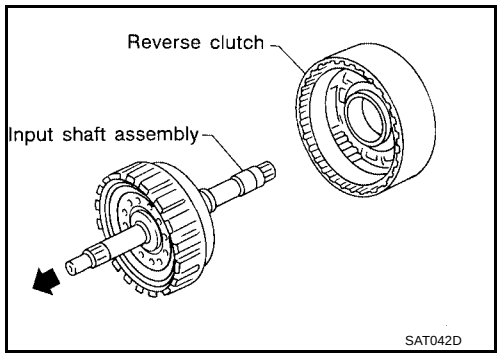
c. Check brake band facing for damage, cracks, wear or burns.



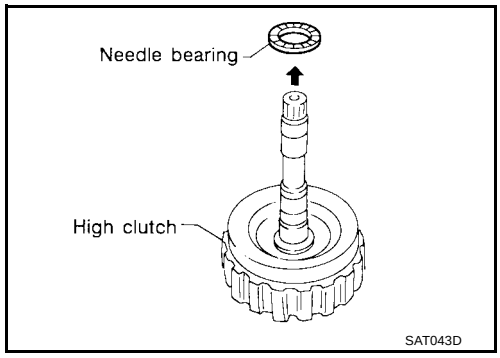
29. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures.



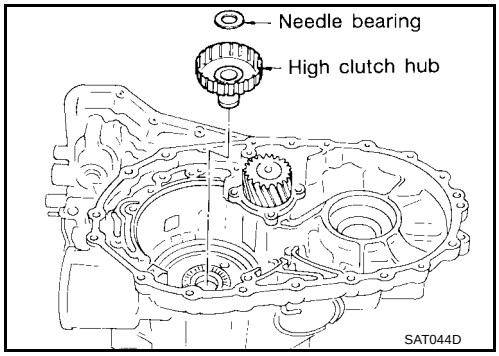
a. Remove input shaft assembly (high clutch) with reverse clutch.
b. Remove input shaft assembly (high clutch) from reverse clutch.



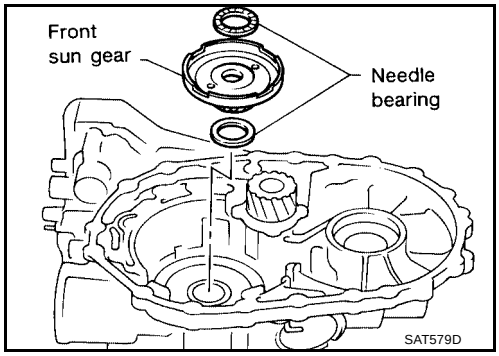
c. Remove needle bearing from high clutch drum.
d. Check input shaft assembly and needle bearing for damage or wear.



30. Remove high clutch hub and needle bearing from transmission case.
31. Check high clutch hub and needle bearing for damage or wear.

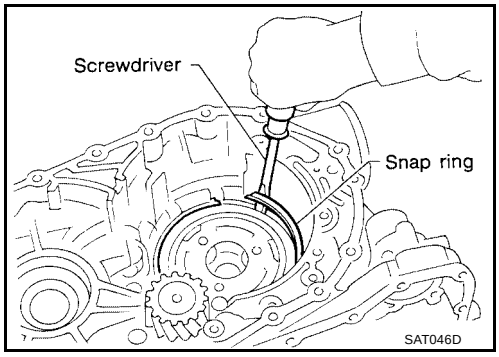


32. Remove front sun gear and needle bearings from transmission case.
33. Check front sun gear and needle bearings for damage or wear.

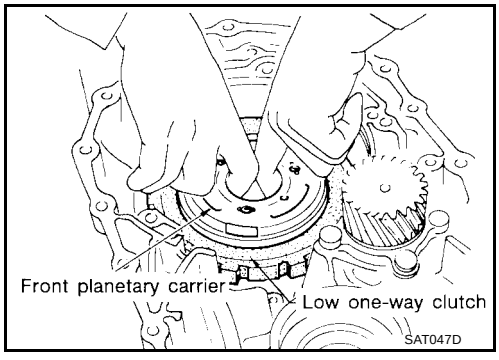


34. Remove front planetary carrier assembly and low one-way clutch according to the following procedures.

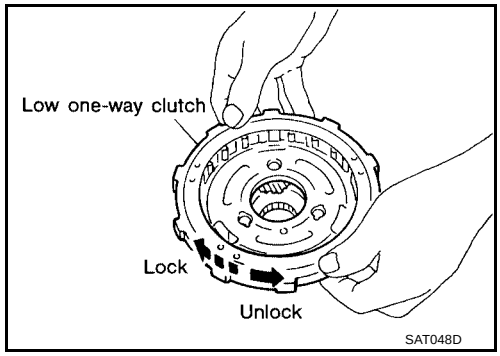
a. Remove snap ring using a screwdriver.
   - **Do not expand snap ring excessively.**



b. Remove front planetary carrier with low one-way clutch.

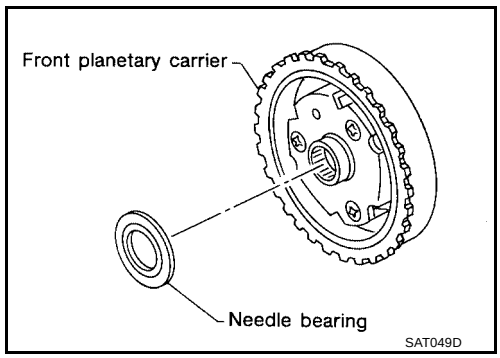


c. Check that low one-way clutch rotates in the direction of the arrow and locks in the opposite direction.



d. Remove low one-way clutch from front planetary carrier by rotating it in the direction of unlock.

e. Remove needle bearing from front planetary carrier.



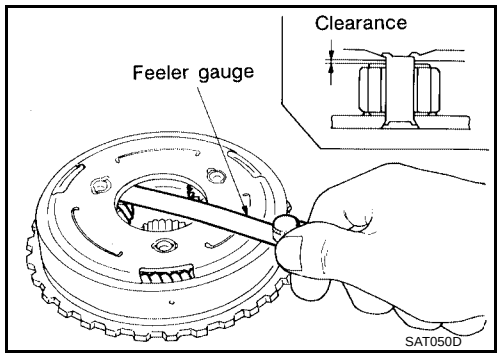
f. Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.

g. Check clearance between pinion washer and planetary carrier using feeler gauge.

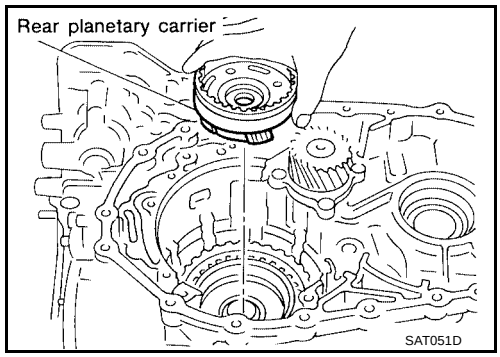
Standard clearance : 0.15 - 0.70 mm (0.0059 - 0.0276 in)

Allowable limit : 0.80 mm (0.0315 in)

Replace front planetary carrier if the clearance exceeds allowable limit.

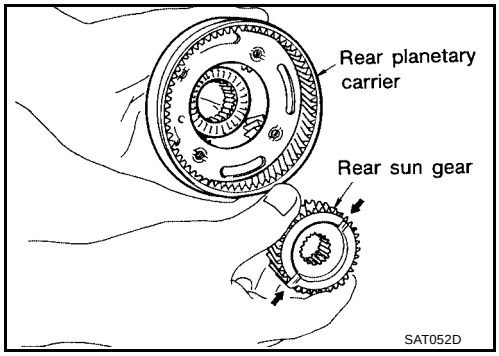


35. Remove rear planetary carrier assembly and rear sun gear according to the following procedures.

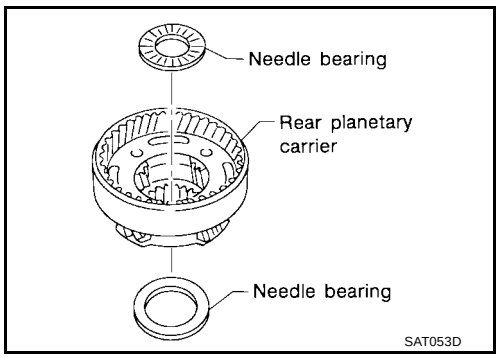


a. Remove rear planetary carrier assembly from transmission case.

b. Remove rear sun gear from rear planetary carrier.



c. Remove needle bearings from rear planetary carrier assembly.



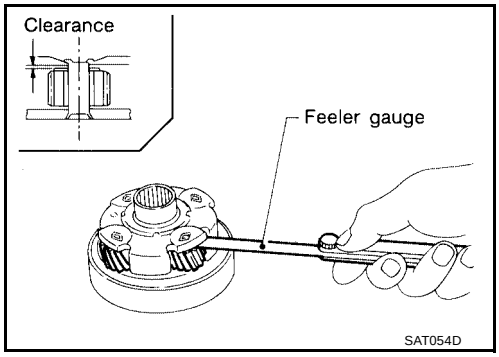
d. Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.

e. Check clearance between pinion washer and rear planetary carrier using feeler gauge.

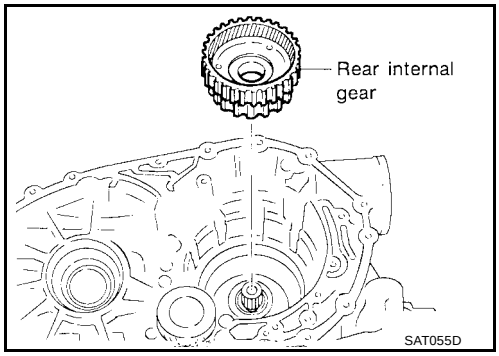
Standard clearance : 0.15 - 0.70 mm (0.0059 - 0.0276 in)

Allowable limit : 0.80 mm (0.0315 in)

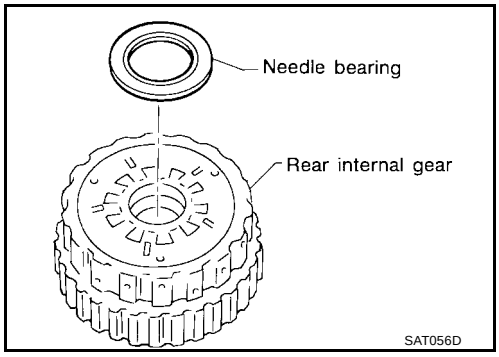
Replace rear planetary carrier if the clearance exceeds allowable limit.



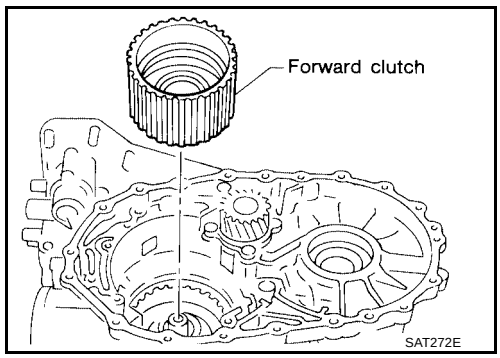
36. Remove rear internal gear from transmission case.



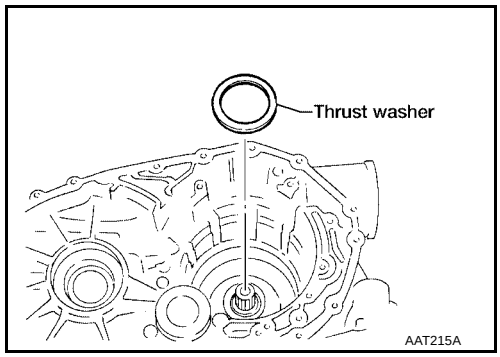
37. Remove needle bearing from rear internal gear.
    - Check needle bearing for damage or wear.



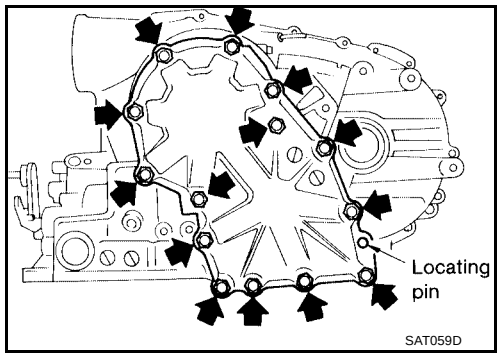
38. Remove forward clutch assembly from transmission case.



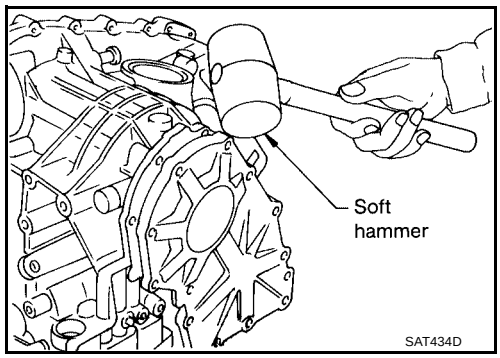
39. Remove thrust washer from transmission case.



40. Remove output shaft assembly according to the following procedures.

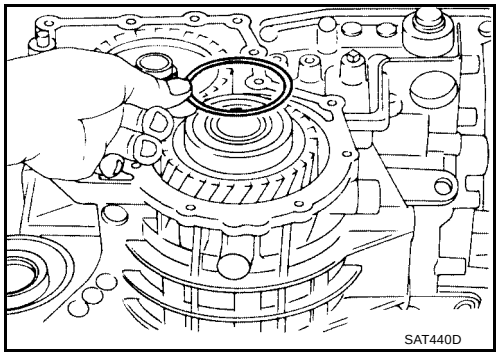


a. Remove side cover bolts.
b. Remove side cover by lightly tapping it with a soft hammer.

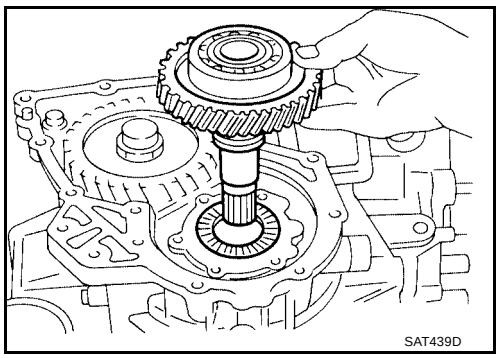


- **Be careful not to drop output shaft assembly. It might come out when removing side cover.**

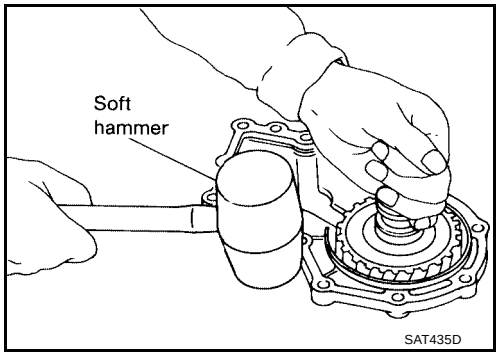
c. Remove adjusting shim.


SAT440D

d. Remove output shaft assembly.

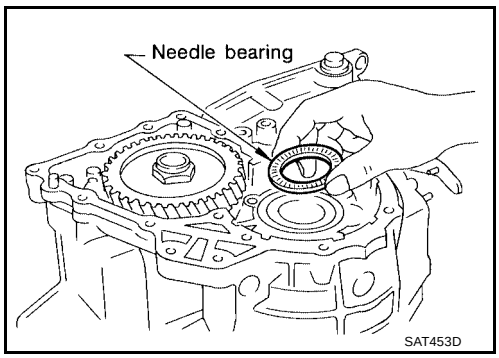

SAT439D

- If output shaft assembly came off with side cover, tap cover with a soft hammer to separate.



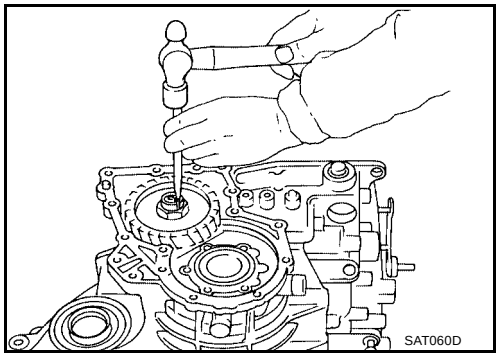
SAT435D

e. Remove needle bearing.

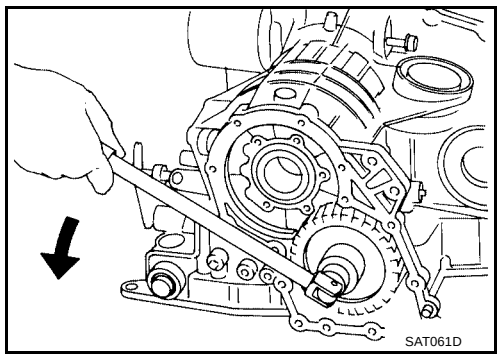


SAT453D

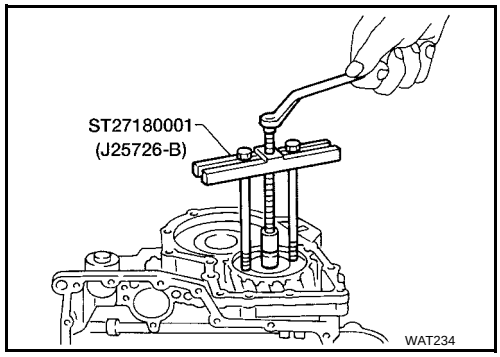
41. Disassemble reduction pinion gear according to the following procedures.


SAT060D

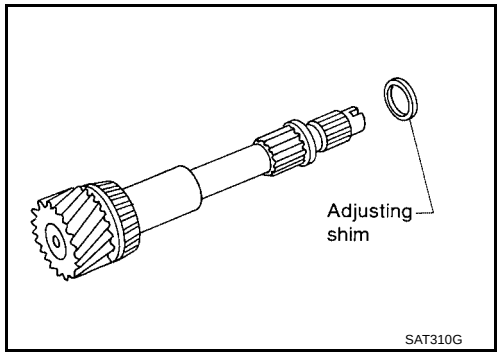
a. Set manual shaft to position “P” to fix idler gear.
b. Unlock idler gear lock nut using a pin punch.
c. Remove idler gear lock nut.
   - **Do not reuse idler gear lock nut.**



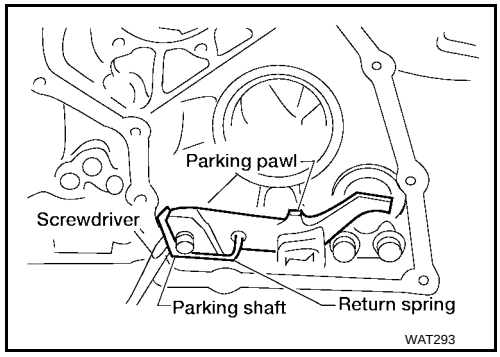
d. Remove idler gear with puller using Tool.



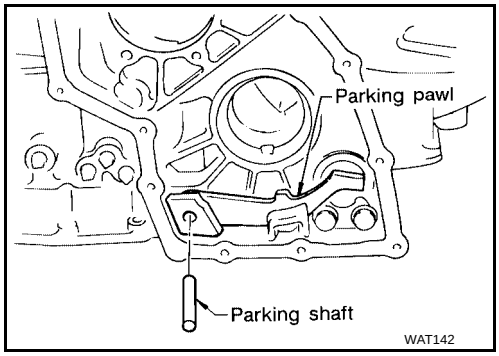
e. Remove reduction pinion gear.
f. Remove adjusting shim from reduction pinion gear.



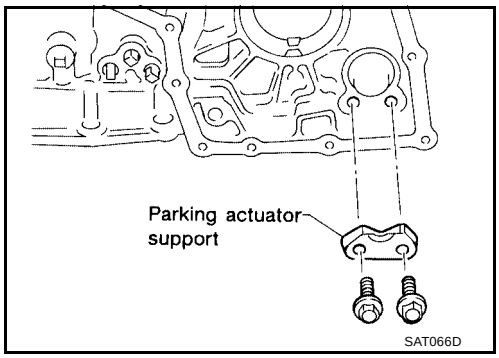
42. Remove return spring from parking shaft using a screwdriver.



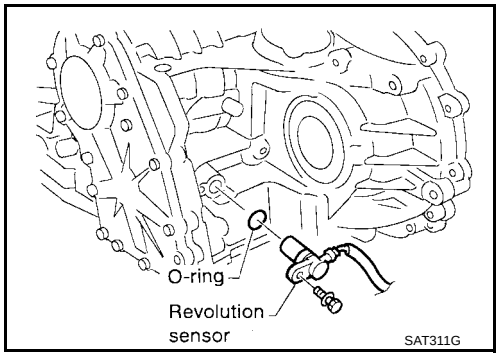
43. Draw out parking shaft and remove parking pawl from transmission case.
44. Check parking pawl and shaft for damage or wear.



45. Remove parking actuator support from transmission case.
    - Check parking actuator support for damage or wear.



46. Remove revolution sensor from transmission case.

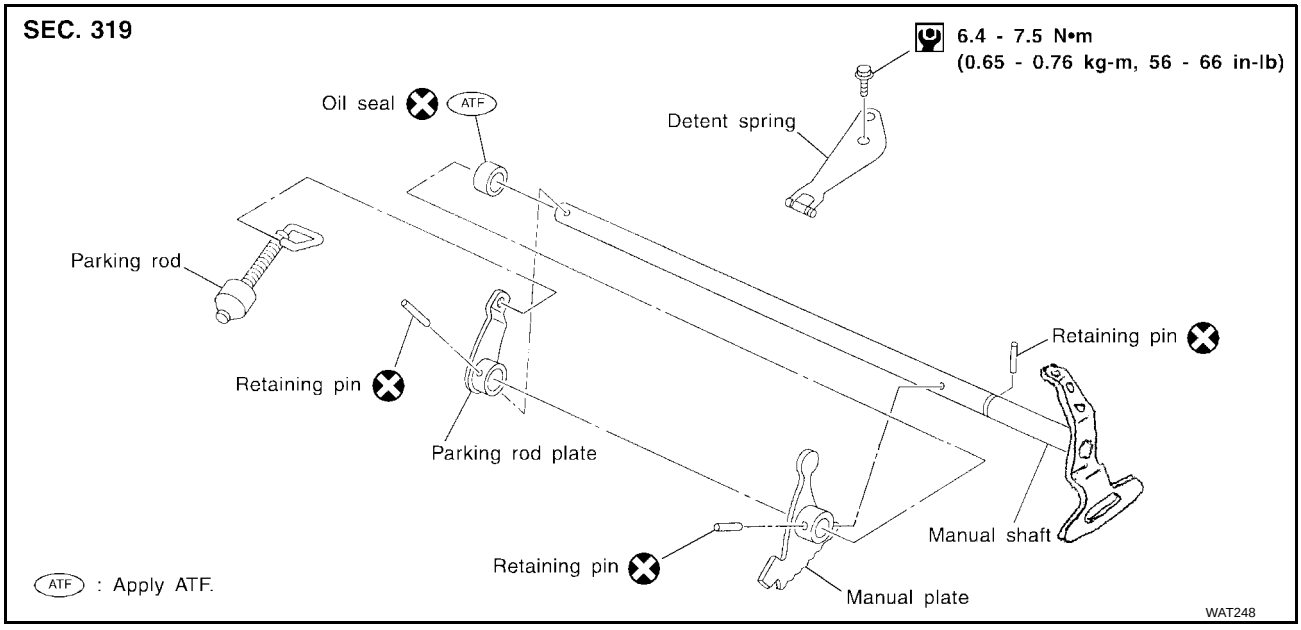


MANUAL SHAFT

PFP:31920

Components

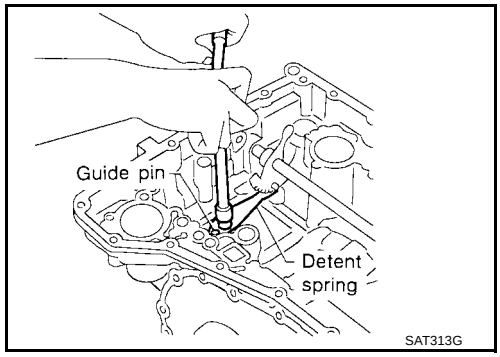
ECS005ZR



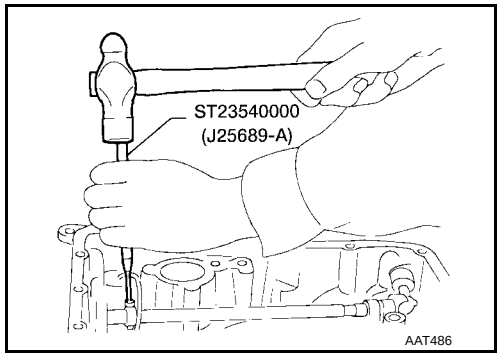
Removal

ECS005ZS

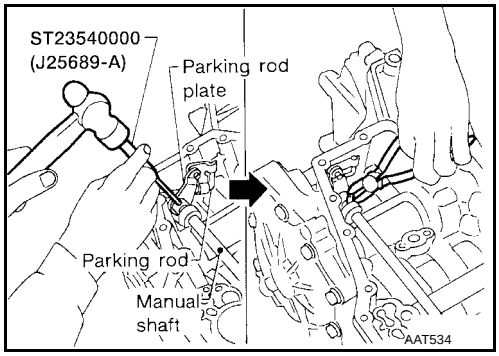
1. Remove detent spring from transmission case.



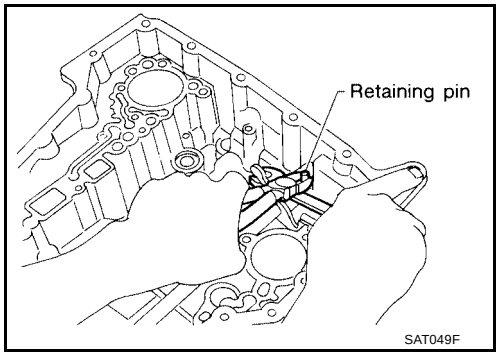
2. Drive out manual plate retaining pin using Tool.



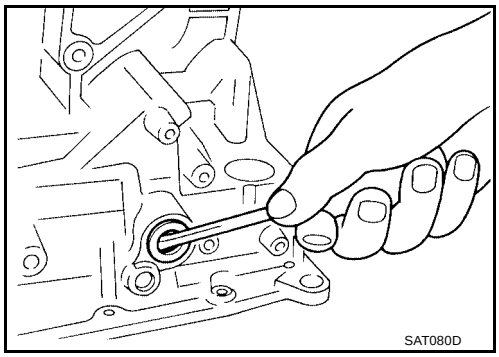
3. Drive and pull out parking rod plate retaining pin using Tool.
4. Remove parking rod plate from manual shaft.
5. Draw out parking rod from transmission case.



6. Pull out manual shaft retaining pin.



7. Remove manual shaft and manual plate from transmission case.
8. Remove manual shaft oil seal.



Inspection

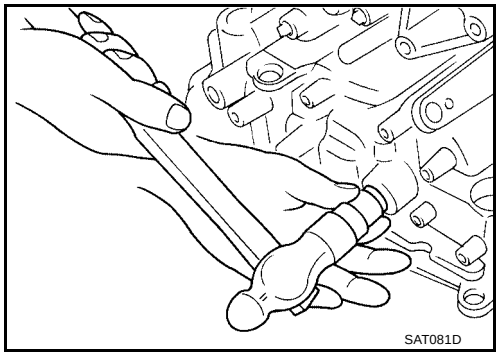
ECS005ZT

- Check component parts for wear or damage. Replace if necessary.

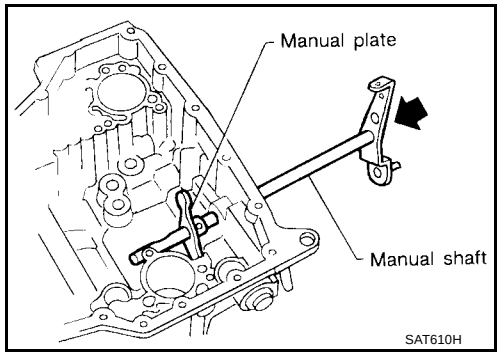
Installation

ECS005ZU

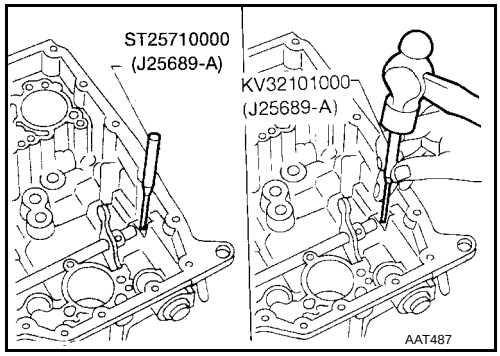
1. Install manual shaft oil seal using a suitable tool.
   - **Apply ATF to outer surface of oil seal.**



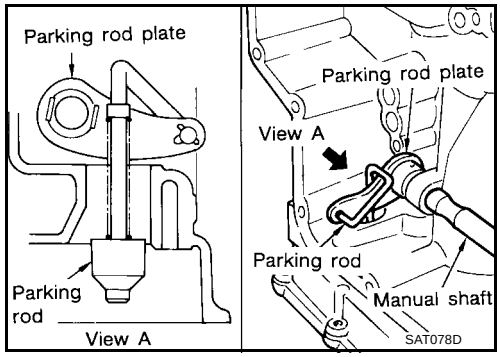
2. Install manual shaft and manual plate.



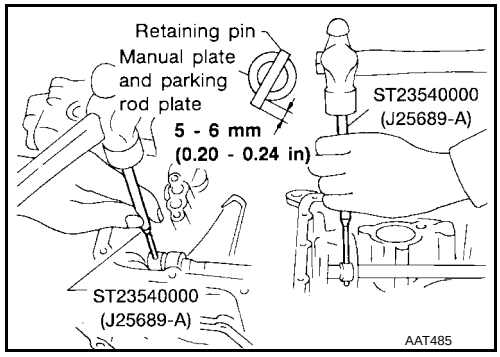
3. Align groove of manual shaft and hole of transmission case.
4. Install manual shaft retaining pin using Tool.



5. Install parking rod to parking rod plate.
6. Set parking rod assembly onto manual shaft.

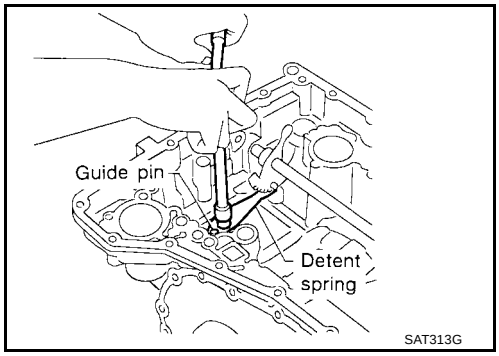


7. Drive in manual plate retaining pin and parking rod plate retaining pin using Tool.



8. Install detent spring.

: 6.4 - 7.5 N·m (0.65 - 0.76 kg-m, 56.4 - 66.0 in-lb)

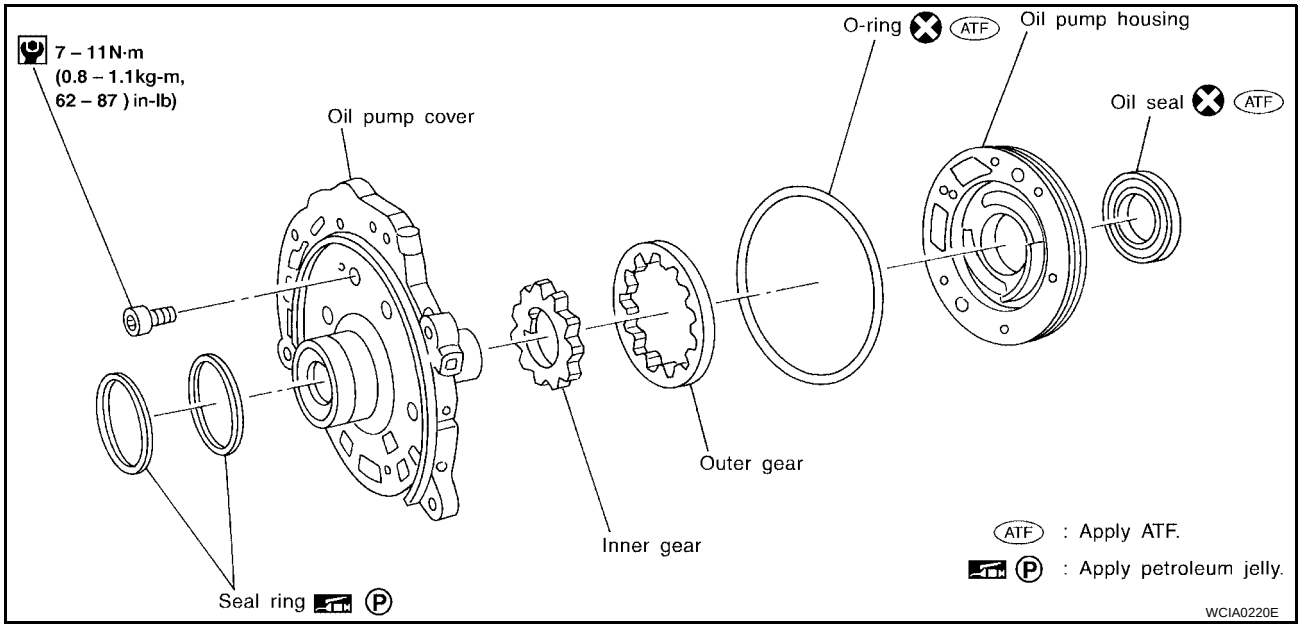


OIL PUMP

PFP:15010

Components

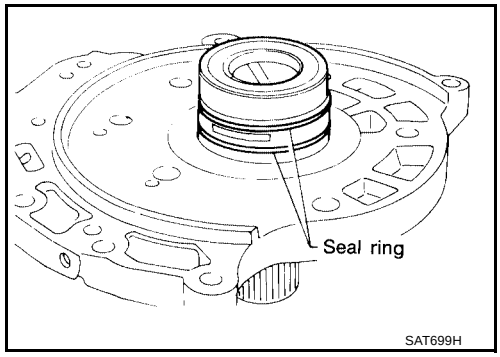
ECS005ZV



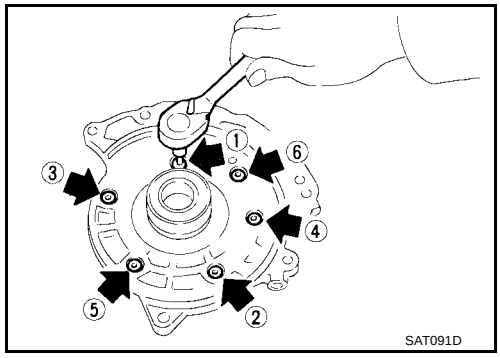
Disassembly

ECS005ZW

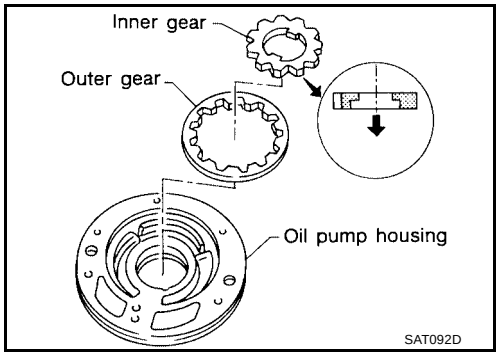
1. Remove seal rings.



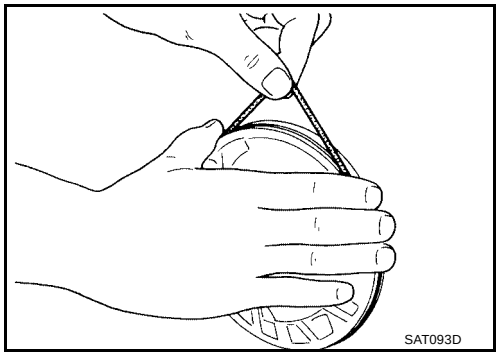
2. Loosen bolts in numerical order and remove oil pump cover.



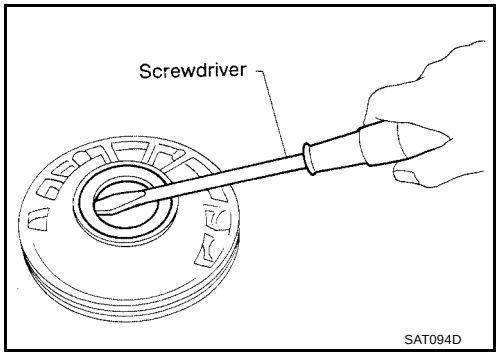
3. Remove inner and outer gear from oil pump housing.



4. Remove O-ring from oil pump housing.



5. Remove oil pump housing oil seal.



Inspection

ECS005ZX

OIL PUMP HOUSING, OIL PUMP COVER, INNER GEAR AND OUTER GEAR

- Check for wear or damage.

SIDE CLEARANCES

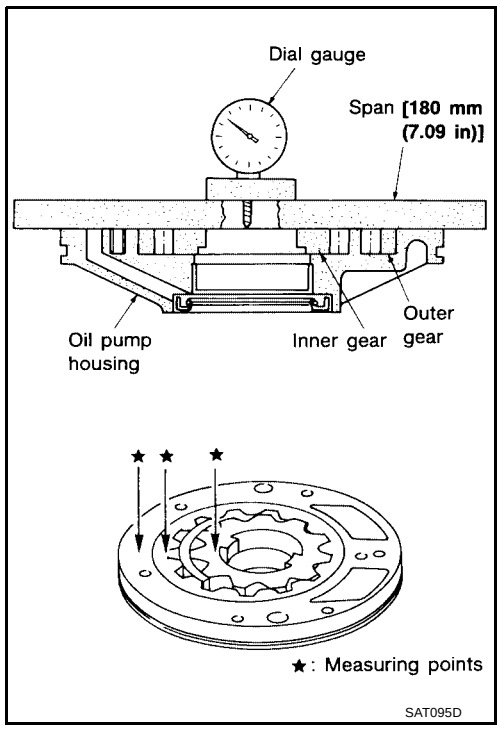
- Measure side clearance of inner and outer gears in at least four places around each outside edge. Maximum measured values should be within specified range.

  Standard clearance : 0.02 - 0.04 mm (0.0008 - 0.0016 in)

- If clearance is less than standard, select inner and outer gear as a set so that clearance is within specifications.

  Inner and outer gear : Refer to AT-295, "SIDE CLEARANCES" .

- If clearance is more than standard, replace whole oil pump assembly except oil pump cover.

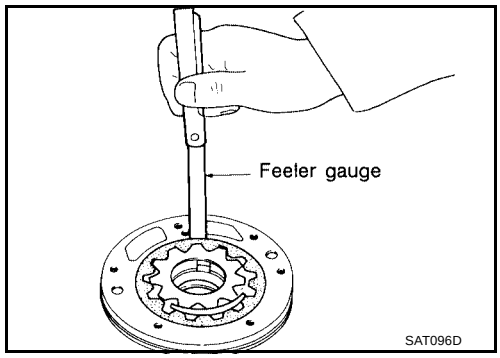


- Measure clearance between outer gear and oil pump housing.

  Standard clearance : 0.08 - 0.15 mm (0.0031 - 0.0059 in)

  Allowable limit : 0.15 mm (0.0059 in)

- If not within allowable limit, replace whole oil pump assembly except oil pump cover.



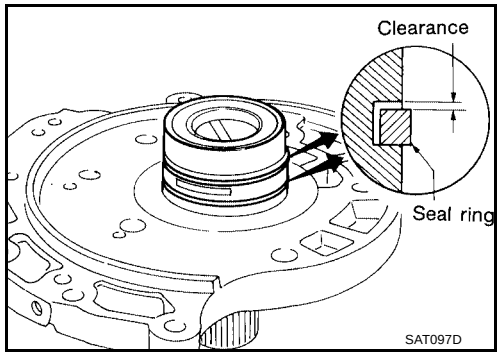
SIDE RING CLEARANCE

- Install new seal rings onto oil pump cover.
- Measure clearance between seal ring and ring groove.

  Standard clearance : 0.1 - 0.25 mm (0.0039 - 0.0098 in)

  Allowable limit : 0.25 mm (0.0098 in)

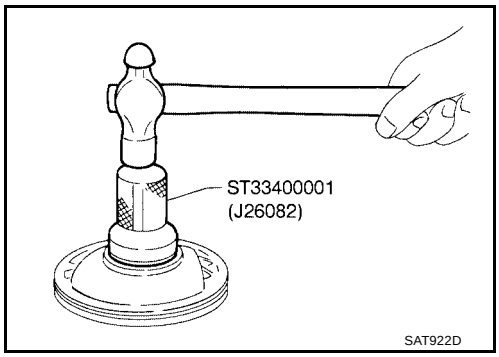
- If not within allowable limit, replace oil pump cover assembly.



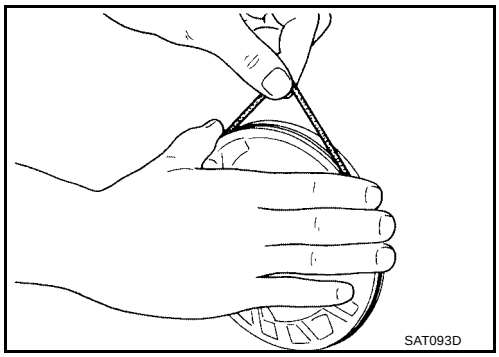
Assembly

ECS005ZY

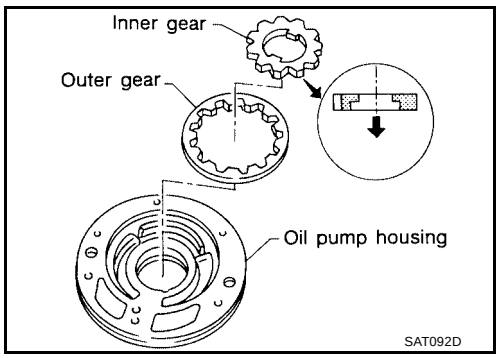
1. Install oil seal on oil pump housing using Tool.



2. Install O-ring on oil pump housing.
   - **Apply ATF to O-ring.**



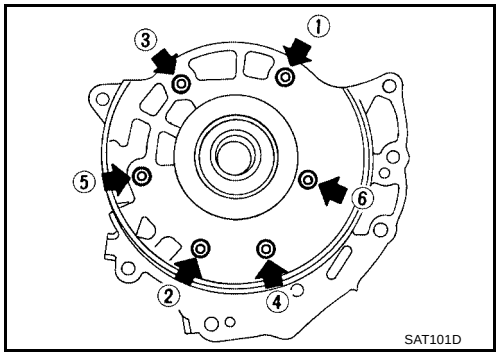
3. Install inner and outer gears on oil pump housing.
   - **Take care with the direction of the inner gear.**



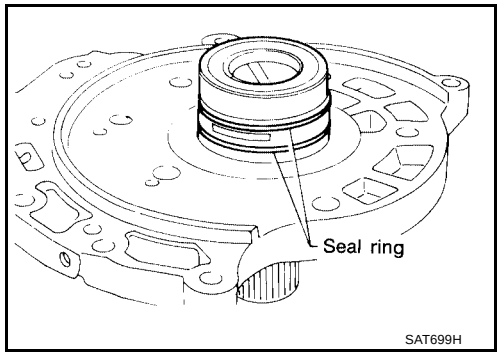
4. Install oil pump cover on oil pump housing.

a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.

b. Tighten bolts in numerical order.



5. Install new seal rings carefully after packing ring groove with petroleum jelly.
   - **Do not spread gap of seal ring excessively while installing. It may deform the ring.**

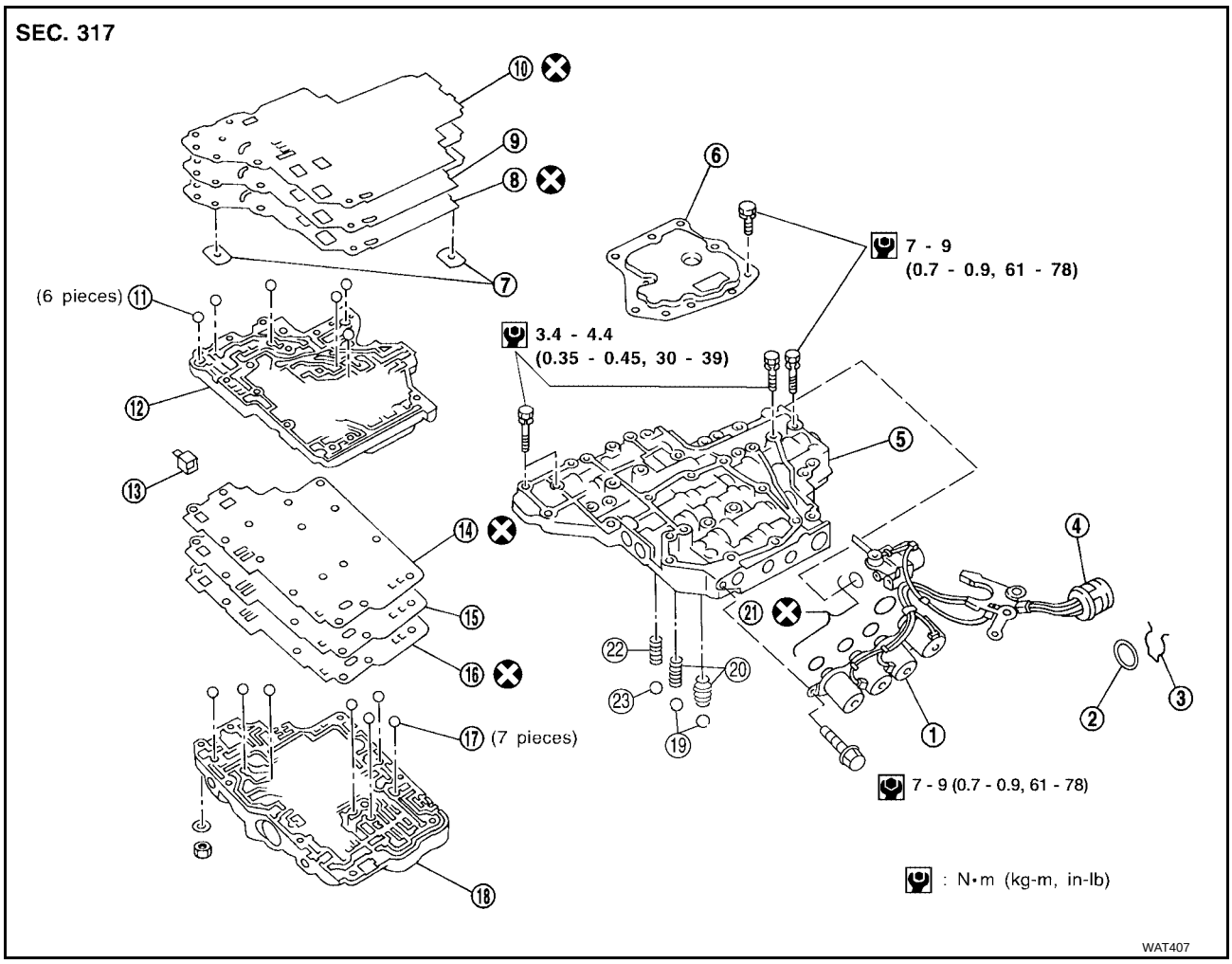


CONTROL VALVE ASSEMBLY

PFP:31705

Components

ECS005ZZ



1. Solenoid valve assembly
2. O-ring
3. Stopper ring
4. Terminal body
5. Control valve lower body
6. Oil strainer
7. Support plate
8. Lower inter separating gasket
9. Separating plate
10. Lower separating gasket
11. Steel ball
12. Control valve inter body
13. Pilot filter
14. Upper inter separating gasket
15. Separating plate
16. Upper separating gasket
17. Steel ball
18. Control valve upper body
19. Check ball
20. Oil cooler relief valve spring
21. O-ring
22. T/C pressure holding spring
23. Check ball

Disassembly

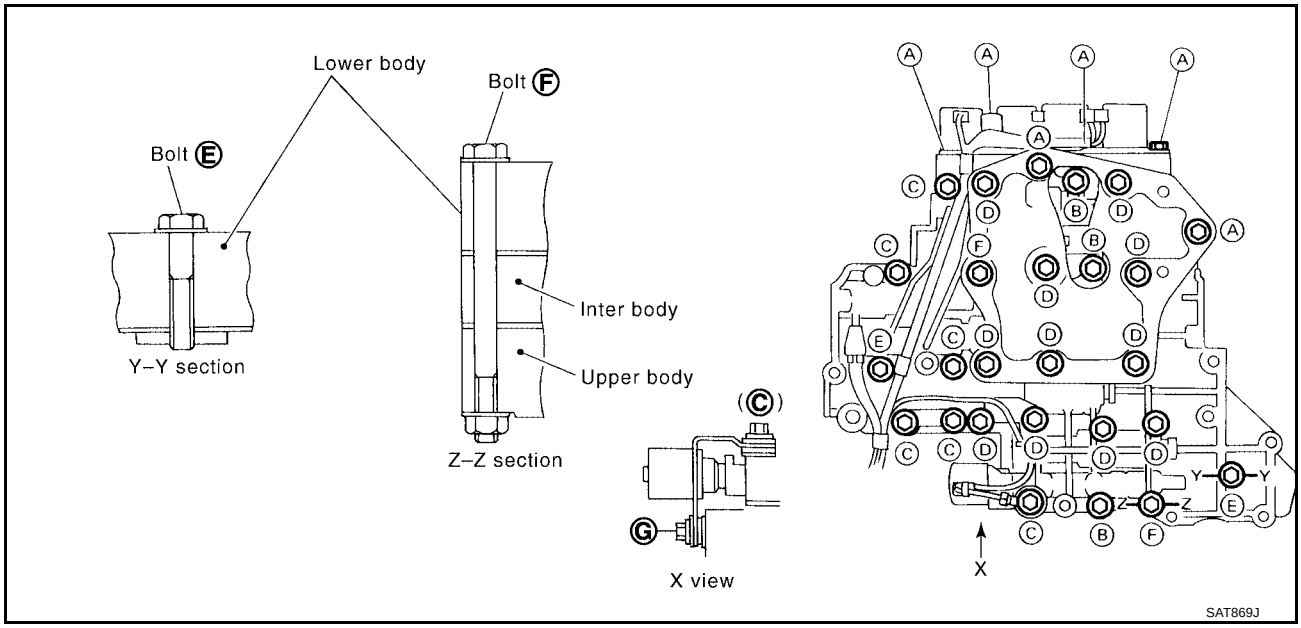
ECS00600

- Disassemble upper, inter and lower bodies.

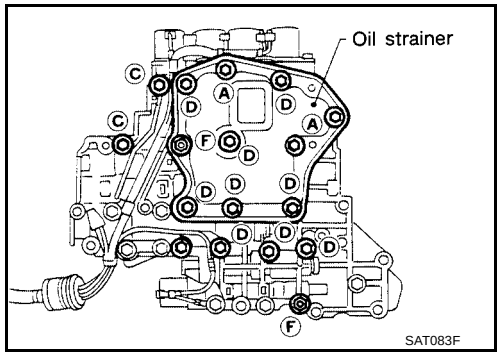
Bolt length, number and location:

Bolt symbol	A	B	C	D	E	F	G
Bolt length "l"	13.5 mm (0.531 in)	58.0 mm (2.283 in)	40.0 mm (1.575 in)	66.0 mm (2.598 in)	33.0 mm (1.299 in)	78.0 mm (3.071 in)	18.0 mm (0.709 in)
Number of bolts	6	3	6	11	2	2	1

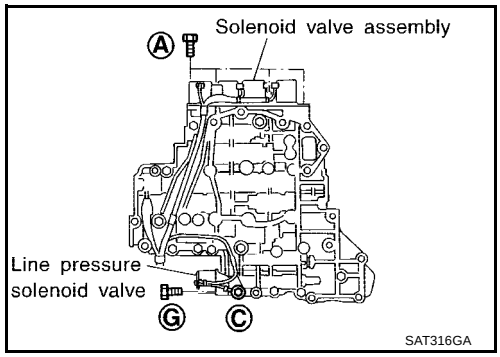
F: Reamer bolt with nut



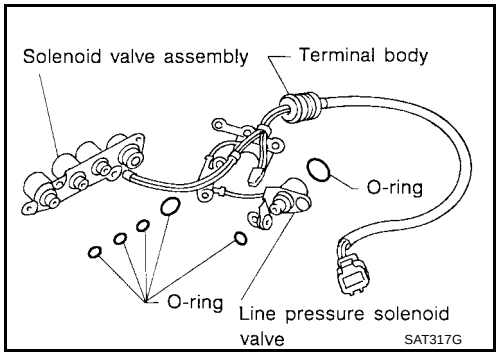
1. Remove bolts A, D and F, and remove oil strainer from control valve assembly.



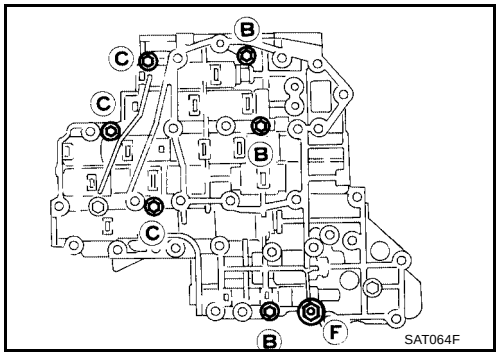
2. Remove solenoid valve assembly and line pressure solenoid valve from control valve assembly.
   - **Be careful not to lose the line pressure solenoid valve spring.**



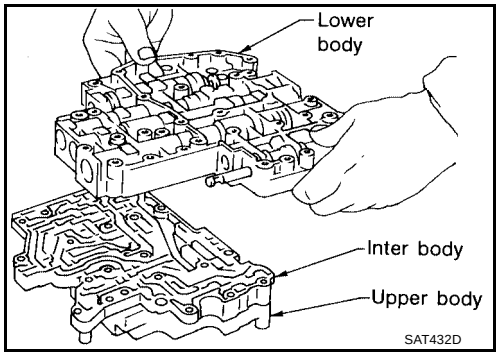
3. Remove O-rings from solenoid valves and terminal body.



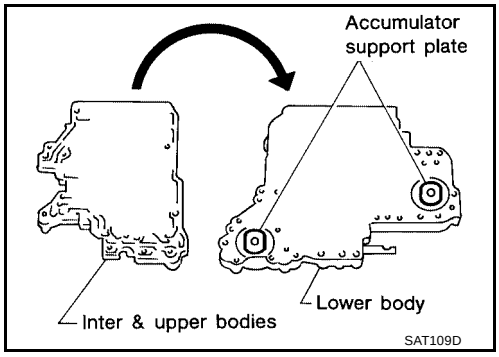
4. Place upper body face down, and remove bolts B, C and F.



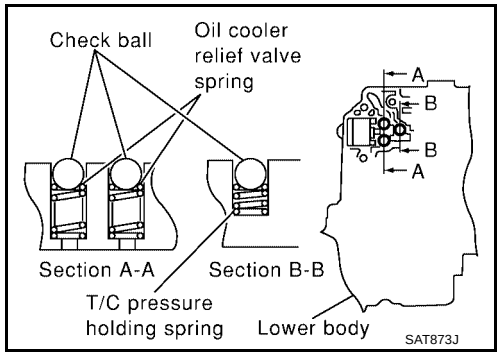
5. Remove lower body from inter body.



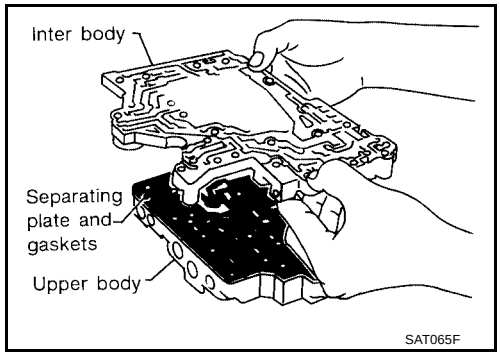
6. Turn over lower body, and accumulator support plates.



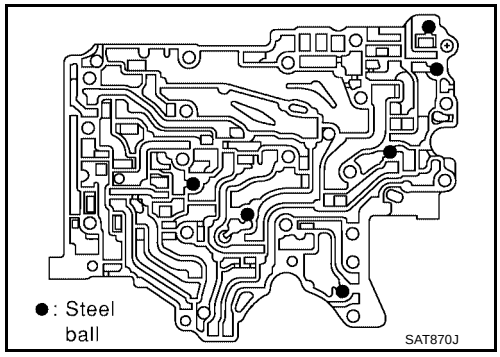
7. Remove bolts E, separating plate and separating gaskets from lower body.
8. Remove check balls, oil cooler relief valve springs and T/C pressure holding spring from lower body.
   - **Be careful not to lose steel balls and relief valve springs.**



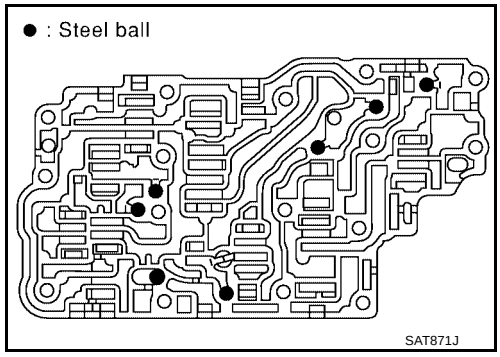
9. Remove inter body from upper body.
10. Remove pilot filter, separating plate and gaskets from upper body.



11. Check to see that steel balls are properly positioned in inter body and then remove them.
    - **Be careful not to lose steel balls.**



12. Check to see that steel balls are properly positioned in upper body and then remove them.
    - **Be careful not to lose steel balls.**

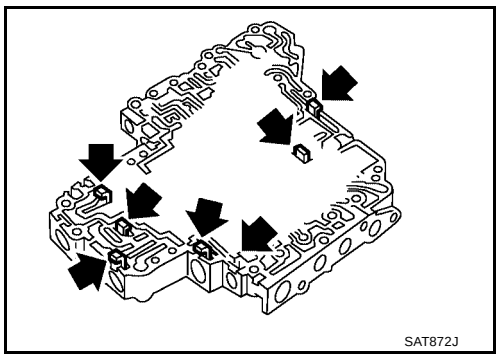


Inspection

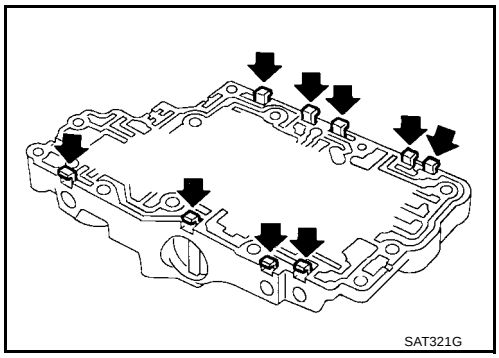
ECS00601

LOWER AND UPPER BODIES

- Check to see that retainer plates are properly positioned in lower body.

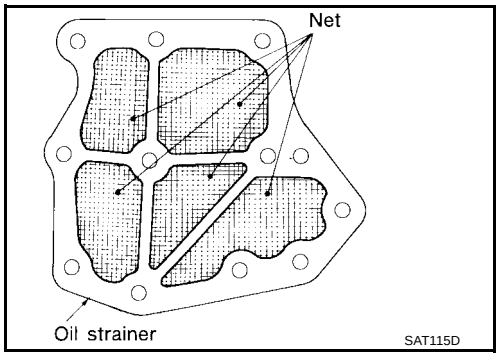


- Check to see that retainer plates are properly positioned in upper body.



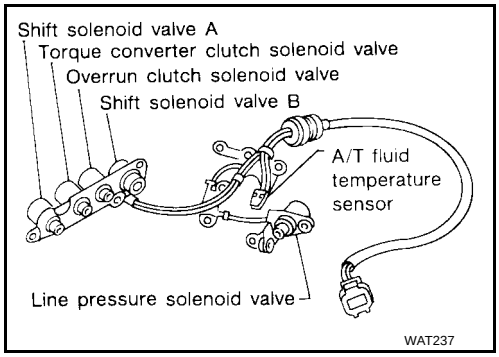
OIL STRAINER

- Check wire netting of oil strainer for damage.



SHIFT SOLENOID VALVES A AND B, LINE PRESSURE SOLENOID VALVE, TORQUE CONVERTER CLUTCH SOLENOID VALVE AND OVERRUN CLUTCH SOLENOID VALVE

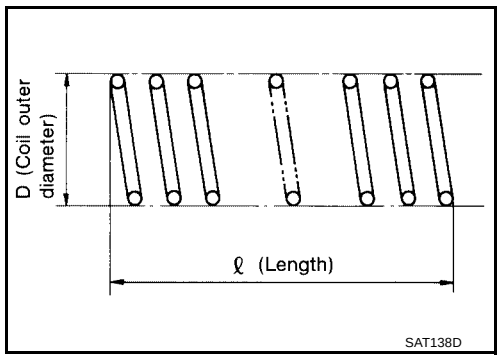
- Refer to AT-183, "SHIFT SOLENOID VALVE A" , AT-187, "SHIFT SOLENOID VALVE B" , AT-178, "LINE PRESSURE SOLENOID VALVE" , AT-178, "LINE PRESSURE SOLENOID VALVE" and AT-197, "OVERRUN CLUTCH SOLENOID VALVE" .



OIL COOLER RELIEF VALVE SPRING

- Check springs for damage or deformation.
- Measure free length and outer diameter.

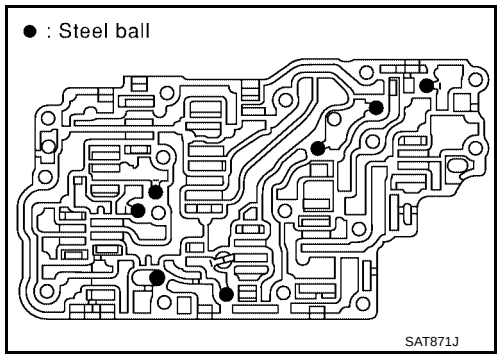
Inspection standard : Refer to AT-389, "Clutch and Brake Return Springs"



Assembly

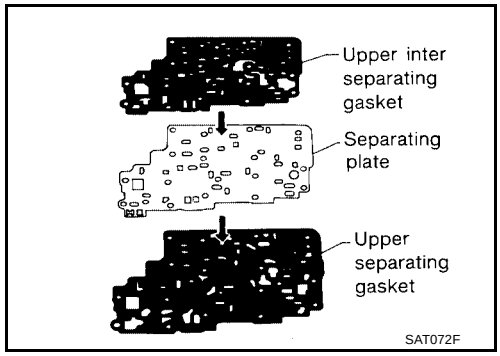
ECS00602

1. Install upper, inter and lower body.



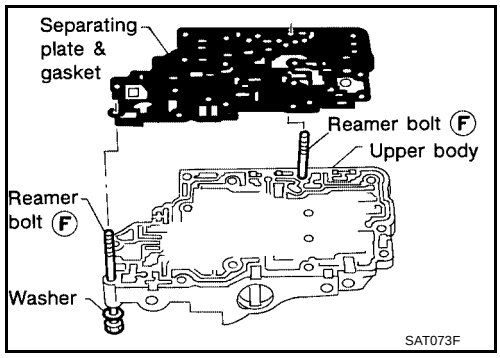
a. Place oil circuit of upper body face up. Install steel balls in their proper positions.

b. Install upper separating gasket, upper inter separating gasket and upper separating plate in order shown in illustration.

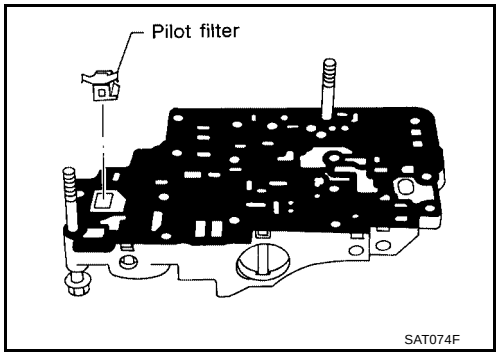


- **Always use new gaskets.**

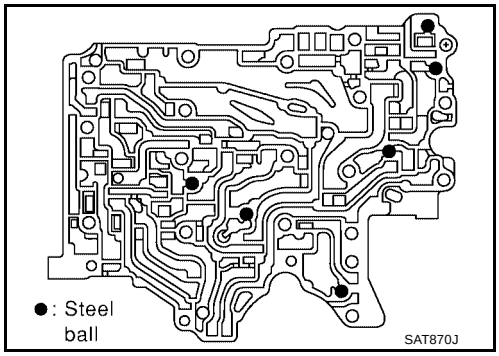
c. Install reamer bolts **F** from bottom of upper body. Using reamer bolts as guides, install separating plate and gaskets as a set.



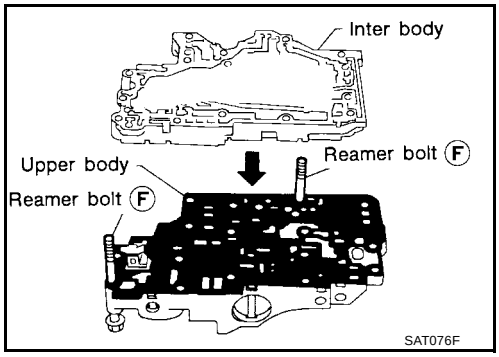
d. Install pilot filter.



e. Place inter body as shown in the illustration. Install steel balls in their proper positions.

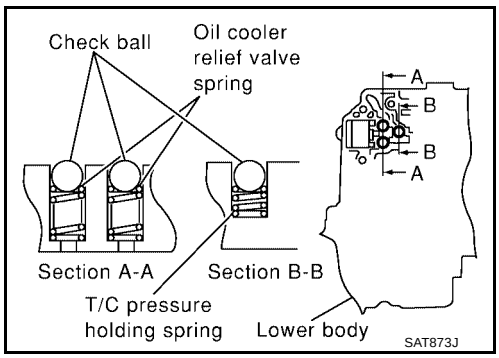


f. Install inter body on upper body using reamer bolts **F** as guides.

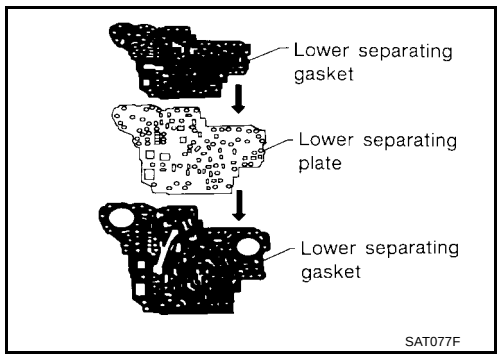


- **Be careful not to dislocate or drop steel balls.**

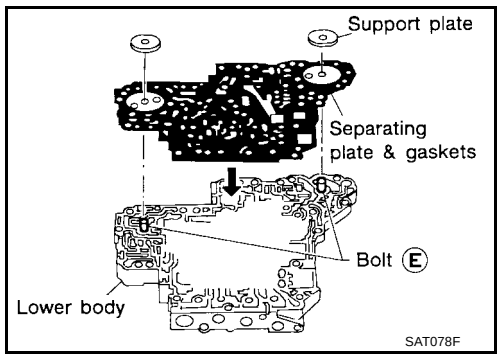
g. Install steel balls, oil cooler relief valve springs and T/C pressure holding spring in their proper positions in lower body.



h. Install lower separating gasket, inter separating gasket and lower separating plate in order shown in the illustration.

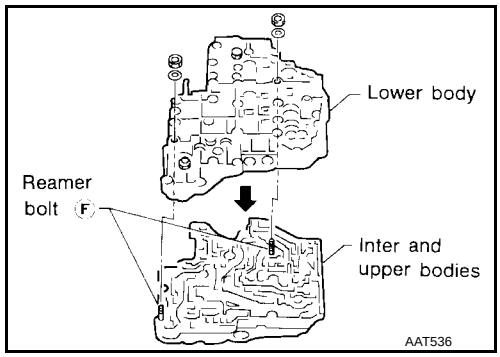


i. Install bolts **E** from bottom of lower body. Using bolts **E** as guides, install separating plate and gaskets as a set.

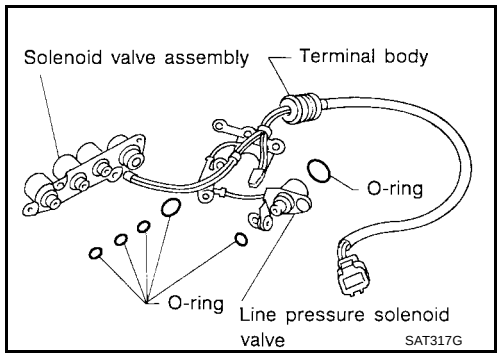


j. Install support plates on lower body.

k. Install lower body on inter body using reamer bolts **F** as guides and tighten reamer bolts **F** slightly.



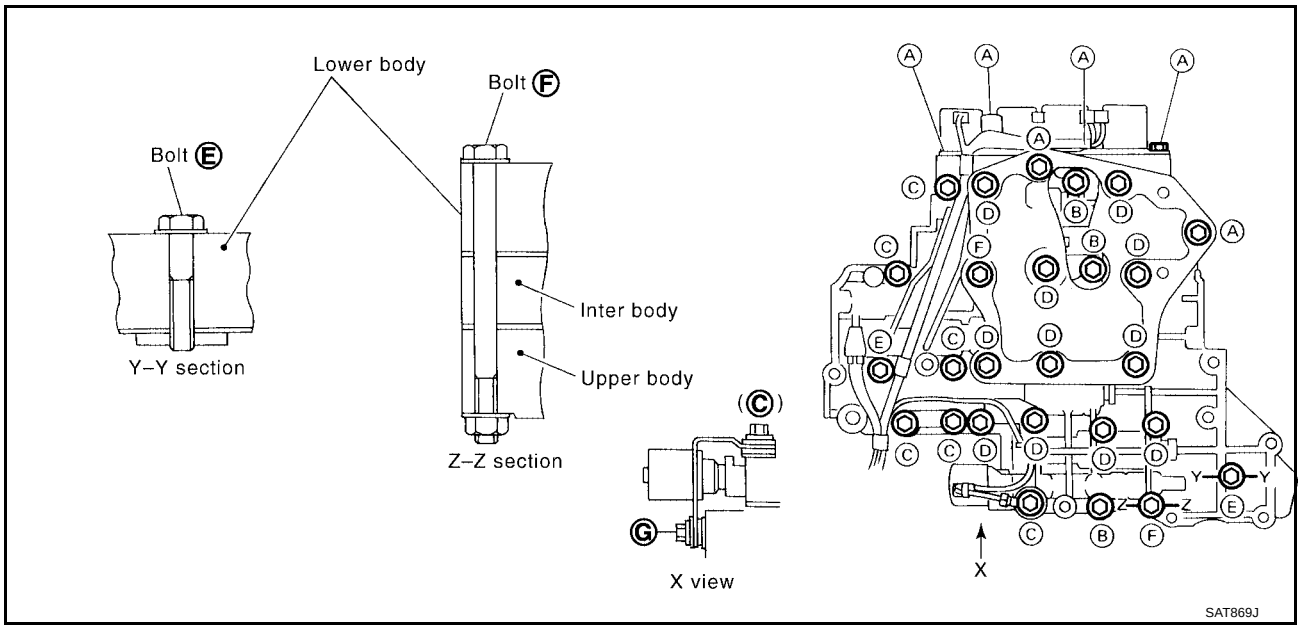
2. Install O-rings to solenoid valves and terminal body.
   - **Apply ATF to O-rings.**
3. Install and tighten bolts.



Bolt length, number and location:

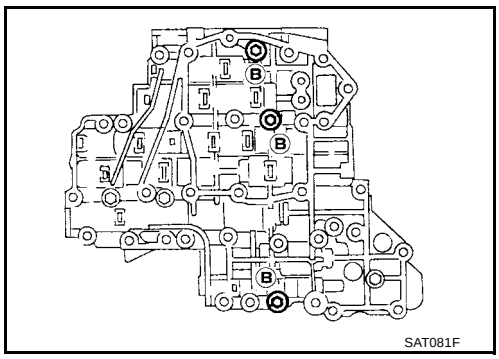
Bolt symbol	A	B	C	D	E	F	G
Bolt length "l"	13.5 mm (0.531 in)	58.0 mm (2.283 in)	44.0 mm (1.732 in)	66.0 mm (2.598 in)	33.0 mm (1.299 in)	78.0 mm (3.071 in)	18.0 mm (0.709 in)
Number of bolts	6	3	6	11	2	2	1

F: Reamer bolt with nut

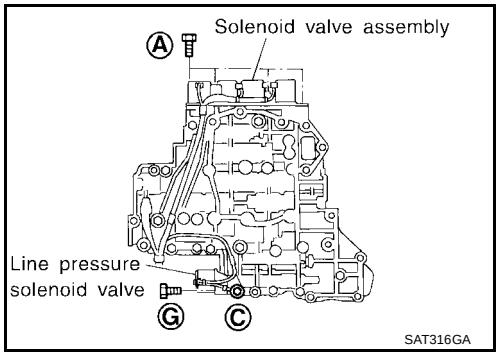


a. Install and tighten bolts **B** to specified torque.

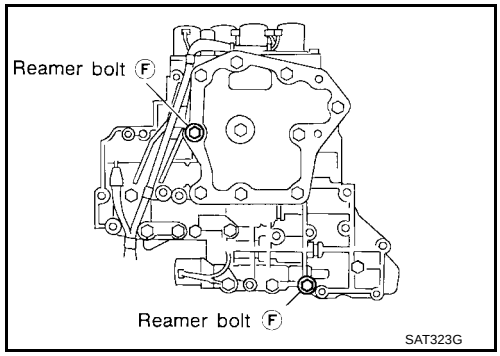
: 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)



b. Install solenoid valve assembly and line pressure solenoid valve to lower body.



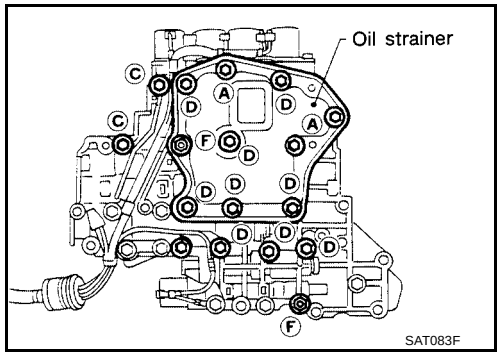
c. Remove reamer bolts **F** and set oil strainer on control valve assembly.



d. Reinstall reamer bolts **F** from lower body side.

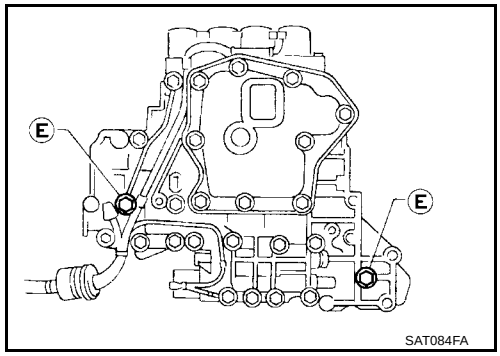
e. Tighten bolts **A** , **C** , **D** and **F** to specified torque.

: 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)



f. Tighten bolts **E** to specified torque.

: 3.4 - 4.4 N·m (0.35 - 0.45 kg-m, 30.4 - 39.1 in-lb)



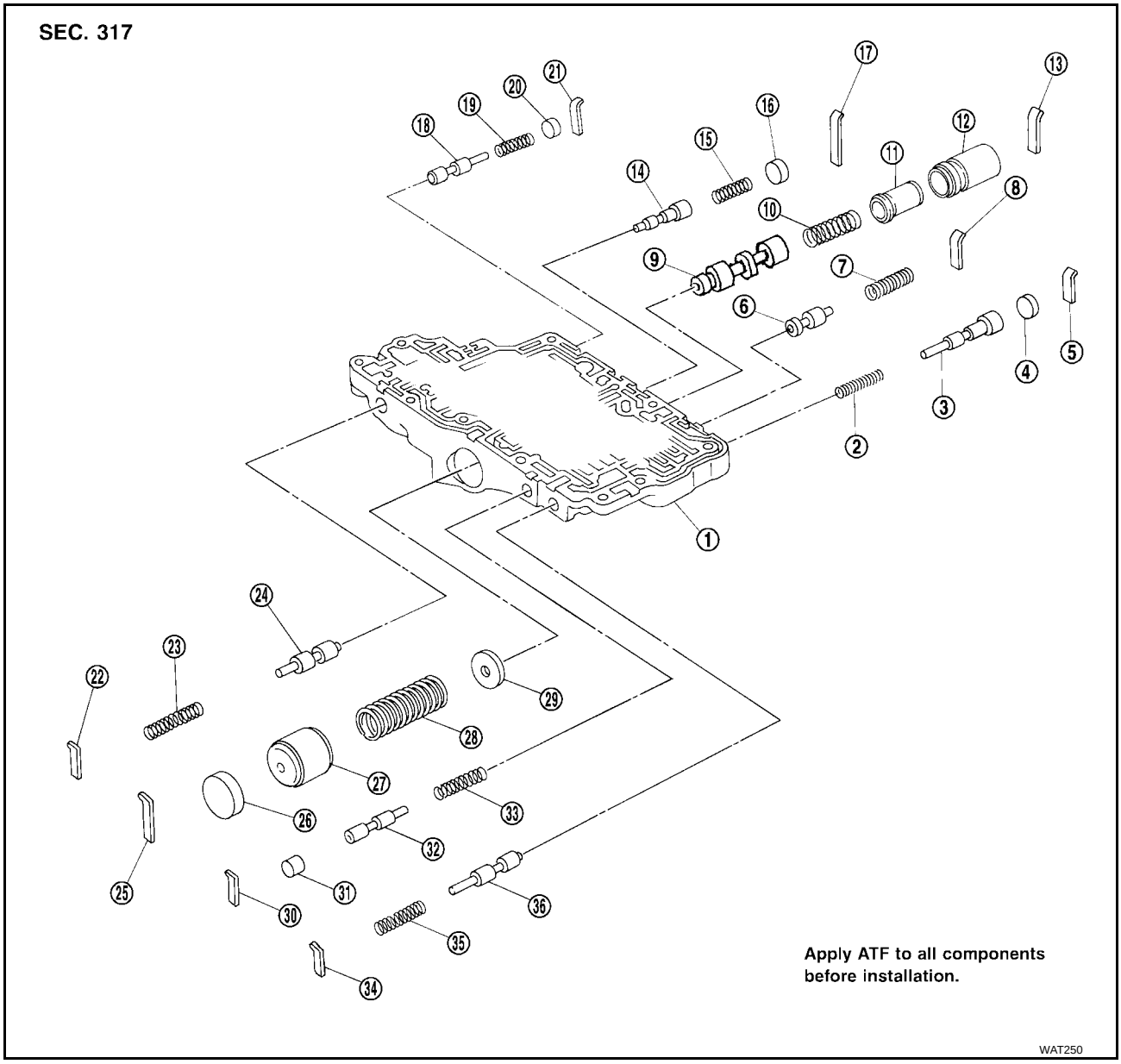
CONTROL VALVE UPPER BODY

PFP:31711

Components

ECS00603

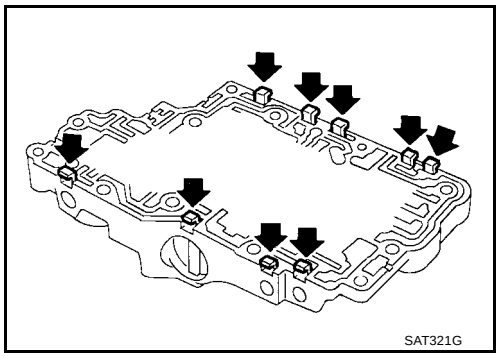
Numbers preceding valve springs correspond with those shown in AT-387, "CONTROL VALVE AND PLUG RETURN SPRINGS" .



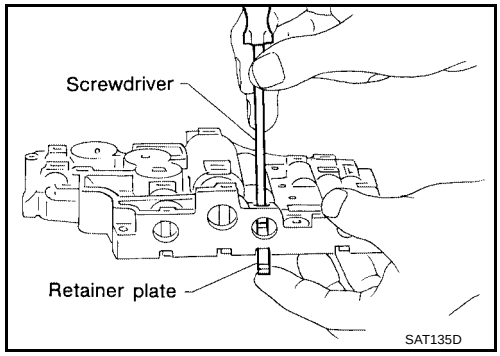
Disassembly

ECS00604

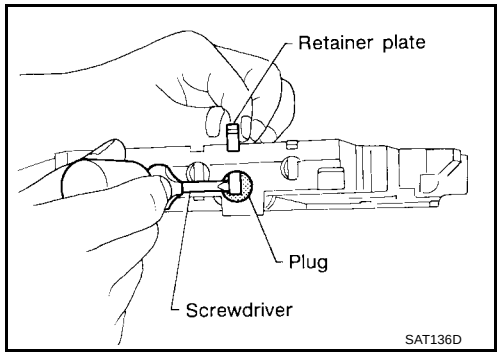
1. Remove valves at retainer plates.
   - **Do not use a magnetic “hand”.**



a. Use a screwdriver to remove retainer plates.

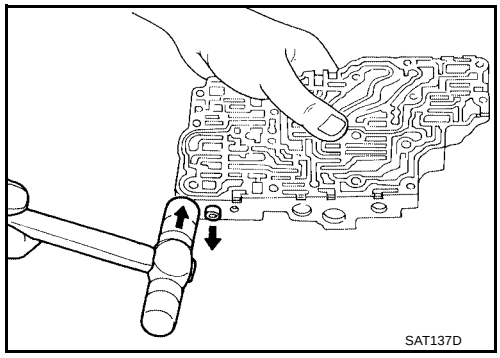


b. Remove retainer plates while holding spring, plugs or sleeves.



- **Remove plugs slowly to prevent internal parts from jumping out.**

c. Place mating surface of valve body face down, and remove internal parts.
- **If a valve is hard to remove, place valve body face down and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**



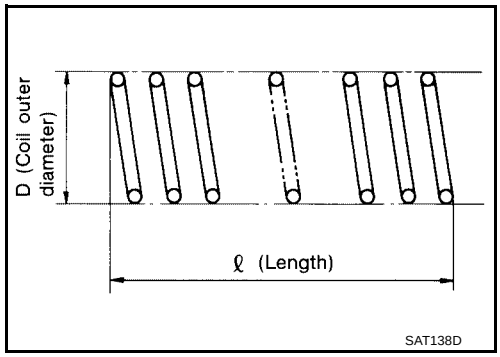
Inspection

ECS00605

VALVE SPRING

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.

Inspection standard **: Refer to AT-387, "CONTROL VALVE AND PLUG RETURN SPRINGS" .**



- Replace valve springs if deformed or fatigued.

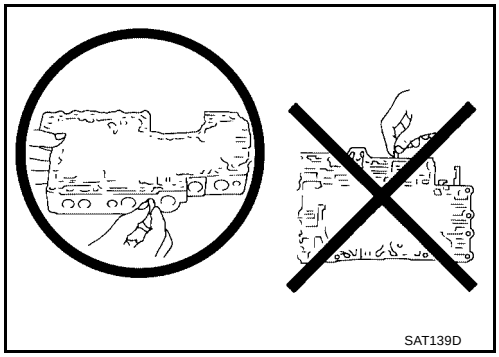
CONTROL VALVES

- Check sliding surfaces of valves, sleeves and plugs.

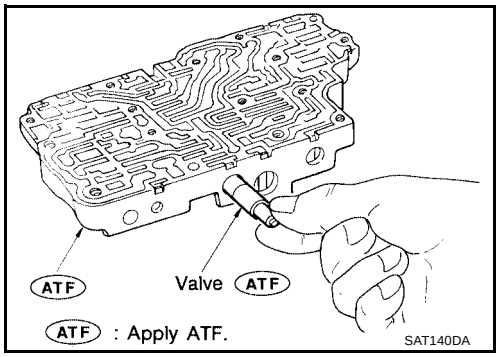
Assembly

ECS00606

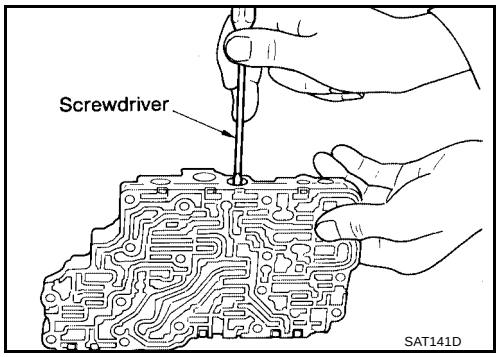
- **Lay control valve body down when installing valves. Do not stand the control valve body upright.**



1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.

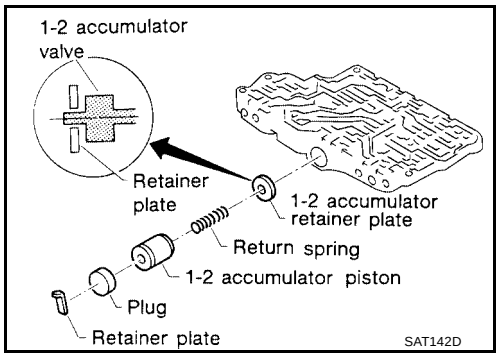


- **Be careful not to scratch or damage valve body.**
- Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.

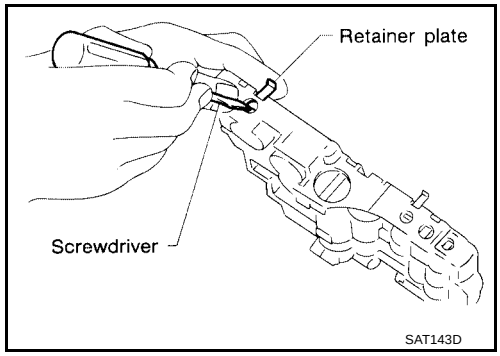


1-2 ACCUMULATOR VALVE

- Install 1-2 accumulator valve. Align 1-2 accumulator retainer plate from opposite side of control valve body.
- Install return spring, 1-2 accumulator piston and plug.



1. Install retainer plates.
   - Install retainer plate while pushing plug or return spring.

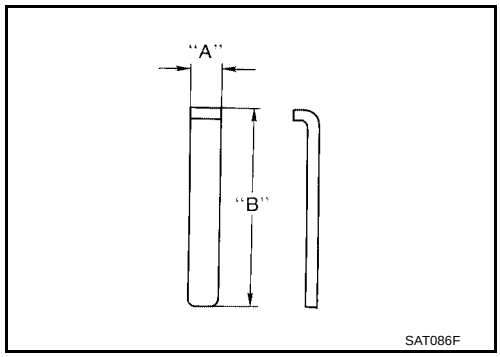


RETAINER PLATE (FOR CONTROL VALVE UPPER BODY)

Refer to AT-308, "CONTROL VALVE UPPER BODY" .

Unit: mm (in)

Name of valve and piston	No.	Width A	Length B
Pilot valve	22	6.0 (0.236)	21.5 (0.846)
1-2 accumulator valve	17		40.5 (1.594)
1-2 accumulator piston	25		
1st reducing valve	30		21.5 (0.846)
Overrun clutch reducing valve	5		24.0 (0.945)
Torque converter relief valve	8		21.5 (0.846)
Torque converter clutch control valve	13		28.0 (1.102)
3-2 timing valve	34		21.5 (0.846)
Cooler check valve	21		24.0 (0.945)



- Install proper retainer plates.

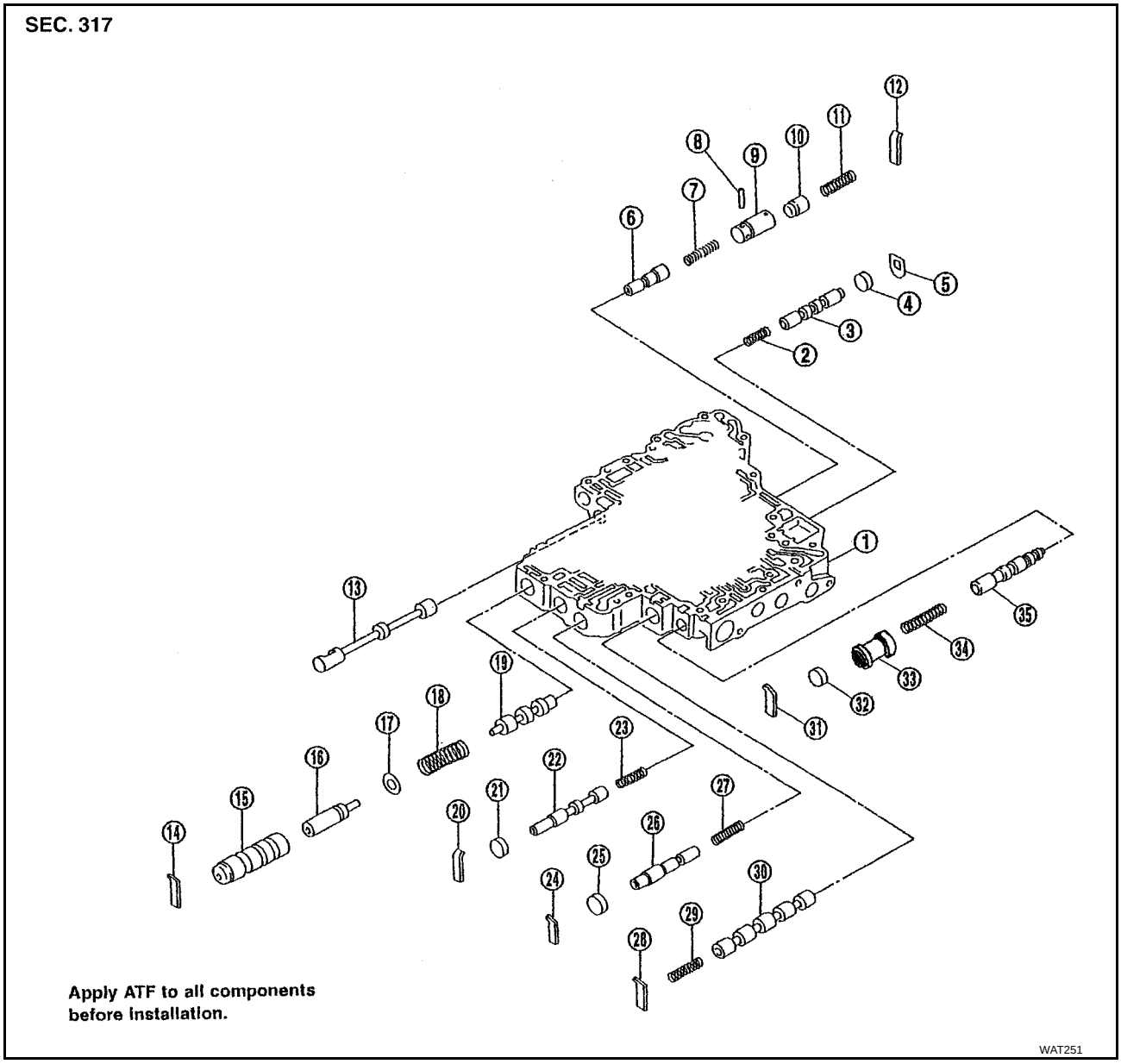
CONTROL VALVE LOWER BODY

PFP:31713

Components

ECS00607

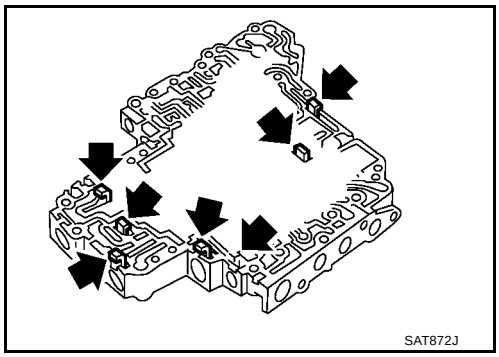
Numbers preceding valve springs correspond with those shown in AT-387, "CONTROL VALVE AND PLUG RETURN SPRINGS" .



Disassembly

ECS00608

Remove valves at retainer plate.
For removal procedures, refer to AT-312, "Disassembly" .



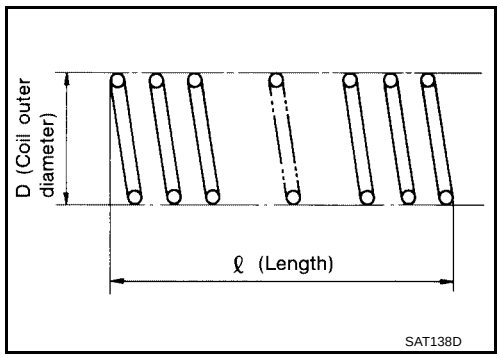
Inspection

ECS00609

VALVE SPRINGS

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.

Inspection standard **: Refer to AT-387, "CONTROL VALVE AND PLUG RETURN SPRINGS" .**



- Replace valve springs if deformed or fatigued.

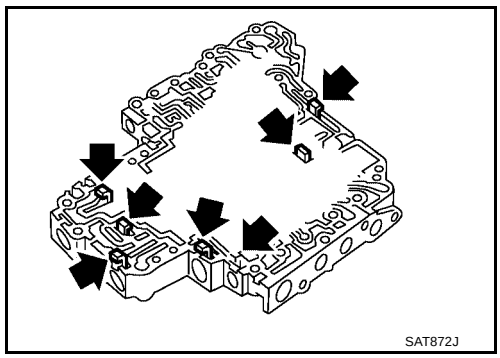
CONTROL VALVES

- Check sliding surfaces of control valves, sleeves and plugs for damage.

Assembly

ECS0060A

- Install control valves.
  For installation procedures, refer to AT-313, "Assembly" .

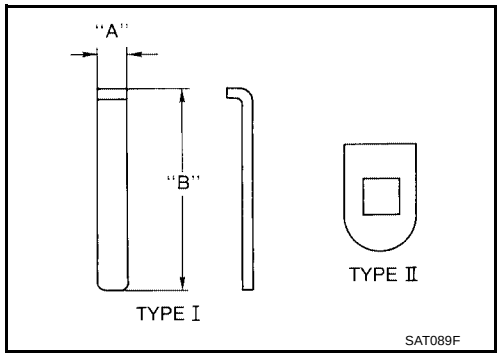


RETAINER PLATE (FOR CONTROL VALVE LOWER BODY)

Refer to AT-312, "CONTROL VALVE LOWER BODY" .

Unit: mm (in)

Name of control valve	No.	Width A	Length B	Type
Pressure regulator valve	14	6.0 (0.236)	28.0 (1.102)	I
Accumulator control valve	24			
Shift valve A	28			
Overrun clutch control valve	20			
Pressure modifier valve	12			
Shuttle control valve	31			
Shift valve B	5	—	—	II



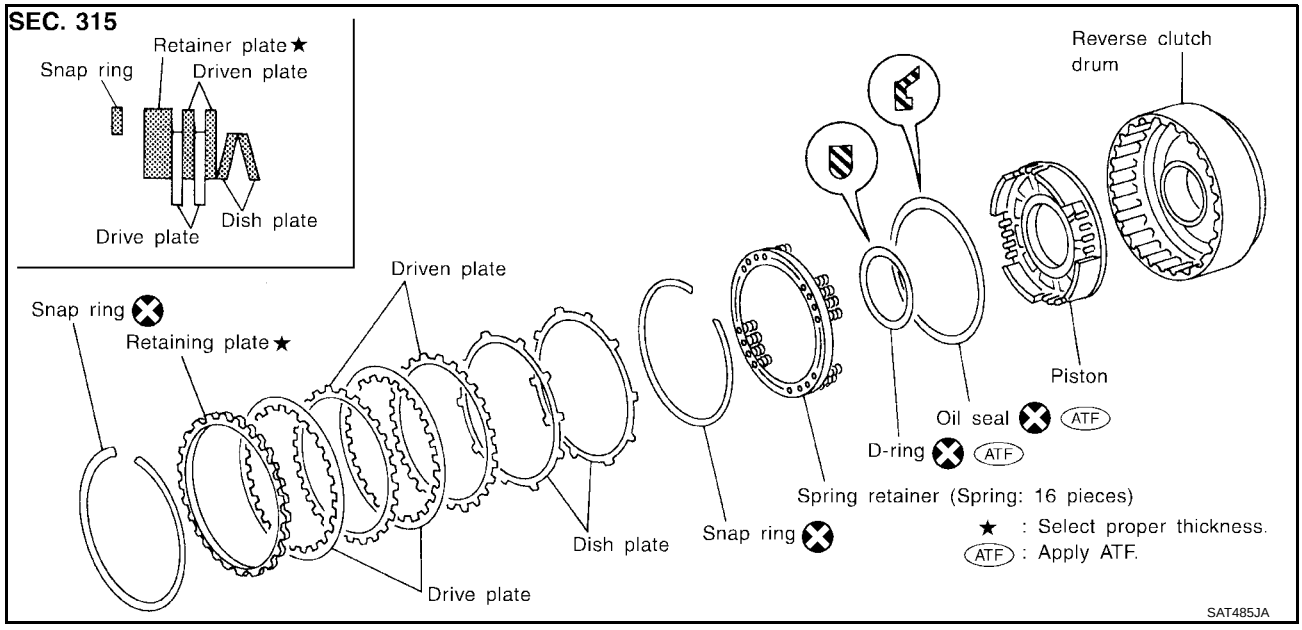
- Install proper retainer plates.

REVERSE CLUTCH

PFP:31510

Components

ECS0060B



Disassembly

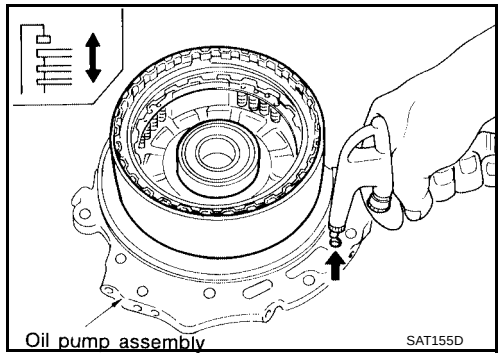
ECS0060C

1. Check operation of reverse clutch.

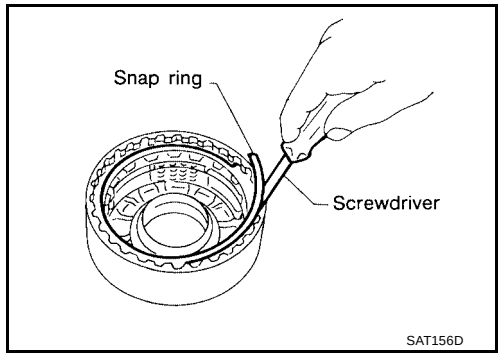
a. Install seal ring onto drum support of oil pump cover and install reverse clutch assembly. Apply compressed air to oil hole.

b. Check to see that retaining plate moves to snap ring.

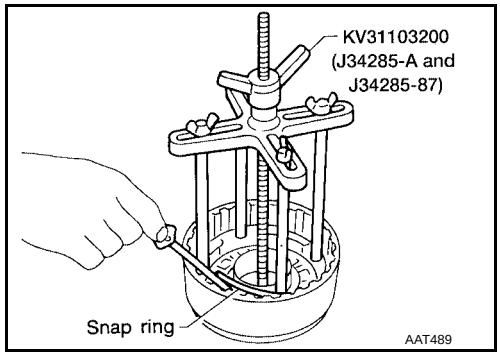
c. If retaining plate does not contact snap ring:
   - D-ring might be damaged.
   - Oil seal might be damaged.
   - Fluid might be leaking past piston check ball.



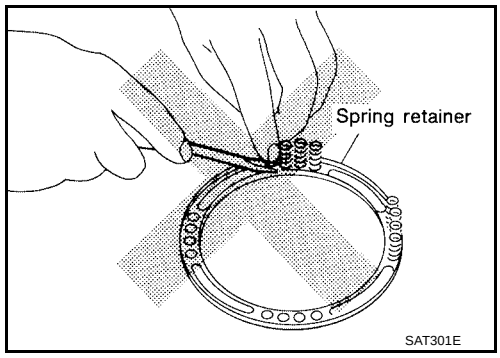
2. Remove snap ring.
   - **Do not expand snap ring excessively.**
3. Remove drive plates, driven plates, retaining plate, and dish plates.



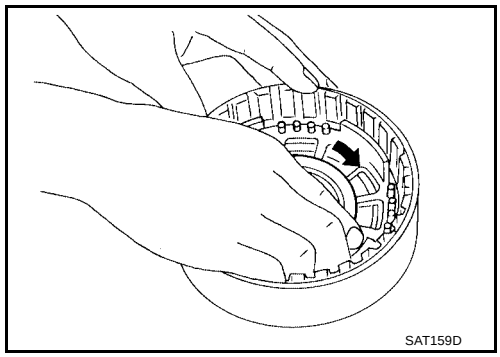
4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
   - **Set Tool directly above springs.**
   - **Do not expand snap ring excessively.**



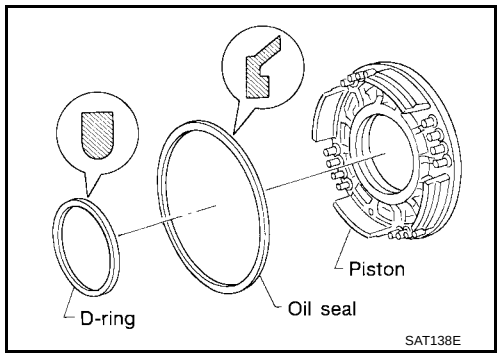
5. Remove spring retainer and return springs.
   - **Do not remove return springs from spring retainer.**



6. Remove piston from reverse clutch drum by turning it.



7. Remove D-ring and oil seal from piston.



Inspection

ECS0060D

REVERSE CLUTCH SNAP RING, SPRING RETAINER AND RETURN SPRINGS

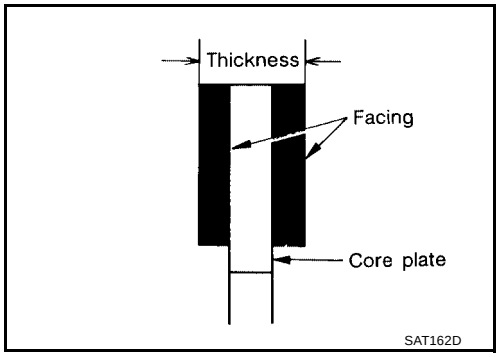
- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**

REVERSE CLUTCH DRIVE PLATES

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate
Standard value : 2.0 mm (0.079 in)
Wear limit : 1.8 mm (0.071 in)

- If not within wear limit, replace.

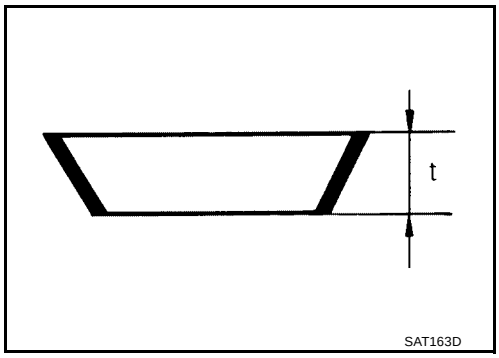


REVERSE CLUTCH DISH PLATES

- Check for deformation or damage.
- Measure thickness of dish plate.

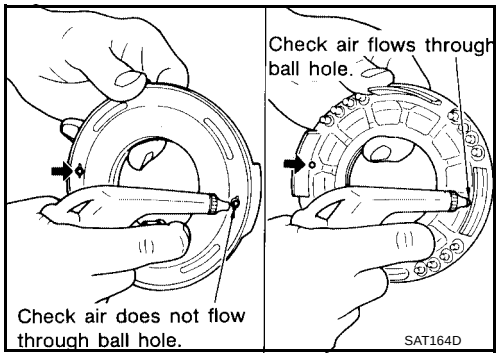
Thickness of dish plate "t" : 2.8 mm (0.110 in)

- If deformed or fatigued, replace.



REVERSE CLUTCH PISTON

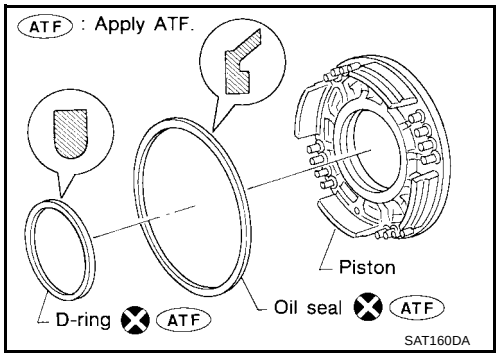
- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure that there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure air leaks past ball.



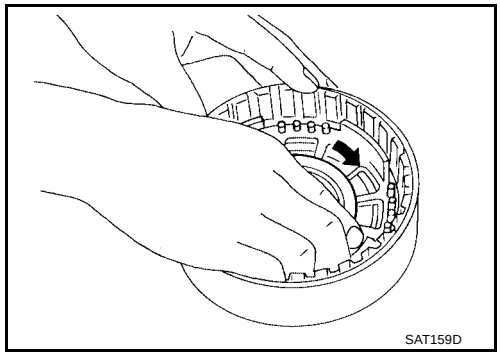
Assembly

ECS0060E

1. Install D-ring and oil seal on piston.
   - **Take care with the direction of the oil seal.**
   - **Apply ATF to both parts.**

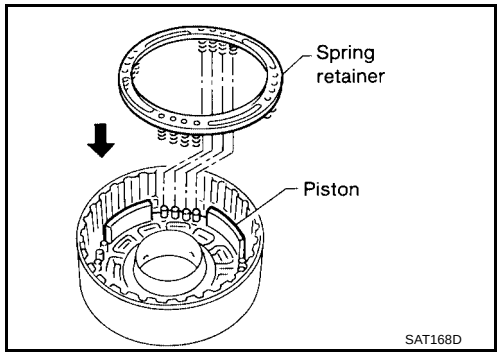


2. Install piston assembly by turning it slowly.
   - **Apply ATF to inner surface of drum.**

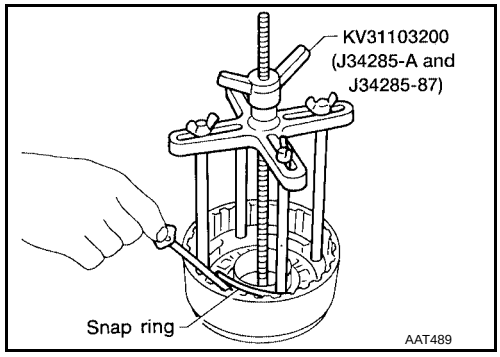


3. Install return springs and spring retainer on piston.

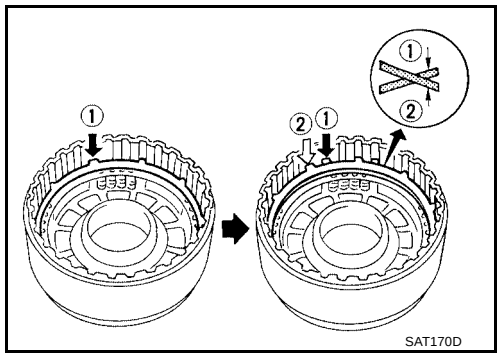
Return spring **: Refer to AT-389, "Clutch and Brake Return Springs" .**



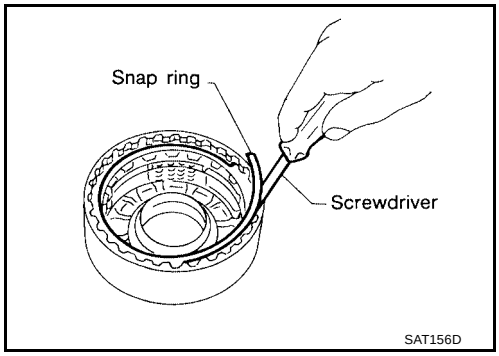
4. Set Tool on spring retainer and install snap ring while compressing return springs.
   - **Set Tool directly above return springs.**



5. Install drive plates, driven plates, retaining plate and dish plates.
   - **Do not align the projections of any two dish plates.**
   - **Take care with the order and direction of plates.**



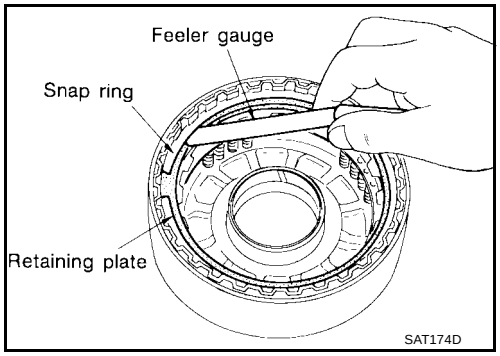
6. Install snap ring.
   - **Do not expand snap ring excessively.**



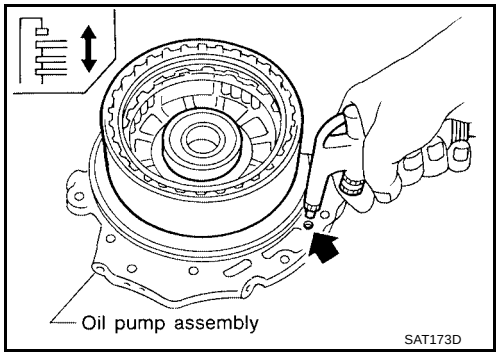
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance

Standard	**: 0.5 - 0.8 mm (0.020 - 0.031 in)**
Allowable limit	**: 1.2 mm (0.047 in)**
Retaining plate	**: Refer to AT-387, "REVERSE CLUTCH"**



8. Check operation of reverse clutch.
   Refer to AT-314, "Components" .

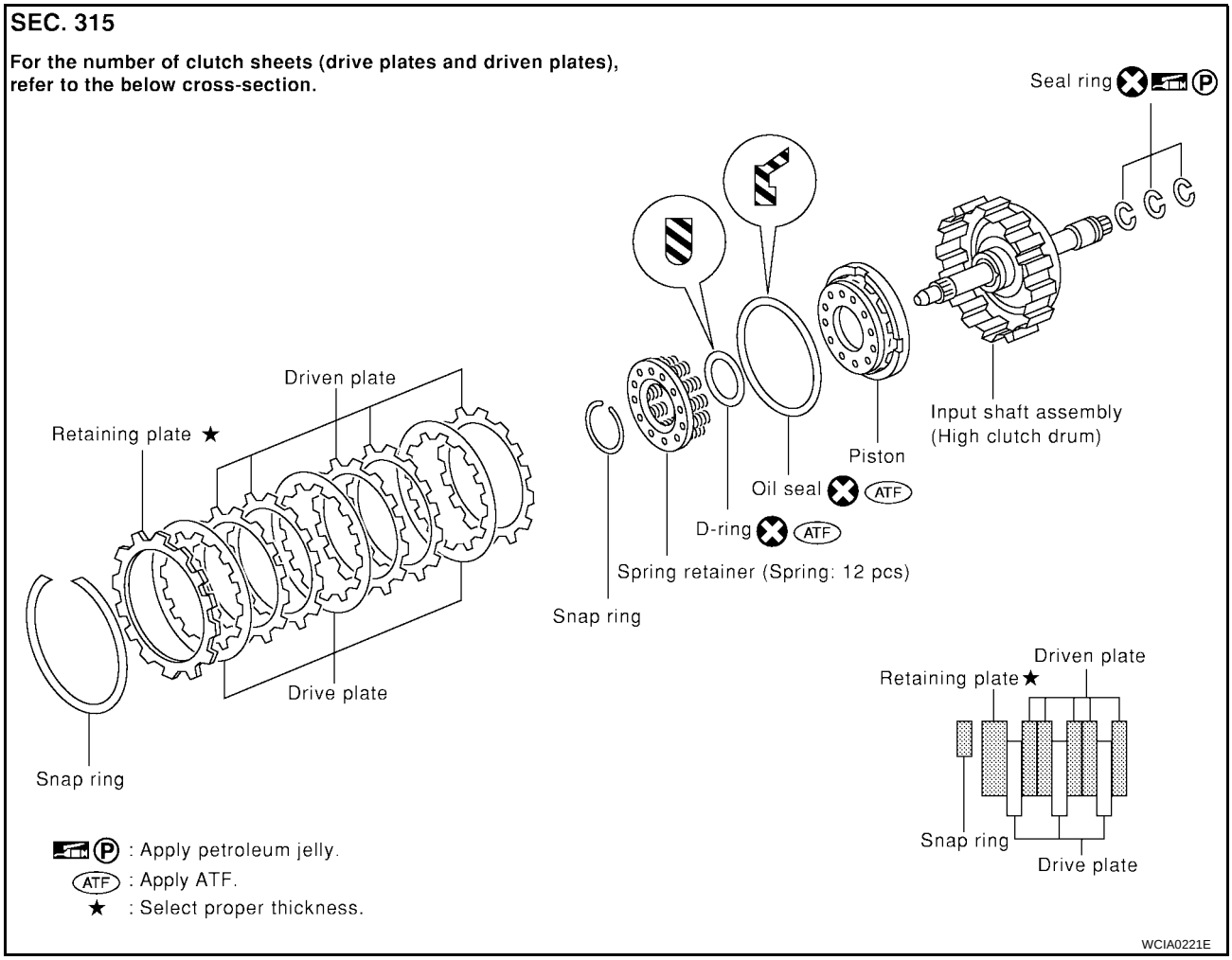


HIGH CLUTCH

PFP:31410

Components

ECS0060F



Disassembly

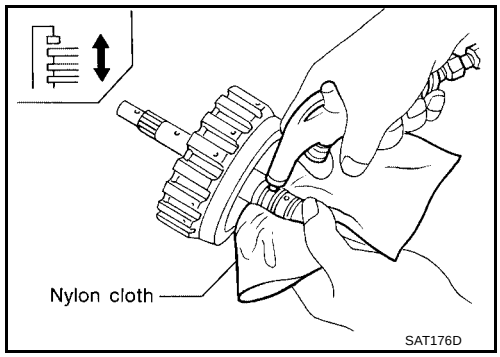
ECS0060G

1. Check operation of high clutch.

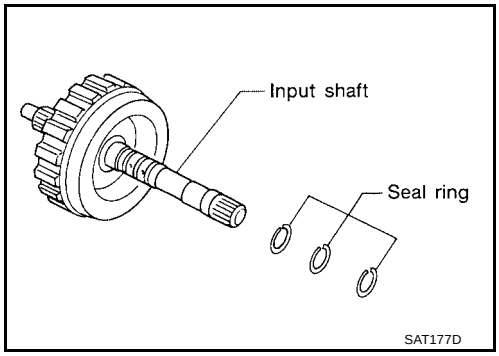
a. Apply compressed air to oil hole of input shaft.
   - **Stop up a hole on opposite side of input shaft.**

b. Check to see that retaining plate moves to snap ring.

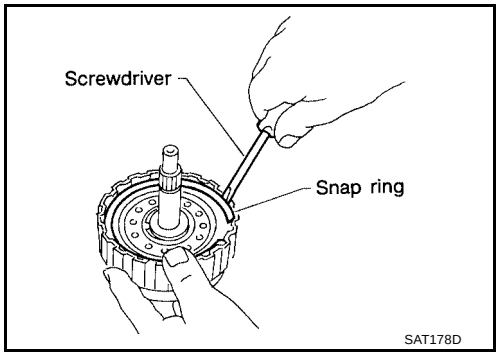
c. If retaining plate does not contact snap ring:
   - D-ring might be damaged.
   - Oil seal might be damaged.
   - Fluid might be leaking past piston check ball.



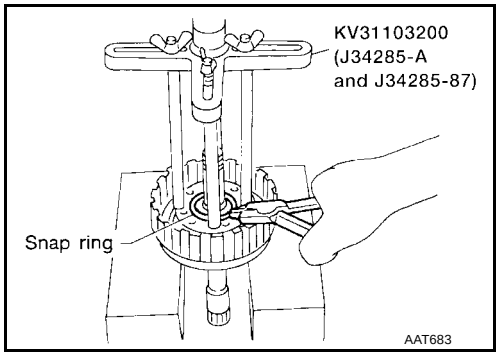
2. Remove seal rings from input shaft.

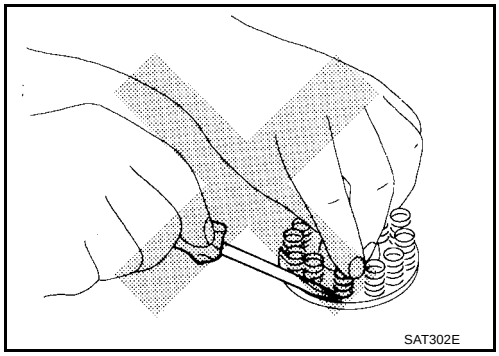


3. Remove snap ring.
   - **Do not expand snap ring excessively.**
4. Remove drive plates, driven plates and retaining plate.

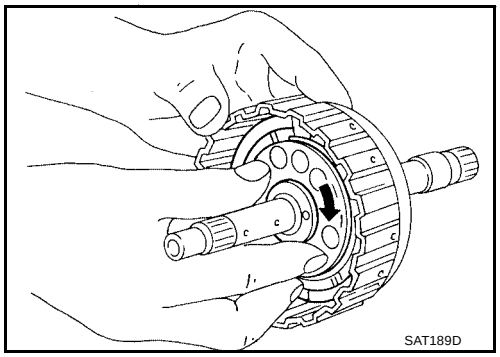


5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
   - **Set Tool directly above springs.**
   - **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.
   - **Do not remove return spring from spring retainer.**

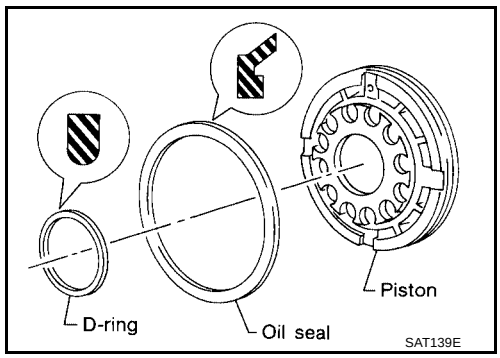




7. Remove piston from high clutch drum by turning it.



8. Remove D-ring and oil seal from piston.



Inspection

ECS0060H

REVERSE CLUTCH SNAP RING, SPRING RETAINER AND RETURN SPRINGS

- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**

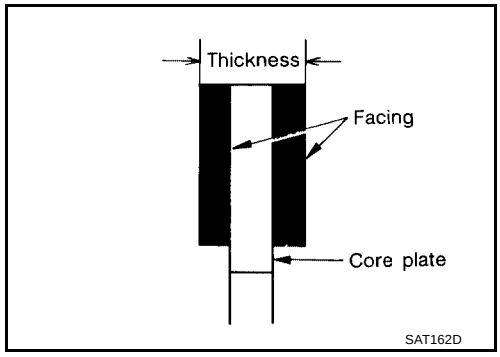
HIGH CLUTCH DRIVE PLATES

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate

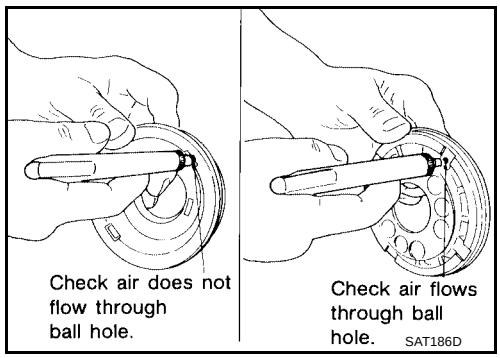
Standard value	**: 2.0 mm (0.079 in)**
Wear limit	**: 1.8 mm (0.071 in)**

- If not within wear limit, replace.



HIGH CLUTCH PISTON

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure air leaks past ball.

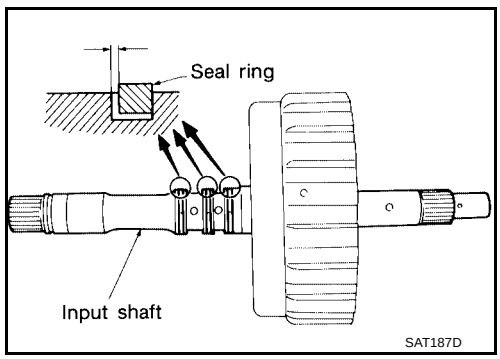


SEAL RING CLEARANCE

- Install new seal rings onto input shaft.
- Measure clearance between seal ring and ring groove.

Standard clearance	**: 0.08 - 0.23 mm (0.0031 - 0.0091 in)**
Allowable limit	**: 0.23 mm (0.0091 in)**

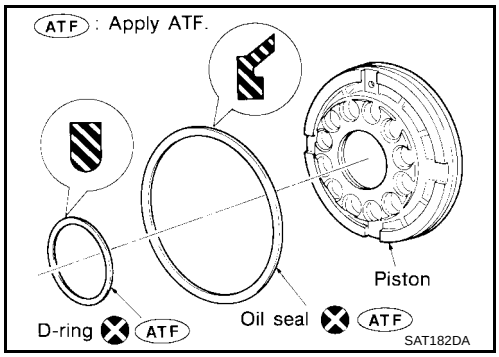
- If not within wear limit, replace input shaft assembly.



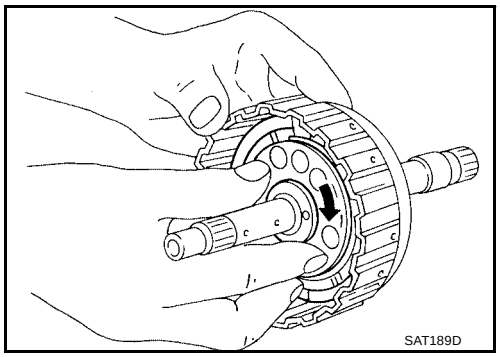
Assembly

ECS0060I

1. Install D-ring and oil seal on piston.
   - **Take care with the direction of the oil seal.**
   - **Apply ATF to both parts.**

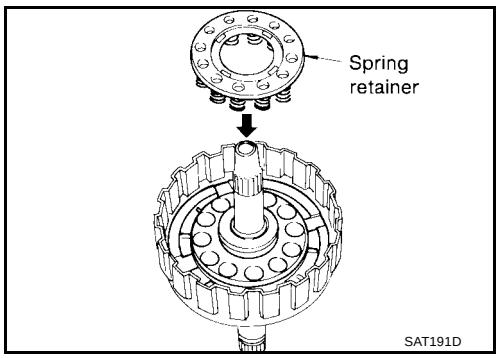


2. Install piston assembly by turning it slowly.
   - **Apply ATF to inner surface of drum.**

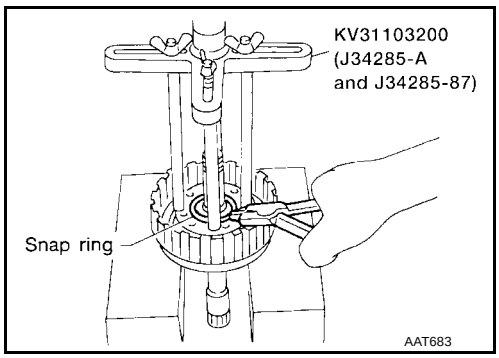


3. Install return springs and spring retainer on piston.

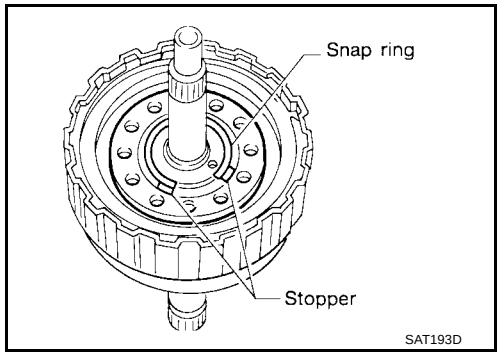
   Return spring **: Refer to AT-389, "Clutch and Brake Return Springs" .**



4. Set Tool on spring retainer and install snap ring while compressing return springs.
   - **Set Tool directly above return springs.**
   - **Do not expand snap ring excessively.**



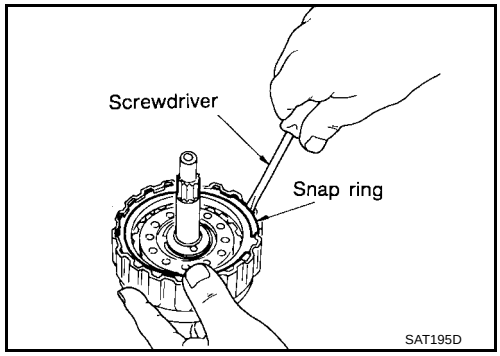
- **Do not align snap ring gap with spring retainer stopper.**



5. Install drive plates, driven plates and retaining plate.

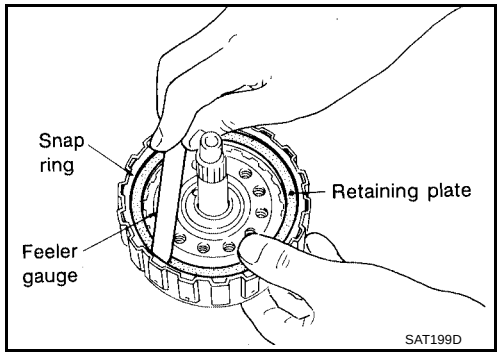
Take care with the order and direction of plates.

6. Install snap ring.
   - **Do not expand snap ring excessively.**

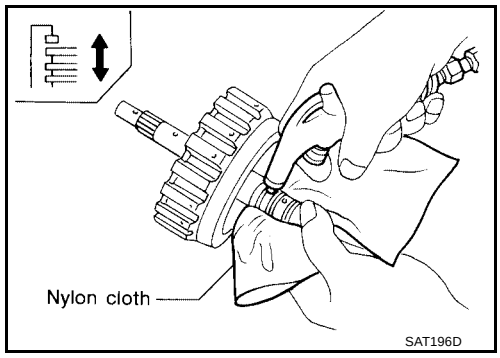


7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

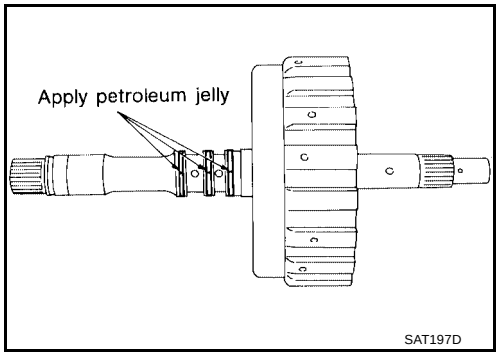
Specified clearance	
Standard	**: 1.4 - 1.8 mm (0.055 - 0.071 in)**
Allowable limit	**: 2.4 mm (0.094 in)**
Retaining plate	**: Refer to AT-388, "HIGH CLUTCH" .**



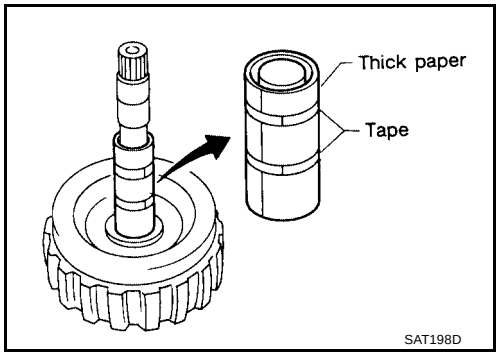
8. Check operation of high clutch.
   Refer to AT-319, "HIGH CLUTCH" .



9. Install seal rings to input shaft.
   - **Apply petroleum jelly to seal rings.**



   - **Roll paper around seal rings to prevent seal rings from spreading.**

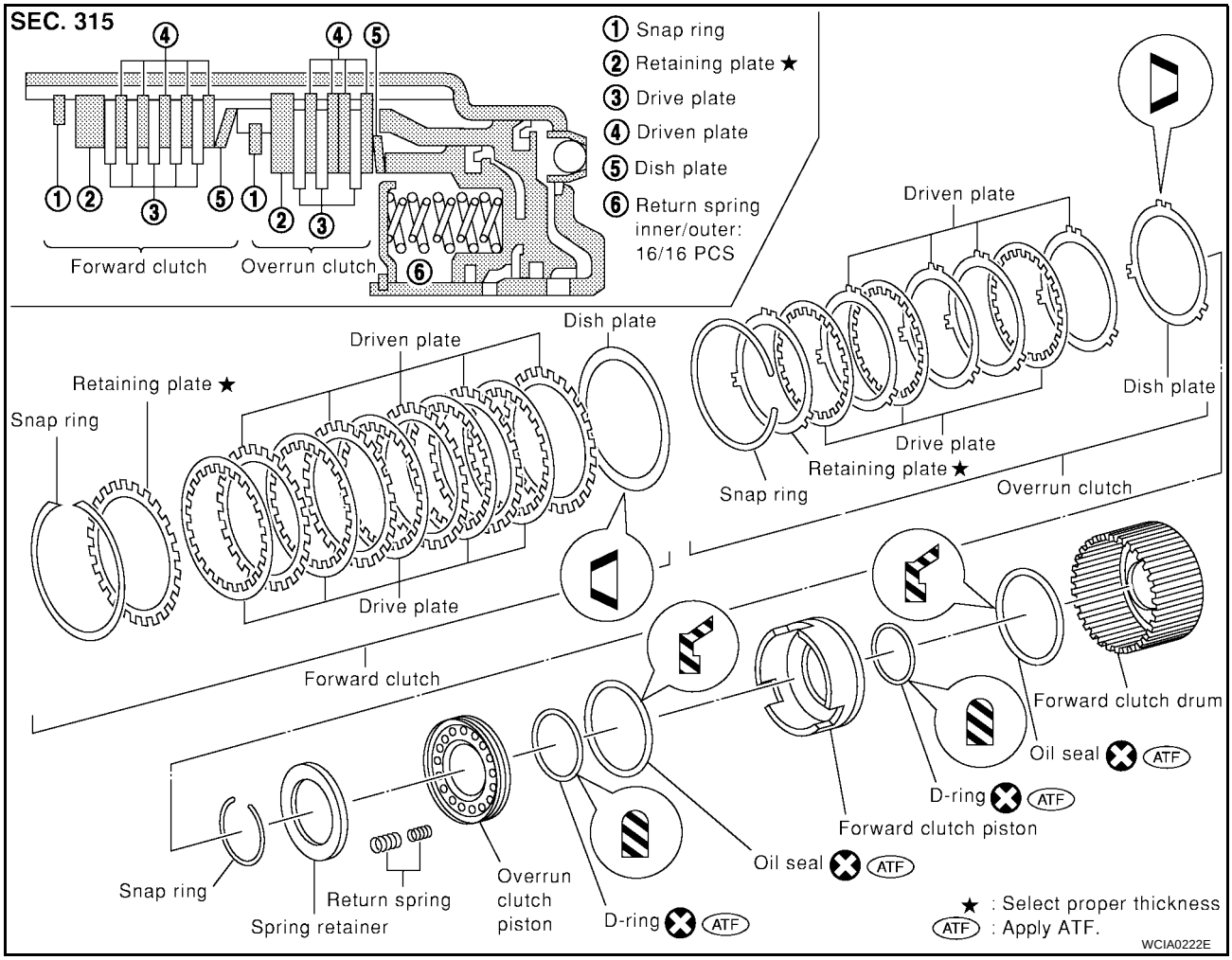


FORWARD CLUTCH AND OVERRUN CLUTCH

PFP:31570

Components

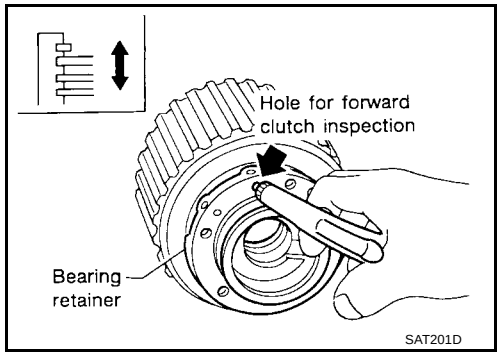
ECS0060J



Disassembly

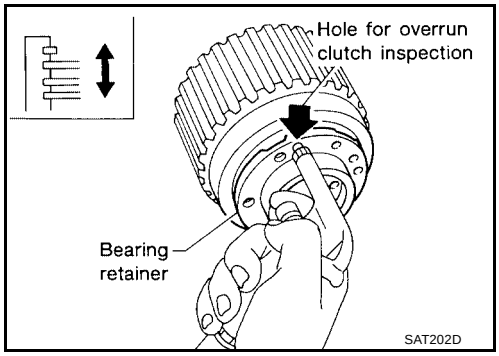
ECS0060K

1. Check operation of forward clutch and overrun clutch.

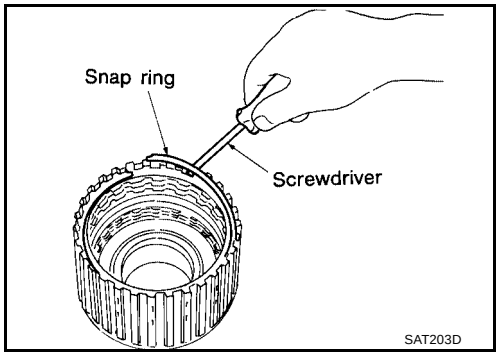


a. Install bearing retainer on forward clutch drum.
b. Apply compressed air to oil hole of forward clutch drum.
c. Check to see that retaining plate moves to snap ring.

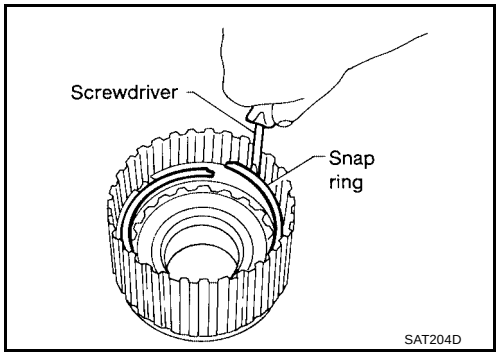
d. If retaining plate does not contact snap ring:
   - D-ring might be damaged.
   - Oil seal might be damaged.
   - Fluid might be leaking past piston check ball.



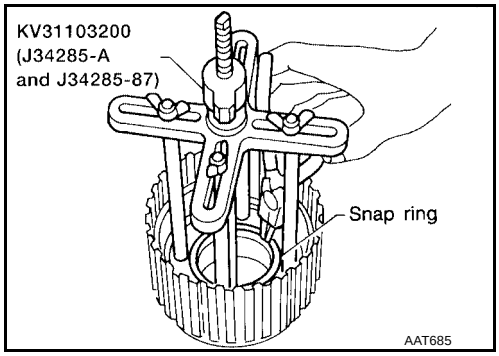
2. Remove snap ring for forward clutch.
   - **Do not expand snap ring excessively.**
3. Remove drive plates, driven plates, retaining plate and dish plate for forward clutch.



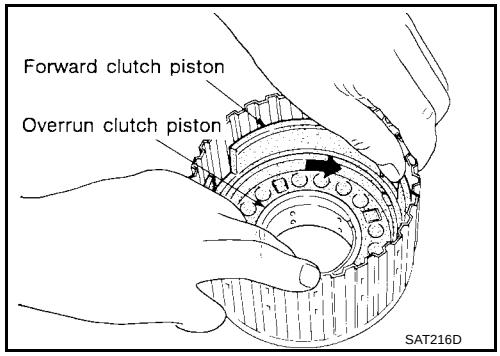
4. Remove snap ring for overrun clutch.
   - **Do not expand snap ring excessively.**
5. Remove drive plates, driven plates, retaining plate and dish plate for overrun clutch.



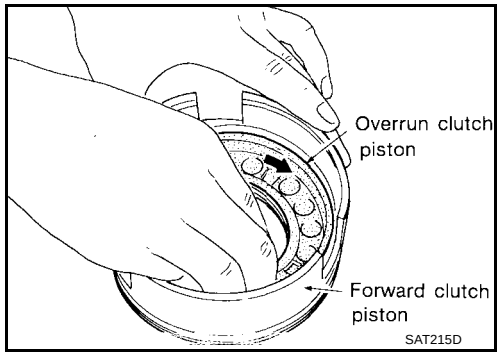
6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
   - **Set Tool directly above return springs.**
   - **Do not expand snap ring excessively.**
7. Remove spring retainer and return springs.



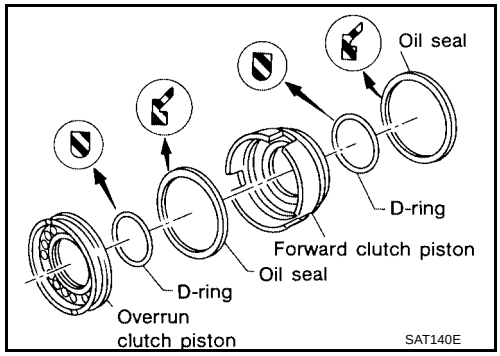
8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.



9. Remove overrun clutch piston from forward clutch piston by turning it.



10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.



Inspection

ECS0060L

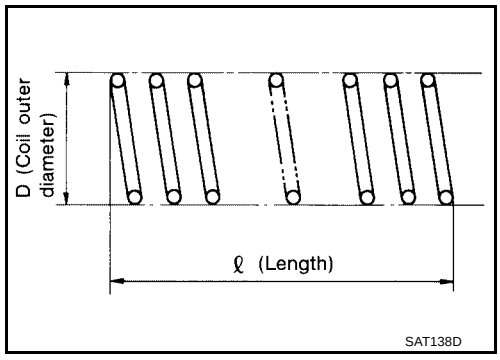
SNAP RINGS AND SPRING RETAINER

- Check for deformation, fatigue or damage.

FORWARD CLUTCH AND OVERRUN CLUTCH RETURN SPRINGS

- Check for deformation or damage.
- Measure free length and outer diameter.

Inspection standard : Refer to AT-389, "Clutch and Brake Return Springs" .



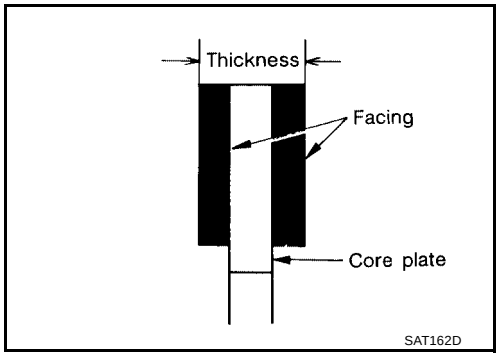
- Replace if deformed or fatigued.

FORWARD CLUTCH AND OVERRUN CLUTCH DRIVE PLATES

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate

Forward clutch	
Standard value	**: 1.8 mm (0.071 in)**
Wear limit	**: 1.6 mm (0.063 in)**
Overrun clutch	
Standard value	**: 1.6 mm (0.063 in)**
Wear limit	**: 1.4 mm (0.055 in)**



- If not within wear limit, replace.

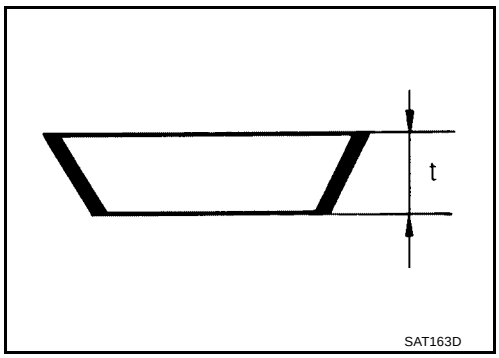
FORWARD CLUTCH AND OVERRUN CLUTCH DISH PLATES

- Check for deformation or damage.
- Measure thickness of dish plate.

Thickness of dish plate "t"

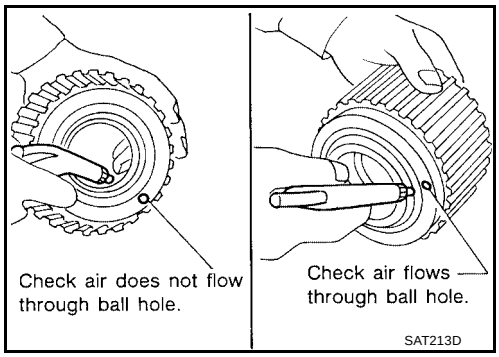
Forward clutch	**: 2.5 mm (0.098 in)**
Overrun clutch	**: 2.15 mm (0.0846 in)**

- If deformed or fatigued, replace.



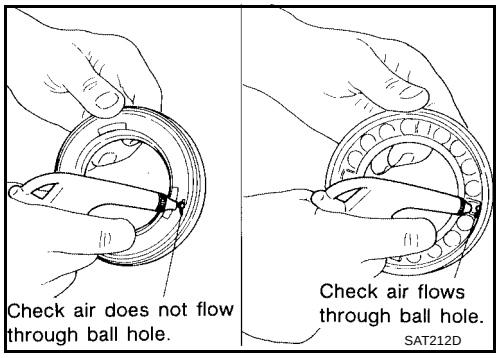
FORWARD CLUTCH DRUM

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole from outside of forward clutch drum. Make sure air leaks past ball.
- Apply compressed air to oil hole from inside of forward clutch drum. Make sure there is no air leakage.



OVERRUN CLUTCH PISTON

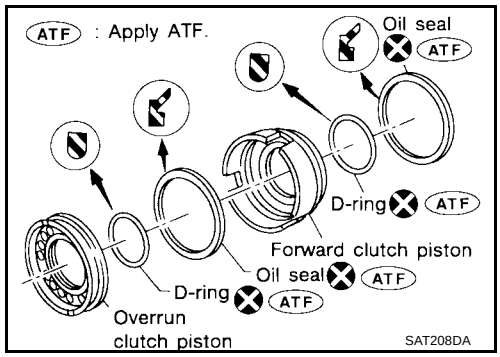
- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side. Make sure air leaks past ball.



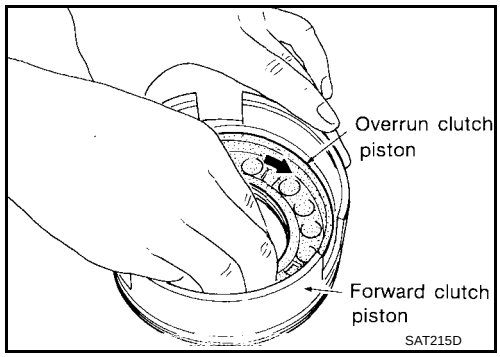
Assembly

ECS0060M

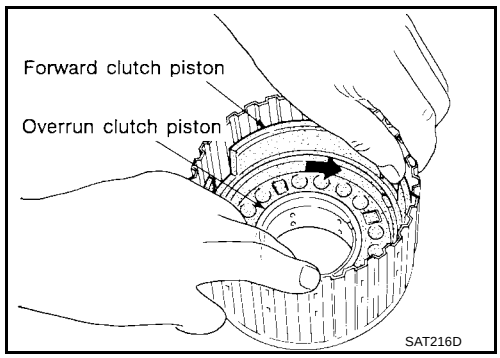
1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.
   - **Take care with direction of oil seal.**
   - **Apply ATF to both parts.**



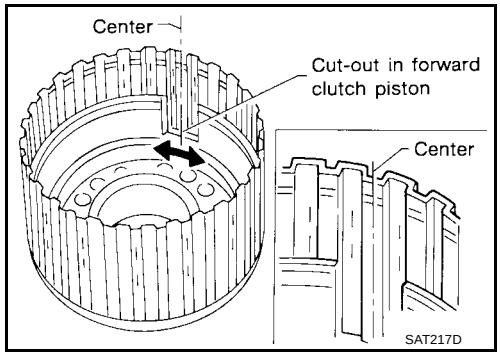
2. Install overrun clutch piston assembly on forward clutch piston while turning it slowly.
   - **Apply ATF to inner surface of forward clutch piston.**



3. Install forward clutch piston assembly on forward clutch drum while turning it slowly.
   - **Apply ATF to inner surface of drum.**

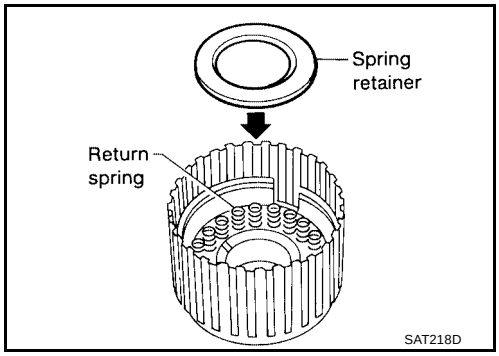


4. Align notch in forward clutch piston with groove in forward clutch drum.

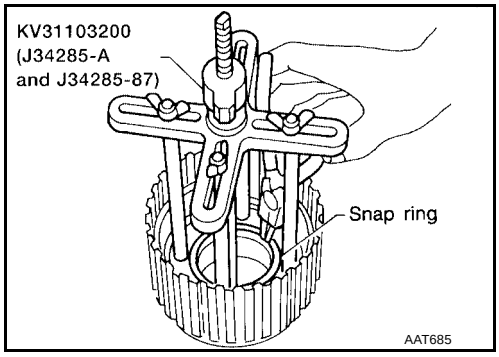


5. Install return spring on piston.
6. Install spring retainer on return springs.

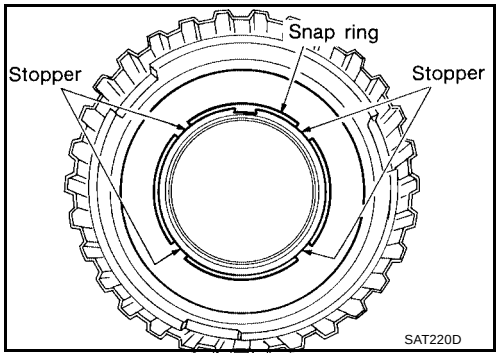
Return spring **: Refer to AT-389, "Clutch and Brake Return Springs" .**



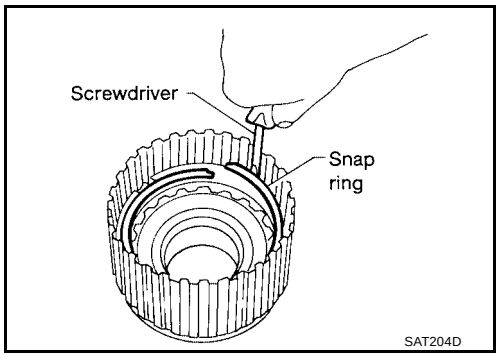
7. Set Tool on spring retainer and install snap ring while compressing return springs.
   - **Set Tool directly above return springs.**
   - **Do not expand snap ring excessively.**



   - **Do not align snap ring gap with spring retainer stopper.**

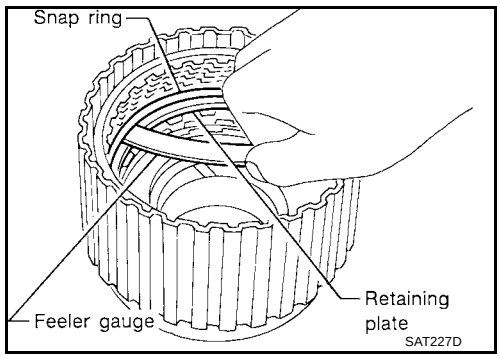


8. Install drive plates, driven plates, retaining plate and dish plate for overrun clutch.
9. Install snap ring for overrun clutch.
   - Do not expand snap ring excessively.



10. Measure clearance between overrun clutch retaining plate and snap ring.
If not within allowable limit, select proper retaining plate.

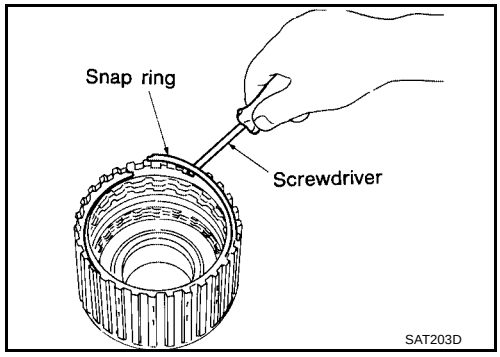
Specified clearance	
Standard	: 1.0 - 1.4 mm (0.039 - 0.055 in)
Allowable limit	: 2.0 mm (0.079 in)
Overrun clutch retaining plate	: Refer to AT-388, "OVERRUN CLUTCH" .



11. Install drive plates, driven plates, retaining plate and dish plate for forward clutch.

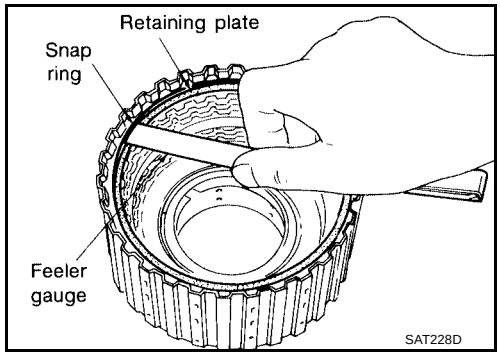
Take care with the order and direction of plates.

12. Install snap ring for forward clutch.
- Do not expand snap ring excessively.

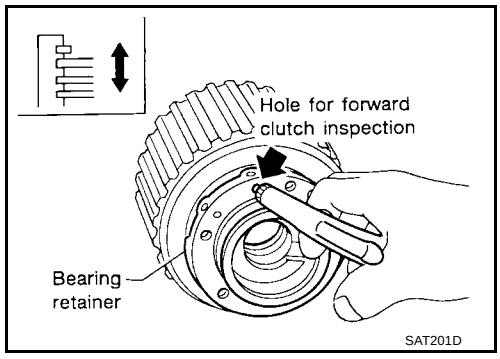


13. Measure clearance between forward clutch retaining plate and snap ring.
If not within allowable limit, select proper retaining plate.

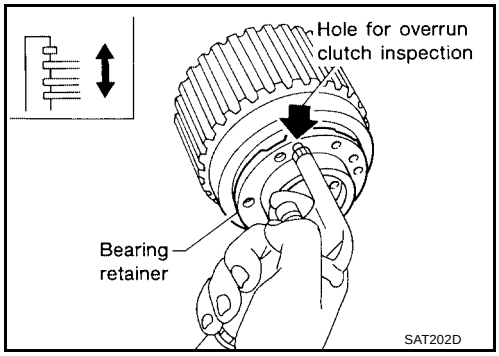
Specified clearance	
Standard	: 0.45 - 0.85 mm (0.0177 - 0.0335 in)
Allowable limit	: 1.85 mm (0.0728 in)
Forward clutch retaining plate	: Refer to AT-388, "FORWARD CLUTCH"



14. Check operation of forward clutch.
Refer to AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH" .



15. Check operation of overrun clutch.
    Refer to AT-325, "FORWARD CLUTCH AND OVERRUN CLUTCH" .

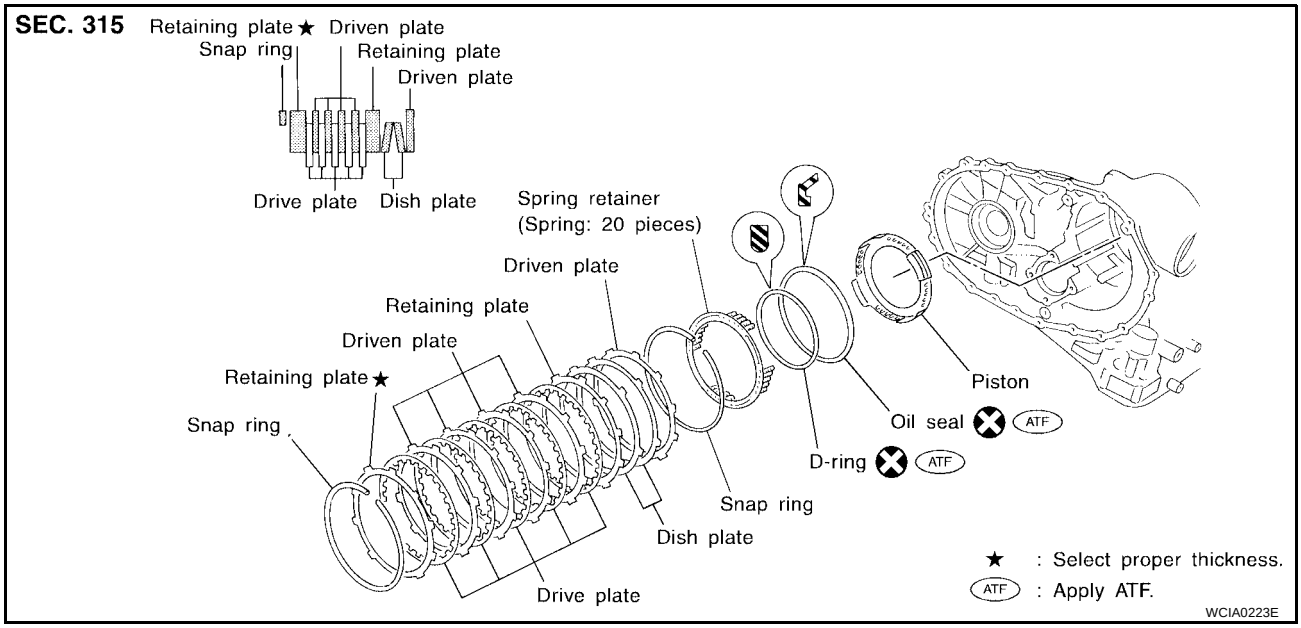


LOW & REVERSE BRAKE

PFP:31645

Components

ECS0060N

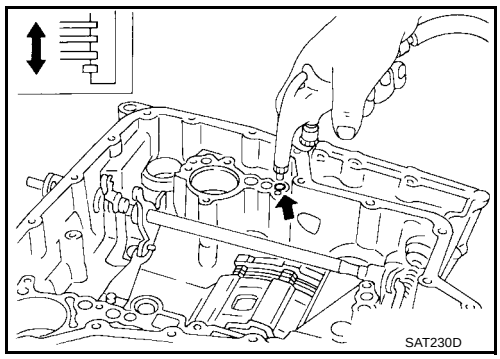


Disassembly

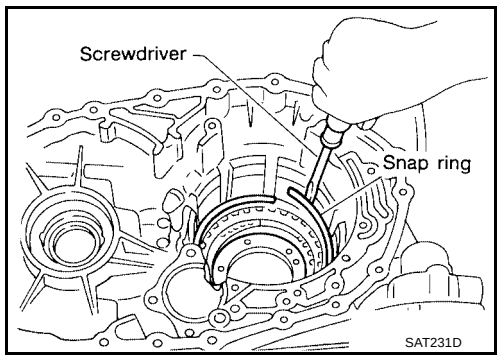
ECS0060O

1. Check operation of low & reverse brake.

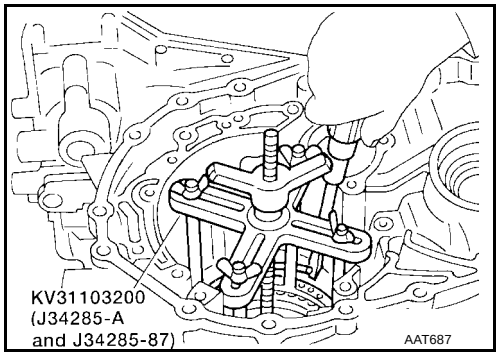
a. Apply compressed air to oil hole of transmission case.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not contact snap ring:
   - D-ring might be damaged.
   - Oil seal might be damaged.
   - Fluid might be leaking past piston check ball.



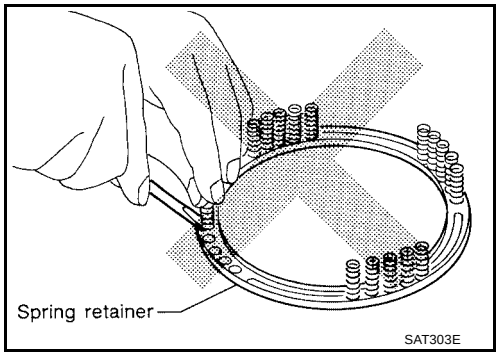
2. Stand transmission case.
3. Remove snap ring.
   - **Do not expand snap ring excessively.**
4. Remove drive plates, driven plates, retaining plate from transmission case.



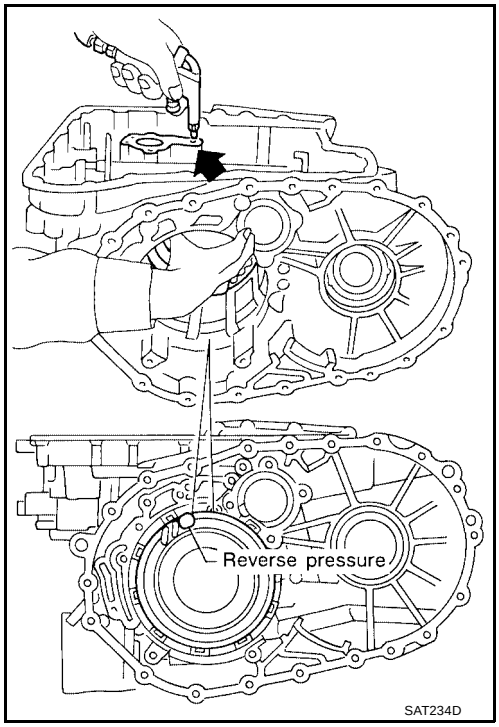
5. Set Tool on spring retainer and remove snap ring while compressing return springs.
   - **Set Tool directly above return springs.**
   - **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.



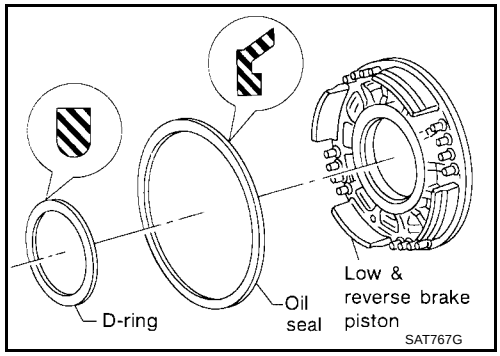
   - **Do not remove return springs from spring retainer.**



7. Apply compressed air to oil hole of transmission case while holding piston.
8. Remove piston from transmission case by turning it.



9. Remove D-ring and oil seal from piston.



Inspection

ECS0060P

LOW & REVERSE CLUTCH SNAP RING, SPRING RETAINER AND RETURN SPRINGS

- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**

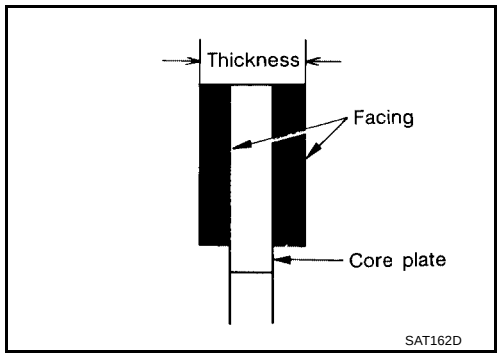
LOW & REVERSE BRAKE DRIVE PLATES

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate

Standard value	**: 2.0 mm (0.079 in)**
Wear limit	**: 1.8 mm (0.071 in)**

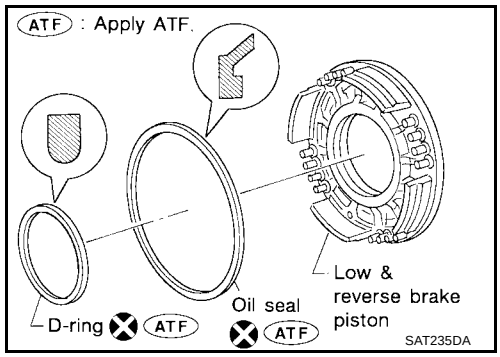
- If not within wear limit, replace.



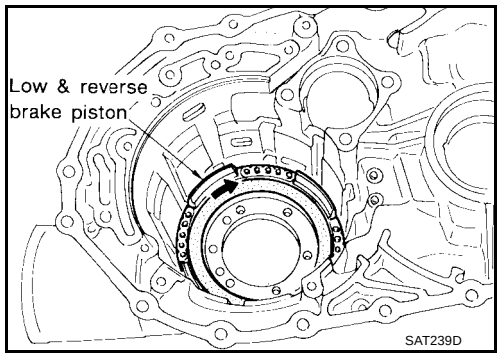
Assembly

ECS0060Q

1. Install D-ring and oil seal on piston.
   - **Take care with the direction of the oil seal.**
   - **Apply ATF to both parts.**

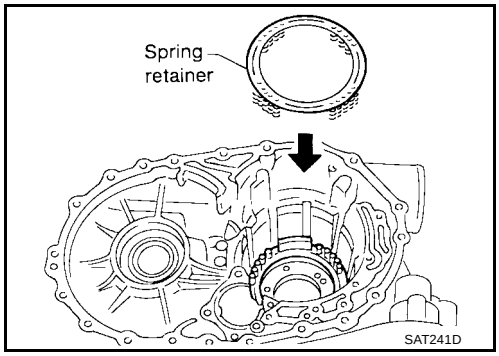


2. Stand transmission case.
3. Install piston assembly on transmission case while turning it slowly.
   - **Apply ATF to inner surface of transmission case.**

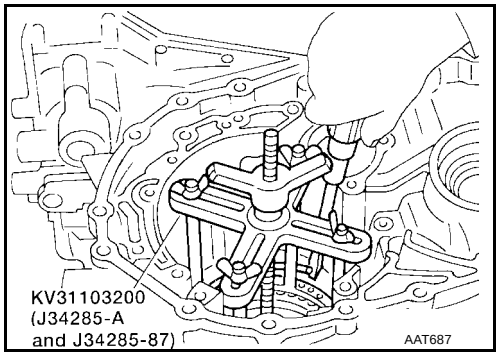


4. Install return springs and spring retainer on piston.

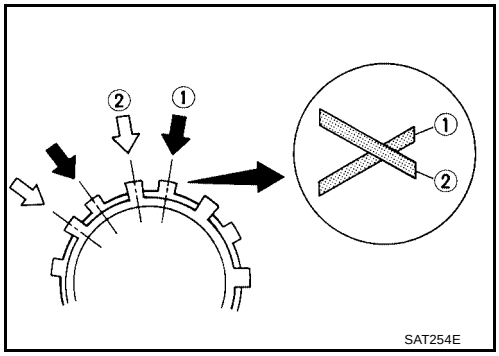
Return spring **:Refer to AT-389, "Clutch and Brake Return Springs" .**



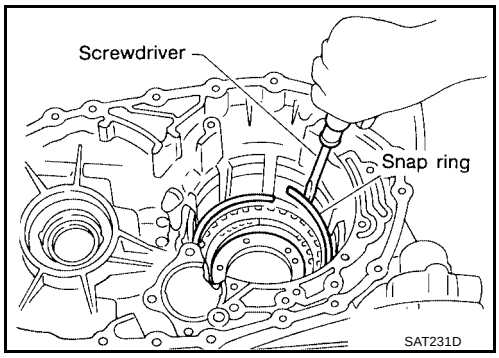
5. Install snap ring while compressing return springs.
   - **Set Tool directly above return springs.**



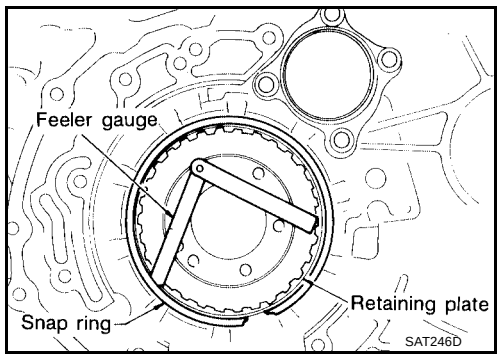
6. Install drive plates, driven plates, retaining plates and dished plates.
   - **Do not align the projections on the two dished plates.**
   - **Make sure to put the plates in the correct order and direction.**



7. Install snap ring.
   - **Do not expand snap ring excessively.**



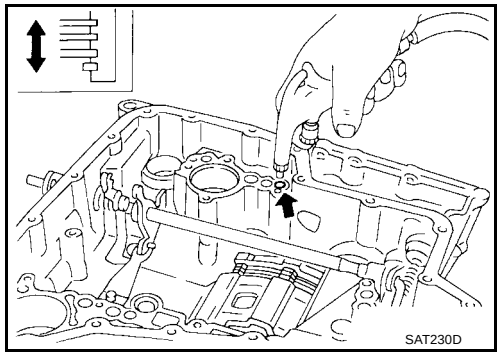
8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate (front side).



Specified clearance

Standard	**: 1.4 - 1.8 mm (0.055 - 0.071 in)**
Allowable limit	**: 2.8 mm (0.110 in)**
Retaining plate	**: Refer to AT-388, "LOW & REVERSE BRAKE" .**

9. Check operation of low and reverse brake.
Refer to AT-333, "LOW & REVERSE BRAKE" .

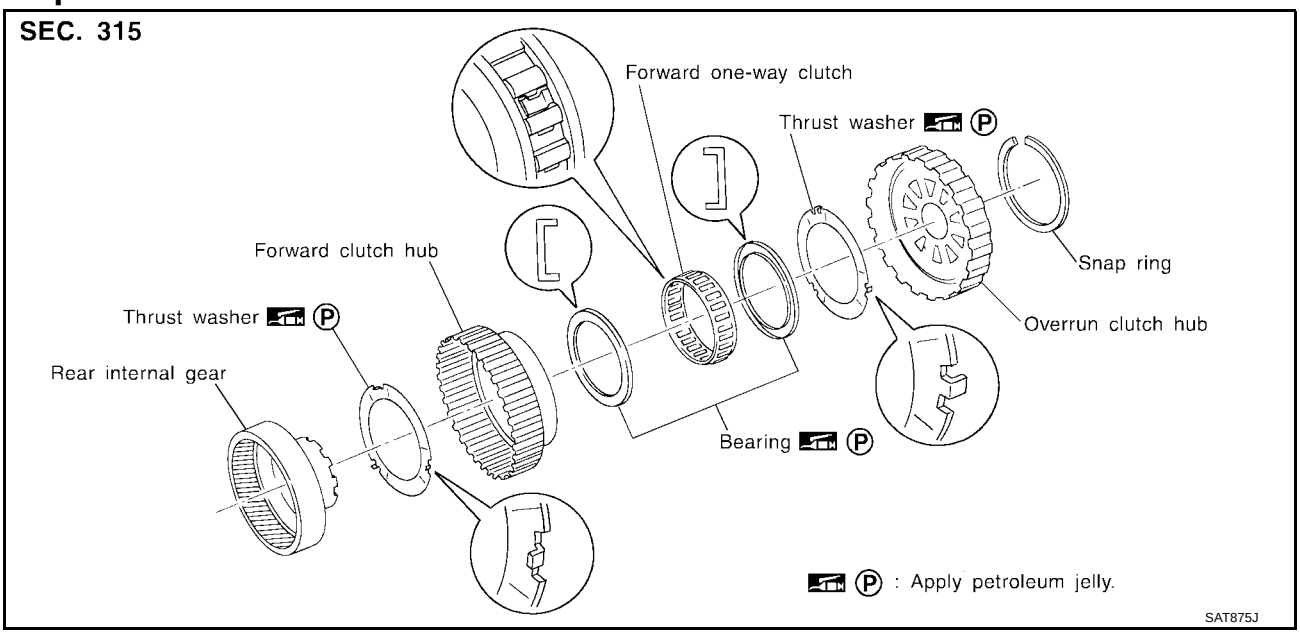


REAR INTERNAL GEAR, FORWARD CLUTCH HUB AND OVERRUN CLUTCH HUB

PFP:31450

Components

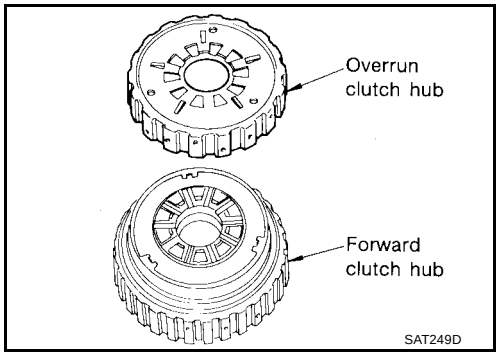
ECS0060R



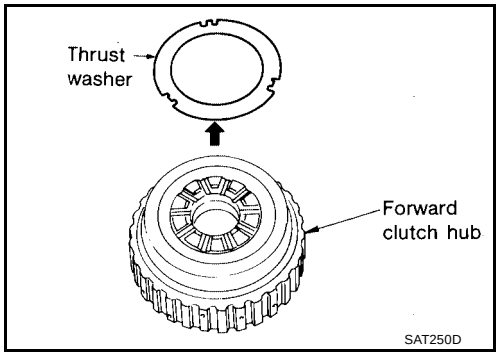
Disassembly

ECS0060S

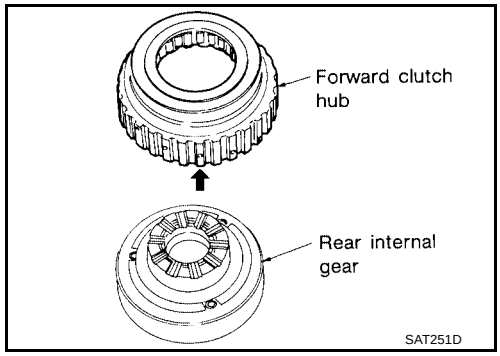
1. Remove snap ring from overrun clutch hub.
2. Remove overrun clutch hub from forward clutch hub.



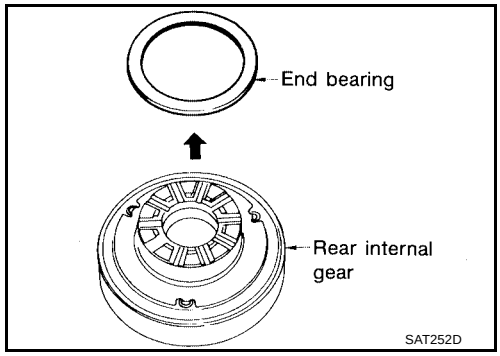
3. Remove thrust washer from forward clutch hub.



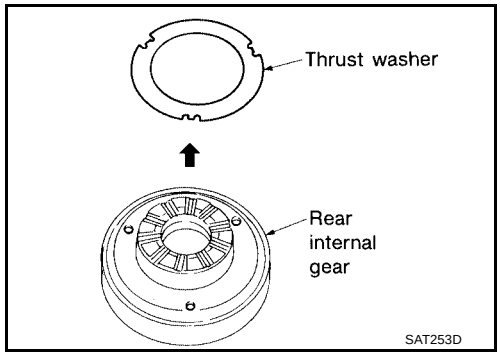
4. Remove forward clutch hub from rear internal gear.



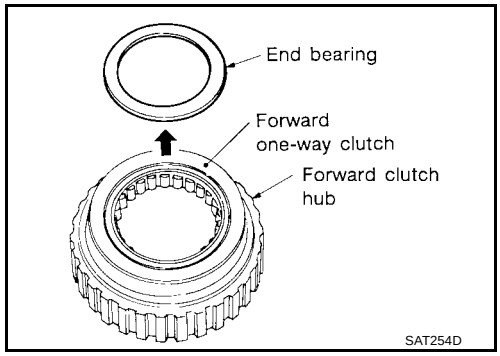
5. Remove end bearing from rear internal gear.



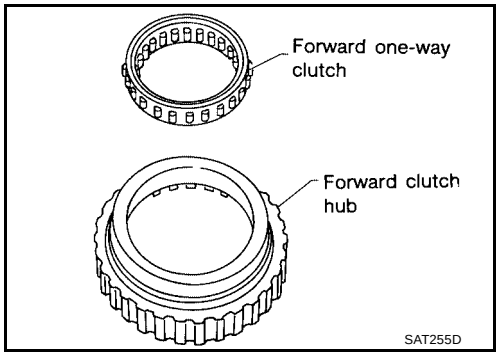
6. Remove thrust washer from rear internal gear.



7. Remove end bearing from forward one-way clutch.



8. Remove one-way clutch from forward clutch hub.

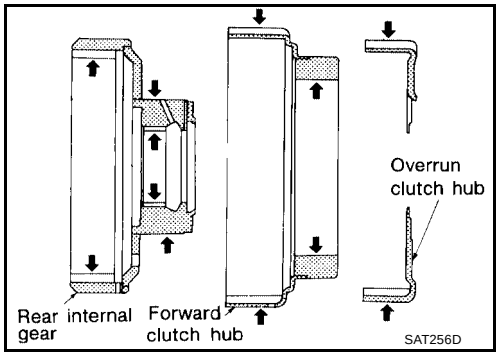


Inspection

ECS0060T

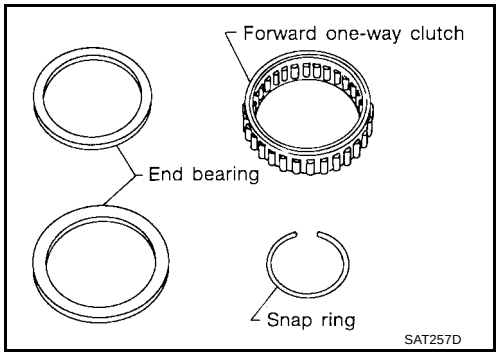
REAR INTERNAL GEAR, FORWARD CLUTCH HUB AND OVERRUN CLUTCH HUB

- Check rubbing surfaces for wear or damage.



SNAP RING, END BEARINGS AND FORWARD ONE-WAY CLUTCH

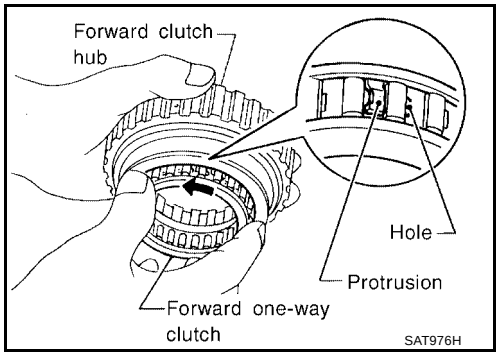
- Check snap ring and end bearings for deformation and damage.
- Check forward one-way clutch for wear and damage.



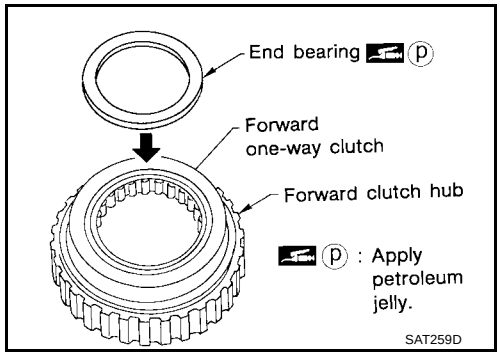
Assembly

ECS0060U

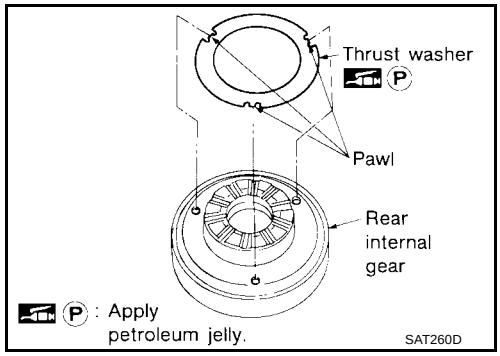
1. Install forward one-way clutch on forward clutch.
   - **Take care with the direction of forward one-way clutch.**



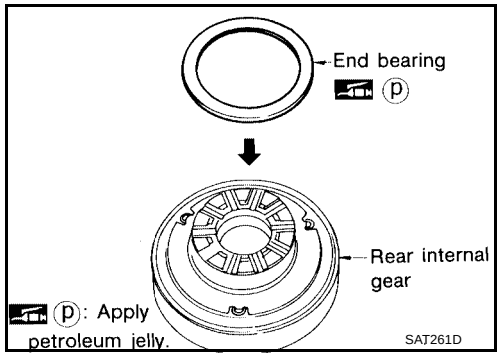
2. Install end bearing on forward one-way clutch.
   - **Apply petroleum jelly to end bearing.**



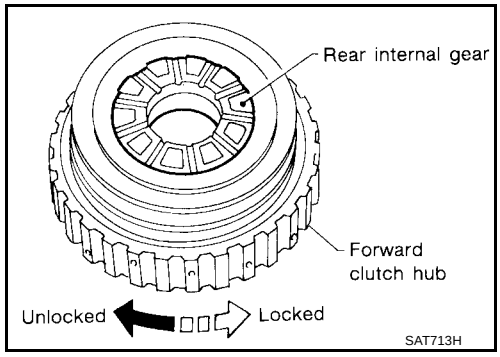
3. Install thrust washer on rear internal gear.
   - **Apply petroleum jelly to thrust washer.**
   - **Align pawls of thrust washer with holes of rear internal gear.**



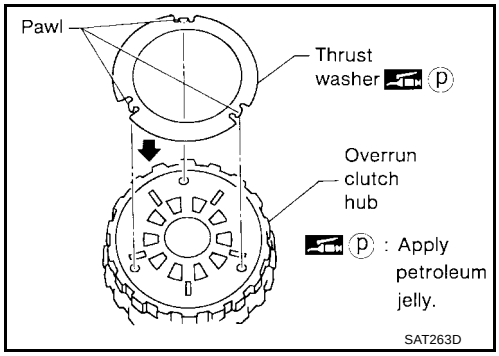
4. Install end bearing on rear internal gear.
   - **Apply petroleum jelly to end bearing.**



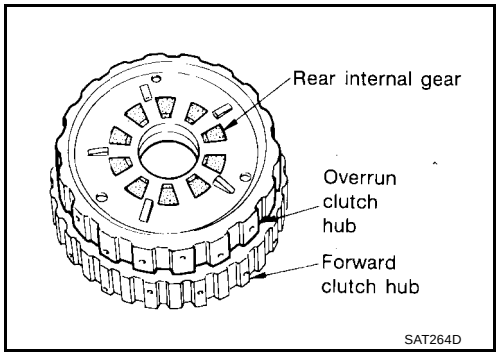
5. Install forward clutch hub on rear internal gear.
   - **Check operation of forward one-way clutch.**
     Hold rear internal gear and turn forward clutch hub. Check forward clutch hub for correct locking and unlocking directions.
   - **If not as shown in illustration, check installation direction of forward one-way clutch.**



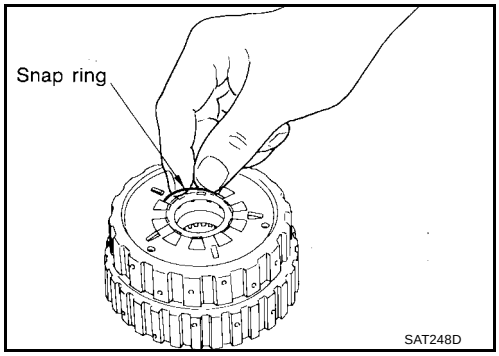
6. Install thrust washer and overrun clutch hub.
   - **Apply petroleum jelly to thrust washer.**
   - **Align pawls of thrust washer with holes of overrun clutch hub.**



7. Install overrun clutch hub on rear internal gear.
   - **Align projections of rear internal gear with holes of overrun clutch hub.**



8. Install snap ring to groove of rear internal gear.

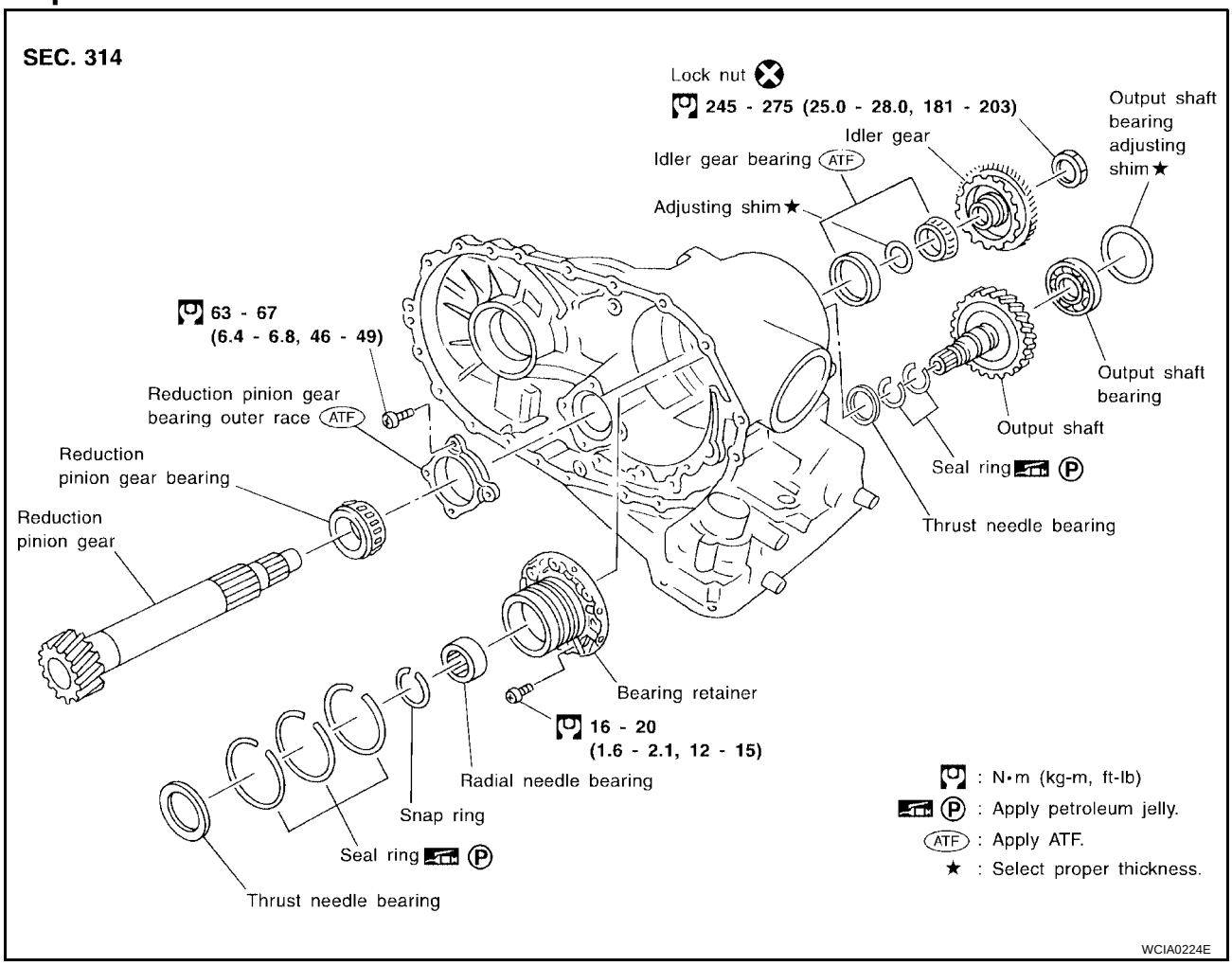


OUTPUT SHAFT, IDLER GEAR, REDUCTION PINION GEAR AND BEARING RETAINER

PFP:31480

Components

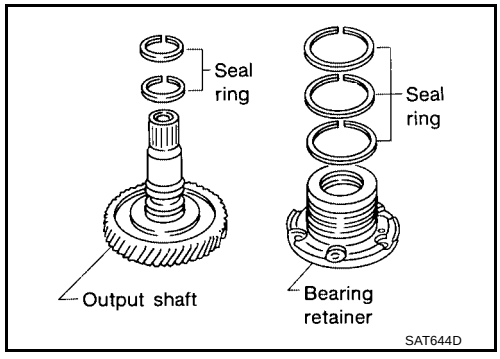
ECS0060V



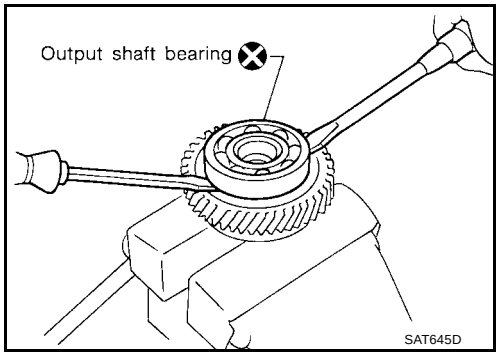
Disassembly

ECS0060W

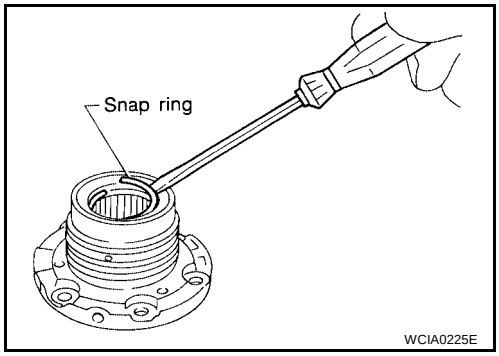
1. Remove seal rings from output shaft and bearing retainer.



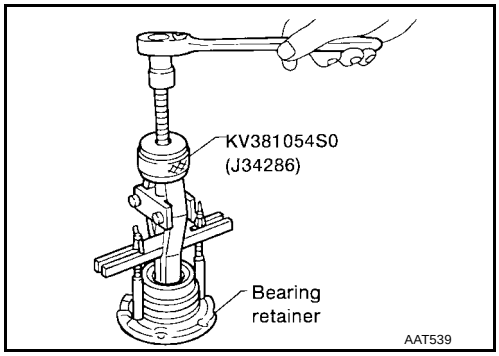
2. Remove output shaft bearing with screwdrivers.
   - **Always replace bearing with a new one when removed.**
   - **Do not damage output shaft.**



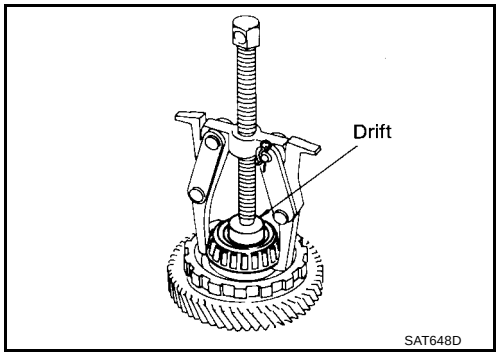
3. Remove snap ring from bearing retainer.
   - **Do not expand snap ring excessively.**



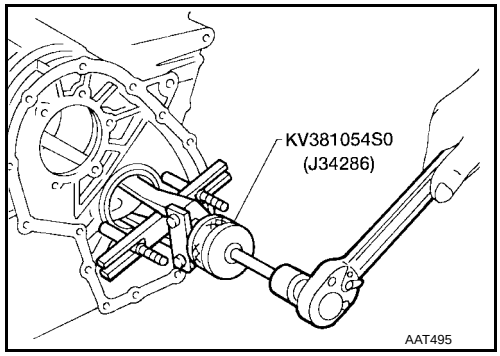
4. Remove needle bearing from bearing retainer.



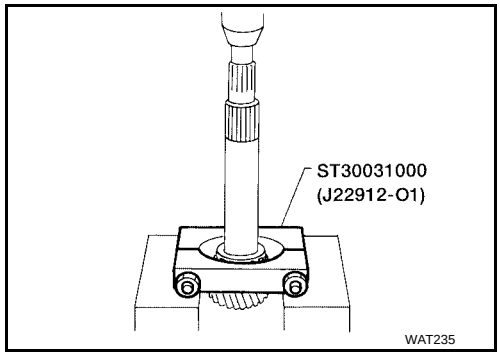
5. Remove idler gear bearing inner race from idler gear.



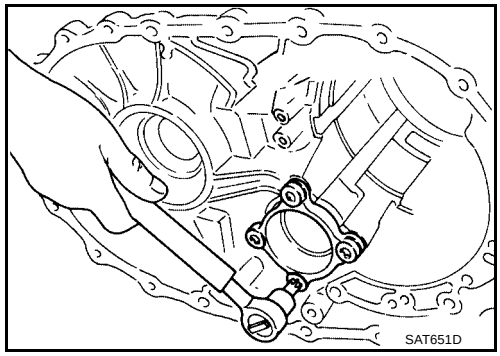
6. Remove idler gear bearing outer race from transmission case.



7. Press out reduction pinion gear bearing from reduction pinion gear.



8. Remove reduction pinion gear bearing outer race from transmission case.



Inspection

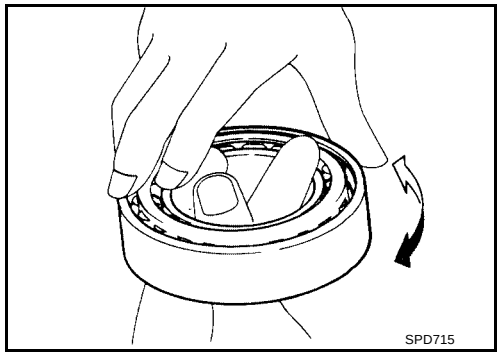
ECS0060X

OUTPUT SHAFT, IDLER GEAR AND REDUCTION PINION GEAR

- Check shafts for cracks, wear or bending.
- Check gears for wear, chips and cracks.

BEARING

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**



SEAL RING CLEARANCE

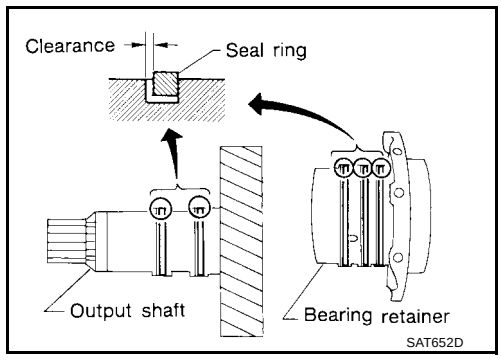
- Install new seal rings to output shaft.
- Measure clearance between seal ring and ring groove of output shaft.

Standard clearance : 0.10 - 0.25 mm (0.0039 - 0.0098 in)
Allowable limit : 0.25 mm (0.0098 in)

- If not within allowable limit, replace output shaft.
- Install new seal rings to bearing retainer.
- Measure clearance between seal ring and ring groove of bearing retainer.

Standard clearance : 0.10 - 0.25 mm (0.0039 - 0.0098 in)
Allowable limit : 0.25 mm (0.0098 in)

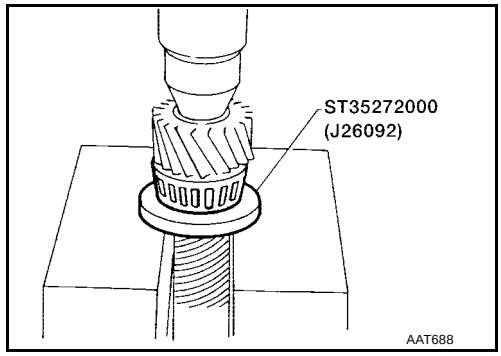
- If not within allowable limit, replace bearing retainer.



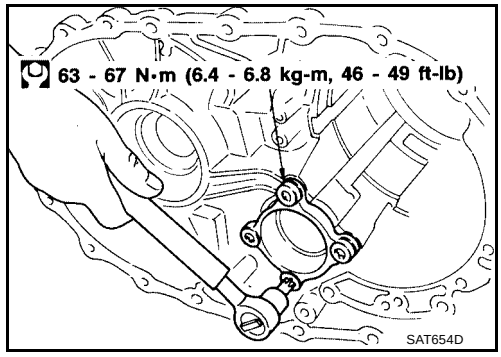
Assembly

ECS0060Y

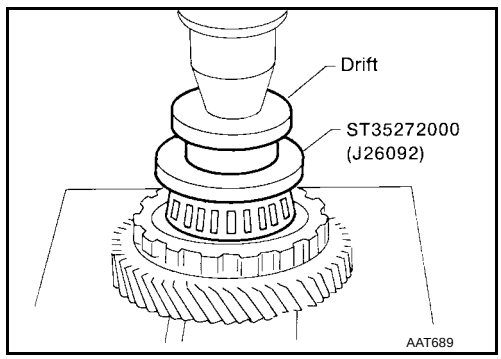
1. Press reduction pinion gear bearing on reduction pinion gear.



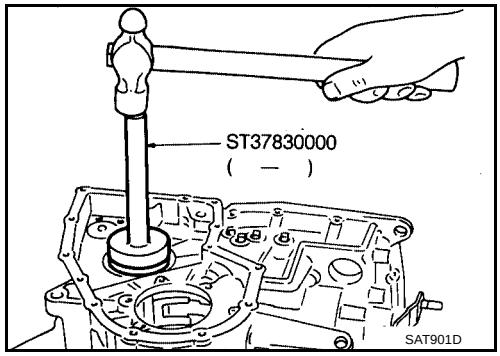
2. Install reduction pinion gear bearing outer race on transmission case.



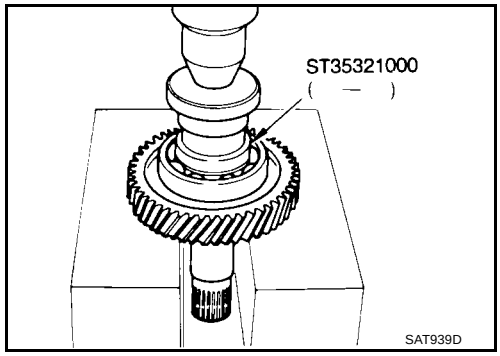
3. Press idler gear bearing inner race on idler gear.



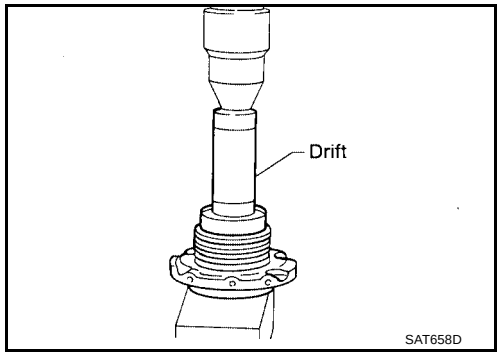
4. Install idler gear bearing outer race on transmission case.



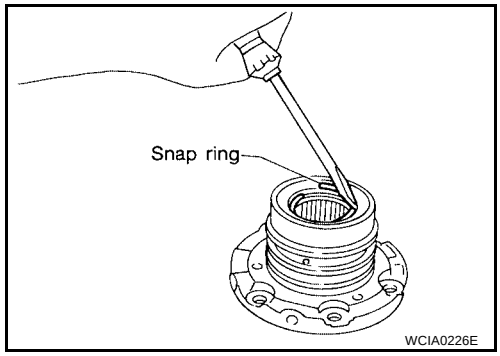
5. Press output shaft bearing on output shaft.



6. Press needle bearing on bearing retainer.

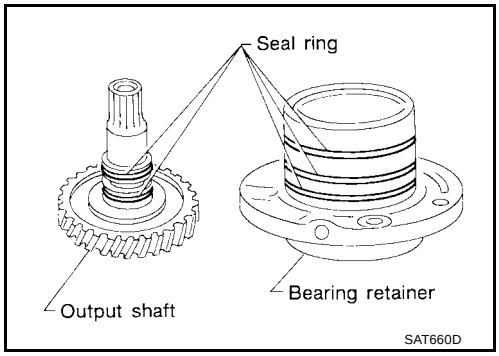


7. Install snap ring to bearing retainer.

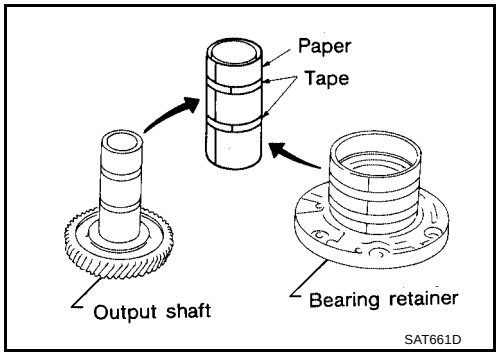


8. After packing ring grooves with petroleum jelly, carefully install new seal rings on output shaft and bearing retainer.

   NOTE:
   Do not align gaps in seal rings.



- **Roll paper around seal rings to prevent seal rings from spreading.**

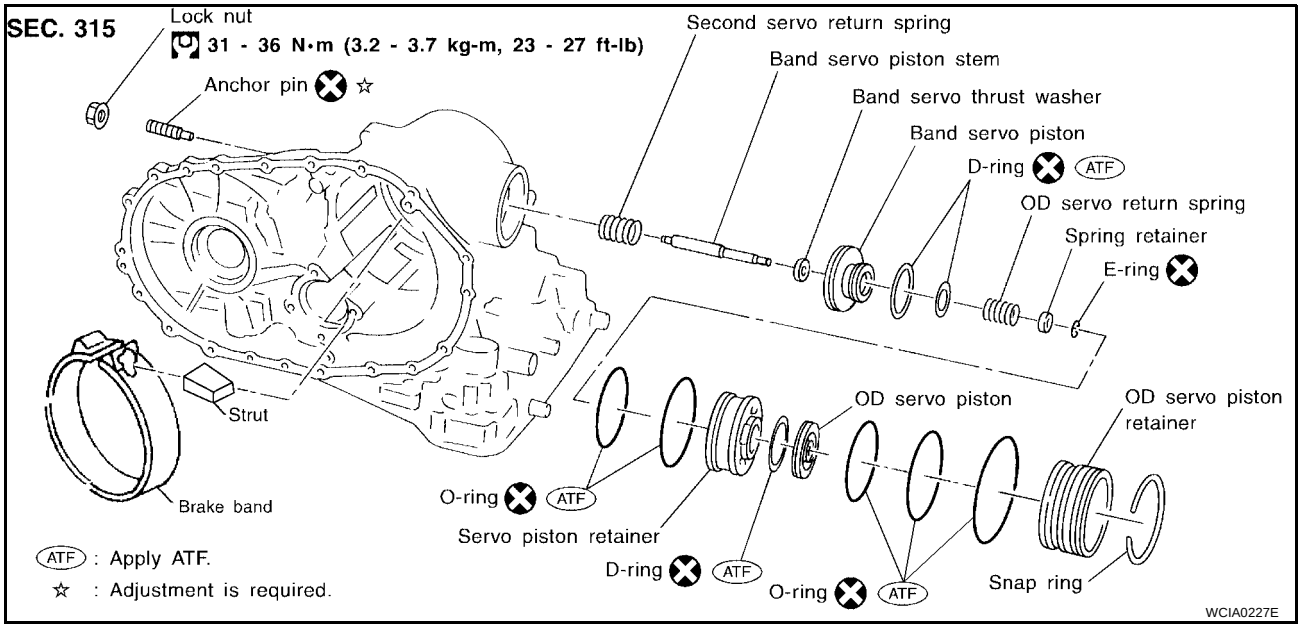


BAND SERVO PISTON ASSEMBLY

PFP:31615

Components

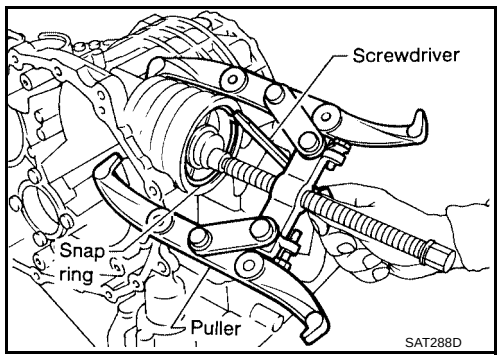
ECS0060Z



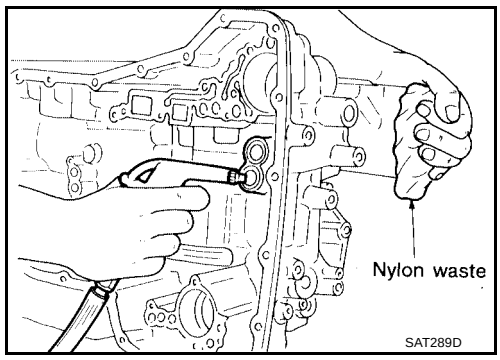
Disassembly

ECS00610

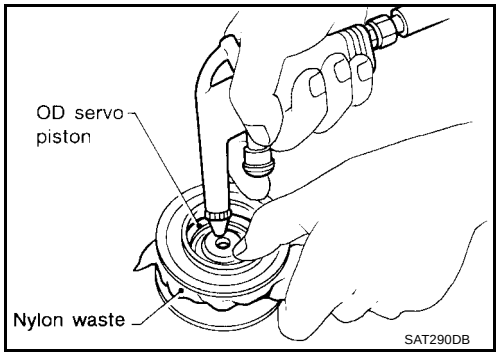
1. Remove band servo piston snap ring.



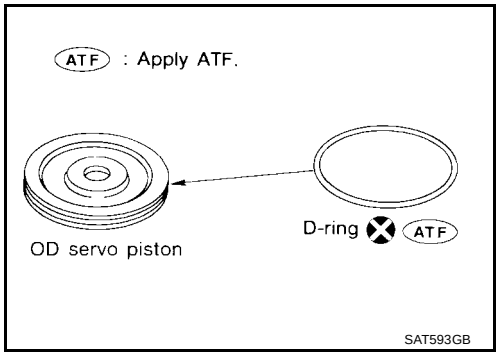
2. Apply compressed air to oil hole in transmission case to remove OD servo piston retainer and band servo piston assembly.
   - **Hold band servo piston assembly with a rag or nylon waste.**



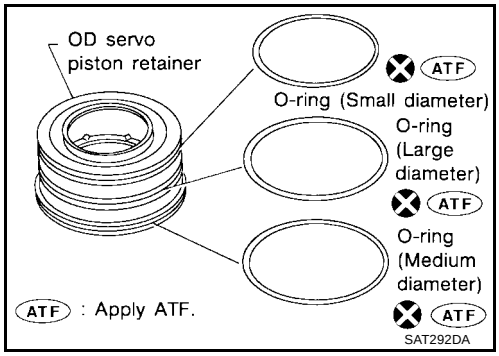
3. Apply compressed air to oil hole in OD servo piston retainer to remove OD servo piston from retainer.
   - **Hold OD servo piston while applying compressed air.**



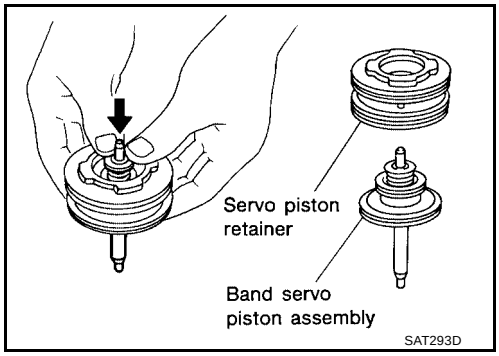
4. Remove D-ring from OD servo piston.



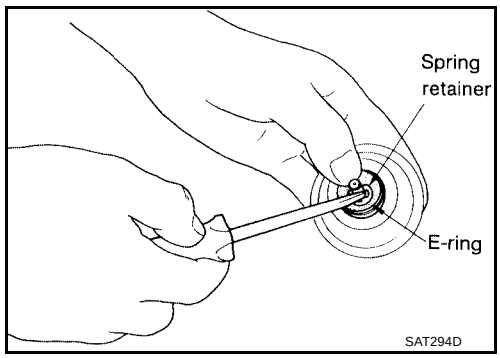
5. Remove O-rings from OD servo piston retainer.



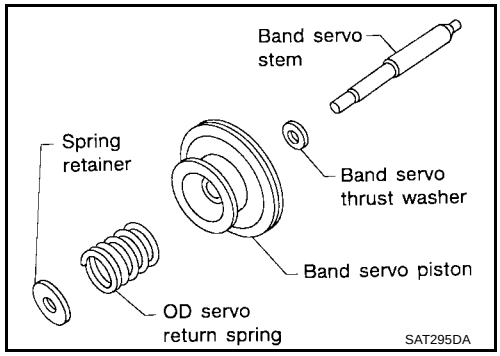
6. Remove band servo piston assembly from servo piston retainer by pushing it forward.



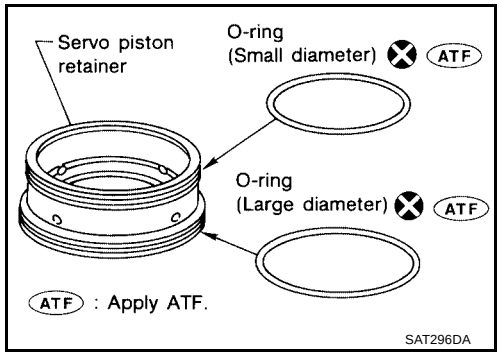
7. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.



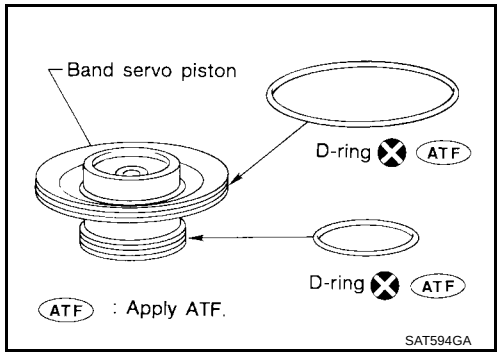
8. Remove OD servo return spring, band servo thrust washer and band servo piston stem from band servo piston.



9. Remove O-rings from servo piston retainer.



10. Remove D-rings from band servo piston.

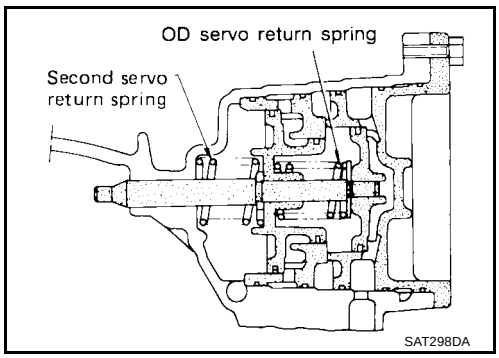


Inspection

ECS00611

PISTONS, RETAINERS AND PISTON STEM

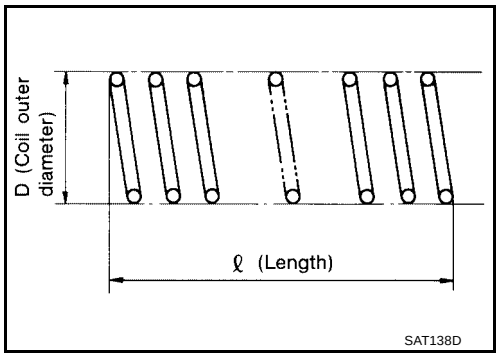
- Check frictional surfaces for abnormal wear or damage.



RETURN SPRINGS

- Check for deformation or damage.
- Measure free length and outer diameter.

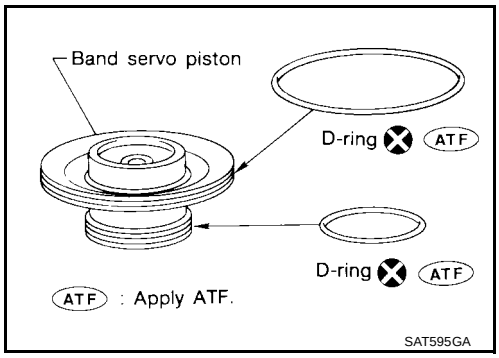
Band servo inspection standard : Refer to AT-394, "RETURN SPRING" .



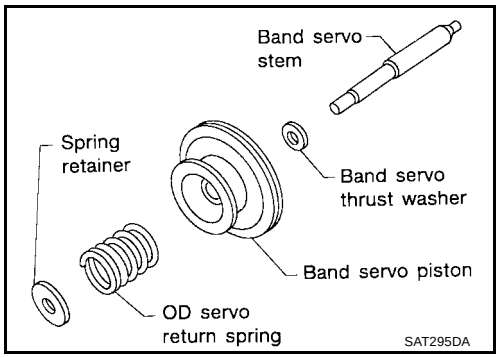
Assembly

ECS00612

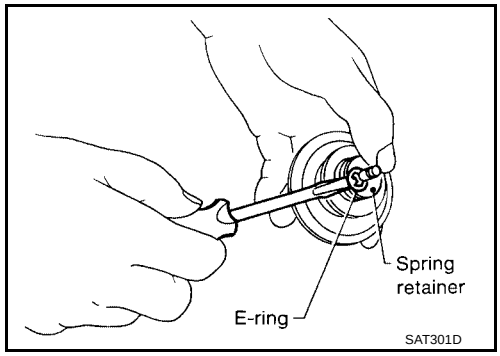
1. Install D-rings to band servo piston retainer.
   - **Apply ATF to D-rings.**
   - **Pay attention to position of each D-ring.**



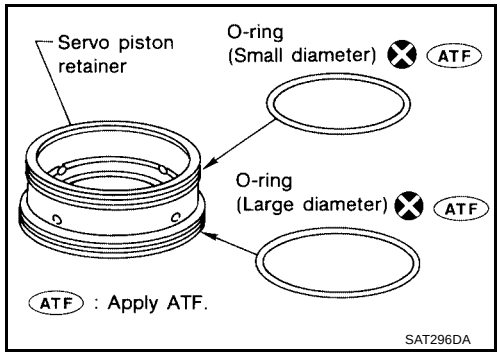
2. Install band servo piston stem, band servo thrust washer, OD servo return spring and spring retainer to band servo piston.



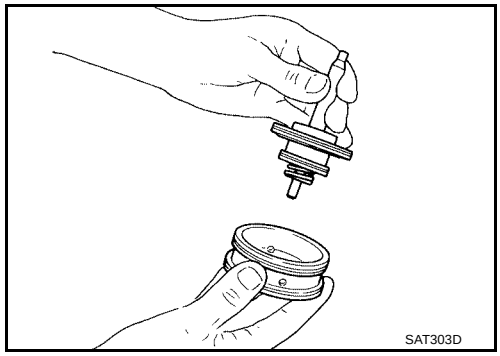
3. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



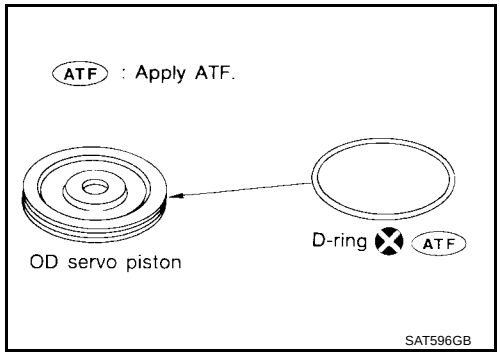
4. Install O-rings to servo piston retainer.
   - **Apply ATF to O-rings.**
   - **Pay attention to the positions of the O-rings.**



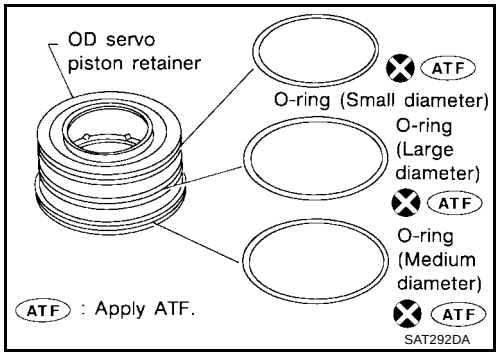
5. Install band servo piston assembly to servo piston retainer by pushing it inward.



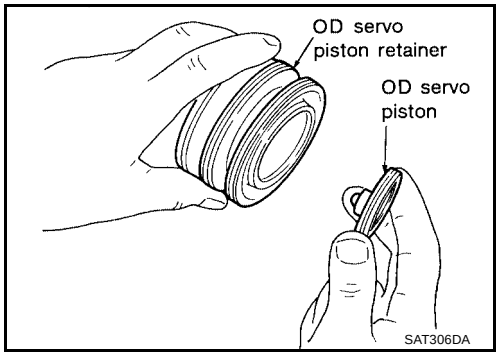
6. Install D-ring to OD servo piston.
   - **Apply ATF to D-ring.**



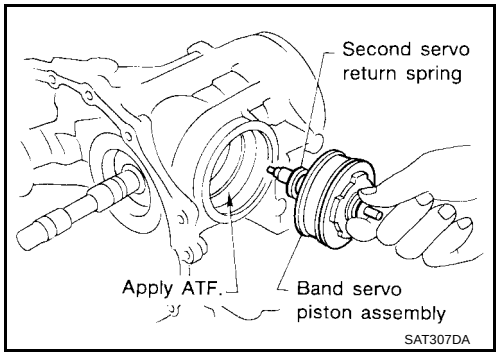
7. Install O-rings to OD servo piston retainer.
   - **Apply ATF to O-rings.**
   - **Pay attention to the positions of the O-rings.**



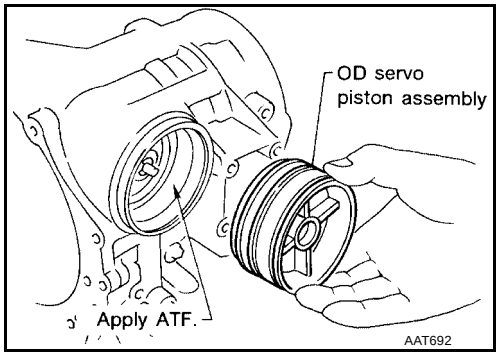
8. Install OD servo piston to OD servo piston retainer.



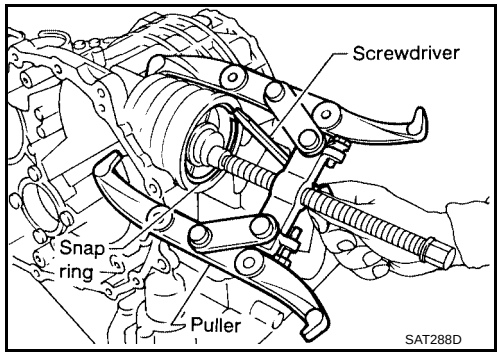
9. Install band servo piston assembly and 2nd servo return spring to transmission case.
   - **Apply ATF to O-ring of band servo piston and transmission case.**



10. Install OD servo piston assembly to transmission case.
    - **Apply ATF to O-ring of band servo piston and transmission case.**



11. Install band servo piston snap ring to transmission case.

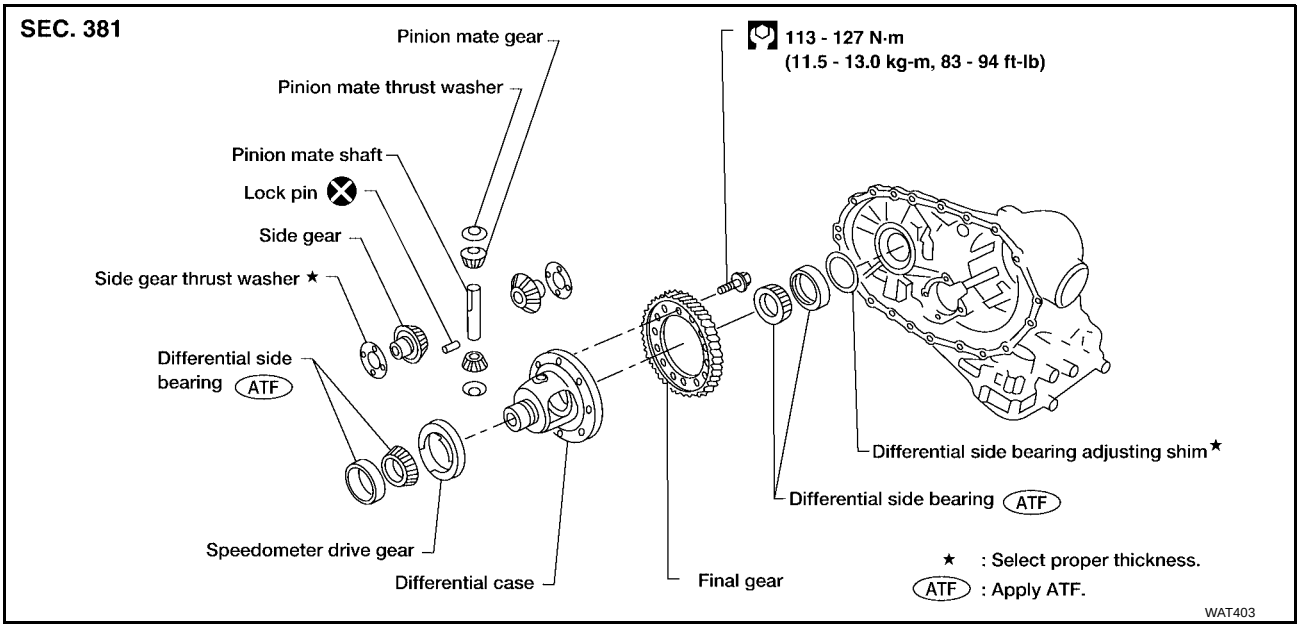


FINAL DRIVE

PFP:38411

Components

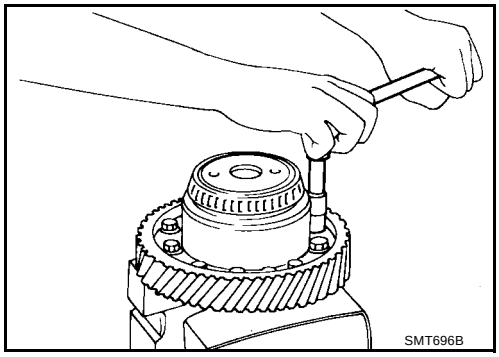
ECS00613



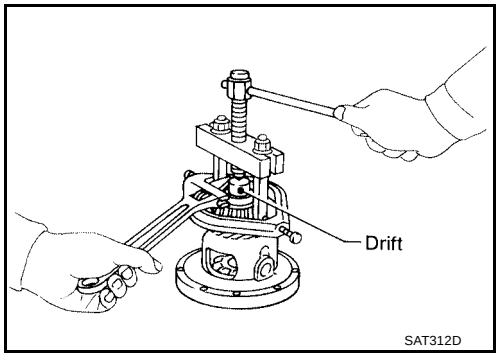
Disassembly

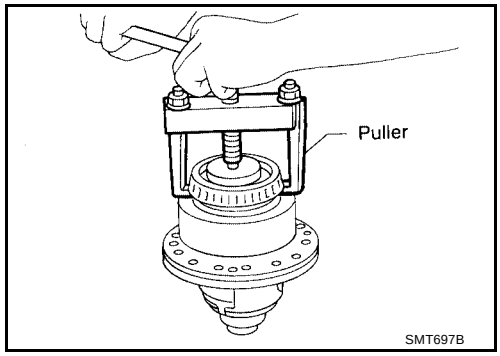
ECS00614

1. Remove final gear.

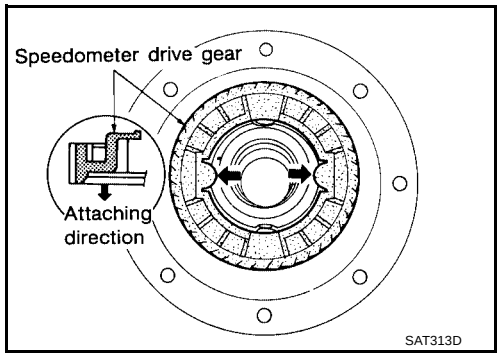


2. Press out differential side bearings.

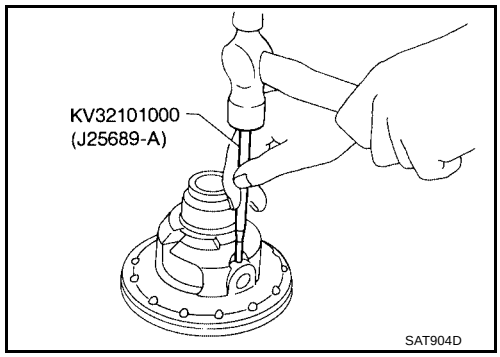




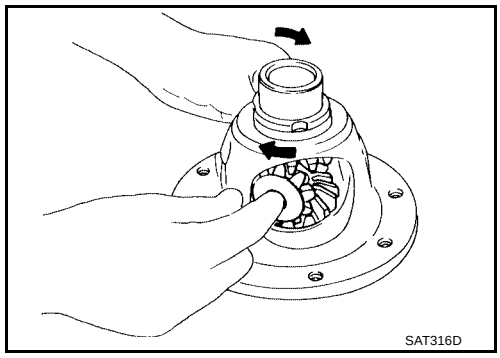
3. Remove speedometer drive gear.



4. Drive out pinion mate shaft lock pin.



5. Draw out pinion mate shaft from differential case.
6. Remove pinion mate gears and side gears.

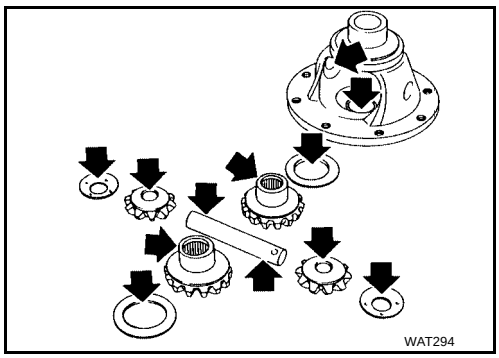


Inspection

ECS00615

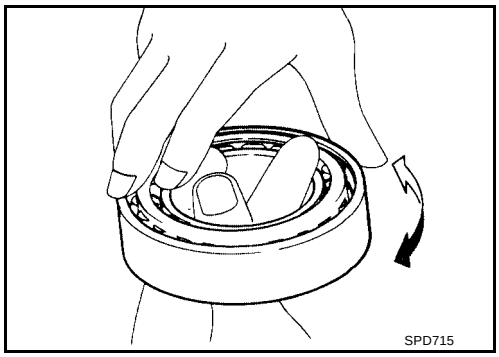
GEAR, WASHER, SHAFT AND CASE

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



BEARINGS

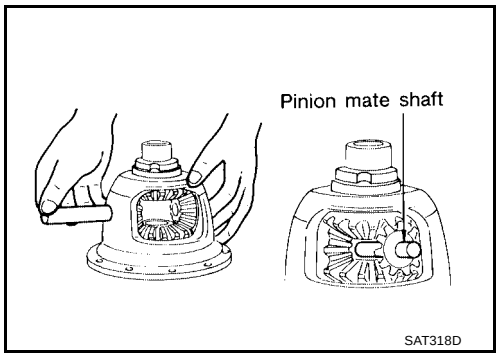
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**



Assembly

ECS00616

1. Install side gear and thrust washers in differential case.
2. Install pinion mate gears and thrust washers in differential case while rotating them.
   - **When inserting, be careful not to damage pinion mate gear washers.**
   - **Apply ATF to any parts.**

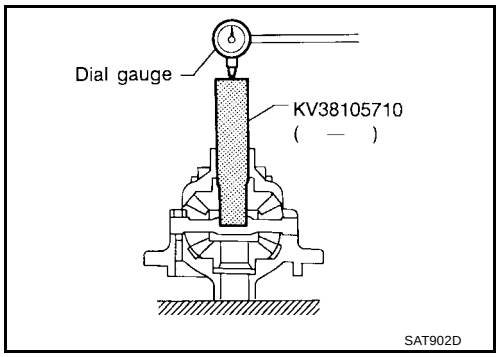


3. Measure clearance between side gear and differential case with washers using the following procedure.

a. Set Tool and dial indicator on side gear.

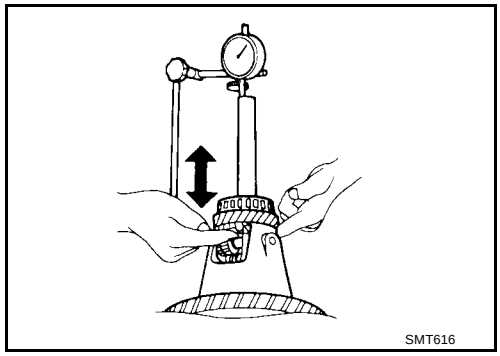
b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

Clearance between side gear and differential case with washers : 0.1 - 0.2 mm (0.004 - 0.008 in)

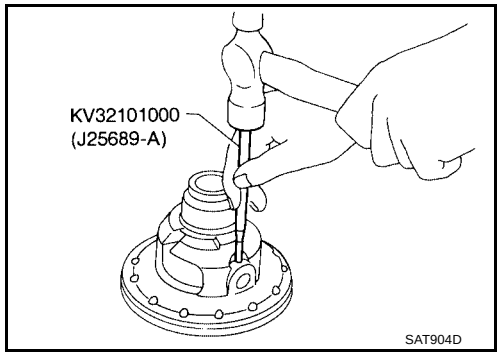


c. If not within specification adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washer	**: Refer to AT-390, "DIFFERENTIAL SIDE GEAR THRUST WASHERS" .**

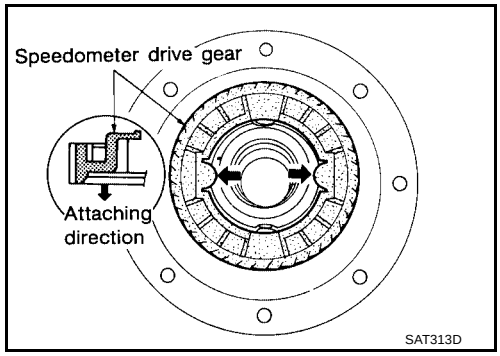

SMT616

4. Install lock pin.
   - **Make sure that lock pin is flush with case.**



SAT904D

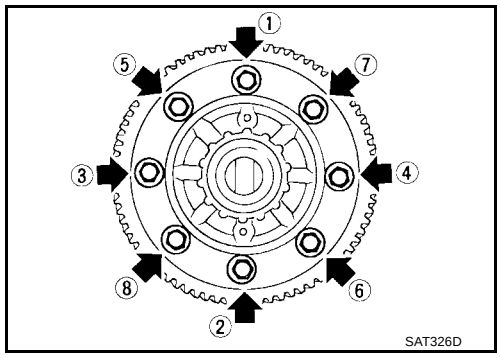
5. Install speedometer drive gear on differential case.
   - **Align the projection of speedometer drive gear with the groove of differential case.**



SAT313D

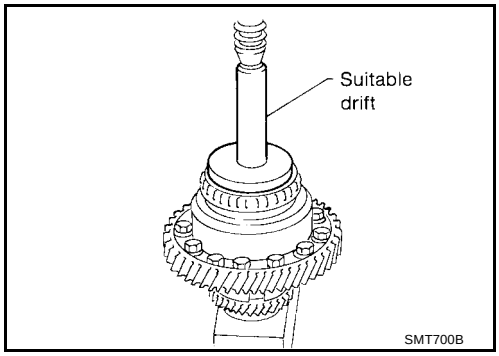
6. Install final gear and tighten fixing bolts in numerical order.

   : 113 - 127 N·m (11.5 - 13.0 kg-m, 83 - 94 ft-lb)



SAT326D

7. Press on differential side bearings.



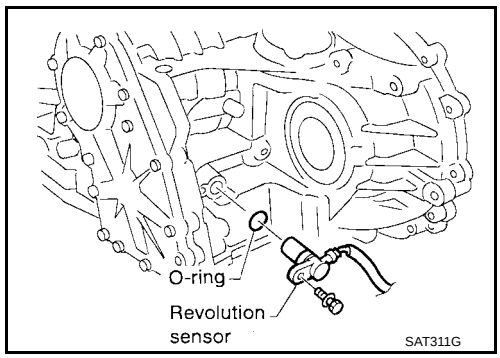
ASSEMBLY

PFP:00000

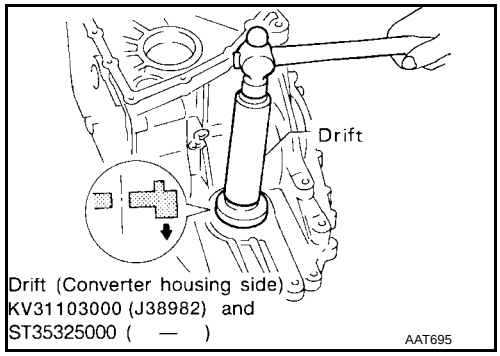
Assembly (1)

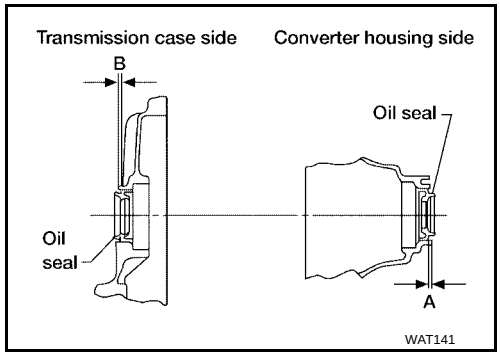
ECS00617

1. Install revolution sensor onto transmission case.
Always use new sealing parts.



2. Install differential side oil seals on transmission case and converter housing, so that “A” and “B” are within specifications.

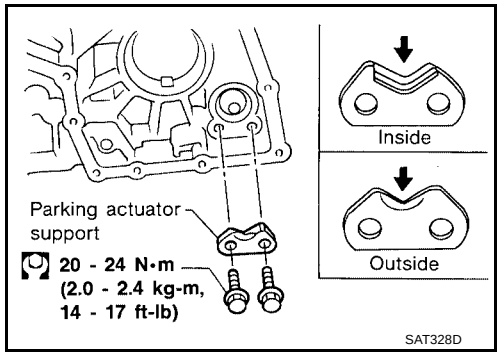




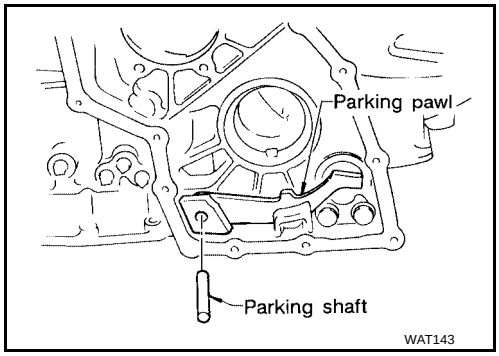
Unit: mm (in)

A	B
5.5 - 6.5 (0.217 - 0.256)	–0.5 to 0.5 (–0.020 to 0.020)

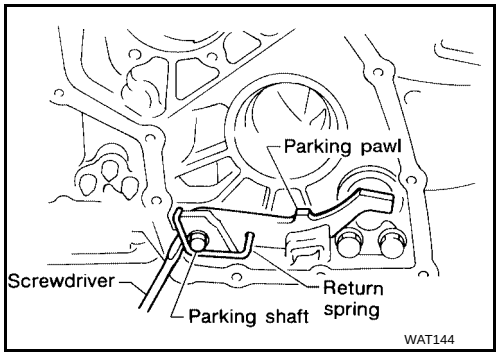
3. Install parking actuator support to transmission case.
- **Pay attention to direction of parking actuator support.**



4. Install parking pawl on transmission case and fix it with parking shaft.



5. Install return spring.

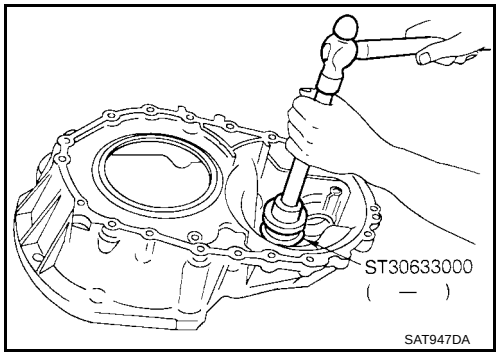


Adjustment (1)

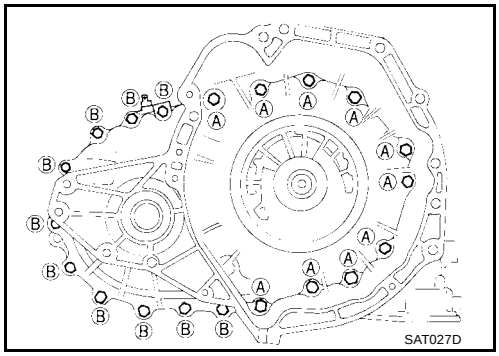
ECS00618

DIFFERENTIAL SIDE BEARING PRELOAD

1. Install differential side bearing outer race without adjusting shim on transmission case.
2. Install differential side bearing outer race on converter housing.



3. Place final drive assembly on transmission case.
4. Install transmission case on converter housing. Tighten transmission case fixing bolts **A** and **B** to the specified torque.

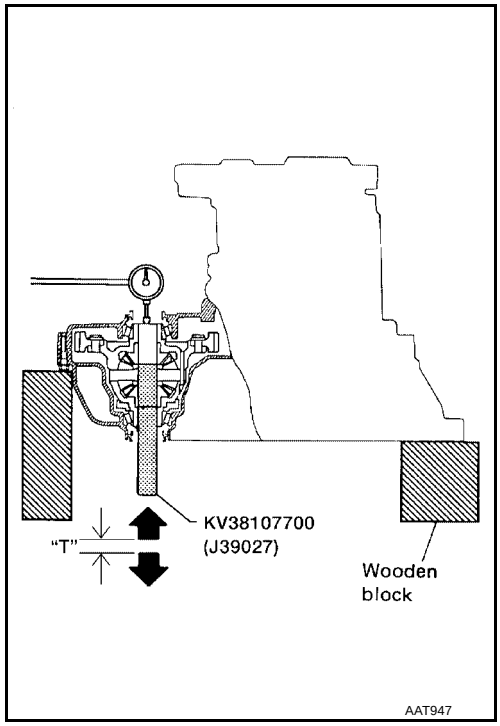


5. Attach dial indicator on differential case at transmission case side.
6. Insert Tool into differential side gear from converter housing.
7. Move Tool up and down and measure dial indicator deflection.

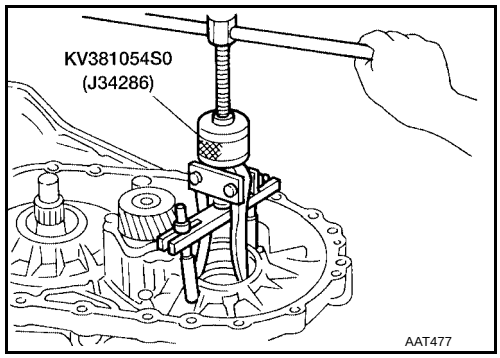
Differential side bearing preload "T" : **0.04 - 0.09 mm (0.0016 - 0.0035 in)**

8. Select proper thickness of differential side bearing adjusting shim(s) using SDS table as a guide.

Differential side bearing adjusting shim : **Refer to AT-390, "DIFFERENTIAL SIDE BEARING ADJUSTING SHIMS" .**



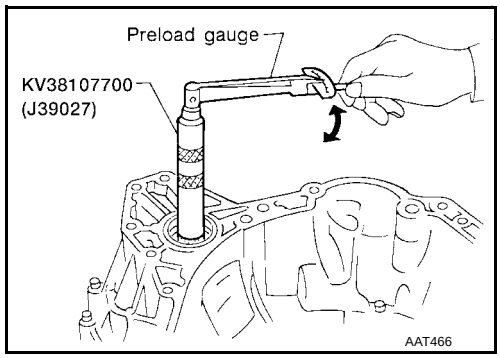
9. Remove converter housing from transmission case.
10. Remove final drive assembly from transmission case.
11. Remove differential side bearing outer race from transmission case.
12. Reinstall differential side bearing outer race and shim(s) selected from SDS table on transmission case.
13. Reinstall converter housing on transmission case and tighten transmission case fixing bolts to the specified torque.



14. Insert Tool into differential case and measure turning torque of final drive assembly.
    - **Turn final drive assembly in both directions several times to seat bearing rollers correctly.**

Turning torque of final drive assembly (New bearing) : **0.49 - 1.08 N·m (5.0 - 11.0 kg-cm, 4.3 - 9.5 in-lb)**

    - **When old bearing is used again, turning torque will be slightly less than the above.**
    - **Make sure torque is within the specified range.**

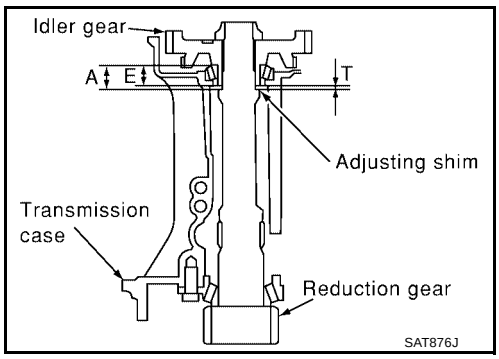


REDUCTION PINION GEAR BEARING PRELOAD

- Be sure to remove final drive assembly before doing this procedure.
- Using caliper and straightedge, calculate a dimension “T” (adjuster shim thickness) using the following formula. Adjust the inspection standard for preload (rotating slide torque) as shown below.

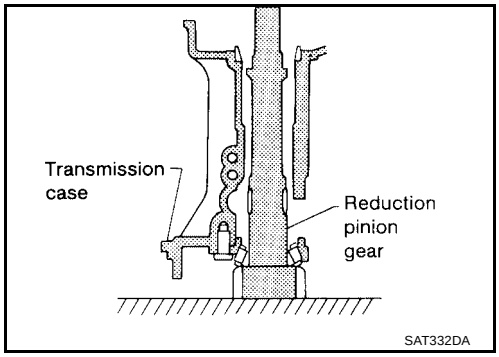
T = A – E

Inspection standard for preload	**:0.1 - 0.69 N·m (1.1 - 7.0 kg-cm, 0.95 - 6.08 in-lb)**



1. Remove transmission case and final drive assembly from converter housing.
2. Select proper thickness of reduction pinion gear bearing adjusting shim using the following procedures.

a. Place reduction pinion gear on transmission case as shown.

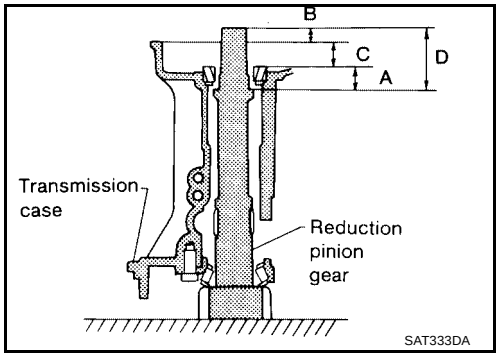


b. Place idler gear bearing on transmission case.

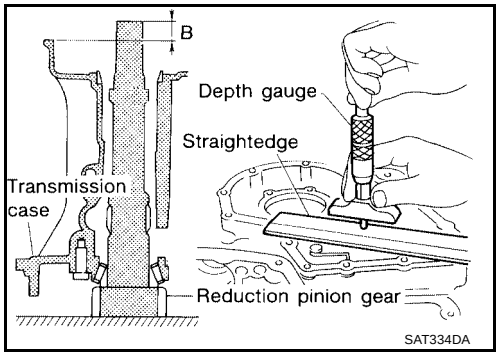
c. Measure dimensions “B”, “C” and “D” and calculate dimension “A”.

A = D – (B + C)

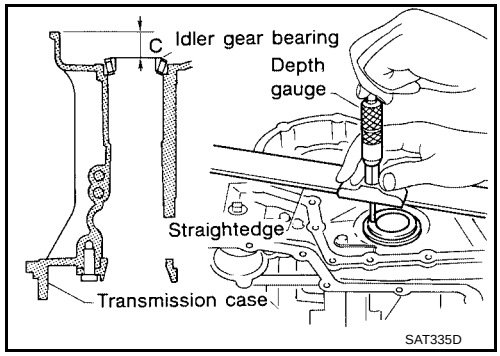
“A”	**: Distance between the surface of idler gear bearing inner race and the adjusting shim mating surface of reduction pinion gear.**



- Measure dimension “B” between the end of reduction pinion gear and the surface of transmission case.
- **Measure dimension “B” in at least two places.**

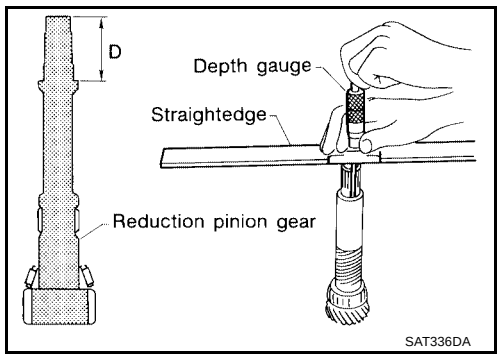


- Measure dimension “C” between the surface of idler gear bearing inner race and the surface of transmission case.
- **Measure dimension “C” in at least two places.**



- Measure dimension “D” between the end of reduction pinion gear and the adjusting shim mating surface of reduction pinion gear.
- **Measure dimension “D” in at least two places.**
- Calculate dimension “A”.

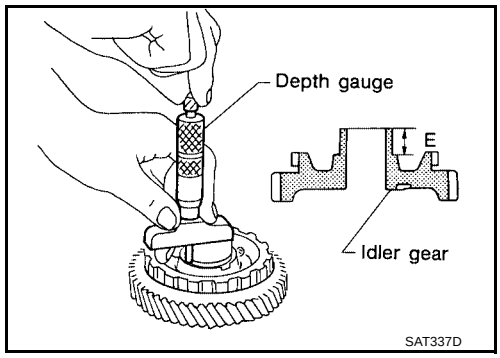
A = D – (B + C)



d. Measure dimension “E” between the end of idler gear and the idler gear bearing inner race mating surface of idler gear.
   - **Measure dimension “E” in at least two places.**
e. Calculate “T” and select proper thickness of reduction pinion gear bearing adjusting shim using SDS table as a guide.

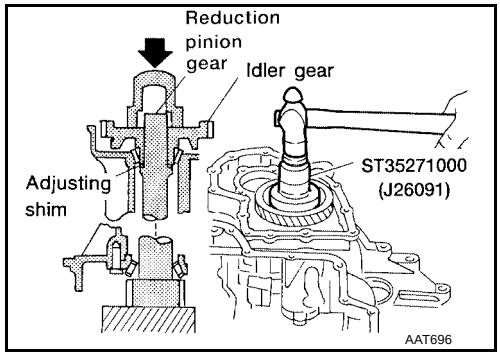
T = A – E – 0.05 mm (0.0020 in)*

Reduction pinion gear bearing adjusting shim : **Refer to** AT-392, "REDUCTION PINION GEAR BEARING ADJUSTING SHIMS" .

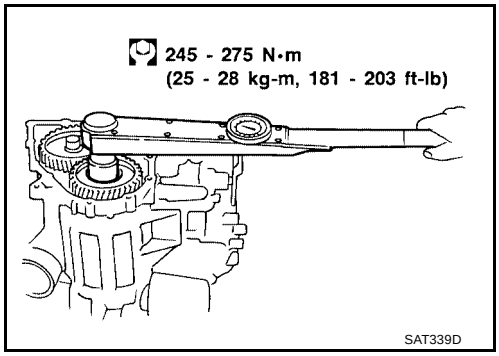


*: Bearing preload

3. Install reduction pinion gear and reduction pinion gear bearing adjusting shim selected in step 2-e on transmission case using Tool.
4. Press idler gear bearing inner race on idler gear.
5. Press idler gear on reduction pinion gear.
   - **Press idler gear so that idler gear can be locked by parking pawl.**

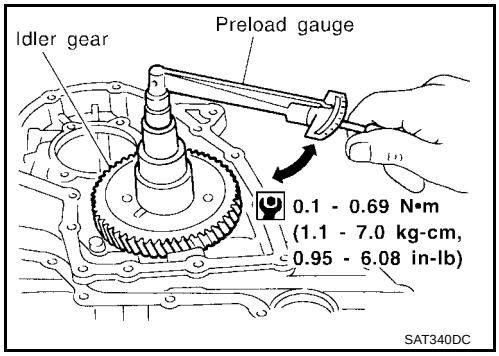


6. Tighten idler gear lock nut to the specified torque.
   - **Lock idler gear with parking pawl when tightening lock nut.**



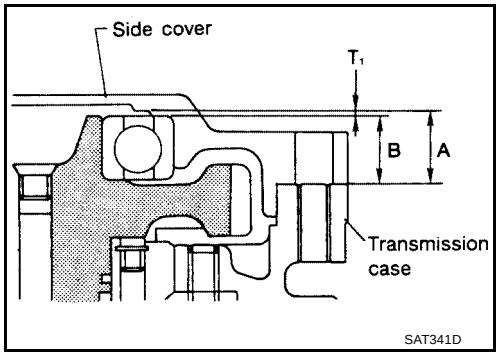
7. Measure turning torque of reduction pinion gear.
   - **When measuring turning torque, turn reduction pinion gear in both directions several times to seat bearing rollers correctly.**

Turning torque of reduction pinion gear	**: 0.1 - 0.69 N·m (1.1 - 7.0 kg-cm, 0.95 - 6.08 in-lb)**

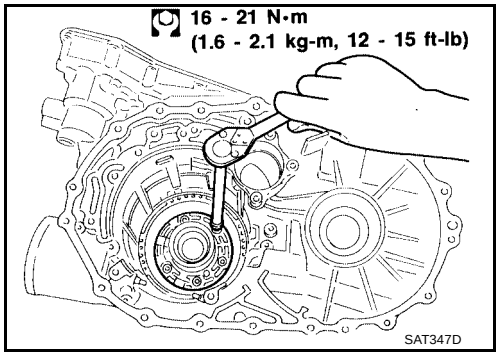


OUTPUT SHAFT END PLAY

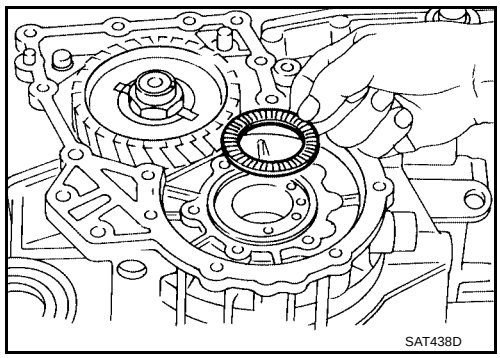
- Measure clearance between side cover and the end of the output shaft bearing.
- Select proper thickness of adjusting shim so that clearance is within specifications.



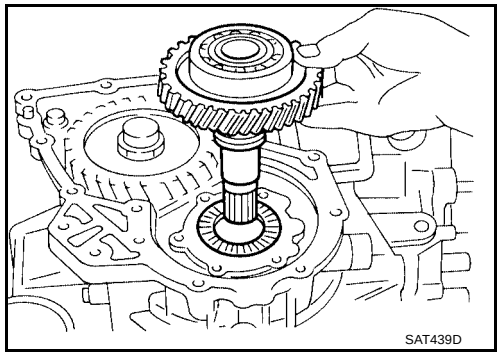
1. Install bearing retainer for output shaft.



2. Install output shaft thrust needle bearing on bearing retainer.



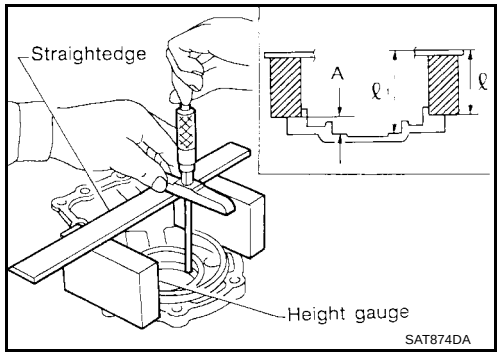
3. Install output shaft on transmission case.



4. Measure dimensions "l_1 " and "l_2 " at side cover and then calculate dimension "A".
   - **Measure dimension "l_1 " and "l_2 " in at least two places**
     "A": Distance between transmission case fitting surface and adjusting shim mating surface

     $A = l_1 - l_2$

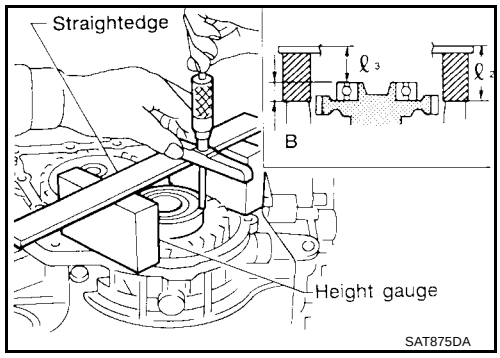
     l_2 : Height of gauge



5. Measure dimensions "l_2 " and "l_3 " and then calculate dimension "B".
   Measure "l_2 " and "l_3 " in at least two places.
   "B": Distance between the end of output shaft bearing outer race and the side cover fitting surface of transmission case

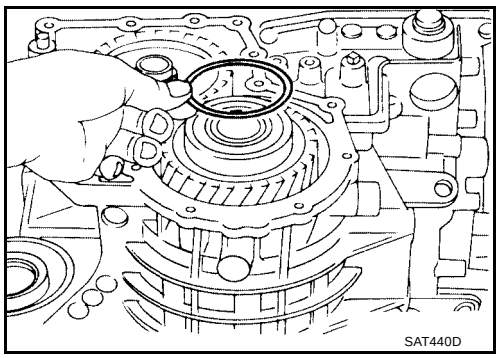
   $B = l_2 - l_3$

   l_2 : Height of gauge



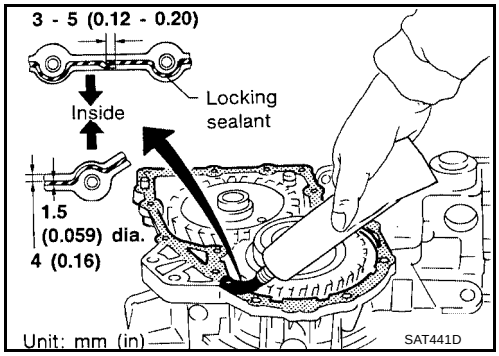
6. Select proper thickness of adjusting shim so that output shaft end play (clearance between side cover and output shaft bearing) is within specifications.

Output shaft end play (A – B)	**: 0 - 0.5 mm (0 - 0.020 in)**
Output shaft end play adjusting shim	**: Refer to AT-393, "OUTPUT SHAFT END PLAY ADJUSTING SHIMS" .**

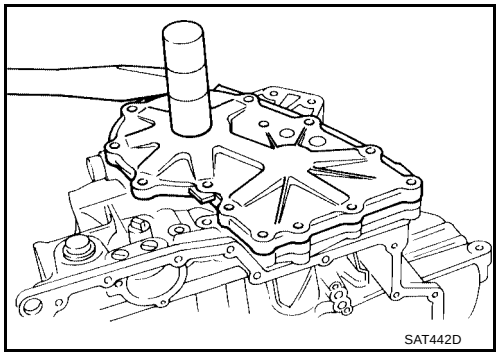


7. Install adjusting shim on output shaft bearing.

8. Apply locking sealant (Loctite 5/8 or equivalent) to transmission case as shown in illustration.



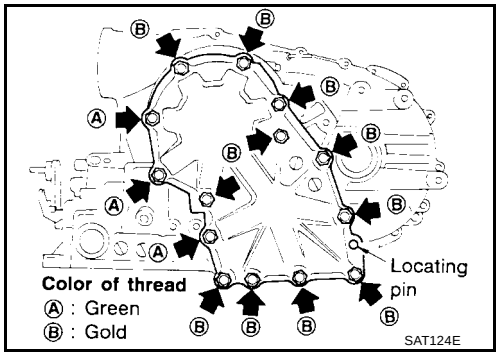
9. Install side cover on transmission case.
   - **Apply locking sealant to the mating surface of transmission case.**



10. Tighten side cover fixing bolts to specified torque.

    : 26 - 30 N·m (2.7 - 3.1 kg-m, 20 - 22 ft-lb)

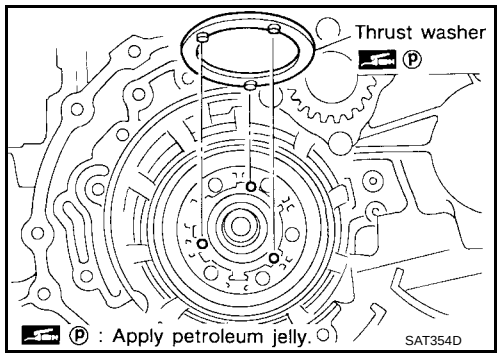
   - **Do not mix bolts A and B.**
   - **Always replace bolts A as they are self-sealing bolts.**



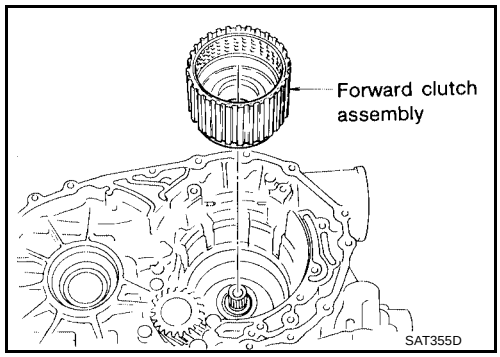
Assembly (2)

ECS00619

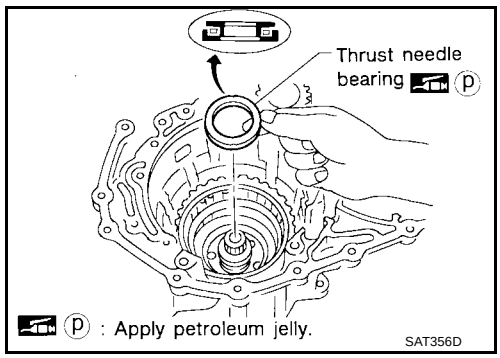
1. Remove paper rolled around bearing retainer.
2. Install thrust washer on bearing retainer.
   - **Apply petroleum jelly to thrust washer.**



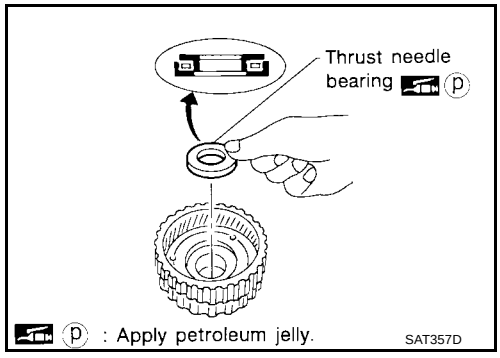
3. Install forward clutch assembly.
   - **Align teeth of low & reverse brake drive plates before installing.**
   - **Make sure that bearing retainer seal rings are not spread.**



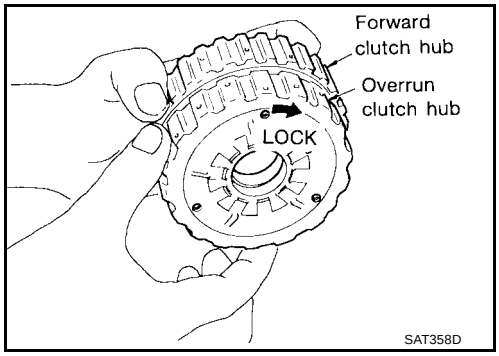
4. Install thrust needle bearing on bearing retainer.
   - **Apply petroleum jelly to thrust bearing.**
   - **Pay attention to direction of thrust needle bearing.**



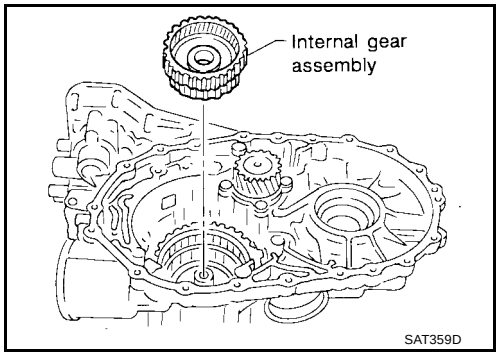
5. Install thrust needle bearing on rear internal gear.
   - **Apply petroleum jelly to thrust needle bearing.**
   - **Pay attention to direction of thrust needle bearing.**



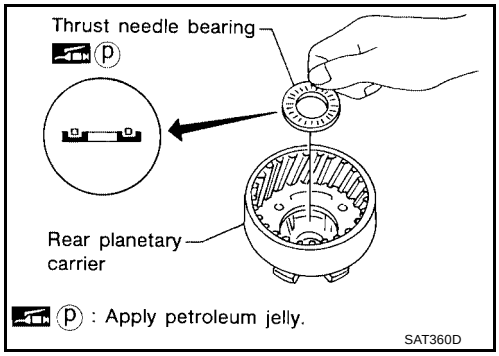
6. Hold forward clutch hub and turn overrun clutch hub.
   Check overrun clutch hub for directions of lock and unlock.
   - If not as shown in illustration, check installed direction of forward one-way clutch.



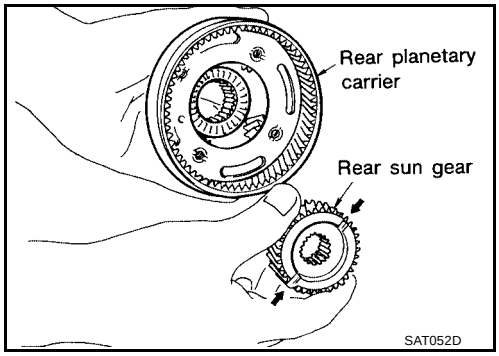
7. Install rear internal gear assembly.
   - **Align teeth of forward clutch and overrun clutch drive plate.**



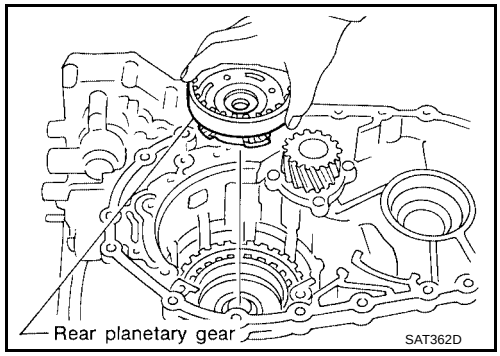
8. Install needle bearing on rear planetary carrier.
   - **Apply petroleum jelly to needle bearing.**
   - **Pay attention to direction of needle bearing.**



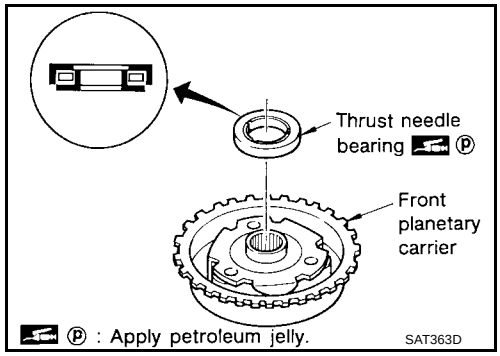
9. Install rear sun gear on rear planetary carrier.
   - **Pay attention to direction of rear sun gear.**



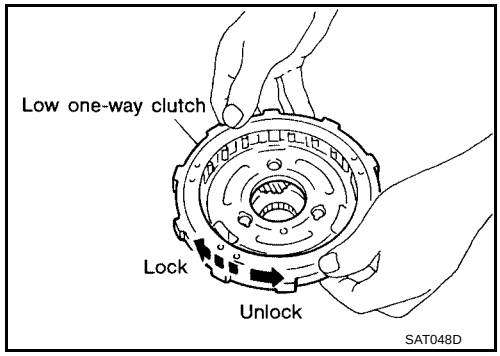
10. Install rear planetary carrier on transmission case.



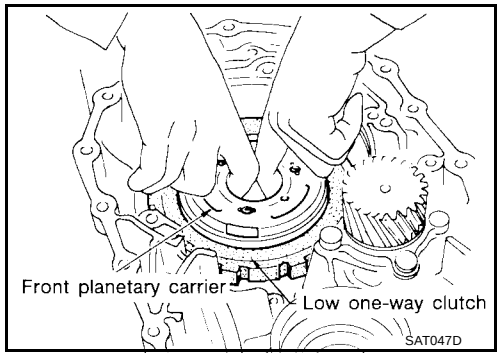
11. Install thrust needle bearing on front planetary carrier.
    - **Apply petroleum jelly to thrust needle bearing.**
    - **Pay attention to direction of thrust needle bearing.**



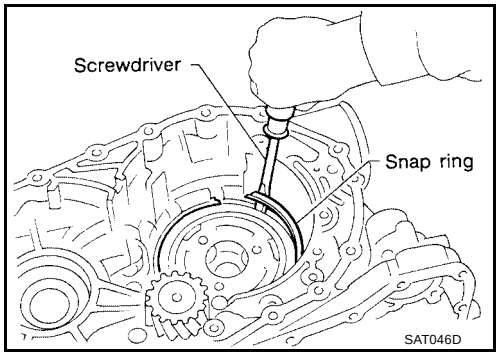
12. Install low one-way clutch to front planetary carrier by turning it in the direction of the arrow as shown.
13. While holding front planetary carrier, turn low one-way clutch. Check low one-way clutch for correct directions of lock and unlock.



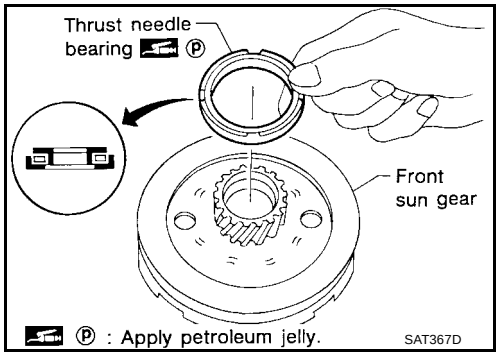
14. Install front planetary carrier assembly on transmission case.



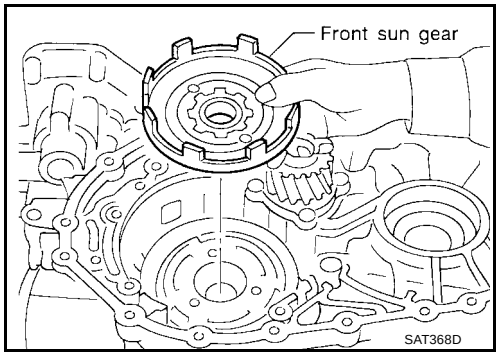
15. Install snap ring with screwdriver.
    - **Forward clutch and bearings must be correctly installed for snap ring to fit groove of transmission case.**



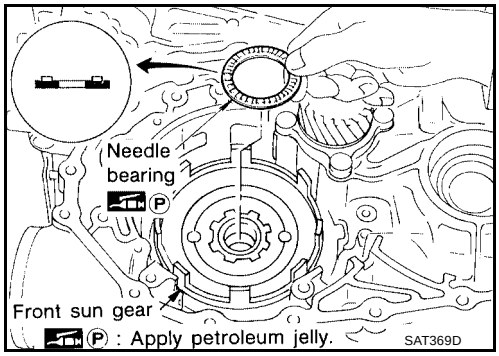
16. Install needle bearing on front sun gear.
    - **Apply petroleum jelly to needle bearing.**
    - **Pay attention to direction of needle bearing.**



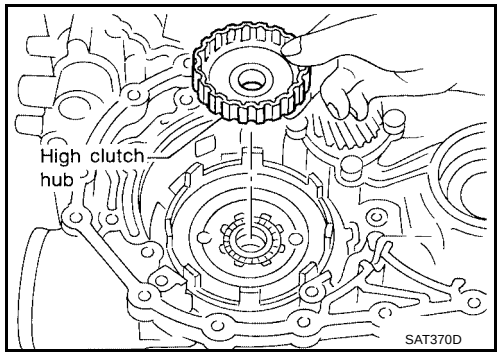
17. Install front sun gear on front planetary carrier.



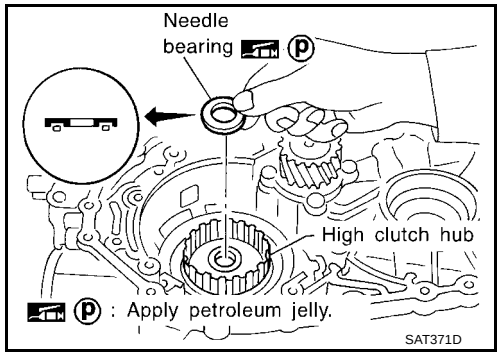
18. Install needle bearing on front sun gear.
    - **Apply petroleum jelly to needle bearing.**
    - **Pay attention to direction of needle bearing.**



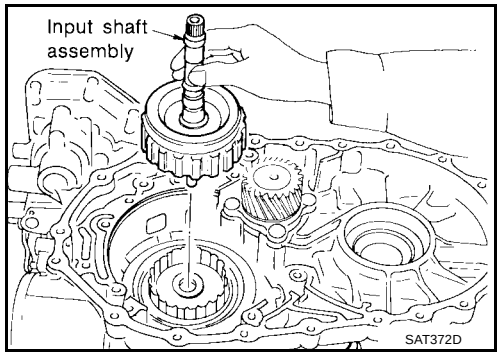
19. Install high clutch hub on front sun gear.



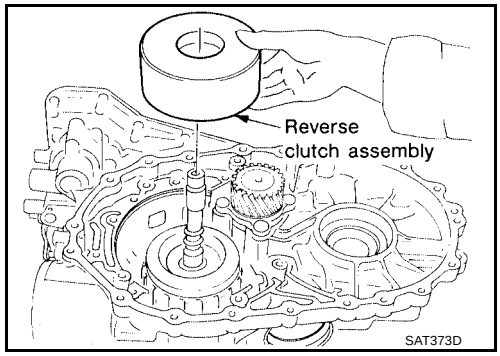
20. Install needle bearing on high clutch hub.
    - **Apply petroleum jelly to needle bearing.**
    - **Pay attention to direction of needle bearing.**



21. Remove paper rolled around input shaft.
22. Install input shaft assembly.
    - **Align teeth of high clutch drive plates before installing.**



23. Install reverse clutch assembly.
    - **Align teeth of reverse clutch drive plates before installing.**



Adjustment (2)

ECS0061A

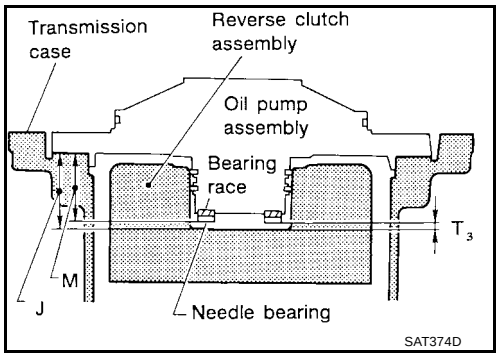
When any parts listed below are replaced, adjust total end play and reverse clutch end play.

Part name	Total end play	Reverse clutch end play
Transmission case	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●

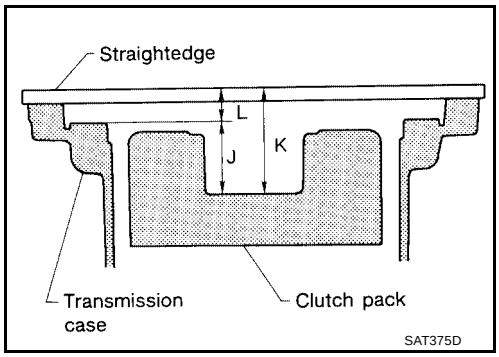
Part name	Total end play	Reverse clutch end play
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	—	●

TOTAL END PLAY

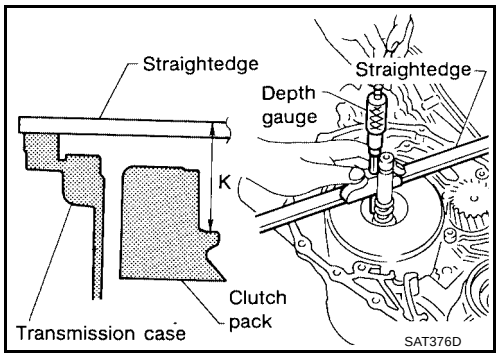
- Measure clearance between reverse clutch drum and needle bearing for oil pump cover.
- Select proper thickness of bearing race so that end play is within specifications.



1. Measure dimensions “K” and “L” and then calculate dimension “J”.



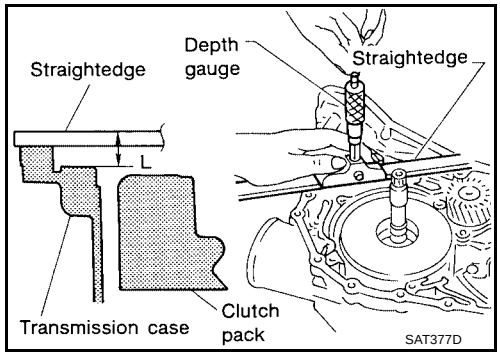
a. Measure dimension “K”.



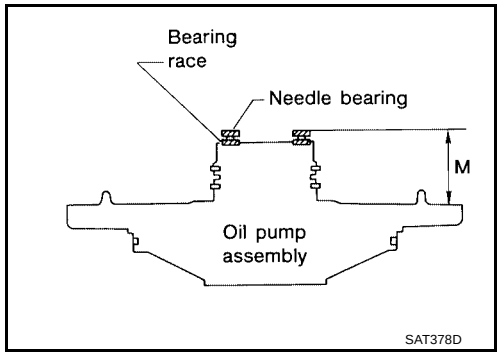
b. Measure dimension “L”.

c. Calculate dimension “J”.
“J”: Distance between oil pump fitting surface of transmission case and needle bearing mating surface of high clutch drum

J = K – L

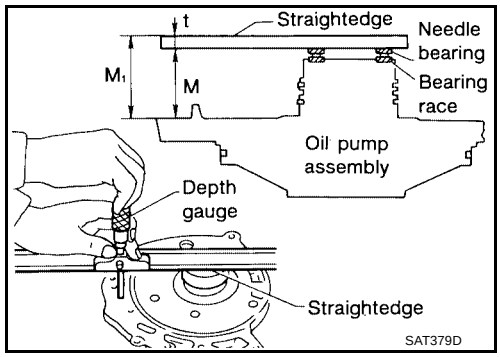


2. Measure dimension “M”.



a. Place bearing race and needle bearing on oil pump assembly.

b. Measure dimension “M”.
“M”: Distance between transmission case fitting surface and needle bearing on oil pump cover
“M_1 ”: Indication of gauge



c. Measure thickness of straightedge “t”.

$M = M_1 – t$

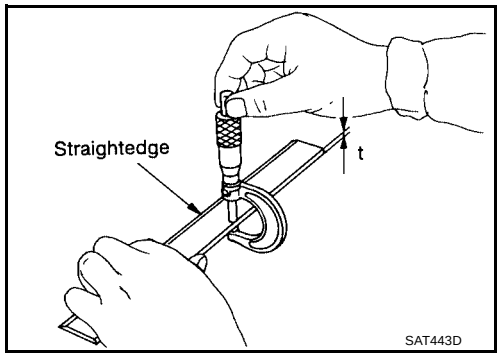
3. Adjust total end play “T_3 ”.

$T_3 = J – M$

Total end play “T_3 : 0.25 - 0.55 mm (0.0098 - 0.0217 in) ”

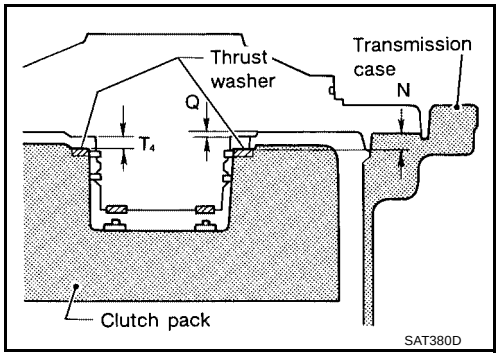
- Select proper thickness of bearing race so that total end play is within specifications.

Bearing races **: Refer to AT-394, "BEARING RACE FOR ADJUSTING TOTAL END PLAY"**

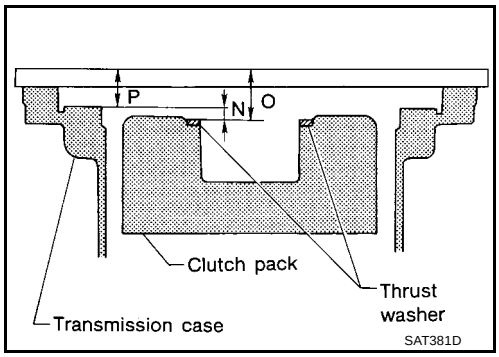


REVERSE CLUTCH END PLAY

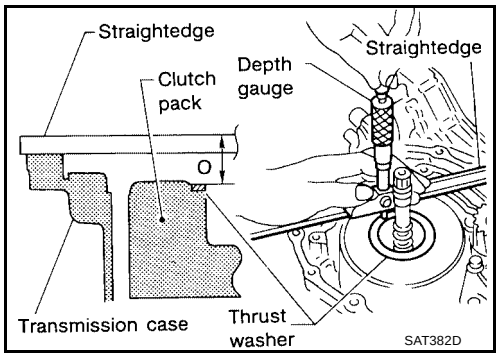
- Measure clearance between oil pump cover and thrust washer for reverse clutch drum.
- Select proper thickness of thrust washer so that end play is within specifications.



1. Measure dimensions “O” and “P” and then calculate dimension “N”.

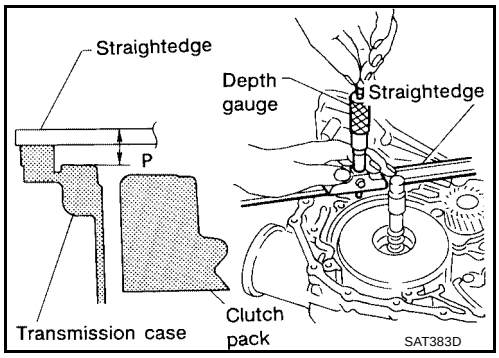


a. Place thrust washer on reverse clutch drum.

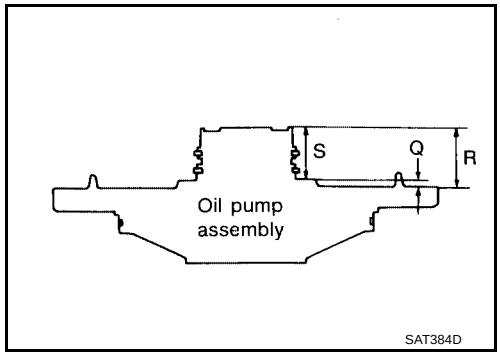


b. Measure dimension “O”.
c. Measure dimension “P”.
d. Calculate dimension “N”.
“N”: Distance between oil pump fitting surface of transmission case and thrust washer on reverse clutch drum

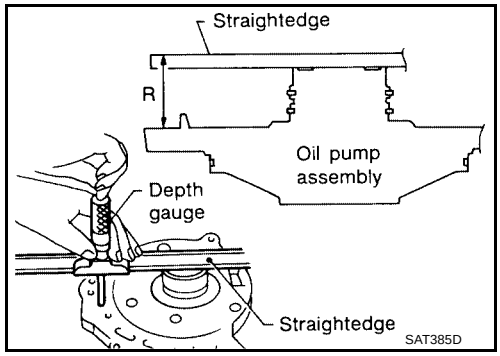
N = O – P



2. Measure dimensions “R” and “S” and then calculate dimension “Q”.



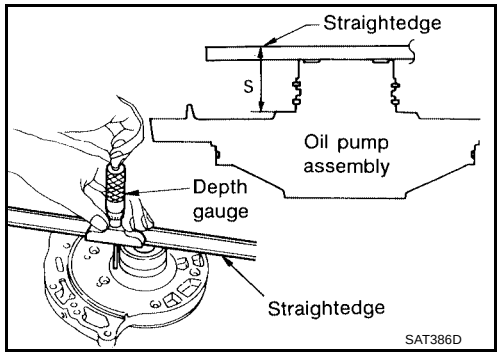
a. Measure dimension “R”.



b. Measure dimension “S”.

c. Calculate dimension “Q”.
“Q”: Distance between transmission case fitting surface and thrust washer mating surface

Q = R – S



3. Adjust reverse clutch end play “T_4 ”.

T_4 = N – Q

Reverse clutch end play	**: 0.65 - 1.00 mm (0.0256 - 0.0394 in)**

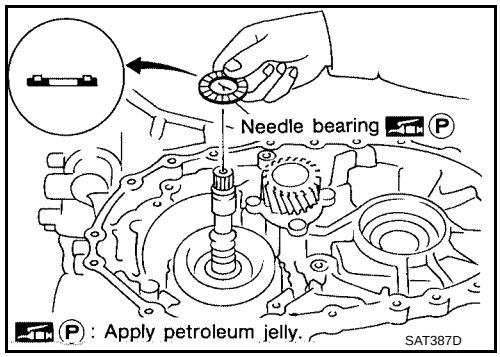
- Select proper thickness of thrust washer so that reverse clutch end play is within specifications.

Thrust washer	**: Refer to AT-394, "THRUST WASHERS FOR ADJUSTING REVERSE CLUTCH END PLAY"**

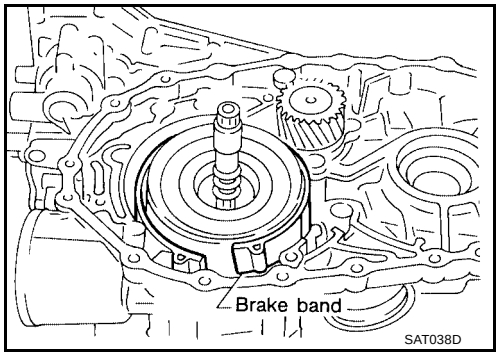
Assembly (3)

ECS0061B

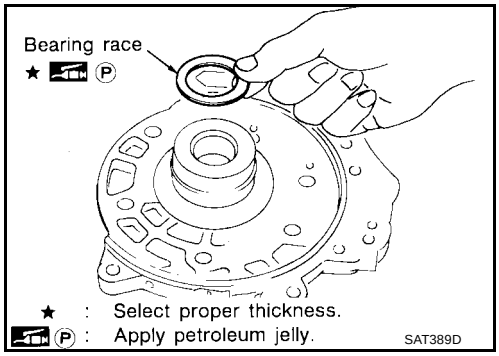
1. Remove reverse clutch assembly and install needle bearing on high clutch assembly.
   - **Pay attention to direction of needle bearing.**
2. Install reverse clutch assembly.



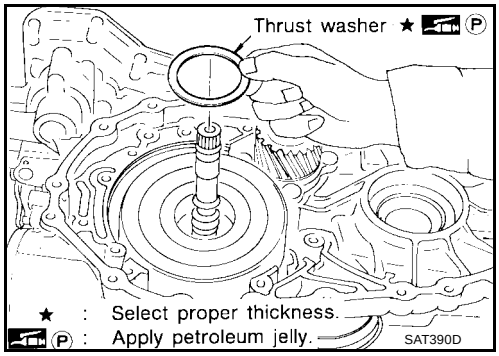
3. Install anchor end pin and lock nut on transmission case.
4. Place brake band on outside of reverse clutch drum. Tighten anchor end pin just enough so that brake band is evenly fitted on reverse clutch drum.



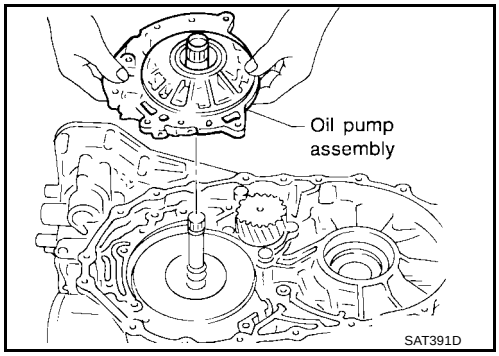
5. Place bearing race selected in total end play adjustment step on oil pump cover.
   - **Apply petroleum jelly to bearing race.**



6. Place thrust washer selected in reverse clutch end play step on reverse clutch drum.
   - **Apply petroleum jelly to thrust washer.**

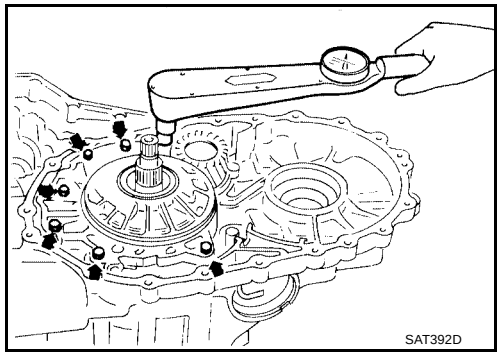


7. Install oil pump assembly on transmission case.

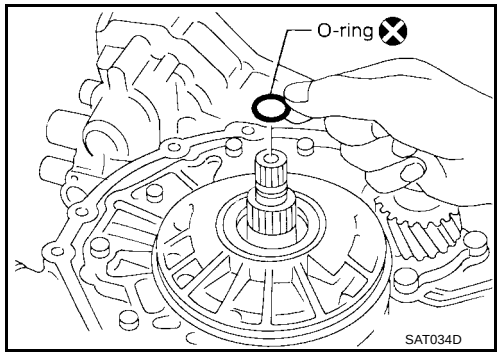


8. Tighten oil pump fixing bolts to specified torque.

: 18 - 21 N·m (1.8 - 2.1 kg-m, 13 - 15 ft-lb)



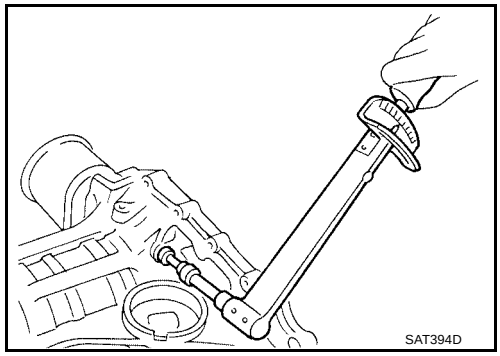
9. Install O-ring to input shaft.
   - **Apply ATF to O-ring.**



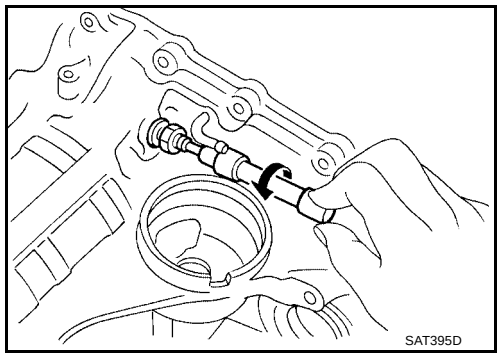
10. Adjust brake band.

a. Tighten anchor end pin to specified torque.

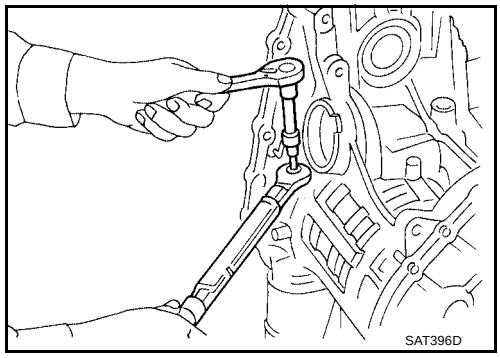
Anchor end pin	**: 3.9 - 5.9 N·m (0.4 - 0.6 kg-m, 35 - 52 in-lb)**



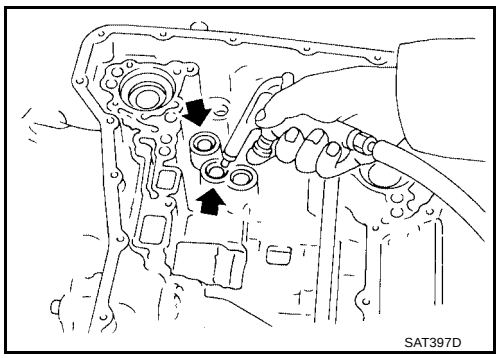
b. Back off anchor end pin two and a half turns.



c. While holding anchor end pin, tighten lock nut.



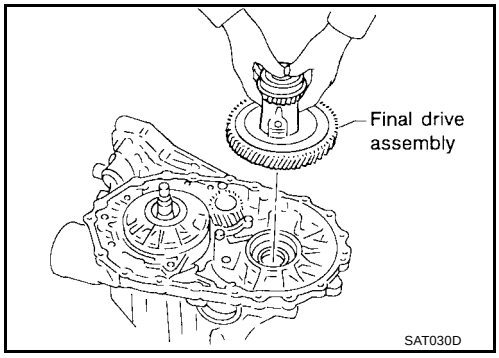
11. Apply compressed air to oil holes of transmission case and check operation of brake band.



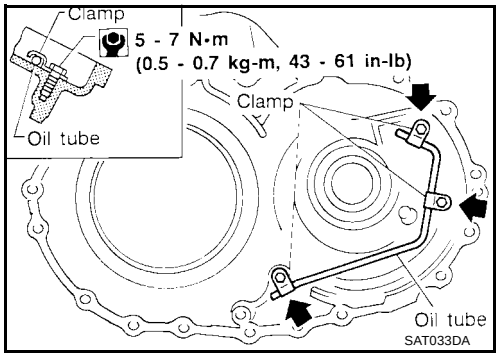
Assembly (4)

ECS0061C

1. Install final drive assembly on transmission case.

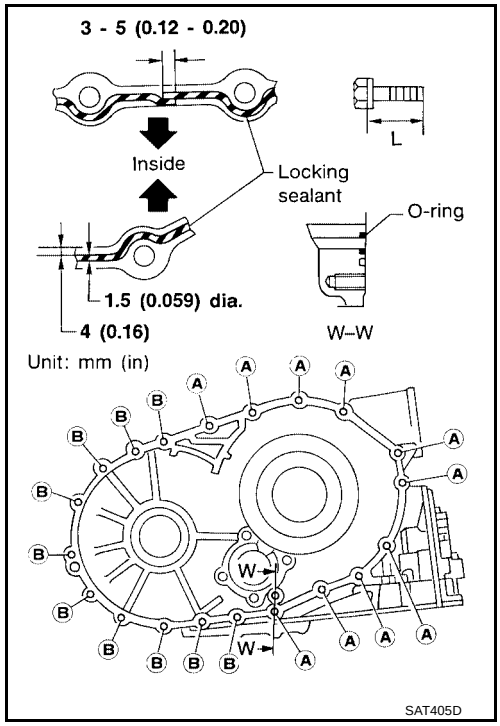


2. Install oil tube on converter housing.



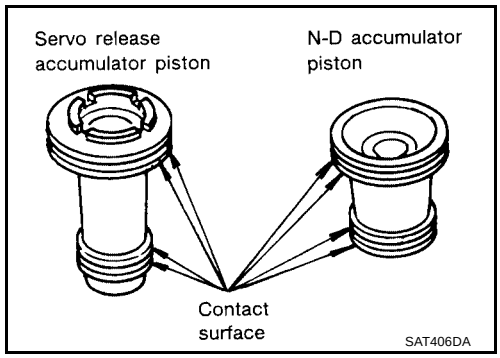
3. Install O-ring on differential oil port of transmission case.
4. Install converter housing on transmission case.
   - **Apply locking sealant to mating surface of converter housing.**

Bolt	Length mm (in)
A	32.8 (1.291)
B	40 (1.57)



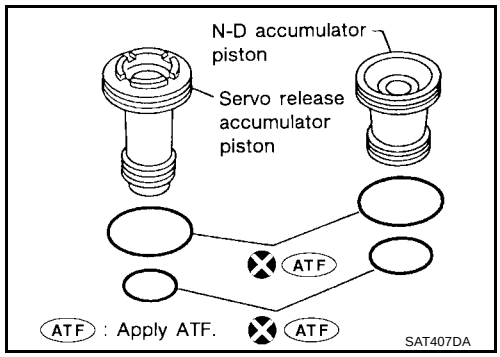
5. Install accumulator piston.

a. Check contact surface of accumulator piston for damage.



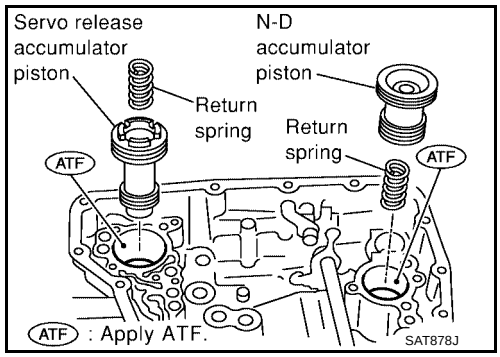
b. Install O-rings on accumulator piston.
   - Apply ATF to O-rings.

Accumulator piston O-rings **: Refer to AT-394, "O-RING" .**

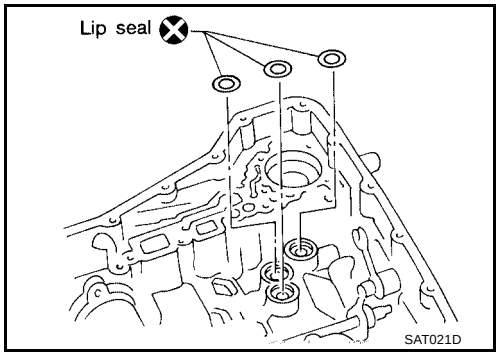


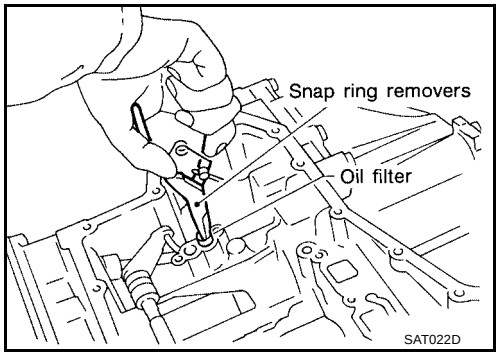
c. Install accumulator pistons and return springs on transmission case.
   - **Apply ATF to inner surface of transmission case.**

Return springs **: Refer to AT-394, "RETURN SPRING" .**



6. Install lip seals for band servo oil holes on transmission case.

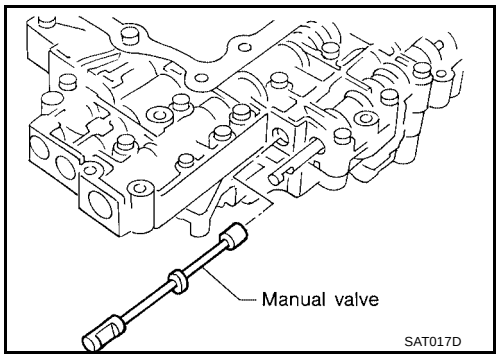




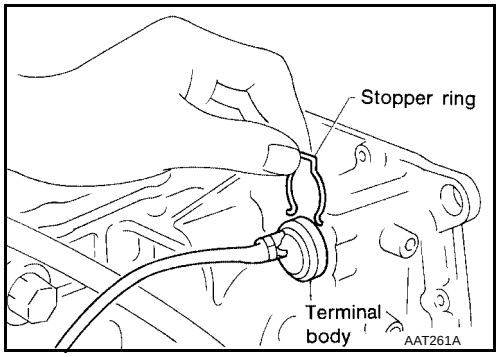
- **Apply petroleum jelly to lip seals.**

7. Install control valve assembly.

a. Insert manual valve into control valve assembly.
   - **Apply ATF to manual valve.**

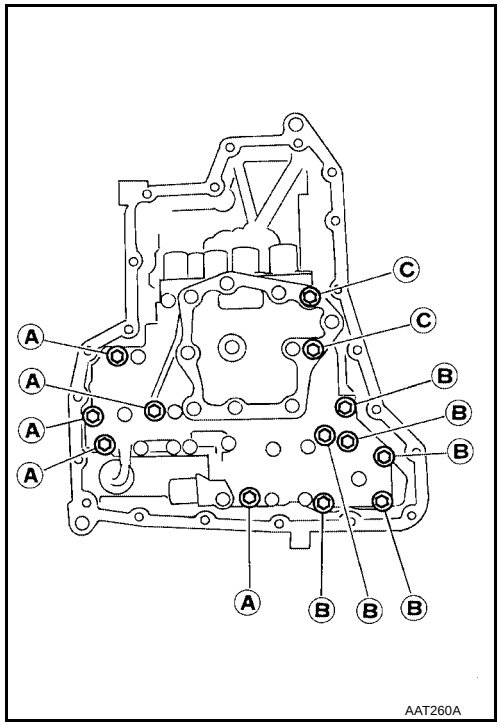


b. Pass solenoid harness through transmission case and install terminal body on transmission case by pushing it.
c. Install stopper ring to terminal body.



d. Tighten bolts **A** , **B** and **C** .

: **7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)**



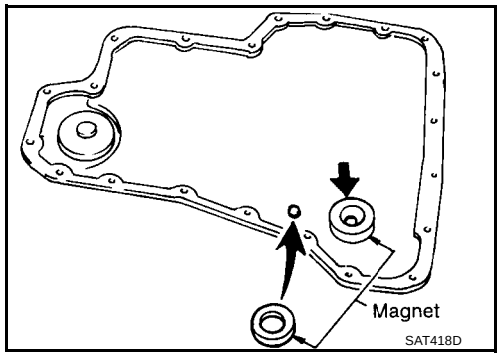
AAT260A

Bolt length, number and location

Bolt symbol	A	B	C
Bolt length “l”	40.0 mm (1.575 in)	33.0 mm (1.299 in)	43.5 mm (1.713 in)
Number of bolts	5	6	2

8. Install oil pan.

a. Attach magnet to oil pan.



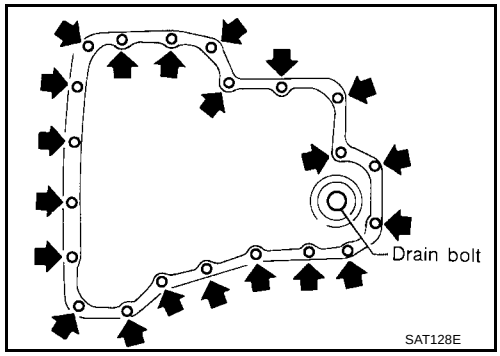
SAT418D

b. Install new oil pan gasket on transmission case.

c. Install oil pan on transmission case.

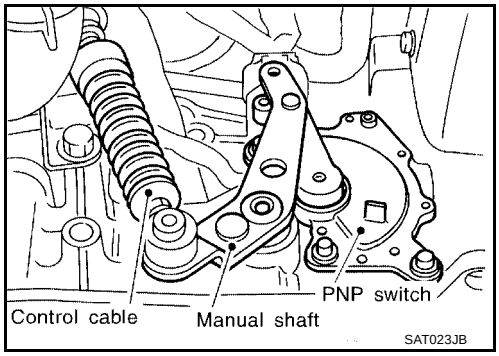
- **Always replace oil pan bolts as they are self-sealing bolts.**
- **Tighten the bolts in a criss-cross pattern to prevent dislocation of gasket.**

d. Tighten drain plug to specified torque.

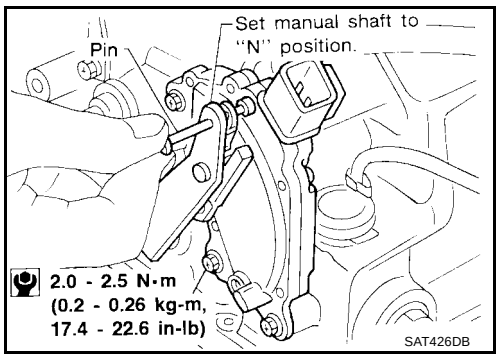


SAT128E

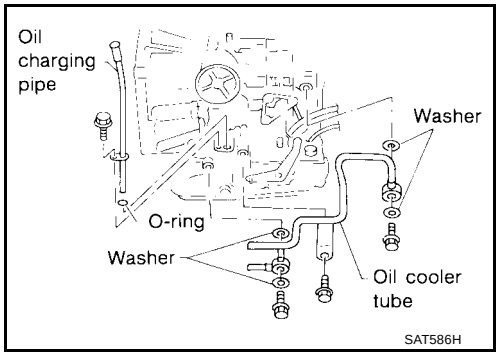
9. Install PNP switch.
a. Set manual shaft in “P” position.
b. Temporarily install PNP switch on manual shaft.
c. Move selector lever to “N” position.



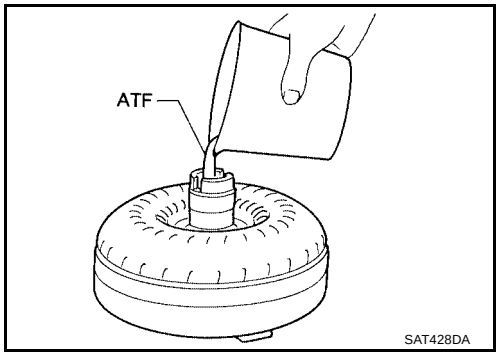
d. Use a 4 mm (0.157 in) pin for this adjustment.
   1. Insert the pin straight into the manual shaft adjustment hole.
   2. Rotate PNP switch until the pin can also be inserted straight into hole in PNP switch.
e. Tighten PNP switch fixing bolts.
f. Remove pin from adjustment hole after adjusting PNP switch.



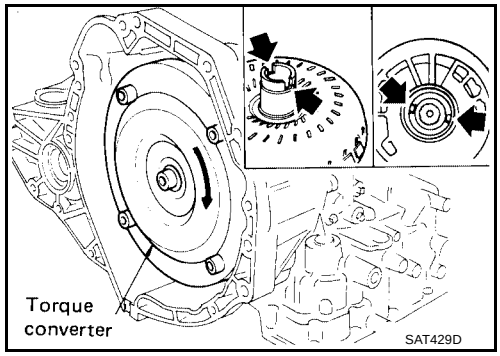
10. Install oil charging pipe and oil cooler tube to transmission case.



11. Install torque converter.
a. Pour ATF into torque converter.
   - **Approximately 1 liter (1-1/8 US qt, 7/8 Imp qt) of fluid is required for a new torque converter.**
   - **When reusing old torque converter, add the same amount of fluid as was drained.**

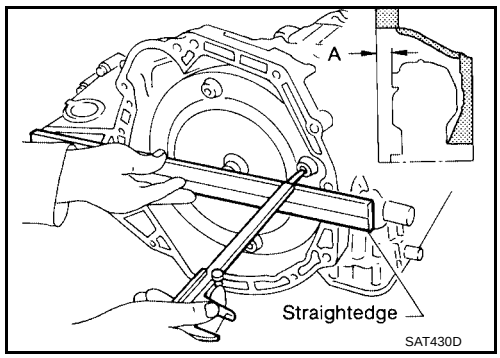


b. Install torque converter while aligning notches of torque converter with notches of oil pump.



c. Measure distance “A” to check that torque converter is in proper position.

Distance “A” : 21.1 mm (0.831 in)



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

ECS0061D

Engine		QG18DE
Automatic transaxle model		RE4F03B
Automatic transaxle assembly	Model code number	3AX60
Transaxle gear ratio	1st	2.861
	2nd	1.562
	3rd	1.000
	4th	0.698
	Reverse	2.230
	Final drive	3.827
Recommended fluid		Nissan Matic “D” (Continental U.S. and Alaska) or Genuine Nissan Automatic Transmission Fluid (Canada)*1
Fluid capacity		7.0l (7-3/8 US qt, 6-1/8 Imp qt)

*1: Refer to MA-13, "Fluids and Lubricants" .

Shift Schedule

ECS0061E

VEHICLE SPEED WHEN SHIFTING GEARS

QG18DE (Calif. CA Model)

Throttle position	Shift pattern	Vehicle speed km/h (MPH)						
		$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	Comfort	54 - 62 (34 - 39)	103 - 111 (64 - 69)	163 - 171 (101 - 106)	159 - 167 (99 - 104)	93 - 101 (58 - 63)	41 - 49 (25 - 30)	54 - 62 (34 - 39)
Half throttle	Comfort	32 - 40 (20 - 25)	60 - 68 (37 - 42)	124 - 132 (77 - 82)	70 - 78 (43 - 48)	35 - 43 (22 - 27)	25 - 33 (16 - 21)	54 - 62 (34 - 39)

QG18DE (Except Calif. CA Model)

Throttle position	Shift pattern	Vehicle speed km/h (MPH)						
		$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	Comfort	52 - 60 (32 - 37)	100 - 108 (62 - 67)	158 - 166 (98 - 103)	154 - 162 (96 - 101)	70 - 98 (56 - 61)	41 - 49 (25 - 30)	52 - 60 (32 - 37)
Half throttle	Comfort	31 - 39 (19 - 24)	58 - 66 (36 - 41)	119 - 127 (74 - 79)	68 - 76 (42 - 47)	34 - 42 (21 - 26)	24 - 32 (15 - 20)	52 - 60 (32 - 37)

VEHICLE SPEED WHEN PERFORMING LOCK-UP

QG18DE (Calif. CA Model)

Throttle opening	OD switch	Shift pattern	Vehicle speed km/h (MPH)	
			Lock-up ON	Lock-up OFF
2/8	ON (D_4)	Comfort	97 - 105 (60 - 65)	63 - 71 (39 - 44)
	OFF (D_3)	Comfort	86 - 94 (53 - 58)	83 - 91 (52 - 57)

QG18DE (Except Calif. CA Model)

Throttle opening	OD switch	Shift pattern	Vehicle speed km/h (MPH)	
			Lock-up ON	Lock-up OFF
2/8	ON (D_4)	Comfort	94 - 102 (58 - 63)	61 - 69 (38 - 43)
	OFF (D_3)	Comfort	86 - 94 (53 - 58)	83 - 91 (52 - 57)

Stall Revolution

ECS0061F

Engine model	Stall revolution rpm
QG18DE	2,350 - 2,800

Line Pressure

ECS0061G

Engine speed rpm	Line pressure kPa (kg/cm^2 , psi)			
	R position	D position	2 position	1 position
Idle	778 (7.9, 113)	500 (5.1, 73)	500 (5.1, 73)	500 (5.1, 73)
Stall	1,816 (18.5, 263)	1,167 (11.9, 169)	1,167 (11.9, 169)	1,167 (11.9, 169)

Control Valves

ECS0061H

CONTROL VALVE AND PLUG RETURN SPRINGS

Unit: mm (in)

	No.	Parts	Part No.*	Free length	Outer diameter
Upper body Refer to AT-308, "CONTROL VALVE UPPER BODY" .	35	3-2 timing valve spring	31736-01X00	23.29 (0.917)	6.65 (0.2618)
	19	Cooler check valve spring	31742-3AX05	28.04 (1.1039)	7.15 (0.2815)
	23	Pilot valve spring	31742-3AX03	38.98 (1.5346)	8.9 (0.350)
	15	1-2 accumulator valve spring	31742-3AX00	20.5 (0.807)	6.95 (0.2736)
	28	1-2 accumulator piston spring	31742-3AX09	55.66 (2.1913)	19.5 (0.7677)
	33	1st reducing valve spring	31742-80X05	27.0 (1.063)	7.0 (0.276)
	2	Overrun clutch reducing valve spring	31742-80X06	37.5 (1.476)	7.0 (0.276)
	7	Torque converter relief valve spring	31742-3AX04	33.3 (1.3110)	9.0 (0.354)
	10	Torque converter clutch control valve spring	31742-3AX02	53.01 (2.0870)	6.5 (0.256)
Lower body Refer to AT-312, "CONTROL VALVE LOWER BODY" .	34	Shuttle control valve spring	31762-41X04	51.0 (2.0079)	5.65 (0.2224)
	18	Pressure regulator valve spring	31742-80X13	45.0 (1.772)	15.0 (0.591)
	23	Overrun clutch control valve spring	31762-80X00	21.7 (0.854)	7.0 (0.276)
	27	Accumulator control valve spring	31742-80X02	22.0 (0.866)	6.5 (0.256)
	29	Shift valve A spring	31762-80X00	21.7 (0.854)	7.0 (0.276)
	2	Shift valve B spring	31762-80X00	21.7 (0.854)	7.0 (0.276)
	11	Pressure modifier valve spring	31742-41X15	30.5 (1.201)	9.8 (0.386)
	7	Pressure modifier valve spring	31742-80X16	32.0 (1.260)	6.9 (0.272)
	—	Oil cooler relief valve spring	31872-31X00	17.02 (0.6701)	8.0 (0.315)
	—	T/C pressure spring	31742-3AX11	9.0 (0.354)	7.3 (0.287)

*: Always check with the Parts Department for the latest parts information.

Clutch, Brake and Brake Band

ECS0061I

REVERSE CLUTCH

Number of drive plates		2	
Number of driven plates		2	
Drive plate thickness mm (in)	Standard	2.0 (0.079)	
	Allowable limit	1.8 (0.071)	
Clearance mm (in)	Standard	0.5 - 0.8 (0.020 - 0.031)	
	Allowable limit	1.2 (0.047)	
Thickness of retaining plates		Thickness mm (in)	Part number*
		4.4 (0.173)	31537-31X00
		4.6 (0.181)	31537-31X01
		4.8 (0.189)	31537-31X02
		5.0 (0.197)	31537-31X03
		5.2 (0.205)	31537-31X04

*: Always check with the Parts Department for the latest parts information.

HIGH CLUTCH

Number of drive plates		3	
Number of driven plates		5	
Drive plate thickness mm (in)	Standard	2.0 (0.079)	
	Allowable limit	1.8 (0.071)	
Clearance mm (in)	Standard	1.4 - 1.8 (0.055 - 0.071)	
	Allowable limit	2.4 (0.094)	
Thickness of retaining plates		Thickness mm (in)	Part number*
		4.8 (0.189) 5.0 (0.197) 5.2 (0.205) 5.4 (0.213) 5.6 (0.220) 5.8 (0.228) 6.0 (0.236)	31537-32X05 31537-32X06 31537-32X07 31537-32X08 31537-32X09 31537-32X10 31537-32X11

*: Always check with the Parts Department for the latest parts information.

FORWARD CLUTCH

Number of drive plates		5	
Number of driven plates		5	
Drive plate thickness mm (in)	Standard	1.8 (0.071)	
	Allowable limit	1.6 (0.063)	
Clearance mm (in)	Standard	0.45 - 0.85 (0.0177 - 0.0335)	
	Allowable limit	1.85 (0.0728)	
Thickness of retaining plate		Thickness mm (in)	Part number*
		3.6 (0.142) 3.8 (0.150) 4.0 (0.157) 4.2 (0.165) 4.4 (0.173) 4.6 (0.181)	31537-31X60 31537-31X61 31537-31X62 31537-31X63 31537-31X64 31537-31X65

*: Always check with the Parts Department for the latest parts information.

OVERRUN CLUTCH

Number of drive plates		3	
Number of driven plates		4	
Drive plate thickness mm (in)	Standard	1.6 (0.063)	
	Allowable limit	1.4 (0.055)	
Clearance mm (in)	Standard	1.0 - 1.4 (0.039 - 0.055)	
	Allowable limit	2.0 (0.079)	
Thickness of retaining plate		Thickness mm (in)	Part number*
		3.6 (0.142) 3.8 (0.150) 4.0 (0.157) 4.2 (0.165) 4.4 (0.173)	31567-31X79 31567-31X80 31567-31X81 31567-31X82 31567-31X83

*: Always check with the Parts Department for the latest parts information.

LOW & REVERSE BRAKE

Number of drive plates	5
Number of driven plates	4 + 1

Drive plate thickness mm (in)	Standard	2.0 (0.079)	
	Allowable limit	1.8 (0.071)	
Clearance mm (in)	Standard	1.4 - 1.8 (0.055 - 0.071)	
	Allowable limit	2.8 (0.110)	
Thickness of retaining plate		Thickness mm (in)	Part number*
		3.6 (0.142) 3.8 (0.150) 4.0 (0.157) 4.2 (0.165) 4.4 (0.173) 4.6 (0.181)	31667-31X16 31667-31X17 31667-31X18 31667-31X19 31667-31X20 31667-31X21

*: Always check with the Parts Department for the latest parts information.

BRAKE BAND

Anchor end pin tightening torque	3.5 - 5.9 N-m (0.35 - 0.6 kg-m, 31 - 52 in-lb)
Number of returning revolutions for anchor end pin	2.5±0.125
Lock nut tightening torque	31 - 36 N-m (3.2 - 3.7 kg-m, 23 - 27 ft-lb)

Clutch and Brake Return Springs

ECS0061J

Unit: mm (in)

Parts		Free length	Outer diameter	Part number*
Forward clutch (Overrun clutch)	Outer (16 pcs)	26.6 (1.047)	10.6 (0.417)	31505-31X02
	Inner (16 pcs)	26.3 (1.035)	7.7 (0.303)	31505-31X03
Reverse clutch (16 pcs)		18.6 (0.732)	8.0 (0.315)	31505-31X00
High clutch (12 pcs)		19.7 (0.776)	11.1 (0.437)	31505-31X01
Low reverse brake (20 pcs)		25.1 (0.988)	7.6 (0.299)	31505-31X04

*: Always check with the Parts Department for the latest parts information.

Oil Pump

ECS0061K

Oil pump side clearance mm (in)		0.02 - 0.04 (0.0008 - 0.0016)	
Thickness of inner gears and outer gears		Inner gear	
		Thickness mm (in)	Part number*
		9.99 - 10.00 (0.3933 - 0.3937) 9.98 - 9.99 (0.3929 - 0.3933) 9.97 - 9.98 (0.3925 - 0.3929)	31346-31X00 31346-31X01 31346-31X02
		Outer gear	
		Thickness mm (in)	Part number*
		9.99 - 10.00 (0.3933 - 0.3937) 9.98 - 9.99 (0.3929 - 0.3933) 9.97 - 9.98 (0.3925 - 0.3929)	31347-31X00 31347-31X01 31347-31X02
Clearance between oil pump housing and outer gear mm (in)	Standard	0.08 - 0.15 (0.0031 - 0.0059)	
	Allowable limit	0.15 (0.0059)	
Oil pump cover seal ring clearance mm (in)	Standard	0.1 - 0.25 (0.0039 - 0.0098)	
	Allowable limit	0.25 (0.0098)	

*: Always check with the Parts Department for the latest parts information.

Input Shaft

ECS0061L

Unit: mm (in)

Input shaft seal ring clearance	Standard	0.08 - 0.23 (0.0031 - 0.0091)
	Allowable limit	0.23 (0.0091)

Planetary Carrier

ECS0061M

Unit: mm (in)

Clearance between planetary carrier and pinion washer	Standard	0.15 - 0.70 (0.0059 - 0.0276)
	Allowable limit	0.80 (0.0315)

Final Drive

ECS0061N

DIFFERENTIAL SIDE GEAR CLEARANCE

Clearance between side gear and differential case with washer	0.1 - 0.2 mm (0.004 - 0.008 in)

DIFFERENTIAL SIDE GEAR THRUST WASHERS

Thickness mm (in)	Part number*
0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

*: Always check with the Parts Department for the latest parts information.

BEARING PRELOAD

Differential side bearing preload “T”	0.04 - 0.09 mm (0.0016 - 0.0035 in)

TURNING TORQUE

Turning torque of final drive assembly	0.49 - 1.08 N-m (5.0 - 11.0 kg-cm, 4.3 - 9.5 in-lb)

DIFFERENTIAL SIDE BEARING ADJUSTING SHIMS

Thickness mm (in)	Part number*
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21

*: Always check with the Parts Department for the latest parts information.

TABLE FOR SELECTING DIFFERENTIAL SIDE BEARING ADJUSTING SHIMS

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.31 - 0.35 (0.0122 - 0.0138)	0.40 (0.0157)
0.35 - 0.39 (0.0138 - 0.0154)	0.44 (0.0173)
0.39 - 0.43 (0.0154 - 0.0169)	0.48 (0.0189)
0.43 - 0.47 (0.0169 - 0.0185)	0.52 (0.0205)
0.47 - 0.51 (0.0185 - 0.0201)	0.56 (0.0220)
0.51 - 0.55 (0.0201 - 0.0217)	0.60 (0.0236)
0.55 - 0.59 (0.0217 - 0.0232)	0.64 (0.0252)
0.59 - 0.63 (0.0232 - 0.0248)	0.68 (0.0268)
0.63 - 0.67 (0.0248 - 0.0264)	0.72 (0.0283)
0.67 - 0.71 (0.0264 - 0.0280)	0.76 (0.0299)
0.71 - 0.75 (0.0280 - 0.0295)	0.80 (0.0315)
0.75 - 0.79 (0.0295 - 0.0311)	0.84 (0.0331)
0.79 - 0.83 (0.0311 - 0.0327)	0.88 (0.0346)
0.83 - 0.87 (0.0327 - 0.0343)	0.92 (0.0362)
0.87 - 0.91 (0.0343 - 0.0358)	0.48 (0.0189) + 0.48 (0.0189)
0.91 - 0.95 (0.0358 - 0.0374)	0.48 (0.0189) + 0.52 (0.0205)
0.95 - 0.99 (0.0374 - 0.0390)	0.52 (0.0205) + 0.52 (0.0205)
0.99 - 1.03 (0.0390 - 0.0406)	0.52 (0.0205) + 0.56 (0.0220)
1.03 - 1.07 (0.0406 - 0.0421)	0.56 (0.0220) + 0.56 (0.0220)
1.07 - 1.11 (0.0421 - 0.0437)	0.56 (0.0220) + 0.60 (0.0236)
1.11 - 1.15 (0.0437 - 0.0453)	0.60 (0.0236) + 0.60 (0.0236)
1.15 - 1.19 (0.0453 - 0.0469)	0.60 (0.0236) + 0.64 (0.0252)
1.19 - 1.23 (0.0469 - 0.0484)	0.64 (0.0252) + 0.64 (0.0252)
1.23 - 1.27 (0.0484 - 0.0500)	0.64 (0.0252) + 0.68 (0.0268)
1.27 - 1.31 (0.0500 - 0.0516)	0.68 (0.0268) + 0.68 (0.0268)
1.31 - 1.35 (0.0516 - 0.0531)	0.68 (0.0268) + 0.72 (0.0283)
1.35 - 1.39 (0.0531 - 0.0547)	1.44 (0.0567)
1.39 - 1.43 (0.0547 - 0.0563)	0.72 (0.0283) + 0.76 (0.0299)
1.43 - 1.47 (0.0563 - 0.0579)	0.76 (0.0299) + 0.76 (0.0299)
1.47 - 1.51 (0.0579 - 0.0594)	0.76 (0.0299) + 0.80 (0.0315)
1.51 - 1.55 (0.0594 - 0.0610)	0.80 (0.0315) + 0.80 (0.0315)
1.55 - 1.59 (0.0610 - 0.0626)	0.80 (0.0315) + 0.84 (0.0331)
1.59 - 1.63 (0.0626 - 0.0642)	0.84 (0.0331) + 0.84 (0.0331)
1.63 - 1.67 (0.0642 - 0.0657)	0.84 (0.0331) + 0.88 (0.0346)
1.67 - 1.71 (0.0657 - 0.0673)	0.88 (0.0346) + 0.88 (0.0346)
1.71 - 1.75 (0.0673 - 0.0689)	0.88 (0.0346) + 0.92 (0.0362)
1.75 - 1.79 (0.0689 - 0.0705)	0.92 (0.0362) + 0.92 (0.0362)
1.79 - 1.83 (0.0705 - 0.0720)	0.92 (0.0362) + 0.96 (0.0378)
1.83 - 1.87 (0.0720 - 0.0736)	0.96 (0.0378) + 0.96 (0.0378)
1.87 - 1.91 (0.0736 - 0.0752)	0.52 (0.0205) + 1.44 (0.0567)
1.91 - 1.95 (0.0752 - 0.0768)	0.56 (0.0220) + 1.44 (0.0567)

Reduction Pinion Gear

ECS0061O

BEARING PRELOAD

Reduction pinion gear bearing preload	0.05 mm (0.0020 in)

TURNING TORQUE

Turning torque of reduction pinion gear	0.1 - 0.69 N-m (1.1 - 7.0 kg-cm, 0.95 - 6.08 in-lb)

REDUCTION PINION GEAR BEARING ADJUSTING SHIMS

Thickness mm (in)	Part number*
1.74 (0.0685)	31438-31X16
1.78 (0.0701)	31438-31X17
1.82 (0.0717)	31438-31X18
1.86 (0.0732)	31438-31X19
1.90 (0.0748)	31438-31X20
1.92 (0.0756)	31439-31X60
1.94 (0.0764)	31438-31X21
1.96 (0.0772)	31439-31X61
1.98 (0.0780)	31438-31X22
2.00 (0.0787)	31439-31X62
2.02 (0.0795)	31438-31X23
2.04 (0.0803)	31439-31X63
2.06 (0.0811)	31438-31X24
2.08 (0.0819)	31439-31X64
2.10 (0.0827)	31438-31X60
2.12 (0.0835)	31439-31X65
2.14 (0.0843)	31438-31X61
2.16 (0.0850)	31439-31X66
2.18 (0.0858)	31438-31X62
2.20 (0.0866)	31439-31X67
2.22 (0.0874)	31438-31X63
2.24 (0.0882)	31439-31X68
2.26 (0.0890)	31438-31X64
2.28 (0.0898)	31439-31X69
2.30 (0.0906)	31438-31X65
2.34 (0.0921)	31438-31X66
2.38 (0.0937)	31438-31X67
2.42 (0.0953)	31438-31X68
2.46 (0.0969)	31438-31X69
2.50 (0.0984)	31438-31X70
2.54 (0.1000)	31438-31X71
2.58 (0.1016)	31438-31X72
2.62 (0.1031)	31438-31X73
2.66 (0.1047)	31438-31X74

*: Always check with the Parts Department for the latest parts information.

TABLE FOR SELECTING REDUCTION PINION GEAR BEARING ADJUSTING SHIM

Unit: mm (in)

Dimension “T”	Suitable shim(s)
1.77 - 1.81 (0.0697 - 0.0713)	1.74 (0.0685)
1.81 - 1.85 (0.0713 - 0.0728)	1.78 (0.0701)
1.85 - 1.89 (0.0728 - 0.0744)	1.82 (0.0717)
1.89 - 1.93 (0.0744 - 0.0760)	1.86 (0.0732)
1.93 - 1.96 (0.0760 - 0.0772)	1.90 (0.0748)
1.96 - 1.98 (0.0772 - 0.0780)	1.92 (0.0756)
1.98 - 2.00 (0.0780 - 0.0787)	1.94 (0.0764)
2.00 - 2.02 (0.0787 - 0.0795)	1.96 (0.0772)
2.02 - 2.04 (0.0795 - 0.0803)	1.98 (0.0780)
2.04 - 2.06 (0.0803 - 0.0811)	2.00 (0.0787)
2.06 - 2.08 (0.0811 - 0.0819)	2.02 (0.0795)
2.08 - 2.10 (0.0819 - 0.0827)	2.04 (0.0803)
2.10 - 2.12 (0.0827 - 0.0835)	2.06 (0.0811)
2.12 - 2.14 (0.0835 - 0.0843)	2.08 (0.0819)
2.14 - 2.16 (0.0843 - 0.0850)	2.10 (0.0827)
2.16 - 2.18 (0.0850 - 0.0858)	2.12 (0.0835)
2.18 - 2.20 (0.0858 - 0.0866)	2.14 (0.0843)
2.20 - 2.22 (0.0866 - 0.0874)	2.16 (0.0850)
2.22 - 2.24 (0.0874 - 0.0888)	2.18 (0.0858)
2.24 - 2.26 (0.0882 - 0.0890)	2.20 (0.0866)
2.26 - 2.28 (0.0890 - 0.0898)	2.22 (0.0874)
2.28 - 2.30 (0.0898 - 0.0906)	2.24 (0.0882)
2.30 - 2.32 (0.0906 - 0.0913)	2.26 (0.0890)
2.32 - 2.34 (0.0913 - 0.0921)	2.28 (0.0898)
2.34 - 2.37 (0.0921 - 0.0933)	2.30 (0.0906)
2.37 - 2.41 (0.0933 - 0.0949)	2.34 (0.0921)
2.41 - 2.45 (0.0949 - 0.0965)	2.38 (0.0937)
2.45 - 2.49 (0.0965 - 0.0980)	2.42 (0.0953)
2.49 - 2.53 (0.0980 - 0.0996)	2.46 (0.0969)
2.53 - 2.57 (0.0996 - 0.1012)	2.50 (0.0984)
2.57 - 2.61 (0.1012 - 0.1028)	2.54 (0.1000)
2.61 - 2.65 (0.1028 - 0.1043)	2.58 (0.1016)
2.65 - 2.69 (0.1043 - 0.1059)	2.62 (0.1031)
2.69 - 2.73 (0.1059 - 0.1075)	2.66 (0.1047)

Output Shaft

ECS0061P

SEAL RING CLEARANCE

Unit: mm (in)

Output shaft seal ring clearance	Standard	0.10 - 0.25 (0.0039 - 0.0098)
	Allowable limit	0.25 (0.0098)

END PLAY

Output shaft end play	0 - 0.5 mm (0 - 0.020 in)

OUTPUT SHAFT END PLAY ADJUSTING SHIMS

Thickness mm (in)	Part number*
0.56 (0.0220)	31438-31X46
0.96 (0.0378)	31438-31X47
1.36 (0.0535)	31438-31X48

*: Always check with the Parts Department for the latest parts information.

Bearing Retainer

ECS0061Q

SEAL RING CLEARANCE

Unit: mm (in)

Bearing retainer seal ring clearance	Standard	0.10 - 0.25 (0.0039 - 0.0098)
	Allowable limit	0.25 (0.0098)

Total End Play

ECS0061R

Total end play "T_3 "	0.25 - 0.55 mm (0.0098 - 0.0217 in)

BEARING RACE FOR ADJUSTING TOTAL END PLAY

Thickness mm (in)	Part number*
0.6 (0.024)	31435-31X01
0.8 (0.031)	31435-31X02
1.0 (0.039)	31435-31X03
1.2 (0.047)	31435-31X04
1.4 (0.055)	31435-31X05
1.6 (0.063)	31435-31X06
1.8 (0.071)	31435-31X07
2.0 (0.079)	31435-31X08

*: Always check with the Parts Department for the latest parts information.

Reverse Clutch End Play

ECS0061S

Reverse clutch end play "T_4 "	0.65 - 1.00 mm (0.0256 - 0.0394 in)

THRUST WASHERS FOR ADJUSTING REVERSE CLUTCH END PLAY

Thickness mm (in)	Part number*
0.65 (0.0256)	31508-31X10
0.80 (0.0315)	31508-31X11
0.95 (0.0374)	31508-31X12
1.10 (0.0433)	31508-31X13
1.25 (0.0492)	31508-31X14
1.40 (0.0551)	31508-31X15

*: Always check with the Parts Department for the latest parts information.

Accumulator

ECS0061T

O-RING

Unit: mm (in)

Accumulator	Diameter (Small)	Part number*	Diameter (Large)	Part number*
Servo release accumulator	26.9 (1.059)	31526-41X03	44.2 (1.740)	31526-41X02
N-D accumulator	34.6 (1.362)	31526-31X08	39.4 (1.551)	31672-21X00

*: Always check with the Parts Department for the latest parts information.

RETURN SPRING

Unit: mm (in)

Accumulator	Free length	Outer diameter	Part number*
Servo release accumulator spring	52.5 (2.067)	20.1 (0.791)	31605-80X00
N-D accumulator spring	45.0 (1.772)	27.6 (1.087)	31605-33X01

*: Always check with the Parts Department for the latest parts information.

Band Servo

ECS0061U

RETURN SPRING

Unit: mm (in)

Return spring	Free length	Outer diameter	Part number*
2nd servo return spring	32.5 (1.280)	25.9 (1.020)	31605-31X20
OD servo return spring	38.52 (1.5165)	22.0 (0.866)	31605-31X21

*: Always check with the Parts Department for the latest parts information.

Removal and Installation

ECS0061V

Unit: mm (in)

Distance between end of converter housing and torque converter	21.1 (0.831)

Shift Solenoid Valves

ECS0061W

Gear	Solenoid A	Solenoid B
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF

Solenoid Valve

ECS0061X

Solenoid valve	Resistance (Approx.)	Terminal number
Shift solenoid A	20 - 30Ω	2
Shift solenoid B	5 - 20Ω	1
Ovr. clutch sol.	20 - 30Ω	3
Line pres. sol.	2.5 - 5Ω	4
T/conv. clutch sol.	5 - 20Ω	5

A/T Fluid Temperature Sensor

ECS0061Y

Monitor Item	Condition	Specification (Approx.)	
A/T fluid temperature sensor	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]	1.5V ↓ 0.5V	2.5 kΩ ↓ 0.3 kΩ

Revolution Sensor

ECS0061Z

Condition	Judgement standard
When moving at 20 km/h (12 MPH), use the CONSULT-II pulse frequency measuring function. *1 **CAUTION:** **Connect the diagnosis data link cable to the vehicle diagnosis connector.** *1: A circuit tester cannot be used to test this item.	Approximately 150 Hz
When vehicle not moving.	Under 1.3V or over 4.5V

Dropping Resistor

ECS00620

Resistance	10 - 15Ω

TROUBLE DIAGNOSIS - INDEX

PFP:00000

Alphabetical & P No. Index for DTC

ECS00621

ALPHABETICAL INDEX FOR DTC

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A/T 1ST GR FNCTN	P0731	AT-512
A/T 2ND GR FNCTN	P0732	AT-517
A/T 3RD GR FNCTN	P0733	AT-522
A/T 4TH GR FNCTN	P0734	AT-527
A/T TCC S/V FNCTN	P0744	AT-539
ATF TEMP SEN/CIRC	P0710	AT-497
ENGINE SPEED SIG	P0725	AT-508
L/PRESS SOL/CIRC	P0745	AT-547
O/R CLTCH SOL/CIRC	P1760	AT-568
PNP SW/CIRC	P0705	AT-491
SFT SOL A/CIRC*2	P0750	AT-553
SFT SOL B/CIRC*2	P0755	AT-558
TCC SOLENOID/CIRC	P0740	AT-534
TP SEN/CIRC A/T*2	P1705	AT-563
VEH SPD SEN/CIR AT*3	P0720	AT-503
CAN COMM CIRCUIT	U1000	AT-590

*1: These numbers are prescribed by SAE J2012.
*2: When the fail-safe operation occurs, the MIL illuminates.
*3: The MIL illuminates when both the “Revolution sensor signal” and the “Vehicle speed sensor signal” meet the fail-safe condition at the same time.

P NO. INDEX FOR DTC

DTC CONSULT-II GST*1	Items (CONSULT-II screen terms)	Reference page
P0705	PNP SW/CIRC	AT-491
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P0720	VEH SPD SEN/CIR AT*3	AT-503
P0725	ENGINE SPEED SIG	AT-508
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P0750	SFT SOL A/CIRC*2	AT-553
P0755	SFT SOL B/CIRC*2	AT-558
P1705	TP SEN/CIRC A/T*2	AT-563
P1760	O/R CLTCH SOL/CIRC	AT-568
U1000	CAN COMM CIRCUIT	AT-590

*1: These numbers are prescribed by SAE J2012.
*2: When the fail-safe operation occurs, the MIL illuminates.
*3: The MIL illuminates when both the “Revolution sensor signal” and the “Vehicle speed sensor signal” meet the fail-safe condition at the same time.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

ECS00622

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Precautions for On Board Diagnostic (OBD) System of A/T and Engine

ECS00623

The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

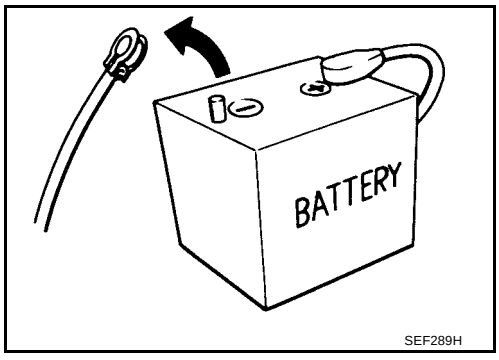
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to an open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Be sure to route and secure the harnesses properly after work. Interference of the harness with a bracket, etc. may cause the MIL to light up due to a short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to a malfunction of the EGR system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the TCM or ECM before returning the vehicle to the customer.**

Precautions

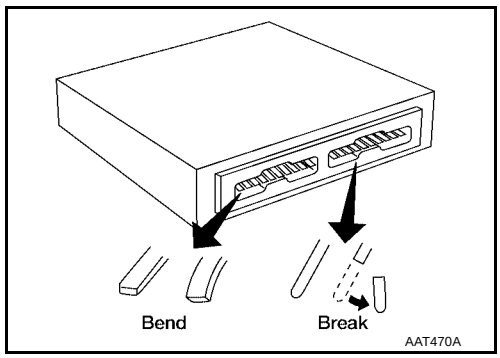
ECS00624

- **Before connecting or disconnecting the TCM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the TCM, because battery voltage is applied to TCM even if ignition switch is turned off.**

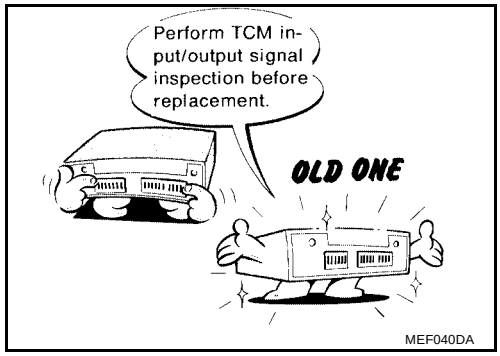


SEF289H

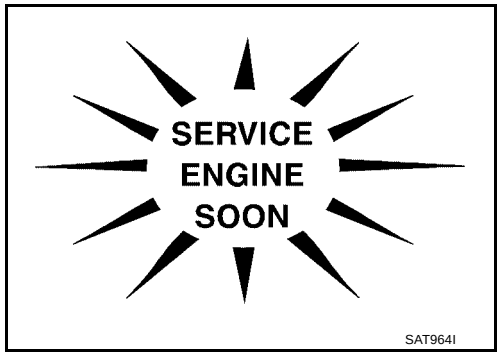
- **When connecting or disconnecting pin connectors into or from TCM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on TCM pin terminal, when connecting pin connectors.



- **Before replacing TCM, perform TCM input/output signal inspection and verify whether TCM functions properly or not. Refer to AT-420, "INPUT/OUTPUT SIGNAL OF TCM".**



- **After performing each TROUBLE DIAGNOSIS, perform "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".**
  The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed.
- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.



- Place disassembled parts in order for easier and proper assembly.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transaxle is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place disassembled valve body parts in order for easier and proper assembly. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along bores in valve body under their own weight.
- Before assembly, apply a coat of recommended ATF to all parts. Apply petroleum jelly to protect O-rings and seals, or hold bearings and washers in place during assembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- Replace ATF cooler if excessive foreign material is found in oil pan or clogging strainer. Refer to AT-400, "ATF COOLER SERVICE" .
- After overhaul, refill the transaxle with new ATF.
- When the A/T drain plug is removed, only some of the fluid is drained. Old A/T fluid will remain in torque converter and ATF cooling system.
  Always follow the procedures when changing A/T fluid. Refer to MA-31, "Changing A/T Fluid" .

Service Notice or Precautions

ECS00625

FAIL-SAFE

The TCM has an electronic Fail-Safe (limp home mode). This allows the vehicle to be driven even if a major electrical input/output device circuit is damaged.
Under Fail-Safe, the vehicle always runs in third gear, even with a shift lever position of 1, 2 or D. The customer may complain of sluggish or poor acceleration.
When the ignition key is turned ON following Fail-Safe operation, O/D OFF indicator lamp blinks for about 8 seconds. [Or, refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)"].
The blinking of the O/D OFF indicator lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions.
Always follow the “Work Flow”. Refer to AT-450, "Work Flow" .
The SELF-DIAGNOSIS results will be as follows:

- The first SELF-DIAGNOSIS will indicate damage to the vehicle speed sensor or the revolution sensor.
- During the next SELF-DIAGNOSIS, performed after checking the sensor, no damages will be indicated.

TORQUE CONVERTER SERVICE

The torque converter should be replaced under any of the following conditions:

- External leaks in the hub weld area.
- Converter hub is scored or damaged.
- Converter pilot is broken, damaged or fits poorly into crankshaft.
- Steel particles are found after flushing the cooler and cooler lines.
- Pump is damaged or steel particles are found in the converter.
- Vehicle has TCC shudder and/or no TCC apply. Replace only after all hydraulic and electrical diagnoses have been made. (Converter clutch material may be glazed.)
- Converter is contaminated with engine coolant containing antifreeze.
- Internal failure of stator roller clutch.
- Heavy clutch debris due to overheating (blue converter).
- Steel particles or clutch lining material found in fluid filter or on magnet when no internal parts in unit are worn or damaged — indicates that lining material came from converter.
  The torque converter should not be replaced if:
- The fluid has an odor, is discolored, and there is no evidence of metal or clutch facing particles.
- The threads in one or more of the converter bolt holes are damaged.
- Transaxle failure did not display evidence of damaged or worn internal parts, steel particles or clutch plate lining material in unit and inside the fluid filter.
- Vehicle has been exposed to high mileage (only). The exception may be where the torque converter clutch dampener plate lining has seen excess wear by vehicles operated in heavy and/or constant traffic, such as taxi, delivery or police use.

ATF COOLER SERVICE

If A/T fluid contains frictional material (clutches, bands, etc.), replace radiator and flush cooler line using cleaning solvent and compressed air after repair of A/T. Refer to CO-30, "RADIATOR" .

OBD-II SELF-DIAGNOSIS

- A/T self-diagnosis is performed by the TCM in combination with the ECM. The results can be read through the blinking pattern of the O/D OFF indicator or the malfunction indicator lamp (MIL). Refer to the table on AT-433 for the indicator used to display each self-diagnostic result.
- The self-diagnostic results indicated by the MIL are automatically stored in both the ECM and TCM memories.
  Always perform the procedure “HOW TO ERASE DTC” on AT-430 to complete the repair and avoid unnecessary blinking of the MIL.
- The following self-diagnostic items can be detected using ECM self-diagnostic results mode* only when the O/D OFF indicator lamp does not indicate any malfunctions.

– park/neutral position (PNP) switch
*: For details of OBD-II, refer to EC-1260, "ON BOARD DIAGNOSTIC (OBD) SYSTEM" .

- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector.**

For description and how to disconnect, refer to GI-23, "How to Check Terminal" .

Wiring Diagrams and Trouble Diagnosis

ECS00626

When you read wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams"
- PG-2, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"

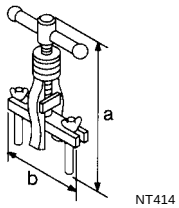
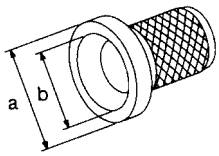
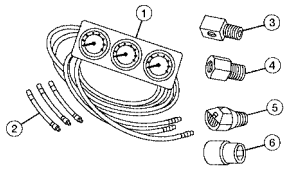
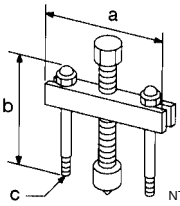
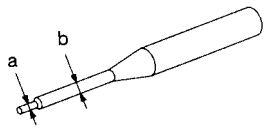
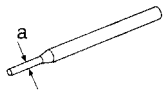
PREPARATION

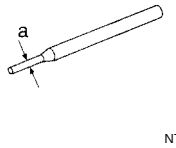
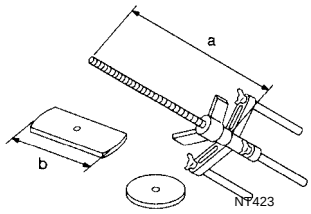
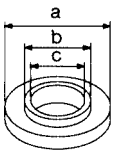
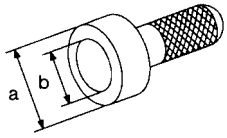
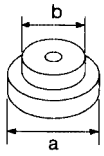
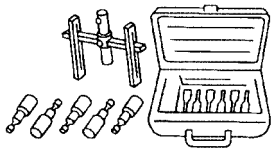
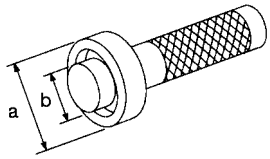
PFP:00002

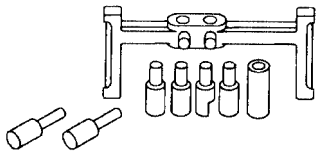
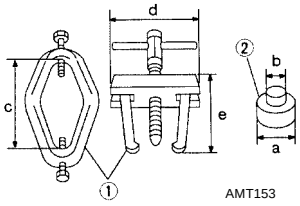
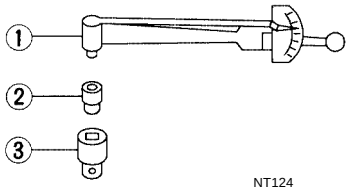
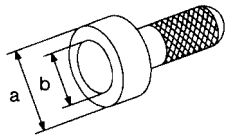
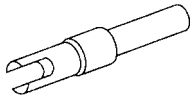
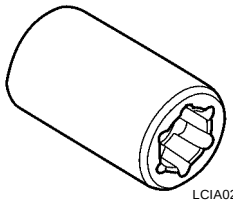
Special Service Tools

ECS00627

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

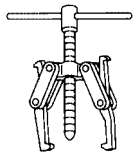
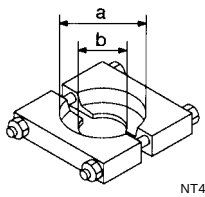
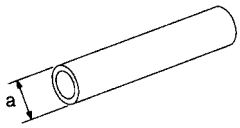
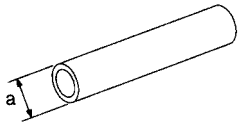
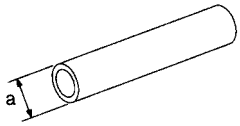
Tool number (Kent-Moore No.) Tool name	Description
KV381054S0 (J34286) Puller  NT414	● Removing differential side oil seals ● Removing differential side bearing outer race ● Removing idler gear bearing outer race **a: 250 mm (9.84 in)** **b: 160 mm (6.30 in)**
ST33400001 (J26082) Drift  NT086	● Installing differential side oil seal F04B and F04W (RH side) ● Installing oil seal on oil pump housing **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**
(J34301-C) Oil pressure gauge set 1 (J34301-1) Oil pressure gauge 2 (J34301-2) Hoses 3 (J34298) Adapter 4 (J34282-2) Adapter 5 (790-301-1230-A) 60° Adapter 6 (J34301-15) Square socket  AAT896	● Measuring line pressure
ST27180001 (J25726-A) Puller  NT424	● Removing idler gear **a: 100 mm (3.94 in)** **b: 110 mm (4.33 in)** **c: M8 x 1.25P**
ST23540000 (J25689-A) Pin punch  NT442	● Removing and installing parking rod plate and manual plate pins **a: 2.3 mm (0.091 in) dia.** **b: 4 mm (0.16 in) dia.**
ST25710000 (J25689-A) Pin punch  NT410	● Aligning groove of manual shaft and hole of transmission case **a: 2 mm (0.08 in) dia.**

Tool number (Kent-Moore No.) Tool name	Description
KV32101000 (J25689-A) Pin punch  NT410	● Removing and installing manual shaft retaining pin ● Removing and installing pinion mate shaft lock pin **a: 4 mm (0.16 in) dia.**
KV31102400 (J34285 and J34285-87) Clutch spring compressor  NT423	● Removing and installing clutch return springs ● Installing low and reverse brake piston **a: 320 mm (12.60 in)** **b: 174 mm (6.85 in)**
KV40100630 (J26092) Drift  NT107	● Installing reduction gear bearing inner race ● Installing idler gear bearing inner race **a: 67.5 mm (2.657 in) dia.** **b: 44 mm (1.73 in) dia.** **c: 38.5 mm (1.516 in) dia.**
ST30720000 (J25405 and J34331) Bearing installer  NT115	● Installing idler gear bearing outer race **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**
ST35321000 (—) Drift  NT073	● Installing output shaft bearing **a: 49 mm (1.93 in) dia.** **b: 41 mm (1.61 in) dia.**
(J34291-A) Shim setting gauge set  NT101	● Selecting oil pump cover bearing race and oil pump thrust washer ● Selecting side gear thrust washer
ST33230000 (J25805-01) Drift  NT084	● Installing differential side bearing inner race (RH side) **a: 51 mm (2.01 in) dia.** **b: 28.5 mm (1.122 in) dia.**

Tool number (Kent-Moore No.) Tool name		Description
(J34290) Shim selecting tool set	 NT080	● Selecting differential side bearing adjusting shim
ST3306S001 (J22888-D) Differential side bearing puller set 1 ST33051001 (J22888-D) Puller 2 ST33061000 (J8107-2) Adapter	 AMT153	● Removing differential side bearing inner race **a: 38 mm (1.50 in) dia.** **b: 28.5 mm (1.122 in) dia.** **c: 130 mm (5.12 in)** **d: 135 mm (5.31 in)** **e: 100 mm (3.94 in)**
ST3127S000 (J25765-A) Preload gauge 1 GG91030000 (J25765-A) Torque wrench 2 HT62940000 (—) Socket adapter 3 HT62900000 (—) Socket adapter	 NT124	● Checking differential side bearing preload
ST35271000 (J26091) Drift	 NT115	● Installing idler gear **a: 72 mm (2.83 in) dia.** **b: 63 mm (2.48 in) dia.**
(J39713) Preload adapter	 NT087	● Selecting differential side bearing adjusting shim ● Checking differential side bearing preload
J45816 E20 TORX socket	 LCIA0258E	● Removing flex plate bolts on vehicles equipped with QR25DE engines

Commercial Service Tools

ECS00628

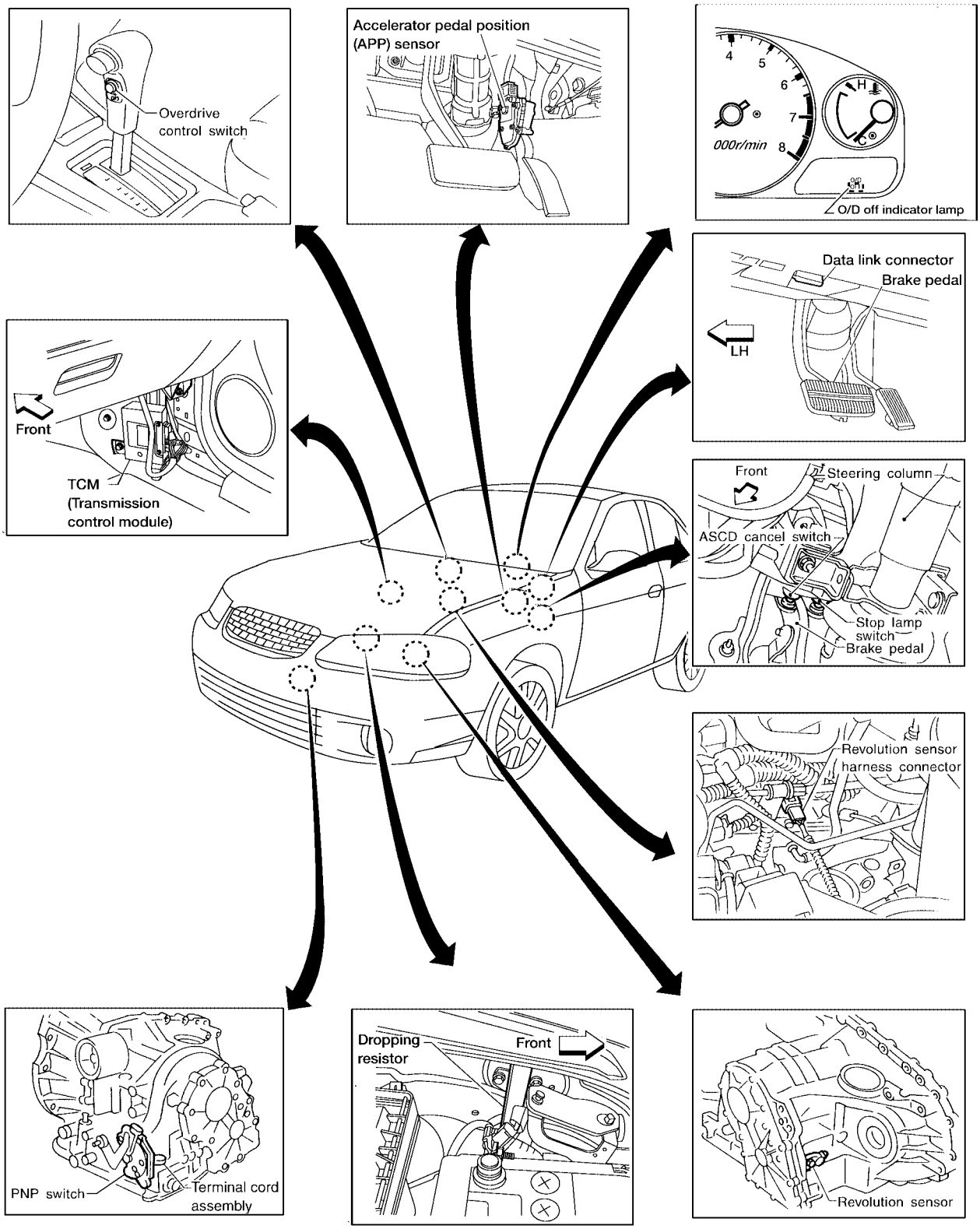
Tool name	Description
Puller  NT077	● Removing idler gear bearing inner race ● Removing and installing band servo piston snap ring
Puller  NT411	● Removing reduction gear bearing inner race **a: 60 mm (2.36 in) dia.** **b: 35 mm (1.38 in) dia.**
Drift  NT083	● Installing needle bearing on bearing retainer **a: 36 mm (1.42 in) dia.**
Drift  NT083	● Removing needle bearing from bearing retainer **a: 33.5 mm (1.319 in) dia.**
Drift  NT083	● Installing differential side bearing outer race (RH side) **a: 75 mm (2.95 in) dia.**

OVERALL SYSTEM

PFP:00000

A/T Electrical Parts Location

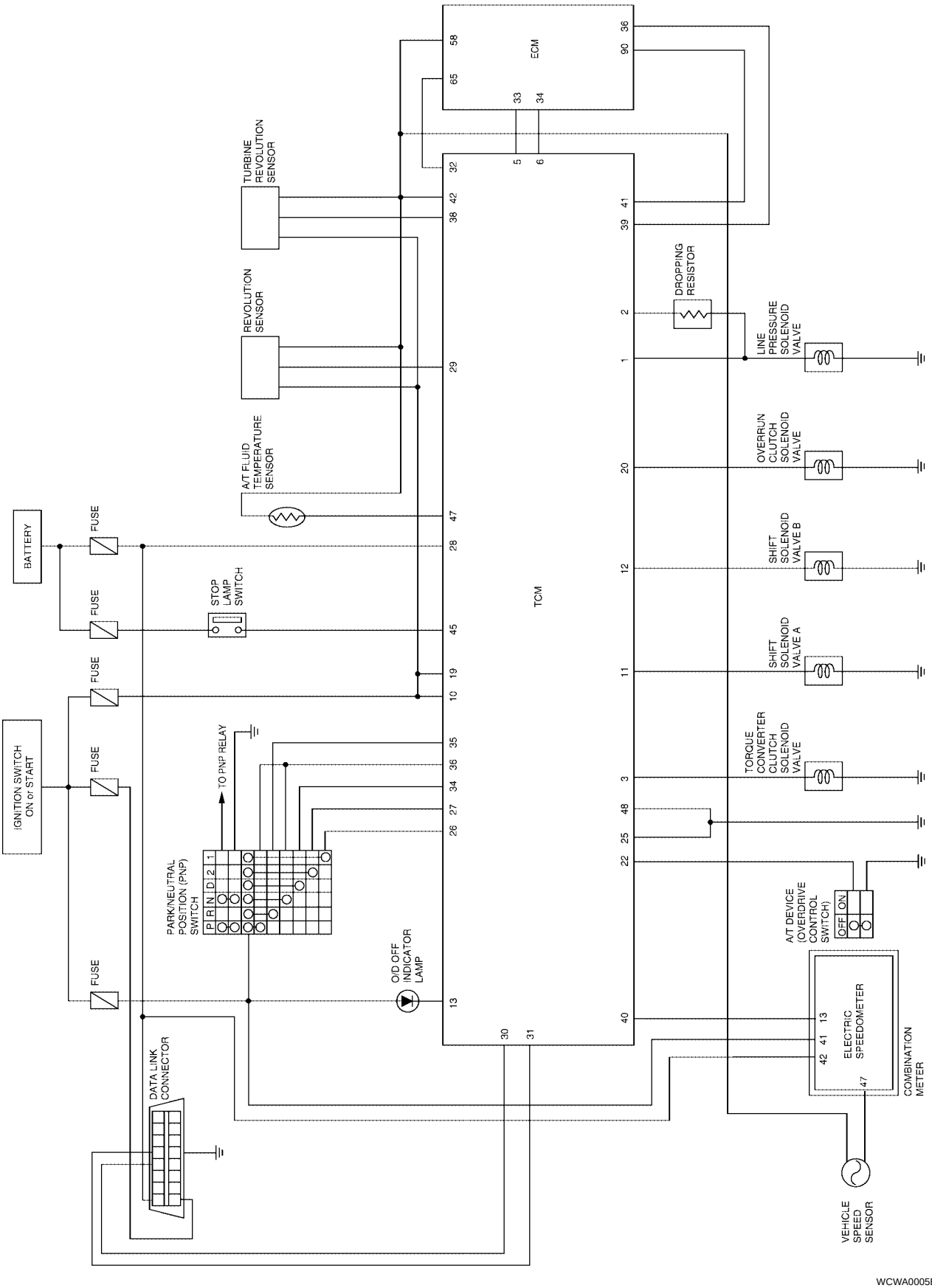
ECS00629



WCIA0131E

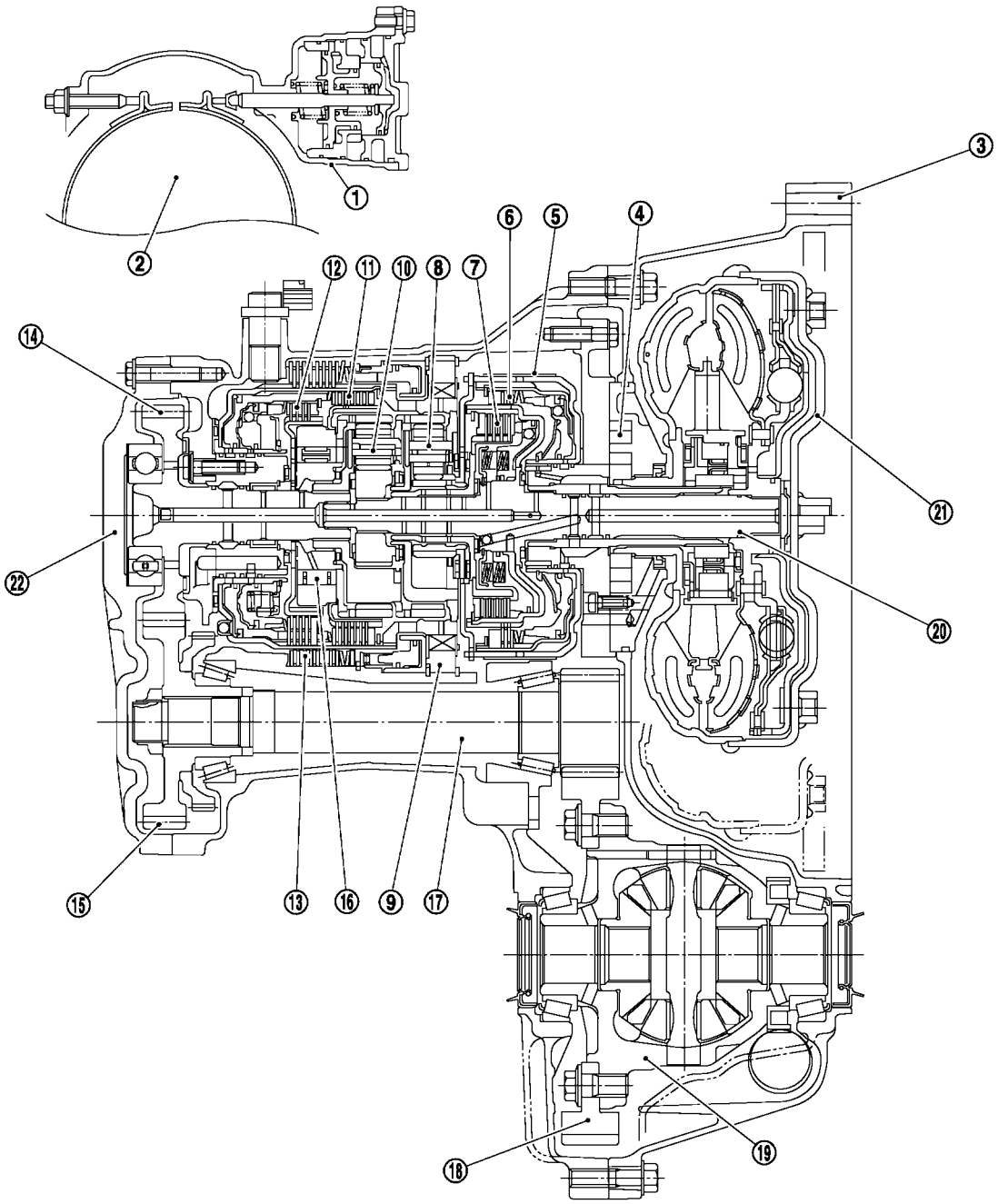
Circuit Diagram

ECS0062A



Cross-sectional View

ECS0062B

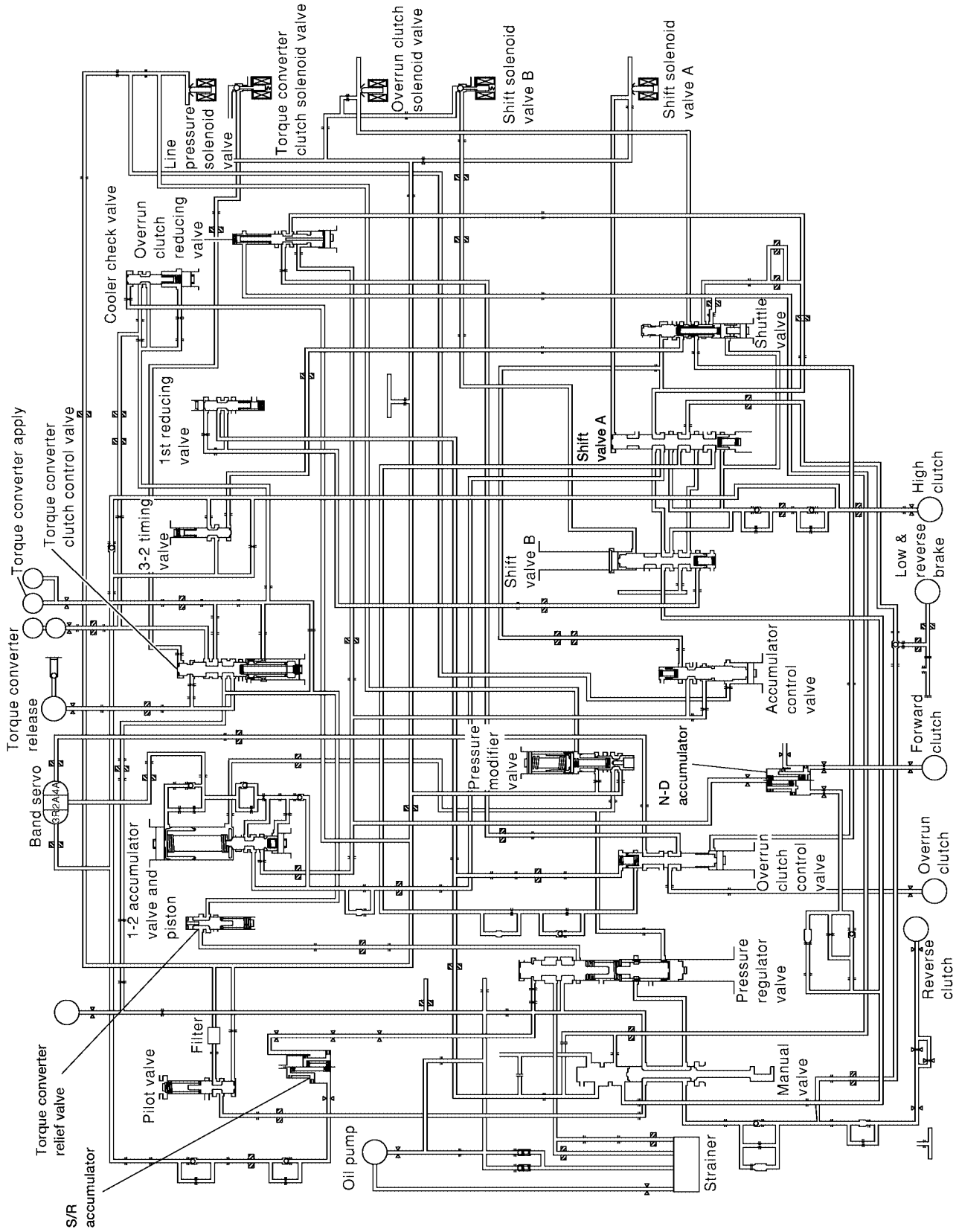


SAT488K

1. Band servo piston
2. Reverse clutch drum
3. Converter housing
4. Oil pump
5. Brake band
6. Reverse clutch
7. High clutch
8. Front planetary gear
9. Low one-way clutch
10. Rear planetary gear
11. Forward clutch
12. Overrun clutch
13. Low & reverse brake
14. Output gear
15. Idler gear
16. Forward one-way clutch
17. Pinion reduction gear
18. Final gear
19. Differential case
20. Input shaft
21. Torque converter
22. Side cover

Hydraulic Control Circuit

ECS0062C



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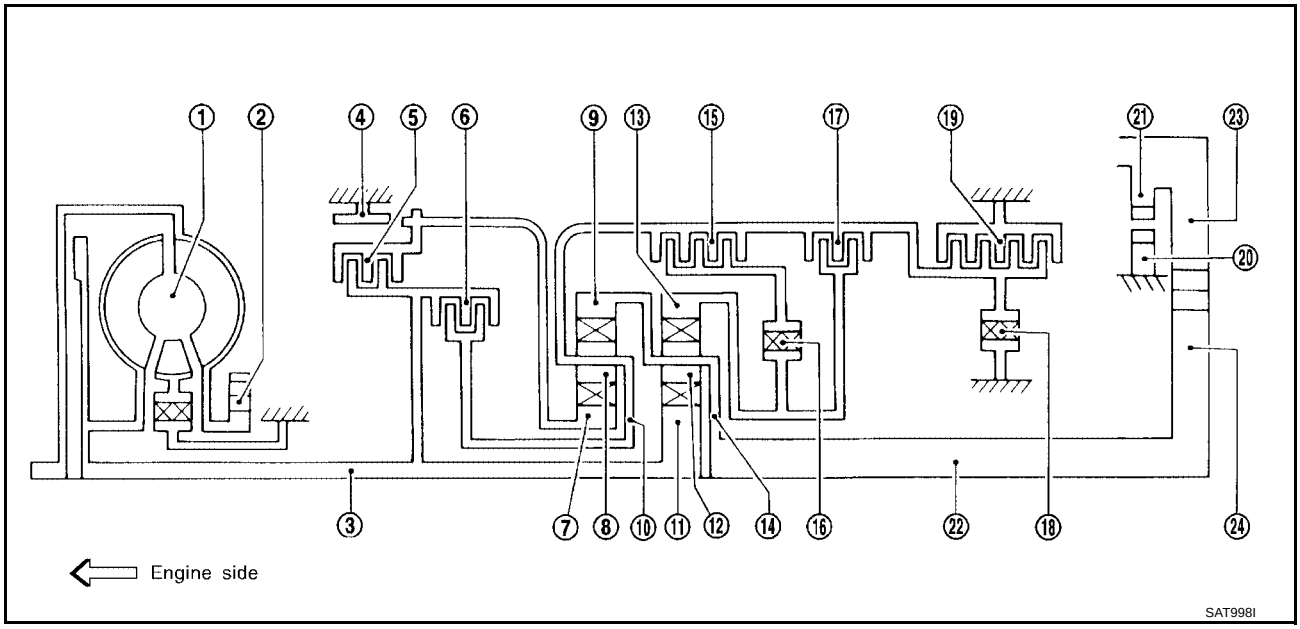
Shift Mechanism

ECS0062D

CONSTRUCTION



1. Torque converter	2. Oil pump	3. Input shaft
4. Brake band	5. Reverse clutch	6. High clutch
7. Front sun gear	8. Front pinion gear	9. Front internal gear
10. Front planetary carrier	11. Rear sun gear	12. Rear pinion gear
13. Rear internal gear	14. Rear planetary carrier	15. Forward clutch
16. Forward one-way clutch	17. Overrun clutch	18. Low one-way clutch
19. Low & reverse brake	20. Parking pawl	21. Parking gear
22. Output shaft	23. Idle gear	24. Output gear

FUNCTION OF CLUTCH AND BRAKE

Clutch and brake components	Abbr.	Function
Reverse clutch **5**	R/C	To transmit input power to front sun gear **7** .
High clutch **6**	H/C	To transmit input power to front planetary carrier **10** .
Forward clutch **15**	F/C	To connect front planetary carrier **10** with forward one-way clutch **16** .
Overrun clutch **17**	O/C	To connect front planetary carrier **10** with rear internal gear **13** .
Brake band **4**	B/B	To lock front sun gear **7** .
Forward one-way clutch **16**	F/O.C	When forward clutch **15** is engaged, to stop rear internal gear **13** from rotating in opposite direction against engine revolution.
Low one-way clutch **18**	L/O.C	To stop front planetary carrier **10** from rotating in opposite direction against engine revolution.
Low & reverse brake **19**	L & R/B	To lock front planetary carrier **10** .

CLUTCH AND BAND CHART

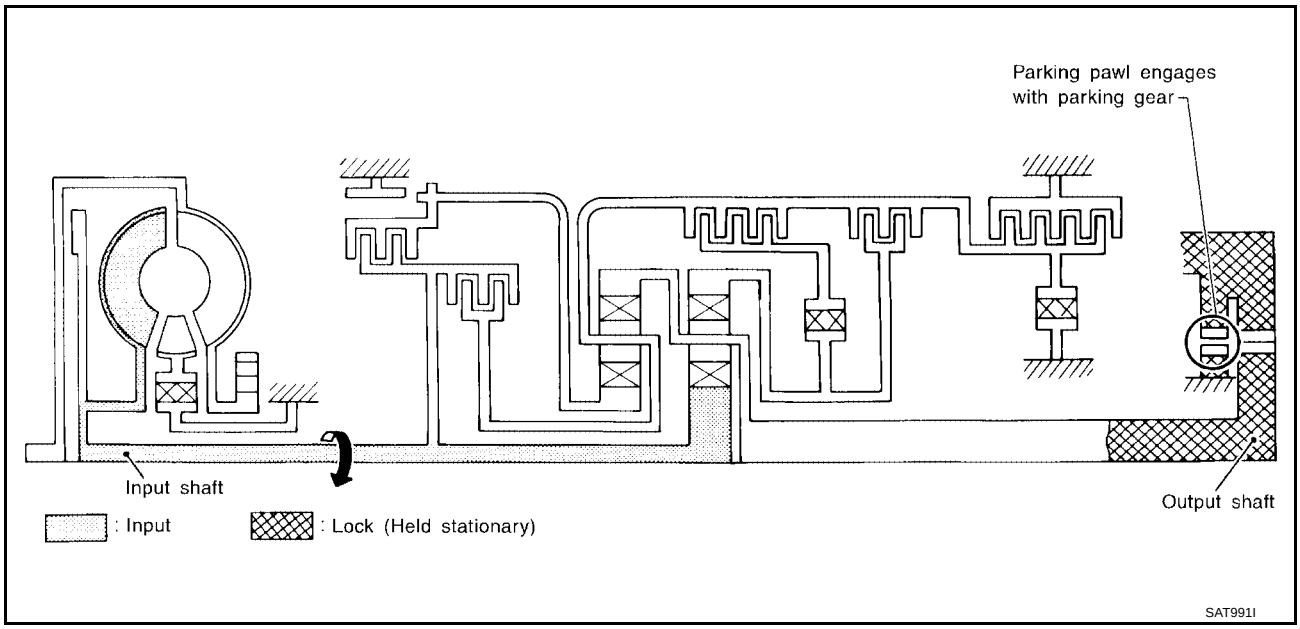
Shift position		Reverse clutch **5**	High clutch **6**	For-ward clutch **15**	Over-run clutch **17**	Band servo			For-ward one-way clutch **16**	Low one-way clutch **18**	Low & reverse brake **19**	Lock-up	Remarks
						2nd apply	3rd release	4th apply					
P													PARK POSITION
R		O									O		REVERSE POSITION
N													NEUTRAL POSITION
D*4	1st			O	*1 D				B	B			Automatic shift 1 ⇔ 2 ⇔ 3 ⇔ 4
	2nd			O	*1 A	O			B				
	3rd		O	O	*1 A	*2 C	C		B			*4 O	
	4th		O	C		*3 C	C	O	B			O	
2	1st			O	O				B	B			Automatic shift 1 ⇔ 2 ⇐ 3
	2nd			O	O	O			B				
	3rd			O	O				B				
1	1st			O	O				B		O		Locks (held stationary) in 1st speed 1 ⇐ 2 ⇐ 3
	2nd			O	O	O			B				
	3rd			O	O	*2 C			B				

*1: Operates when overdrive control switch is set in OFF position.
*2: Oil pressure is applied to both 2nd “apply” side and 3rd “release” side of band servo piston. However, brake band does not contract because oil pressure area on the “release” side is greater than that on the “apply” side.
*3: Oil pressure is applied to 4th “apply” side in condition *2 above, and brake band contracts.
*4: A/T will not shift to 4th when overdrive control switch is set in OFF position.
O: Operates
A: Operates when throttle opening is less than 3/16, activating engine brake.
B: Operates during “progressive” acceleration.
C: Operates but does not affect power transmission.
D: Operates when throttle opening is less than 3/16, but does not affect engine brake.

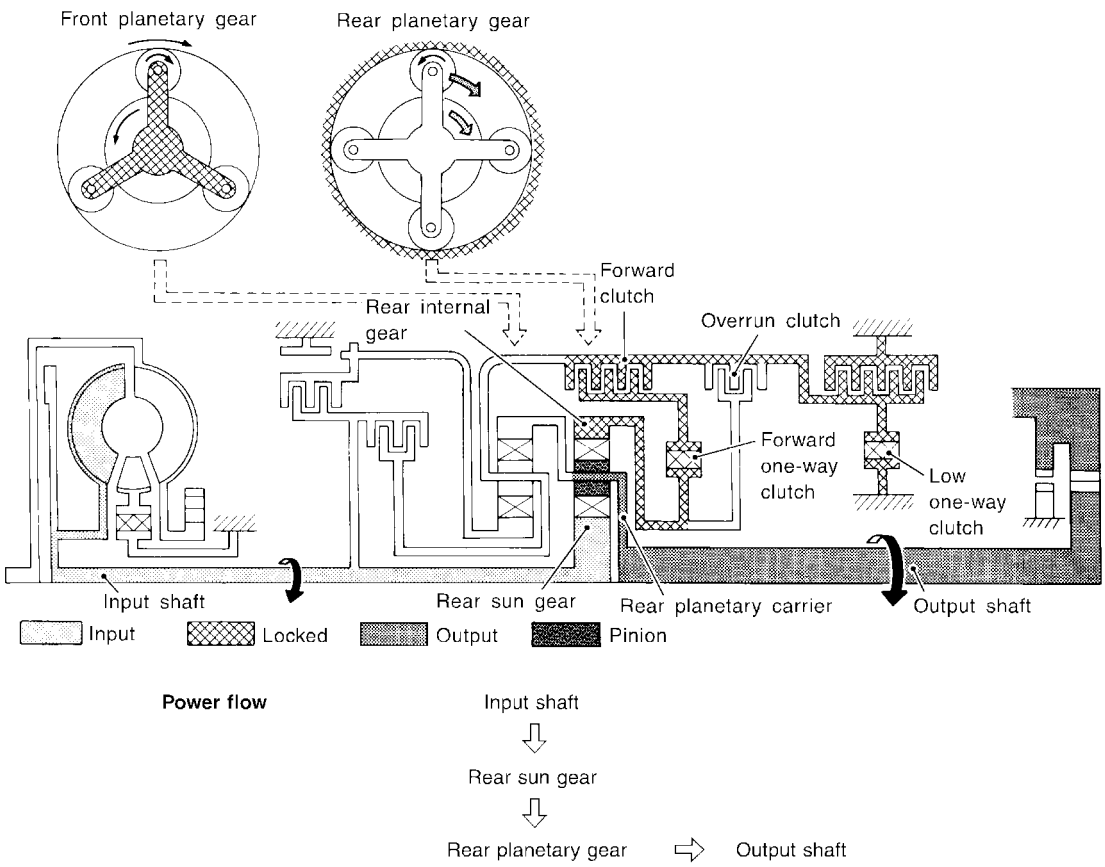
POWER TRANSMISSION

P and N Positions

- P position
  Similar to the N position, the clutches do not operate. The parking pawl engages with the parking gear to mechanically hold the output shaft so that the powertrain is locked.
- N position
  Power from the input shaft is not transmitted to the output shaft because the clutches do not operate.

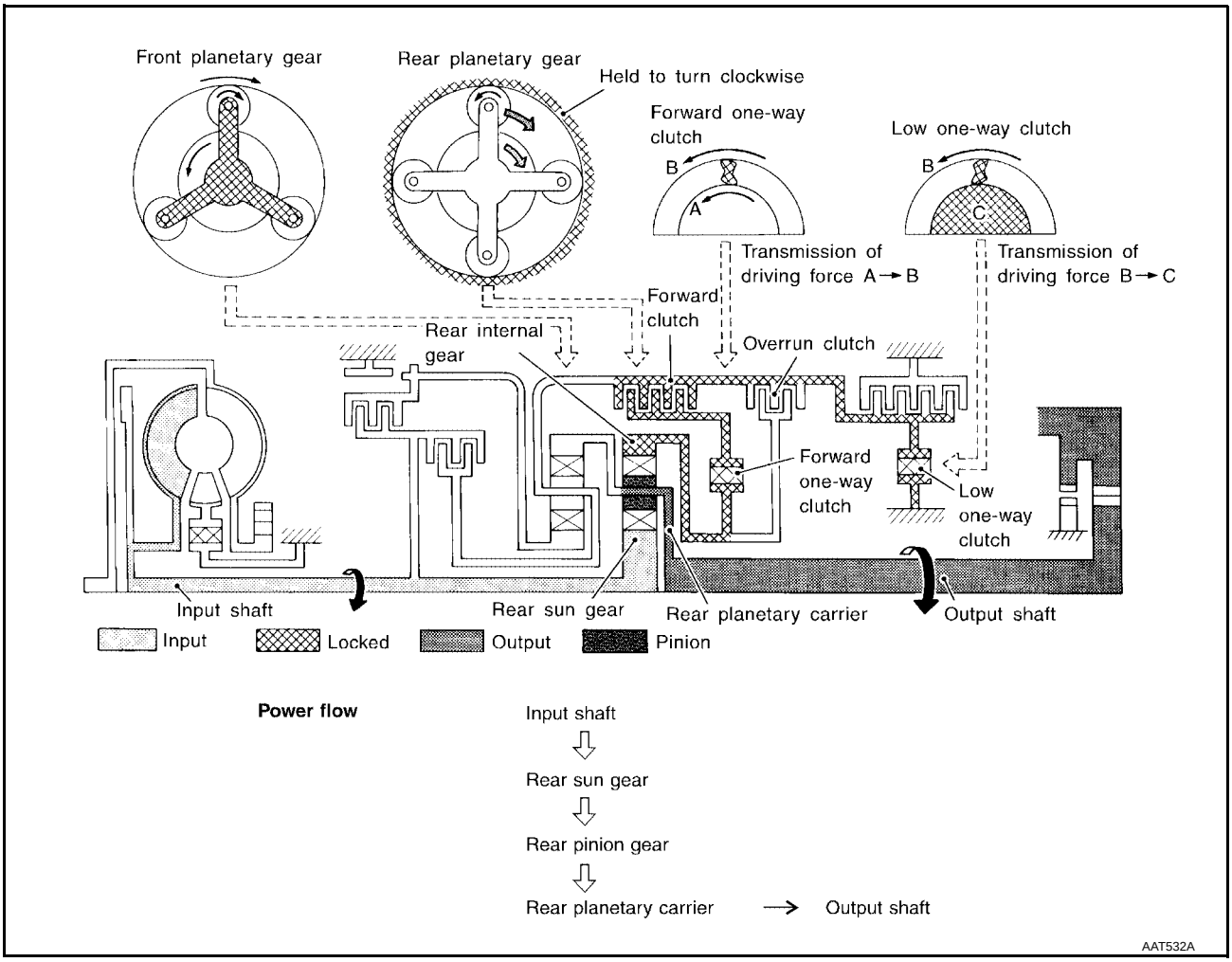


11 Position



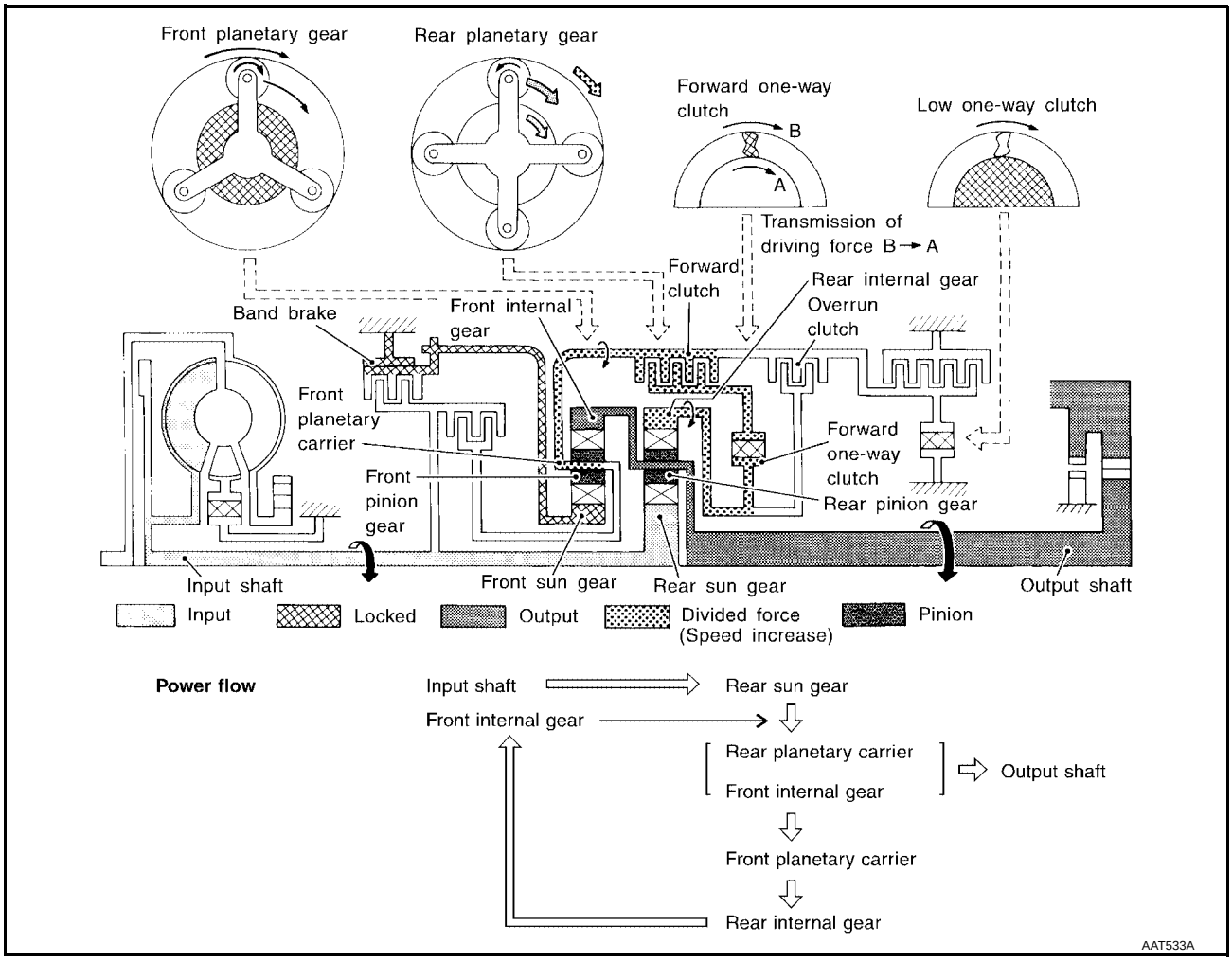
● **Forward clutch** ● **Forward one-way clutch** ● **Overrun clutch** ● **Low and reverse brake**	As overrun clutch engages, rear internal gear is locked by the operation of low and reverse brake. This is different from that of D_1 and 2_1 .
Engine brake	Overrun clutch always engages, therefore engine brake can be obtained when decelerating.

D1 and 21 Positions



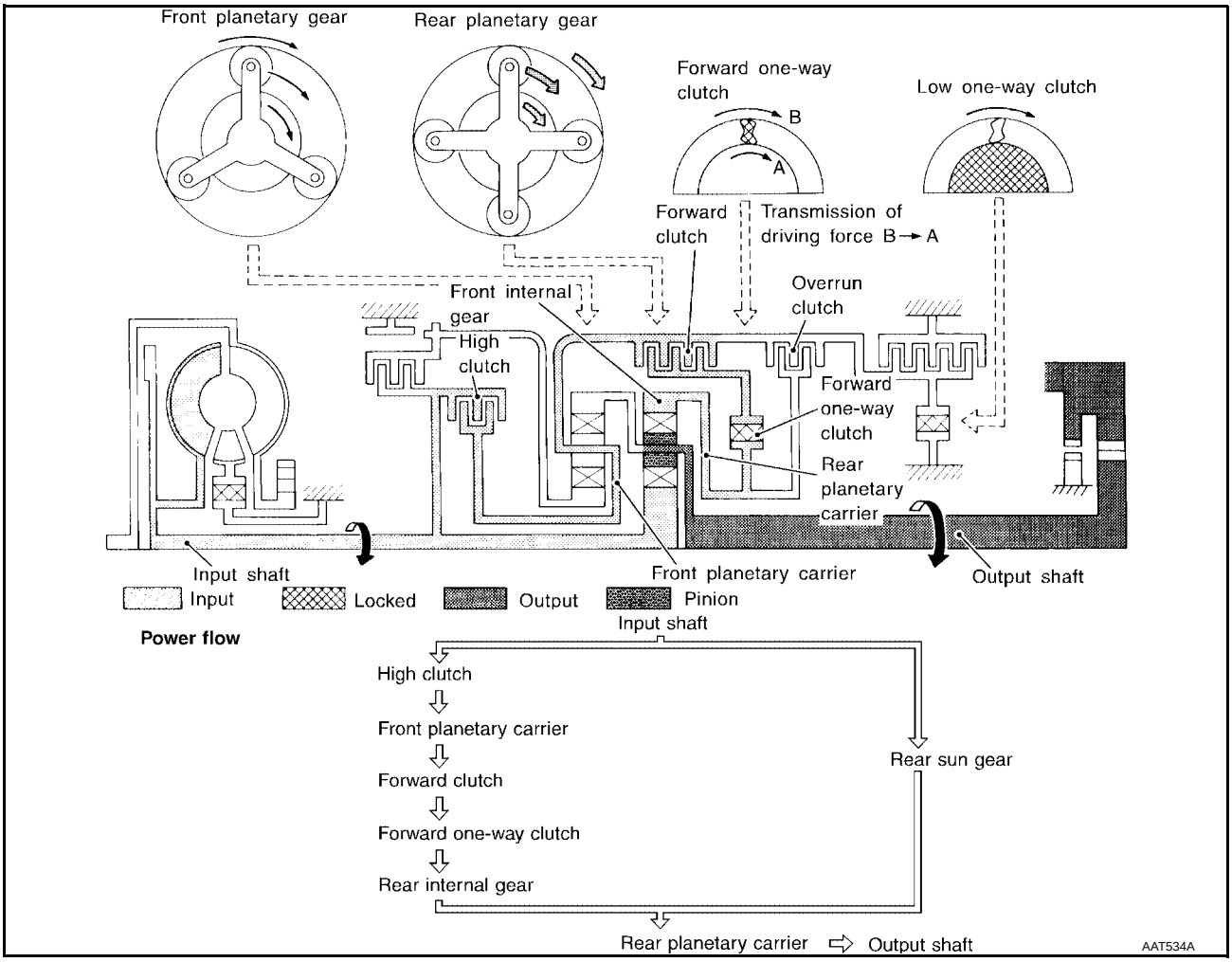
● **Forward one-way clutch** ● **Forward clutch** ● **Low one-way clutch**	Rear internal gear is locked to rotate counterclockwise because of the functioning of these three clutches.
Overrun clutch engagement conditions (Engine brake)	D1 : Overdrive control switch OFF and throttle opening is less than 3/16 21 : Always engaged At D1 and 21 positions, engine brake is not activated due to free turning of low one-way clutch.

D_2 , 3_2 , 2_2 and 1_2 Positions



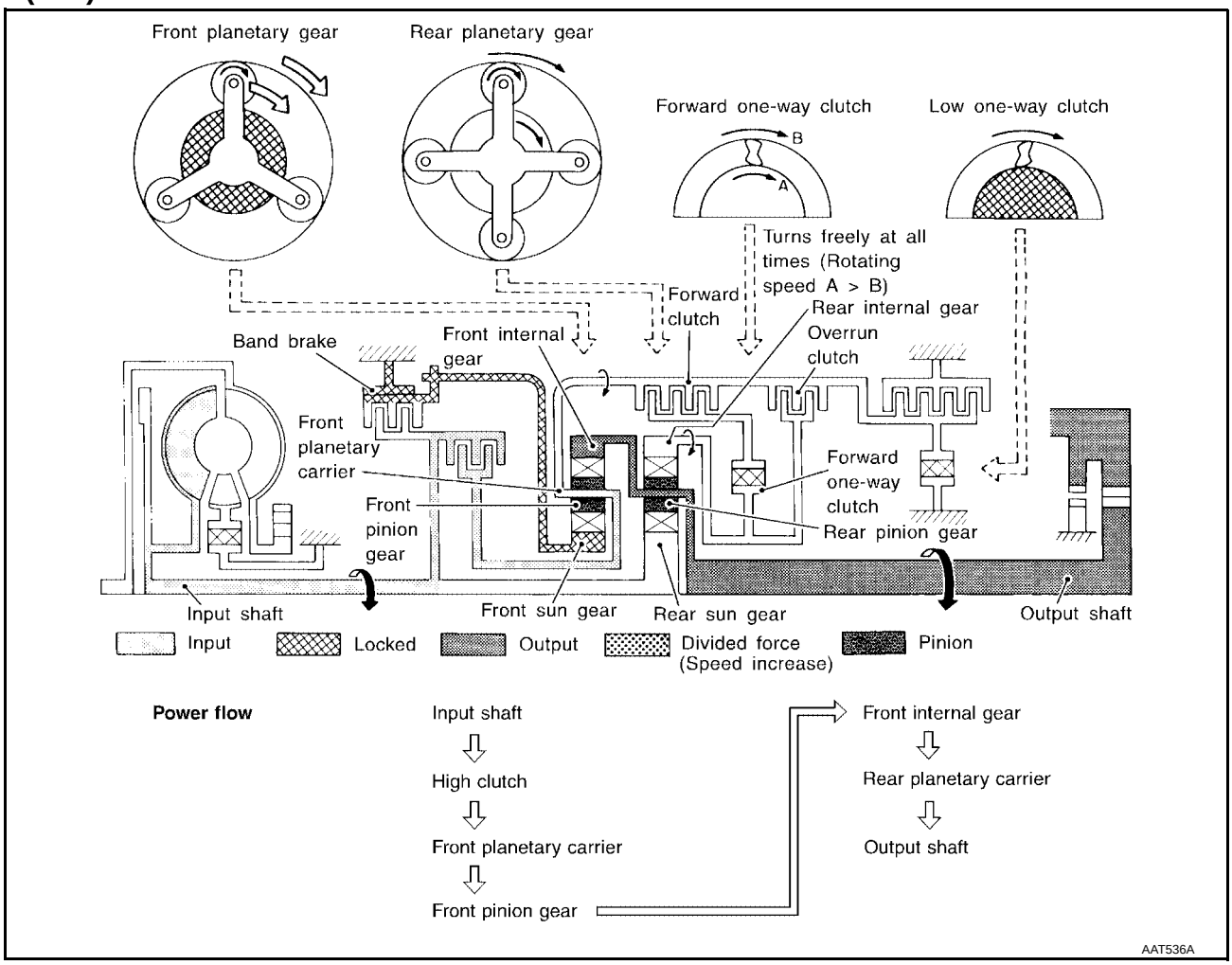
● **Forward clutch** ● **Forward one-way clutch** ● **Brake band**	Rear sun gear drives rear planetary carrier and combined front internal gear. Front internal gear now rotates around front sun gear accompanying front planetary carrier. As front planetary carrier transfers the power to rear internal gear through forward clutch and forward one-way clutch, this rotation of rear internal gear increases the speed of rear planetary carrier compared with that of the 1st speed.
Overrun clutch engagement conditions	D_2 : Overdrive control switch OFF and throttle opening is less than 3/16 2_2 and 1_2 : Always engaged

D3 and 33 Positions



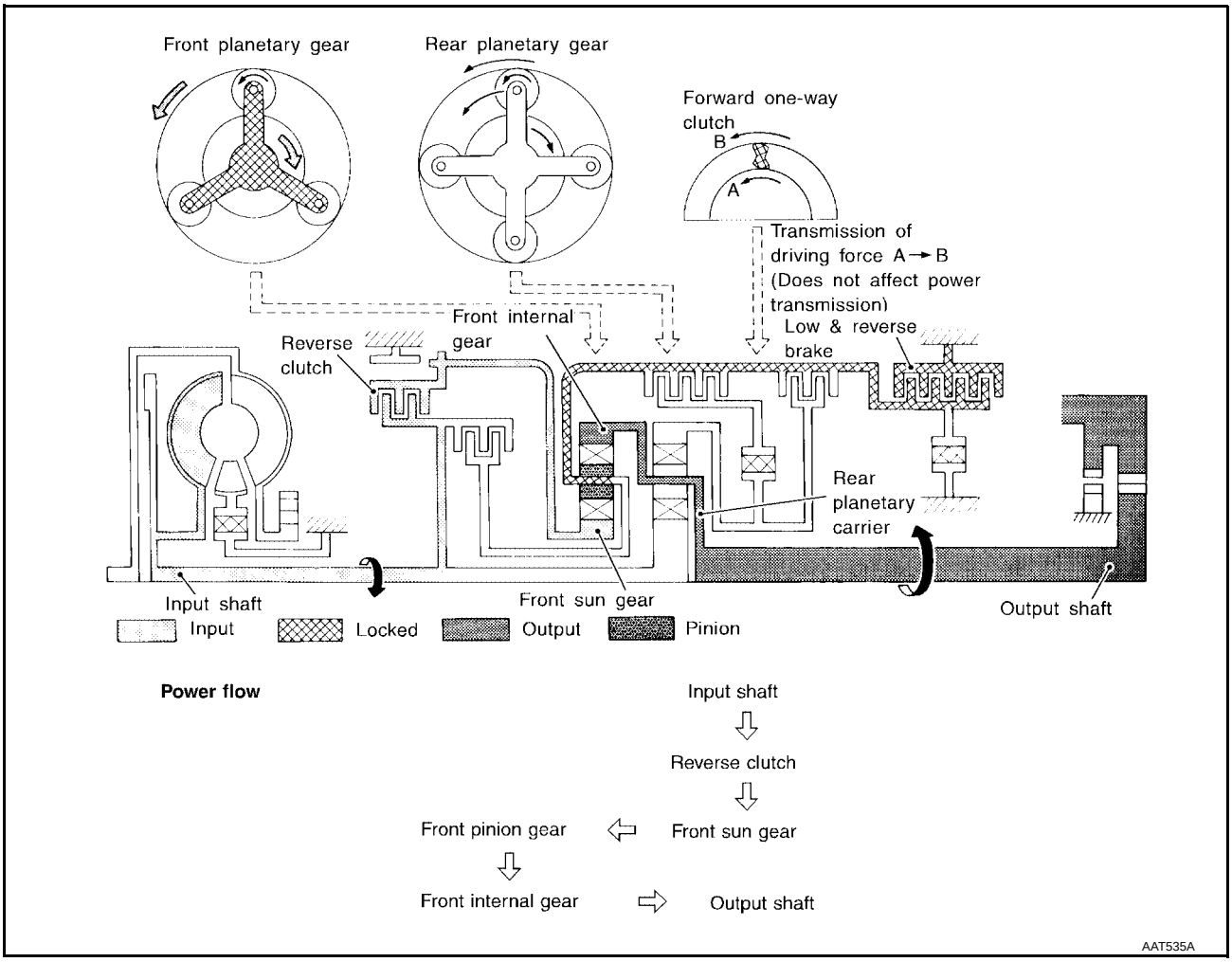
● **High clutch** ● **Forward clutch** ● **Forward one-way clutch**	Input power is transmitted to front planetary carrier through high clutch. And front planetary carrier is connected to rear internal gear by operation of forward clutch and forward one-way clutch. This rear internal gear rotation and another input (the rear sun gear) accompany rear planetary carrier to turn at the same speed.
Overrun clutch engagement conditions	D3 : Overdrive control switch OFF and throttle opening is less than 3/16

D4 (O/D) Position



● **High clutch** ● **Brake band** ● **Forward clutch** (Does not affect power transmission)	Input power is transmitted to front carrier through high clutch. This front carrier turns around the sun gear which is fixed by brake band and makes front internal gear (output) turn faster.
Engine brake	At D4 position, there is no one-way clutch in the power transmission line and engine brake can be obtained when decelerating.

R Position



Power flow

Input shaft
⇩
Reverse clutch
⇩
Front pinion gear ⇦ Front sun gear
⇩
Front internal gear ⇨ Output shaft

● **Reverse clutch** ● **Low and reverse brake**	Front planetary carrier is stationary because of the operation of low and reverse brake. Input power is transmitted to front sun gear through reverse clutch, which drives front internal gear in the opposite direction.
Engine brake	As there is no one-way clutch in the power transmission line, engine brake can be obtained when decelerating.

Control System

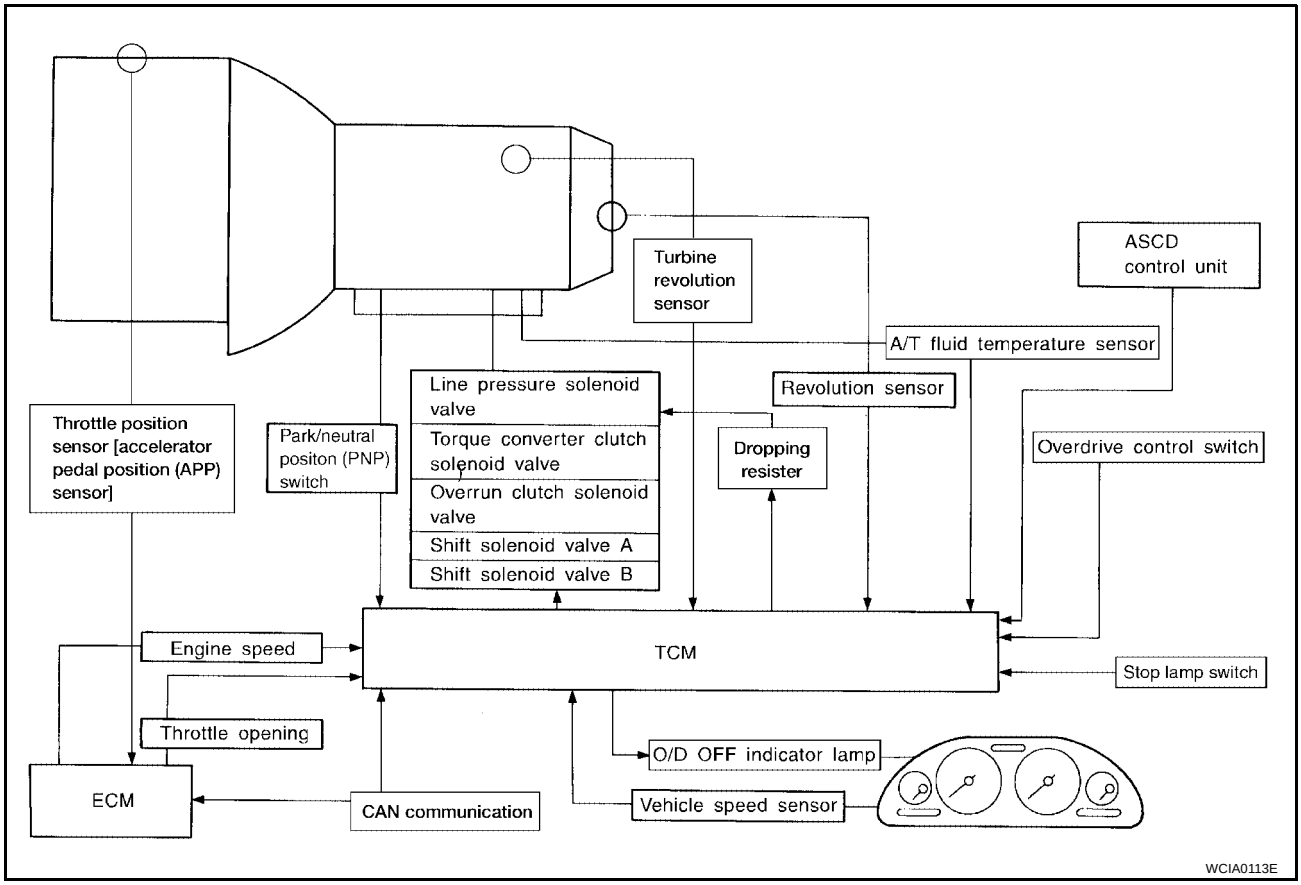
ECS0062E

OUTLINE

The automatic transaxle senses vehicle operating conditions through various sensors. It always controls the optimum shift position and reduces shifting and lock-up shocks.

SENSORS		TCM		ACTUATORS
Park/neutral position (PNP) switch Throttle position sensor [accelerator pedal position (APP) sensor] Engine speed signal A/T fluid temperature sensor Revolution sensor Vehicle speed sensor Overdrive control switch ASCD control unit Stop lamp switch Turbine revolution sensor	▶	Shift control Line pressure control Lock-up control Overrun clutch control Timing control Fail-safe control Self-diagnosis CONSULT-II communication line control	▶	Shift solenoid valve A Shift solenoid valve B Overrun clutch solenoid valve Torque converter clutch solenoid valve Line pressure solenoid valve O/D OFF indicator lamp

CONTROL SYSTEM



TCM FUNCTION

The function of the TCM is to:

- Receive input signals sent from various switches and sensors.
- Determine required line pressure, shifting point, lock-up operation, and engine brake operation.
- Send required output signals to the respective solenoids.

INPUT/OUTPUT SIGNAL OF TCM

	Sensors and solenoid valves	Function
Input	Park/neutral position (PNP) switch	Detects select lever position and sends a signal to TCM.
	Throttle position sensor [accelerator pedal position (APP) sensor]	Detects accelerator pedal position and requested throttle opening and sends a signal to TCM.
	Engine speed signal	Receives signal from ECM and controls lock-up control solenoid valve.
	A/T fluid temperature sensor	Detects transmission fluid temperature and sends a signal to TCM.
	Revolution sensor	Detects output shaft rpm and sends a signal to TCM.
	Vehicle speed sensor	Used as an auxiliary vehicle speed sensor. Sends a signal which is used if revolution sensor (installed on transmission) malfunctions.
	Overdrive control switch	Sends a signal to the TCM which prohibits a shift to D_4 (overdrive) position.
	ASCD control unit	Sends the cruise signal and D_4 (overdrive) cancellation signal from ASCD control unit to TCM.
	Stop lamp switch	Send the lock-up release signal to the TCM at time of D_4 (lock-up).
	CAN communication	Control units are connected to two communication lines (CAN H and CAN L) allowing a high rate of information transmission.
Output	Shift solenoid valve A/B	Selects shifting point suited to driving conditions in relation to a signal sent from TCM.
	Line pressure solenoid valve	Regulates line pressure suited to driving conditions in relation to a signal sent from TCM.
	Torque converter clutch solenoid valve	Regulates lock-up pressure suited to driving conditions in relation to a signal sent from TCM.
	Overrun clutch solenoid valve	Controls an “engine brake” effect suited to driving conditions in relation to a signal sent from TCM.
	O/D OFF indicator lamp	Shows TCM faults, when A/T control components malfunction.
	CAN communication	Control units are connected to two communication lines (CAN H and CAN L) allowing a high rate of information transmission.

CAN Communication

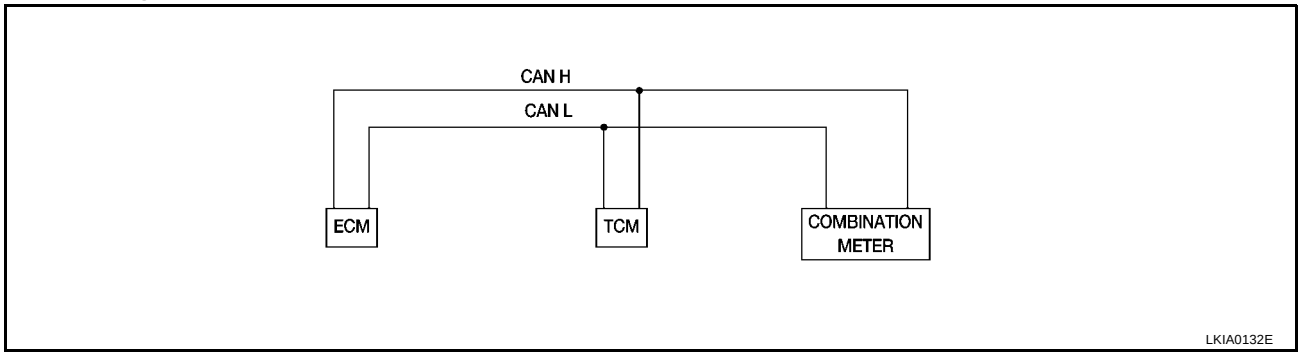
ECS006H8

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

CAN COMMUNICATION UNIT

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	TCM
Accelerator pedal position signal	T	R
Output shaft revolution signal	R	T
A/T self-diagnosis signal	R	T
Wide open throttle position signal	T	R
Overdrive cancel signal	T	R

Control Mechanism

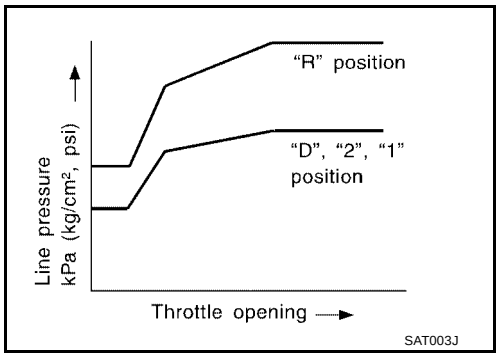
ECS0062F

LINE PRESSURE CONTROL

TCM has various line pressure control characteristics to meet the driving conditions.
An ON-OFF duty signal is sent to the line pressure solenoid valve based on TCM characteristics.
Hydraulic pressure on the clutch and brake is electronically controlled through the line pressure solenoid valve to accommodate engine torque. This results in smooth shift operation.

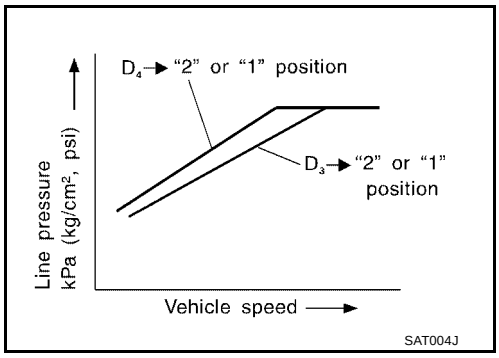
Normal Control

The line pressure to throttle opening characteristics is set for suitable clutch operation.



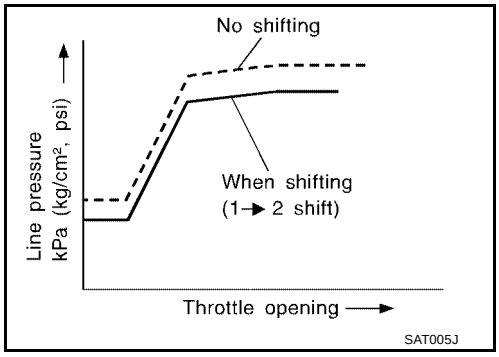
Back-up Control (Engine brake)

If the selector lever is shifted to 2 position while driving in D_4 (O/D) or D_3 , great driving force is applied to the clutch inside the transmission. Clutch operating pressure (line pressure) must be increased to deal with this driving force.



During Shift Change

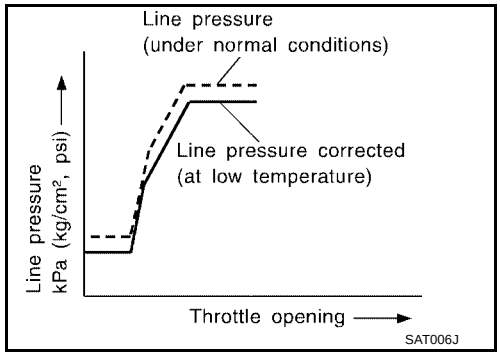
The line pressure is temporarily reduced corresponding to a change in engine torque when shifting gears (that is, when the shift solenoid valve is switched for clutch operation) to reduce shifting shock.



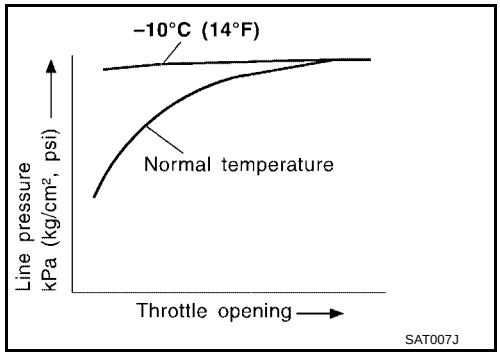
At Low Fluid Temperature

- Fluid viscosity and frictional characteristics of the clutch facing change with fluid temperature. Clutch engaging or band-contacting pressure is compensated for, according to fluid temperature, to stabilize shifting quality.

- The line pressure is reduced below 60°C (140°F) to prevent shifting shock due to low viscosity of automatic transmission fluid when temperature is low.



- Line pressure is increased to a maximum irrespective of the throttle opening when fluid temperature drops to −10°C (14°F). This pressure rise is adopted to prevent a delay in clutch and brake operation due to extreme drop of fluid viscosity at low temperature.

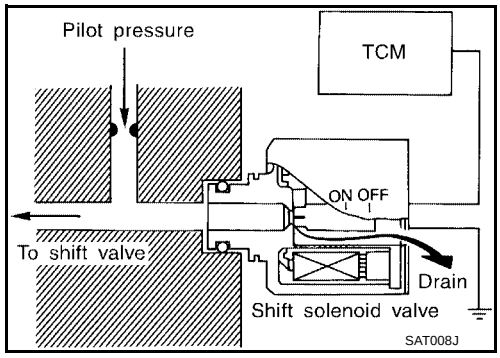


SHIFT CONTROL

The shift is regulated entirely by electronic control to accommodate vehicle speed and varying engine operations. This is accomplished by electrical signals transmitted by the revolution sensor and the ECM (throttle opening). This results in improved acceleration performance and fuel economy.

Control of Shift Solenoid Valves A and B

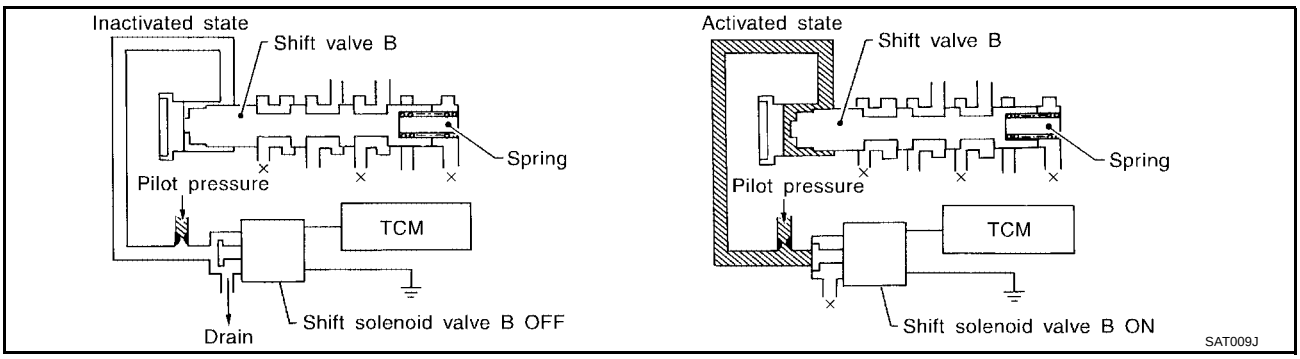
The TCM activates shift solenoid valves A and B according to signals from the ECM (throttle opening) and revolution sensor to select the optimum gear position on the basis of the shift schedule memorized in the TCM.
The shift solenoid valve performs simple ON-OFF operation. When set to ON, the drain circuit closes and pilot pressure is applied to the shift valve.



Relation between shift solenoid valves A and B and gear positions

Shift solenoid valve	Gear position				
	D_1 , 2_1 , 1_1	D_2 , 2_2 , 1_2	D_3	D_4 (O/D)	N-P
A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)	ON (Closed)
B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)

Control of Shift Valves A and B



Pilot pressure generated by the operation of shift solenoid valves A and B is applied to the end face of shift valves A and B.
The drawing above shows the operation of shift valve B. When the shift solenoid valve is ON, pilot pressure applied to the end face of the shift valve overcomes spring force, moving the valve upward.

LOCK-UP CONTROL

The torque converter clutch piston in the torque converter is locked to eliminate torque converter slip to increase power transmission efficiency. The solenoid valve is controlled by an ON-OFF duty signal sent from the TCM. The signal is converted to an oil pressure signal which controls the lock-up piston.

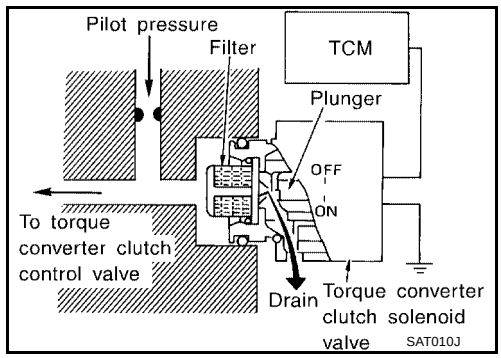
Conditions for Lock-up Operation

When vehicle is driven in 3rd and 4th gear position, vehicle speed and throttle opening are detected. If the detected values fall within the lock-up zone memorized in the TCM, lock-up occurs.

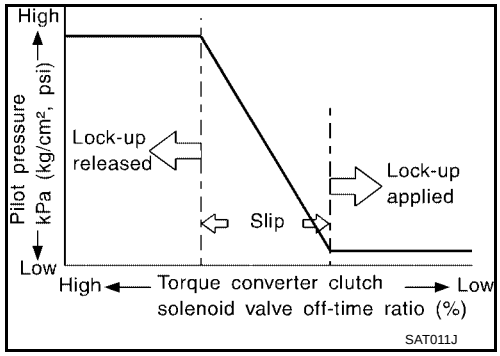
Overdrive control switch	ON	OFF
Selector lever	D position	
Gear position	D_4	D_3
Vehicle speed sensor	More than set value	
ECM (throttle opening)	Less than set opening	
A/T fluid temperature sensor	More than 40°C (104°F)	

Torque Converter Clutch Solenoid Valve Control

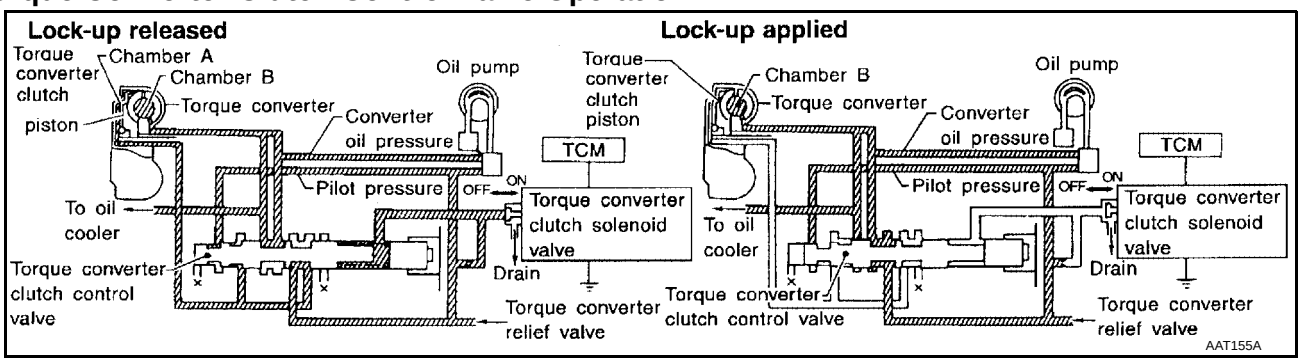
The torque converter clutch solenoid valve is controlled by the TCM. The plunger closes the drain circuit during the OFF period, and opens the circuit during the ON period. If the percentage of OFF-time increases in one cycle, the pilot pressure drain time is reduced and pilot pressure remains high.



The torque converter clutch piston is designed to slip to adjust the ratio of ON-OFF, thereby reducing lock-up shock.
OFF-time INCREASING
↓
Amount of drain DECREASING
↓
Pilot pressure HIGH
↓
Lock-up RELEASING



Torque Converter Clutch Control Valve Operation



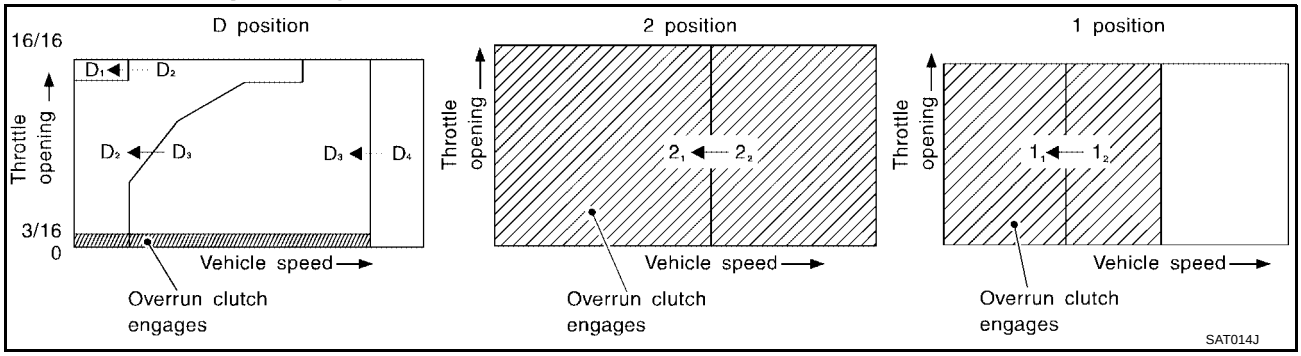
Lock-up released
The OFF-duration of the torque converter clutch solenoid valve is long, and pilot pressure is high. The pilot pressure pushes the end face of the torque converter clutch control valve in combination with spring force to move the valve to the left. As a result, converter pressure is applied to chamber A (torque converter clutch piston release side). Accordingly, the torque converter clutch piston remains unlocked.

Lock-up applied
When the OFF-duration of the torque converter clutch solenoid valve is short, pilot pressure drains and becomes low. Accordingly, the control valve moves to the right by the pilot pressure of the other circuit and converter pressure. As a result, converter pressure is applied to chamber B, keeping the torque converter clutch piston applied.
Also smooth lock-up is provided by transient application and release of the lock-up.

OVERRUN CLUTCH CONTROL (ENGINE BRAKE CONTROL)

Forward one-way clutch is used to reduce shifting shocks in downshifting operations. This clutch transmits engine torque to the wheels. However, drive force from the wheels is not transmitted to the engine because the one-way clutch rotates idle. This means the engine brake is not effective.
The overrun clutch operates when the engine brake is needed.

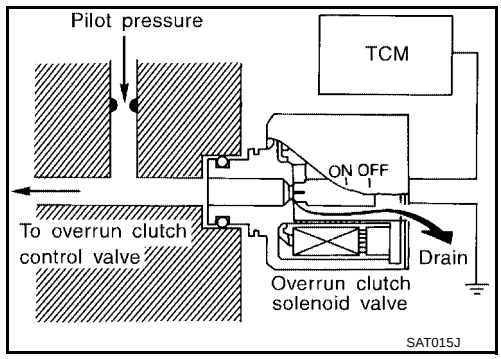
Overrun Clutch Operating Conditions



	Gear position	Throttle opening
D position	D1 , D2 , D3 gear position	Less than 3/16
2 position	21 , 22 gear position	
1 position	11 , 12 gear position	At any position

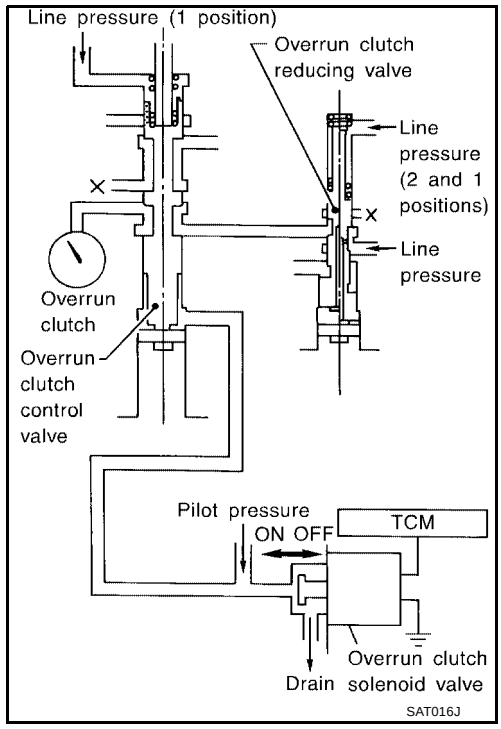
Overrun Clutch Solenoid Valve Control

The overrun clutch solenoid valve is operated by an ON-OFF signal transmitted by the TCM to provide overrun clutch control (engine brake control).
When this solenoid valve is ON, the pilot pressure drain port closes. When it is OFF, the drain port opens.
During the solenoid valve ON pilot pressure is applied to the end face of the overrun clutch control valve.



Overrun Clutch Control Valve Operation

When the solenoid valve is ON, pilot pressure is applied to the overrun clutch control valve. This pushes up the overrun clutch control valve. The line pressure is then shut off so that the clutch does not engage.
When the solenoid valve is OFF, pilot pressure is not generated. At this point, the overrun clutch control valve moves downward by spring force. As a result, overrun clutch operation pressure is provided by the overrun clutch reducing valve. This causes the overrun clutch to engage.
In the 1 position, the overrun clutch control valve remains pushed down so that the overrun clutch is engaged at all times.



Control Valve

ECS0062G

FUNCTION OF CONTROL VALVES

Valve name	Function
Pressure regulator valve, plug and sleeve plug	Regulates oil discharged from the oil pump to provide optimum line pressure for all driving conditions.
Pressure modifier valve and sleeve	Used as a signal supplementary valve to the pressure regulator valve. Regulates pressure-modifier pressure (signal pressure) which controls optimum line pressure for all driving conditions.
Pilot valve	Regulates line pressure to maintain a constant pilot pressure level which controls lock-up mechanism, overrun clutch, shift timing.
Accumulator control valve	Regulates accumulator back-pressure to pressure suited to driving conditions.
Manual valve	Directs line pressure to oil circuits corresponding to select positions. Hydraulic pressure drains when the shift lever is in Neutral.
Shift valve A	Simultaneously switches three oil circuits using output pressure of shift solenoid valve A to meet driving conditions (vehicle speed, throttle opening, etc.). Provides automatic downshifting and up-shifting (1st → 2nd → 3rd → 4th gears/4th → 3rd → 2nd → 1st gears) in combination with shift valve B.

Valve name	Function
Shift valve B	Simultaneously switches two oil circuits using output pressure of shift solenoid valve B in relation to driving conditions (vehicle speed, throttle opening, etc.). Provides automatic downshifting and up-shifting (1st → 2nd → 3rd → 4th gears/4th → 3rd → 2nd → 1st gears) in combination with shift valve A.
Overrun clutch control valve	Switches hydraulic circuits to prevent engagement of the overrun clutch simultaneously with application of the brake band in D_4 . (Interlocking occurs if the overrun clutch engages during D_4 .)
“1” reducing valve	Reduces low & reverse brake pressure to dampen engine-brake shock when down-shifting from the 1 position 1_2 to 1_1 .
Overrun clutch reducing valve	Reduces oil pressure directed to the overrun clutch and prevents engine-brake shock. In 1 and 2 positions, line pressure acts on the overrun clutch reducing valve to increase the pressure-regulating point, with resultant engine brake capability.
Torque converter relief valve	Prevents an excessive rise in torque converter pressure.
Torque converter clutch control valve, plug and sleeve	Activates or inactivates the lock-up function. Also provides smooth lock-up through transient application and release of the lock-up system.
1-2 accumulator valve and piston	Dampens the shock encountered when 2nd gear band servo contracts, and provides smooth shifting.
3-2 timing valve	Switches the pace that oil pressure is released depending on vehicle speed; maximizes the high clutch release timing, and allows for soft down shifting.
Shuttle valve	Determines if the overrun clutch solenoid valve should control the 3-2 timing valve or the overrun clutch control valve and switches between the two.
Cooler check valve	At low speeds and with a small load when little heat is generated, saves the volume of cooler flow, and stores the oil pressure for lock up.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

PFP:00000

Introduction

ECS0062H

The A/T system has two self-diagnostic systems.
The first is the emission-related on board diagnostic system (OBD-II) performed by the TCM (transmission control module) in combination with the ECM. The malfunction is indicated by the MIL (malfunction indicator lamp) and is stored as a DTC in the ECM memory but not the TCM memory.
The second is the TCM original self-diagnosis indicated by the O/D OFF indicator lamp. The malfunction is stored in the TCM memory. The detected items are overlapped with OBD-II self-diagnostic items. For details, refer to AT-428, "OBD-II Function for A/T System" .

OBD-II Function for A/T System

ECS0062I

The ECM provides emission-related on board diagnostic (OBD-II) functions for the A/T system. One function is to receive a signal from the TCM used with OBD-related parts of the A/T system. The signal is sent to the ECM when a malfunction occurs in the corresponding OBD-related part. The other function is to indicate a diagnostic result by means of the MIL (malfunction indicator lamp) on the instrument panel. Sensors, switches and solenoid valves are used as sensing elements.
The MIL automatically illuminates in One or Two Trip Detection Logic when a malfunction is sensed in relation to A/T system parts.

One or Two Trip Detection Logic of OBD-II

ECS0062J

ONE TRIP DETECTION LOGIC

If a malfunction is sensed during the first test drive, the MIL will illuminate and the malfunction will be stored in the ECM memory as a DTC. The TCM is not provided with such a memory function.

TWO TRIP DETECTION LOGIC

When a malfunction is sensed during the first test drive, it is stored in the ECM memory as a 1st trip DTC (diagnostic trouble code) or 1st trip freeze frame data. At this point, the MIL will not illuminate. — First Trip
If the same malfunction as that experienced during the first test drive is sensed during the second test drive, the MIL will illuminate. — Second Trip
A/T-related parts for which the MIL illuminates during the first or second test drive are listed below.

Items	MIL	
	One trip detection	Two trip detection
Shift solenoid valve A — DTC: P0750	X	
Shift solenoid valve B — DTC: P0755	X	
Throttle position sensor [accelerator pedal position (APP) sensor] — DTC: P1705	X	
Except above		X

The “trip” in the “One or Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation.

OBD-II Diagnostic Trouble Code (DTC)

ECS0062K

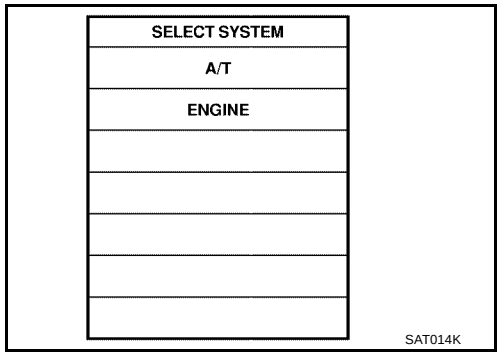
HOW TO READ DTC AND 1ST TRIP DTC

DTC and 1st trip DTC can be read by the following methods.

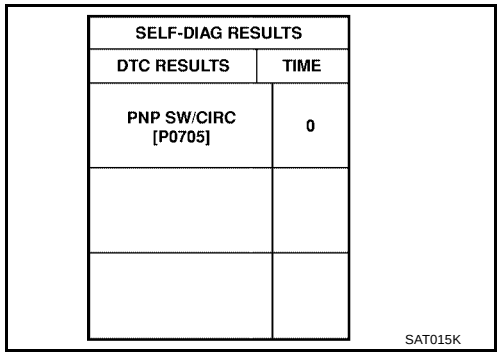
(With CONSULT-II or GST) GST) CONSULT-II or GST (Generic Scan Tool) Examples: P0705, P0710, P0720, P0725, etc.
These DTCs are prescribed by SAE J2012.
(CONSULT-II also displays the malfunctioning component or system.)

- **1st trip DTC No. is the same as DTC No.**
- **Output of the diagnostic trouble code indicates that the indicated circuit has a malfunction. However, in case of the Mode II and GST they do not indicate whether the malfunction is still occurring or occurred in the past and returned to normal.**
  CONSULT-II can identify them as shown below. Therefore, using CONSULT-II (if available) is recommended.

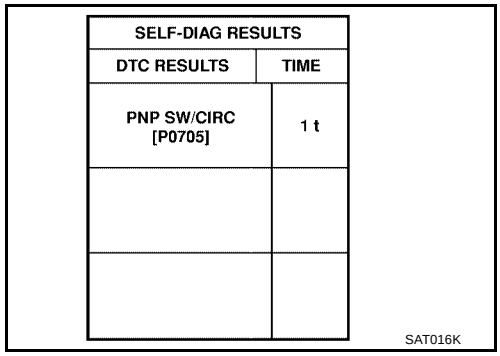
A sample of CONSULT-II display for DTC and 1st trip DTC is shown in the following page. DTC or 1st trip DTC of a malfunction is displayed in “SELF DIAGNOSIS” mode for “ENGINE” with CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.



If the DTC is being detected currently, the time data will be “0”.



If a 1st trip DTC is stored in the ECM, the time data will be “1t”.



Freeze Frame Data and 1st Trip Freeze Frame Data

The ECM has a memory function, which stores the driving condition such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed and vehicle speed at the moment the ECM detects a malfunction.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data, and the data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For detail, refer to EC-1264, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .
Only one set of freeze frame data (either 1st trip freeze frame data of freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0306 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

HOW TO ERASE DTC

The diagnostic trouble code can be erased by CONSULT-II, GST or ECM DIAGNOSTIC TEST MODE as described in the following.

- **If the battery terminal is disconnected, the diagnostic trouble code will be lost within 24 hours.**
- **When you erase the DTC, using CONSULT-II or GST is easier and quicker than switching the mode selector on the ECM.**

The following emission-related diagnostic information is cleared from the ECM memory when erasing DTC related to OBD-II. For details, refer to EC-1261, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" .

- **Diagnostic trouble codes (DTC)**
- **1st trip diagnostic trouble codes (1st trip DTC)**
- **Freeze frame data**
- **1st trip freeze frame data**
- **System readiness test (SRT) codes**
- **Test values**

HOW TO ERASE DTC (WITH CONSULT-II)

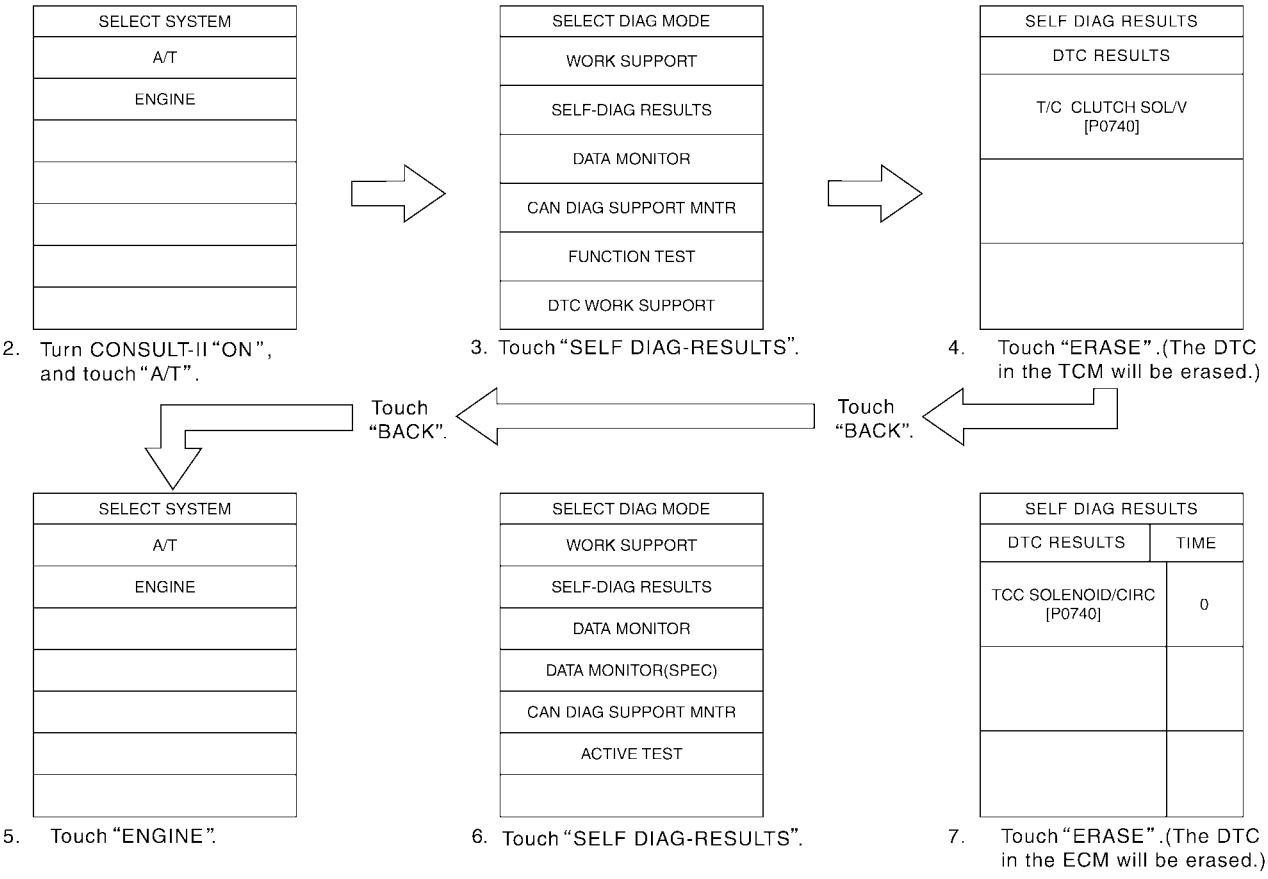
- **If a DTC is displayed for both ECM and TCM, it needs to be erased for both ECM and TCM.**

1. If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “A/T”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the TCM will be erased.) Then touch “BACK” twice.
5. Touch “ENGINE”.
6. Touch “SELF DIAGNOSIS”.

7. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.



HOW TO ERASE DTC (WITH GST)

1. If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
2. Perform TCM self-diagnostic procedure. Refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" . (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with Generic Scan Tool (GST). For details, refer to EC-1274, "How to Erase DTC (With GST)" .

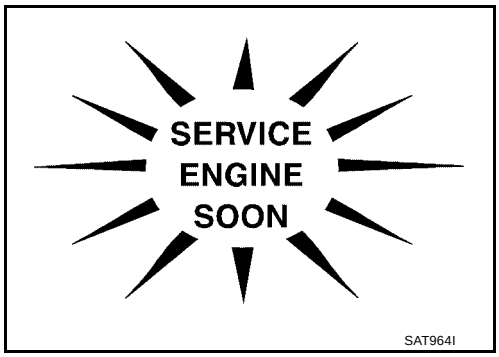
HOW TO ERASE DTC (NO TOOLS)

1. If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
2. Perform TCM self-diagnostic procedure. Refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" . (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Perform OBD-II self-diagnostic procedure. Refer to AT-441, "OBD-II SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" . (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)

Malfunction Indicator Lamp (MIL)

ECS0062L

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is for checking the lamp.
   - If the malfunction indicator lamp does not light up, refer to DI-27, "WARNING LAMPS" .
     (Or see AT-432, "Malfunction Indicator Lamp (MIL)" .)
2. When the engine is started, the malfunction indicator lamp should go off.
   If the lamp remains on, the on board diagnostic system has detected an emission-related (OBD-II) malfunction. For details, refer to AT-428, "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" .



CONSULT-II

ECS0062M

After performing AT-433, "SELF-DIAGNOSTIC PROCEDURE (WITH CONSULT-II)" , place check marks for results on the AT-447, "DIAGNOSTIC WORKSHEET" . Reference pages are provided following the items.

NOTICE:

1. The CONSULT-II electrically displays shift timing and lock-up timing (that is, operation timing of each solenoid).
   Check for time difference between actual shift timing and the CONSULT-II display. If the difference is noticeable, mechanical parts (except solenoids, sensors, etc.) may be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
2. Shift schedule (which implies gear position) displayed on CONSULT-II and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:

- Actual shift schedule has more or less tolerance or allowance,
- Shift schedule indicated in Service Manual refers to the point where shifts start, and
- Gear position displayed on CONSULT-II indicates the point where shifts are completed.

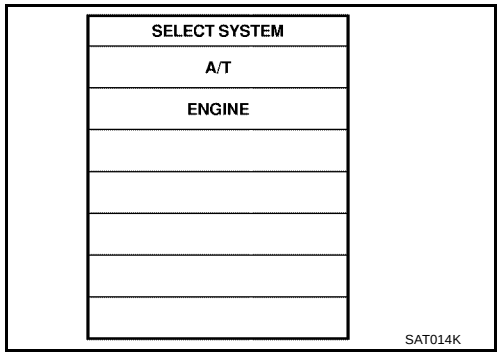
3. Shift solenoid valve “A” or “B” is displayed on CONSULT-II at the start of shifting. Gear position is displayed upon completion of shifting (which is computed by TCM).
4. Additional CONSULT-II information can be found in the Operation Manual supplied with the CONSULT-II unit.

FUNCTION

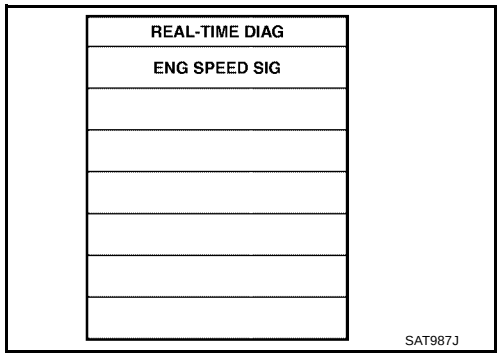
Diagnostic test mode	Function	Reference Page
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT-II.	—
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	AT-433
Data monitor	Input/Output data in the ECM can be read.	AT-435
CAN diagnostic support monitor	The results of transmit/receive diagnosis of CAN communication can be read.	—
Function test	Performed by CONSULT-II instead of a technician to determine whether each system is “OK” or “NG”.	—
DTC work support	Select the operating condition to confirm Diagnosis Trouble Codes.	AT-437
TCM part number	TCM part number can be read.	—

SELF-DIAGNOSTIC PROCEDURE (WITH CONSULT-II)

1. Turn on CONSULT-II and touch “ENGINE” for OBD-II detected items or touch “A/T” for TCM self-diagnosis.
   If A/T is not displayed, check TCM power supply and ground circuit. Refer to AT-488, "TROUBLE DIAGNOSIS FOR POWER SUPPLY" . If result is NG, refer to PG-2, "POWER SUPPLY ROUTING" .



2. Touch “SELF DIAGNOSIS”.
   Display shows malfunction experienced since the last erasing operation.
   CONSULT-II performs “Real Time Diagnosis”.
   Also, any malfunction detected while in this mode will be displayed at real time.



SELF-DIAGNOSTIC RESULT TEST MODE

Detected items (Screen terms for CONSULT-II, “SELF DIAGNOSIS” test mode)		Malfunction is detected when ...	TCM self-diagnosis	OBD-II (DTC)
“A/T”	“ENGINE”		Available by O/D OFF indicator lamp or “A/T” on CONSULT-II	Available by malfunction indicator lamp*2, “ENGINE” on CONSULT-II or GST
Park/neutral position (PNP) switch circuit		● TCM does not receive the correct voltage signal (based on the gear position) from the switch.	—	P0705
—	PNP SW/CIRC			
Revolution sensor		● TCM does not receive the proper voltage signal from the sensor.	X	P0720
VHCL SPEED SEN·A/T	VEH SPD SEN/ CIR AT			
Vehicle speed sensor (Meter)		● TCM does not receive the proper voltage signal from the sensor.	X	—
VHCL SPEED SEN·MTR	—			

Detected items (Screen terms for CONSULT-II, "SELF DIAGNOSIS" test mode)		Malfunction is detected when ...	TCM self-diagnosis	OBD-II (DTC)
"A/T"	"ENGINE"		Available by O/D OFF indicator lamp or "A/T" on CONSULT-II	Available by malfunction indicator lamp*2, "ENGINE" on CONSULT-II or GST
A/T 1st gear function		● A/T cannot be shifted to the 1st gear position even if electrical circuit is good.	—	P0731*1
A/T 1ST GR FNCTN	A/T 1ST GR FNCTN			
A/T 2nd gear function		● A/T cannot be shifted to the 2nd gear position even if electrical circuit is good.	—	P0732*1
A/T 2ND GR FNCTN	A/T 2ND GR FNCTN			
A/T 3rd gear function		● A/T cannot be shifted to the 3rd gear position even if electrical circuit is good.	—	P0733*1
A/T 3RD GR FNCTN	A/T 3RD GR FNCTN			
A/T 4th gear function		● A/T cannot be shifted to the 4th gear position even if electrical circuit is good.	—	P0734*1
A/T 4TH GR FNCTN	A/T 4TH GR FNCTN			
A/T TCC S/V function (lock-up)		● A/T cannot perform lock-up even if electrical circuit is good.	—	P0744*1
A/T TCC S/V FNCTN	A/T TCC S/V FNCTN			
Shift solenoid valve A		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P0750
SHIFT SOLENOID/V A	SFT SOL A/CIRC			
Shift solenoid valve B		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P0755
SHIFT SOLENOID/V B	SFT SOL B/CIRC			
Overrun clutch solenoid valve		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P1760
OVERRUN CLUTCH S/V	O/R CLUCH SOL/CIRC			
T/C clutch solenoid valve		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P0740
T/C CLUTCH SOL/V	TCC SOLENOID/CIRC			
Line pressure solenoid valve		● TCM detects an improper voltage drop when it tries to operate the solenoid valve.	X	P0745
LINE PRESSURE S/V	L/PRESS SOL/CIRC			
Throttle position sensor [accelerator pedal position (APP) sensor] signal		● TCM receives an excessively low or high voltage from this sensor.	X	P1705
THROTTLE POSI SEN TP/SEN/CIRC A/T				
Engine speed signal		● TCM does not receive the proper voltage signal from the ECM.	X	P0725
ENGINE SPEED SIG				
A/T fluid temperature sensor		● TCM receives an excessively low or high voltage from the sensor.	X	P0710
BATT/FLUID TEMP SEN	ATF TEMP SEN/CIRC			
Engine control		● The ECM-A/T communication line is open or shorted.	X	U1000
A/T COMM LINE	—			
Turbine revolution sensor		● TCM does not receive the proper voltage signal from the sensor.	X	P0710
TURBINE REV				
TCM (RAM)		● TCM memory (RAM) is malfunctioning	—	—
CONTROL UNIT (RAM)	—			

Detected items (Screen terms for CONSULT-II, “SELF DIAGNOSIS” test mode)		Malfunction is detected when ...	TCM self-diagnosis	OBD-II (DTC)
“A/T”	“ENGINE”		Available by O/D OFF indicator lamp or “A/T” on CONSULT-II	Available by malfunction indicator lamp*2, “ENGINE” on CONSULT-II or GST
TCM (ROM)		● TCM memory (ROM) is malfunctioning	—	—
CONTROL UNIT (ROM)	—			
TCM (EEP ROM)		● TCM memory (EEP ROM) is malfunctioning.	—	—
CONT UNIT(EEP ROM)	—			
Initial start		● This is not a malfunction message (Whenever shutting off a power supply to the TCM, this message appears on the screen.)	X	—
INITIAL START	—			
No failure (NO SELF DIAGNOSTIC FAILURE INDICATED FURTHER TESTING MAY BE REQUIRED**)		● No failure has been detected.	X	X

X: Applicable
–: Not applicable

*1: These malfunctions cannot be displayed by MIL (SERVICE ENGINE SOON) if another malfunction is assigned to MIL.
*2: Refer to EC-1275, "Malfunction Indicator Lamp (MIL)" .

DATA MONITOR MODE (A/T)

Item	Display	Monitor item		Description	Remarks
		TCM Input signals	Main signals		
Vehicle speed sensor 1 (A/T) (Revolution sensor)	VHCL/S SE·A/T [km/h] or [mph]	X	—	● Vehicle speed computed from signal of revolution sensor is displayed.	When racing engine in N or P with vehicle stationary, CONSULT-II data may not indicate 0 km/h (0 mph).
Vehicle speed sensor 2 (Meter)	VHCL/S SE·MTR [km/h] or [mph]	X	—	● Vehicle speed computed from signal of vehicle speed sensor is displayed.	Vehicle speed display may not be accurate under approx. 10 km/h (6 mph). It may not indicate 0 km/h (0 mph) when vehicle is stationary.
Throttle position sensor [accelerator pedal position (APP) sensor]	THRTL POS SEN [V]	X	—	● Throttle position sensor signal voltage is displayed.	
A/T fluid temperature sensor	FLUID TEMP SE [V]	X	—	● A/T fluid temperature sensor signal voltage is displayed. ● Signal voltage lowers as fluid temperature rises.	
Battery voltage	BATTERY VOLT [V]	X	—	● Source voltage of TCM is displayed.	
Engine speed	ENGINE SPEED [rpm]	X	X	● Engine speed, computed from engine speed signal, is displayed.	Engine speed display may not be accurate under approx. 800 rpm. It may not indicate 0 rpm even when engine is not running.

Item	Display	Monitor item		Description	Remarks
		TCM Input signals	Main signals		
Turbine revolution sensor	TURBINE REV	X	—	● Checks changing speed then performs oil pressure control and torque down control.	
Overdrive control switch	OVERDRIVE SW [ON/OFF]	X	—	● ON/OFF state computed from signal of overdrive control SW is displayed.	
PN position (PNP) switch	PN POSI SW [ON/OFF]	X	—	● ON/OFF state computed from signal of PN position SW is displayed.	
R position switch	R POSITION SW [ON/OFF]	X	—	● ON/OFF state computed from signal of R position SW is displayed.	
D position switch	D POSITION SW [ON/OFF]	X	—	● ON/OFF state computed from signal of D position SW is displayed.	
2 position switch	2 POSITION SW [ON/OFF]	X	—	● ON/OFF status, computed from signal of 2 position SW, is displayed.	
1 position switch	1 POSITION SW [ON/OFF]	X	—	● ON/OFF status, computed from signal of 1 position SW, is displayed.	
ASCD cruise signal	ASCD·CRUISE [ON/OFF]	X	—	● Status of ASCD cruise signal is displayed. ON ... Cruising state OFF ... Normal running state	● This is displayed even when no ASCD is mounted.
ASCD OD cut signal	ASCD·OD CUT [ON/OFF]	X	—	● Status of ASCD OD release signal is displayed. ON ... OD released OFF ... OD not released	● This is displayed even when no ASCD is mounted.
Kickdown switch	KICKDOWN SW [ON/OFF]	X	—	● ON/OFF status, computed from signal of kickdown SW, is displayed.	● This is displayed even when no kickdown switch is equipped.
Gear position	GEAR	—	X	● Gear position data used for computation by TCM, is displayed.	
Selector lever position	SLCT LVR POSI	—	X	● Selector lever position data, used for computation by TCM, is displayed.	● A specific value used for control is displayed if fail-safe is activated due to error.
Vehicle speed	VEHICLE SPEED [km/h] or [mph]	—	X	● Vehicle speed data, used for computation by TCM, is displayed.	
Throttle position sensor [accelerator pedal position (APP) sensor]	THROTTLE POSI [/8]	—	X	● Throttle position data, used for computation by TCM, is displayed.	● A specific value used for control is displayed if fail-safe is activated due to error.
Stop lamp switch	BRAKE SW [ON/OFF]	X	—	● ON/OFF status is displayed. ON ... Brake pedal is depressed. OFF ... Brake pedal is released.	

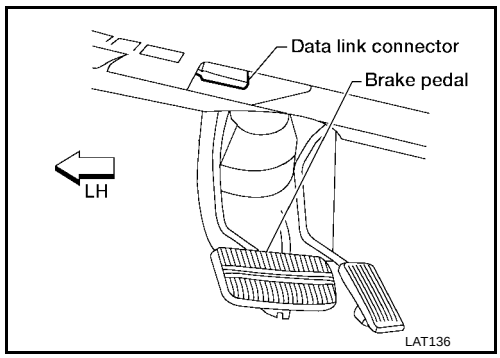
Item	Display	Monitor item		Description	Remarks
		TCM Input signals	Main signals		
Line pressure duty	LINE PRES DTY [%]	—	X	● Control value of line pressure solenoid valve, computed by TCM from each input signal, is displayed.	
Torque converter clutch solenoid valve duty	TCC S/V DUTY [%]	—	X	● Control value of torque converter clutch solenoid valve, computed by TCM from each input signal, is displayed.	
Shift solenoid valve A	SHIFT S/V A [ON/OFF]	—	X	● Control value of shift solenoid valve A, computed by TCM from each input signal, is displayed.	Control value of solenoid is displayed even if solenoid circuit is disconnected. The OFF signal is displayed if solenoid circuit is shorted.
Shift solenoid valve B	SHIFT S/V B [ON/OFF]	—	X	● Control value of shift solenoid valve B, computed by TCM from each input signal, is displayed.	
Overrun clutch solenoid valve	OVERRUN/C S/V [ON/OFF]	—	X	● Control value of overrun clutch solenoid valve computed by TCM from each input signal is displayed.	
Self-diagnosis display lamp (O/D OFF indicator lamp)	SELF-D DP LMP [ON/OFF]	—	X	● Control status of O/D OFF indicator lamp is displayed.	

X: Applicable
—: Not applicable

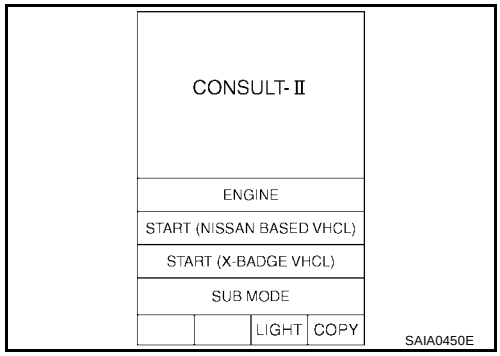
DTC WORK SUPPORT MODE WITH CONSULT-II

CONSULT-II Setting Procedure

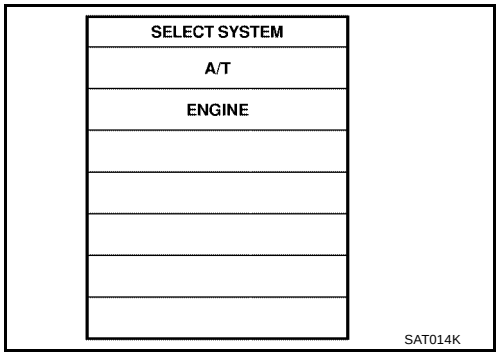
1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located in left side dash panel.



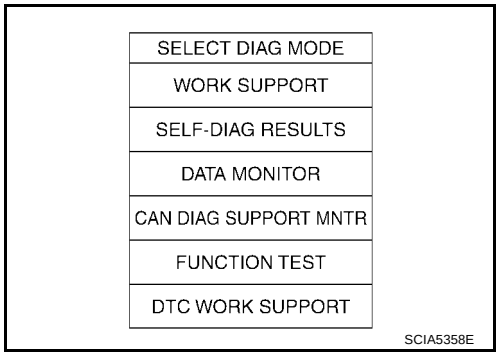
3. Turn ignition switch ON.
4. Touch “START (NISSAN BASED VHCL)”.



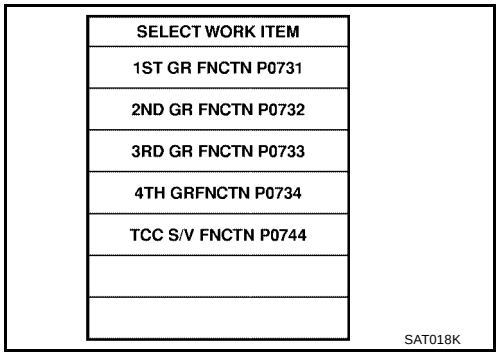
5. Touch “A/T”.



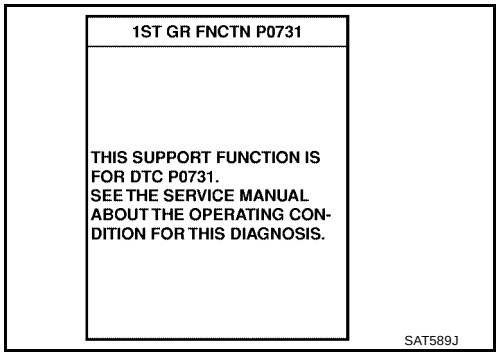
6. Touch “DTC WORK SUPPORT”.



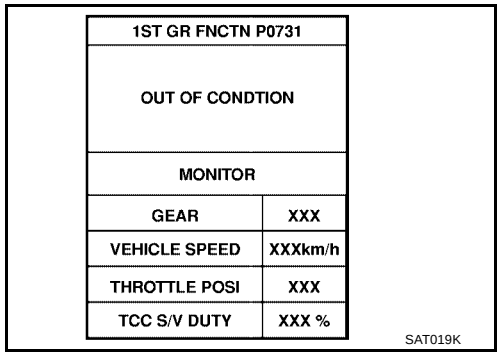
7. Touch select item menu (1ST, 2ND, etc.).



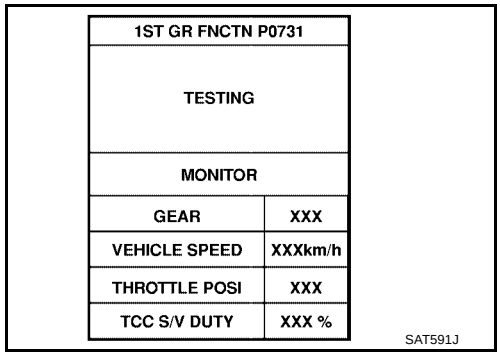
8. Touch “START”.



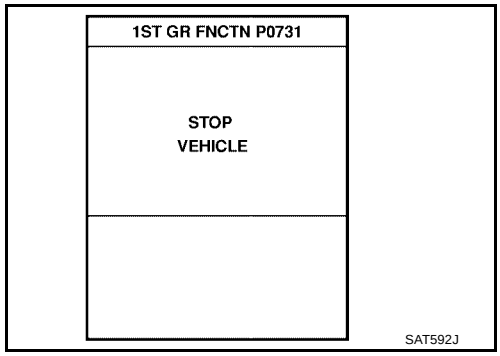
9. Perform driving test according to “DTC CONFIRMATION PROCEDURE” in “TROUBLE DIAGNOSIS FOR DTC”.

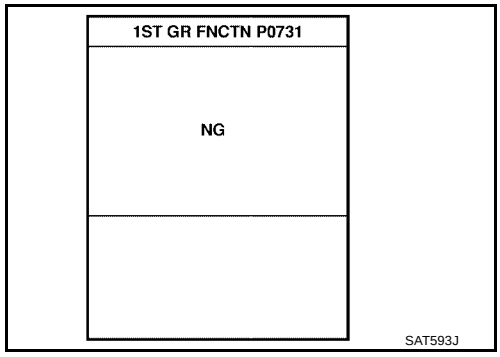


- **When testing conditions are satisfied, CONSULT-II screen changes from “OUT OF CONDITION” to “TESTING”.**

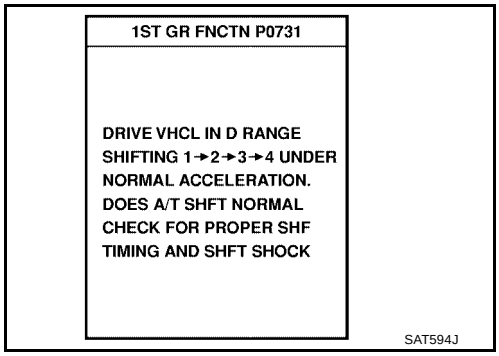


10. Stop vehicle. If “NG” appears on the screen, malfunction may exist. Go to “DIAGNOSTIC PROCEDURE”.

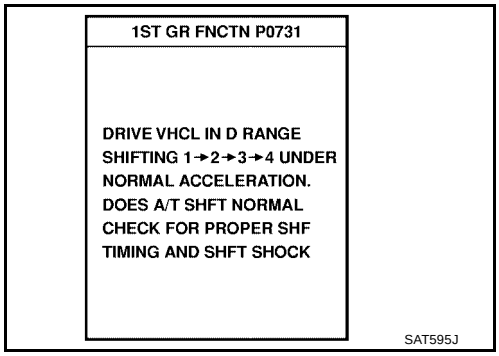




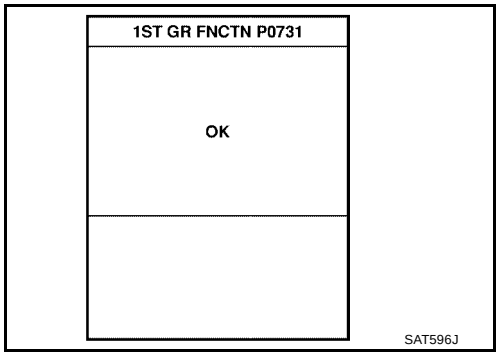
11. Perform test drive to check gear shift feeling in accordance with instructions displayed.

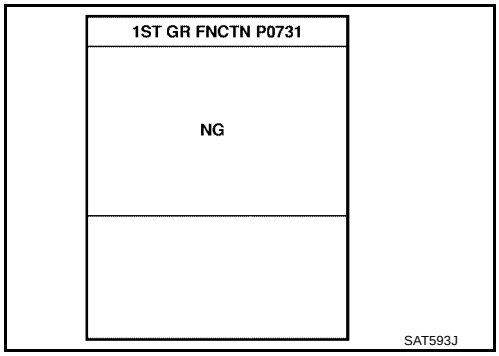


12. Touch “YES” or “NO”.



13. CONSULT-II procedure ended.





If “NG” appears on the screen, a malfunction may exist. Go to “DIAGNOSTIC PROCEDURE”.

DTC WORK SUPPORT MODE

DTC work support item	Description	Check item
1ST GR FNCTN P0731	Following items for “A/T 1st gear function (P0731)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Shift solenoid valve A ● Shift solenoid valve B ● Each clutch ● Hydraulic control circuit
2ND GR FNCTN P0732	Following items for “A/T 2nd gear function (P0732)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Shift solenoid valve B ● Each clutch ● Hydraulic control circuit
3RD GR FNCTN P0733	Following items for “A/T 3rd gear function (P0733)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Shift solenoid valve A ● Each clutch ● Hydraulic control circuit
4TH GR FNCTN P0734	Following items for “A/T 4th gear function (P0734)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Shift solenoid valve A ● Shift solenoid valve B ● Line pressure solenoid valve ● Each clutch ● Hydraulic control circuit
TCC S/V FNCTN P0744	Following items for “A/T TCC S/V function (lock-up) (P0744)” can be confirmed. ● Self-diagnosis status (whether the diagnosis is being conducted or not) ● Self-diagnosis result (OK or NG)	● Torque converter clutch solenoid valve ● Each clutch ● Hydraulic control circuit

Diagnostic Procedure Without CONSULT-II

ECS0062N

OBD-II SELF-DIAGNOSTIC PROCEDURE (WITH GST)

Refer to EC-1329, "Generic Scan Tool (GST) Function" .

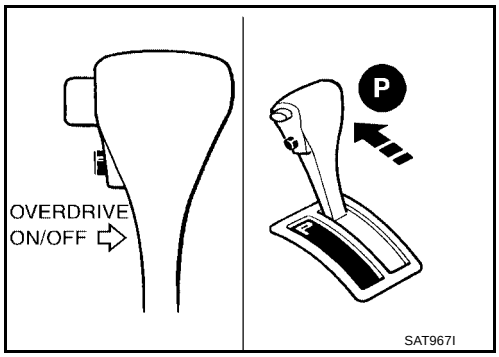
OBD-II SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)

Refer to EC-1275, "Malfunction Indicator Lamp (MIL)" .

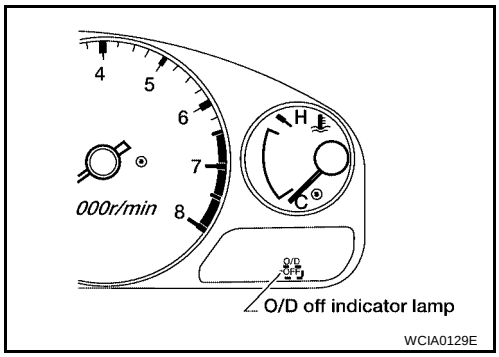
TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)

1. CHECK O/D OFF INDICATOR LAMP

1. Move selector lever to P position.
   Start engine and warm it up to normal engine operating temperature.
2. Turn ignition switch to OFF position.
3. Wait 5 seconds.
4. Turn ignition switch to ON position.
   (Do not start engine.)



5. Does O/D OFF indicator lamp come on for about 2 seconds?

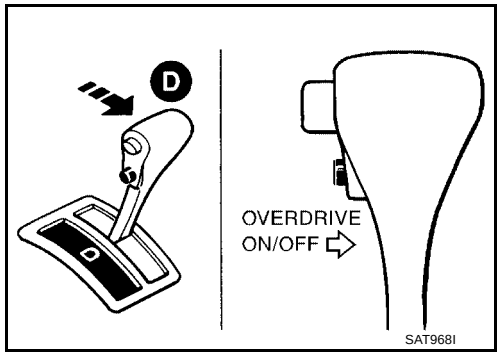


Yes or No

Yes >> GO TO 2.
No >> Stop procedure. Perform AT-602, "1. O/D OFF Indicator Lamp Does Not Come On" before proceeding.

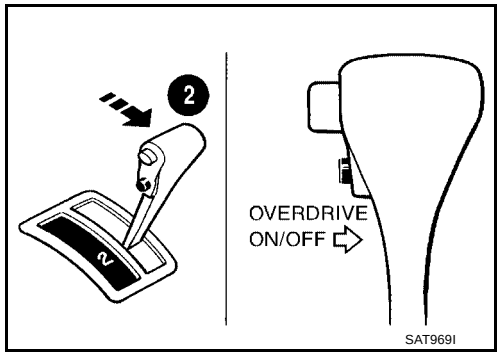
2. JUDGEMENT PROCEDURE STEP 1

1. Turn ignition switch to OFF position.
2. Turn ignition switch to ACC position.
3. Move selector lever from P to D position.
4. Turn ignition switch to ON position.
   (Do not start engine.)
5. Depress and hold overdrive control switch in OFF position (the O/D OFF indicator lamp will be ON) until directed to release the switch. (If O/D OFF indicator lamp does not come on, refer to “Steps 3 and 4” in AT-602, "1. O/D OFF Indicator Lamp Does Not Come On").
6. Turn ignition switch to OFF position.
7. Turn ignition switch to ON position (Do not start engine.)
8. Release the overdrive control switch (the O/D OFF indicator lamp will be OFF).
9. Wait 2 seconds.
10. Move selector lever to 2 position.
11. Depress and release overdrive control switch in ON position until next step is completed (the O/D OFF indicator lamp will be ON).



12. Depress and hold the overdrive control switch (the O/D OFF indicator lamp will be OFF) until directed to release the switch.

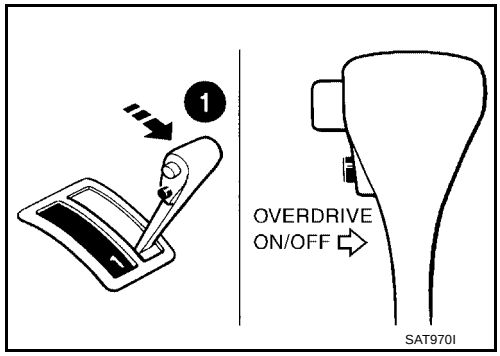
    >> GO TO 3.



3. JUDGEMENT PROCEDURE STEP 2

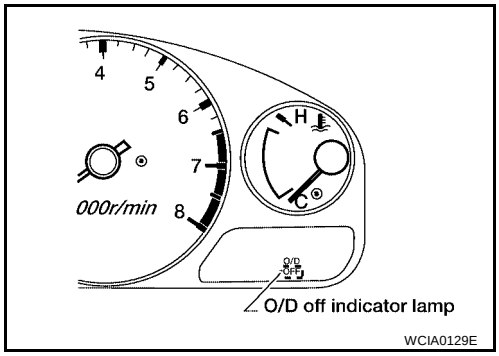
1. Move selector lever to 1 position.
2. Release the overdrive control switch.
3. Depress and release the overdrive control switch (the O/D OFF indicator lamp will be ON).
4. Depress and release the overdrive control switch (the O/D OFF indicator lamp will be OFF).
5. Depress and hold the overdrive control switch (the O/D OFF indicator lamp will be ON) until directed to release the switch.
6. Depress accelerator pedal fully and release it.
7. Release the overdrive control switch (the O/D OFF indicator lamp will begin to flash ON and OFF).

    >> GO TO 4.



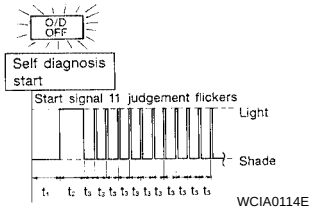
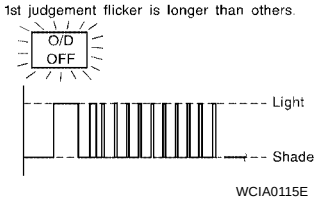
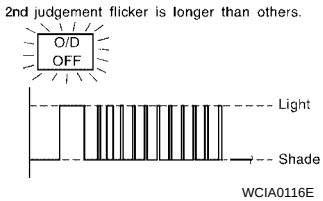
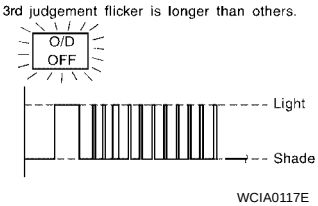
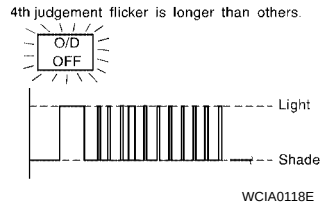
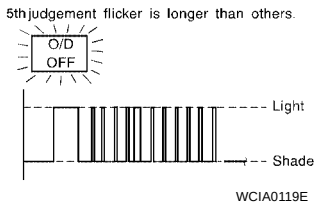
4. CHECK SELF-DIAGNOSTIC CODE

Check O/D OFF indicator lamp.
Refer to AT-444, "JUDGEMENT OF SELF-DIAGNOSIS CODE" .

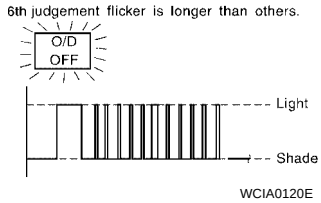
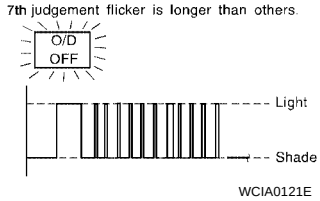
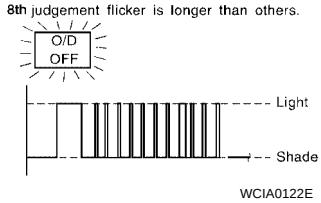
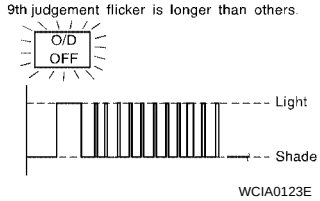
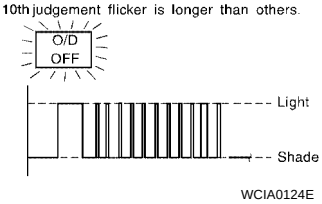
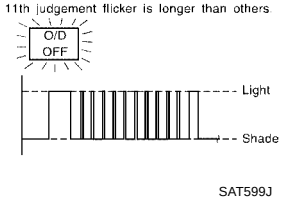
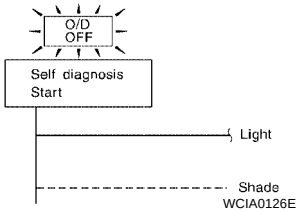
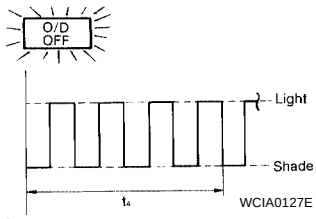


>> **DIAGNOSIS END**

JUDGEMENT OF SELF-DIAGNOSIS CODE

O/D OFF indicator lamp:	
All judgement flickers are the same.  All circuits that can be confirmed by self-diagnosis are OK.	1st judgement flicker is longer than others.  Revolution sensor circuit is short-circuited or disconnected. ⇒ **Go to** **AT-503, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)"** **.**
2nd judgement flicker is longer than others.  Vehicle speed sensor circuit is short-circuited or disconnected. ⇒ **Go to** **AT-580, "DTC VEHICLE SPEED SENSOR MTR"** **.**	3rd judgement flicker is longer than others.  Throttle position sensor [accelerator pedal position (APP) sensor] circuit is short-circuited or disconnected. ⇒ **Go to** **AT-563, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]"** **.**
4th judgement flicker is longer than others.  Shift solenoid valve A circuit is short-circuited or disconnected. ⇒ **Go to** **AT-553, "DTC P0750 SHIFT SOLENOID VALVE A"** **.**	5th judgement flicker is longer than others.  Shift solenoid valve B circuit is short-circuited or disconnected. ⇒ **Go to** **AT-558, "DTC P0755 SHIFT SOLENOID VALVE B"** **.**

O/D OFF indicator lamp:

6th judgement flicker is longer than others.  Overrun clutch solenoid valve circuit is short-circuited or disconnected. ⇒ **Go to** AT-568, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE" .	7th judgement flicker is longer than others.  Torque converter clutch solenoid valve circuit is short-circuited or disconnected. ⇒ **Go to** AT-534, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE" .
8th judgement flicker is longer than others.  A/T fluid temperature sensor is disconnected or TCM power source circuit is damaged. ⇒ **Go to** AT-497, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" .	9th judgement flicker is longer than others.  Engine speed signal circuit is short-circuited or disconnected. ⇒ **Go to** AT-508, "DTC P0725 ENGINE SPEED SIGNAL" .
10th judgement flicker is longer than others.  Line pressure solenoid valve circuit is short-circuited or disconnected. ⇒ **Go to** AT-547, "DTC P0745 LINE PRESSURE SOLENOID VALVE" .	11th judgement flicker is longer than others.  The ECM-A/T communication line is open or shorted. ⇒ **Go to** AT-590, "DTC U1000 CAN COMMUNICATION LINE" .
Lamp comes on.  Park/neutral position (PNP) switch, overdrive control switch or throttle position switch circuit is disconnected or TCM is damaged. ⇒ **Go to** AT-632, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}" .	Flickers as shown below.  Battery power is low. Battery has been disconnected for a long time. Battery is connected conversely. (When reconnecting TCM connectors. — This is not a problem.)

t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second t_4 = 1.0 second

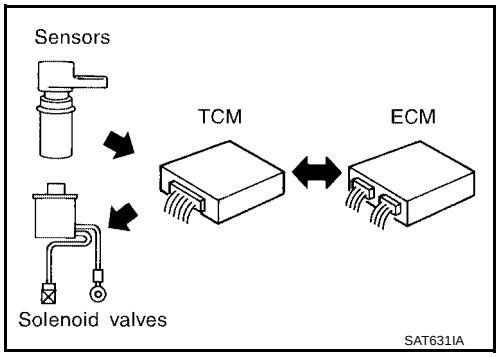
TROUBLE DIAGNOSIS - INTRODUCTION

PFP:00000

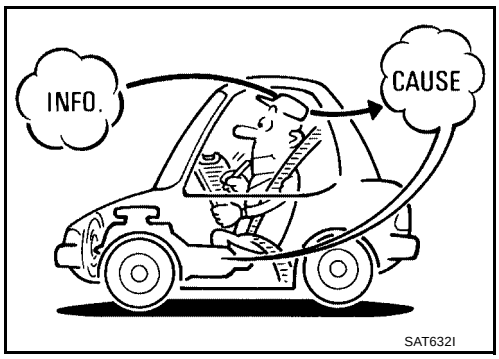
Introduction

ECS0062O

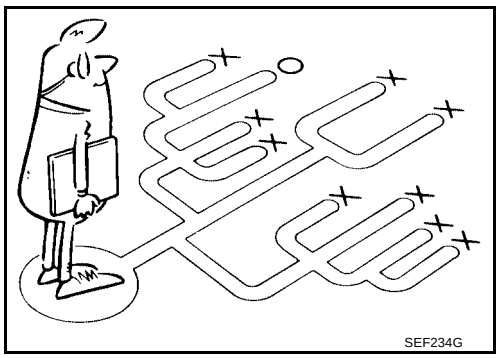
The TCM receives a signal from the vehicle speed sensor, ECM (throttle opening) or park/neutral position (PNP) switch and provides shift control or lock-up control via A/T solenoid valves.
The TCM also communicates with the ECM by means of a signal sent from sensing elements used with the OBD-related parts of the A/T system for malfunction-diagnostic purposes. The TCM is capable of diagnosing malfunctioning parts while the ECM can store malfunctions in its memory.
Input and output signals must always be correct and stable in the operation of the A/T system. The A/T system must be in good operating condition and be free of valve seizure, solenoid valve malfunction, etc.



It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.
A visual check only, may not find the cause of the problems. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow”. Refer to AT-450, "Work Flow"
.



Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “DIAGNOSTIC WORKSHEET” like the example referenced at AT-447 should be used.
Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.
Also check related Service bulletins for information.



DIAGNOSTIC WORKSHEET

Information from Customer

KEY POINTS
WHAT ..... Vehicle & A/T model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Symptoms

Customer name MR/MS	Model & Year	VIN
Trans. model	Engine	Mileage
Incident Date	Manuf. Date	In Service Date
Frequency	❑ Continuous ❑ Intermittent (times a day)	
Symptoms	❑ Vehicle does not move. (❑ Any position ❑ Particular position)	
	❑ No up-shift (❑ 1st → 2nd ❑ 2nd → 3rd ❑ 3rd → O/D)	
	❑ No down-shift (❑ O/D → 3rd ❑ 3rd → 2nd ❑ 2nd → 1st)	
	❑ Lockup malfunction	
	❑ Shift point too high or too low.	
	❑ Shift shock or slip (❑ N → D ❑ Lockup ❑ Any drive position)	
	❑ Noise or vibration	
	❑ No kickdown	
	❑ No pattern select	
	❑ Others ( )	
O/D OFF indicator lamp	Blinks for about 8 seconds.	
	❑ Continuously lit	❑ Not lit
Malfunction indicator lamp (MIL)	❑ Continuously lit	❑ Not lit

Diagnostic Worksheet

1.	❑ Read the Fail-safe and listen to customer complaints.			AT-400
2.	❑ CHECK A/T FLUID			AT-452
		❑ Leakage (Follow specified procedure) ❑ Fluid condition ❑ Fluid level		
3.	❑ Perform STALL TEST and PRESSURE TEST.			AT-452, AT-456
		❑ Stall test — Mark possible damaged components/others.		
			❑ Torque converter one-way clutch ❑ Reverse clutch ❑ Forward clutch ❑ Overrun clutch ❑ Forward one-way clutch	❑ Low & reverse brake ❑ Low one-way clutch ❑ Engine ❑ Line pressure is low ❑ Clutches and brakes except high clutch and brake band are OK
		❑ Pressure test — Suspected parts:		
4.	❑ Perform all ROAD TEST and mark required procedures.			AT-457
	4-1.	Check before engine is started.		AT-459
		❑ SELF-DIAGNOSTIC PROCEDURE - Mark detected items.		
			❑ Park/neutral position (PNP) switch, AT-491 . ❑ A/T fluid temperature sensor, AT-573 . ❑ Vehicle speed sensor·A/T (Revolution sensor), AT-503 . ❑ Engine speed signal, AT-508 . ❑ Turbine revolution sensor, AT-585 . ❑ Torque converter clutch solenoid valve, AT-534 . ❑ Line pressure solenoid valve, AT-547 . ❑ Shift solenoid valve A, AT-553 . ❑ Shift solenoid valve B, AT-558 . ❑ Throttle position sensor [accelerator pedal position (APP) sensor, AT-563 . ❑ Overrun clutch solenoid valve, AT-568 . ❑ Park/neutral position (PNP), overdrive control and throttle position sensor [accelerator pedal position (APP) sensor] circuit checks, AT-632 . ❑ A/T fluid temperature sensor and TCM power source, AT-488 . ❑ Vehicle speed sensor·MTR, AT-580 . ❑ A/T communication line, AT-590 . ❑ Control unit (RAM), Control unit (ROM), AT-593 . ❑ Control unit (EEP ROM), AT-595 . ❑ Battery ❑ Others	

4.	4-2.	Check at idle	AT-459
		❑ 1. O/D OFF Indicator Lamp Does Not Come On, AT-602 . ❑ 2. Engine Cannot Be Started In P and N Position, AT-604 . ❑ 3. In P Position, Vehicle Moves Forward or Backward When Pushed, AT-605 . ❑ 4. In N Position, Vehicle Moves, AT-605 . ❑ 5. Large Shock. N → R Position, AT-607 . ❑ 6. Vehicle Does Not Creep Backward In R Position, AT-609 . ❑ 7. Vehicle Does Not Creep Forward In D, 2 or 1 Position, AT-612 .	
	4-3.	Cruise test	AT-462 AT-465
		Part-1	
		❑ 8. Vehicle Cannot Be Started From D_1 , AT-614 . ❑ 9. A/T Does Not Shift: D_1 → D_2 or Does Not Kickdown: D_4 → D_2 , AT-617 . ❑ 10. A/T Does Not Shift: D_2 → D_3 , AT-619 . ❑ 11. A/T Does Not Shift: D_3 → D_4 , AT-622 . ❑ 12. A/T Does Not Perform Lock-up, AT-624 . ❑ 13. A/T Does Not Hold Lock-up Condition, AT-625 . ❑ 14. Lock-up Is Not Released, AT-626 . ❑ 15. Engine Speed Does Not Return To Idle (Light Braking D_4 → D_3), AT-627 .	
		Part-2	AT-468
		❑ 16. Vehicle Does Not Start From D_1 , AT-629 . ❑ 9. A/T Does Not Shift: D_1 → D_2 or Does Not Kickdown: D_4 → D_2 , AT-617 . ❑ 10. A/T Does Not Shift: D_2 → D_3 , AT-619 . ❑ 11. A/T Does Not Shift: D_3 → D_4 , AT-622 .	
		Part-3	AT-470
		❑ 17. A/T Does Not Shift: D_4 → D_3 When Overdrive Control Switch ON → OFF, AT-630 . ❑ 15. Engine Speed Does Not Return To Idle (Engine Brake In D_3), AT-627 . ❑ 18. A/T Does Not Shift: D_3 → 2_2 , When Selector Lever D → 2 Position, AT-630 . ❑ 15. Engine Speed Does Not Return To Idle (Engine Brake In 2_2), AT-627 . ❑ 19. A/T Does Not Shift: 2_2 → 1_1 , When Selector Lever 2 → 1 Position, AT-631 . ❑ 20. Vehicle Does Not Decelerate By Engine Brake, AT-632 . ❑ SELF-DIAGNOSTIC PROCEDURE — Mark detected items.	
		❑ Park/neutral position (PNP) switch, AT-491 . ❑ A/T fluid temperature sensor, AT-497 . ❑ Vehicle speed sensor·A/T (Revolution sensor), AT-503 . ❑ Engine speed signal, AT-508 . ❑ Turbine revolution sensor, AT-585 . ❑ Torque converter clutch solenoid valve, AT-534 . ❑ Line pressure solenoid valve, AT-547 . ❑ Shift solenoid valve A, AT-553 . ❑ Shift solenoid valve B, AT-558 . ❑ Throttle position sensor [accelerator pedal position (APP) sensor], AT-563 . ❑ Overrun clutch solenoid valve, AT-568 . ❑ Park/neutral position (PNP), overdrive control and throttle position sensor [accelerator pedal position (APP) sensor] circuit checks, AT-632 . ❑ A/T fluid temperature sensor and TCM power source, AT-488 . ❑ Vehicle speed sensor·MTR, AT-580 . ❑ A/T communication line, AT-590 . ❑ Control unit (RAM), Control unit (ROM), AT-593 . ❑ Control unit (EEP ROM), AT-595 . ❑ Battery ❑ Others	
5.	❑ For self-diagnosis NG items, inspect each component. Repair or replace the damaged parts.		AT-644
6.	❑ Perform all ROAD TEST and re-mark required procedures.		AT-457
7.	❑ Perform DTC CONFIRMATION PROCEDURE for following MIL indicating items and check out NG items. Refer to EC-1261 , “Emission-related Diagnostic Information”.		EC-1261
	❑ DTC (P0731) A/T 1st gear function, AT-512 . ❑ DTC (P0732) A/T 2nd gear function, AT-517 . ❑ DTC (P0733) A/T 3rd gear function, AT-522 . ❑ DTC (P0734) A/T 4th gear function, AT-527 . ❑ DTC (P0744) A/T TCC S/V function (lock-up), AT-539 .		

8.	❑ Perform the Diagnostic Procedures for all remaining items marked NG. Repair or replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)	AT-433 AT-441
9.	❑ Erase DTC from TCM and ECM memories.	AT-430

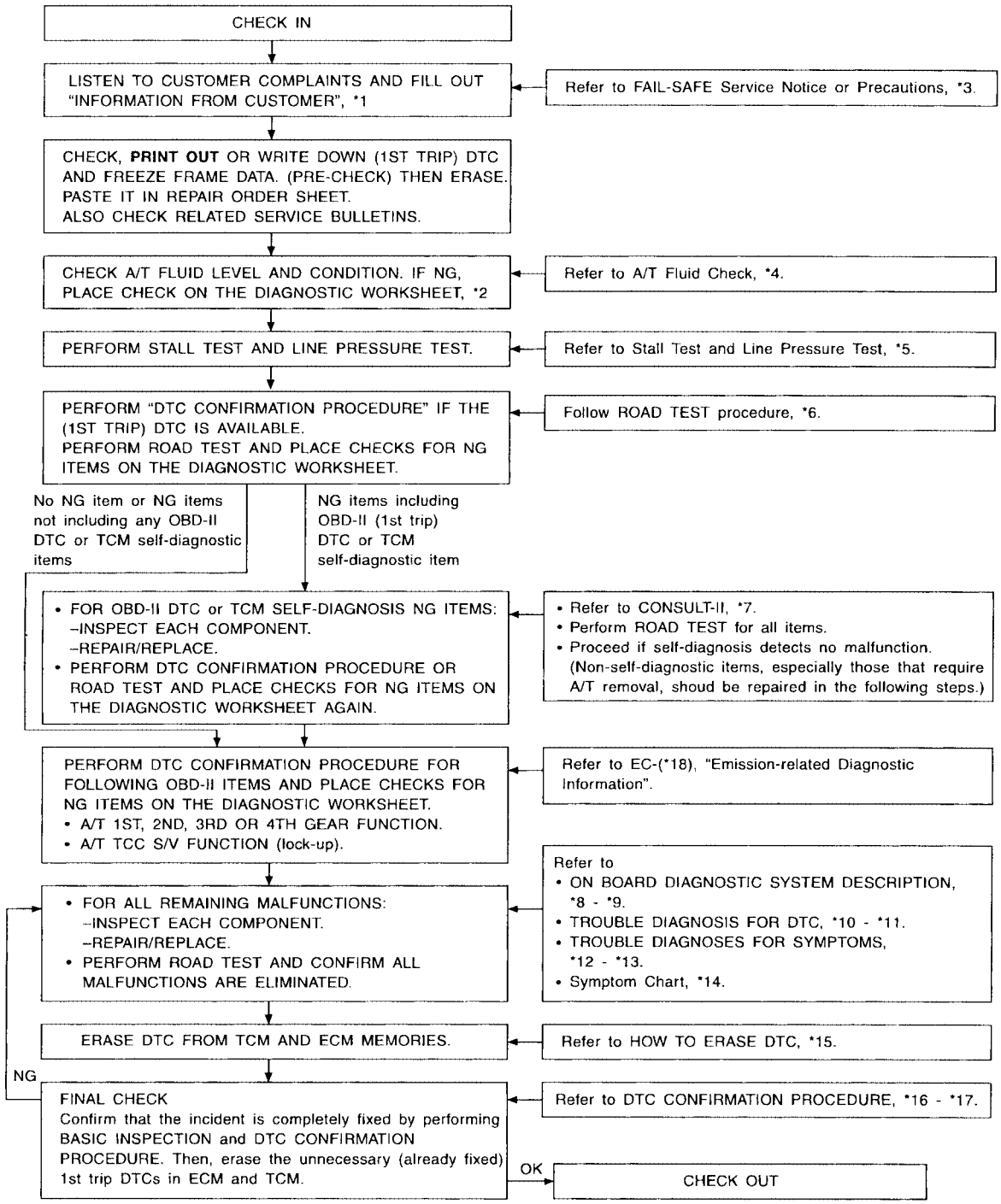
Work Flow

ECS0062P

HOW TO PERFORM TROUBLE DIAGNOSES FOR QUICK AND ACCURATE REPAIR

A good understanding of the malfunction conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.
Make good use of the two sheets provided, AT-447, "Information from Customer" and AT-448, "Diagnostic Worksheet" , to perform the best troubleshooting possible.

WORK FLOW CHART



SAT086JI

*1: AT-447 *2: AT-448 *3: AT-400
*4: AT-452 *5: AT-452, AT-456 *6: AT-457
*7: AT-432 *8: AT-428 *9: AT-446
*10: AT-491 *11: AT-597 *12: AT-597
*13: AT-637 *14: AT-473 *15: AT-430
*16: AT-491 *17: AT-593 *18: EC-1261

TROUBLE DIAGNOSIS - BASIC INSPECTION

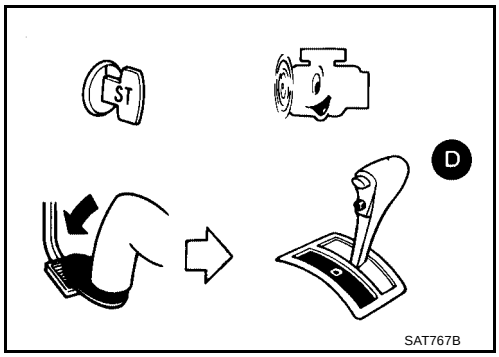
PFP:00000

A/T Fluid Check

ECS0062Q

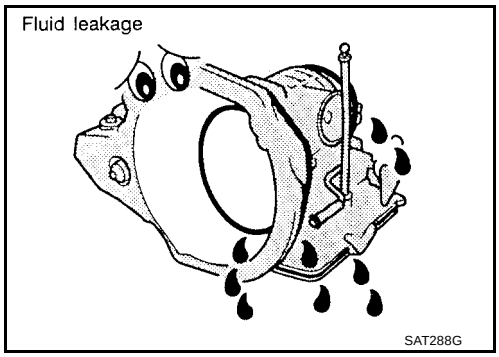
FLUID LEAKAGE CHECK

1. Clean area suspected of leaking. For example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in D position and wait a few minutes.
3. Stop engine.



SAT767B

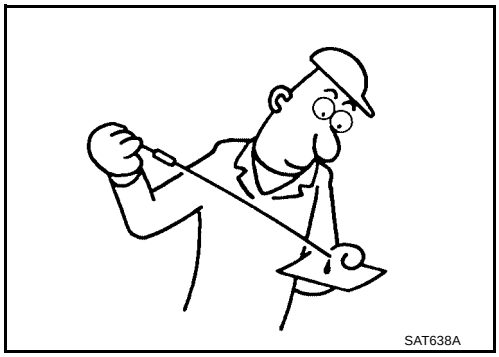
4. Check for fresh leakage.



SAT288G

FLUID CONDITION CHECK

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling, — Overheating


SAT638A

FLUID LEVEL CHECK

Refer to MA-30, "Checking A/T Fluid" .

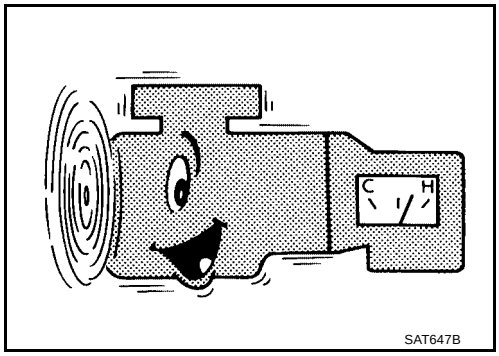
Stall Test

ECS0062R

STALL TEST PROCEDURE

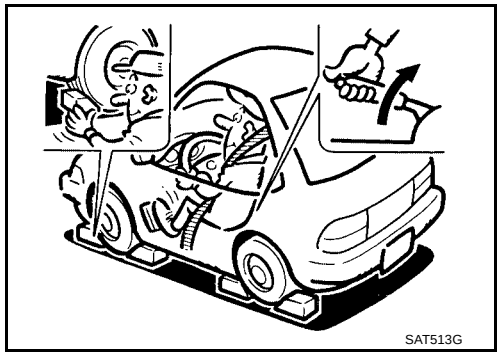
1. Check A/T fluid and engine oil levels. If necessary, add fluid and oil.
2. Drive vehicle for approx. 10 minutes or until fluid and oil reach operating temperature.

ATF operating temperature :50 - 80°C (122 - 176°F)



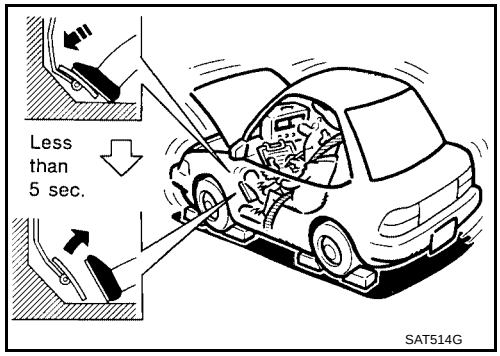
SAT647B

3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.
   - **It is good practice to mark the point of specified engine rpm on indicator.**


SAT513G

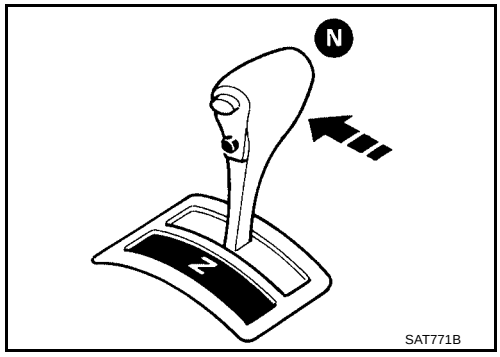
5. Start engine, apply foot brake, and place selector lever in D position.
6. Accelerate to wide open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.
   - **During test, never hold throttle wide open for more than 5 seconds.**

   Stall revolution :2,350 - 2,800 rpm



SAT514G

8. Move selector lever to N position.
9. Cool off ATF.
   - **Run engine at idle for at least one minute.**
10. Repeat steps 5 through 9 with selector lever in 2, 1 and R positions.



SAT771B

JUDGEMENT OF STALL TEST

The test result and possible damaged components relating to each result are shown in the illustrations on next page.
In order to pinpoint the possible damaged components, follow the procedure shown in AT-451, "WORK FLOW CHART" .

NOTE:
Stall revolution is too high in D, 2 or 1 position:

- Slippage occurs in 1st gear but not in 2nd and 3rd gears. ..... Low one-way clutch slippage
- Slippage occurs in the following gears:
  1st through 3rd gears in D position and engine brake functions with overdrive control switch set to OFF.
  1st and 2nd gears in 2 position and engine brake functions with accelerator pedal released (fully closed throttle). ..... Forward clutch or forward one-way clutch slippage

Stall revolution is too high in R position:

- Engine brake does not function in 1 position. ..... Low & reverse brake slippage
- Engine brake functions in 1 position. ..... Reverse clutch slippage

Stall revolution within specifications:

- Vehicle does not achieve speed of more than 80 km/h (50 MPH). ..... One-way clutch seizure in torque converter housing

CAUTION:
Be careful since automatic fluid temperature increases abnormally.

- Slippage occurs in 3rd and 4th gears in D position. ..... High clutch slippage

- Slippage occurs in 2nd and 4th gear in D position. ..... Brake band slippage
- Engine brake does not function in 2nd and 3rd gears in D position, 2nd gear in 2 position, and 1st gear in 1 position with overdrive control switch set to OFF. ..... Overrun clutch slippage

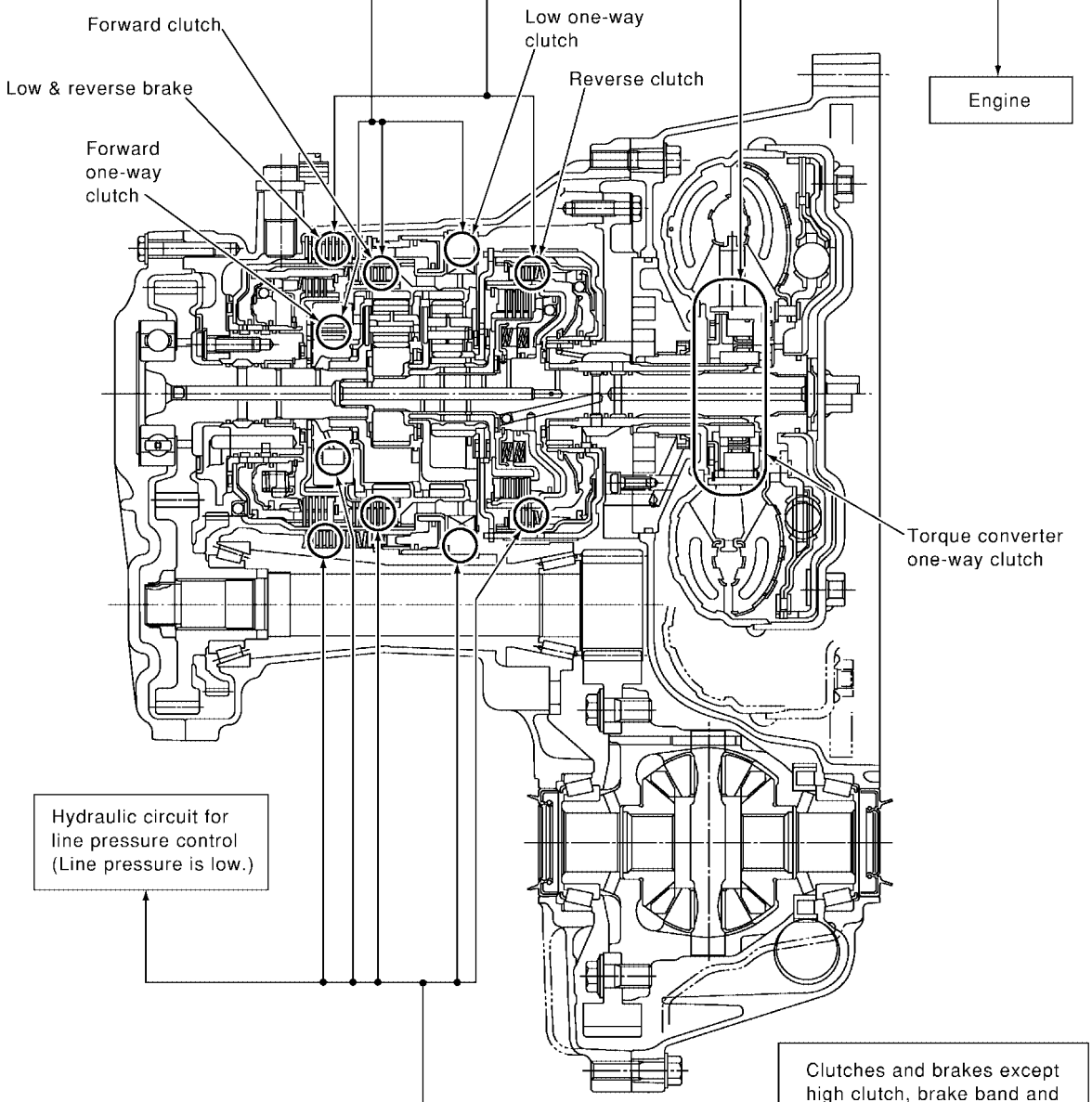
Stall revolution less than specifications:

- Poor acceleration during starts. ..... One-way clutch seizure in torque converter

Selector lever position	Judgement		
D	H	O	L
2	H	O	L
1	H	O	L
R	O	H	L

O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.

Damaged components



Selector lever position	Judgement	
D	H	O
2	H	O
1	H	O
R	H	O

SAT499K

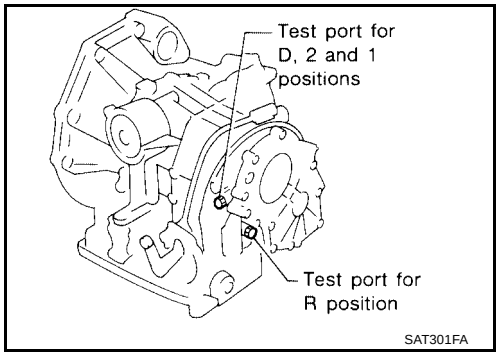
Line Pressure Test

ECS0062S

LINE PRESSURE TEST PORTS

Location of line pressure test ports are shown in the illustration.

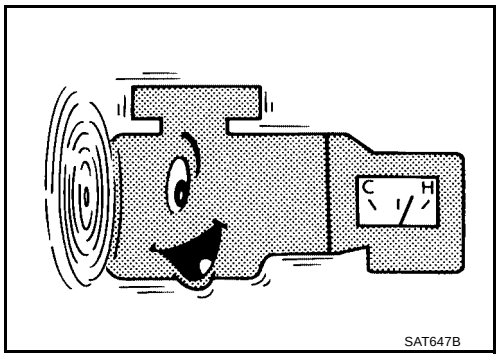
- **Always replace pressure plugs as they are self-sealing bolts.**



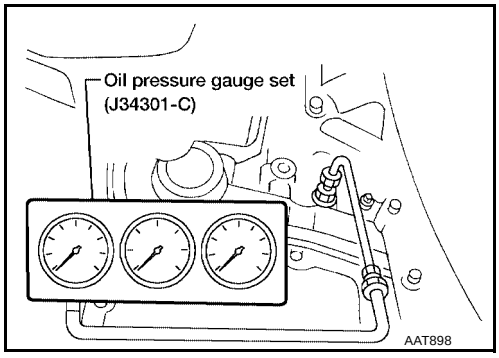
LINE PRESSURE TEST PROCEDURE

1. Check A/T fluid and engine oil levels. If necessary, add fluid and oil.
2. Drive vehicle for approx. 10 minutes or until fluid and oil reach operating temperature.

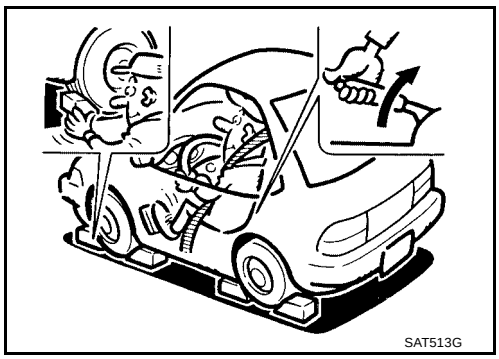
   ATF operating temperature :50 - 80°C (122 - 176°F)



3. Install pressure gauge to corresponding line pressure port.

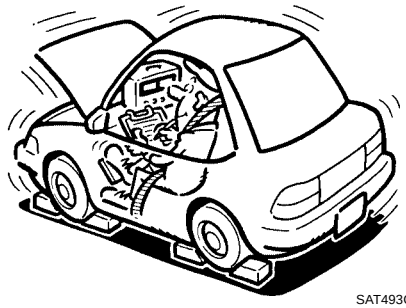


4. Set parking brake and block wheels.
   - **Continue to depress brake pedal fully while line pressure test is being performed at stall speed.**



5. Start engine and measure line pressure at idle and stall speed.
   - **When measuring line pressure at stall speed, follow the stall test procedure.**

AT-456, "Line Pressure Test" : Refer to SDS, AT-753, "Line Pressure"


SAT493G

JUDGEMENT OF LINE PRESSURE TEST

Judgement		Suspected parts
At idle	Line pressure is low in all positions.	● Oil pump wear ● Control piston damage ● Pressure regulator valve or plug sticking ● Spring for pressure regulator valve damaged ● Fluid pressure leakage between oil strainer and pressure regulator valve ● Clogged strainer
	Line pressure is low in particular position.	● Fluid pressure leakage between manual valve and particular clutch ● For example, line pressure is: – Low in R and 1 positions, but – Normal in D and 2 positions. Therefore, fluid leakage exists at or around low and reverse brake circuit. Refer to AT-411, "CLUTCH AND BAND CHART" .
	Line pressure is high.	● A/T fluid temperature sensor damaged ● Line pressure solenoid valve sticking ● Short circuit of line pressure solenoid valve circuit ● Pressure modifier valve sticking ● Pressure regulator valve or plug sticking ● Open in dropping resistor circuit
At stall speed	Line pressure is low.	● Line pressure solenoid valve sticking ● Short circuit of line pressure solenoid valve circuit ● Pressure regulator valve or plug sticking ● Pressure modifier valve sticking ● Pilot valve sticking

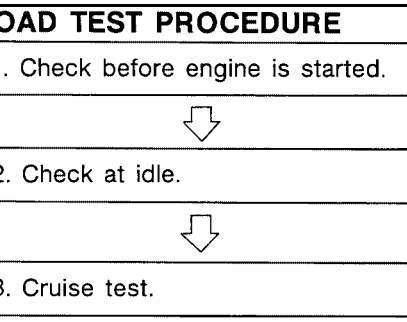
Road Test

ECS0062T

DESCRIPTION

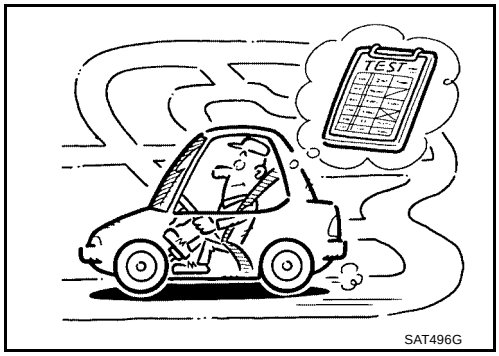
- The purpose of the test is to determine overall performance of A/T and analyze causes of problems.
- The road test consists of the following three parts:

1. Check before engine is started
2. Check at idle
3. Cruise test



SAT786A

- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items until specified symptom is found. Troubleshoot items which check out No Good after road test. Refer to AT-428, "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" and AT-597, "TROUBLE DIAGNOSIS FOR SYMPTOMS" .



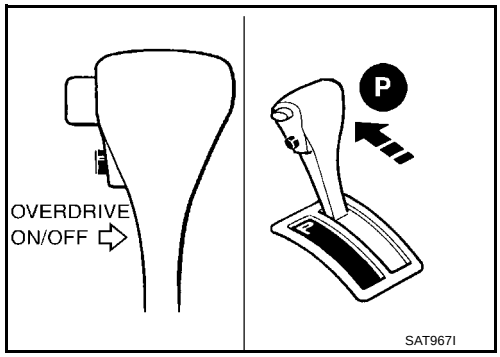
1. CHECK BEFORE ENGINE IS STARTED

1. CHECK O/D OFF INDICATOR LAMP

1. Park vehicle on flat surface.
2. Move selector lever to P position.
3. Turn ignition switch to OFF position. Wait at least 5 seconds.
4. Turn ignition switch to ON position. (Do not start engine.)
5. Does O/D OFF indicator lamp come on for about 2 seconds?

Yes or No

Yes >> GO TO 2.
No >> Stop ROAD TEST. Go to AT-602, "1. O/D OFF Indicator Lamp Does Not Come On" .

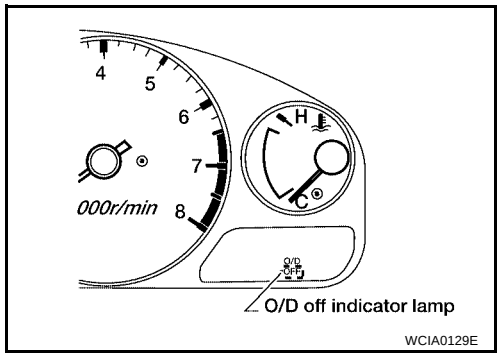


2. CHECK O/D OFF INDICATOR LAMP

Does O/D OFF indicator lamp flicker for about 8 seconds?

Yes or No

Yes >> TCM is in fail-safe mode. Perform self-diagnosis and check NG items on the DIAGNOSTIC WORKSHEET, AT-448 . Refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" .
No >> 1. Turn ignition switch to OFF position.
2. Perform self-diagnosis and note NG items. Refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" .
3. Go to AT-459, "2. CHECK AT IDLE" .



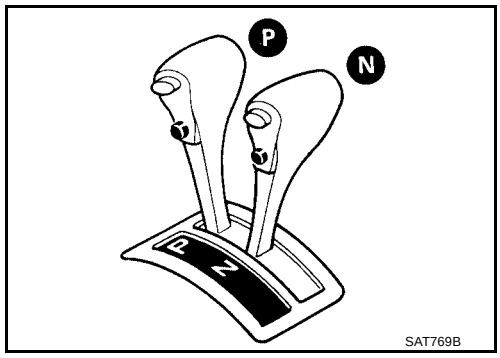
2. CHECK AT IDLE

1. CHECK ENGINE START

1. Park vehicle on flat surface.
2. Move selector lever to P position.
3. Turn ignition switch to OFF position.
4. Turn ignition switch to START position.
5. Is engine started?

Yes or No

Yes >> Stop ROAD TEST.
No >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-604, "2. Engine Cannot Be Started In P and N Position" .



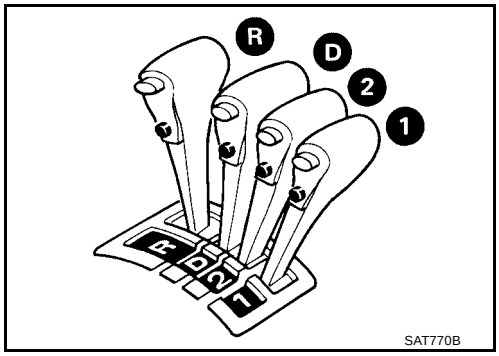
2. CHECK ENGINE START

1. Turn ignition switch to ACC position.
2. Move selector lever to D, 1, 2 or R position.
3. Turn ignition switch to START position.
4. Is engine started?

Yes or No

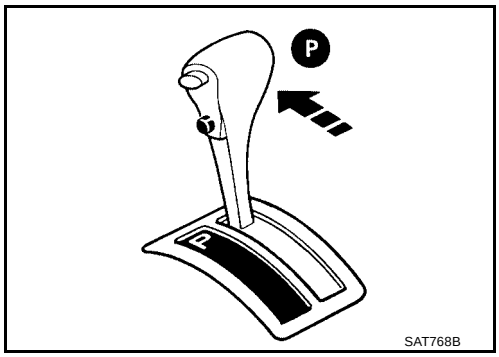
Yes >> Stop ROAD TEST. Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-604, "2. Engine Cannot Be Started In P and N Position" .

No >> GO TO 3.



3. CHECK VEHICLE MOVE

1. Move selector lever to P position.
2. Turn ignition switch to OFF position.
3. Release parking brake.

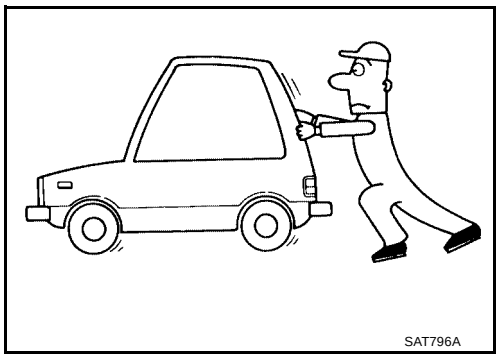


4. Push vehicle forward or backward.
5. Does vehicle move when it is pushed forward or backward?
6. Apply parking brake.

Yes or No

Yes >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-605, "3. In P Position, Vehicle Moves Forward or Backward When Pushed" . Continue ROAD TEST.

No >> GO TO 4.



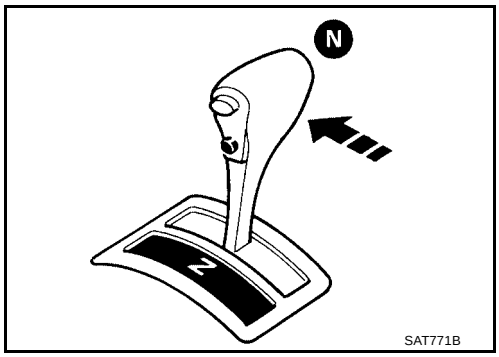
4. CHECK VEHICLE MOVE

1. Start engine.
2. Move selector lever to N position.
3. Release parking brake.
4. Does vehicle move forward or backward?

Yes or No

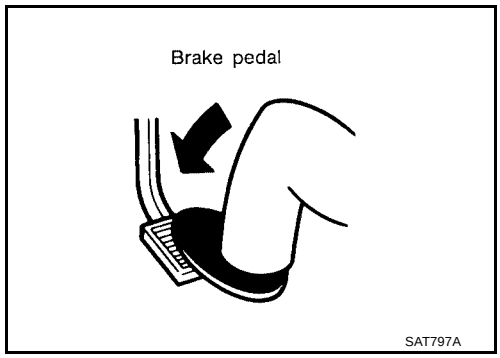
Yes >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-605, "4. In N Position, Vehicle Moves" . Continue ROAD TEST.

No >> GO TO 5.



5. CHECK SHIFT LOCK

1. Apply foot brake.

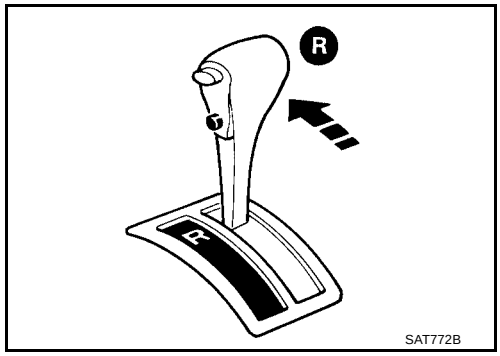


2. Move selector lever to R position.
3. Is there large shock when changing from N to R position?

Yes or No

Yes >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-607, "5. Large Shock N → R Position" . Continue ROAD TEST.

No >> GO TO 6.



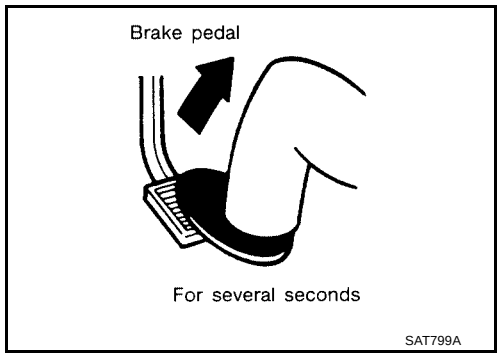
6. CHECK VEHICLE MOVE

1. Release foot brake for several seconds.
2. Does vehicle creep backward when foot brake is released?

Yes or No

Yes >> GO TO 7.

No >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-609, "6. Vehicle Does Not Creep Backward In R Position" . Continue ROAD TEST.



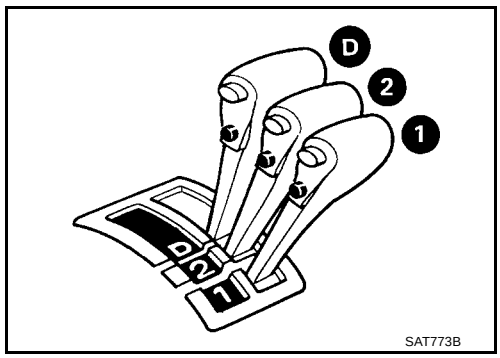
7. CHECK VEHICLE MOVE

1. Move selector lever to D, 2 and 1 positions and check if vehicle creeps forward.
2. Does vehicle creep forward in all three positions?

Yes or No

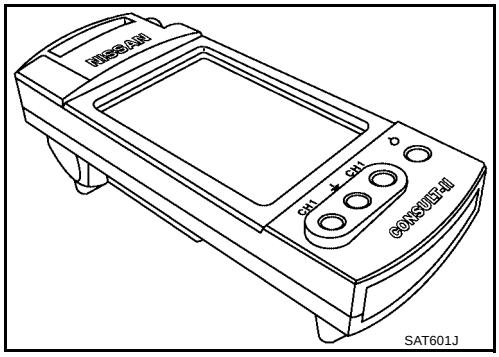
Yes >> Go to AT-462, "3. CRUISE TEST" .

No >> Mark the box on the DIAGNOSTIC WORKSHEET. Go to AT-612, "7. Vehicle Does Not Creep Forward in D, 2 or 1 Position" . Continue ROAD TEST.



3. CRUISE TEST

- Check all items listed in Parts 1 through 3.

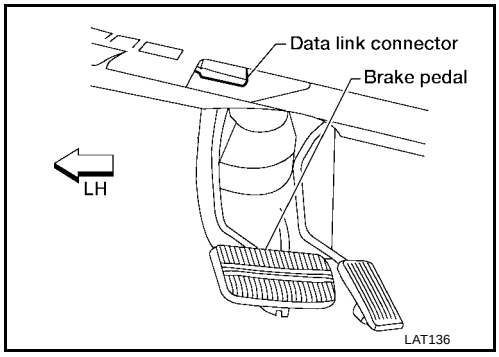


With CONSULT-II

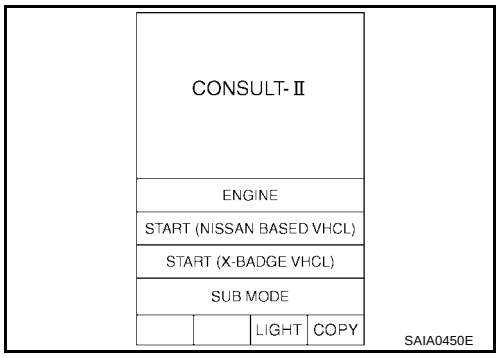
- Using CONSULT-II, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per Shift Schedule. Refer to AT-752, "Shift Schedule"

CONSULT-II Setting Procedure

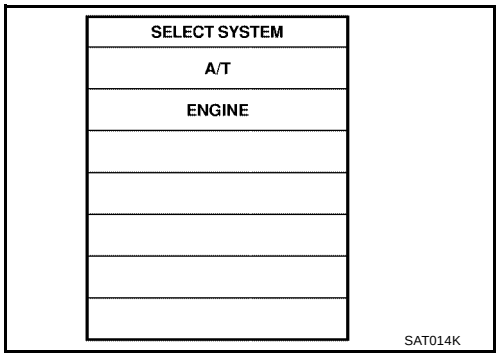
1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located in left side dash panel.
3. Turn ignition switch ON.



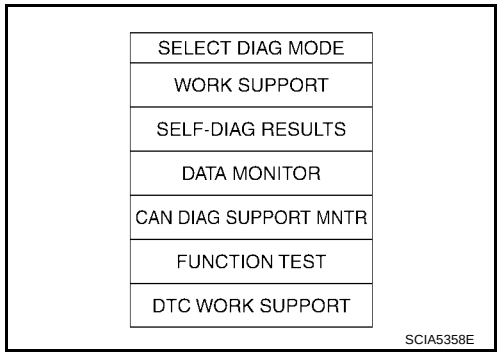
4. Touch “START (NISSAN BASED VHCL)”.



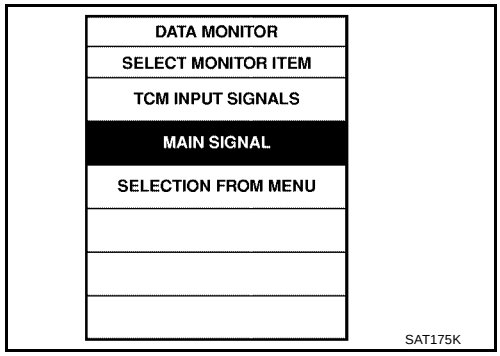
5. Touch “A/T”.



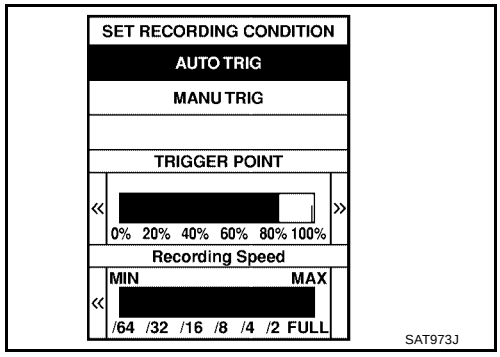
6. Touch “DATA MONITOR”.



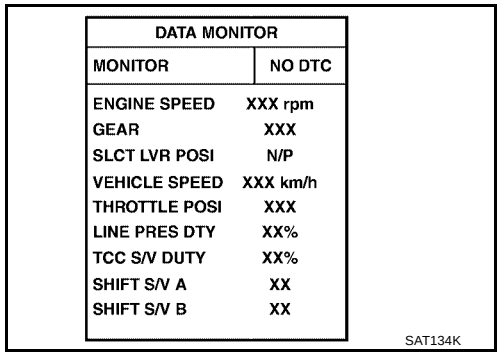
7. Touch “MAIN SIGNAL” or “TCM INPUT SIGNALS”.
8. See “NUMERICAL DISPLAY”, “BARCHART DISPLAY” or “LINE GRAPH DISPLAY”.



9. Touch “SETTING” to set recording condition (“AUTO TRIG” or “MANU TRIG”) and touch “BACK”.
10. Touch “START”.



11. When performing cruise test, touch “RECORD”.



12. After finishing cruise test part 1, touch “STOP”.

DATA MONITOR		
Recording Data	X%	DTC DETECTED
ENGINE SPEED	XXX rpm	
GEAR	XXX	
SLCT LVR POSI	N/P	
VEHICLE SPEED	XXX km/h	
THROTTLE POSI	XXX	
LINE PRES DTY	XX%	
TCC S/V DUTY	XX%	
SHIFT S/V A	XX	
SHIFT S/V B	XX	

SAT135K

13. Touch “STORE” and touch “BACK”.

REAL-TIME DIAG
ENG SPEED SIG

SAT987J

14. Touch “DISPLAY”.
15. Touch “PRINT”.
16. Check the monitor data printed out.
17. Continue cruise test part 2 and 3.

Trigger	VHCL S/SEN A/T	VHCL S/SEN MTR	THRTL POSI SEN
	km/h	km/h	V

SAT975J

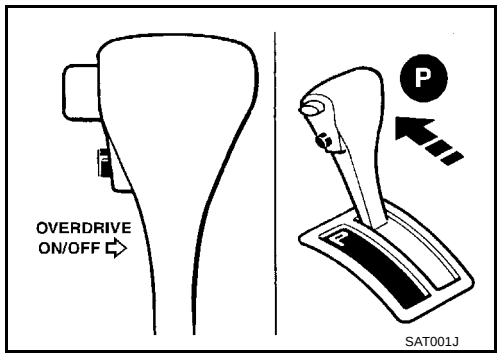
Cruise Test — Part 1

1. CHECK STARTING GEAR (D_1) POSITION

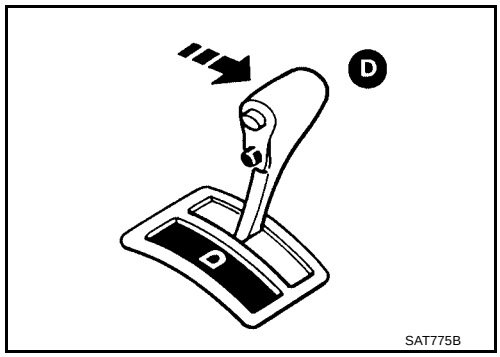
1. Drive vehicle for approx. 10 minutes to warm engine oil and ATF up to operating temperature.

   ATF operating temperature: :50 - 80°C (122 - 176°F)

2. Park vehicle on flat surface.
3. Set overdrive control switch to ON position.
4. Move selector lever to P position.
5. Start engine.



6. Move selector lever to D position.

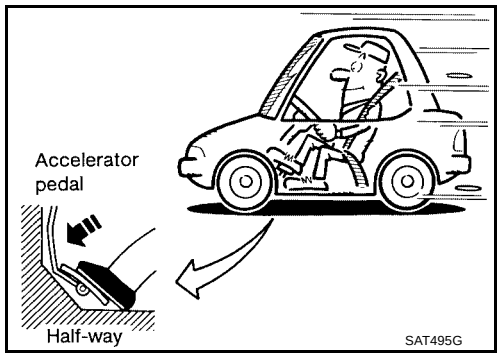


7. Accelerate vehicle by constantly depressing accelerator pedal half-way.
8. Does vehicle start from D_1 ?

   Read gear position.

Yes or No

Yes >> GO TO 2.
No >> Go to AT-614, "8. Vehicle Cannot Be Started From D_1" . Continue ROAD TEST.

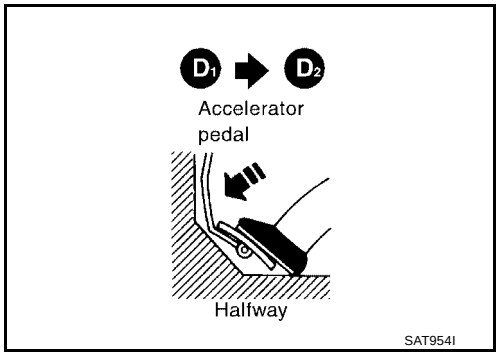


2. CHECK SHIFT UP (D_1 TO D_2)

Does A/T shift from D_1 to D_2 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_1 to D_2 **:Refer to AT-752, "Shift Schedule" .**



Yes or No

Yes >> GO TO 3.

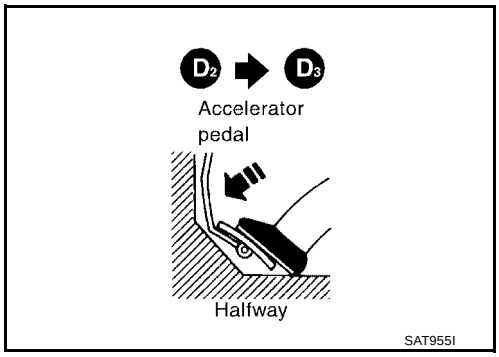
No >> Go to AT-617, "9. A/T Does Not Shift: $D_1 \rightarrow D_2$ or Does Not Kickdown: $D_4 \rightarrow D_2$" . Continue ROAD TEST.

3. CHECK SHIFT UP (D_2 TO D_3)

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_2 to D_3 **:Refer to AT-752, "Shift Schedule" .**



Yes or No

Yes >> GO TO 4.

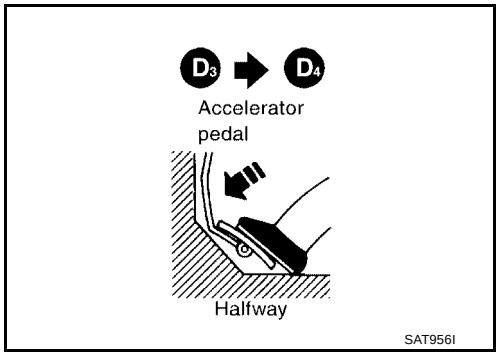
No >> Go to AT-619, "10. A/T Does Not Shift: $D_2 \rightarrow D_3$" . Continue ROAD TEST.

4. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_3 to D_4 **:Refer to AT-752, "Shift Schedule" .**



Yes or No

Yes >> GO TO 5.

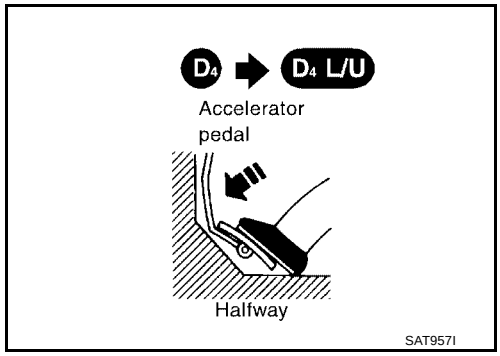
No >> Go to AT-622, "11. A/T Does Not Shift: $D_3 \rightarrow D_4$" . Continue ROAD TEST.

5. CHECK LOCK-UP (D4 TO D4 L/U)

Does A/T perform lock-up at the specified speed?

Read vehicle speed, throttle opening when lock-up duty becomes 94%.

Specified speed when lock-up occurs :Refer to AT-752, "Shift Schedule" .



Yes or No

Yes >> GO TO 6.
No >> Go to AT-624, "12. A/T Does Not Perform Lock-up" . Continue ROAD TEST.

6. CHECK HOLD LOCK-UP

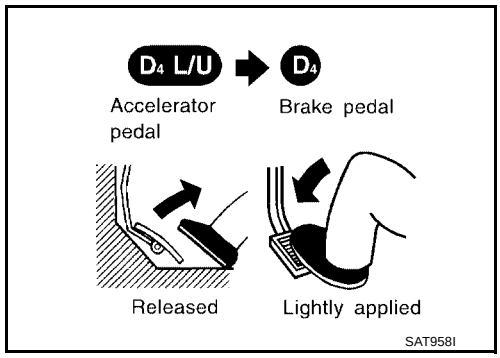
Does A/T hold lock-up condition for more than 30 seconds?

Yes or No

Yes >> GO TO 7.
No >> Go to AT-625, "13. A/T Does Not Hold Lock-up Condition" .

7. CHECK SHIFT DOWN (D4 L/U TO D4)

1. Release accelerator pedal.
2. Is lock-up released when accelerator pedal is released?



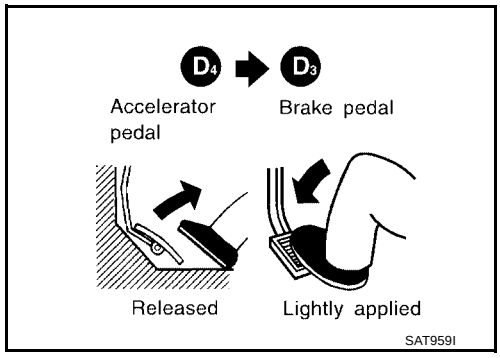
Yes or No

Yes >> GO TO 8.
No >> Go to AT-626, "14. Lock-up Is Not Released" . Continue ROAD TEST.

8. CHECK SHIFT DOWN (D4 TO D3)

1. Decelerate vehicle by applying foot brake lightly.
2. Does engine speed return to idle smoothly when A/T is shifted from D4 to D3 ?

Read gear position and engine speed.



Yes or No

Yes >> 1. Stop vehicle.
2. Go to AT-468, "Cruise Test — Part 2" .
No >> Go to AT-627, "15. Engine Speed Does Not Return To Idle (Light Braking D4 → D3)" . Continue ROAD TEST.

Cruise Test — Part 2

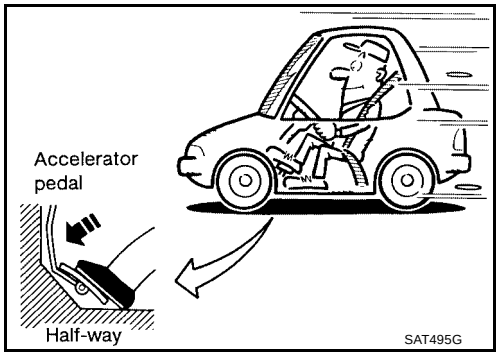
1. CHECK STARTING GEAR (D_1) POSITION

1. Confirm overdrive control switch is in ON position.
2. Confirm selector lever is in D position.
3. Accelerate vehicle by half throttle again.
4. Does vehicle start from D_1 ?

Read gear position.

Yes or No

Yes >> GO TO 2.
No >> Go to AT-629, "16. Vehicle Does Not Start From D_1" . Continue ROAD TEST.



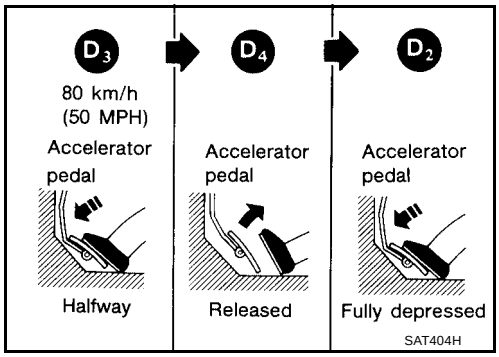
2. CHECK SHIFT UP AND SHIFT DOWN (D_3 TO D_4 TO D_2)

1. Accelerate vehicle to 80 km/h (50 MPH) as shown in illustration.
2. Release accelerator pedal and then quickly depress it fully.
3. Does A/T shift from D_4 to D_2 as soon as accelerator pedal is depressed fully?

Read gear position and throttle opening.

Yes or No

Yes >> GO TO 3.
No >> Go to AT-617, "9. A/T Does Not Shift: $D_1 \rightarrow D_2$ or Does Not Kickdown: $D_4 \rightarrow D_2$" . Continue ROAD TEST.



3. CHECK SHIFT UP (D_2 TO D_3)

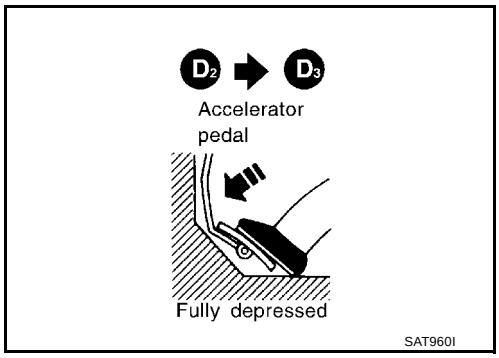
Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_2 to D_3 **:Refer to AT-752, "Shift Schedule" .**

Yes or No

Yes >> GO TO 4.
No >> Go to AT-619, "10. A/T Does Not Shift: $D_2 \rightarrow D_3$" . Continue ROAD TEST.



4. CHECK SHIFT UP (D_3 TO D_4) AND ENGINE BRAKE

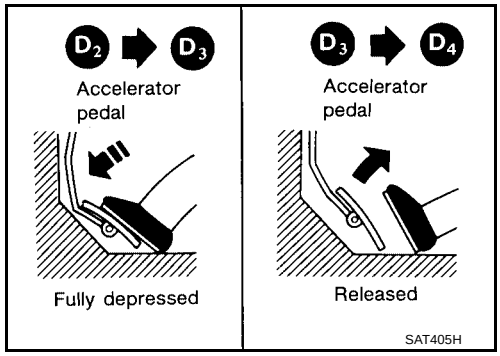
Release accelerator pedal after shifting from D_2 to D_3.
Does A/T shift from D_3 to D_4 and does vehicle decelerate by engine brake?

Read gear position, throttle opening and vehicle speed.

Yes or No

Yes >> 1. Stop vehicle.
2. Go to AT-470, "Cruise Test — Part 3".

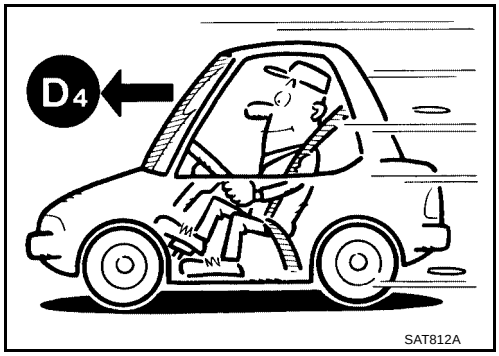
No >> Go to AT-622, "11. A/T Does Not Shift: $D_3 \rightarrow D_4$". Continue ROAD TEST.



Cruise Test — Part 3

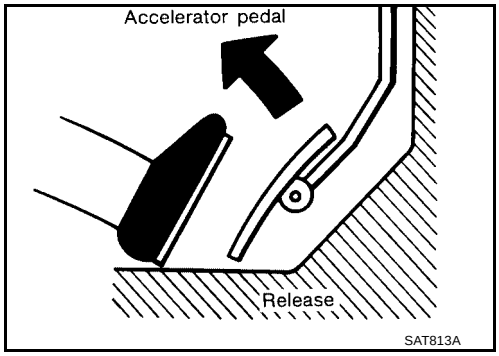
1. VEHICLE SPEED (D_4) POSITION

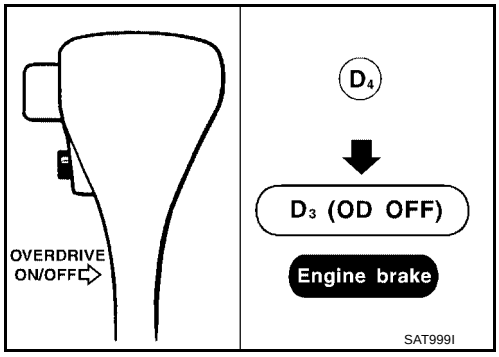
1. Confirm overdrive control switch is in ON position.
2. Confirm selector lever is in D position.
3. Accelerate vehicle using half-throttle to D_4.



4. Release accelerator pedal.
5. Set overdrive control switch to OFF position while driving in D_4.
6. Does A/T shift from D_4 to D_3 (O/D OFF)?

Read gear position and vehicle speed.





Yes or No

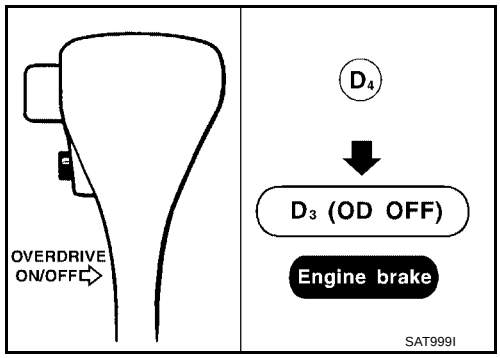
Yes >> GO TO 2.
No >> Go to AT-630, "17. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch ON → OFF". Continue ROAD TEST.

2. CHECK ENGINE BRAKE

Does vehicle decelerate by engine brake?

Yes or No

Yes >> GO TO 3.
No >> Go to AT-627, "15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)" . Continue ROAD TEST.



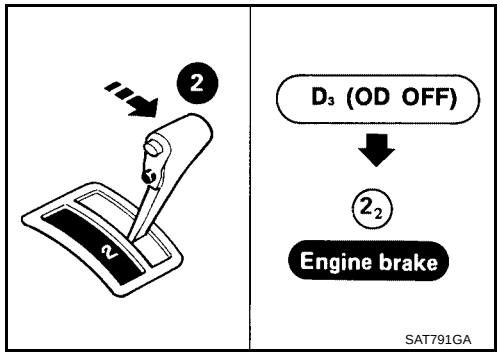
3. CHECK SHIFT DOWN (D_3 TO D_2)

1. Move selector lever from D to 2 position while driving in D_3 (O/D OFF).
2. Does A/T shift from D_3 (O/D OFF) to 2_2 ?

Read gear position.

Yes or No

Yes >> GO TO 4.
No >> Go to AT-630, "18. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever D → 2 Position" . Continue ROAD TEST.

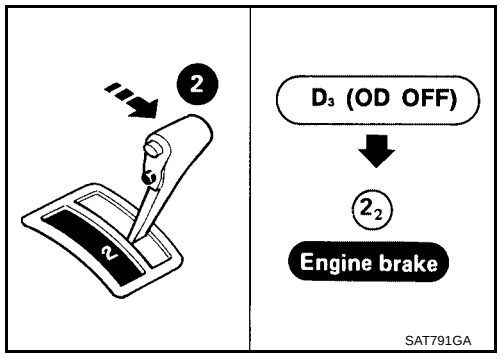


4. CHECK ENGINE BRAKE

Does vehicle decelerate by engine brake?

Yes or No

Yes >> GO TO 5.
No >> Go to AT-627, "15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)" . Continue ROAD TEST.



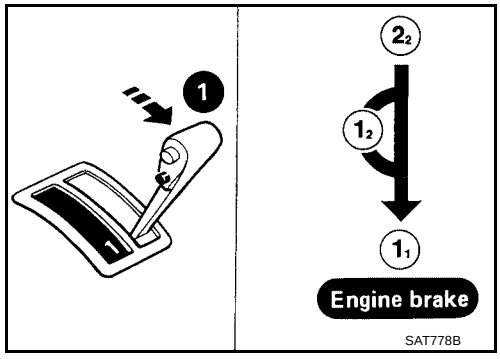
5. CHECK SHIFT DOWN (2_2 TO 1_1)

1. Move selector lever from 2 to 1 position while driving in 2_2 .
2. Does A/T shift from 2_2 to 1_1 position?

Read gear position.

Yes or No

Yes >> GO TO 6.
No >> Go to AT-631, "19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever 2 → 1 Position" . Continue ROAD TEST.



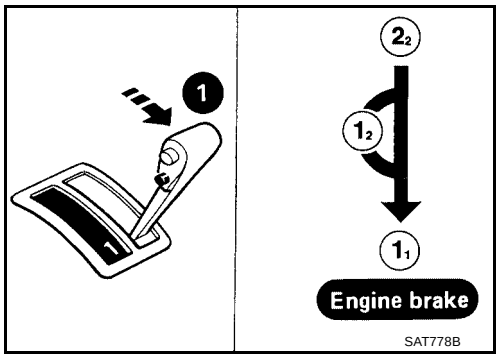
6. CHECK ENGINE BRAKE

Does vehicle decelerate by engine brake?

Yes or No

Yes >> 1. Stop vehicle.
2. Perform self-diagnosis. Refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" .

No >> Go to AT-632, "20. Vehicle Does Not Decelerate By Engine Brake" . Continue ROAD TEST.



TROUBLE DIAGNOSIS - GENERAL DESCRIPTION

PFP:00000

Symptom Chart

ECS0062U

Numbers are arranged in order of inspection.
Perform inspections starting with number one and work up.

Items	Symptom	Condition	Diagnostic Item	Reference Page
No Lock-up Engagement/ TCC Inoperative	Torque converter is not locked up.	ON vehicle	1. Throttle position sensor {accelerator pedal position (APP) sensor]	AT-563
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			3. Engine speed signal	AT-508
			4. A/T fluid temperature sensor	AT-573
			5. Line pressure test	AT-456
			6. Torque converter clutch solenoid valve	AT-534
			7. Control valve assembly	AT-644
		OFF vehicle	8. Torque converter	AT-657
	Torque converter clutch piston slip.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor {accelerator pedal position (APP) sensor]	AT-563
			3. Line pressure test	AT-456
			4. Torque converter clutch solenoid valve	AT-534
			5. Line pressure solenoid valve	AT-547
			6. Control valve assembly	AT-644
		OFF vehicle	7. Torque converter	AT-657
	Lock-up point is extremely high or low.	ON vehicle	1. Throttle position sensor {accelerator pedal position (APP) sensor]	AT-563
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			3. Torque converter clutch solenoid valve	AT-534
			4. Control valve assembly	AT-644
Shift Shock	Sharp shock in shifting from N to D position.	ON vehicle	1. Engine idling rpm	EC-1244
			2. Throttle position sensor {accelerator pedal position (APP) sensor]	AT-563
			3. Line pressure test	AT-456
			4. A/T fluid temperature sensor	AT-573
			5. Engine speed signal	AT-508
			6. Line pressure solenoid valve	AT-547
			7. Control valve assembly	AT-644
			8. Accumulator N-D	AT-657
		OFF vehicle	9. Forward clutch	AT-702

Items	Symptom	Condition	Diagnostic Item	Reference Page
Shift Shock	Too sharp a shock in change from D_1 to D_2.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-563
			2. Line pressure test	AT-456
			3. Accumulator servo release	AT-657
			4. Control valve assembly	AT-644
			5. A/T fluid temperature sensor	AT-573
		OFF vehicle	6. Brake band	AT-657
	Too sharp a shock in change from D_2 to D_3.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-563
			2. Line pressure test	AT-456
			3. Control valve assembly	AT-644
			4. A/T fluid temperature sensor	AT-497
		OFF vehicle	5. High clutch	AT-697
			6. Brake band	AT-657
	Too sharp a shock in change from D_3 to D_4.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor]	AT-563
			2. Line pressure test	AT-456
			3. Control valve assembly	AT-644
			4. A/T fluid temperature sensor	AT-497
		OFF vehicle	5. Brake band	AT-657
			6. Overrun clutch	AT-702
			7. Forward one-way clutch	AT-657################
	Gear change shock felt during deceleration by releasing accelerator pedal.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			2. Line pressure test	AT-456
			3. Overrun clutch solenoid valve	AT-568
			4. Control valve assembly	AT-644
	Large shock changing from 1_2 to 1_1 in 1 position.	ON vehicle	1. Control valve assembly	AT-644
		ON vehicle	2. Low & reverse brake	AT-708

Items	Symptom	Condition	Diagnostic Item	Reference Page
Improper Shift Timing	Too high a gear change point from D_1 to D_2, from D_2 to D_3, from D_3 to D_4.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			3. Shift solenoid valve A	AT-553
			4. Shift solenoid valve B	AT-558
	Gear change directly from D_1 to D_3 occurs.	ON vehicle	1. Fluid level	AT-452
			2. Accumulator servo release	AT-657
		OFF vehicle	3. Brake band	AT-657
	Too high a change point from D_4 to D_3, from D_3 to D_2, from D_2 to D_1.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
	Kickdown does not operate when depressing pedal in D_4 within kickdown vehicle speed.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			3. Shift solenoid valve A	AT-553
			4. Shift solenoid valve B	AT-558
Improper Shift Timing	Kickdown operates or engine overruns when depressing pedal in D_4 beyond kickdown vehicle speed limit.	ON vehicle	1. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Shift solenoid valve A	AT-553
			4. Shift solenoid valve B	AT-558
	Gear change from 2_2 to 2_3 in 2 position.	ON vehicle	1. Park/neutral position (PNP) switch adjustment	AT-646
	Gear change from 1_1 to 1_2 in 1 position.	ON vehicle	1. Park/neutral position (PNP) switch adjustment	AT-646
			2. Control cable adjustment	AT-647

Items	Symptom	Condition	Diagnostic Item	Reference Page
No Down Shift	Failure to change gear from D_4 to D_3.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Overrun clutch solenoid valve	AT-568
			4. Shift solenoid valve A	AT-553
			5. Line pressure solenoid valve	AT-547
			6. Control valve assembly	AT-644
		OFF vehicle	7. Low & reverse brake	AT-708
			8. Overrun clutch	AT-702
	Failure to change gear from D_3 to D_2 or from D_4 to D_2.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Shift solenoid valve A	AT-553
			4. Shift solenoid valve B	AT-558
			5. Control valve assembly	AT-644
		OFF vehicle	6. High clutch	AT-697
			7. Brake band	AT-657
	Failure to change gear from D_2 to D_1 or from D_3 to D_1.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Shift solenoid valve A	AT-553
			4. Shift solenoid valve B	AT-558
			5. Control valve assembly	AT-644
		OFF vehicle	6. Low one-way clutch	AT-657
			7. High clutch	AT-697
			8. Brake band	AT-657
No Down Shift	Failure to change from D_3 to 2_2 when changing lever into 2 position. AT-630	ON vehicle	1. Park/neutral position (PNP) switch adjustment	AT-646
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Overrun clutch solenoid valve	AT-568
			4. Shift solenoid valve B	AT-558
			5. Shift solenoid valve A	AT-553
			6. Control valve assembly	AT-644
			7. Control cable adjustment	AT-647
		OFF vehicle	8. Brake band	AT-657
			9. Overrun clutch	AT-702
	Does not change from 1_2 to 1_1 in 1 position.	ON vehicle	1. Park/neutral position (PNP) switch adjustment	AT-646
			2. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			3. Shift solenoid valve A	AT-553
			4. Control valve assembly	AT-644
			5. Overrun clutch solenoid valve	AT-568
		OFF vehicle	6. Overrun clutch	AT-702
			7. Low & reverse brake	AT-708

Items	Symptom	Condition	Diagnostic Item	Reference Page
No Up Shift	Failure to change gear from D_1 to D_2.	ON vehicle	1. Park/neutral position (PNP) switch adjustment	AT-646
			2. Control cable adjustment	AT-647
			3. Shift solenoid valve A	AT-553
			4. Control valve assembly	AT-644
			5. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
		OFF vehicle	6. Brake band	AT-657
	Failure to change gear from D_2 to D_3.	ON vehicle	1. Park/neutral position (PNP) switch adjustment	AT-646
			2. Control cable adjustment	AT-647
			3. Shift solenoid valve B	AT-558
			4. Control valve assembly	AT-644
			5. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
		OFF vehicle	6. High clutch	AT-697
			7. Brake band	AT-657
No Up Shift	Failure to change gear from D_3 to D_4.	ON vehicle	1. Park/neutral position (PNP) switch adjustment	AT-646
			2. Control cable adjustment	AT-647
			3. Shift solenoid valve A	AT-553
			4. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			5. A/T fluid temperature sensor	AT-573
		OFF vehicle	6. Brake band	AT-657
	A/T does not shift to D_4 when driving with overdrive control switch ON.	ON vehicle	1. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			2. Park/neutral position (PNP) switch adjustment	AT-646
			3. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			4. Shift solenoid valve A	AT-553
			5. Overrun clutch solenoid valve	AT-568
			6. Control valve assembly	AT-644
			7. A/T fluid temperature sensor	AT-573
			8. Line pressure solenoid valve	AT-547
		OFF vehicle	9. Brake band	AT-657
			10. Overrun clutch	AT-702

Items	Symptom	Condition	Diagnostic Item	Reference Page
Slips/Will Not Engage	Vehicle will not run in R position (but runs in D, 2 and 1 positions). Clutch slips. Very poor acceleration. AT-609	ON vehicle	1. Control cable adjustment	AT-647
			2. Line pressure test	AT-456
			3. Line pressure solenoid valve	AT-547
			4. Control valve assembly	AT-644
		OFF vehicle	5. Reverse clutch	AT-694
			6. High clutch	AT-697
			7. Forward clutch	AT-702
			8. Overrun clutch	AT-702
			9. Low & reverse brake	AT-708
	Vehicle will not run in D and 2 positions (but runs in 1 and R positions).	ON vehicle	1. Control cable adjustment	AT-647
		OFF vehicle	2. Low one-way clutch	AT-657

Items	Symptom	Condition	Diagnostic Item	Reference Page
Slips/Will Not Engage	Vehicle will not run in D, 1, 2 positions (but runs in R position). Clutch slips. Very poor acceleration. AT-612	ON vehicle	1. Fluid level	AT-452
			2. Line pressure test	AT-456
			3. Line pressure solenoid valve	AT-547
			4. Control valve assembly	AT-644
			5. Accumulator N-D	AT-657
		OFF vehicle	6. Reverse clutch	AT-694
			7. High clutch	AT-697
			8. Forward clutch	AT-702
			9. Forward one-way clutch	AT-657
			10. Low one-way clutch	AT-657
	Clutches or brakes slip somewhat in starting.	ON vehicle	1. Fluid level	AT-452
			2. Control cable adjustment	AT-647
			3. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			4. Line pressure test	AT-456
			5. Line pressure solenoid valve	AT-547
			6. Control valve assembly	AT-644
			7. Accumulator N-D	AT-657
		OFF vehicle	8. Forward clutch	AT-702
			9. Reverse clutch	AT-694
			10. Low & reverse brake	AT-708
			11. Oil pump	AT-675
			12. Torque converter	AT-657
	No creep at all. AT-609, AT-612	ON vehicle	1. Fluid level	AT-452
			2. Line pressure test	AT-456
			3. Control valve assembly	AT-644
		OFF vehicle	4. Forward clutch	AT-702
			5. Oil pump	AT-675
			6. Torque converter	AT-657
	Almost no shock or clutches slipping in change from D_1 to D_2.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Line pressure test	AT-456
			4. Accumulator servo release	AT-657
			5. Control valve assembly	AT-644
		OFF vehicle	6. Brake band	AT-657

Items	Symptom	Condition	Diagnostic Item	Reference Page
Slips/Will Not Engage	Almost no shock or slipping in change from D_2 to D_3 .	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Line pressure test	AT-456
			4. Control valve assembly	AT-644
		OFF vehicle	5. High clutch	AT-697
			6. Forward clutch	AT-702
	Almost no shock or slipping in change from D_3 to D_4 .	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Line pressure test	AT-456
			4. Control valve assembly	AT-644
		OFF vehicle	5. High clutch	AT-697
			6. Brake band	AT-657
	Races extremely fast or slips in changing from D_4 to D_3 when depressing pedal.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Line pressure test	AT-456
			4. Line pressure solenoid valve	AT-547
			5. Control valve assembly	AT-644
		OFF vehicle	6. High clutch	AT-697
			7. Forward clutch	AT-702
	Races extremely fast or slips in changing from D_4 to D_2 when depressing pedal.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Line pressure test	AT-456
			4. Line pressure solenoid valve	AT-547
			5. Shift solenoid valve A	AT-553
			6. Control valve assembly	AT-644
		OFF vehicle	7. Brake band	AT-657
			8. Forward clutch	AT-702
	Races extremely fast or slips in changing from D_3 to D_2 when depressing pedal.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Line pressure test	AT-456
			4. Line pressure solenoid valve	AT-547
			5. Control valve assembly	AT-644
			6. A/T fluid temperature sensor	AT-573
		OFF vehicle	7. Brake band	AT-657
			8. Forward clutch	AT-702
			9. High clutch	AT-697

Items	Symptom	Condition	Diagnostic Item	Reference Page
Slips/Will Not Engage	Races extremely fast or slips in changing from D_4 or D_3 to D_1 when depressing pedal.	ON vehicle	1. Fluid level	AT-452
			2. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			3. Line pressure test	AT-456
			4. Line pressure solenoid valve	AT-547
			5. Control valve assembly	AT-644
		OFF vehicle	6. Forward clutch	AT-702
			7. Forward one-way clutch	AT-657
			8. Low one-way clutch	AT-657
	Vehicle will not run in any position.	ON vehicle	1. Fluid level	AT-452
			2. Control cable adjustment	AT-647
			3. Line pressure test	AT-456
			4. Line pressure solenoid valve	AT-547
		OFF vehicle	5. Oil pump	AT-675
			6. High clutch	AT-697
			7. Brake band	AT-657
			8. Low & reverse brake	AT-708
			9. Torque converter	AT-657
			10. Parking components	AT-672
NOT USED	Engine cannot be started in P and N positions. AT-604	ON vehicle	1. Ignition switch and starter	PG-2, SC-9
			2. Control cable adjustment	AT-647
			3. Park/neutral position (PNP) switch adjustment	AT-646
	Engine starts in positions other than P and N. AT-604	ON vehicle	1. Control cable adjustment	AT-647
			2. Park/neutral position (PNP) switch adjustment	AT-646
	Transaxle noise in P and N positions.	ON vehicle	1. Fluid level	AT-452
			2. Line pressure test	AT-456
			3. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			4. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			5. Engine speed signal	AT-508
		OFF vehicle	6. Oil pump	AT-675
			7. Torque converter	AT-657
	Vehicle moves when changing into P position or parking gear does not disengage when shifted out of P position. AT-605	ON vehicle	1. Control cable adjustment	AT-647
		OFF vehicle	2. Parking components	AT-672

Items	Symptom	Condition	Diagnostic Item	Reference Page
NOT USED	Vehicle runs in N position. AT-605	ON vehicle	1. Control cable adjustment	AT-647
		OFF vehicle	2. Forward clutch	AT-702
			3. Reverse clutch	AT-694
			4. Overrun clutch	AT-702
	Vehicle braked when shifting into R position.	ON vehicle	1. Fluid level	AT-452
			2. Control cable adjustment	AT-647
			3. Line pressure test	AT-456
			4. Line pressure solenoid valve	AT-547
			5. Control valve assembly	AT-644
		OFF vehicle	6. High clutch	AT-697
			7. Brake band	AT-657
			8. Forward clutch	AT-702
			9. Overrun clutch	AT-702
	Excessive creep.	ON vehicle	1. Engine idling rpm	EC-1244
	Engine stops when shifting lever into R, D, 2 and 1.	ON vehicle	1. Engine idling rpm	EC-1244
			2. Torque converter clutch solenoid valve	AT-534
			3. Control valve assembly	AT-644
		OFF vehicle	4. Torque converter	AT-657
	Vehicle braked by gear change from D_1 to D_2.	ON vehicle	1. Fluid level	AT-452
		OFF vehicle	2. Reverse clutch	AT-694
			3. Low & reverse brake	AT-708
			4. High clutch	AT-697
			5. Low one-way clutch	AT-657
	Vehicle braked by gear change from D_2 to D_3.	ON vehicle	1. Fluid level	AT-452
		OFF vehicle	2. Brake band	AT-657
	Vehicle braked by gear change from D_3 to D_4.	ON vehicle	1. Fluid level	AT-452
		OFF vehicle	2. Overrun clutch	AT-702
			3. Forward one-way clutch	AT-657
			4. Reverse clutch	AT-694

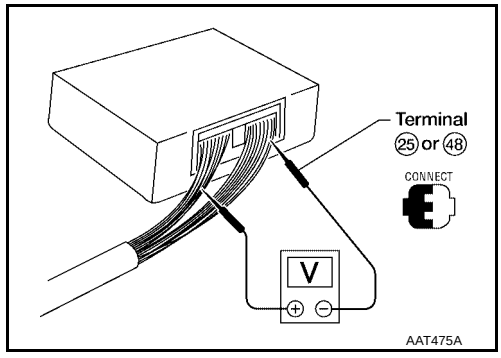
Items	Symptom	Condition	Diagnostic Item	Reference Page
NOT USED	Maximum speed not attained. Acceleration poor.	ON vehicle	1. Fluid level	AT-452
			2. Park/neutral position (PNP) switch adjustment	AT-646
			3. Shift solenoid valve A	AT-553
			4. Shift solenoid valve B	AT-558
			5. Control valve assembly	AT-644
		OFF vehicle	6. Reverse clutch	AT-694
			7. High clutch	AT-697
			8. Brake band	AT-657
			9. Low & reverse brake	AT-708
			10. Oil pump	AT-675
			11. Torque converter	AT-657
	Transaxle noise in D, 2, 1 and R positions.	ON vehicle	1. Fluid level	AT-452
		ON vehicle	2. Torque converter	AT-657
	Engine brake does not operate in “1” position. AT-632	ON vehicle	1. Park/neutral position (PNP) switch adjustment	AT-646
			2. Control cable adjustment	AT-647
			3. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			4. Vehicle speed sensor·A/T (Revolution sensor) and vehicle speed sensor·MTR	AT-503, AT-580
			5. Shift solenoid valve A	AT-553
			6. Control valve assembly	AT-644
			7. Overrun clutch solenoid valve	AT-568
		OFF vehicle	8. Overrun clutch	AT-702
			9. Low & reverse brake	AT-708
	Transaxle overheats.	ON vehicle	1. Fluid level	AT-452
			2. Engine idling rpm	EC-1244
			3. Throttle position sensor [accelerator pedal position (APP) sensor] (Adjustment)	EC-1255
			4. Line pressure test	AT-456
			5. Line pressure solenoid valve	AT-547
			6. Control valve assembly	AT-644
		OFF vehicle	7. Oil pump	AT-675
			8. Reverse clutch	AT-694
			9. High clutch	AT-697
			10. Brake band	AT-657
			11. Forward clutch	AT-702
			12. Overrun clutch	AT-702
			13. Low & reverse brake	AT-708
			14. Torque converter	AT-657

Items	Symptom	Condition	Diagnostic Item	Reference Page
NOT USED	ATF shoots out during operation. White smoke emitted from exhaust pipe during operation.	ON vehicle	1. Fluid level	AT-452
		OFF vehicle	2. Reverse clutch	AT-694
			3. High clutch	AT-697
			4. Brake band	AT-657
			5. Forward clutch	AT-702
			6. Overrun clutch	AT-702
			7. Low & reverse brake	AT-708
	Offensive smell at fluid charging pipe.	ON vehicle	1. Fluid level	AT-452
		OFF vehicle	2. Torque converter	AT-657
			3. Oil pump	AT-675
			4. Reverse clutch	AT-694
			5. High clutch	AT-697
			6. Brake band	AT-657
			7. Forward clutch	AT-702
			8. Overrun clutch	AT-702
			9. Low & reverse brake	AT-708
	Engine is stopped at R, D, 2 and 1 positions.	ON vehicle	1. Fluid level	AT-452
			2. Torque converter clutch solenoid valve	AT-534
			3. Shift solenoid valve B	AT-558
			4. Shift solenoid valve A	AT-553
			5. Control valve assembly	AT-644

TCM Terminals and Reference Value

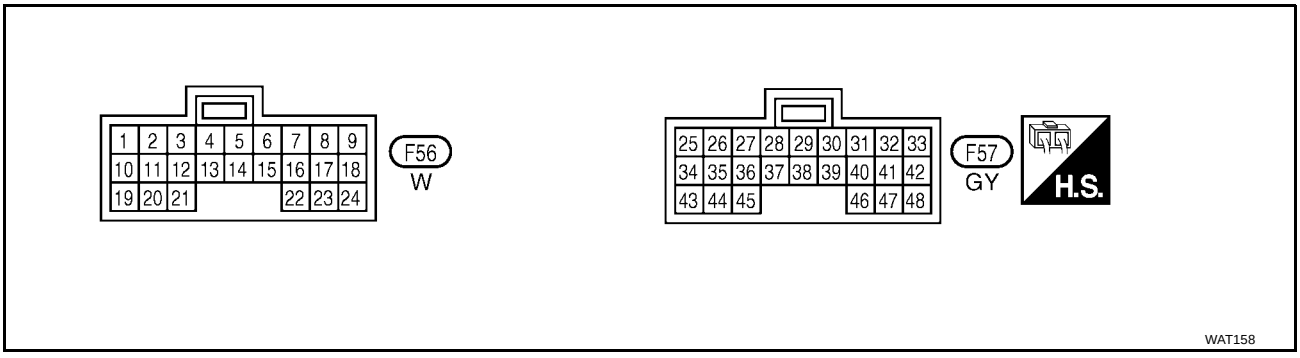
ECS0062V

PREPARATION



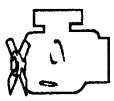
- Measure voltage between each terminal and terminal 25 or 48 by following “TCM INSPECTION TABLE”.

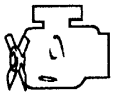
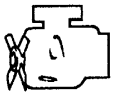
TCM HARNESS CONNECTOR TERMINAL LAYOUT



TCM INSPECTION TABLE

(Data are reference values.)

Terminal No.	Wire color	Item	Condition		Judgement standard (Approx.)
1	R/W	Line pressure solenoid valve		When releasing accelerator pedal after warming up engine.	1.5 - 3.0V
				When depressing accelerator pedal fully after warming up engine.	0V
2	P/B	Line pressure solenoid valve (with dropping resistor)		When releasing accelerator pedal after warming up engine.	4 - 14V
				When depressing accelerator pedal fully after warming up engine.	0V
3	GY/R	Torque converter clutch solenoid valve		When A/T performs lock-up.	8 - 15V
				When A/T does not perform lock-up.	0V
5*	L	CAN-H	—	—	—
6*	Y	CAN-L	—	—	—
10	BR/R	Power source		When turning ignition switch to ON.	Battery voltage
				When turning ignition switch to OFF.	0V
11	L/W	Shift solenoid valve A		When shift solenoid valve A operates. (When driving in D_1 or D_4.)	Battery voltage
				When shift solenoid valve A does not operate. (When driving in D_2 or D_3.)	0V
12	L/Y	Shift solenoid valve B		When shift solenoid valve B operates. (When driving in D_1 or D_2.)	Battery voltage
				When shift solenoid valve B does not operate. (When driving in D_3 or D_4.)	0V
13	G/R	O/D OFF indicator lamp		When setting overdrive control switch in OFF position.	0V
				When setting overdrive control switch in ON position.	Battery voltage
19	BR/R	Power source		With ignition switch ON.	Battery voltage
				With ignition switch OFF.	0V
20	L/B	Overrun clutch solenoid valve		When overrun clutch solenoid valve operates.	Battery voltage
				When overrun clutch solenoid valve does not operate.	0V
22	OR/B	Overdrive control switch		When setting overdrive control switch in ON position.	Battery voltage
				When setting overdrive control switch in OFF position.	0V
25	B	Ground	—	—	—

Terminal No.	Wire color	Item	Condition		Judgement standard (Approx.)
26	OR	PNP switch 1 position		When setting selector lever to 1 position.	Battery voltage
				When setting selector lever to other positions.	0V
27	L	PNP switch 2 position		When setting selector lever to 2 position.	Battery voltage
				When setting selector lever to other positions.	0V
28	R/B	Power source (Memory back-up)		With ignition switch OFF.	Battery voltage
				With ignition switch ON.	Battery voltage
29	W	Revolution sensor		When moving at 20 km/h (12 MPH), use the CONSULT-II pulse frequency measuring function.*1 **CAUTION:** **Connect the diagnosis data link cable to the vehicle diagnosis connector.** *1: A circuit tester cannot be used to test this item.	450 Hz
				When vehicle is parked.	Under 1.3V or over 4.5V
30**	G/B	Data link connector (RX)		—	—
31**	GY/L	Data link connector (TX)		—	—
32	R	Sensor power		Ignition switch ON.	4.5 - 5.5V
				Ignition switch OFF.	0V
34	W/G	PNP switch D position		When setting selector lever to D position.	Battery voltage
				When setting selector lever to other positions.	0V
35	G/W	PNP switch R position		When setting selector lever to R position.	Battery voltage
				When setting selector lever to other positions.	0V
36	BR/W	PNP switch P or N position		When setting selector lever to P or N position.	Battery voltage
				When setting selector lever to other positions.	0V
38	G	Turbine revolution sensor		When moving at 20 km/h (12 MPH), use the CONSULT-II pulse frequency measuring function.*1 **CAUTION:** **Connect the diagnosis data link cable to the vehicle diagnosis connector.** *1: A circuit tester cannot be used to test this item.	240 Hz
				When vehicle is parked.	Under 1.3V or over 4.5V

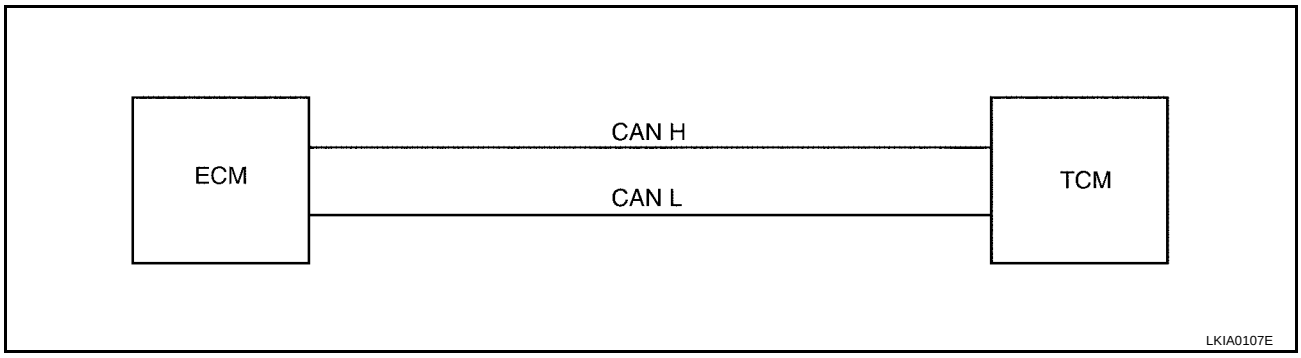
Terminal No.	Wire color	Item	Condition		Judgement standard (Approx.)
39	L/OR	Engine speed signal		Refer to EC-1308, "ECM INSPECTION TABLE" .	
40	PU/R	Vehicle speed sensor		When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.	Voltage varies between less than 1V and more than 4.5V
41	S/B	Throttle position sensor [accelerator pedal position (APP) sensor]		When depressing accelerator pedal slowly after warming up engine. (Voltage rises gradually in response to throttle position.)	Fully-closed throttle: 0.5V Fully-open throttle: 4V
42	B	Sensor ground	—	—	—
45	R/G	Stop lamp switch		With brake pedal depressed	Battery voltage
				With brake pedal released	0V
47	BR	A/T fluid temperature sensor		When ATF temperature is 20°C (68°F).	1.5V
				When ATF temperature is 80°C (176°F).	0.5V
48	B	Ground	—	—	—

*: These terminals are connected to the ECM.
**: These terminals are connected to the Data link connector.

System Description

ECS0062W

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	TCM
Accelerator pedal position signal	T	R
Output shaft revolution signal	R	T
A/T self-diagnosis signal	R	T

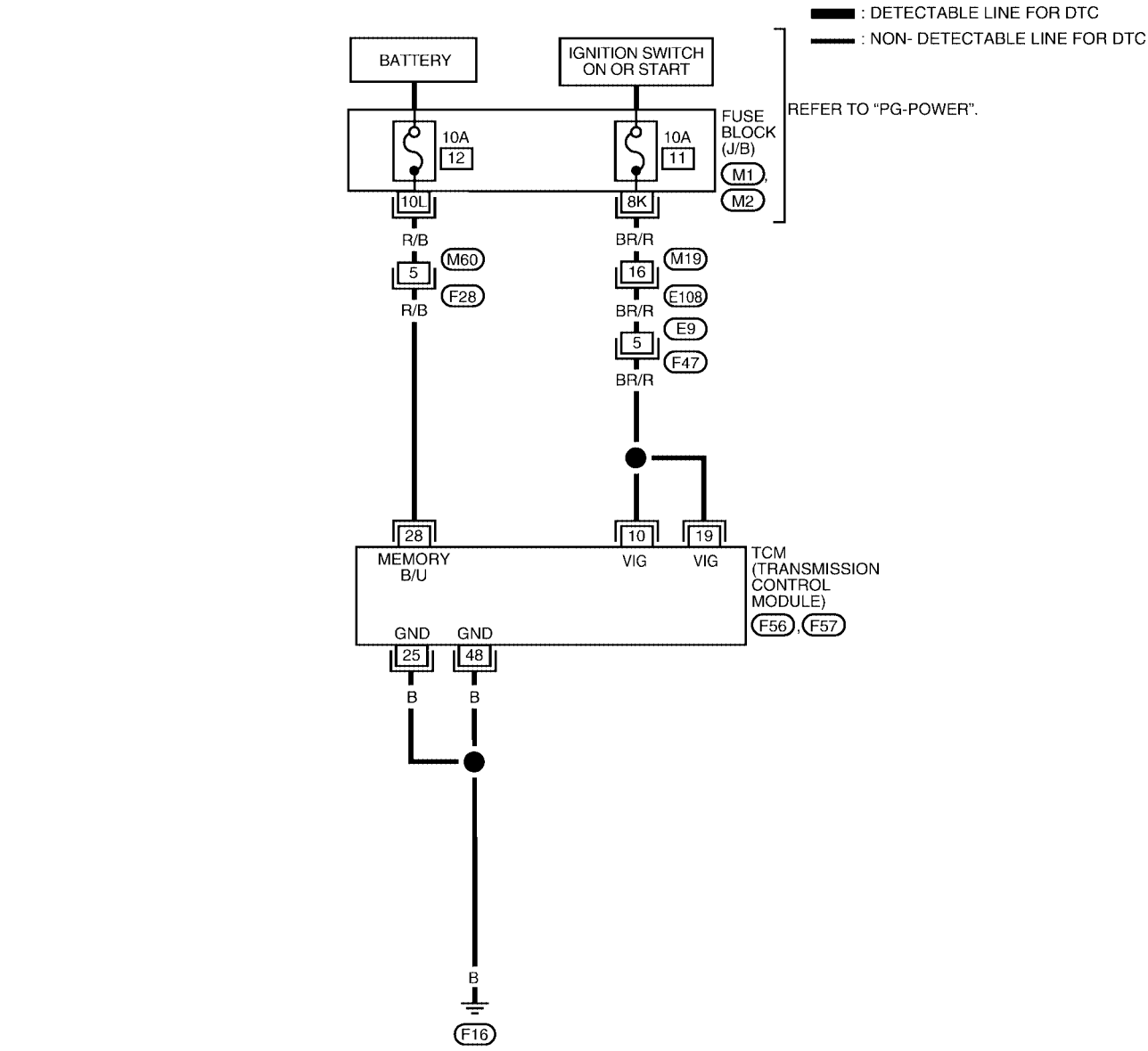
TROUBLE DIAGNOSIS FOR POWER SUPPLY

PFP:00000

Wiring Diagram — AT — MAIN

ECS0062X

AT-MAIN-01



WCWA0011E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)

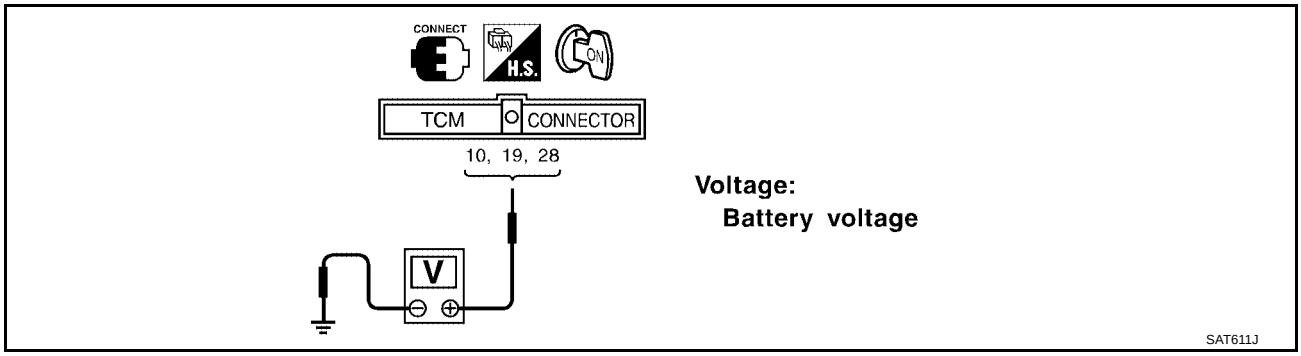
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	BR/R	POWER SOURCE	IGNITION ON	BATTERY VOLTAGE
			IGNITION OFF	APPROX. 0V
19	BR/R	POWER SOURCE	IGNITION ON	BATTERY VOLTAGE
			IGNITION OFF	APPROX. 0V
25	B	GROUND	—	—
28	R/B	POWER SOURCE (MEMORY BACKUP)	IGNITION ON	BATTERY VOLTAGE
			IGNITION OFF	BATTERY VOLTAGE
48	B	GROUND	—	—

Diagnostic Procedure

ECS0062Y

1. CHECK TCM POWER SOURCE STEP 1

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Check voltage between TCM terminals 10 (BR/R), 19 (BR/R), 28 (R/B) and ground.

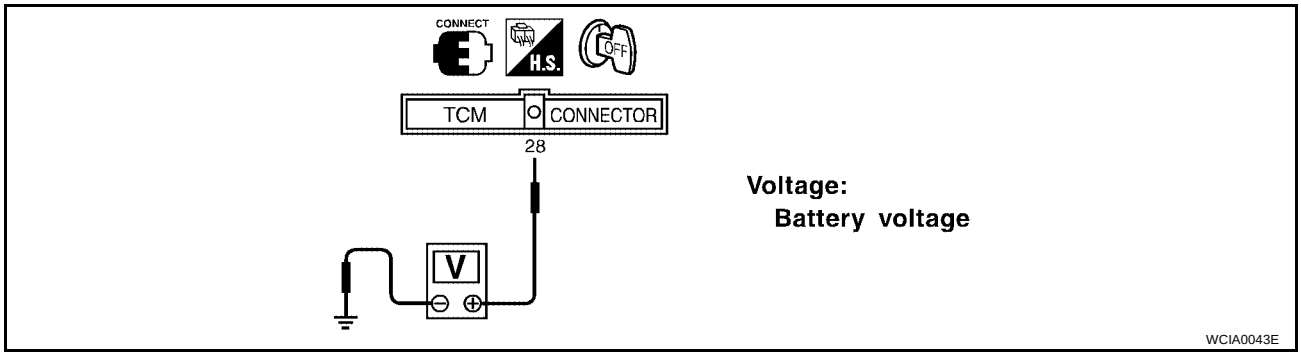


OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK TCM POWER SOURCE STEP 2

1. Turn ignition switch to OFF position.
2. Check voltage between TCM terminal 28 (R/B) and ground.



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING ITEM

Check the following items:

- Harness for short or open between ignition switch and TCM terminals 10, 19 and 28 (Main harness)
- Fuse
- Ignition switch
  Refer to PG-2, "POWER SUPPLY ROUTING" .

OK or NG

OK >> GO TO 4.
NG >> Repair or replace damaged parts.

4. CHECK TCM GROUND CIRCUIT

1. Turn ignition switch to OFF position.
2. Disconnect TCM harness connector.
3. Check continuity between TCM terminals 25, 48 and ground. Refer to AT-488, "Wiring Diagram — AT — MAIN" .

Continuity should exist.

OK or NG

OK >> **INSPECTION END**
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

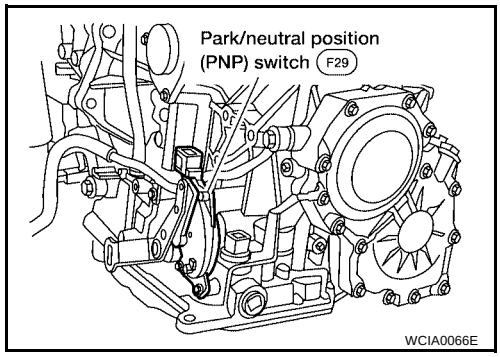
DTC P0705 PARK/NEUTRAL POSITION SWITCH

PFP:32006

Description

ECS0062Z

- The park/neutral position (PNP) switch includes a transmission range switch.
- The transmission range switch detects the selector lever position and sends a signal to the TCM.



On Board Diagnosis Logic

ECS00630

Diagnostic trouble code PNP SW/CIRC with CONSULT-II or P0705 without CONSULT-II is detected when TCM does not receive the correct voltage signal from the switch based on the gear position.

Possible Cause

ECS00631

Check the following items.

- Harness or connectors
  (The park/neutral position (PNP) switch circuit is open or shorted.)
- Park/neutral position (PNP) switch

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS00632

CAUTION:

Always drive vehicle at a safe speed.

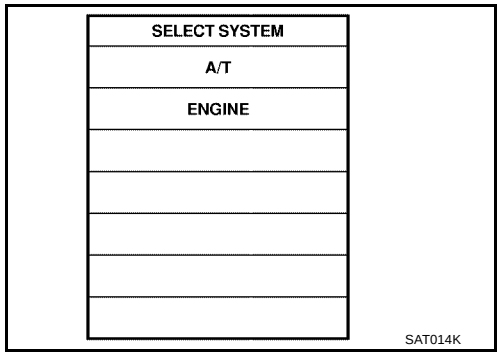
NOTE:

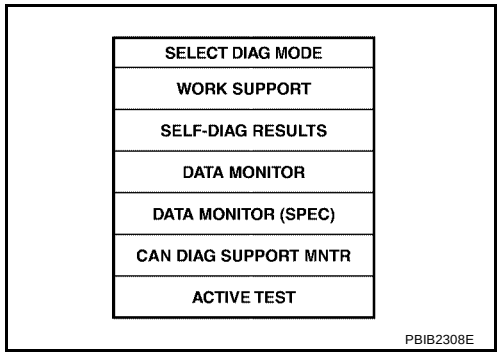
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON.





2. Select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.

3. Start engine and maintain the following conditions for at least 5 consecutive seconds.
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   THRTL POS SEN: More than 1.3V
   Selector lever: D position (O/D ON or OFF)

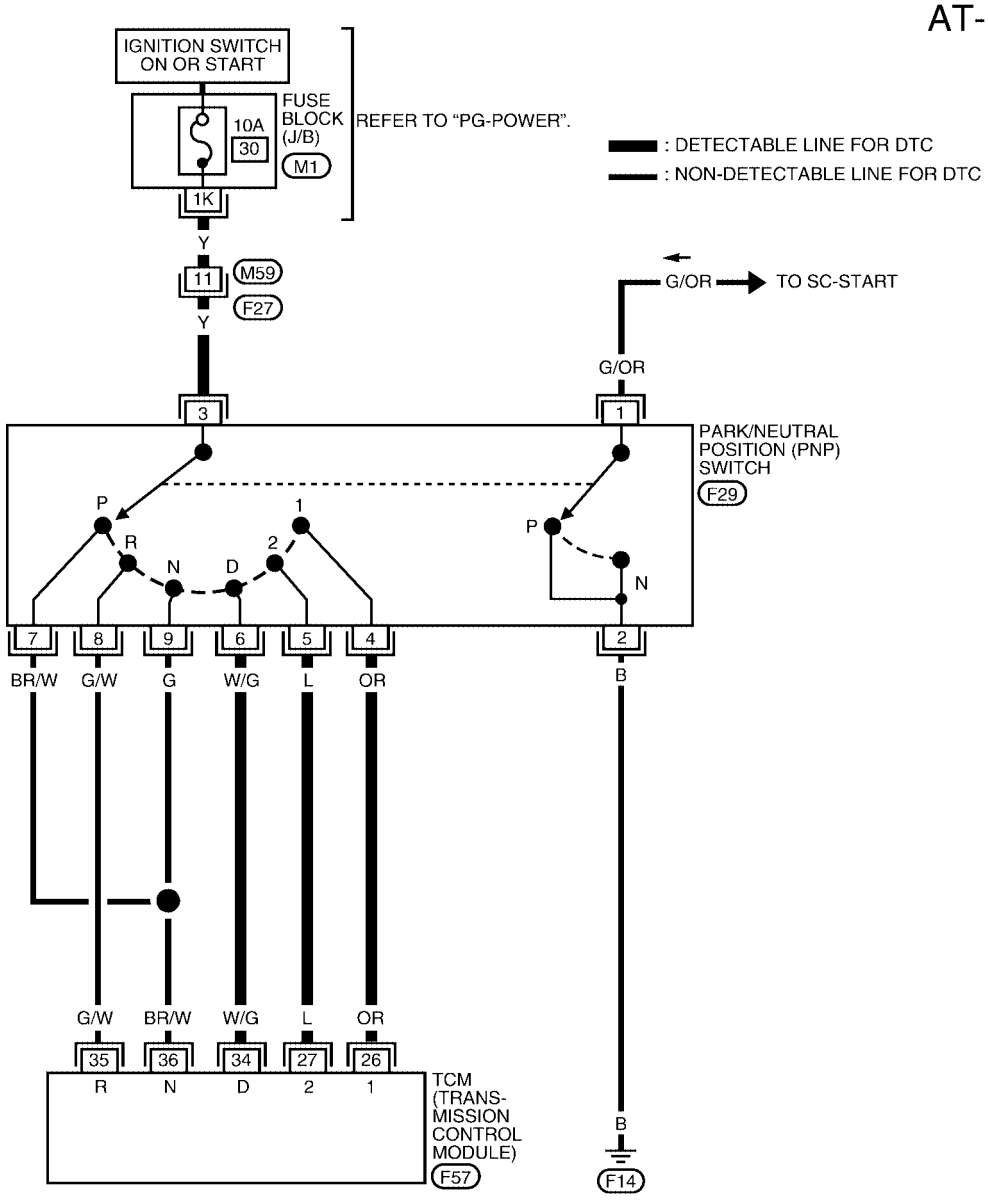
WITH GST

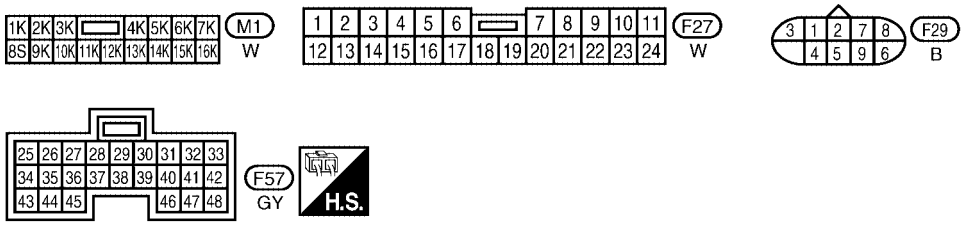
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — PNP/SW

ECS00633

AT-PNP/SW-01





WCWA0077E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
26	OR	PNP SWITCH 1 POSITION	IGNITION ON AND SELECTOR LEVER IN 1 POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V
27	L	PNP SWITCH 2 POSITION	IGNITION ON AND SELECTOR LEVER IN 2 POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V
34	W/G	PNP SWITCH D POSITION	IGNITION ON AND SELECTOR LEVER IN D POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V
35	G/W	PNP SWITCH R POSITION	IGNITION ON AND SELECTOR LEVER IN R POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V
36	BR/W	PNP SWITCH P OR N POSITION	IGNITION ON AND SELECTOR LEVER IN P OR N POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V

Diagnostic Procedure

ECS00634

1. INSPECTION START

Do you have CONSULT-II?

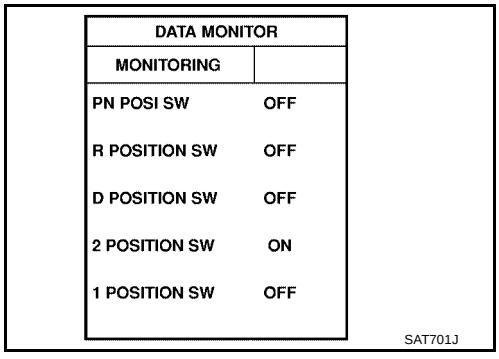
Yes or No

Yes >> GO TO 2.
No >> GO TO 6.

2. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch to ON position. (Do not start engine.)
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out P, R, N, D, 2 and 1 position switches moving selector lever to each position.
   Check that the signal of the selector lever position is indicated properly.



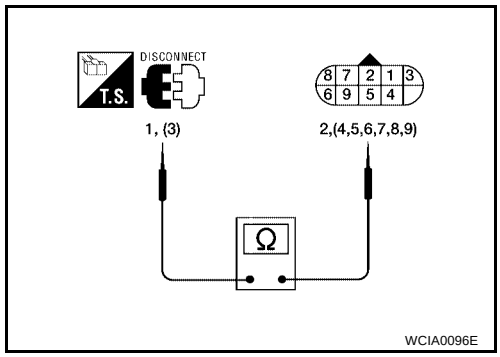
OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING ITEM

Check the following item:

- Park/neutral position (PNP) switch
  Check continuity between park/neutral position (PNP) switch F29 terminals 1 (G/OR) and 2 (B) and between terminals 3 (Y) and 4 (OR), 5 (L), 6 (W/G), 7 (BR/W), 8 (G/W) and 9 (G) while moving manual shaft through each position.



Lever position	Terminal No.	
P	3 - 7	1 - 2
R	3 - 8	
N	3 - 9	1 - 2
D	3 - 6	
2	3 - 5	
1	3 - 4	

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK MANUAL CONTROL CABLE ADJUSTMENT

Check PNP switch again with manual control cable disconnected from manual shaft of A/T assembly. Refer to test group 1.

OK or NG

OK >> Adjust manual control cable. Refer to AT-647, "Control Cable Adjustment" .
NG >> Repair or replace PNP switch.

5. DETECT MALFUNCTIONING ITEM

Check the following items:

- Harness for short or open between ignition switch and park/neutral position (PNP) switch (Main harness)
- Harness for short or open between park/neutral position (PNP) switch and TCM (Main harness)
- Fuse
- Ignition switch
  Refer to PG-2, "POWER SUPPLY ROUTING" .

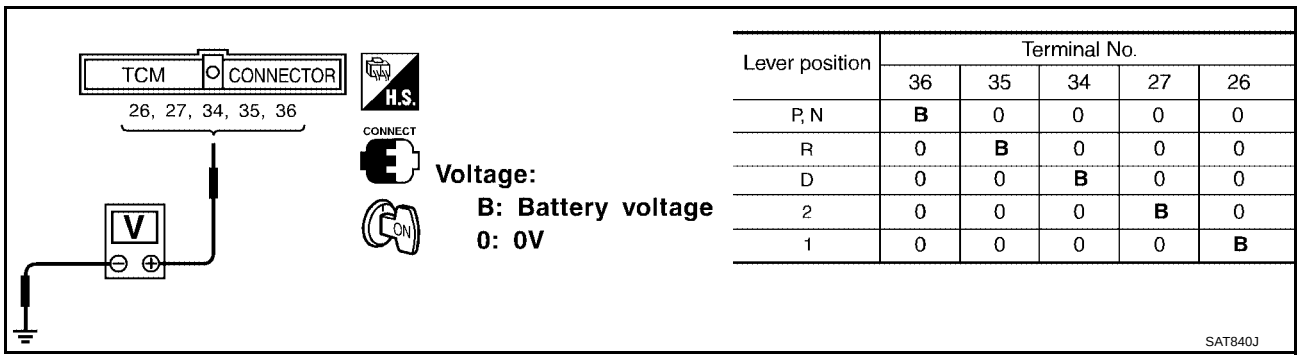
OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

6. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT (WITHOUT CONSULT-II)

Without CONSULT-II

1. Turn ignition switch to ON position. (Do not start engine.)
2. Check voltage between TCM terminals 26 (OR), 27 (L), 34 (W/G), 35 (G/W), 36 (BR/W) and ground while moving selector lever through each position.



Lever position	Terminal No.				
	36	35	34	27	26
P, N	**B**	0	0	0	0
R	0	**B**	0	0	0
D	0	0	**B**	0	0
2	0	0	0	**B**	0
1	0	0	0	0	**B**

OK or NG

OK >> GO TO 7.
NG >> GO TO 5.

7. CHECK DTC

Perform AT-491, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

8. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

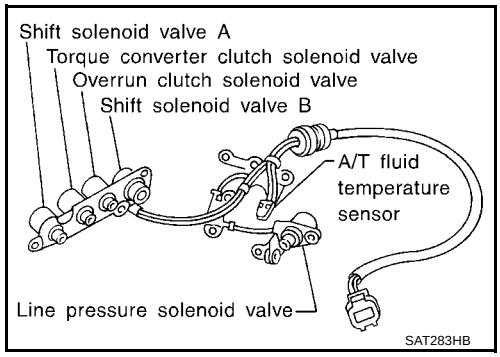
DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT

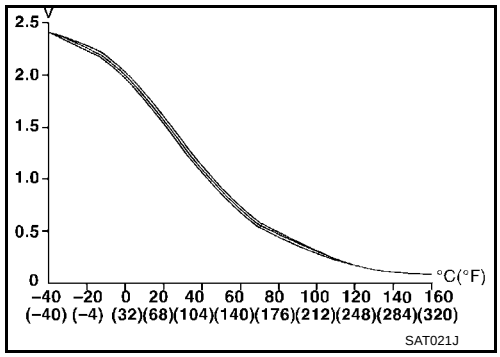
PFP:31940

Description

ECS00635

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the TCM.





CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approximately)	
A/T fluid temperature sensor	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]	1.5V ↓ 0.5V	2.5 kΩ ↓ 0.3 kΩ

On Board Diagnosis Logic

ECS00636

Diagnostic trouble code ATF TEMP SEN/CIRC with CONSULT-II or P0710 without CONSULT-II is detected when TCM receives an excessively low or high voltage from the sensor.

Possible Cause

ECS00637

Check the following items.

- Harness or connectors
  (The sensor circuit is open or shorted.)
- A/T fluid temperature sensor

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS00638

CAUTION:

Always drive vehicle at a safe speed.

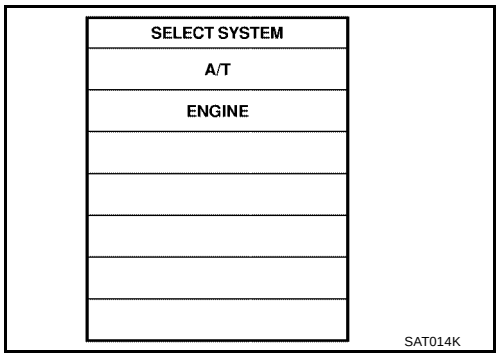
NOTE:

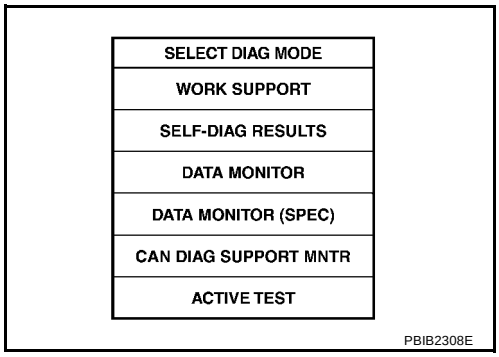
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.





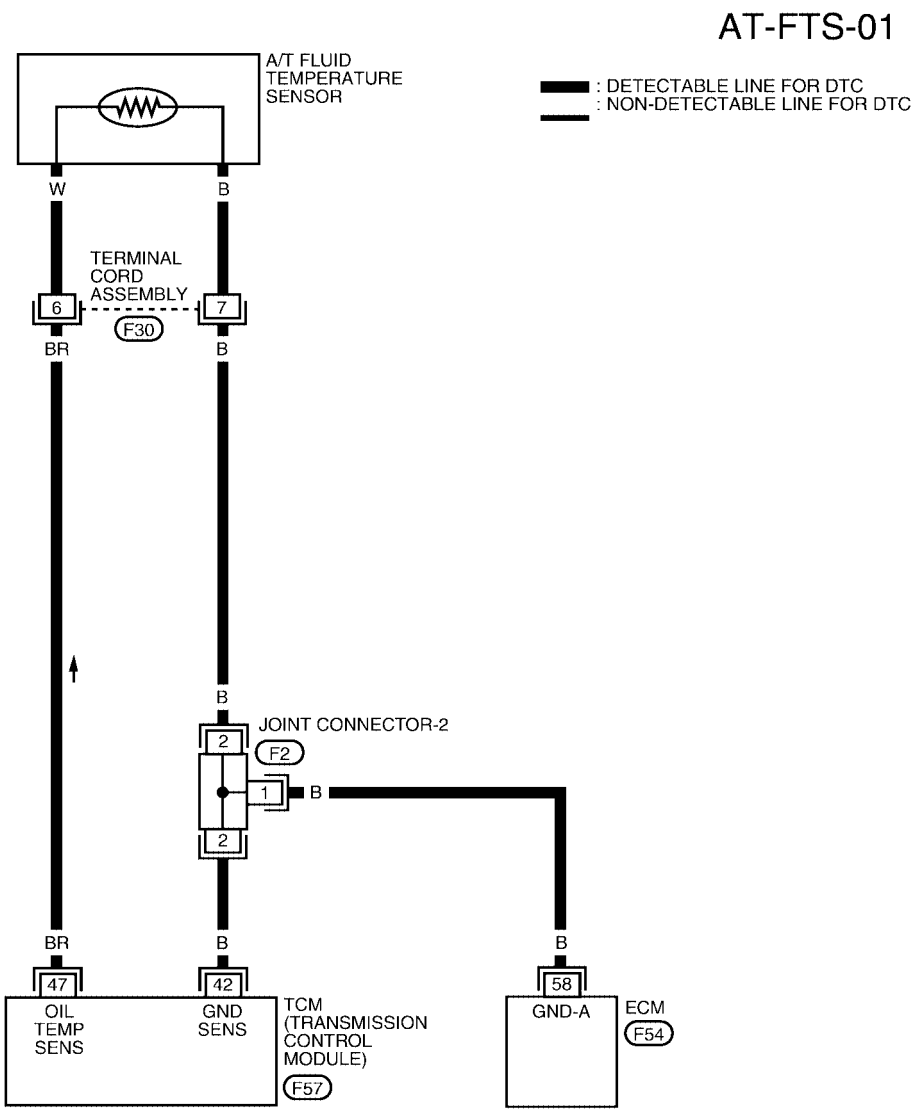
2. Start engine and maintain the following conditions for at least 10 minutes (Total). (It is not necessary to maintain continuously.)
   CMPS·RPM (REF): 450 rpm or more
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   THRTL POS SEN: More than 1.2V
   Selector lever: D position (O/D ON)

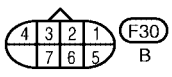
WITH GST

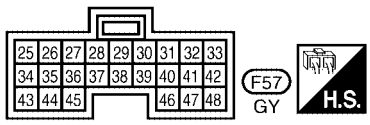
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — FTS

ECS00639







REFER TO THE FOLLOWING.
F2 - JOINT CONNECTOR
F54 - ELECTRICAL UNITS

WCWA0014E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
42	B	SENSOR GROUND	—	—
47	BR	A/T FLUID TEMPERATURE SENSOR	IGNITION ON AND ATF TEMPERATURE IS 20°C (68°F)	APPROX. 1.5V
			IGNITION ON AND ATF TEMPERATURE IS 80°C (176°F)	APPROX. 0.5V

Diagnostic Procedure

ECS0063A

1. INSPECTION START

Do you have CONSULT-II?

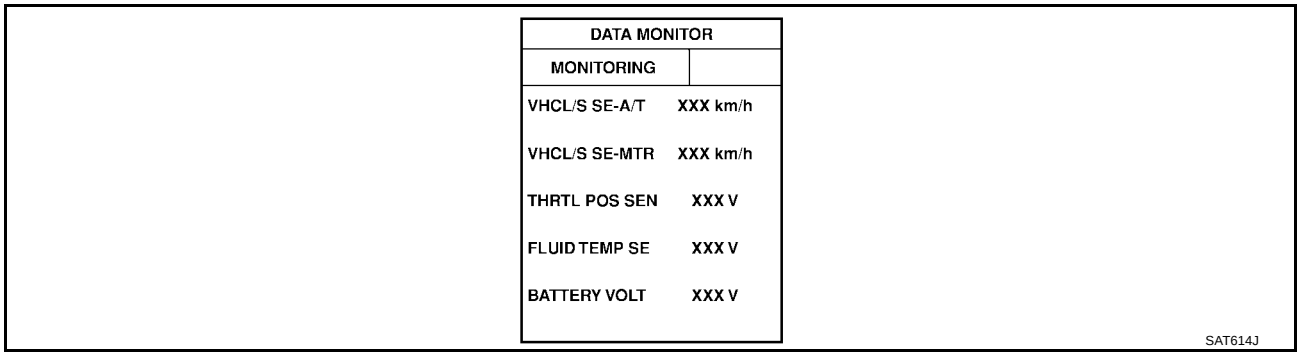
Yes or No

Yes >> GO TO 2.
No >> GO TO 6.

2. CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR (WITH CONSULT-II)

With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “FLUID TEMP SE”.



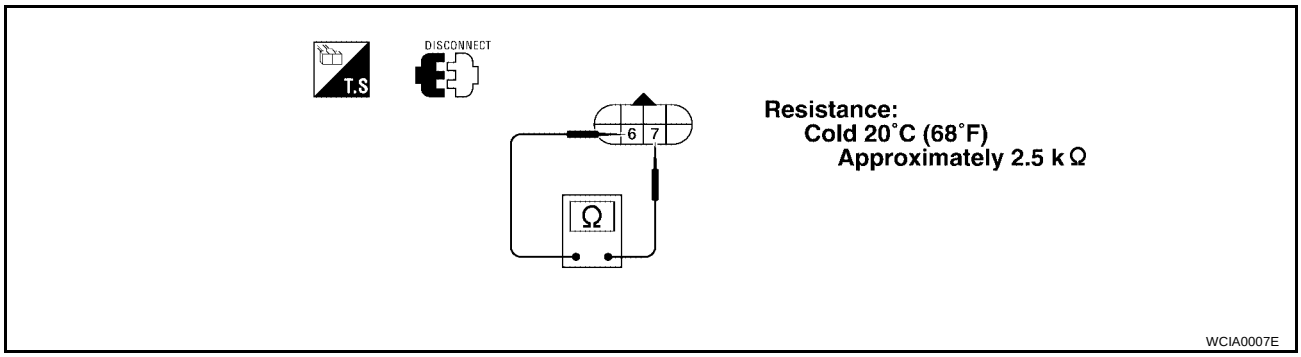
Voltage :Cold [20°C (68°F)] → Hot [80°C (176°F)]
:Approximately 1.5V → 0.5V

OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK A/T FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY

1. Turn ignition switch to OFF position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly F30 terminals 6 and 7 (component side) when A/T is cold.



4. Reinstall any part removed.

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. DETECT MALFUNCTIONING ITEM

Check the following items:

- Harness for short to ground or short to power or open between TCM, ECM and terminal cord assembly (Main harness)
- Ground circuit for ECM
  Refer to AT-488, "TROUBLE DIAGNOSIS FOR POWER SUPPLY" .

OK or NG

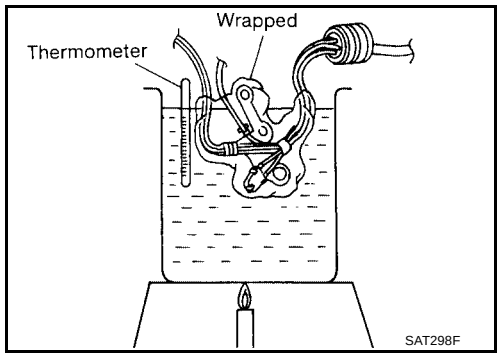
OK >> GO TO 7.
NG >> Repair or replace damaged parts.

5. DETECT MALFUNCTIONING ITEM

1. Remove oil pan.
2. Check the following items:

– A/T fluid temperature sensor
  Check resistance between two terminals while changing temperature as shown in figure.

Temperature	Resistance (Approx.)
20°C (68°F)	2.5kΩ
80°C (176°F)	0.3kΩ



– Harness of terminal cord assembly for short or open

OK or NG

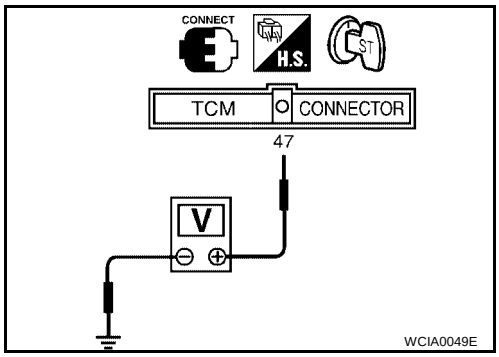
OK >> GO TO 7.
NG >> Repair or replace damaged parts.

6. CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR (WITHOUT CONSULT-II)

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM connector F57 terminal 47 (BR) and ground while warming up A/T.

Voltage :Cold [20°C (68°F)] → Hot [80°C (176°F)]
:Approximately 1.5V → 0.5V



OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

7. CHECK DTC

Perform AT-497, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

8. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

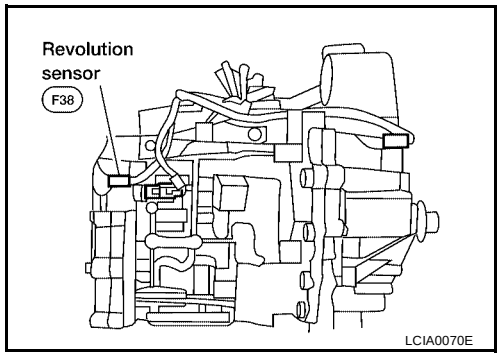
DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)

PFP:32702

Description

ECS0063B

The revolution sensor detects the revolution of the idler gear parking pawl lock gear and emits a pulse signal. The pulse signal is sent to the TCM which converts it into vehicle speed.



On Board Diagnosis Logic

ECS0063C

Diagnostic trouble code VEH SPD SEN/CIR AT with CONSULT-II or P0720 without CONSULT-II is detected when TCM does not receive the proper voltage signal from the sensor.

Possible Cause

ECS0063D

Check the following items.

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Revolution sensor

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS0063E

CAUTION:

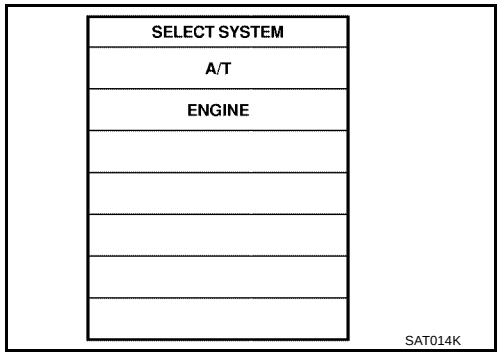
- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

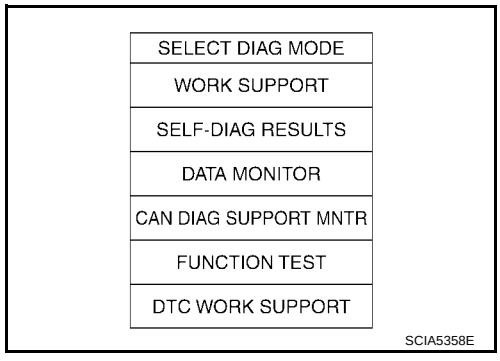
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

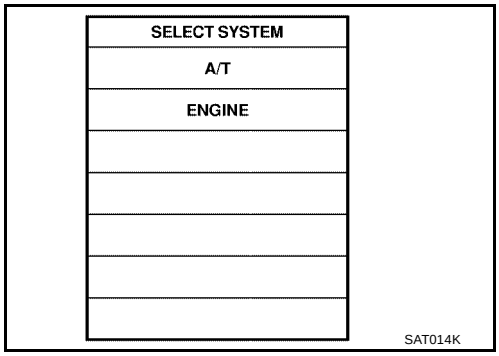
WITH CONSULT-II

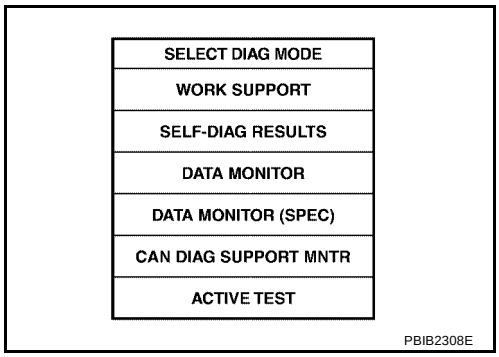
1. Turn ignition switch ON and select “DATA MONITOR” mode for “A/T” with CONSULT-II.





2. Drive vehicle and check for an increase of “VHCL/S SE·MTR” value.
   If the check result is NG, go to AT-506, "Diagnostic Procedure" .
   If the check result is OK, go to following step.
3. Select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.





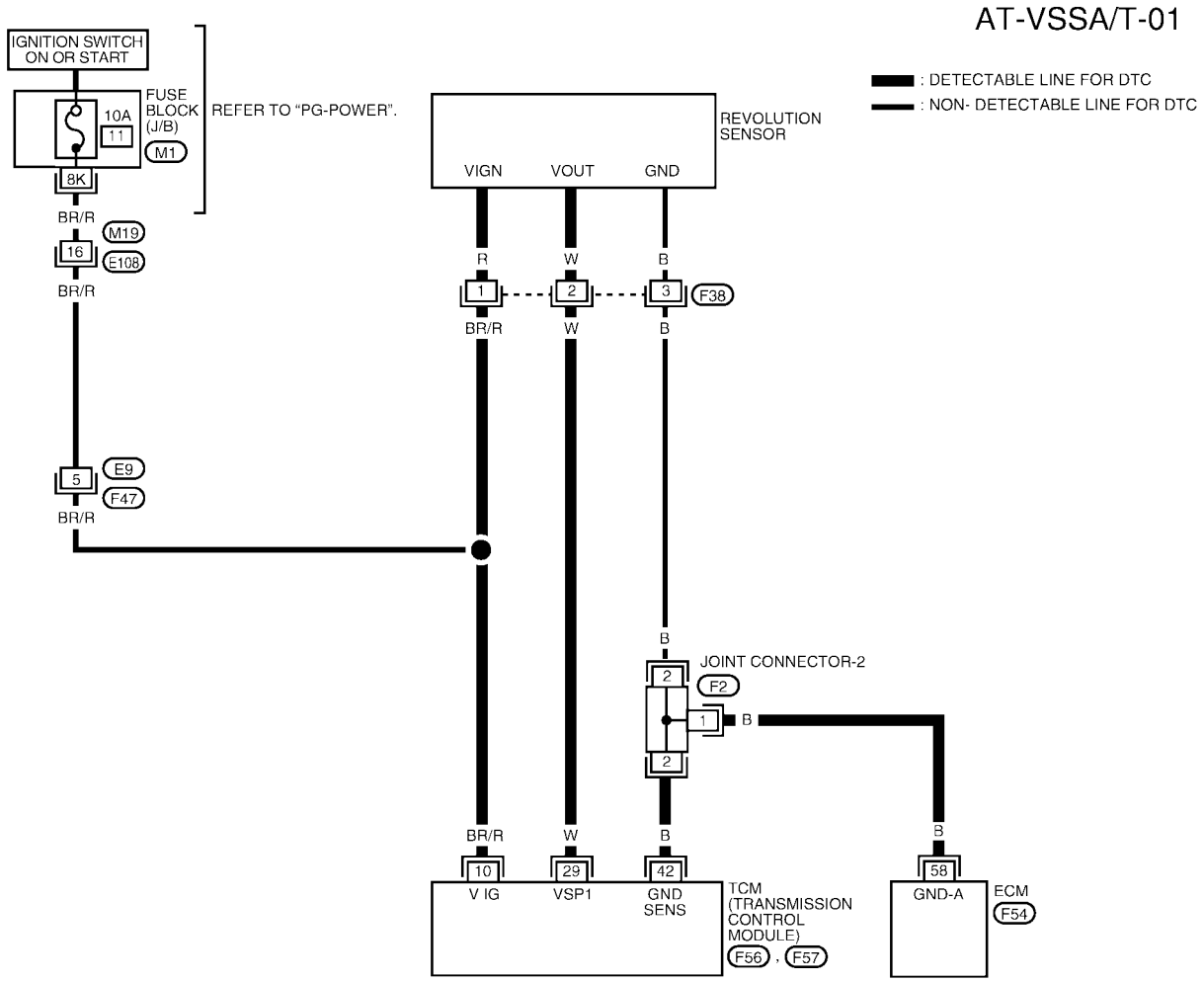
4. Start engine and maintain the following conditions for at least 5 consecutive seconds.
   VHCL SPEED SE: 30 km/h (19 MPH) or more
   THRTL POS SEN: More than 1.2V
   Selector lever: D position (O/D ON)
   Driving location: Driving the vehicle uphill (increased engine load) will help maintain the driving conditions required for this test.
   If the check result is NG, go to AT-506, "Diagnostic Procedure" .
   If the check result is OK, go to following step.
5. Maintain the following conditions for at least 5 consecutive seconds.
   CMPS·RPM (REF): 3,500 rpm or more
   THRTL POS SEN: More than 1.2V
   Selector lever: D position (O/D ON)
   Driving location: Driving the vehicle uphill (increased engine load) will help maintain the driving conditions required for this test.

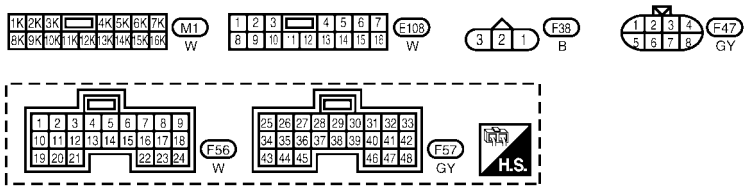
WITH GST

Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — VSSA/T

ECS0063F





REFER TO THE FOLLOWING.
F2 - JOINT CONNECTOR
F54 - ELECTRICAL UNITS

WCWA0016E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
29	W	REVOLUTION SENSOR	VEHICLE MOVING AT 20 KM/H (12 MPH). USE THE CONSULT-II PULSE FREQUENCY MEASURING FUNCTION. A CIRCUIT TESTER CANNOT BE USED TO TEST THIS ITEM. CAUTION: CONNECT THE DIAGNOSIS DATA LINK CABLE TO THE VEHICLE DIAGNOSIS CONNECTOR.	450 HZ
			VEHICLE NOT MOVING.	LESS THAN 1.3V OR GREATER THAN 4.5V
42	B	SENSOR GROUND	—	—

Diagnostic Procedure

ECS0063G

1. CHECK INPUT SIGNAL (WITH CONSULT-II)

With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “VHCL/S SE·A/T” while driving.
   Check the value changes according to driving speed.

DATA MONITOR	
MONITORING	
VHCL/S SE-A/T	XXX km/h
VHCL/S SE-MTR	XXX km/h
THRTL POS SEN	XXX V
FLUID TEMP SE	XXX V
BATTERY VOLT	XXX V

SAT614J

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. CHECK REVOLUTION SENSOR (WITH CONSULT-II)

With CONSULT-II

1. Start engine.

Condition	Judgement standard (Approx.)
When moving at 20 km/h (12 MPH), use the CONSULT-II pulse frequency measuring function. *1 **CAUTION:** **Connect the diagnosis data link cable to the vehicle diagnosis connector.** *1: A circuit tester cannot be used to test this item.	450 Hz
When vehicle parks.	Under 1.3V or over 4.5V

MTBL0594

- Harness for short or open between TCM, ECM and revolution sensor (Main harness)

OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK DTC

Perform AT-503, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

DTC P0725 ENGINE SPEED SIGNAL

PFP:24825

Description

ECS0063H

The engine speed signal is sent from the ECM to the TCM.

On Board Diagnosis Logic

ECS0063I

Diagnostic trouble code ENGINE SPEED SIG with CONSULT-II or P0725 without CONSULT-II is detected when TCM does not receive the proper voltage signal from ECM.

Possible Cause

ECS0063J

Check harness or connectors. (The sensor circuit is open or shorted.)

Diagnostic Trouble Code (DTC) Confirmation Procedure

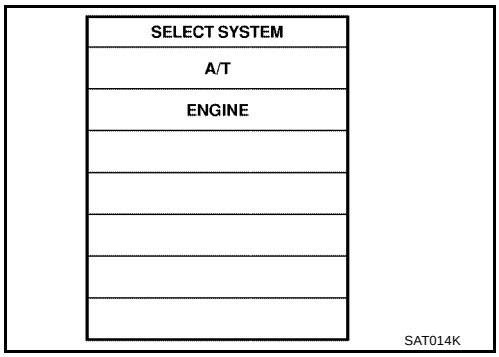
ECS0063K

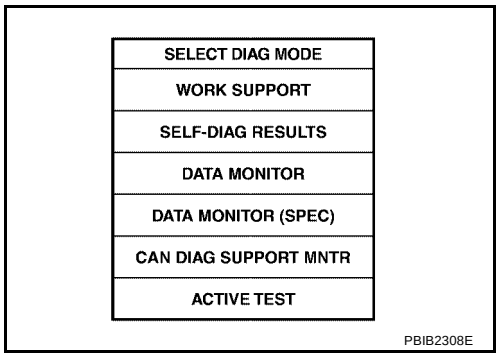
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.





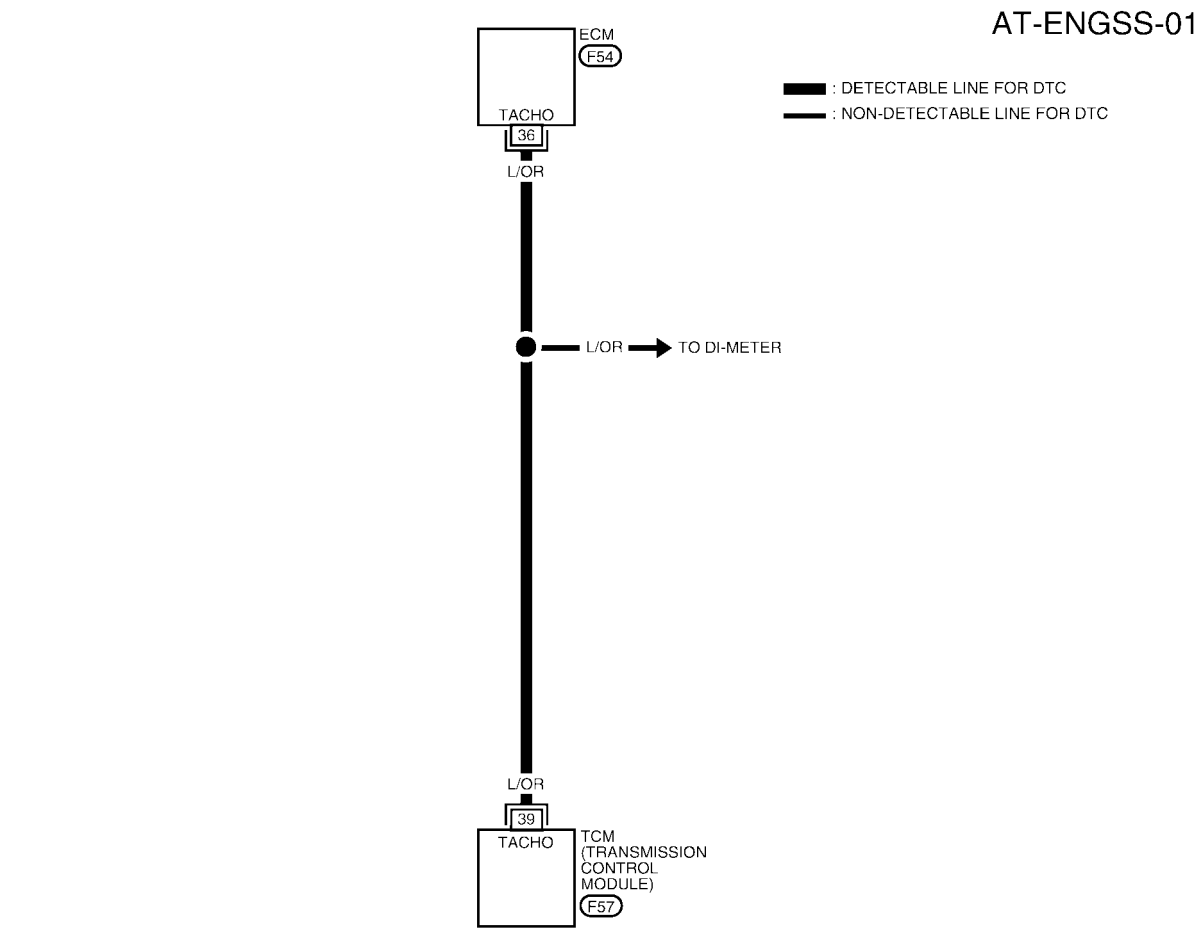
2. Start engine and maintain the following conditions for at least 10 consecutive seconds.
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   THRTL POS SEN: More than 1.2V
   Selector lever: D position (O/D ON)

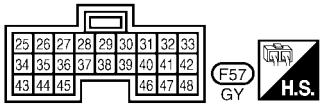
WITH GST

Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — ENGSS

ECS0063L





REFER TO THE FOLLOWING.
F54 - ELECTRICAL UNITS

WCWA0017E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
39	L/OR	ENGINE SPEED SIGNAL	WITH ENGINE RUNNING AT IDLE SPEED	APPROX. 0.6V
			WITH ENGINE RUNNING AT 3,000 RPM	APPROX. 2.2V

Diagnostic Procedure

ECS0063M

1. CHECK DTC WITH ECM

- Check P code with CONSULT-II “ENGINE”.
  Turn ignition switch ON and select “SELF-DIAGNOSTIC RESULTS” mode for “ENGINE” with CONSULT-II.
  Refer to EC-1275, "Malfunction Indicator Lamp (MIL)" .

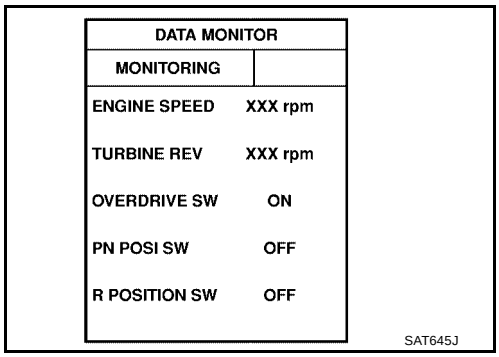
OK or NG

OK (with CONSULT-II)>>GO TO 2.
OK (without CONSULT-II)>>GO TO 4.
NG >> Check ignition signal circuit for engine control. Refer to EC-1777, "IGNITION SIGNAL" .

2. CHECK INPUT SIGNAL (WITH CONSULT-II)

With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “ENGINE SPEED”.
   Check engine speed changes according to throttle position.



OK or NG

OK >> GO TO 6.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING ITEM

Check the following items:

- Harness for short or open between TCM and ECM
- Resistor and ignition coil
  Refer to EC-1777, "IGNITION SIGNAL" .

OK or NG

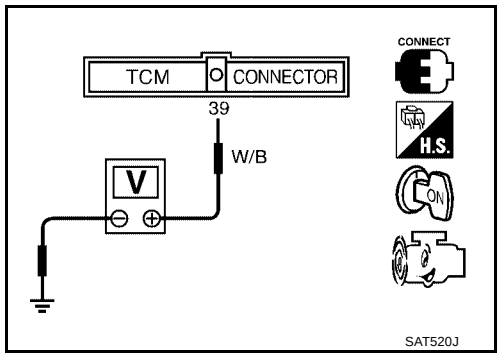
OK >> GO TO 6.
NG >> Repair or replace damaged parts.

4. CHECK INPUT SIGNAL (WITHOUT CONSULT-II)

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM connector F57 terminal 39 and ground.

Voltage :0.6 (Idle speed) - 2.2V (3,000 rpm)



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING ITEM

Check the following items:

- Harness for short or open between TCM and ECM
- Resistor and ignition coil
  Refer to EC-1777, "IGNITION SIGNAL" .

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

6. CHECK DTC

Perform AT-508, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

7. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

DTC P0731 A/T 1ST GEAR FUNCTION

PFP:31940

Description

ECS0063N

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into first gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, etc.

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

On Board Diagnosis Logic

ECS0063O

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (1st) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when either shift solenoid valve A is stuck open or shift solenoid valve B is stuck open.
Gear positions supposed by TCM are as follows.
In case of gear position with no malfunctions: **1** , 2, 3 and 4 positions
In case of gear position with shift solenoid valve A stuck open: **2*** , 2, 3 and 3 positions
In case of gear position with shift solenoid valve B stuck open: **4*** , 3, 3 and 4 positions to each gear position above
*: P0731 is detected.
Diagnostic trouble code A/T 1ST GR FNCTN with CONSULT-II or P0731 without CONSULT-II is detected when A/T cannot be shifted to the 1st gear position even if electrical circuit is good.

Possible Cause

ECS0063P

Check the following items.

- Shift solenoid valve A
- Shift solenoid valve B
- Each clutch
- Hydraulic control circuit

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS0063Q

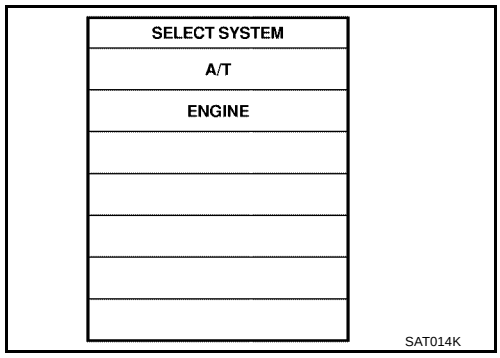
CAUTION:

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

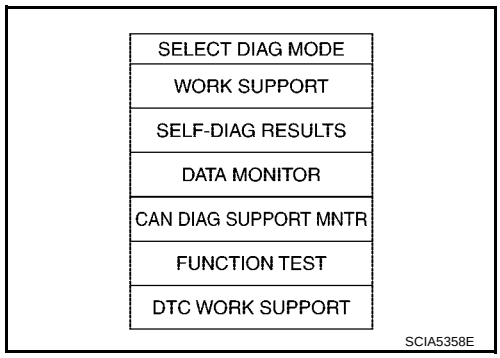
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always drive vehicle on a level road to improve the accuracy of test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Start engine and select “DATA MONITOR” mode for “A/T” with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3. Select “1ST GR FNCTN P0731” of “DTC WORK SUPPORT” mode for “A/T” with CONSULT-II and touch “START”.

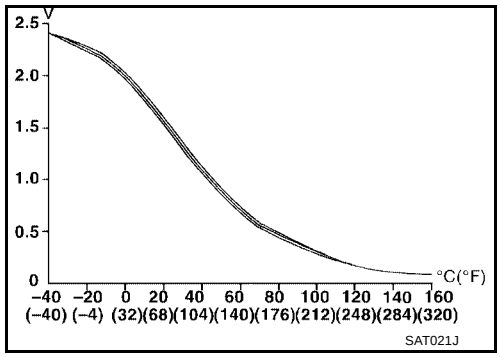


4. Accelerate vehicle to 20 to 25 km/h (12 to 16 MPH) under the following condition and release the accelerator pedal completely.
   THROTTLE POSI: Less than 1.0/8 (at all times during step 4)
   Selector lever: D position (O/D ON)
   - **Check that “GEAR” shows “2” after releasing pedal.**
5. Depress accelerator pedal to WOT (more than 7.0/8 of “THROTTLE POSI”) quickly from a speed of 20 to 25 km/h (12 to 16 MPH) until “TESTING” changes to “STOP VEHICLE” or “COMPLETED”. (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT-II screen, go to AT-515, "Diagnostic Procedure" .
   If “STOP VEHICLE” appears on CONSULT-II screen, go to the following step.
   - **Check that “GEAR” shows “1” when depressing accelerator pedal to WOT.**
   - **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAG RESULTS” for “ENGINE”. In case a 1st trip DTC other than P0731 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**



6. Stop vehicle.
7. Follow the instruction displayed. (Check for normal shifting referring to the table below.)

Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists.	1 → 2 → 3 → 4
Malfunction for P0731 exists.	2 → 2 → 3 → 3
	4 → 3 → 3 → 4



8. Make sure that “OK” is displayed. (If “NG” is displayed, refer to “DIAGNOSTIC PROCEDURE”.)
   Refer to AT-515, "Diagnostic Procedure" .
   Refer to AT-752, "Shift Schedule" .

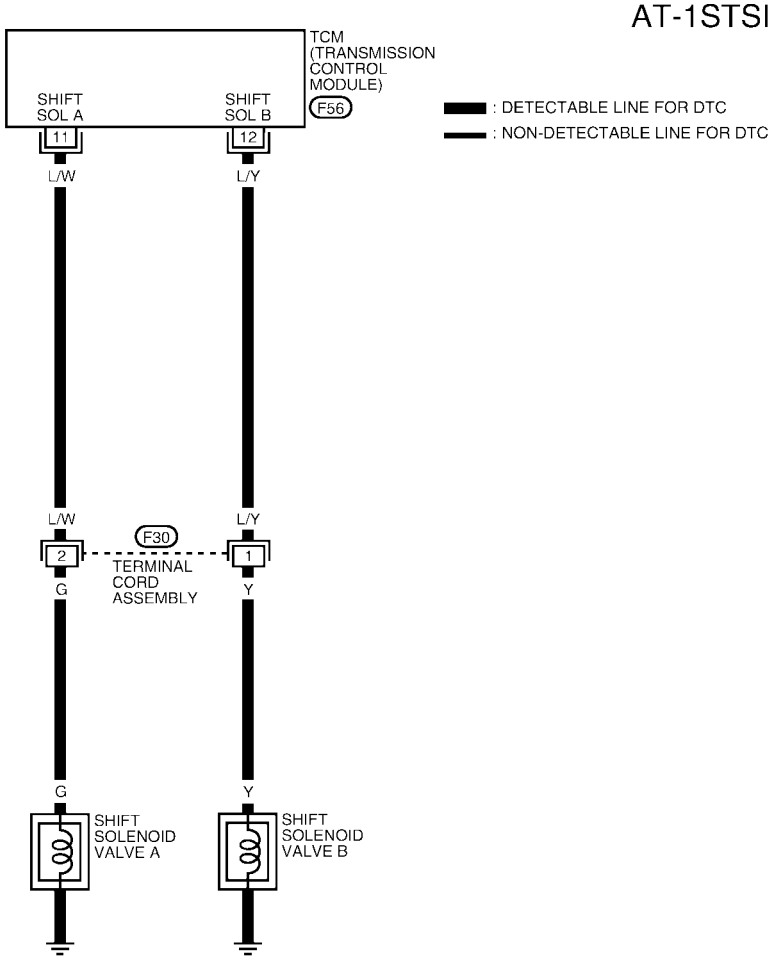
WITH GST

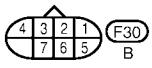
Follow the procedure “With CONSULT-II”.

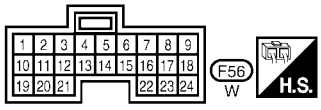
Wiring Diagram — AT — 1ST

ECS0063R

AT-1STSIG-01







WCWA0021E

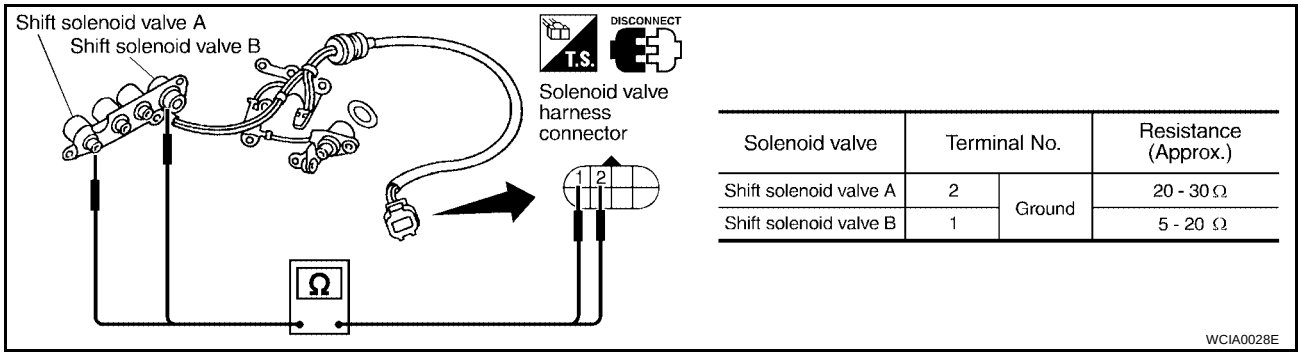
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
11	L/W	SHIFT SOLENOID VALVE A	WHEN SHIFT SOLENOID VALVE A IS OPERATING (DRIVING IN D1 OR D4)	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE A IS NOT OPERATING (DRIVING IN D2 OR D3)	APPROX. 0V
12	L/Y	SHIFT SOLENOID VALVE B	WHEN SHIFT SOLENOID VALVE B IS OPERATING (DRIVING IN D1 OR D2)	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE B IS NOT OPERATING (DRIVING IN D3 OR D4)	APPROX. 0V

Diagnostic Procedure

ECS0063S

1. CHECK VALVE RESISTANCE

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Shift solenoid valve A
- Shift solenoid valve B
2. Check resistance between terminal cord assembly F30 terminals 1 and 2, and ground.



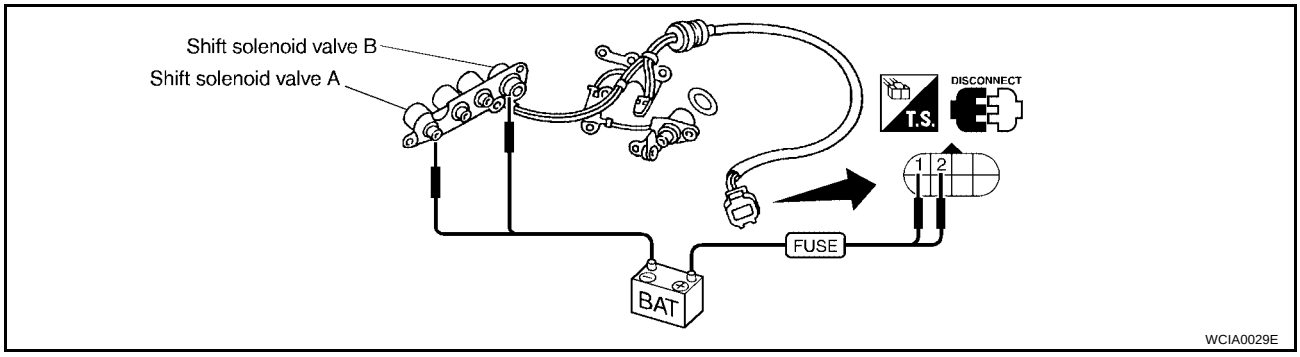
Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	2	Ground	20 - 30 Ω
Shift solenoid valve B	1		5 - 20 Ω

OK or NG

OK >> GO TO 2.
NG >> Repair or replace damaged parts.

2. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Shift solenoid valve A
- Shift solenoid valve B
2. Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.

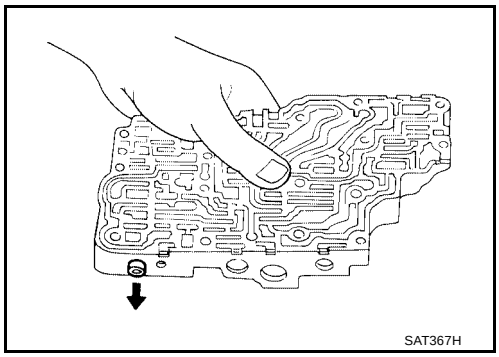


OK or NG

OK >> GO TO 3.
NG >> Repair or replace shift solenoid valve assembly.

3. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-679, "DISASSEMBLY" .
2. Check to ensure that:
- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.



OK or NG

OK >> GO TO 4.
NG >> Repair control valve assembly.

4. CHECK DTC

Perform AT-512, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> Check control valve again. Repair or replace control valve assembly.

DTC P0732 A/T 2ND GEAR FUNCTION

PFP:31940

Description

ECS0063T

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into second gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, etc.

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

On Board Diagnosis Logic

ECS0063U

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (2nd) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when shift solenoid valve B is stuck open.
Gear positions supposed by TCM are as follows.
In case of gear position with no malfunctions: 1, **2** , 3 and 4 positions
In case of gear position with shift solenoid valve B stuck open: 4, **3*** , 3 and 4 positions to each gear position above
*: P0732 is detected.
Diagnostic trouble code A/T 2ND GR FNCTN with CONSULT-II or P0732 without CONSULT-II is detected when A/T cannot be shifted to the 2nd gear position even if electrical circuit is good.

Possible Cause

ECS0063V

Check the following items.

- Shift solenoid valve B
- Each clutch
- Hydraulic control circuit

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS0063W

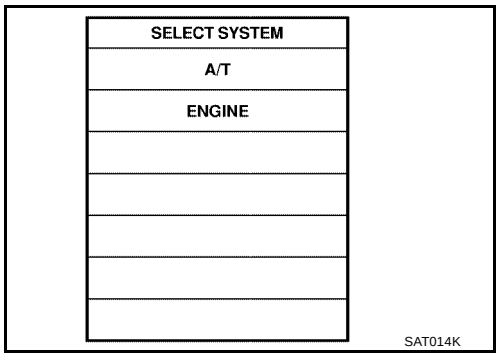
CAUTION:

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

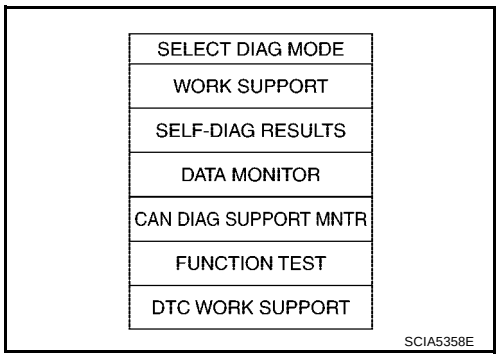
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always drive vehicle on a level road to improve the accuracy of test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

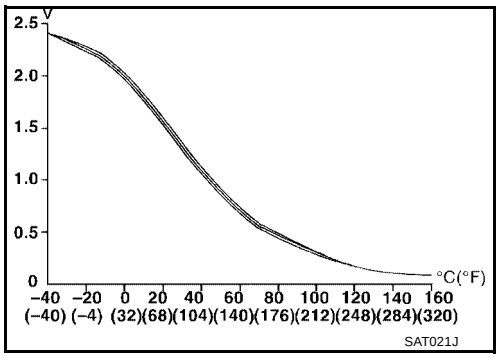
WITH CONSULT-II

1. Start engine and select “DATA MONITOR” mode for “A/T” with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3. Select “2ND GR FNCTN P0732” of “DTC WORK SUPPORT” mode for “A/T” with CONSULT-II and touch “START”.



4. Accelerate vehicle to 63 to 68 km/h (39 to 42 MPH) under the following condition and release the accelerator pedal completely.
   THROTTLE POSI: Less than 1.0/8
   Selector lever: D position (O/D ON)
   - **Check that “GEAR” shows “3” or “4” after releasing pedal.**
5. Depress accelerator pedal to WOT (more than 7.0/8 of “THROTTLE POSI”) quickly from a speed of 63 to 68 km/h (39 to 42 MPH) until “TESTING” changes to “STOP VEHICLE” or “COMPLETE”. (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT-II screen, go to AT-520, "Diagnostic Procedure" .
   If “STOP VEHICLE” appears on CONSULT-II screen, go to following step.
   - **Check that “GEAR” shows “2” when depressing accelerator pedal to WOT.**
   - **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAG RESULTS” for “ENGINE”. In case a 1st trip DTC other than P0732 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**
6. Stop vehicle.
7. Follow the instruction displayed. (Check for normal shifting referring to the table below.)





Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists	1 → 2 → 3 → 4
Malfunction for P0732 exists.	4 → 3 → 3 → 4

8. Make sure that “OK” is displayed. (If “NG” is displayed, refer to “DIAGNOSTIC PROCEDURE”.)
   Refer to AT-520, "Diagnostic Procedure" .
   Refer to AT-752, "Shift Schedule" .

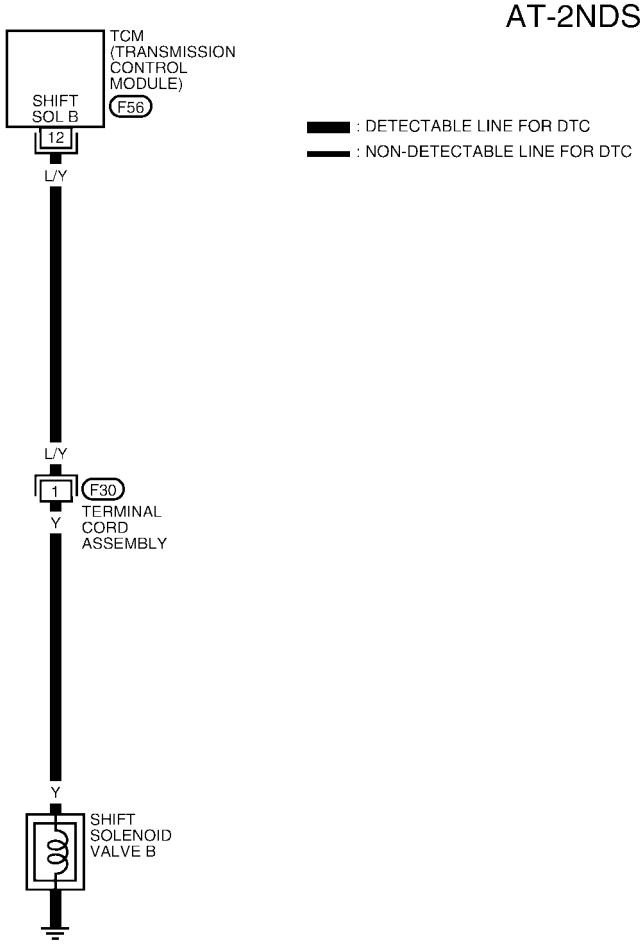
WITH GST

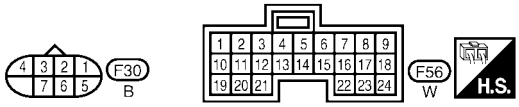
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — 2ND

ECS0063X

AT-2NDSIG-01





WCWA0022E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)

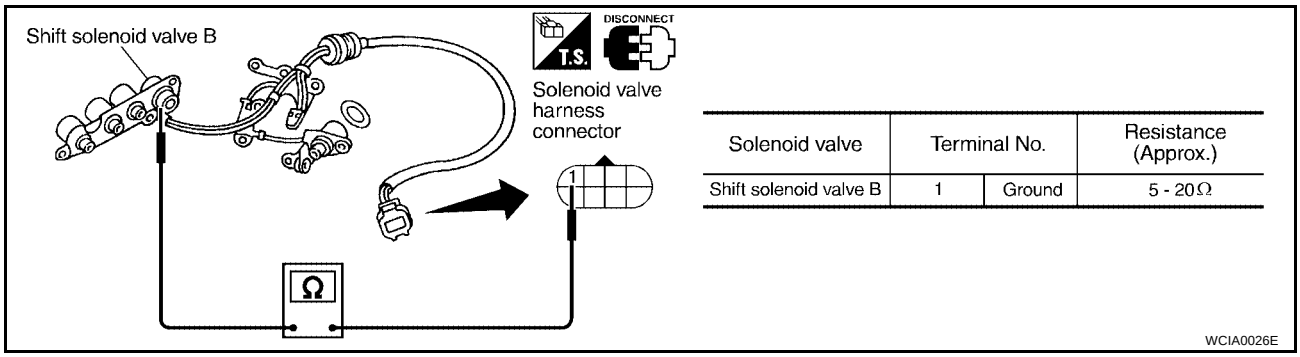
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
12	L/Y	SHIFT SOLENOID VALVE B	WHEN SHIFT SOLENOID VALVE B IS OPERATING (DRIVING IN D1 OR D2)	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE B IS NOT OPERATING (DRIVING IN D3 OR D4)	APPROX. 0V

Diagnostic Procedure

ECS0063Y

1. CHECK VALVE RESISTANCE

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Shift solenoid valve B
2. Check resistance between terminal cord assembly F30 terminal 1 and ground.



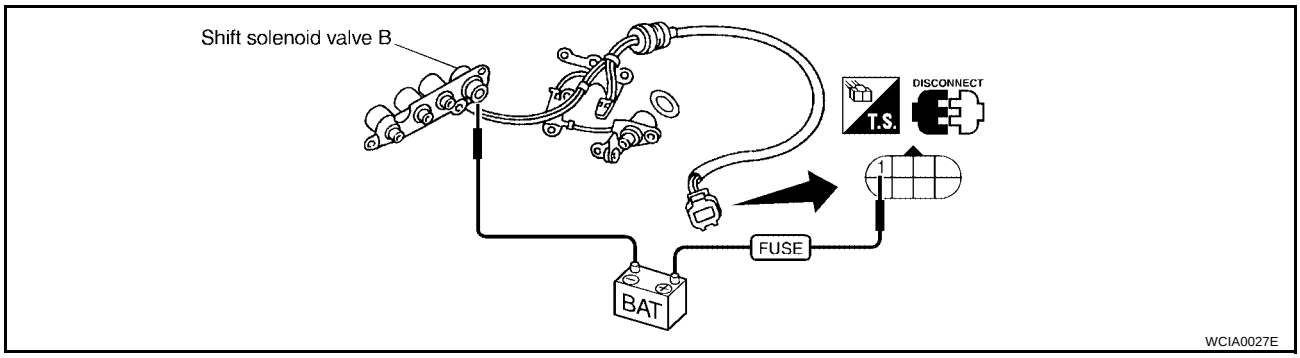
Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve B	1	Ground	5 - 20Ω

OK or NG

OK >> GO TO 2.
NG >> Repair or replace shift solenoid valve assembly.

2. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Shift solenoid valve B
2. Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.



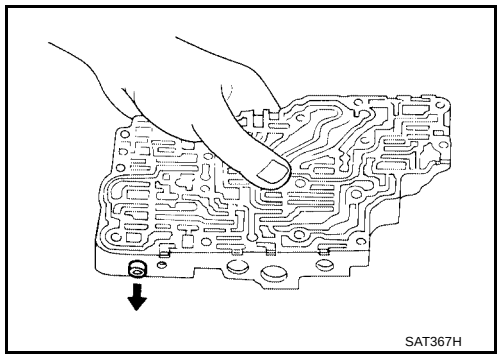
OK or NG

OK >> GO TO 3.
NG >> Repair or replace shift solenoid valve assembly.

3. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-679, "DISASSEMBLY" .
2. Check to ensure that:

- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.



OK or NG

OK >> GO TO 4.
NG >> Repair control valve assembly.

4. CHECK DTC

Perform AT-517, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> Check control valve again. Repair or replace control valve assembly.

DTC P0733 A/T 3RD GEAR FUNCTION

PFP:31940

Description

ECS0063Z

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into third gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning servo piston or brake band, etc.

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

On Board Diagnosis Logic

ECS00640

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (3rd) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when shift solenoid valve A is stuck closed.
Gear positions supposed by TCM are as follows.
In case of gear position with no malfunctions: 1, 2, **3** and 4 positions
In case of gear position with shift solenoid valve A stuck closed: 1, 1, **4*** and 4 positions to each gear position above
*: P0733 is detected.
Diagnostic trouble code A/T 3RD GR FNCTN with CONSULT-II or P0733 without CONSULT-II is detected when A/T cannot be shifted to the 3rd gear position even if electrical circuit is good.

Possible Cause

ECS00641

Check the following items.

- Shift solenoid valve A
- Each clutch
- Hydraulic control circuit

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS00642

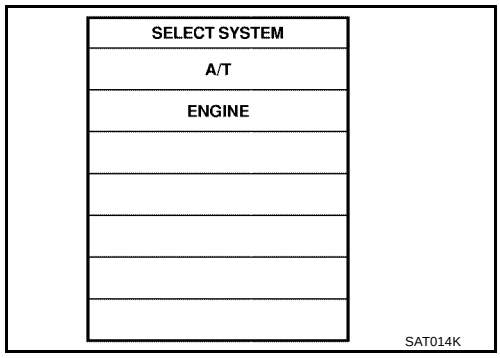
CAUTION:

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

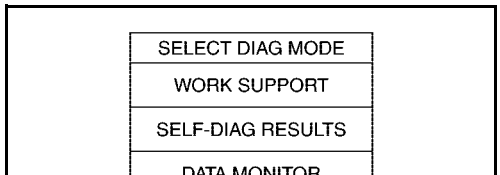
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always drive vehicle on a level road to improve the accuracy of test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

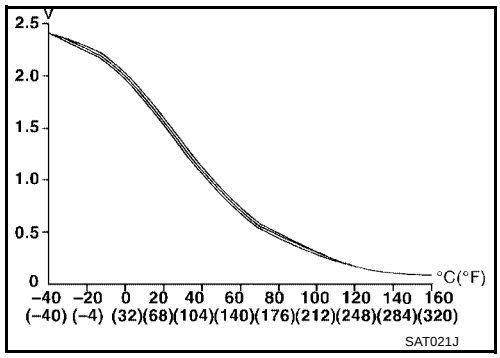
WITH CONSULT-II

1. Start engine and select “DATA MONITOR” mode for “A/T” with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3. Select “3RD GR FNCTN P0733” of “DTC WORK SUPPORT” mode for “A/T” with CONSULT-II and touch “START”.



4. Accelerate vehicle to 80 to 95 km/h (50 to 59 MPH) under the following condition and release the accelerator pedal completely.
   THROTTLE POSI: Less than 1.0/8 (at all times during step 4)
   Selector lever: D position (OD “ON”)
   - **Check that “GEAR” shows “4” after releasing pedal.**
5. Depress accelerator pedal steadily with 3.5/8 - 4.5/8 of “THROTTLE POSI” from a speed of 80 to 95 km/h (50 to 59 MPH) until “TESTING” changes to “STOP VEHICLE” or “COMPLETED”. (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT-II screen, go to AT-525, "Diagnostic Procedure" .
   If “STOP VEHICLE” appears on CONSULT-II screen, go to following step.
   - **Check that “GEAR” shows “3” when depressing accelerator pedal with 3.5/8 - 4.5/8 of “THROTTLE POSI”.**
   - **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAG RESULTS” for “ENGINE”. In case a 1st trip DTC other than P0733 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**
6. Stop vehicle.
7. Follow the instruction displayed. (Check for normal shifting referring to the table below.)





Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists.	1 → 2 → 3 → 4
Malfunction for P0733 exists.	1 → 1 → 4 → 4

8. Make sure that “OK” is displayed. (If “NG” is displayed, refer to “DIAGNOSTIC PROCEDURE”.)
   Refer to AT-525, "Diagnostic Procedure" .
   Refer to AT-752, "Shift Schedule" .

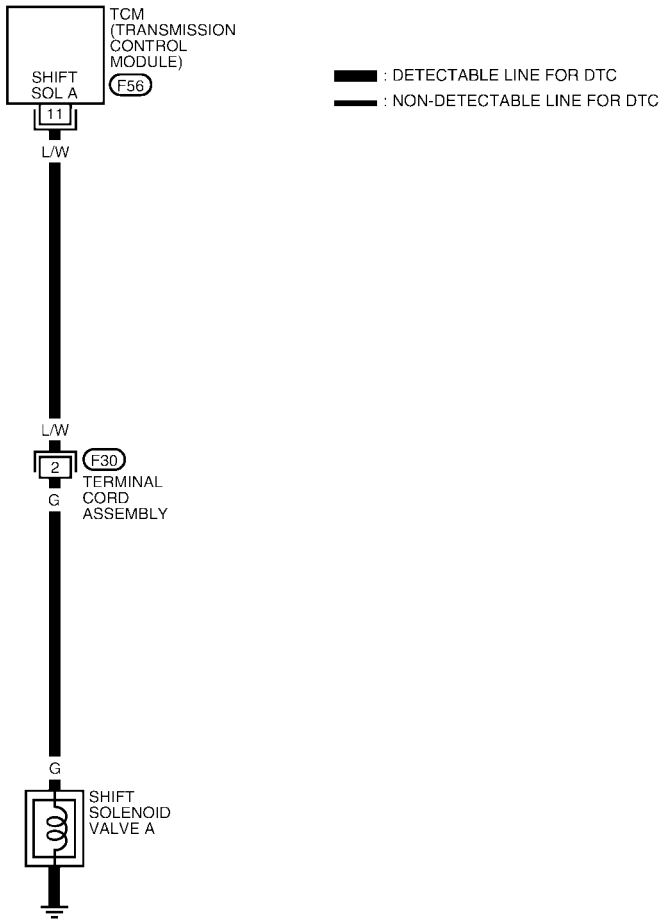
WITH GST

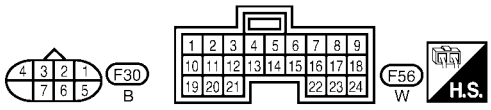
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — 3RD

ECS00643

AT-3RDSIG-01





WCWA0023E

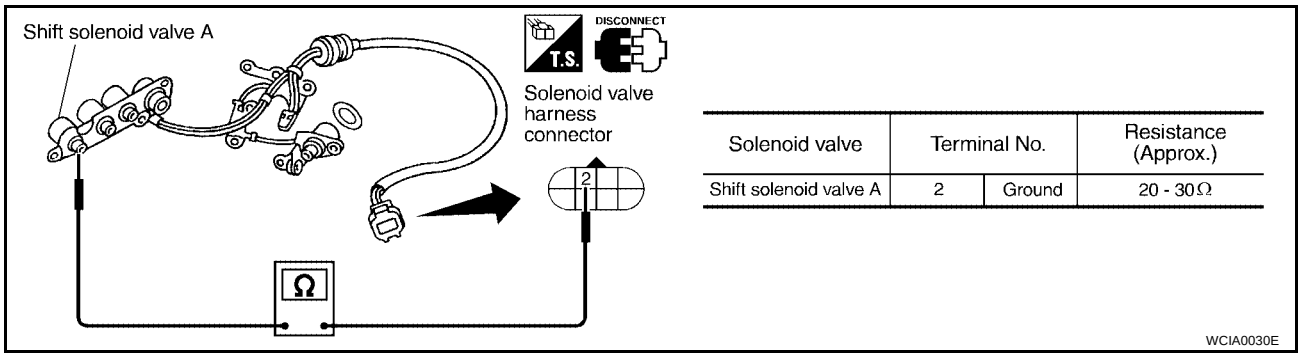
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
11	L/W	SHIFT SOLENOID VALVE A	WHEN SHIFT SOLENOID VALVE A IS OPERATING (DRIVING IN D1 OR D4)	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE A IS NOT OPERATING (DRIVING IN D2 OR D3)	APPROX. 0V

Diagnostic Procedure

ECS00644

1. CHECK VALVE RESISTANCE

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Shift solenoid valve A
2. Check resistance between terminal cord assembly F30 terminal 2 and ground.



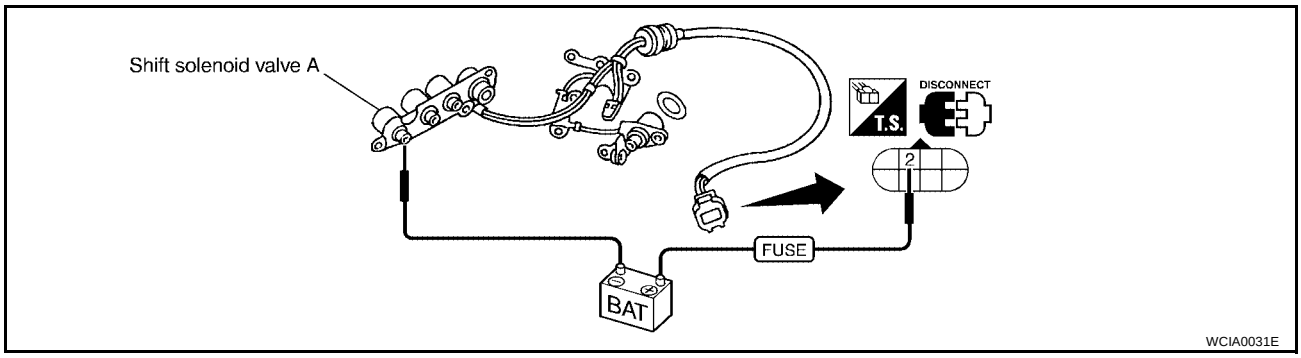
Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	2	Ground	20 - 30Ω

OK or NG

OK >> GO TO 2.
NG >> Repair or replace shift solenoid valve assembly.

2. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Shift solenoid valve A
2. Check solenoid valve by listening for its operating sound while applying battery voltage and ground ot the solenoid.



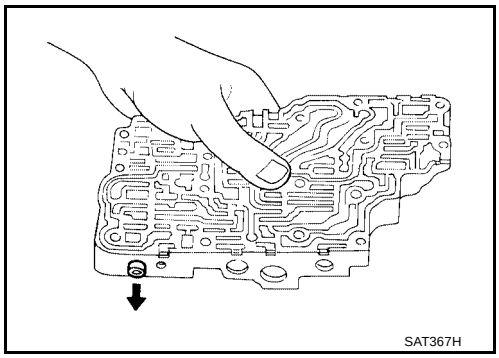
OK or NG

OK >> GO TO 3.
NG >> Repair or replace shift solenoid valve assembly.

3. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-679, "DISASSEMBLY" .
2. Check to ensure that:

- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.



OK or NG

OK >> GO TO 4.
NG >> Repair control valve assembly.

4. CHECK DTC

Perform AT-522, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> Check control valve again. Repair or replace control valve assembly.

DTC P0734 A/T 4TH GEAR FUNCTION

PFP:31940

Description

ECS00645

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into fourth gear position or the torque converter clutch does not lock up as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning oil pump or torque converter clutch, etc.

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Torque converter clutch solenoid valve duty	Lock-up OFF ↓ Lock-up ON	Approximately 4% ↓ Approximately 94%
Line pressure solenoid valve duty	Small throttle opening (Low line pressure) ↓ Large throttle opening (High line pressure)	Approximately 24% ↓ Approximately 95%

On Board Diagnosis Logic

ECS00646

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is much lower than the position (4th) supposed by TCM, the slip ratio will be much less than normal. In case the ratio does not reach the specified value, TCM judges this diagnosis malfunction. This malfunction will be caused when shift solenoid valve B is stuck closed.
Gear positions supposed by TCM are as follows.
In case of gear position with no malfunctions: 1, 2, 3 and **4** positions
In case of gear position with shift solenoid valve B stuck closed: 1, 2, 2 and **1*** positions to each gear position above
*: P0734 is detected.
Diagnostic trouble code A/T 4TH GR FNCTN with CONSULT-II or P0734 without CONSULT-II is detected when A/T cannot be shifted to the 4th gear position even if electrical circuit is good.

Possible Cause

ECS00647

Check the following items.

- Shift solenoid valve A
- Shift solenoid valve B
- Line pressure solenoid valve
- Each clutch
- Hydraulic control circuit

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS00648

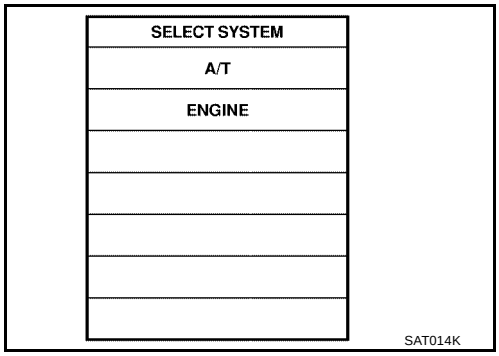
CAUTION:

- **Always drive vehicle at a safe speed.**
- **If conducting this "DTC CONFIRMATION PROCEDURE" again, always turn ignition switch OFF and wait at least 10 seconds before continuing.**
- **Be careful not to rev engine into the red zone on the tachometer.**

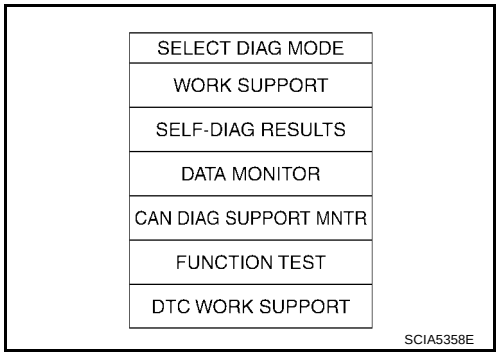
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always drive vehicle on a level road to improve the accuracy of test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

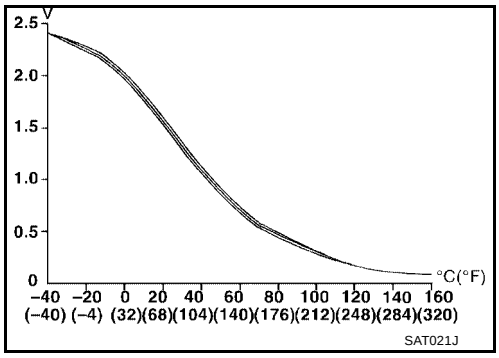
1. Start engine and select “DATA MONITOR” mode for “A/T” with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3. Select “4TH GR FNCTN P0734” of “DTC WORK SUPPORT” mode for “A/T” with CONSULT-II and touch “START”.



4. Accelerate vehicle to 60 to 70 km/h (37 to 43 MPH) under the following condition and release the accelerator pedal completely.
   THROTTLE POSI: Less than 5.5/8 (at all times during step 4)
   Selector lever: D position (O/D ON)
   - **Check that “GEAR” shows “3” after releasing pedal.**
5. Depress accelerator pedal steadily with 1.0/8 - 2.0/8 of “THROTTLE POSI” from a speed of 60 to 70 km/h (37 to 43 MPH) until “TESTING” has turned to “STOP VEHICLE” or “COMPLETED”. (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT-II screen, go to AT-530, "Diagnostic Procedure" .
   If “STOP VEHICLE” appears on CONSULT-II screen, go to following step.



   - **Check that “GEAR” shows “4” when depressing accelerator pedal with 1.0/8 - 2.0/8 of “THROTTLE POSI”.**
   - **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAG RESULTS” for “ENGINE”. In case a 1st trip DTC other than P0734 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**
6. Stop vehicle.
7. Follow the instruction displayed. (Check for normal shifting referring to the table below.)



Vehicle condition	Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4
No malfunction exists	1 → 2 → 3 → 4
Malfunction for P0734 exists.	1 → 2 → 2 → 1

8. Make sure that “OK” is displayed. (If “NG” is displayed, refer to “DIAGNOSTIC PROCEDURE”.)
   Refer to AT-530, "Diagnostic Procedure" .
   Refer to AT-752, "Shift Schedule" .

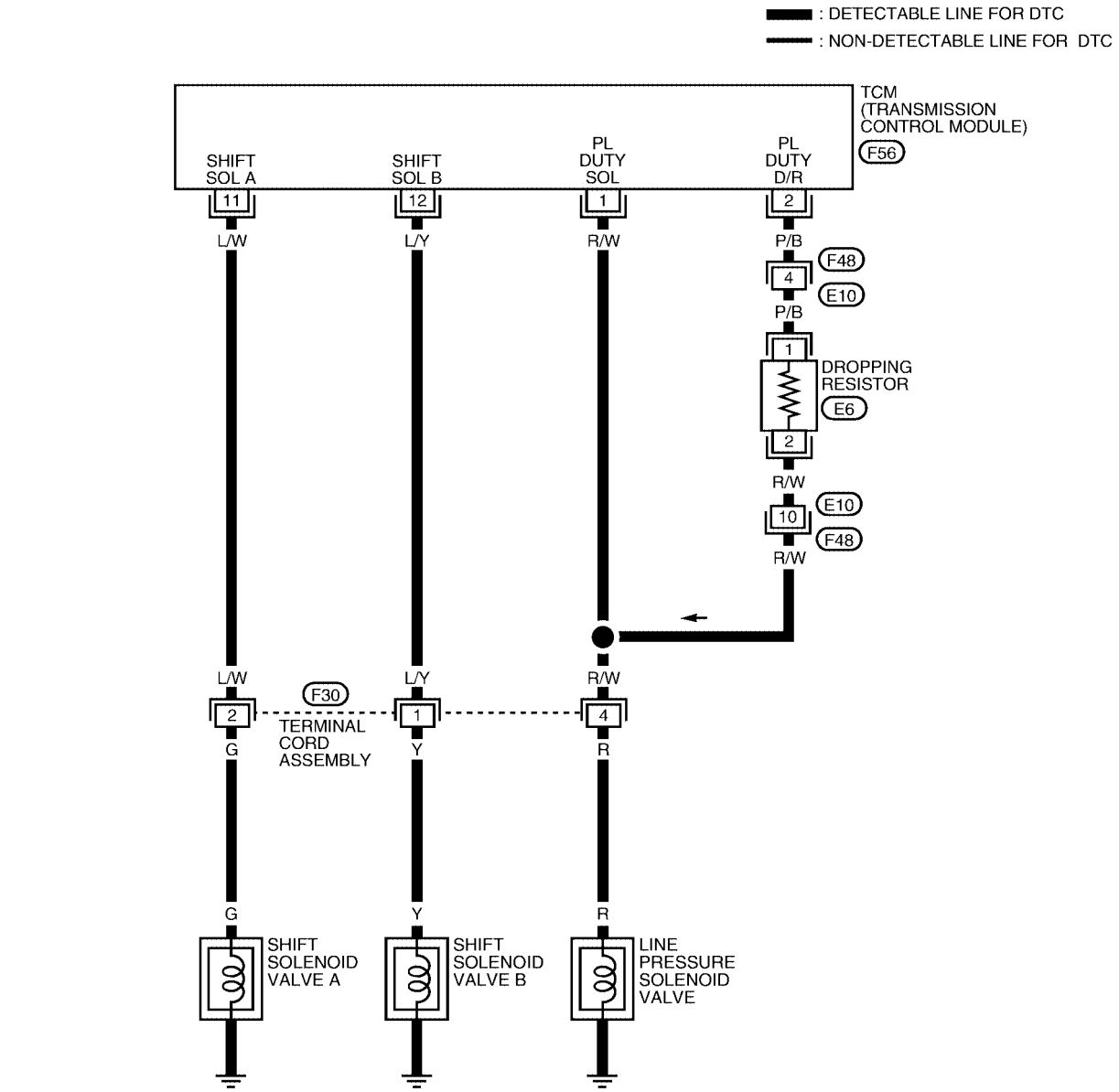
WITH GST

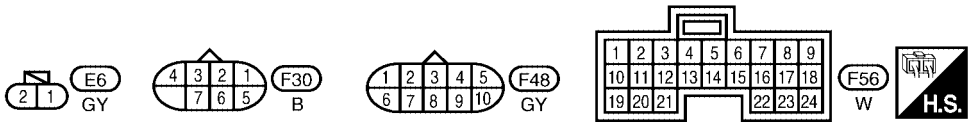
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — 4TH

ECS00649

AT-4THSIG-01





WCWA0024E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	R/W	LINE PRESSURE SOLENOID VALVE	WHEN ACCELERATOR PEDAL IS RELEASED WHILE DRIVING	APPROX. 1.5 - 3.0V
			WHEN ACCELERATOR PEDAL IS DEPRESSED WHILE DRIVING	APPROX. 0V
2	P/B	LINE PRESSURE SOLENOID VALVE (DROPPING RESISTOR)	WHEN ACCELERATOR PEDAL IS RELEASED WHILE DRIVING	APPROX. 4 - 14V
			WHEN ACCELERATOR PEDAL IS DEPRESSED WHILE DRIVING	APPROX. 0V
11	L/W	SHIFT SOLENOID VALVE A	WHEN SHIFT SOLENOID VALVE A IS OPERATING (DRIVING IN D_1 OR D_4)	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE A IS NOT OPERATING (DRIVING IN D_2 OR D_3)	APPROX. 0V
12	L/Y	SHIFT SOLENOID VALVE B	WHEN SHIFT SOLENOID VALVE B IS OPERATING (DRIVING IN D_1 OR D_2)	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE BE IS NOT OPERATING (DRIVING IN D_3 OR D_4)	APPROX. 0V

Diagnostic Procedure

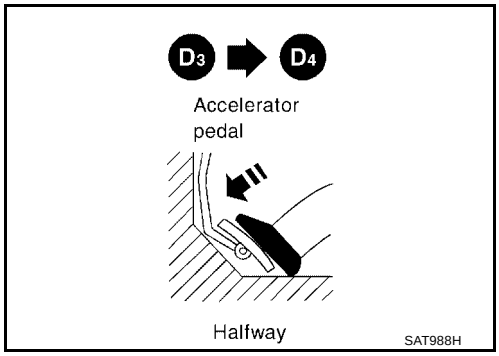
ECS0064A

1. CHECK SHIFT UP (D_3 TO D_4)

During AT-465, "Cruise Test — Part 1" , does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 11.
No >> GO TO 2.



2. CHECK LINE PRESSURE

Perform line pressure test.

Engine Speed RPM	Line Pressure kPa (kg/cm^2 , psi)	
	D, 2 and 1 Position	R Position
Idle	500 (5.1, 73)	778 (7.9, 113)
Stall	1,223 (12.6, 179)	1,918 (19.6, 278)

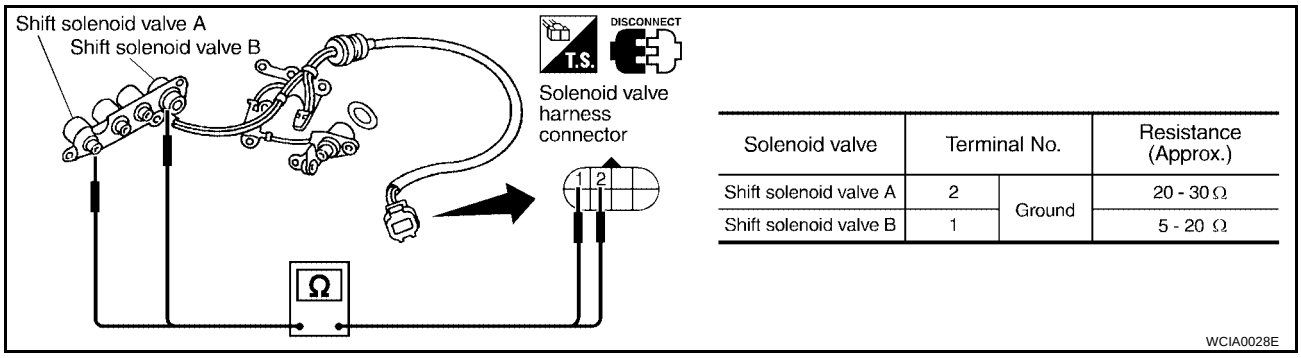
Refer to AT-456, "Line Pressure Test" .

OK or NG

OK >> GO TO 3.
NG >> GO TO 7.

3. CHECK VALVE RESISTANCE

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Shift solenoid valve A
- Shift solenoid valve B
2. Check resistance between terminal cord assembly connector F30 terminals 1 and 2 and ground.



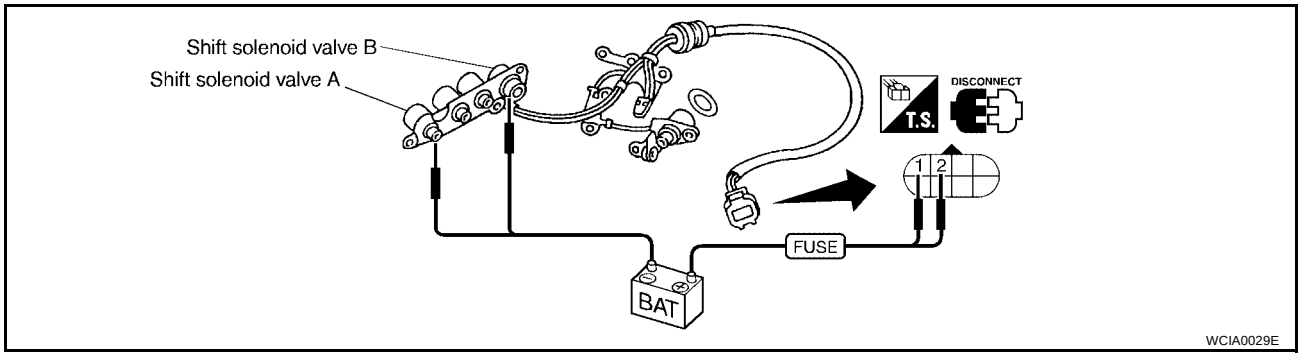
Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	2	Ground	20 - 30 Ω
Shift solenoid valve B	1		5 - 20 Ω

OK or NG

OK >> GO TO 5.
NG >> Replace solenoid valve assembly.

4. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Shift solenoid valve A
- Shift solenoid valve B
2. Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.



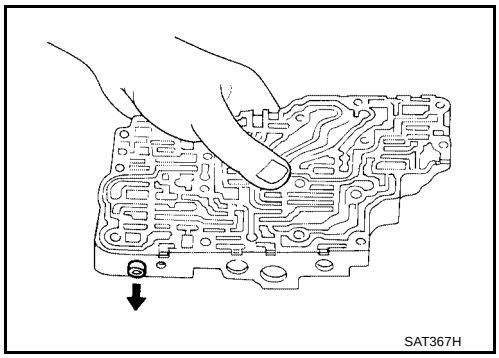
OK or NG

OK >> GO TO 5.
NG >> Replace solenoid valve assembly.

5. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-679, "DISASSEMBLY" .
2. Check to ensure that:

- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.



OK or NG

OK >> GO TO 6.
NG >> Repair control valve.

6. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

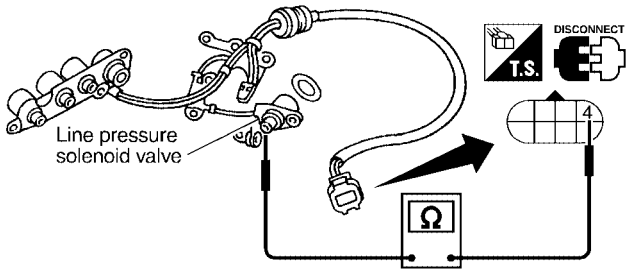
Yes >> GO TO 11.
No >> Check control valve again. Repair or replace control valve assembly.

7. CHECK VALVE RESISTANCE

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .

- Line pressure solenoid valves

2. Check resistance between the terminal cord assembly connector F30 terminal 4 and ground.



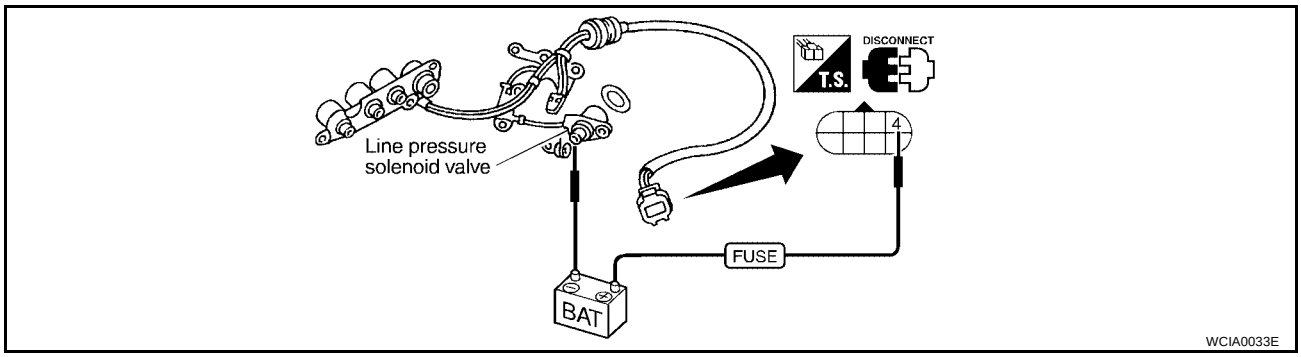
Solenoid valve	Terminal No.		Resistance (Approx.)
Line pressure solenoid valve	4	Ground	2.5 - 5Ω

OK or NG

OK >> GO TO 9.
NG >> Replace solenoid valve assembly.

8. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Line pressure solenoid valves
2. Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.



OK or NG

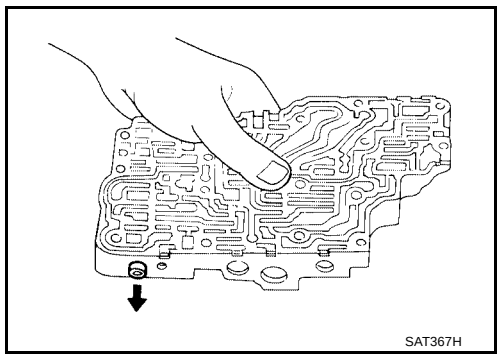
OK >> GO TO 9.
NG >> Replace solenoid valve assembly.

9. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-679, "DISASSEMBLY" .
2. Check line pressure circuit valves for sticking.
- Pressure regulator valve
- Pilot valve
- Pressure modifier valve

OK or NG

OK >> GO TO 10.
NG >> Repair control valve.



10. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 11.
No >> Check control valve again. Repair or replace control valve assembly.

11. CHECK DTC

Perform AT-527, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> Perform “Cruise test — Part 1” again and return to the start point of this test group.

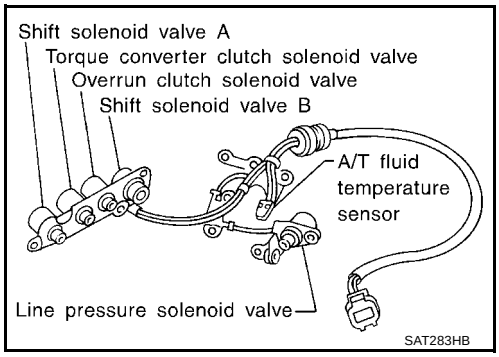
DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE

PFP:31940

Description

ECS0064B

The torque converter clutch solenoid valve is activated, with the gear in D4 , by the TCM in response to signals sent from the vehicle speed and the ECM (throttle opening). Lock-up piston operation will then be controlled.
Lock-up operation, however, is prohibited when A/T fluid temperature is too low.
When the accelerator pedal is depressed (less than 2/8) in lock-up condition, the engine speed should not change abruptly. If there is a big jump in engine speed, there is no lock-up.



CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Torque converter clutch solenoid valve duty	Lock-up OFF ↓ Lock-up ON	Approximately 4% ↓ Approximately 94%

On Board Diagnosis Logic

ECS0064C

Diagnostic trouble code TCC SOLENOID/CIRC with CONSULT-II or P0740 without CONSULT-II is detected when TCM detects an improper voltage drop when it tries to operate the solenoid valve.

Possible Cause

ECS0064D

Check the following items.

- Torque converter clutch solenoid valve
- Harness or connectors
  (The solenoid circuit is open or shorted.)

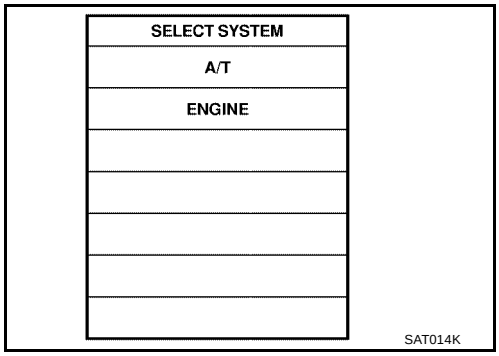
Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS0064E

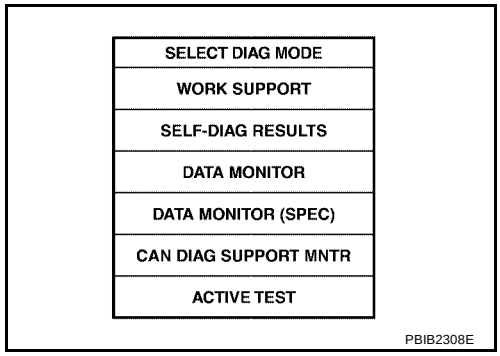
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON.



2. Select “DATA MONITOR” mode for “ENGINE” with CONSULT-II and wait at least 1 second.



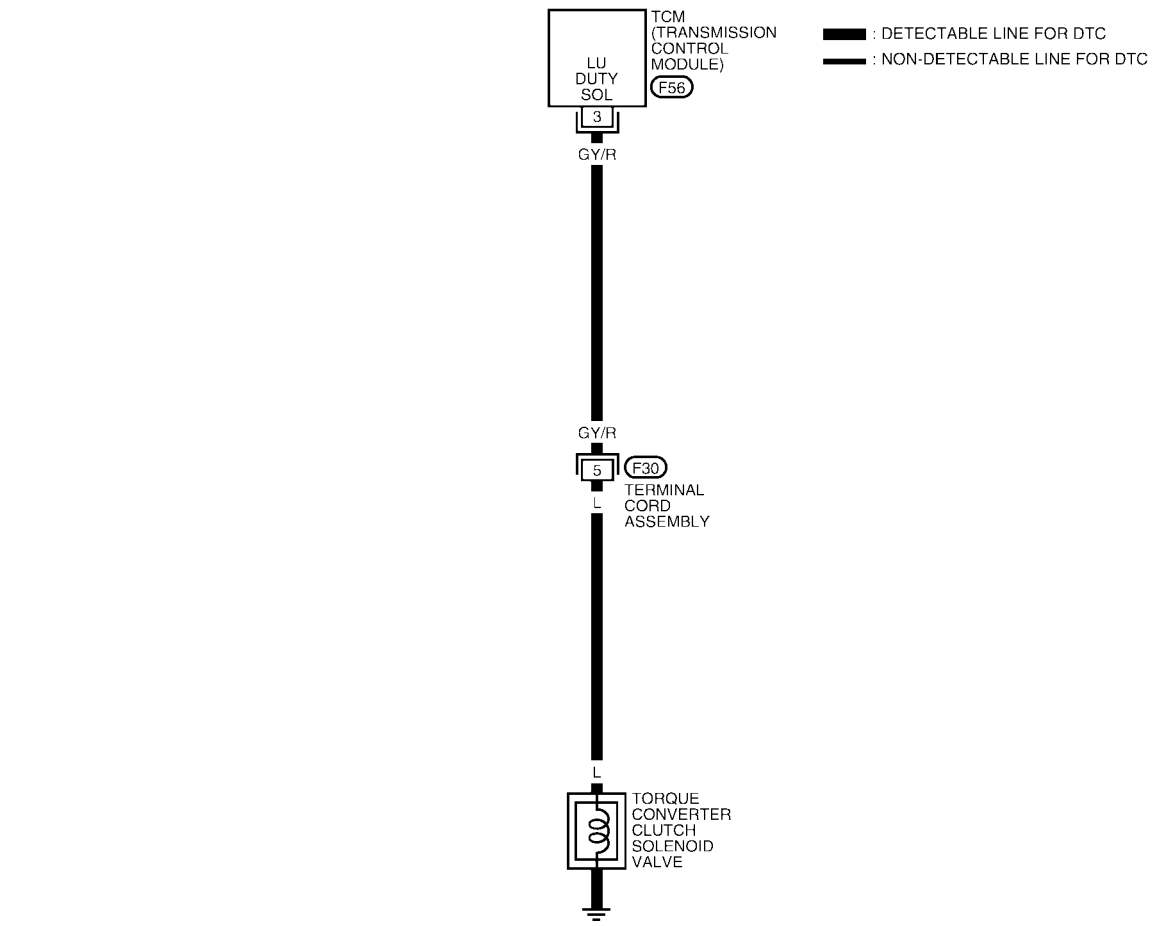
WITH GST

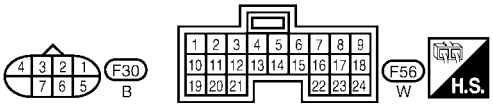
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — TCV

ECS0064F

AT-TCV-01





WCWA0025E

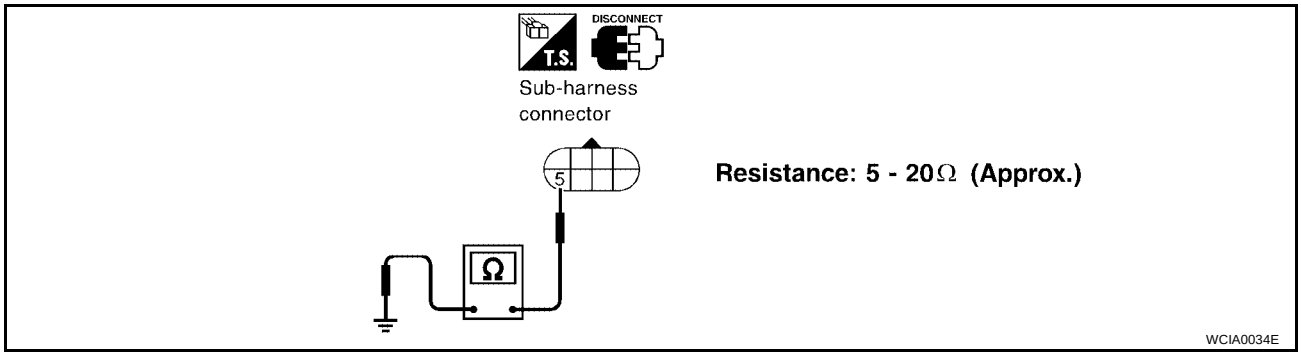
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
3	GY/R	TORQUE CONVERTER CLUTCH SOLENOID VALVE	WITH TORQUE CONVERTER LOCK-UP	APPROX. 8 - 15V
			WITHOUT TORQUE CONVERTER LOCK-UP	APPROX. 0V

Diagnostic Procedure

ECS0064G

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to OFF position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector F30 terminal 5 and ground.



OK or NG

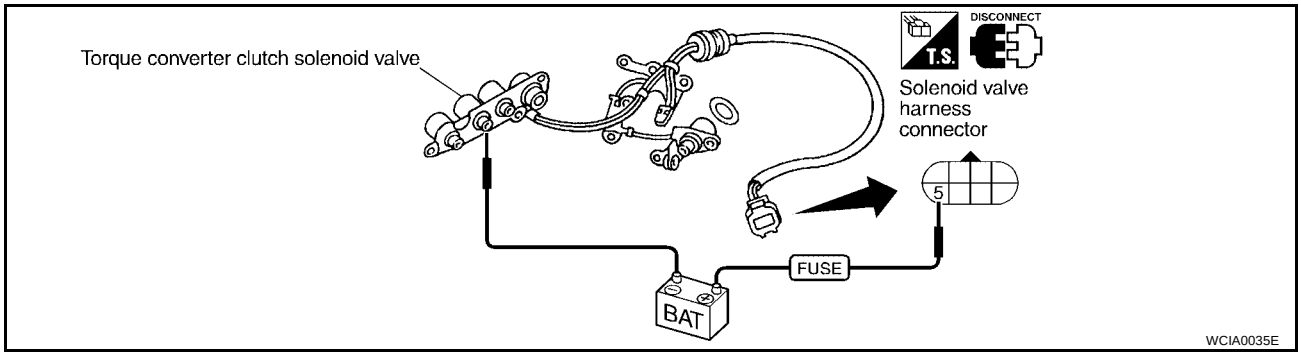
OK >> GO TO 3.
NG >> GO TO 2.

2. CHECK VALVE OPERATION

1. Remove oil pan.
2. Check the following items:

– Torque converter clutch solenoid valve

• Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.



– Harness of terminal cord assembly for short or open

OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to OFF position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal cord assembly harness connector F30 terminal 5 and TCM harness connector F56 terminal 3. Refer to AT-536, "Wiring Diagram — AT — TCV" .

Continuity should exist.

4. Reinstall any part removed.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK DTC

Perform AT-534, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

5. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

DTC P0744 A/T TCC S/V FUNCTION (LOCK-UP)

PFP:31940

Description

ECS0064H

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into fourth gear position or the torque converter clutch does not lock up as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning oil pump or torque converter clutch, etc.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Torque converter clutch solenoid valve duty	Lock-up OFF ↓ Lock-up ON	Approximately 4% ↓ Approximately 94%

On Board Diagnosis Logic

ECS0064I

This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is much lower than the position (4th) supposed by TCM, the slip ratio will be much less than normal. In case the ratio does not reach the specified value, TCM judges this diagnosis malfunction. This malfunction will be caused when shift solenoid valve B is stuck closed.
Gear positions supposed by TCM are as follows.
In case of gear position with no malfunctions: 1, 2, 3 and 4 positions
In case of gear position with shift solenoid valve B stuck closed: 1, 2, 2 and 1* positions to each gear position above
*: P0744 is detected.
Diagnostic trouble code A/T TCC S/V FNCTN with CONSULT-II or P0744 without CONSULT-II is detected when A/T cannot perform lock-up even if electrical circuit is good.

Possible Cause

ECS0064J

Check the following items.

- Line pressure solenoid valve
- Torque converter clutch solenoid valve
- Each clutch
- Hydraulic control circuit

Diagnostic Trouble Code (DTC) Confirmation Procedure

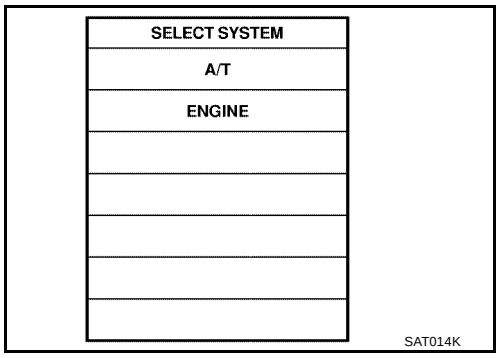
ECS0064K

CAUTION:
Always drive vehicle at a safe speed.

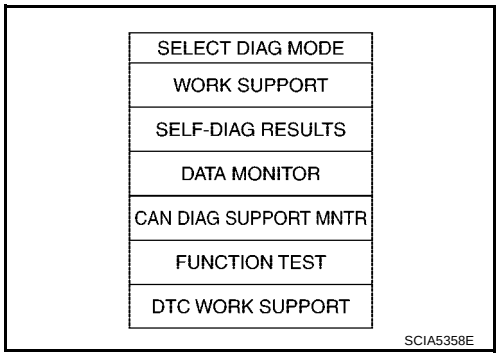
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

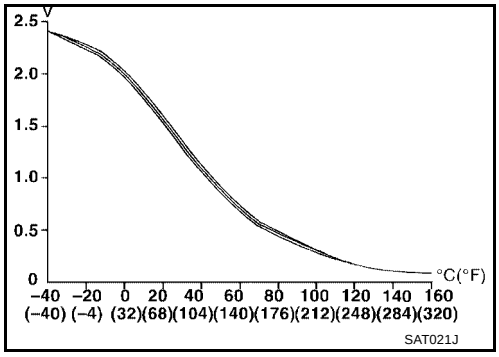
1. Start engine and select “DATA MONITOR” mode for “A/T” with CONSULT-II.
2. Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   FLUID TEMP SEN: 0.4 - 1.5V
   If out of range, drive vehicle to decrease voltage (warm up the fluid) or stop engine to increase voltage (cool down the fluid).
3. Select “TCC S/V FNCTN P0744” of “DTC WORK SUPPORT” mode for “A/T” with CONSULT-II and touch “START”.



4. Accelerate vehicle to more than 70 km/h (43 MPH) and maintain the following condition continuously until “TESTING” has turned to “COMPLETE”. (It will take approximately 30 seconds after “TESTING” shows.)
   THROTTLE POSI: 1.0/8 - 2.0/8 (at all times during step 4)
   Selector lever: D position (O/D ON)
   TCC S/V DUTY: More than 94%
   VHCL/S SE·A/T: Constant speed of more than 70 km/h (43 MPH)
   - **Check that “GEAR” shows “4”.**
   - **For shift schedule, refer to AT-752, "Shift Schedule" .**
   - **If “TESTING” does not appear on CONSULT-II for a long time, select “SELF-DIAG RESULTS”. In case a 1st trip DTC other than P0744 is shown, refer to applicable “TROUBLE DIAGNOSIS FOR DTC”.**



5. Make sure that “OK” is displayed. (If “NG” is displayed, refer to “DIAGNOSTIC PROCEDURE”.)
   Refer to AT-542, "Diagnostic Procedure" .
   Refer to AT-752, "Shift Schedule" .

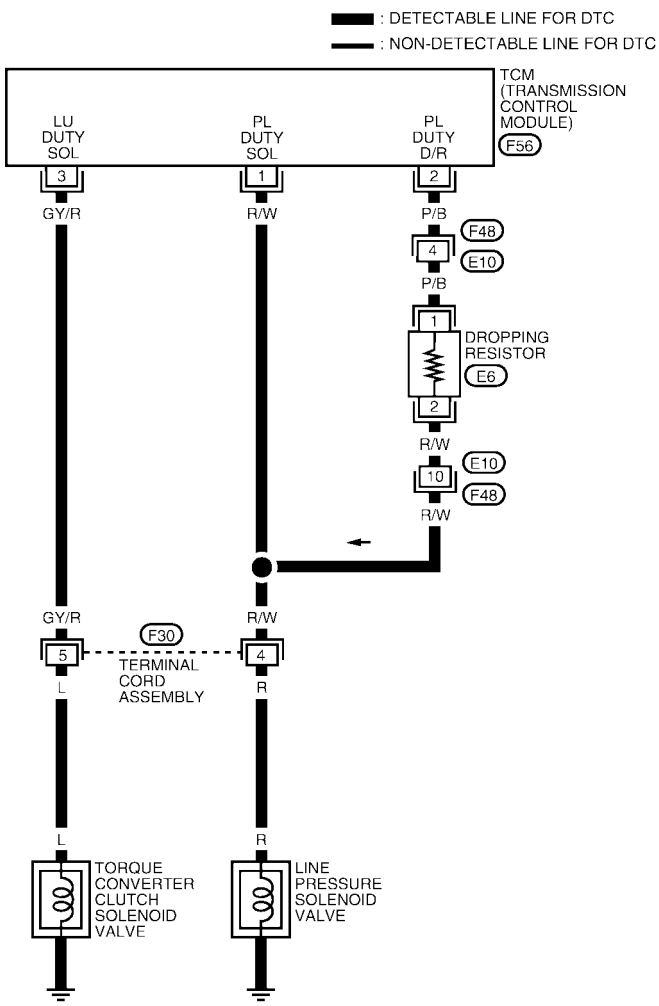


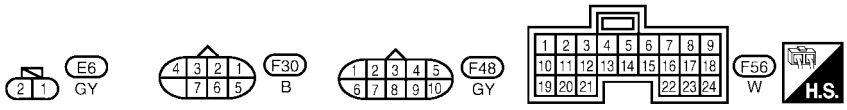
WITH GST

Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — TCCSIG

ECS0064L





WCWA0026E

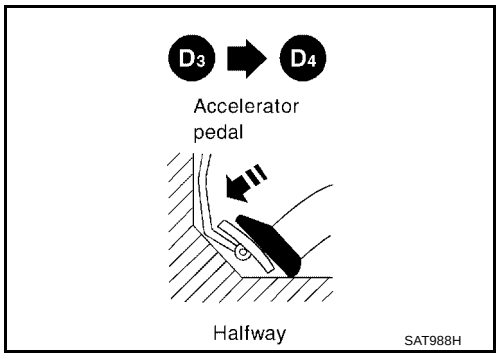
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	R/W	LINE PRESSURE SOLENOID VALVE	WHEN ACCELERATOR PEDAL IS RELEASED WHILE DRIVING	APPROX. 1.5 - 3.0V
			WHEN ACCELERATOR PEDAL IS DEPRESSED WHILE DRIVING	APPROX. 0V
2	P/B	LINE PRESSURE SOLENOID VALVE (DROPPING RESISTOR)	WHEN ACCELERATOR PEDAL IS RELEASED WHILE DRIVING	APPROX. 4 - 14V
			WHEN ACCELERATOR PEDAL IS DEPRESSED WHILE DRIVING	APPROX. 0V
3	GY/R	TORQUE CONVERTER CLUTCH SOLENOID VALVE	WITH TORQUE CONVERTER LOCK-UP	APPROX. 8 - 15V
			WITHOUT TORQUE CONVERTER LOCK-UP	APPROX. 0V

Diagnostic Procedure

ECS0064M

1. CHECK SHIFT UP (D_3 TO D_4)

During AT-465, "Cruise Test — Part 1" , does A/T shift from D_3 to D_4 at the specified speed?



Yes or No

Yes >> GO TO 11.
No >> GO TO 2.

2. CHECK LINE PRESSURE

Perform line pressure test.

Engine Speed RPM	Line Pressure kPa (kg/cm^2 , psi)	
	D, 2 and 1 Position	R Position
Idle	500 (5.1, 73)	778 (7.9, 113)
Stall	1,223 (12.6, 179)	1,918 (19.6, 278)

Refer to AT-456, "Line Pressure Test" .

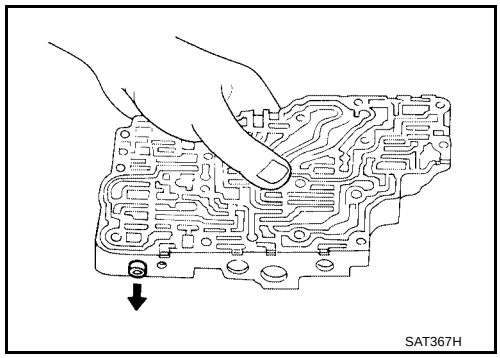
OK or NG

OK >> GO TO 3.
NG >> GO TO 6.

3. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-679, "DISASSEMBLY" .
2. Check to ensure that:

- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.



OK or NG

OK >> GO TO 4.
NG >> Repair control valve.

4. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 5.
No >> Check control valve again. Repair or replace control valve assembly.

5. CHECK DTC

Perform AT-539, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

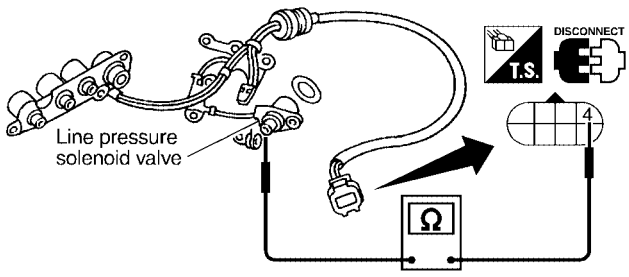
OK >> **INSPECTION END**
NG >> GO TO 11. Check for proper lock-up.

6. CHECK VALVE RESISTANCE

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .

- Line pressure solenoid valve

2. Check resistance to the terminal and ground.



Solenoid valve	Terminal No.		Resistance (Approx.)
Line pressure solenoid valve	4	Ground	2.5 - 5Ω

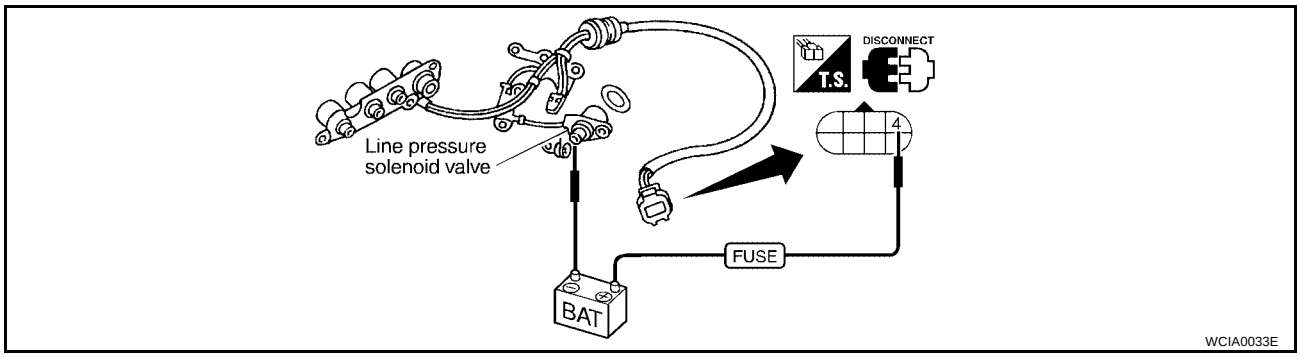
WCIA0032E

OK or NG

OK >> GO TO 8.
NG >> Replace solenoid valve assembly.

7. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Line pressure solenoid valve
2. Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.

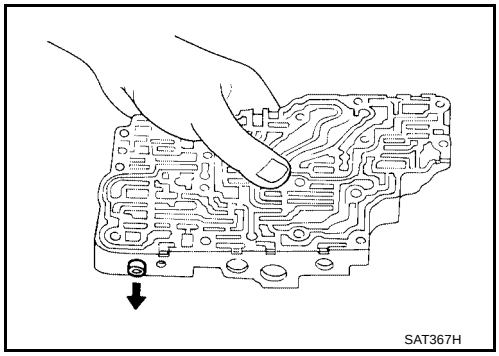


OK or NG

OK >> GO TO 8.
NG >> Replace solenoid valve assembly.

8. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-679, "DISASSEMBLY" .
2. Check line pressure circuit valves for sticking.
- Pressure regulator valve
- Pilot valve
- Pressure modifier valve



OK or NG

OK >> GO TO 9.
NG >> Repair control valve.

9. CHECK SHIFT UP (D_3 TO D_4)

Does A/T shift from D_3 to D_4 at the specified speed?

Yes or No

Yes >> GO TO 10.
No >> Check control valve again. Repair or replace control valve assembly.

10. CHECK DTC

Perform AT-539, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11. Check for proper lock-up.

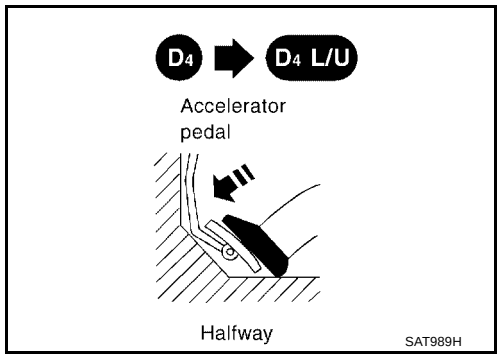
11. CHECK LOCK-UP

During AT-465, "Cruise Test — Part 1" , does A/T perform lock-up at the specified speed?

Yes or No

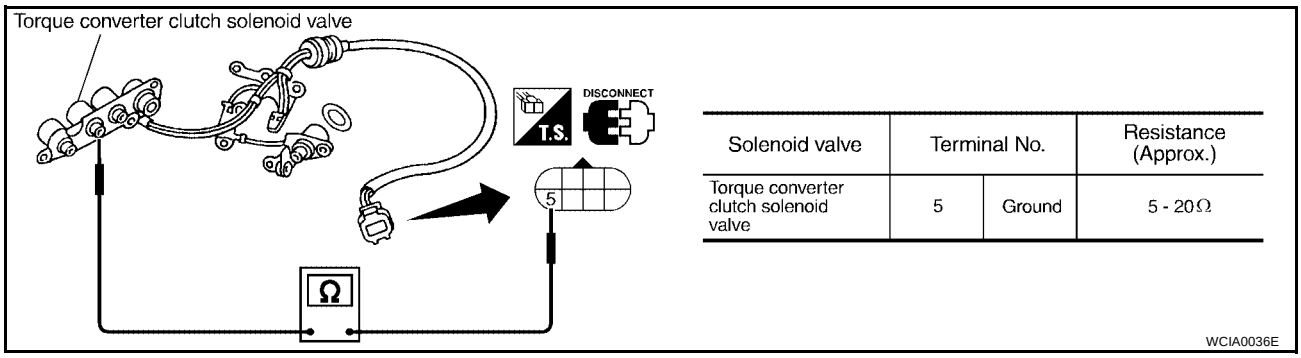
Yes >> Perform “Cruise test — Part 1” again and return to the start point of this test group.

No >> GO TO 12.



12. CHECK VALVE RESISTANCE

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Torque converter clutch solenoid valve
2. Check resistance between terminal cord assembly connector F30 terminal 5 and ground.



Solenoid valve	Terminal No.		Resistance (Approx.)
Torque converter clutch solenoid valve	5	Ground	5 - 20Ω

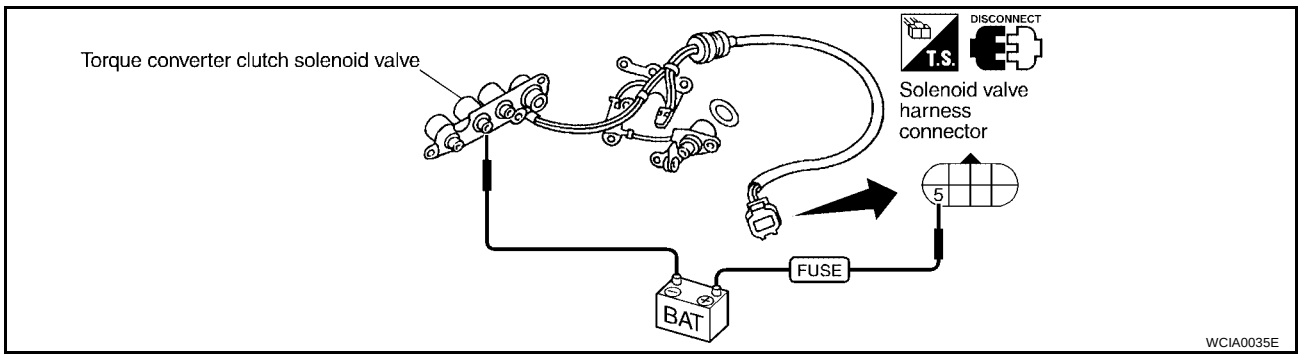
OK or NG

OK >> GO TO 14.

NG >> Replace solenoid valve assembly.

13. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
- Torque converter clutch solenoid valve
2. Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.



OK or NG

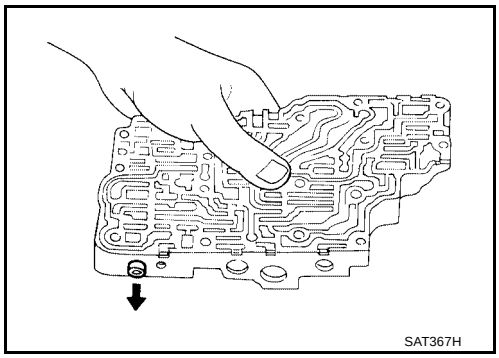
OK >> GO TO 14.

NG >> Replace solenoid valve assembly.

14. CHECK CONTROL VALVE

1. Disassemble control valve assembly. Refer to AT-679, "DISASSEMBLY" .
2. Check control valves for sticking.

- Torque converter clutch control valve
- Torque converter clutch relief valve



OK or NG

OK >> GO TO 15.
NG >> Repair control valve.

15. CHECK LOCK-UP

Does A/T perform lock-up at the specified speed?

Yes or No

Yes >> GO TO 16.
No >> Check control valve again. Repair or replace control valve assembly.

16. CHECK DTC

Perform AT-539, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> Perform “Cruise test — Part 1” again and return to the start point of this test group.

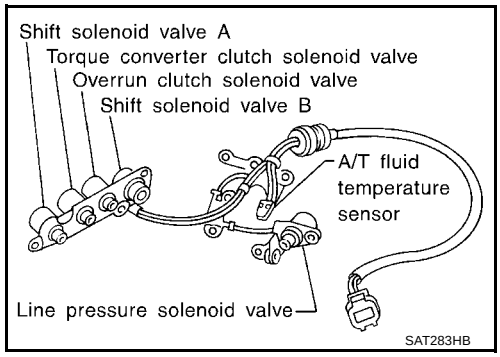
DTC P0745 LINE PRESSURE SOLENOID VALVE

PFP:31940

Description

ECS0064N

The line pressure solenoid valve regulates the oil pump discharge pressure to suit the driving condition in response to a signal sent from the TCM.



CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Line pressure solenoid valve duty	Small throttle opening (Low line pressure) ↓ Large throttle opening (High line pressure)	Approximately 24% ↓ Approximately 95%

On Board Diagnosis Logic

ECS0064O

Diagnostic trouble code L/PRESS SOL/CIRC with CONSULT-II or P0745 without CONSULT-II is detected when TCM detects an improper voltage drop when it tries to operate the solenoid valve.

Possible Cause

ECS0064P

Check the following items.

- Harness or connectors
  (The solenoid circuit is open or shorted.)
- Line pressure solenoid valve

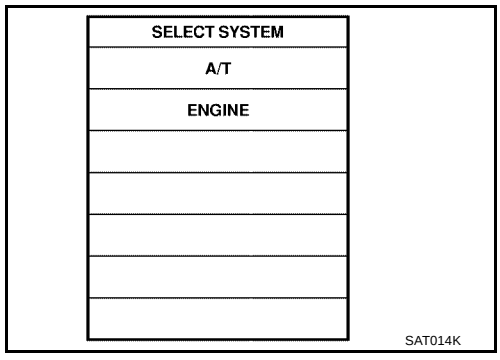
Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS0064Q

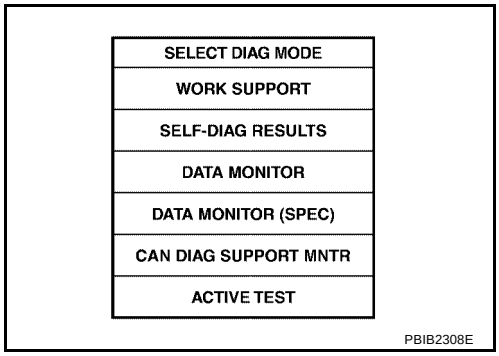
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.



2. Depress accelerator pedal completely and wait at least 1 second.



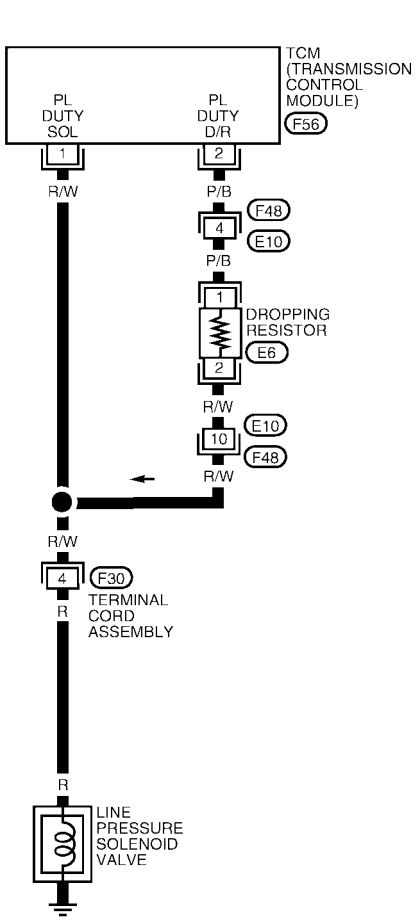
WITH GST

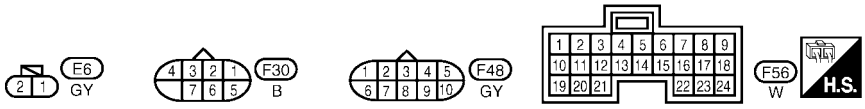
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — LPSV

ECS0064R

AT-LPSV-01





WCWA0027E

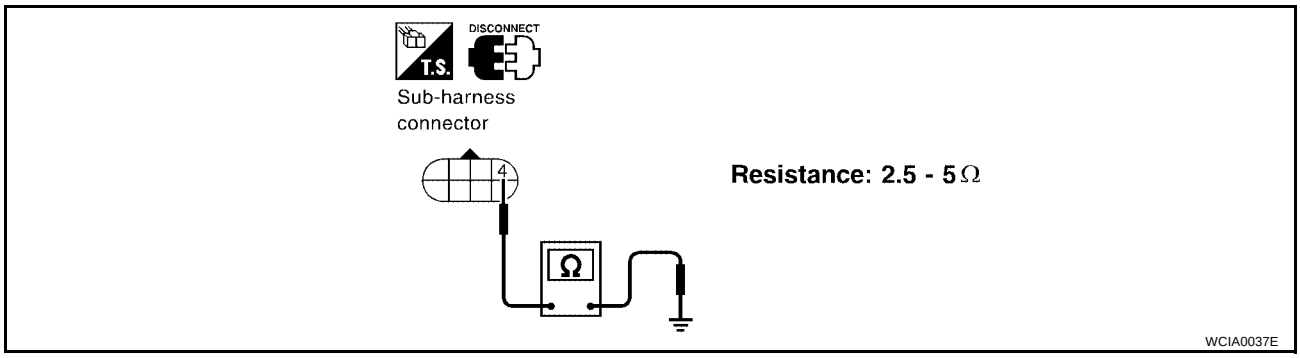
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	R/W	LINE PRESSURE SOLENOID VALVE	WHEN ACCELERATOR PEDAL IS RELEASED WHILE DRIVING	APPROX. 1.5 - 3.0V
			WHEN ACCELERATOR PEDAL IS DEPRESSED WHILE DRIVING	APPROX. 0V
2	P/B	LINE PRESSURE SOLENOID VALVE (DROPPING RESISTOR)	WHEN ACCELERATOR PEDAL IS RELEASED WHILE DRIVING	APPROX. 4 - 14V
			WHEN ACCELERATOR PEDAL IS DEPRESSED WHILE DRIVING	APPROX. 0V

Diagnostic Procedure

ECS0064S

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to OFF position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector F30 terminal 4 and ground.



OK or NG

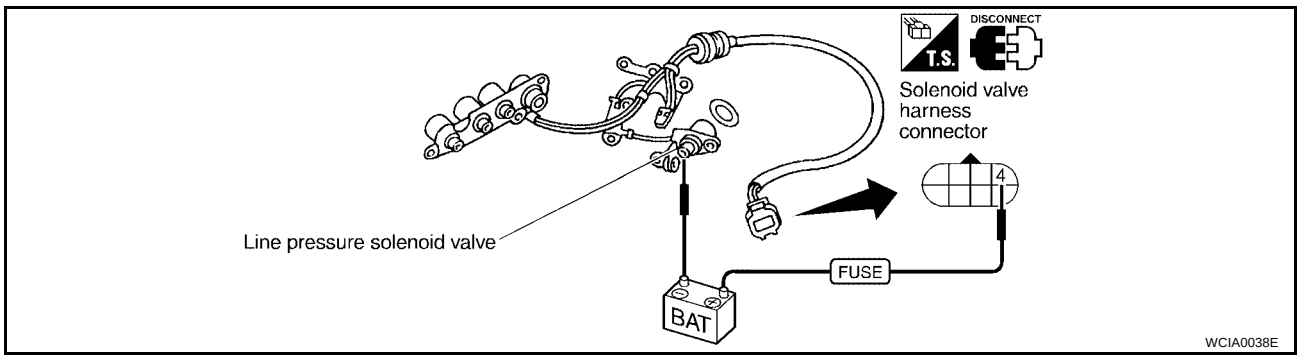
OK >> GO TO 3.
NG >> GO TO 2.

2. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

– Line pressure solenoid valve

• Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.



– Harness of terminal cord assembly for short or open

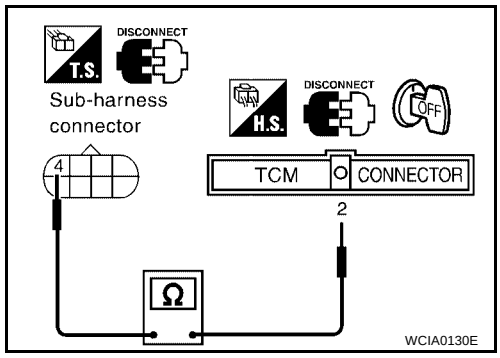
OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK POWER SOURCE AND DROPPING RESISTOR CIRCUIT

1. Turn ignition switch to OFF position.
2. Disconnect TCM harness connector.
3. Check resistance between terminal cord assembly harness connector F30 terminal 4 and TCM harness connector F56 terminal 2.

Resistance : Approximately 12Ω



OK or NG

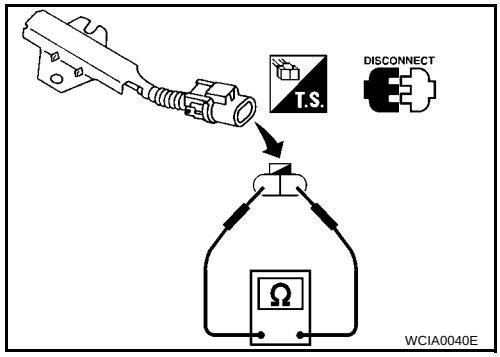
OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING ITEM

Check the following items:

- Dropping resistor
- Check resistance between two terminals.

Resistance : Approximately 12Ω



- Harness for short or open between TCM terminal 2 and terminal cord assembly (Main harness)

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

5. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to OFF position.
2. Check continuity between terminal cord assembly connector F30 terminal 4 and TCM harness connector F56 terminal 1. Refer to AT-549, "Wiring Diagram — AT — LPSV" .

Continuity should exist.

3. Reinstall any part removed.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK DTC

Perform AT-547, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

7. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

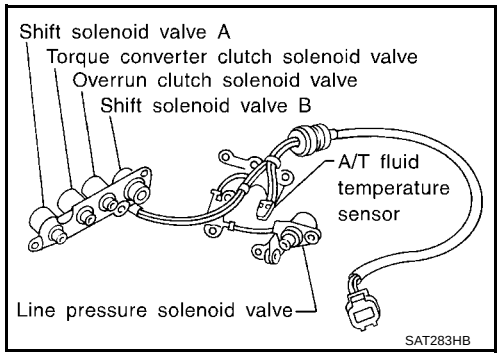
DTC P0750 SHIFT SOLENOID VALVE A

PFP:31940

Description

ECS0064T

Shift solenoid valves A and B are turned ON or OFF by the TCM in response to signals sent from the park/neutral position (PNP) switch, vehicle speed and ECM (throttle opening). Gears will then be shifted to the optimum position.



Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

On Board Diagnosis Logic

ECS0064U

Diagnostic trouble code SFT SOL A/CIRC with CONSULT-II or P0750 without CONSULT-II is detected when TCM detects an improper voltage drop when it tries to operate the solenoid valve.

Possible Cause

ECS0064V

Check the following items.

- Harness or connectors
  (The solenoid circuit is open or shorted.)
- Shift solenoid valve A

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS0064W

CAUTION:

Always drive vehicle at a safe speed.

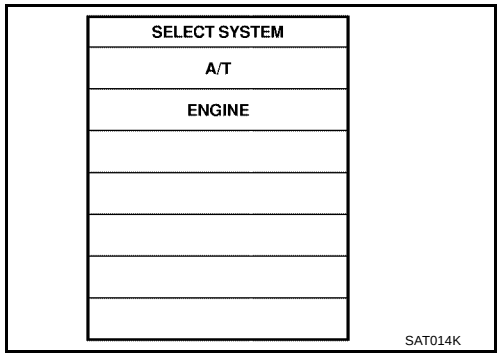
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

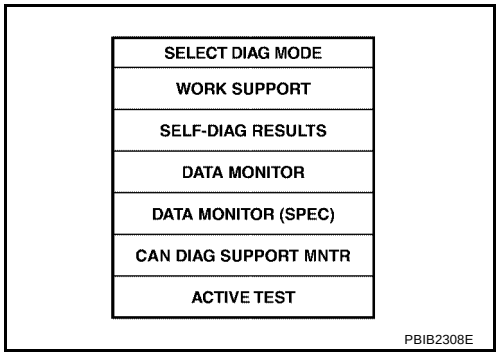
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.



2. Start engine.
3. Drive vehicle in D position and allow the transmission to shift 1 → 2 (“GEAR”).



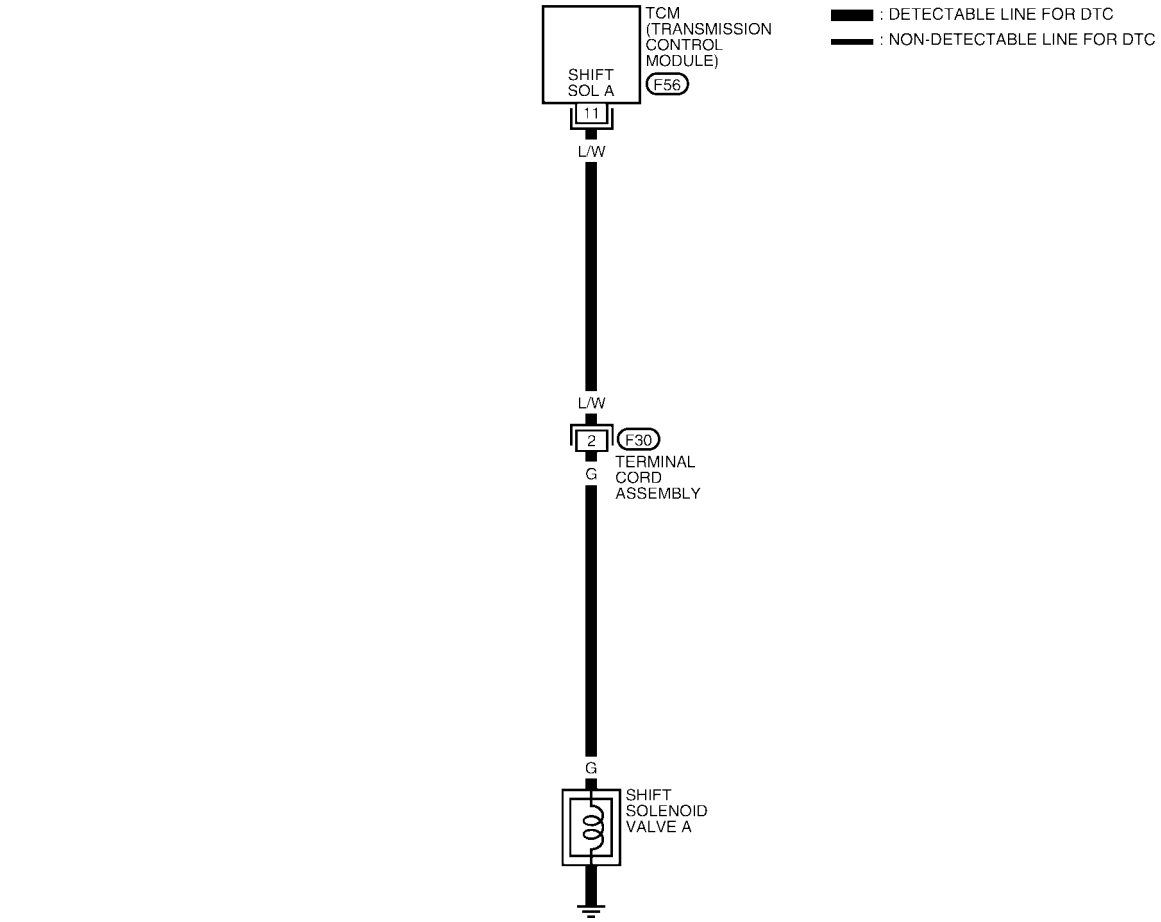
WITH GST

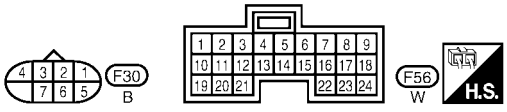
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — SSV/A

ECS0064X

AT-SSV/A-01





WCWA0028E

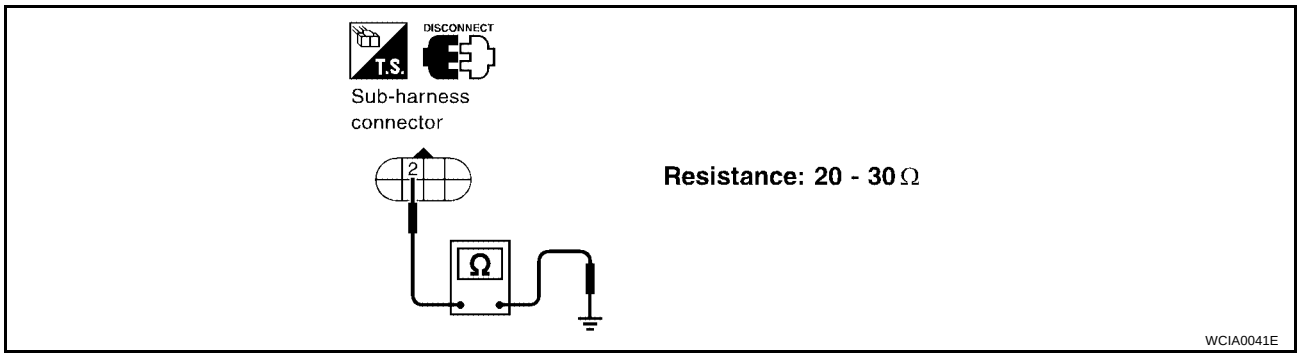
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
11	L/W	SHIFT SOLENOID VALVE A	WHEN SHIFT SOLENOID VALVE A IS OPERATING (DRIVING IN D1 OR D4)	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE A IS NOT OPERATING (DRIVING IN D2 OR D3)	APPROX. 0V

Diagnostic Procedure

ECS0064Y

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to OFF position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector F30 terminal 2 and ground.



OK or NG

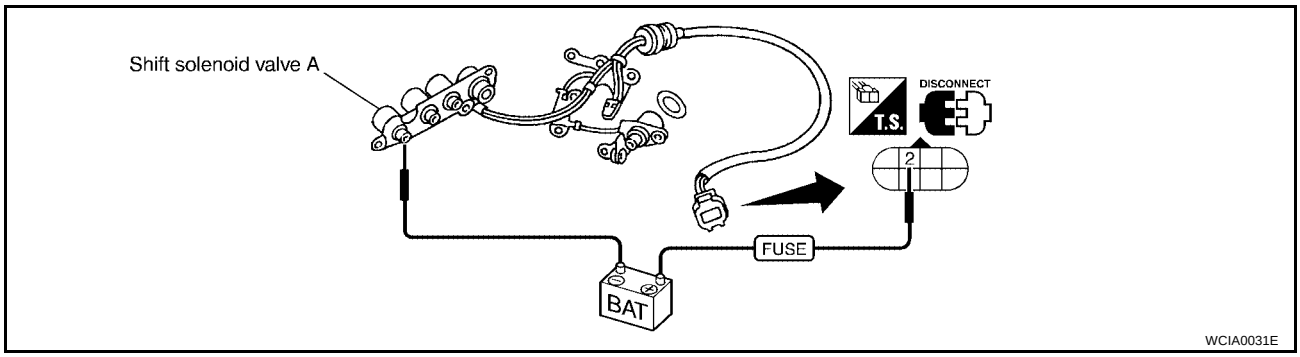
OK >> GO TO 3.
NG >> GO TO 2.

2. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Shift solenoid valve A
- Operation check

• Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.



- Harness of terminal cord assembly for short or open

OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to OFF position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal cord assembly harness connector F30 terminal 2 and TCM harness connector F56 terminal 11. Refer to AT-555, "Wiring Diagram — AT — SSV/A" .

Continuity should exist.

4. Reinstall any part removed.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK DTC

Perform AT-553, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

5. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

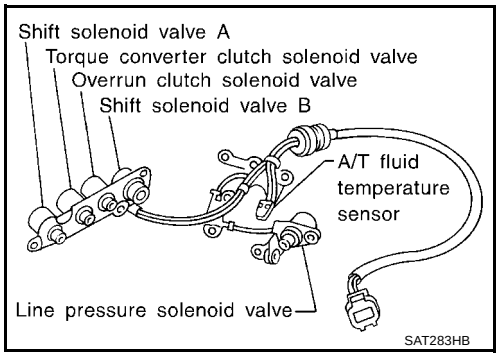
DTC P0755 SHIFT SOLENOID VALVE B

PFP:31940

Description

ECS0064Z

Shift solenoid valves A and B are turned ON or OFF by the TCM in response to signals sent from the park/neutral position (PNP) switch, vehicle speed and ECM (throttle opening). Gears will then be shifted to the optimum position.



Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

On Board Diagnosis Logic

ECS00650

Diagnostic trouble code SFT SOL B/CIRC with CONSULT-II or P0755 without CONSULT-II is detected when TCM detects an improper voltage drop when it tries to operate the solenoid valve.

Possible Cause

ECS00651

Check the following items.

- Harness or connectors
  (The solenoid circuit is open or shorted.)
- Shift solenoid valve B

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS00652

CAUTION:

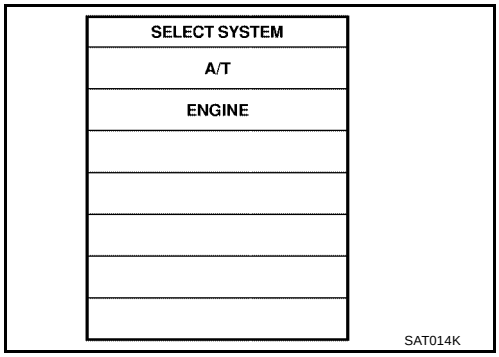
Always drive vehicle at a safe speed.

NOTE:

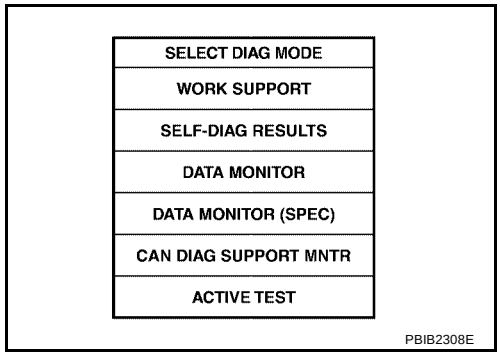
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.



2. Start engine.
3. Drive vehicle in D position and allow the transmission to shift 1 → 2 → 3 (“GEAR”).



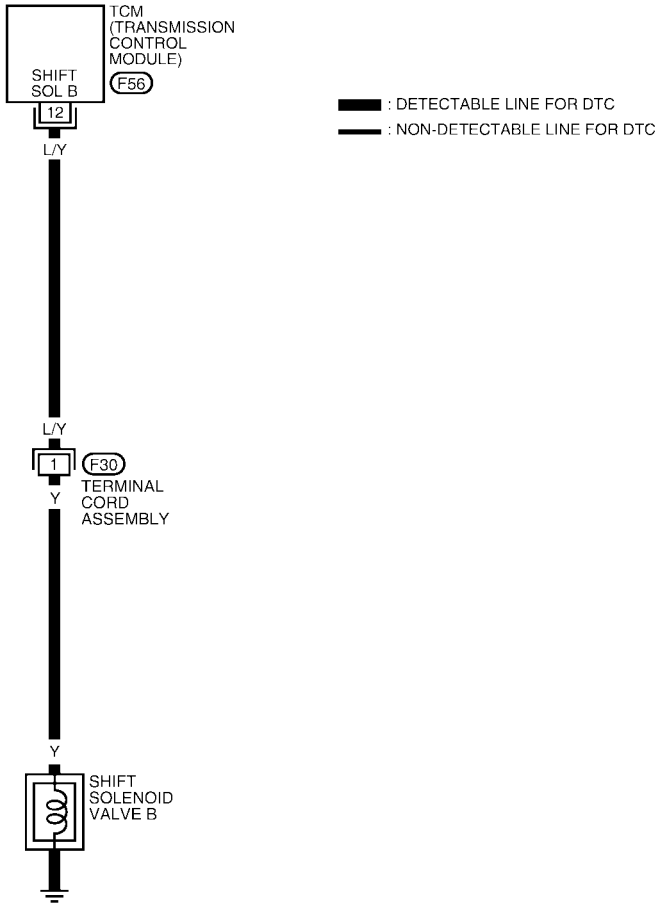
WITH GST

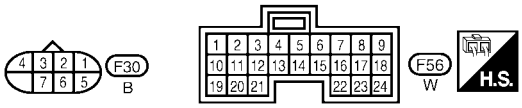
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — SSV/B

ECS00653

AT-SSV/B-01





WCWA0029E

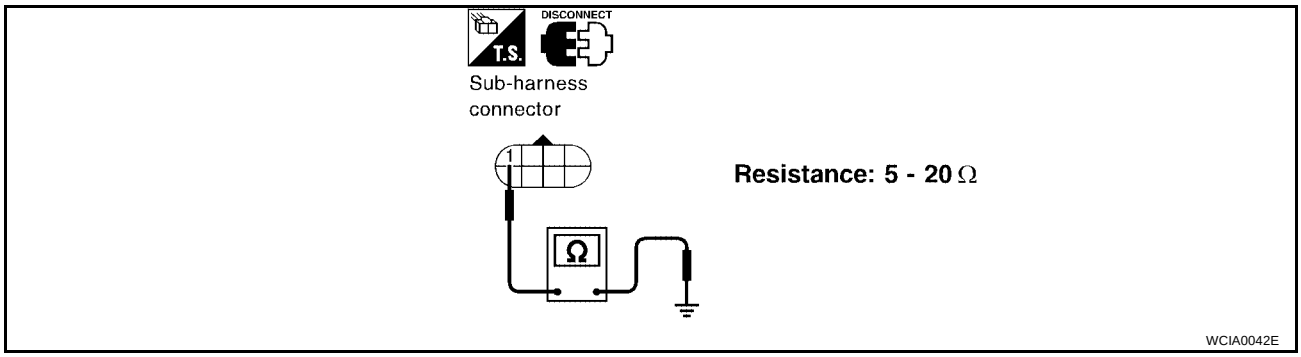
TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
12	L/Y	SHIFT SOLENOID VALVE B	WHEN SHIFT SOLENOID VALVE B IS OPERATING (DRIVING IN D1 OR D2)	BATTERY VOLTAGE
			WHEN SHIFT SOLENOID VALVE BE IS NOT OPERATING (DRIVING IN D3 OR D4)	APPROX. OV

Diagnostic Procedure

ECS00654

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to OFF position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector F30 terminal 1 and ground.



OK or NG

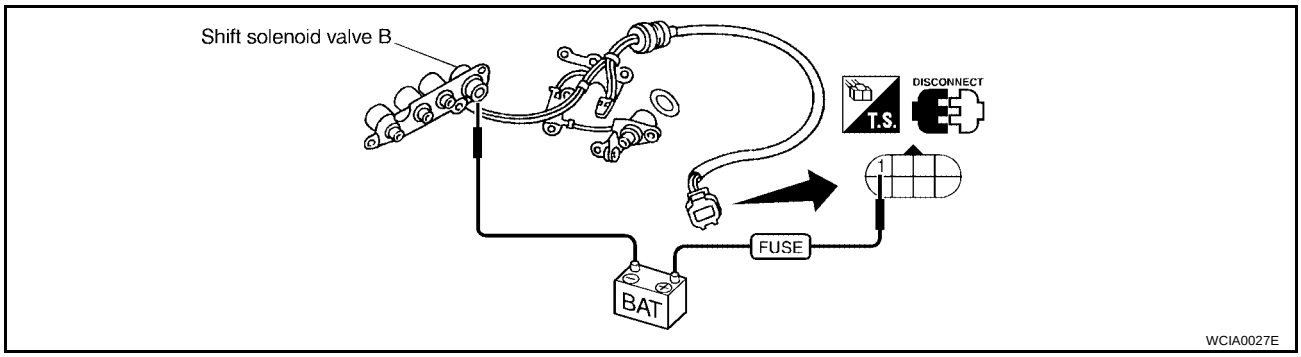
OK >> GO TO 3.
NG >> GO TO 2.

2. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

– Shift solenoid valve B
– Operation check

• Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.



– Harness of terminal cord assembly for short or open

OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to OFF position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal cord assembly harness connector F30 terminal 1 and TCM harness connector F56 terminal 12. Refer to AT-560, "Wiring Diagram — AT — SSV/B" .

Continuity should exist.

4. Reinstall any part removed.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK DTC

Perform AT-558, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

5. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

PFP:22560

Description

ECS00655

The throttle position sensor [accelerator pedal position (APP) sensor] is part of the system that controls throttle position. This system also uses an electric throttle control actuator which consists of a throttle control motor and throttle position sensors. Accelerator pedal position signal is sent to the ECM.

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Throttle position sensor [accelerator pedal position (APP) sensor]	Fully-closed throttle	Approximately 0.5V
	Fully-open throttle	Approximately 4V

On Board Diagnosis Logic

ECS00656

Diagnostic trouble code TP SEN/CIRC A/T with CONSULT-II or P1705 without CONSULT-II is detected when TCM receives an excessively low or high voltage from the ECM.

Possible Cause

ECS00657

Check the following items.

- Harness or connectors
  (The sensor circuit is open or shorted.)

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS00658

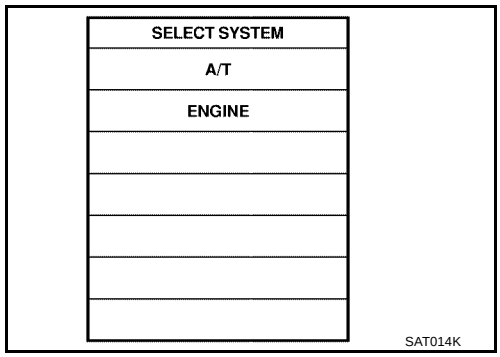
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

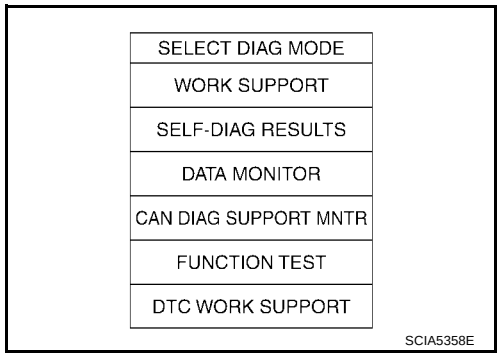
1. Turn ignition switch ON and select “DATA MONITOR” mode for “A/T” with CONSULT-II.

Accelerator pedal condition	THRTL POS SEN	CLOSED THL/SW	W/O THRL/P·SW
Fully released	Less than 4.7V	ON	OFF
Partially depressed	0.1 - 4.6V	OFF	OFF
Fully depressed	1.9 - 4.6V	OFF	ON



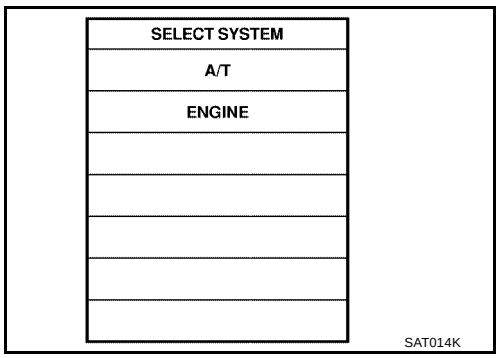
   If the check result is NG, go to AT-566, "Diagnostic Procedure" .
   If the check result is OK, go to following step.

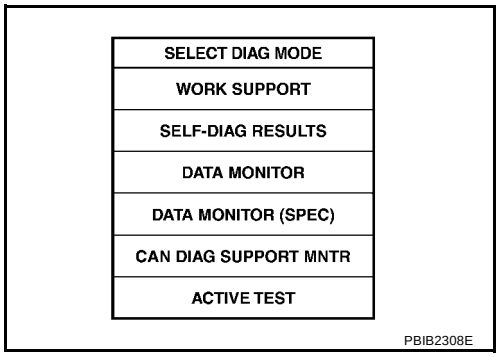
2. Turn ignition switch ON and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
3. Start engine and maintain the following conditions for at least 3 consecutive seconds. Then release accelerator pedal completely.
   VHCL SPEED SE: 10 km/h (6 MPH) or more
   THRTL POS SEN: Approximately 3V or less
   Selector lever: D position (O/D ON)
   If the check result is NG, go to AT-566, "Diagnostic Procedure" .
   If the check result is OK, go to following step.



4. Maintain the following conditions for at least 3 consecutive seconds. Then release accelerator pedal completely.

VHCL SPEED SE: 10 km/h (6 MPH) or more
Accelerator pedal: Wide open throttle
Selector lever: D position (O/D ON)





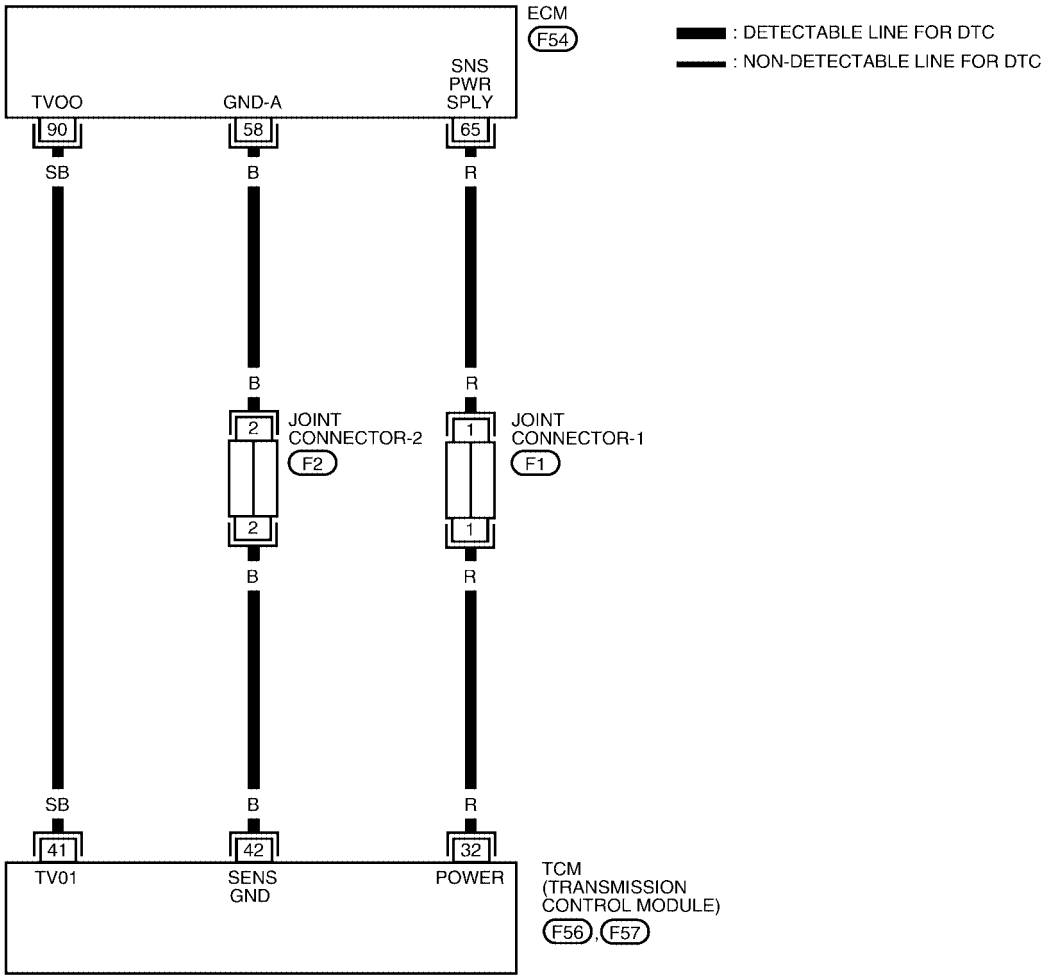
WITH GST

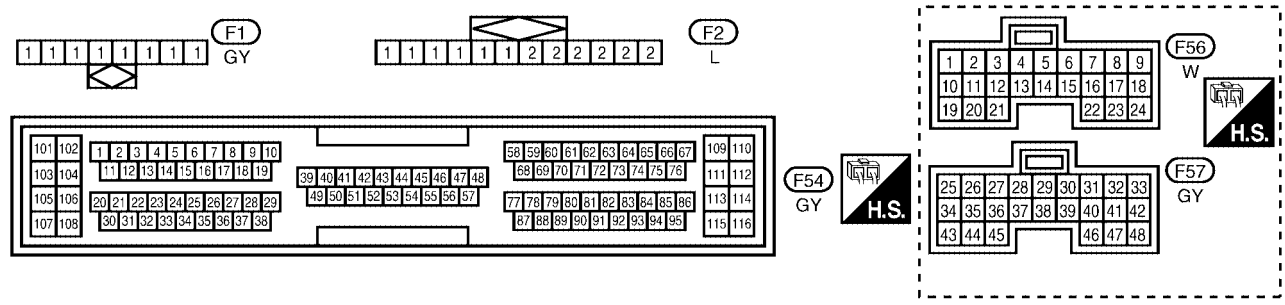
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — TPS

ECS00659

AT-TPS-01





WCWA0079E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
32	R	SENSOR POWER	IGNITION SWITCH ON	4.5 - 5.5V
			IGNITION SWITCH OFF	0V
41	SB	THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]	IGNITION ON AND ACCELERATOR PEDAL IS DEPRESSED SLOWLY AFTER WARMING UP ENGINE	FULLY CLOSED THROTTLE: 0.5V
				WIDE OPEN THROTTLE: 4.0V
42	B	SENSOR GROUND	—	—

Diagnostic Procedure

ECS0065A

1. CHECK DTC WITH ECM

- Check P code with CONSULT-II “ENGINE”.
  Turn ignition switch ON and select “SELF DIAGNOSTIC RESULTS” mode for “ENGINE” with CONSULT-II.

Refer to EC-1275, "Malfunction Indicator Lamp (MIL)" .

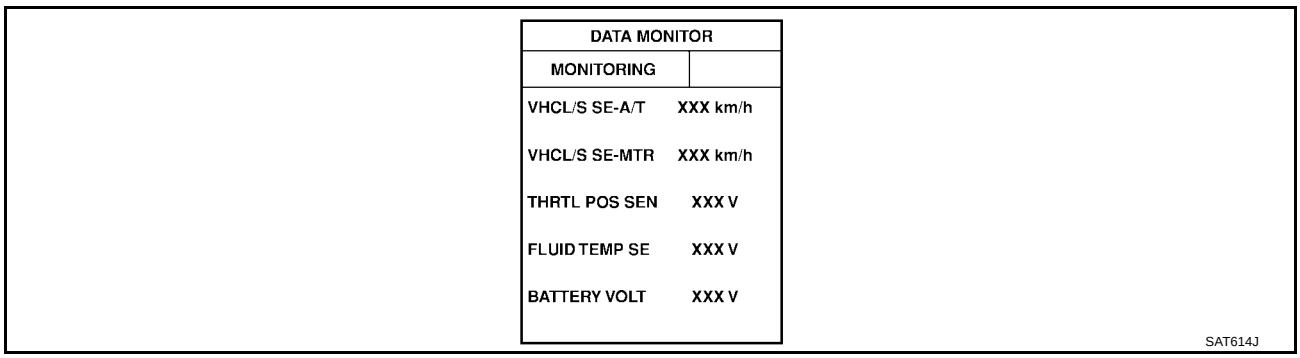
OK or NG

OK (with CONSULT-II)>>GO TO 2.
OK (without CONSULT-II)>>GO TO 3.
NG >> Check throttle position sensor [accelerator pedal position (APP) sensor] circuit for engine control. Refer to EC-1475, "DTC P0222, P0223 TP SENSOR" and EC-1770, "DTC P2138 APP SENSOR" .

2. CHECK INPUT SIGNAL (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “THRTL POS SEN”.



Voltage:
Fully-closed throttle :Approximately 0.5V
Fully-open throttle :Approximately 4V

OK or NG

OK >> GO TO 4.
NG >> Check harness for short or open between ECM and TCM regarding throttle position sensor [accelerator pedal position (APP) sensor] circuit. (Main harness)

3. CHECK INPUT SIGNAL (WITHOUT CONSULT-II)

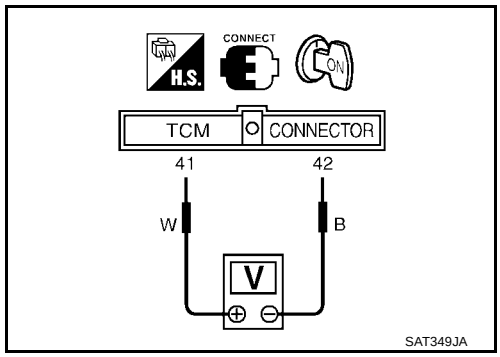
Without CONSULT-II

1. Turn ignition switch to ON position. (Do not start engine.)
2. Check voltage between TCM terminals 41 and 42 while accelerator pedal is depressed slowly.

Voltage:

Fully-closed throttle valve	**:Approximately 0.5V**
Fully-open throttle valve	**:Approximately 4V**

(Voltage rises gradually in response to throttle position.)



OK or NG

OK >> GO TO 4.
NG >> Check harness for short or open between ECM and TCM regarding throttle position sensor [accelerator pedal position (APP) sensor] circuit. (Main harness)

4. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

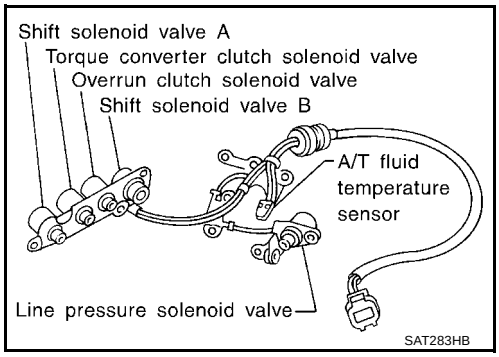
DTC P1760 OVERRUN CLUTCH SOLENOID VALVE

PFP:31940

Description

ECS0065B

The overrun clutch solenoid valve is activated by the TCM in response to signals sent from the park/neutral position (PNP) switch, overdrive control switch, vehicle speed and ECM (throttle opening). The overrun clutch operation will then be controlled.



On Board Diagnosis Logic

ECS0065C

Diagnostic trouble code O/R CLTCH SOL/CIRC with CONSULT-II or P1760 without CONSULT-II is detected when TCM detects an improper voltage drop when it tries to operate the solenoid valve.

Possible Cause

ECS0065D

Check the following items.

- Harness or connectors
  (The solenoid circuit is open or shorted.)
- Overrun clutch solenoid valve

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS0065E

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

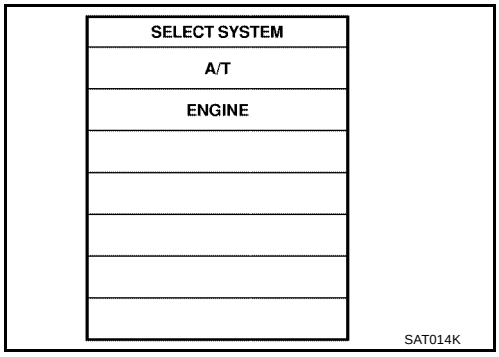
TESTING CONDITION:

Always drive vehicle on a level road to improve accuracy of test.

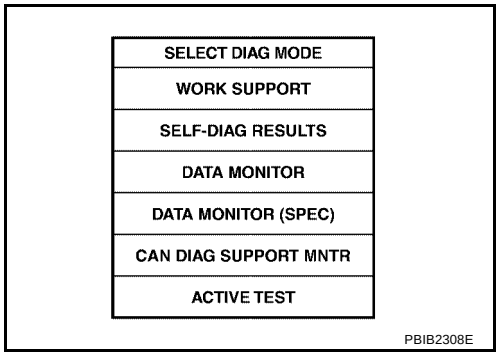
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
2. Start engine.
3. Accelerate vehicle to a speed of more than 10 km/h (6 MPH) with D position (O/D ON).



4. Release accelerator pedal completely with D position (O/D OFF).



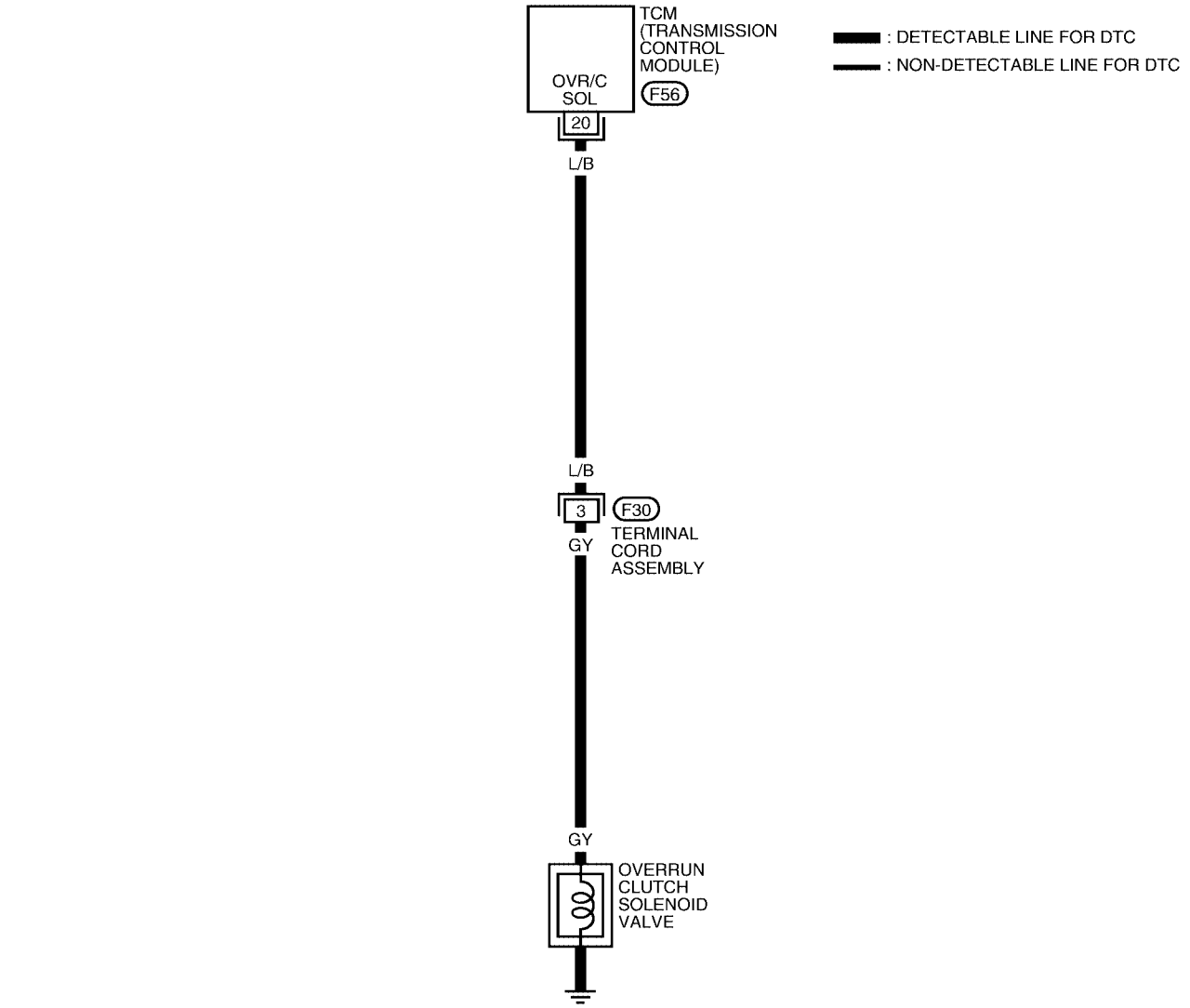
WITH GST

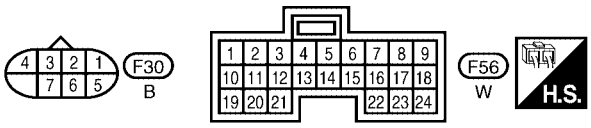
Follow the procedure “With CONSULT-II”.

Wiring Diagram — AT — OVRCSV

ECS0065F

AT-OVRCSV-01





WCWA0031E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
20	L/B	OVERRUN CLUTCH SOLENOID VALVE	WHEN OVERRUN CLUTCH SOLENOID VALVE OPERATES	BATTERY VOLTAGE
			WHEN OVERRUN CLUTCH SOLENOID VALVE DOES NOT OPERATE	APPROX. 0V

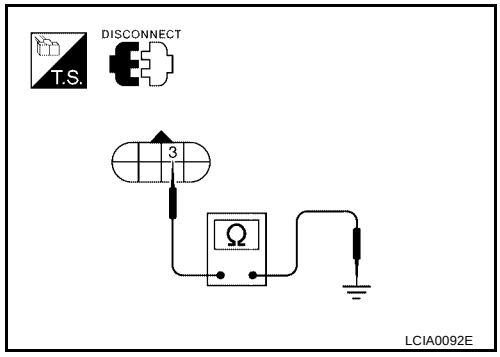
Diagnostic Procedure

ECS0065G

1. CHECK VALVE RESISTANCE

1. Turn ignition switch to OFF position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly F30 terminal 3 (component side) and ground.

Resistance : 20 - 30Ω



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

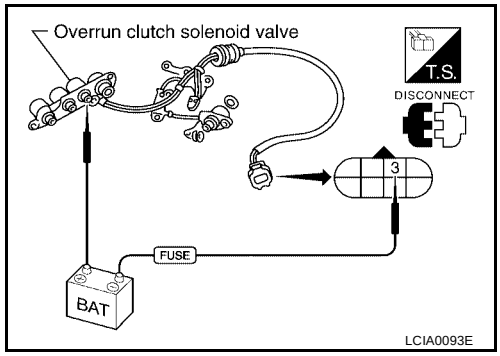
2. CHECK VALVE OPERATION

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

– Overrun clutch solenoid valve
– Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage and ground to the solenoid.

– Harness of terminal cord assembly for short or open



OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK POWER SOURCE CIRCUIT

1. Turn ignition switch to OFF position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal cord assembly connector F30 terminal 3 and TCM harness connector F56 terminal 20. Refer to AT-570, "Wiring Diagram — AT — OVRCSV" .

Continuity should exist.

4. Reinstall any part removed.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK DTC

Perform AT-568, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

5. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

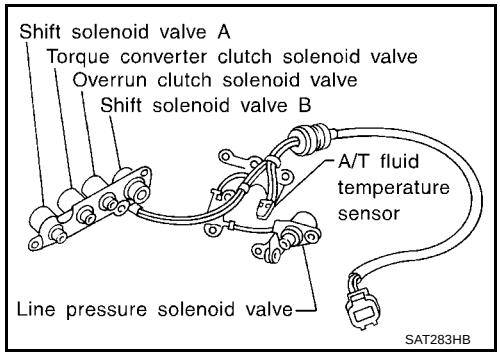
DTC BATT/FLUID TEMP SEN (A/T FLUID TEMP SENSOR CIRCUIT AND TCM POWER SOURCE)

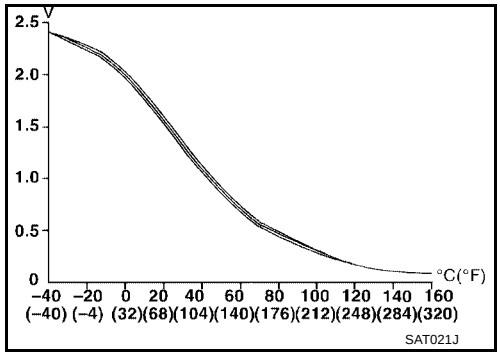
PFP:31940

Description

ECS0065H

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the TCM.





CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approximately)	
A/T fluid temperature sensor	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]	1.5V ↓ 0.5V	2.5 kΩ ↓ 0.3 kΩ

On Board Diagnosis Logic

ECS0065I

Diagnostic trouble code BATT/FLUID TEMP SEN with CONSULT-II or 8th judgement flicker without CONSULT-II is detected when TCM receives an excessively low or high voltage from the sensor.

Possible Cause

ECS0065J

Check the following items.

- Harness or connectors
  (The sensor circuit is open or shorted.)
- A/T fluid temperature sensor

Diagnostic Trouble Code (DTC) Confirmation Procedure

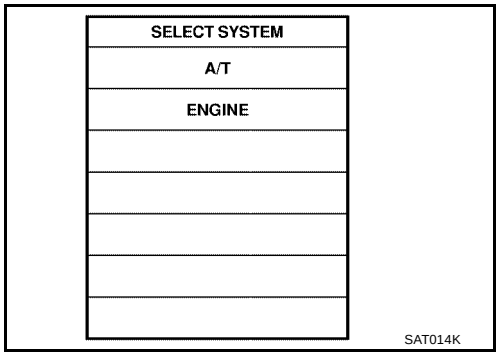
ECS0065K

After the repair, perform the following procedure to confirm the malfunction is eliminated.

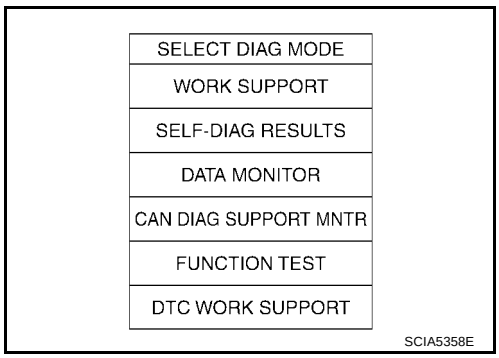
WITH CONSULT-II

1. Start engine.

2. Select “DATA MONITOR” mode for “A/T” with CONSULT-II.

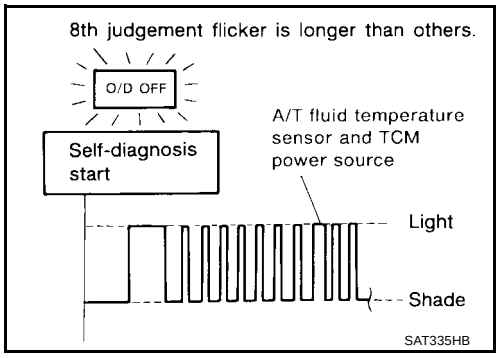


3. Drive vehicle under the following conditions:
   Selector lever in D, vehicle speed higher than 20 km/h (12 MPH).



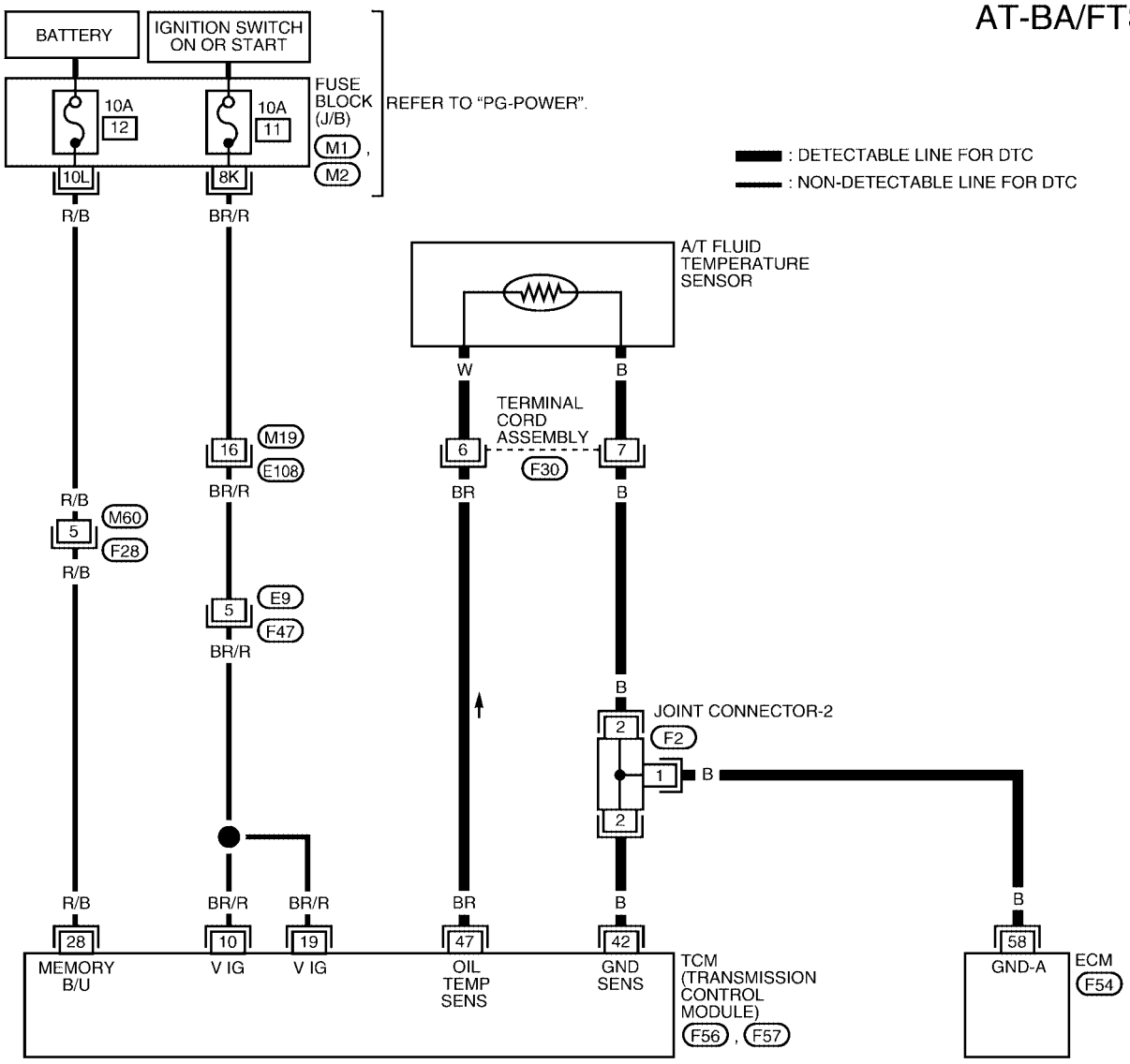
WITHOUT CONSULT-II

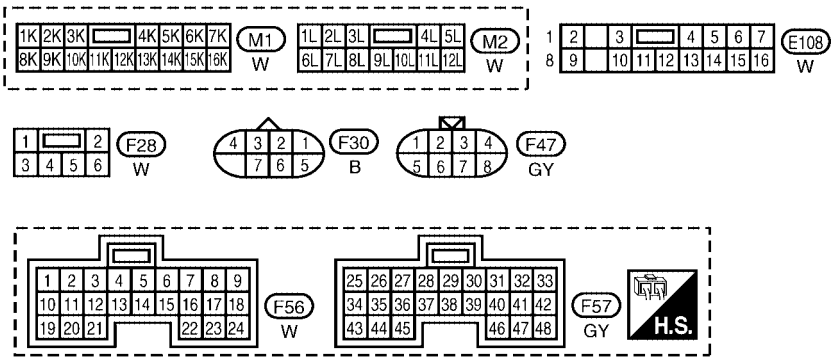
1. Start engine.
2. Drive vehicle under the following conditions:
   Selector lever in D, vehicle speed higher than 20 km/h (12 MPH).
3. Perform self-diagnosis.
   Refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" .



Wiring Diagram — AT — BA/FTS

ECS0065L





REFER TO THE FOLLOWING.
F2 - JOINT CONNECTOR
F54 - ELECTRICAL UNITS

WCWA0080E

TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	BR/R	POWER SOURCE	IGNITION ON	BATTERY VOLTAGE
			IGNITION OFF	APPROX. 0V
19	BR/R	POWER SOURCE	IGNITION ON	BATTERY VOLTAGE
			IGNITION OFF	APPROX. 0V
28	R/B	POWER SOURCE (MEMORY BACKUP)	IGNITION ON	BATTERY VOLTAGE
			IGNITION OFF	BATTERY VOLTAGE
42	B	SENSOR GROUND	—	—
47	BR	A/T FLUID TEMPERATURE SENSOR	IGNITION ON WITH ATF TEMPERATURE AT 20°C (68°F)	APPROX. 1.5V
			IGNITION ON WITH ATF TEMPERATURE AT 80°C (176°F)	APPROX. 0.5V

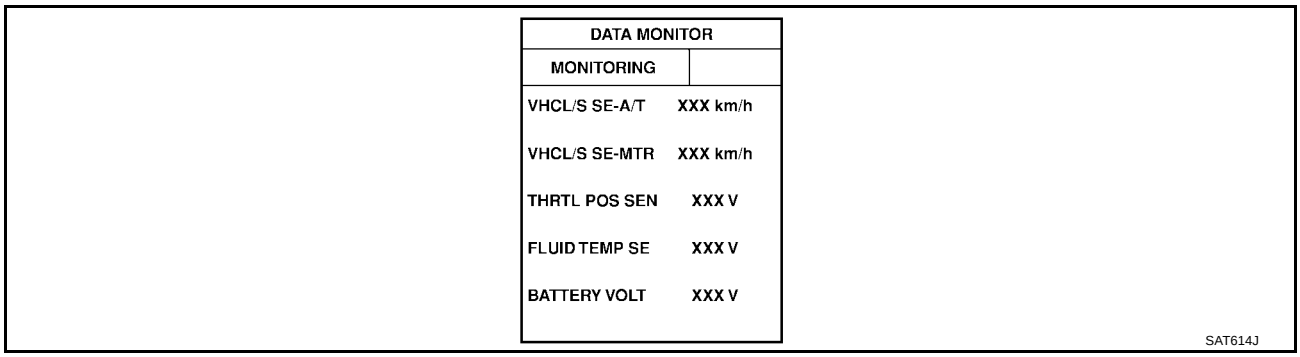
Diagnostic Procedure

ECS0065M

1. CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR (WITH CONSULT-II)

With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “FLUID TEMP SE”.



Voltage :Cold [20°C (68°F)] → Hot [80°C (176°F)]
:Approximately 1.5V → 0.5V

OK or NG

OK >> GO TO 9.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING ITEM

Check the following items:

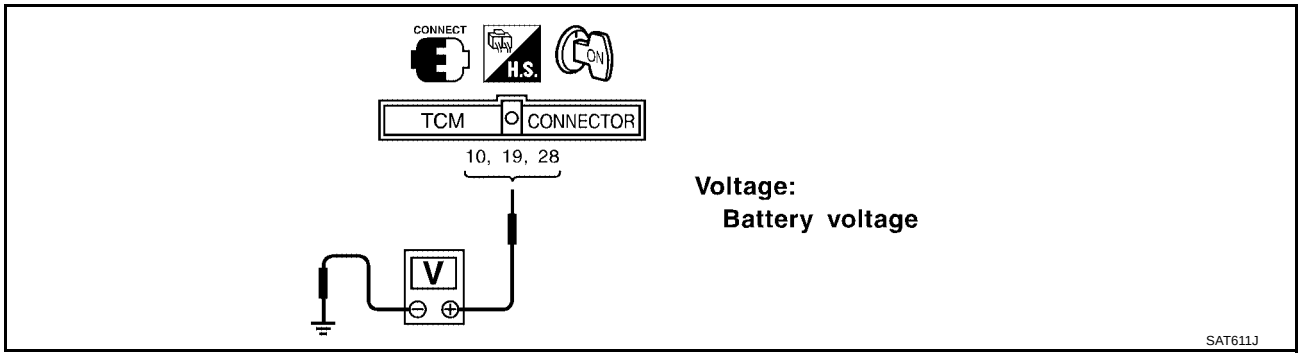
- Harness for short or open between TCM, ECM and terminal cord assembly (Main harness)
- Harness for short or open between battery and TCM (Main harness)
- Ground circuit for ECM
  Refer to EC-1342, "POWER SUPPLY CIRCUIT FOR ECM" .

OK or NG

OK >> GO TO 9.
NG >> Repair or replace damaged parts.

3. CHECK TCM POWER SOURCE STEP 1

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Check voltage between TCM terminals 10, 19, 28 and ground.

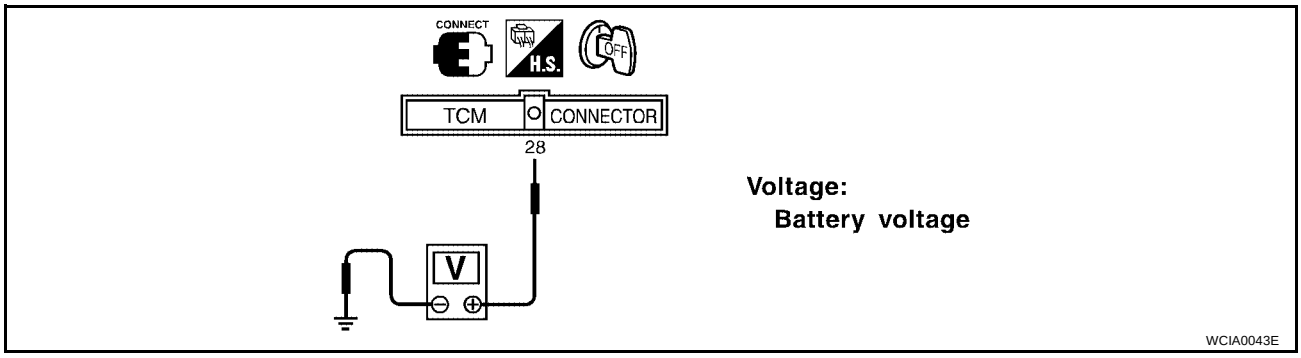


OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK TCM POWER SOURCE STEP 2

1. Turn ignition switch to OFF position.
2. Check voltage between TCM terminal 28 and ground.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING ITEM

Check the following items:

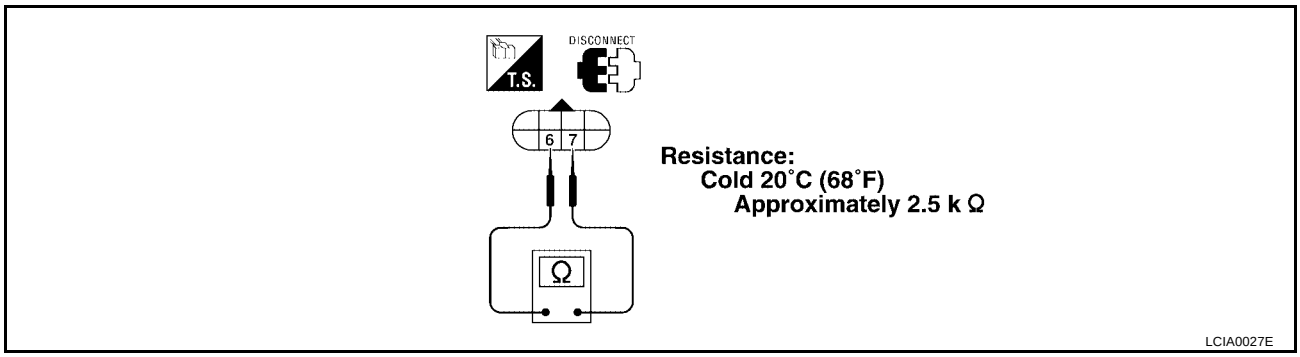
- Harness for short or open between ignition switch and TCM (Main harness)
- Harness for short or open between battery and TCM (Main harness)
- Ignition switch and fuse
  Refer to PG-2, "POWER SUPPLY ROUTING" .

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

6. CHECK A/T FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY

1. Turn ignition switch to OFF position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly F30 terminals 6 and 7 (component side) when A/T is cold.



4. Reinstall any part removed.

OK or NG

OK (without CONSULT-II) >> GO TO 8.
NG >> GO TO 7.

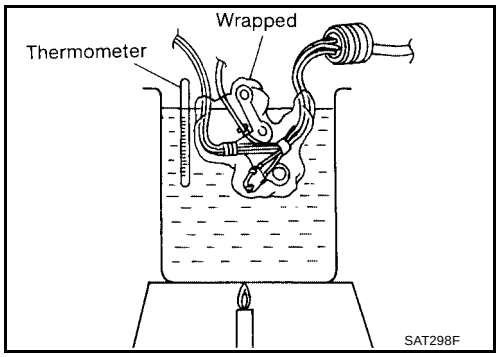
7. DETECT MALFUNCTIONING ITEM

1. Remove oil pan.
2. Check the following items:

– A/T fluid temperature sensor

• Check resistance between two terminals while changing temperature as shown.

Temperature	Resistance (Approx.)
20°C (68°F)	2.5kΩ
80°C (176°F)	0.3kΩ



– Harness of terminal cord assembly for short or open

OK or NG

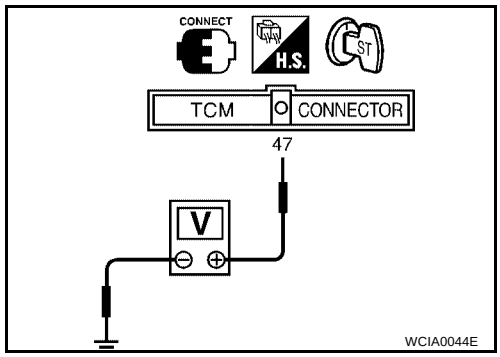
OK (without CONSULT-II) >> GO TO 8.
NG >> Repair or replace damaged parts.

8. CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR (WITHOUT CONSULT-II)

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM terminal 47 and ground while warming up A/T.

   Voltage :Cold [20°C (68°F)] → Hot [80°C (176°F)]
   :Approximately 1.5V → 0.5V



3. Turn ignition switch to OFF position.
4. Disconnect TCM harness connector.
5. Check resistance between TCM harness connector terminal 42 and ground. Refer to AT-575, "Wiring Diagram — AT — BA/FTS" .

   Continuity should exist.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING ITEM

Check the following items:

- Harness for short or open between TCM, ECM and terminal cord assembly (Main harness)
- Ground circuit for ECM
  Refer to PG-2, "POWER SUPPLY ROUTING" .

OK or NG

OK >> GO TO 10.
NG >> Repair or replace damaged parts.

10. CHECK DTC

Perform AT-573, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

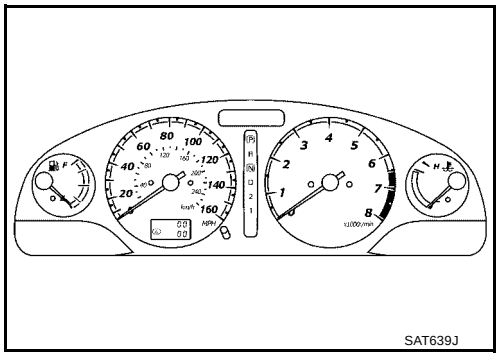
DTC VEHICLE SPEED SENSOR MTR

PFP:24814

Description

ECS0065N

The vehicle speed sensor·MTR is built into the speedometer assembly. The sensor functions as an auxiliary device to the revolution sensor when it is malfunctioning. The TCM will then use a signal sent from the vehicle speed sensor·MTR.



On Board Diagnosis Logic

ECS0065O

Diagnostic trouble code VHCL SPEED SEN·MTR with CONSULT-II or 2nd judgement flicker without CONSULT-II is detected when TCM does not receive the proper voltage signal from the sensor.

Possible Cause

ECS0065P

Check the following items.

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Vehicle speed sensor

Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS0065Q

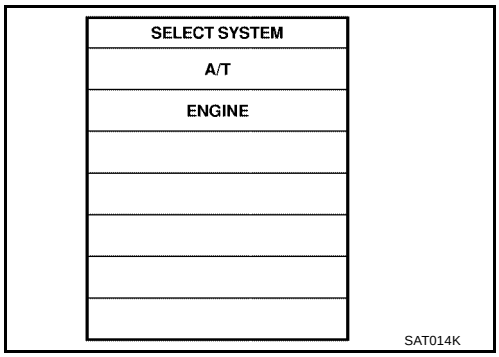
CAUTION:

- **Always drive vehicle at a safe speed.**
- **If conducting this “DTC Confirmation Procedure” again, always turn ignition switch OFF and wait at least 10 seconds before continuing.**

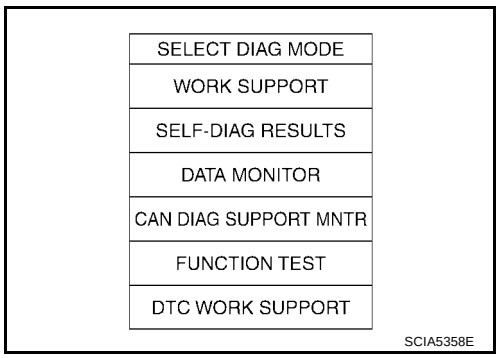
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch ON and select “DATA MONITOR” mode for “A/T” with CONSULT-II.



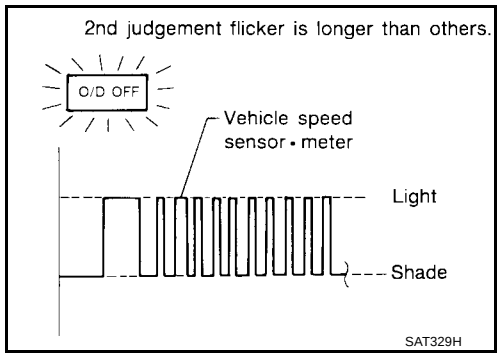
2. Start engine and accelerate vehicle from 0 to 25 km/h (0 to 16 MPH).



WITHOUT CONSULT-II

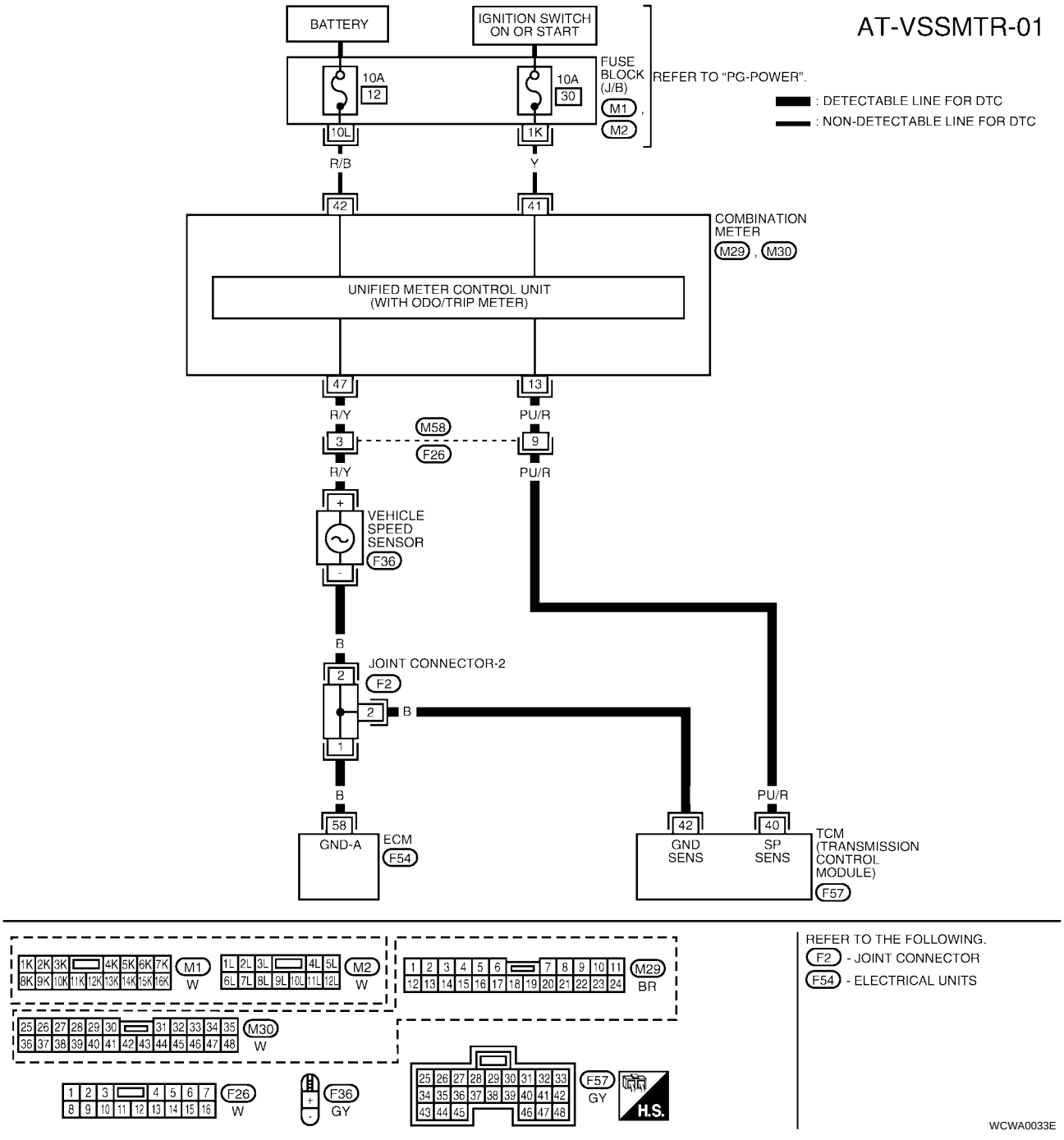
1. Start engine.

2. Drive vehicle under the following conditions:
   Selector lever in D and vehicle speed higher than 25 km/h (16 MPH).
3. Perform self-diagnosis.
   Refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" .



Wiring Diagram — AT — VSSMTR

ECS0065R



TCM TERMINALS AND REFERENCE VALUE (MEASURED BETWEEN EACH TERMINALS AND 25 OR 48 (TCM GROUND)

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC) (Approx.)
40	PU/R	VEHICLE SPEED SENSOR	WHEN MOVING VEHICLE AT 2 TO 3 KM/H (1 TO 2 MPH) FOR 1 M (3 FT)	VOLTAGE VARIES BETWEEN LESS THAN 1V AND MORE THAN 4.5 V

SAT313K

Diagnostic Procedure

ECS0065S

1. CHECK INPUT SIGNAL

With CONSULT-II

DATA MONITOR	
MONITORING	
VHCL/S SE-A/T	XXX km/h
VHCL/S SE-MTR	XXX km/h
THRTL POS SEN	XXX V
FLUID TEMP SE	XXX V
BATTERY VOLT	XXX V

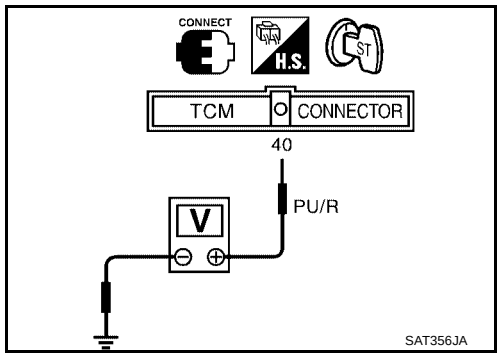
SAT614J

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “VHCL/S SE·MTR” while driving.
   Check the value changes according to driving speed.

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM terminal 40 and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.

Voltage :Voltage varies between less than 1V and more than 4.5V.



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING ITEM

Check the following items:

- Vehicle speed sensor and ground circuit for vehicle speed sensor
  Refer to DI-3, "METERS AND GAUGES" .
- Harness for short or open between TCM and vehicle speed sensor (Main harness)

OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK DTC

Perform AT-580, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

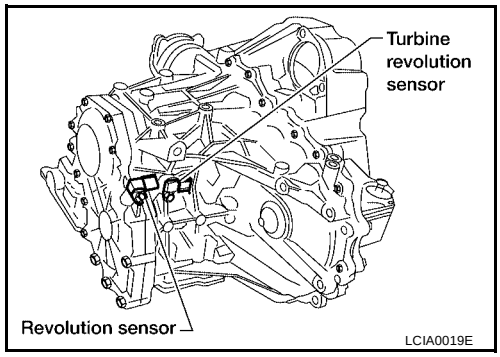
DTC TURBINE REVOLUTION SENSOR

PFP:31935

Description

ECS0065T

The turbine revolution sensor detects input shaft rpm (revolutions per minute). It is located on the input side of the automatic transaxle. The vehicle speed sensor A/T (Revolution sensor) is located on the output side of the automatic transaxle. With the two sensors, input and output shaft rpms are accurately detected. The result is optimal shift timing during deceleration and improved shifting.



ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when...	Check items (Possible cause)
: TURBINE REV : 10th judgement flicker	TCM does not receive the proper voltage signal from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Turbine revolution sensor

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

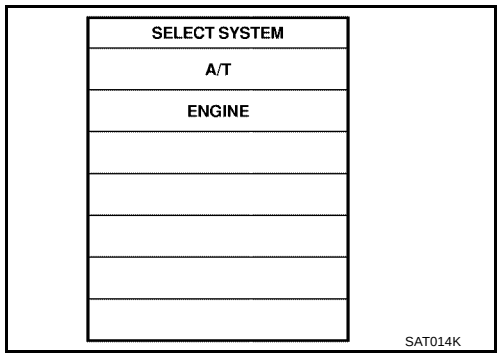
CAUTION:

- **Always drive vehicle at a safe speed.**
- **If conducting this "DTC CONFIRMATION PROCEDURE" again, always turn ignition switch OFF and wait at least 5 seconds before continuing.**

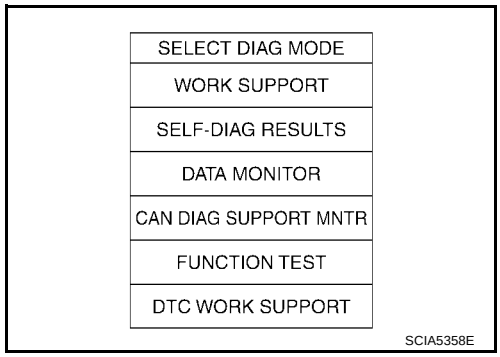
After the repair, perform the following procedure to confirm the malfunction is eliminated.

With CONSULT-II

1. Start engine.



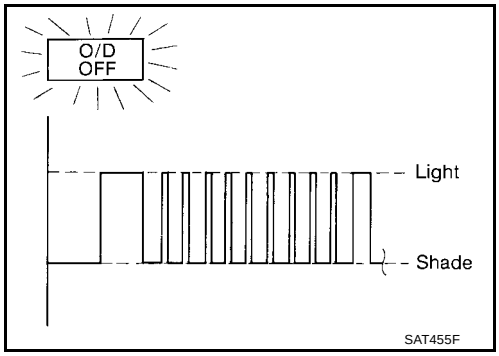
2. Select "DATA MONITOR" mode for "A/T" with CONSULT-II.
3. Drive vehicle under the following conditions:
   Selector lever in D, vehicle speed higher than 40 km/h (25 MPH), engine speed higher than 1,500 rpm, throttle opening greater than 1.0/8 of the full throttle position and driving for more than 5 seconds.



Without CONSULT-II

1. Start engine.
2. Drive vehicle under the following conditions:
   Selector lever in "D" and vehicle speed higher than 40 km/h (25 MPH), engine speed higher than 1,500 rpm, throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.

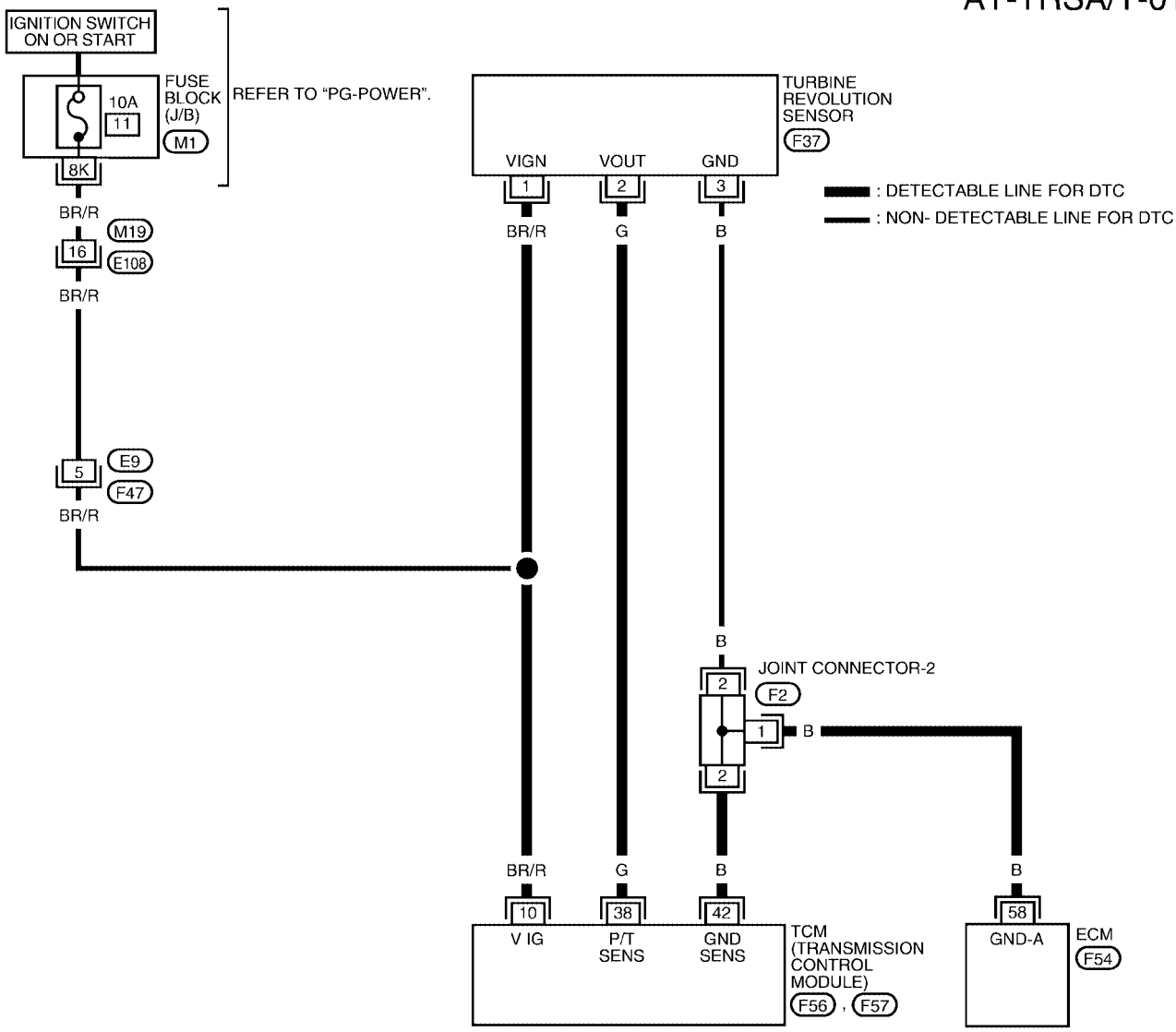
3. Perform self-diagnosis.
   Refer to AT-442, "TCM SELF-DIAGNOSTIC PROCEDURE (NO TOOLS)" .

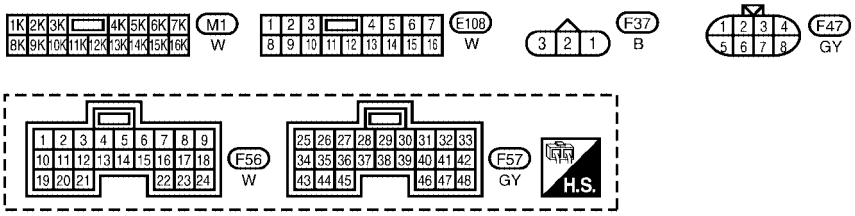


Wiring Diagram — AT — TRSA/T

ECS0065U

AT-TRSA/T-01





REFER TO THE FOLLOWING.
F2 - JOINT CONNECTOR
F54 - ELECTRICAL UNITS

LCWA0003E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	BR/R	TURBINE REVOLUTION SENSOR (POWER)	IGNITION ON	BATTERY VOLTAGE
38	G	TURBINE REVOLUTION SENSOR (SIGNAL)	WITH ENGINE RUNNING AT 1,000 RPM	APPROX. 1.2V VOLTAGE SHOULD INCREASE WITH ENGINE RPM
42	B	SENSOR GROUND	—	—

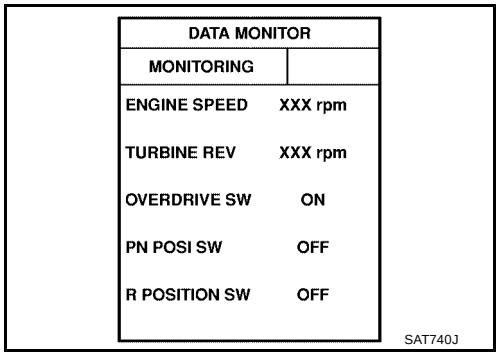
Diagnostic Procedure

ECS0065V

1. CHECK INPUT SIGNAL

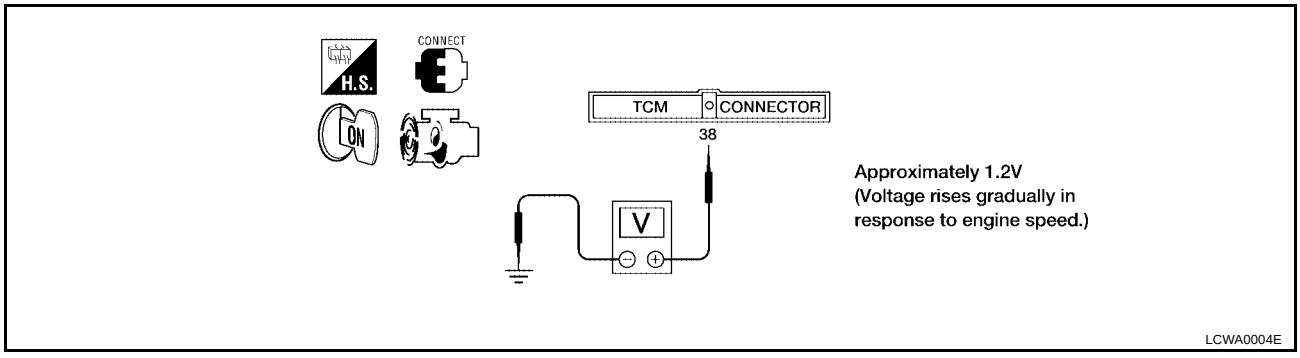
With CONSULT-II

1. Start engine.
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out the value of “TURBINE REF” while driving.
   Check the value changes according to driving speed.



Without CONSULT-II

1. Start engine.
2. Check voltage between TCM terminal 38 and ground (measure in AC range).



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING ITEM

Check harness for short or open between TCM and turbine revolution sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace damaged parts.

3. CHECK DTC

Perform "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION, AT-585, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 4.

4. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminal for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END.**
NG >> Repair or replace damaged parts.

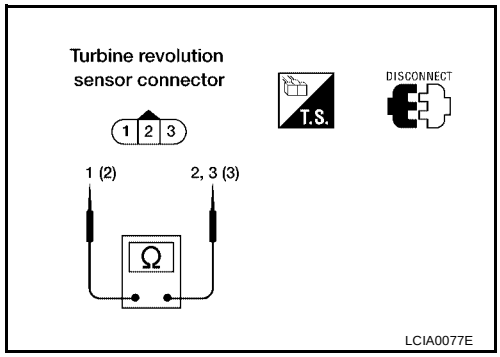
Component Inspection

ECS0065W

TURBINE REVOLUTION SENSOR

- Check resistance between terminals 1, 2 and 3.

Terminal No.		Resistance (Approx.)
1	2	2.4 - 2.8kΩ
1	3	No continuity
2	3	No continuity



DTC U1000 CAN COMMUNICATION LINE

PFP:23710

Description

ECS0065X

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

ECS0065Y

- This is an OBD-II self-diagnostic item.
- Diagnostic trouble code “CAN COMM CIRCUIT” with CONSULT-II or U1000 without CONSULT-II is detected when TCM cannot communicate to other control unit.

Possible Cause

ECS0065Z

Harness or connectors
(CAN communication line is open or shorted.)

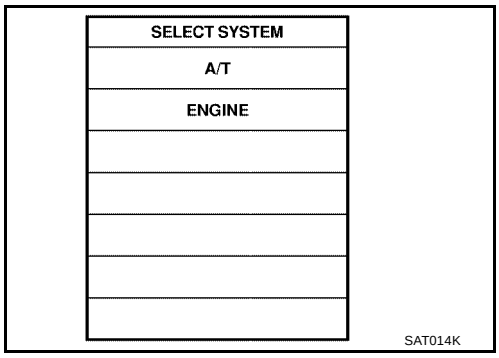
DTC Confirmation Procedure

ECS00660

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
After the repair, perform the following procedure to confirm the malfunction is eliminated.

WITH CONSULT-II

1. Turn ignition switch to ON position. (Do not start engine.)
2. Select “DATA MONITOR” mode for “ENGINE” with CONSULT-II.
3. Start engine and wait for at least 6 seconds.
4. If DTC is detected, go to AT-592, "Diagnostic Procedure" .



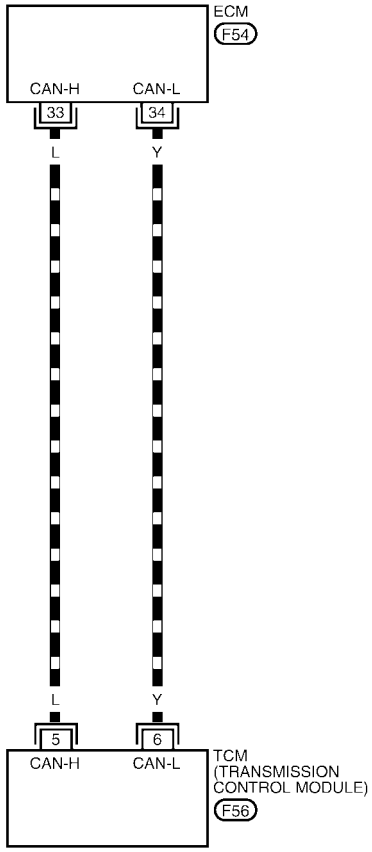
WITH GST

Follow the procedure “WITH CONSULT-II”.

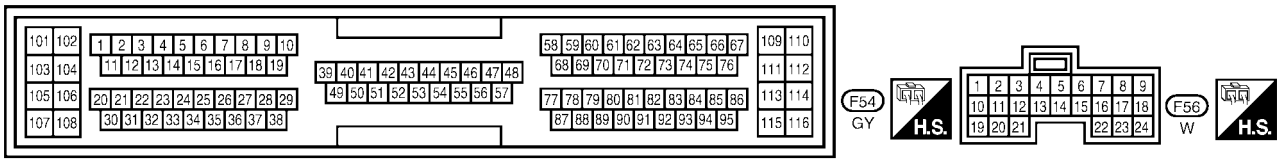
Wiring Diagram — AT — CAN

ECS00661

AT-CAN-01



: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
: DATA LINE



LCWA0002E

Diagnostic Procedure

ECS009SF

1. CHECK CAN COMMUNICATION CIRCUIT

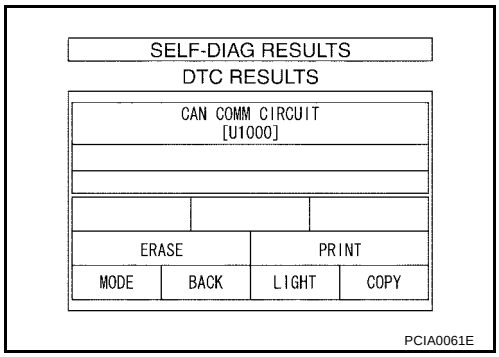
With CONSULT-II

1. Turn ignition switch "ON" and start engine.
2. Select “SELF-DIAG RESULTS” mode for “A/T” with CONSULT-II.

Is any malfunction of the "CAN COMM CIRCUIT" indicated?

Yes >> Print out CONSULT-II screen, GO TO LAN section. Refer to LAN-3, "CAN Communication Unit" .

No >> Inspection End.



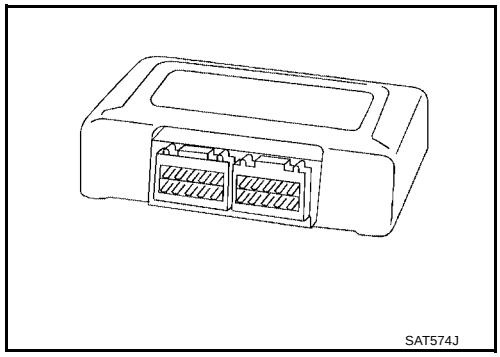
DTC CONTROL UNIT (RAM), CONTROL UNIT (ROM)

PFP:31036

Description

ECS00663

The TCM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the A/T.


SAT574J

On Board Diagnosis Logic

ECS00664

Diagnostic trouble code CONTROL UNIT (RAM), CONTROL UNIT (ROM) with CONSULT-II is detected when TCM memory (RAM) or (ROM).

Possible Cause

ECS00665

Check TCM.

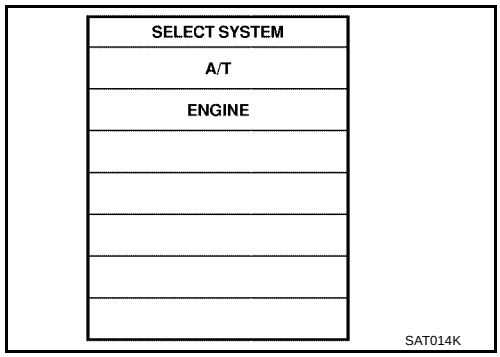
Diagnostic Trouble Code (DTC) Confirmation Procedure

ECS00666

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

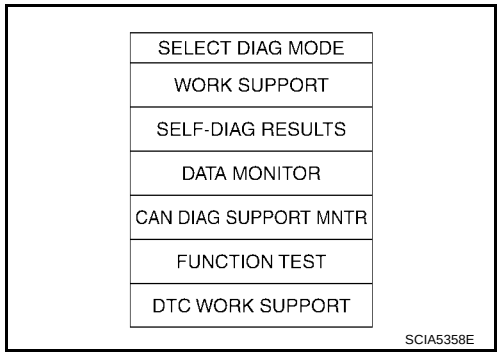
WITH CONSULT-II

1. Turn ignition switch ON and select "DATA MONITOR" mode for A/T with CONSULT-II.
2. Start engine.



SAT014K

3. Run engine for at least 2 seconds at idle speed.



SCIA5358E

Diagnostic Procedure

ECS00667

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch ON and select “SELF DIAGNOSIS” mode for A/T with CONSULT-II.
2. Touch “ERASE”.
3. Perform AT-593, "Diagnostic Trouble Code (DTC) Confirmation Procedure" .
4. Is the “CONTROL UNIT (RAM)” or “CONTROL UNIT (ROM)” displayed again?

Yes or No

Yes >> Replace TCM.
No >> **INSPECTION END**

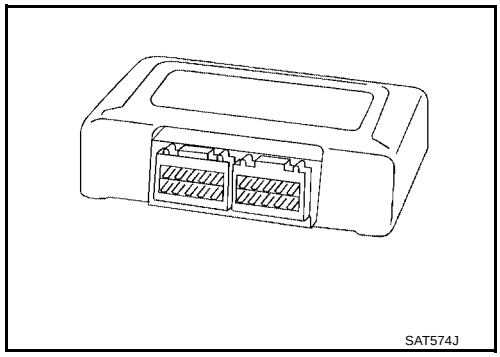
DTC CONTROL UNIT (EEP ROM)

PFP:31036

Description

ECS00668

The TCM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the A/T.


SAT574J

ON BOARD DIAGNOSIS LOGIC

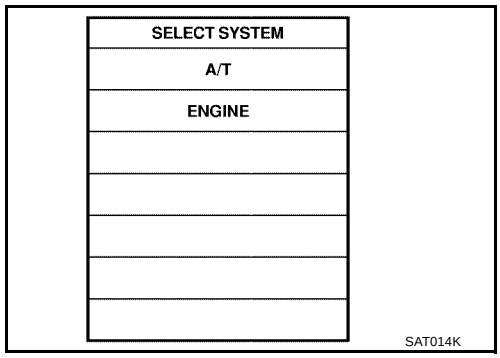
Diagnostic trouble code	Malfunction is detected when...	Check item (Possible cause)
: CONT UNIT (EEP ROM)	TCM memory (EEP ROM) is malfunctioning.	● TCM

DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 5 seconds before conducting the next test.

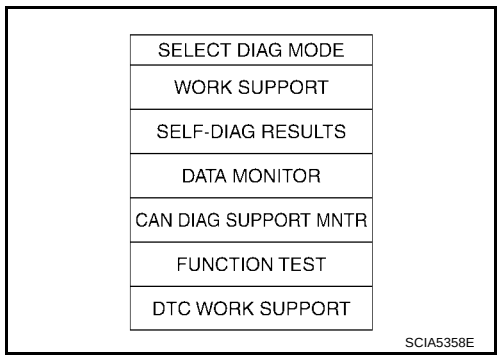
With CONSULT-II

1. Turn ignition switch ON and select "DATA MONITOR" mode for A/T with CONSULT-II.
2. Start engine.



SAT014K

3. Run engine for at least 2 seconds at idle speed.



SCIA5358E

Diagnostic Procedure

ECS00669

1. CHECK DTC

With CONSULT-II

1. Turn ignition switch ON and select “SELF DIAGNOSIS” mode for A/T with CONSULT-II.
2. Move selector lever to “R” position.
3. Depress accelerator pedal (Full throttle position).
4. Touch “ERASE”.
5. Turn ignition switch OFF position for 10 seconds.

Perform AT-595, "DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE" .

Is the “CONT UNIT (EEP ROM)” displayed again?

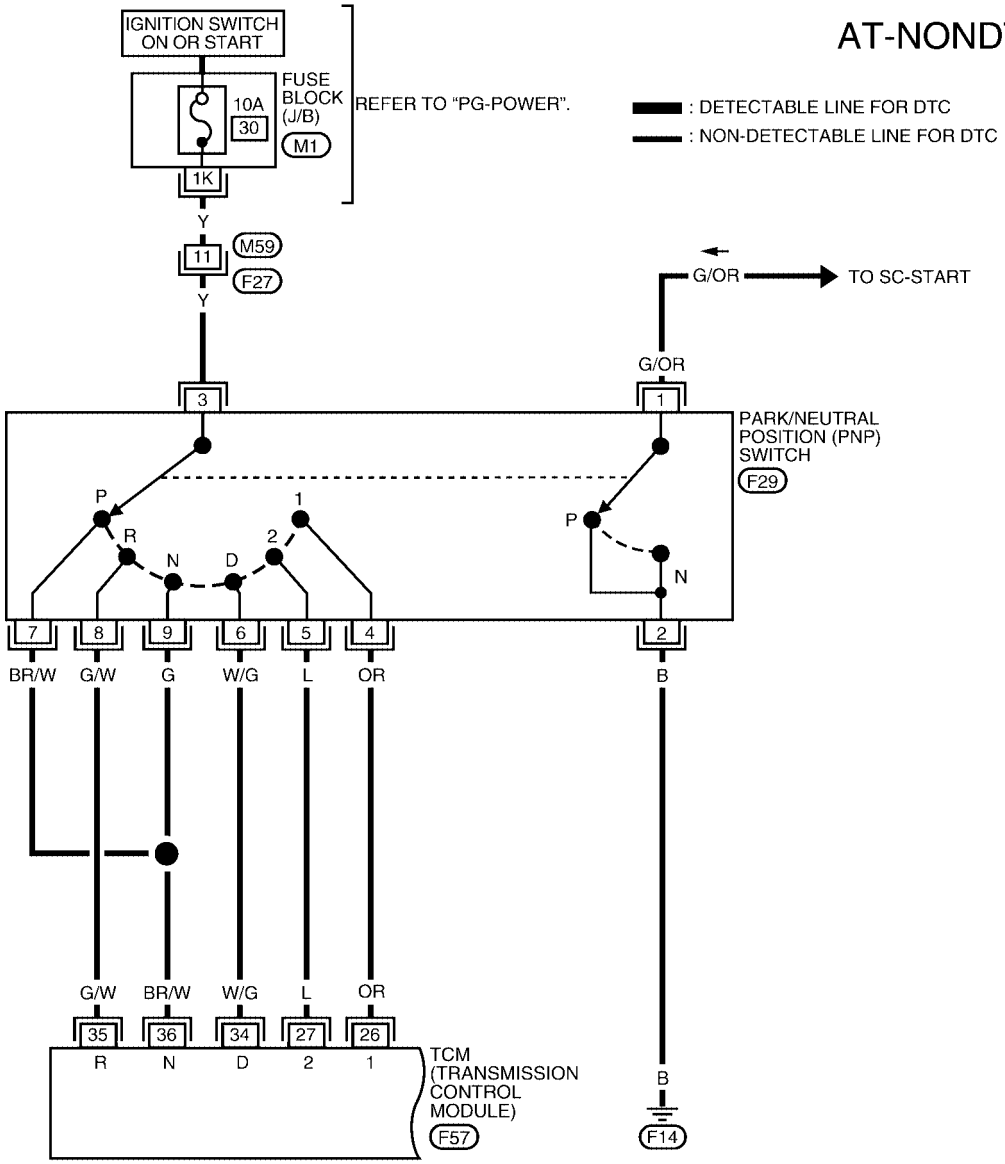
Yes >> Replace TCM.
No >> **INSPECTION END**

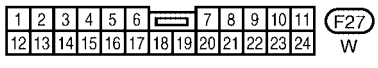
TROUBLE DIAGNOSIS FOR SYMPTOMS

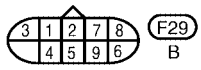
PFP:00007

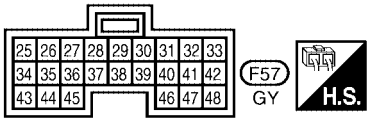
Wiring Diagram — AT — NONDTC

ECS0066A





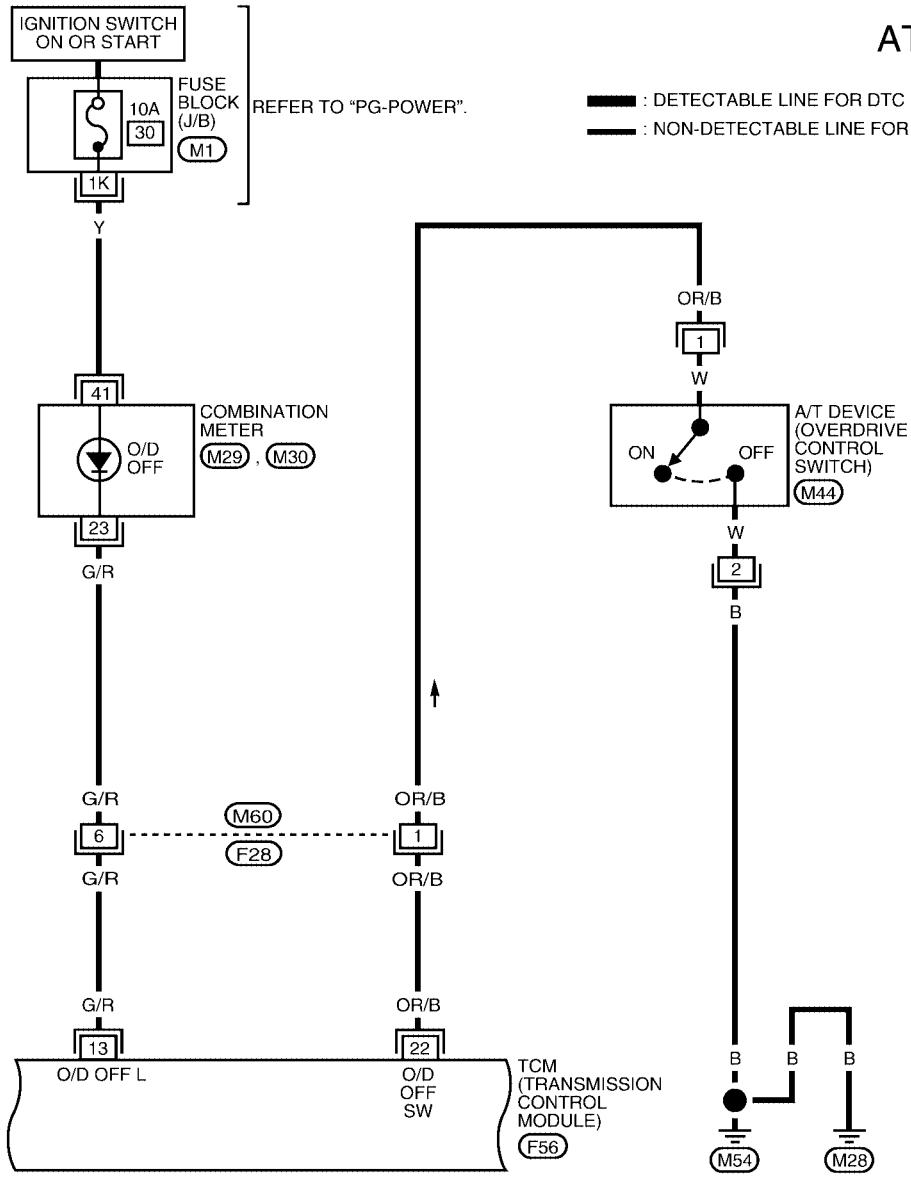


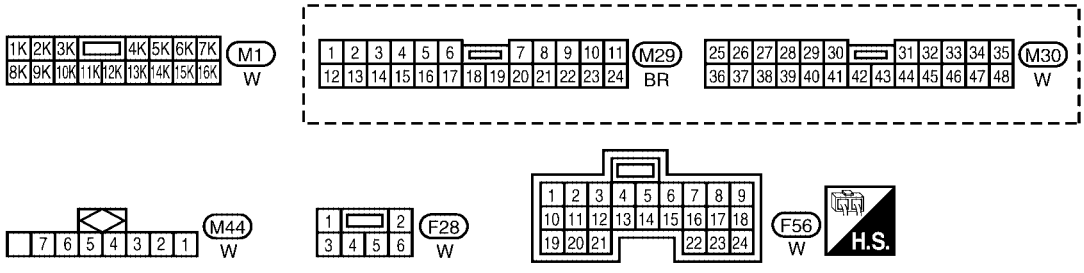


WCWA0081E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
26	OR	PNP SWITCH 1 POSITION	IGNITION ON AND SELECTOR LEVER IN 1 POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V
27	L	PNP SWITCH 2 POSITION	IGNITION ON AND SELECTOR LEVER IN 2 POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V
34	W/G	PNP SWITCH D POSITION	IGNITION ON AND SELECTOR LEVER IN D POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V
35	G/W	PNP SWITCH R POSITION	IGNITION ON AND SELECTOR LEVER IN R POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V
36	BR/W	PNP SWITCH P OR N POSITION	IGNITION ON AND SELECTOR LEVER IN P OR N POSITION	BATTERY VOLTAGE
			IGNITION ON AND SELECTOR LEVER IN OTHER POSITIONS	APPROX. 0V

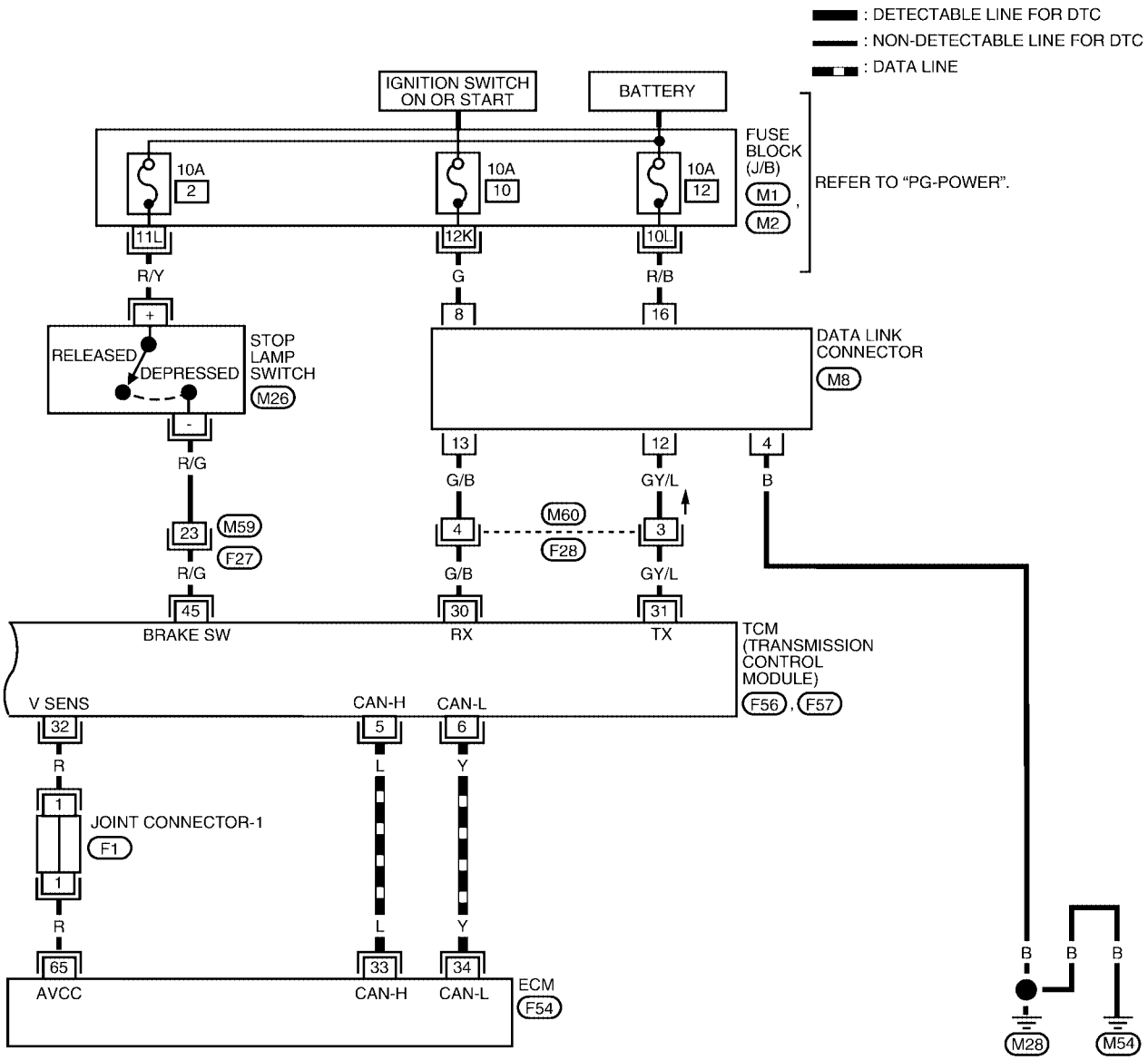

AT-NONDTC-02
IGNITION SWITCH ON OR START
FUSE BLOCK (J/B)
10A
30
M1
1K
REFER TO "PG-POWER".
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
Y
41
COMBINATION METER
O/D OFF
M29 , M30
23
G/R
OR/B
1
W
A/T DEVICE (OVERDRIVE CONTROL SWITCH)
ON
OFF
M44
W
2
B
G/R
6
M60
F28
OR/B
1
G/R
OR/B
G/R
13
O/D OFF L
OR/B
22
O/D OFF SW
TCM (TRANSMISSION CONTROL MODULE)
F56
B
B
B
M54
M28

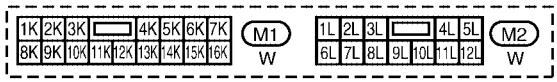

M1
W
M29
BR
M30
W
M44
W
F28
W
F56
W
H.S.

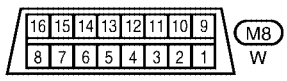
WCWA0082E

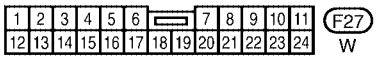
TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
13	G/R	O/D OFF INDICATOR LAMP	WHEN SETTING OVERDRIVE CONTROL SWITCH "OFF"	0V
			WHEN SETTING OVERDRIVE CONTROL SWITCH "ON"	BATTERY VOLTAGE
22	OR/B	OVERDRIVE CONTROL SWITCH	WHEN SETTING OVERDRIVE CONTROL SWITCH "ON"	BATTERY VOLTAGE
			WHEN SETTING OVERDRIVE CONTROL SWITCH "OFF"	0V

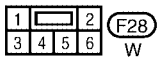
AT-NONDTC-03

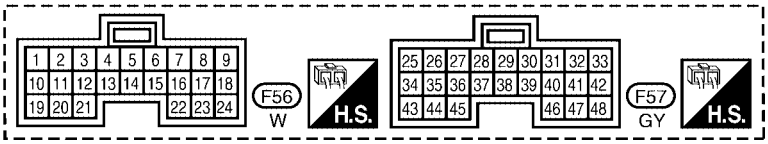












REFER TO THE FOLLOWING.
F1 - JOINT CONNECTOR
F54 - ELECTRICAL UNITS

WCWA0083E

TCM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND 25 OR 48 (TCM GROUND)

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
5	L	CAN-H	—	—
6	Y	CAN-L	—	—
30	G/B	DATA LINK CONNECTOR (RX)	—	—
31	GY/L	DATA LINK CONNECTOR (TX)	—	—
32	R	SENSOR POWER	IGNITION SWITCH ON	APPROX. 4.5 - 5.5v
			IGNITION SWITCH OFF	APPROX. 0V
45	R/G	STOP LAMP SWITCH	BRAKE PEDAL DEPRESSED	BATTERY VOLTAGE
			BRAKE PEDAL RELEASED	APPROX. 0V

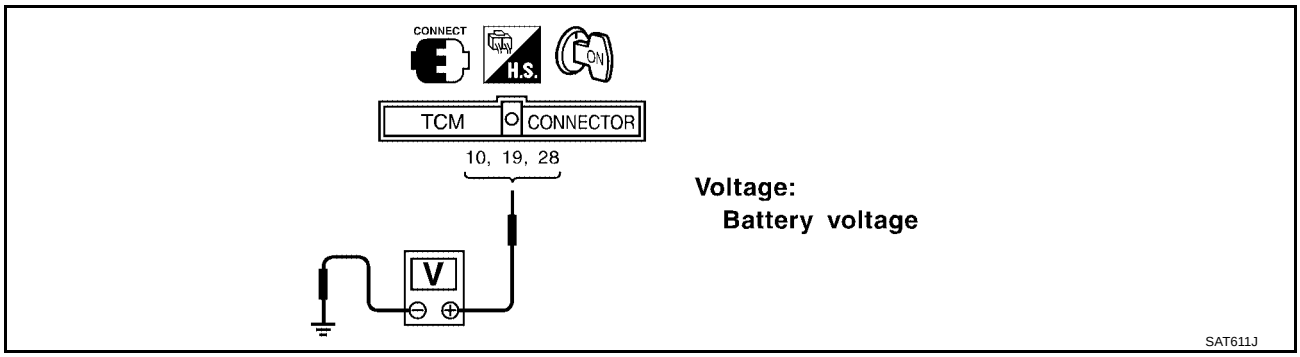
1. O/D OFF Indicator Lamp Does Not Come On

ECS0066B

SYMPTOM:
O/D OFF indicator lamp does not come on for about 2 seconds when turning ignition switch to ON.

1. CHECK TCM POWER SOURCE

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Check voltage between TCM terminals 10, 19, 28 and ground.

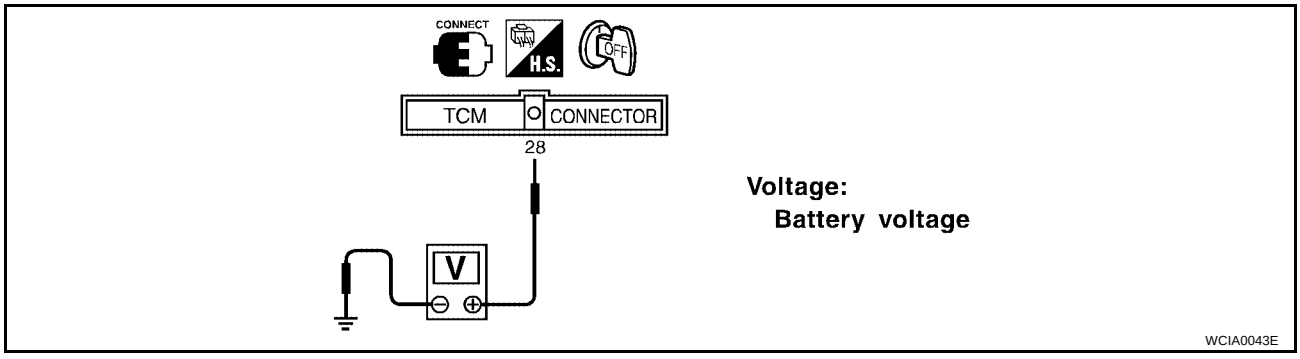


OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK POWER SOURCE STEP 2

1. Turn ignition switch to OFF position.
2. Check voltage between TCM terminal 28 and ground.



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING ITEM

Check the following items:

- Harness for short or open between ignition switch and TCM (Main harness)
  Refer to AT-488, "Wiring Diagram — AT — MAIN" .
- Harness for short or open between battery and TCM (Main harness)
  Refer to AT-488, "Wiring Diagram — AT — MAIN" .
- Ignition switch and fuse
  Refer to PG-2, "POWER SUPPLY ROUTING" .

OK or NG

OK >> GO TO 4.
NG >> Repair or replace damaged parts.

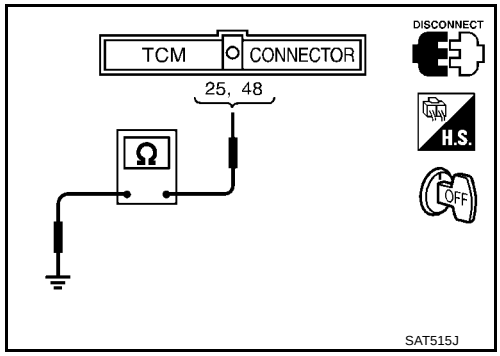
4. CHECK TCM GROUND CIRCUIT

1. Turn ignition switch to OFF position.
2. Disconnect TCM harness connector.
3. Check continuity between TCM terminals 25, 48 and ground.

Continuity should exist.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors. Refer to AT-488, "Wiring Diagram — AT — MAIN" .



5. CHECK LAMP CIRCUIT

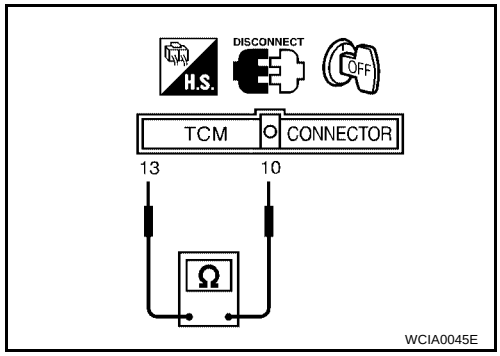
1. Turn ignition switch to OFF position.
2. Check resistance between TCM terminals 10 and 13.

Resistance :50 - 100Ω

3. Reinstall any part removed.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.



6. DETECT MALFUNCTIONING ITEM

Check the following items:

- Harness and fuse for short or open between ignition switch and O/D OFF indicator lamp (Main harness)
  Refer to PG-2, "POWER SUPPLY ROUTING" .
- Harness for short or open between O/D OFF indicator lamp and TCM.

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

7. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

8. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

2. Engine Cannot Be Started In P and N Position

ECS0066C

SYMPTOM:

- **Engine cannot be started with selector lever in P or N position.**
- **Engine can be started with selector lever in D, 2, 1 or R position.**

1. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT

With CONSULT-II

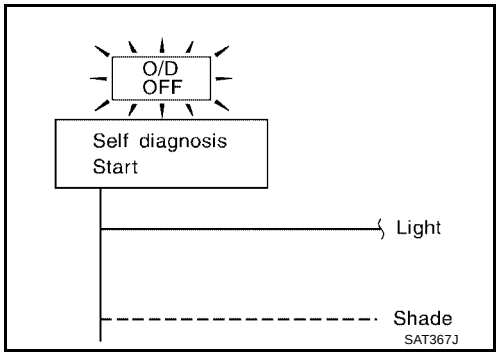
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to park/neutral position (PNP) switch circuit?

Without CONSULT-II

Does self-diagnosis show damage to park/neutral position (PNP) switch circuit?

Yes or No

Yes >> Check park/neutral position (PNP) switch circuit. Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" .
No >> GO TO 2.



2. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH

Check for short or open of park/neutral position (PNP) switch harness connector terminals 1 and 2. Refer to AT-493, "Wiring Diagram — AT — PNP/SW" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace park/neutral position (PNP) switch.

3. CHECK STARTING SYSTEM

Check starting system. Refer to SC-9, "STARTING SYSTEM" .

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

3. In P Position, Vehicle Moves Forward or Backward When Pushed

ECS0066D

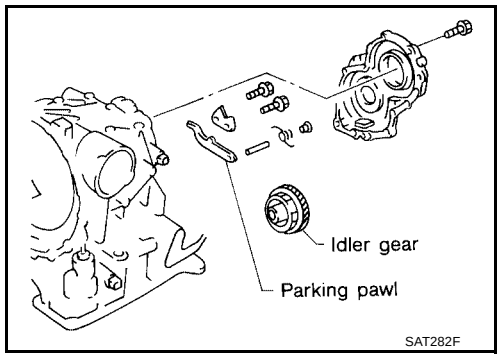
SYMPTOM:
Vehicle moves when it is pushed forward or backward with selector lever in P position.

1. CHECK PARKING COMPONENTS

Check parking components. Refer to AT-652, "OVERHAUL" and AT-729, "ASSEMBLY" .

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.



4. In N Position, Vehicle Moves

ECS0066E

SYMPTOM:
Vehicle moves forward or backward when selecting N position.

1. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT

With CONSULT-II

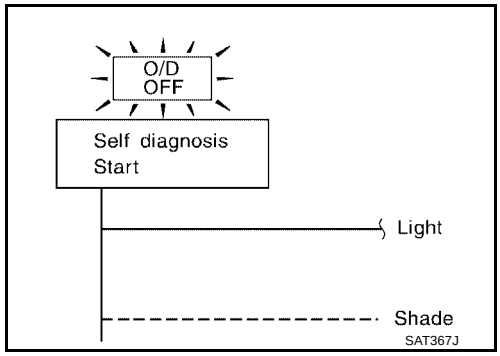
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to park/neutral position (PNP) switch circuit?

Without CONSULT-II

Does self-diagnosis show damage to park/neutral position (PNP) switch circuit?

Yes or No

Yes >> Check park/neutral position (PNP) switch circuit. Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" .
No >> GO TO 2.



2. CHECK CONTROL LINKAGE

Check control cable.

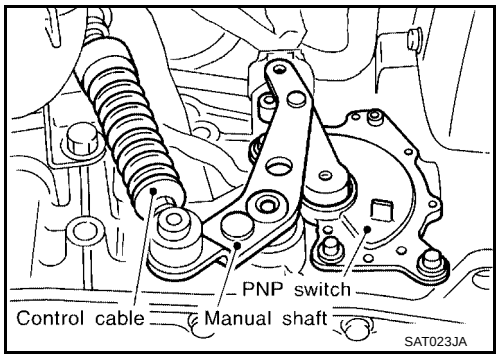
OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. ADJUST CONTROL CABLE

Adjust control cable.

>> Refer to AT-647, "Control Cable Adjustment" .

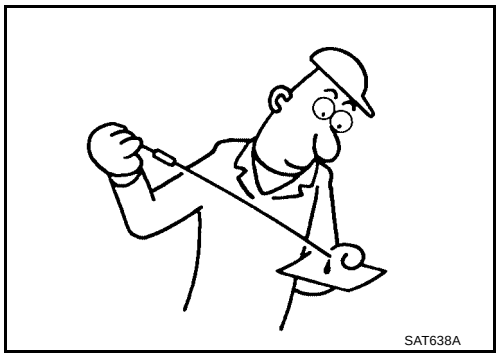


4. CHECK A/T FLUID LEVEL

Check A/T fluid level.

OK or NG

OK >> GO TO 5.
NG >> Refill ATF.

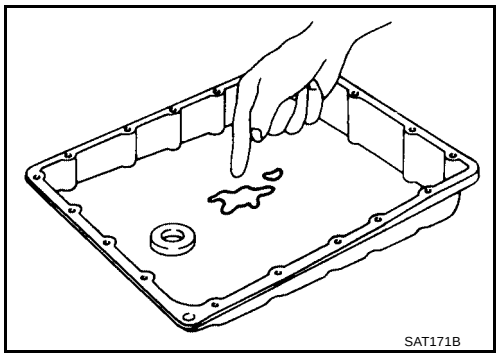


5. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.



6. DETECT MALFUNCTIONING ITEM

1. Disassemble A/T.
2. Check the following items:

- Forward clutch assembly
- Overrun clutch assembly
- Reverse clutch assembly

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

7. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

8. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

5. Large Shock N → R Position

ECS0066F

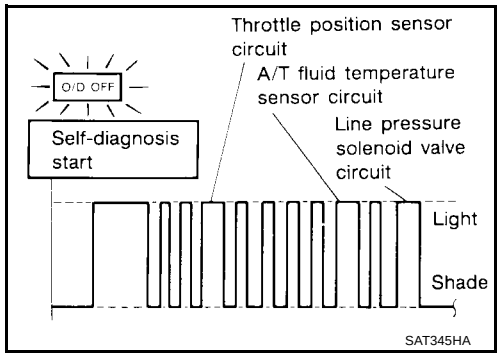
SYMPTOM:
There is large shock when changing from N to R position.

1. CHECK SELF-DIAGNOSTIS RESULTS

Does self-diagnosis show damage to A/T fluid temperature sensor, line pressure solenoid valve or throttle position sensor [accelerator pedal position (APP) sensor] circuit?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.



2. CHECK DAMAGED CIRCUIT

Check damaged circuit.

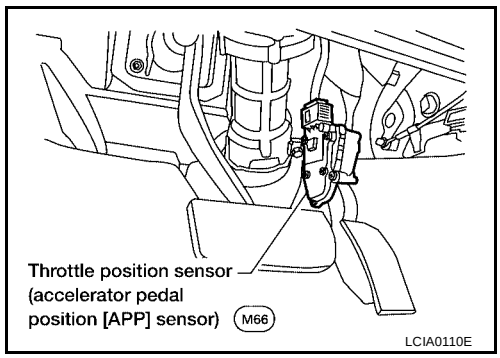
>> Refer to AT-497, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" , AT-547, "DTC P0745 LINE PRESSURE SOLENOID VALVE" , and AT-563, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]" .

3. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor. Refer to EC-1475, "DTC P0222, P0223 TP SENSOR" , and EC-1751, "DTC P2122, P2123 APP SENSOR" .

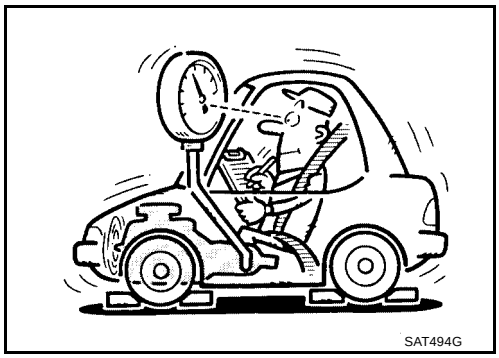
OK or NG

OK >> GO TO 4.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].



4. CHECK LINE PRESSURE

Check line pressure at idle with selector lever in D position. Refer to AT-456, "Line Pressure Test" .



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

6. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

7. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

6. Vehicle Does Not Creep Backward In R Position

ECS0066G

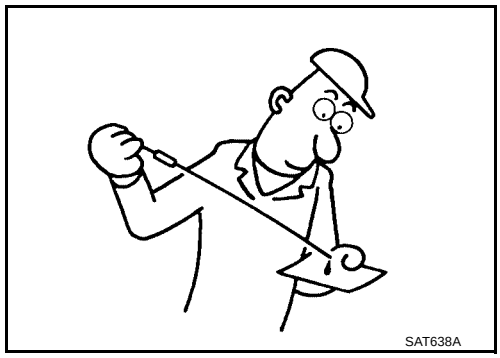
SYMPTOM:
Vehicle does not creep backward when selecting R position.

1. CHECK A/T FLUID LEVEL

Check A/T fluid level.

OK or NG

OK >> GO TO 2.
NG >> Refill ATF.

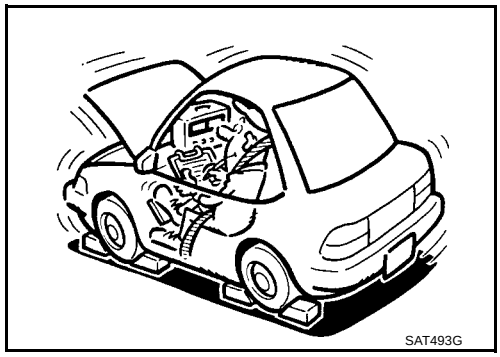

SAT638A

2. CHECK STALL REVOLUTION

Check stall revolution with selector lever in 1 and R positions.

OK or NG

OK >> GO TO 5.
OK in 1 position, NG in R position>>GO TO 3.
NG in both 1 and R positions>>GO TO 4.


SAT493G

3. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T.
4. Check the following items:

- Oil pump assembly
- Torque converter
- Reverse clutch assembly
- High clutch assembly

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

4. DETECT MALFUNCTIONING ITEM

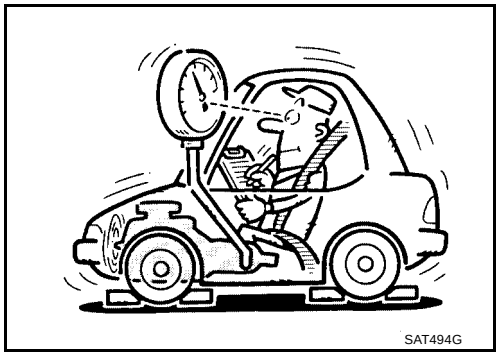
1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly
- Torque converter
- Reverse clutch assembly
- High clutch assembly
- Low & reverse brake assembly
- Low one-way clutch

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

5. CHECK LINE PRESSURE

Check line pressure at idle with selector lever in R position. Refer to AT-456, "Line Pressure Test" .


SAT494G

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING ITEM

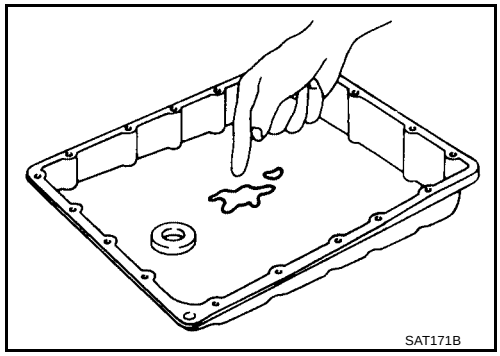
1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following item:
- Oil pump assembly

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

7. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T.
4. Check the following items:

- Oil pump assembly
- Torque converter
- Reverse clutch assembly
- High clutch assembly
- Low & reverse brake assembly
- Low one-way clutch

OK or NG

OK >> GO TO 9.
NG >> Repair or replace damaged parts.

9. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

10. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

7. Vehicle Does Not Creep Forward in D, 2 or 1 Position

ECS0066H

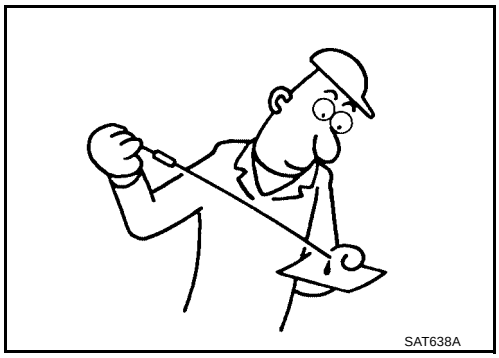
SYMPTOM:
Vehicle does not creep forward when selecting D, 2 or 1 position.

1. CHECK A/T FLUID LEVEL

Check A/T fluid level.

OK or NG

OK >> GO TO 2.
NG >> Refill ATF.

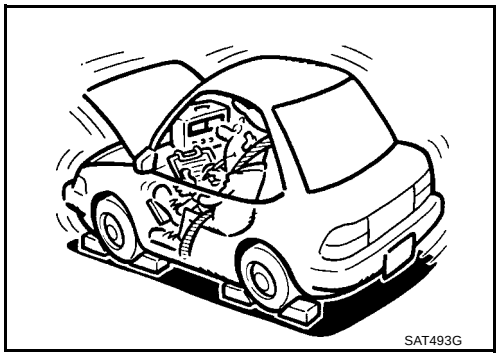

SAT638A

2. CHECK STALL REVOLUTION

Check stall revolution with selector lever in D position. Refer to AT-452, "Stall Test" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.


SAT493G

3. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T.
4. Check the following items:

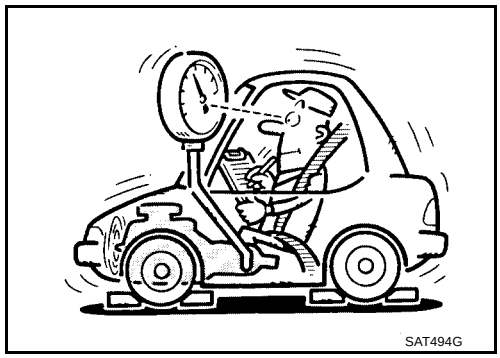
- Oil pump assembly
- Forward clutch assembly
- Forward one-way clutch
- Low one-way clutch
- Low & reverse brake assembly
- Torque converter

OK or NG

OK >> GO TO 4.
NG >> Repair or replace damaged parts.

4. CHECK LINE PRESSURE

Check line pressure at idle with selector lever in D position. Refer to AT-456, "Line Pressure Test" .



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T.
4. Check the following item:

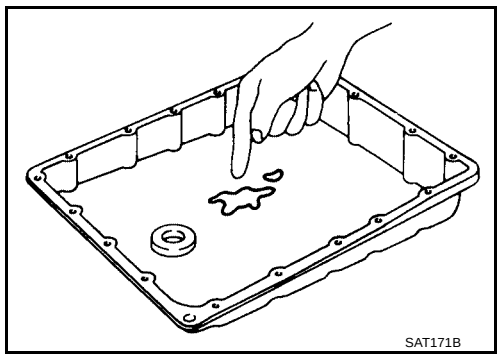
- Oil pump assembly

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

6. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T.
4. Check the following items:

- Oil pump assembly
- Forward clutch assembly
- Forward one-way clutch
- Low one-way clutch
- Low & reverse brake assembly
- Torque converter

OK or NG

OK >> GO TO 8.
NG >> Repair or replace damaged parts.

8. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 9.

9. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

8. Vehicle Cannot Be Started From D1

ECS0066I

SYMPTOM:
Vehicle cannot be started from D1 on Cruise test — Part 1.

1. CHECK SYMPTOM

Is “6. Vehicle Does Not Creep Backward In R Position” OK?

Yes or No

Yes >> GO TO 2.
No >> Go to AT-609, "6. Vehicle Does Not Creep Backward In R Position" .

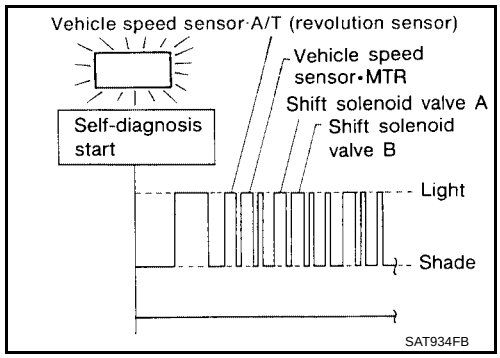
2. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to vehicle speed sensor·A/T (revolution sensor), shift solenoid valve A, B or vehicle speed sensor·MTR after cruise test?

Yes or No

Yes >> Check damaged circuit. Refer to AT-503, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" , AT-553, "DTC P0750 SHIFT SOLENOID VALVE A" , or AT-558, "DTC P0755 SHIFT SOLENOID VALVE B" .

No >> GO TO 3.



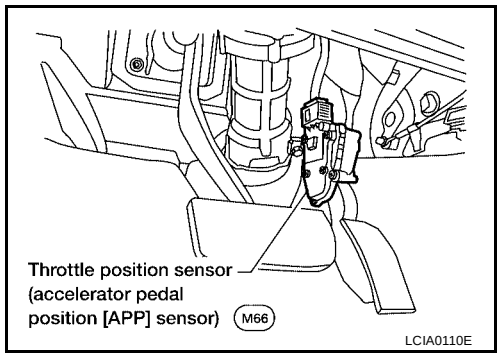
3. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-1391, "DTC P0122, P0123 TP SENSOR" and EC-1751, "DTC P2122, P2123 APP SENSOR" .

OK or NG

OK >> GO TO 4.

NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].



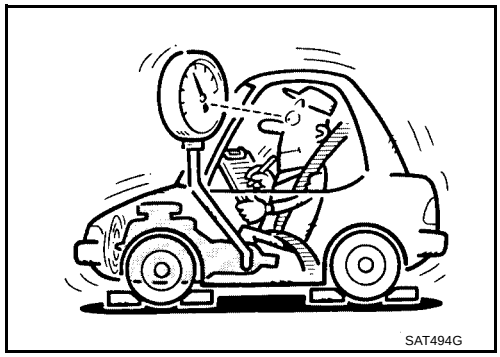
4. CHECK LINE PRESSURE

Check line pressure at stall point with selector lever in D position. Refer to AT-456, "Line Pressure Test" .

OK or NG

OK >> GO TO 6.

NG >> GO TO 5.



5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:
- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Forward clutch assembly
- Forward one-way clutch
- Low one-way clutch
- High clutch assembly
- Torque converter
- Oil pump assembly

OK or NG

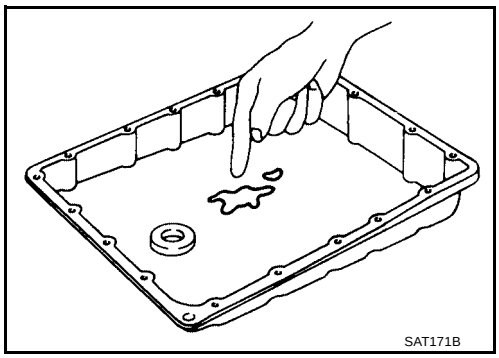
OK >> GO TO 8.
NG >> Repair or replace damaged parts.

6. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.

OK or NG

OK >> GO TO 7.
NG >> GO TO 5.



7. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:
- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 8.
NG >> Repair or replace damage parts.

8. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 9.

9. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

9. A/T Does Not Shift: $D_1 \rightarrow D_2$ or Does Not Kickdown: $D_4 \rightarrow D_2$

ECS0066J

SYMPTOM:
A/T does not shift from D_1 to D_2 at the specified speed.
A/T does not shift from D_4 to D_2 when depressing accelerator pedal fully at the specified speed.

1. CHECK SYMPTOM

Are “7. Vehicle Does Not Creep Forward In D, 2 Or 1 Position” and “8. Vehicle Cannot Be Started From D_1 ” OK?

Yes or No

Yes >> GO TO 2.
No >> Go to AT-612, "7. Vehicle Does Not Creep Forward in D, 2 or 1 Position" and AT-614, "8. Vehicle Cannot Be Started From D_1" .

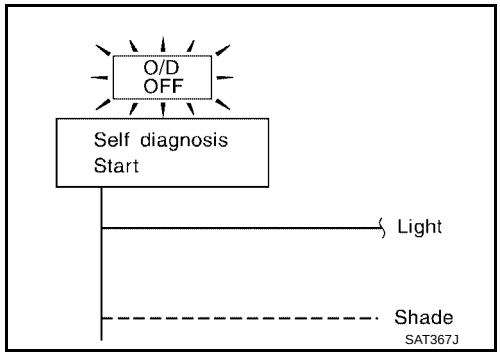
2. CHECK SELF-DIAGNOSTIC RESULTS

With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to park/neutral position (PNP) switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to park/neutral position (PNP) switch circuit?

Yes or No

Yes >> Check park/neutral position (PNP) switch circuit. Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" .
No >> GO TO 3.



3. CHECK VEHICLE SPEED SENSOR·A/T AND VEHICLE SPEED SENSOR·MTR CIRCUIT

Check vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR circuit. Refer to AT-503, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" and AT-580, "DTC VEHICLE SPEED SENSOR MTR" .

OK or NG

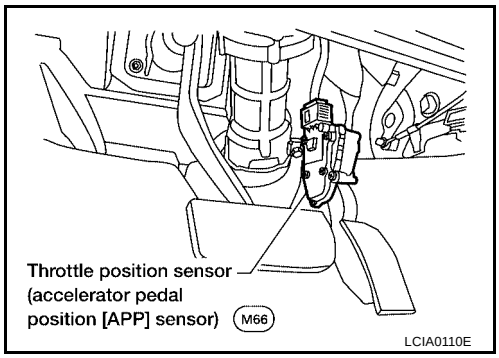
OK >> GO TO 4.
NG >> Repair or replace vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR circuits.

4. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-1391, "DTC P0122, P0123 TP SENSOR" and EC-1751, "DTC P2122, P2123 APP SENSOR" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].

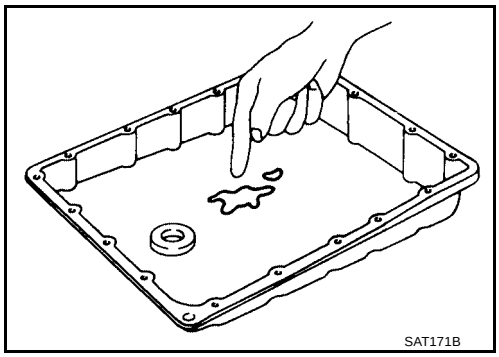


5. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.



6. DETECT MALFUNCTIONING ITEM

1. Remove control valve. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Shift valve A
- Shift solenoid valve A
- Pilot valve
- Pilot filter

3. Disassemble A/T.
4. Check the following items:

- Servo piston assembly
- Brake band
- Oil pump assembly

OK or NG

OK >> GO TO 8.
NG >> Repair or replace damaged parts.

7. DETECT MALFUNCTIONING ITEM

1. Remove control valve. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Shift valve A
- Shift solenoid valve A
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 8.
NG >> Repair or replace damaged parts.

8. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 9.

9. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

10. A/T Does Not Shift: $D_2 \rightarrow D_3$

ECS0066K

SYMPTOM:
A/T does not shift from D_2 to D_3 at the specified speed.

1. CHECK SYMPTOM

Are "7. Vehicle Does Not Creep Forward In D, 2 Or 1 Position" and "8. Vehicle Cannot Be Started From D_1 " OK?

Yes or No

Yes >> GO TO 2.
No >> Go to AT-612, "7. Vehicle Does Not Creep Forward in D, 2 or 1 Position" and AT-614, "8. Vehicle Cannot Be Started From D_1" .

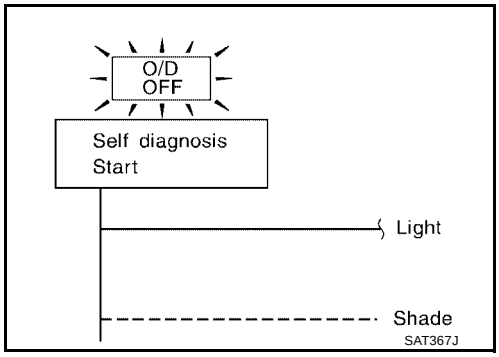
2. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT

With CONSULT-II

Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to park/neutral position (PNP) switch circuit?

Without CONSULT-II

Does self-diagnosis show damage to park/neutral position (PNP) switch circuit?



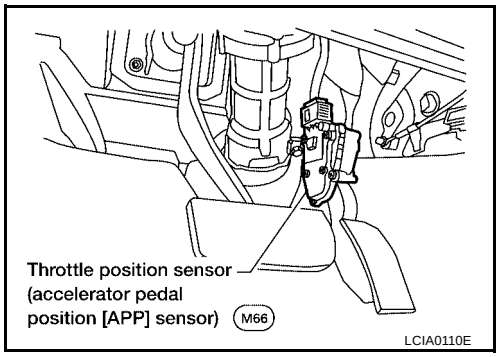
Yes or No

Yes >> Check park/neutral position (PNP) switch circuit. Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" .

No >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-1391, "DTC P0122, P0123 TP SENSOR" and EC-1751, "DTC P2122, P2123 APP SENSOR" .



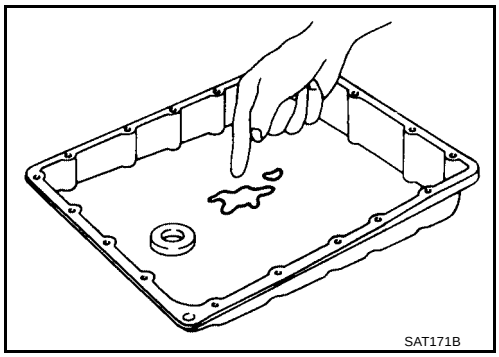
OK or NG

OK >> GO TO 4.

NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].

4. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 6.

NG >> GO TO 5.

5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter

3. Disassemble A/T.
4. Check the following items:

- Servo piston assembly
- High clutch assembly
- Oil pump assembly

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

6. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

7. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

8. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

11. A/T Does Not Shift: $D_3 \rightarrow D_4$

ECS0066L

SYMPTOM:

- **A/T does not shift from D_3 to D_4 at the specified speed.**
- **A/T must be warm before D_3 to D_4 shift will occur.**

1. CHECK SYMPTOM

Are “7. Vehicle Does Not Creep Forward In D, 2 Or 1 Position” and “8. Vehicle Cannot Be Started From D_1 ” OK?

Yes or No

Yes >> GO TO 2.
No >> Go to AT-612, "7. Vehicle Does Not Creep Forward in D, 2 or 1 Position" and AT-614, "8. Vehicle Cannot Be Started From D_1" .

2. CHECK SELF-DIAGNOSTIC RESULTS

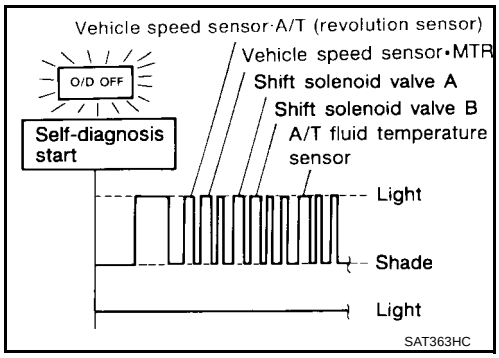
With CONSULT-II

Does self-diagnosis, after cruise test, show damage to any of the following circuits?

- Park/neutral position (PNP) switch
- Overdrive control switch
- A/T fluid temperature sensor
- Vehicle speed sensor·A/T (revolution sensor)
- Shift solenoid valve A or B
- Vehicle speed sensor·MTR

Yes or No

Yes >> Check damaged circuit. Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" , AT-497, "DTC P0710 A/T FLUID TEMPERATURE SENSOR CIRCUIT" , AT-503, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" , AT-553, "DTC P0750 SHIFT SOLENOID VALVE A" , AT-558, "DTC P0755 SHIFT SOLENOID VALVE B" , or AT-580, "DTC VEHICLE SPEED SENSOR MTR" .
No >> GO TO 3.

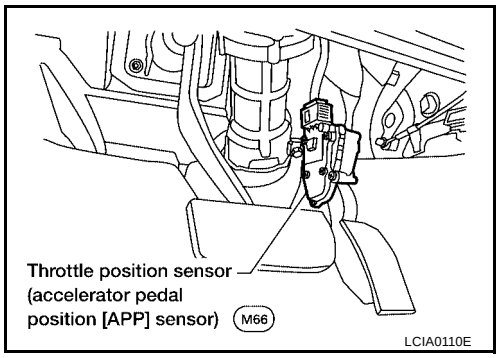


3. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-1391, "DTC P0122, P0123 TP SENSOR" and EC-1770, "DTC P2138 APP SENSOR" .

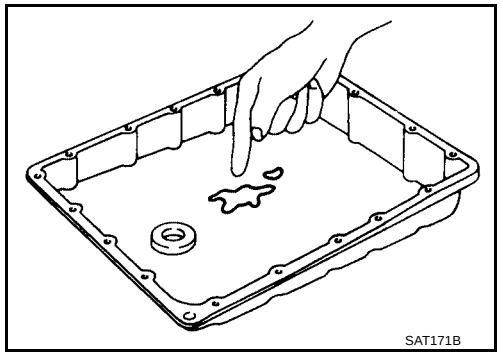
OK or NG

OK >> GO TO 4.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].



4. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Shift valve B
- Overrun clutch control valve
- Shift solenoid valve B
- Pilot valve
- Pilot filter

3. Disassemble A/T.
4. Check the following items:

- Servo piston assembly
- Brake band
- Torque converter
- Oil pump assembly

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

6. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Shift valve B
- Overrun clutch control valve
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

7. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

8. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

12. A/T Does Not Perform Lock-up

ECS0066M

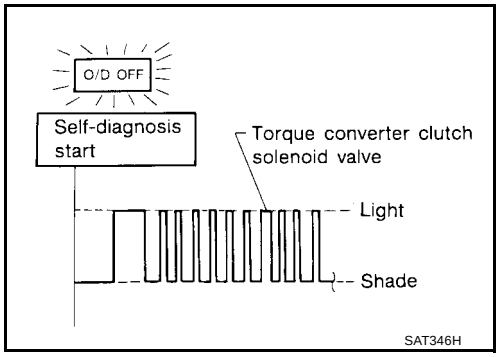
SYMPTOM:
A/T does not perform lock-up at the specified speed.

1. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to torque converter clutch solenoid valve circuit after cruise test?

Yes or No

Yes >> Check torque converter clutch solenoid valve circuit. Refer to AT-534, "DTC P0740 TORQUE CONVERTER CLUTCH SOLENOID VALVE" .
No >> GO TO 2.

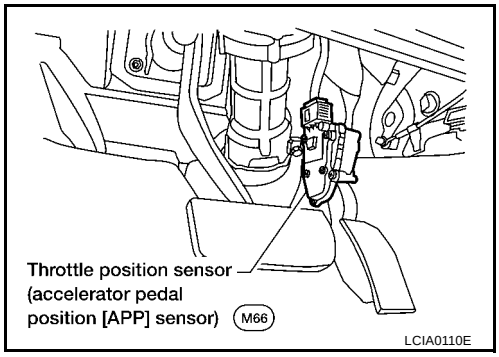


2. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-1475, "DTC P0222, P0223 TP SENSOR" and EC-1770, "DTC P2138 APP SENSOR" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].



3. DETECT MALFUNCTIONING ITEM

1. Remove control valve. Refer to AT-644, "REMOVAL" .
2. Check following items:

- Torque converter clutch control valve
- Torque converter relief valve
- Torque converter clutch solenoid valve
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 4.
NG >> Repair or replace damaged parts.

4. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

5. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

13. A/T Does Not Hold Lock-up Condition

ECS0066N

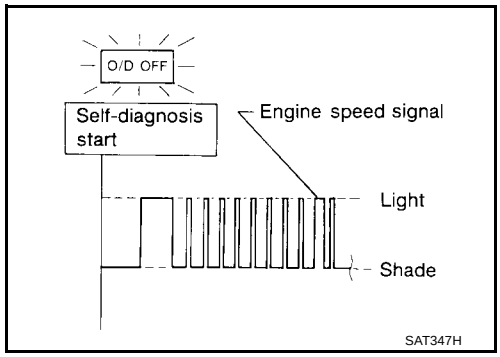
SYMPTOM:
A/T does not hold lock-up condition for more than 30 seconds.

1. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to engine speed signal circuit after cruise test?

Yes or No

Yes >> Check engine speed signal circuit. Refer to AT-508, "DTC P0725 ENGINE SPEED SIGNAL" .
No >> GO TO 2.

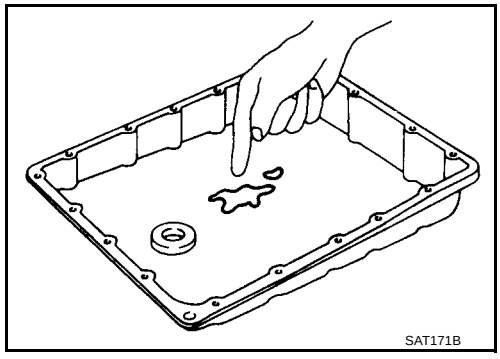


2. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check torque converter and oil pump assembly.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

4. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

5. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 6.

6. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

14. Lock-up Is Not Released

ECS0066O

SYMPTOM:
Lock-up is not released when accelerator pedal is released.

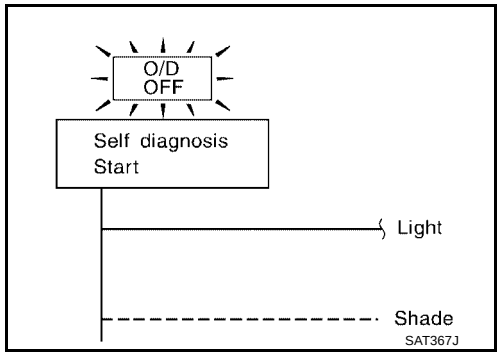
1. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR] CIRCUIT

With CONSULT-II

Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to the throttle position switch [accelerator pedal position (APP) sensor] circuit?

Without CONSULT-II

Does self-diagnosis show damage to the throttle position sensor [accelerator pedal position (APP) sensor] circuit?



Yes or No

Yes >> Check the throttle position switch [accelerator pedal position (APP) sensor circuit. Refer to EC-1391, "DTC P0122, P0123 TP SENSOR" and EC-1770, "DTC P2138 APP SENSOR" .

No >> GO TO 2.

2. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 3.

3. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**

NG >> Repair or replace damaged parts.

15. Engine Speed Does Not Return To Idle (Light Braking D4 → D3)

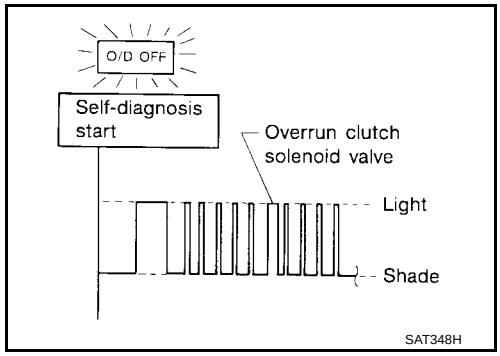
ECS0066P

SYMPTOM:

- **Engine speed does not smoothly return to idle when A/T shifts from D4 to D3 .**
- **Vehicle does not decelerate by engine brake when turning overdrive control switch OFF.**
- **Vehicle does not decelerate by engine brake when shifting A/T from D to 2 position.**

1. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to overrun clutch solenoid valve circuit after cruise test?



Yes or No

Yes >> Check overrun clutch solenoid valve circuit. Refer to AT-568, "DTC P1760 OVERRUN CLUTCH SOLENOID VALVE" .

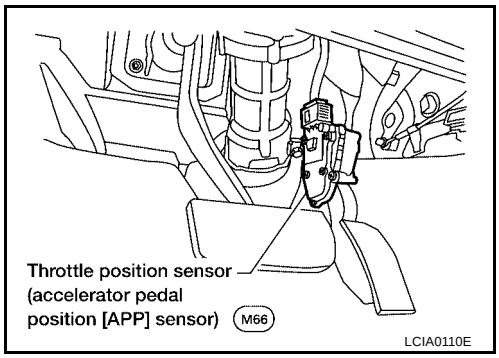
No >> GO TO 2.

2. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

Check throttle position sensor [accelerator pedal position (APP) sensor]. Refer to EC-1391, "DTC P0122, P0123 TP SENSOR" and EC-1770, "DTC P2138 APP SENSOR" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace throttle position sensor [accelerator pedal position (APP) sensor].

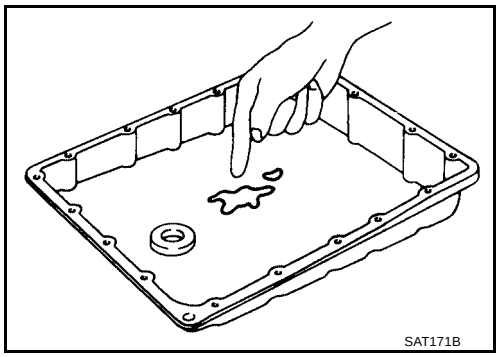


3. CHECK A/T FLUID CONDITION

1. Remove oil pan.
2. Check A/T fluid condition.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Overrun clutch control valve
- Overrun clutch reducing valve
- Overrun clutch solenoid valve

3. Disassemble A/T.
4. Check the following items:

- Overrun clutch assembly
- Oil pump assembly

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

5. DETECT MALFUNCTIONING ITEM

1. Remove control valve assembly. Refer to AT-644, "REMOVAL" .
2. Check the following items:

- Overrun clutch control valve
- Overrun clutch reducing valve
- Overrun clutch solenoid valve

OK or NG

OK >> GO TO 6.
NG >> Repair or replace damaged parts.

6. CHECK SYMPTOM

Check again.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

7. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

16. Vehicle Does Not Start From D1

ECS0066Q

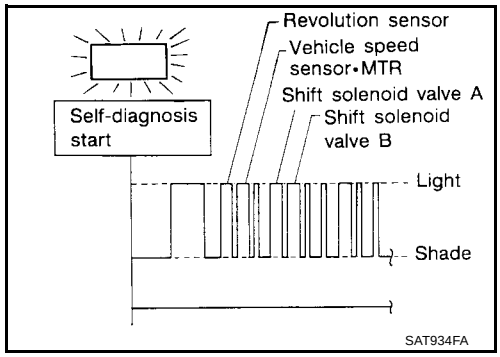
SYMPTOM:
Vehicle does not start from D1 on Cruise test — Part 2.

1. CHECK SELF-DIAGNOSTIC RESULTS

Does self-diagnosis show damage to vehicle speed sensor·A/T (revolution sensor), shift solenoid valve A, B or vehicle speed sensor·MTR after cruise test?

Yes or No

Yes >> Check damaged circuit. Refer to AT-503, "DTC P0720 VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR)" , AT-553, "DTC P0750 SHIFT SOLENOID VALVE A" , AT-558, "DTC P0755 SHIFT SOLENOID VALVE B" or AT-580, "DTC VEHICLE SPEED SENSOR MTR" .
No >> GO TO 2.



2. CHECK SYMPTOM

Check again.

OK or NG

OK >> Go to AT-614, "8. Vehicle Cannot Be Started From D1" .
NG >> GO TO 3.

3. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

17. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch ON → OFF

ECS0066R

SYMPTOM:
A/T does not shift from D_4 to D_3 when changing overdrive control switch to OFF position.

1. CHECK OVERDRIVE SWITCH CIRCUIT

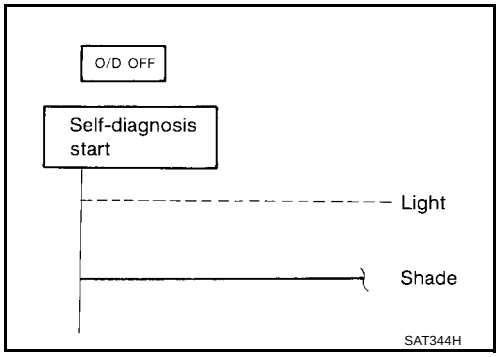
With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to overdrive control switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to overdrive control switch circuit?

Yes or No

Yes >> Check overdrive control switch circuit. Refer to AT-632, "21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}" .

No >> Go to AT-619, "10. A/T Does Not Shift: $D_2 \rightarrow D_3$" .



18. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever D → 2 Position

ECS0066S

SYMPTOM:
A/T does not shift from D_3 to 2_2 when changing selector lever from D to 2 position.

1. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT

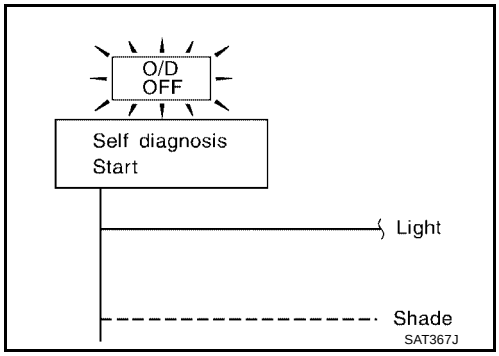
With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to park/neutral position (PNP) switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to park/neutral position (PNP) switch circuit?

Yes or No

Yes >> Check park/neutral position (PNP) switch circuit. Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" .

No >> Go to AT-617, "9. A/T Does Not Shift: $D_1 \rightarrow D_2$ or Does Not Kickdown: $D_4 \rightarrow D_2$" .



19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever 2 → 1 Position

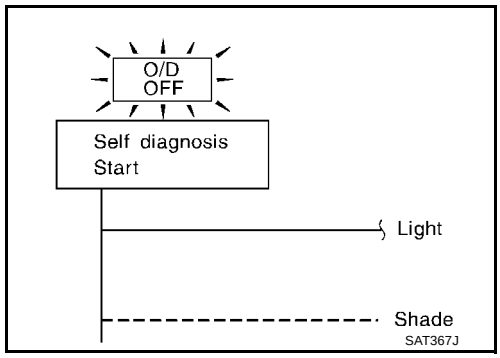
ECS0066T

SYMPTOM:
A/T does not shift from 2_2 to 1_1 when changing selector lever from 2 to 1 position.

1. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT

With CONSULT-II
Does “TCM INPUT SIGNALS” in “DATA MONITOR” show damage to park/neutral position (PNP) switch circuit?

Without CONSULT-II
Does self-diagnosis show damage to park/neutral position (PNP) switch circuit?

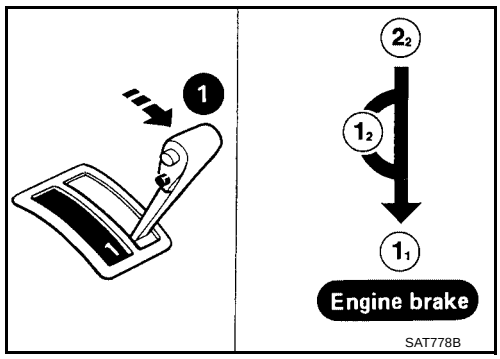


Yes or No

Yes >> Check park/neutral position (PNP) switch circuit. Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" .
No >> GO TO 2.

2. CHECK SYMPTOM

Check again.



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. CHECK TCM INSPECTION

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace damaged parts.

20. Vehicle Does Not Decelerate By Engine Brake

ECS0066U

SYMPTOM:
Vehicle does not decelerate by engine brake when shifting from 2_2 (1_2) to 1_1.

1. CHECK SYMPTOM

Is “6. Vehicle Does Not Creep Backward In R Position” OK?

Yes or No

Yes >> Go to AT-627, "15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)".
No >> Go to AT-609, "6. Vehicle Does Not Creep Backward In R Position".

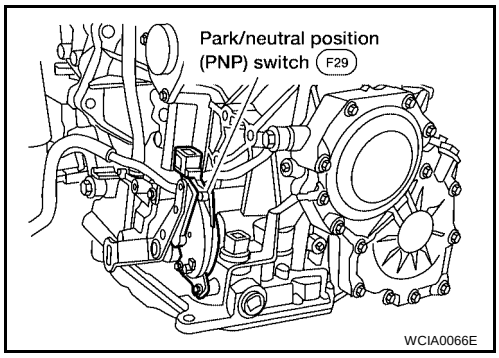
21. TCM Self-diagnosis Does Not Activate {Park/neutral Position (PNP), Overdrive Control and Throttle Position Sensor [Accelerator Pedal Position (APP) Sensor] Switches Circuit Checks}

ECS0066V

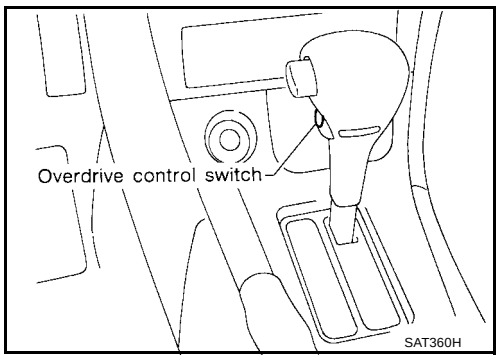
SYMPTOM:
O/D OFF indicator lamp does not come on in TCM self-diagnostic procedure even if the lamp circuit is good.

DESCRIPTION

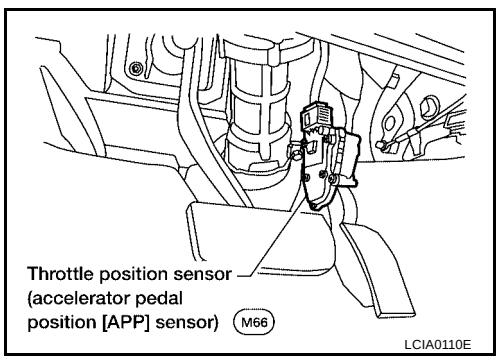
- Park/neutral position (PNP) switch
  The park/neutral (PNP) switch assembly includes a transmission range switch. The transmission range switch detects the selector lever position and sends a signal to the TCM.



- Overdrive control switch
  Detects the overdrive control switch position (ON or OFF) and sends a signal to the TCM.



- Throttle position sensor [accelerator pedal position (APP) sensor]
  The throttle position sensor [accelerator pedal position (APP) sensor] is part of the system that controls the throttle position. This system also uses an electric throttle control actuator, which consists of a throttle control motor and throttle position sensors. Accelerator pedal position signal is sent to the ECM.



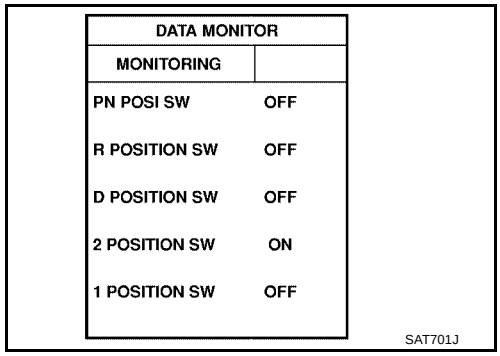
DIAGNOSTIC PROCEDURE

NOTE:
The diagnostic procedure includes inspections for the overdrive control switch circuits.

1. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out P/N, R, D, 2 and 1 position switches moving selector lever to each position.
   Check that the signal of the selector lever position is indicated properly.



OK or NG

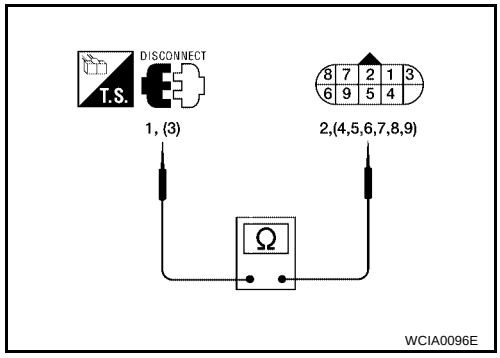
OK >> GO TO 5.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING ITEM

Check the following items:

- Park/neutral position (PNP) switch

– Check continuity between park/neutral position (PNP) switch F29 terminals 1 (G/OR) and 2 (B) and between terminals 3 (Y) and 4 (OR), 5 (L), 6 (W/G), 7 (BR/W), 8 G/W), 9 (G) while moving manual shaft through each position.



Lever position	Terminal No.	
P	3 - 7	1 - 2
R	3 - 8	
N	3 - 9	1 - 2
D	3 - 6	
2	3 - 5	
1	3 - 4	

– If NG, check again with manual control cable disconnected from manual shaft of A/T assembly. Refer to step a.
– If OK on step b, adjust manual control cable. Refer to AT-647, "Control Cable Adjustment" .
– If NG on step b, remove park/neutral position (PNP) switch from A/T and check continuity of park/neutral position (PNP) switch terminals. Refer to step a.
– If OK on step d, adjust park/neutral position (PNP) switch. Refer to AT-646, "Park/Neutral Position (PNP) Switch Adjustment" .
– If NG on step d, replace park/neutral position (PNP) switch.

- Harness for short or open between ignition switch and park/neutral position (PNP) switch (Main harness)
- Harness for short or open between park/neutral position (PNP) switch and TCM (Main harness)

OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

3. CHECK PARK/NEUTRAL POSITION (PNP) SWITCH CIRCUIT (WITHOUT CONSULT-II)

Without CONSULT-II

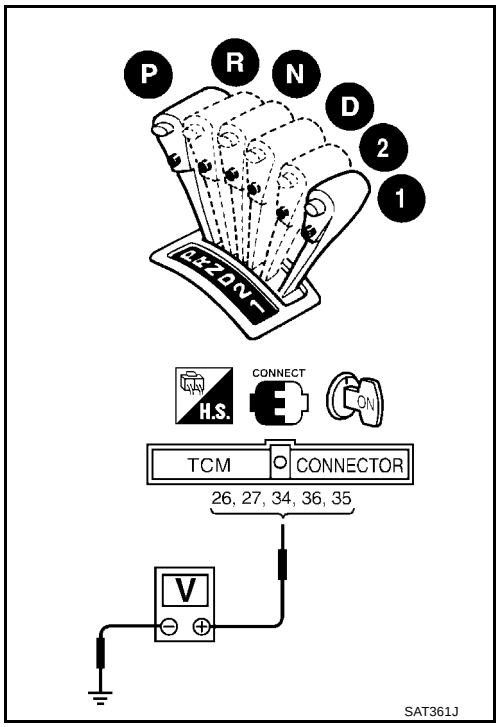
1. Turn ignition switch to ON position. (Do not start engine.)
2. Check voltage between TCM terminals 26 (OR), 27 (L), 34 (W/G), 35 (G/W), 36 (BR/W) and ground while moving selector lever through each position.

Lever position	Terminal No.				
	36	35	34	27	26
P,N	B	0	0	0	0
R	0	B	0	0	0
D	0	0	B	0	0
2	0	0	0	B	0
1	0	0	0	0	B

Voltage:

B : Battery voltage

0 : 0V



OK or NG

OK >> GO TO 6.
NG >> GO TO 4.

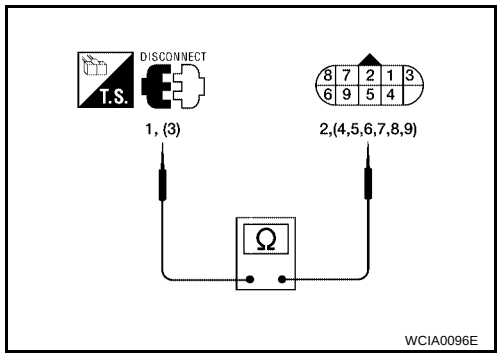
4. DETECT MALFUNCTIONING ITEM

Check the following items:

- Park/neutral position (PNP) switch

– Check continuity between park/neutral position (PNP) switch F29 terminals 1 (G/OR) and 2 (B) and between terminals 3 (Y) and 4 (OR), 5 (L), 6 (W/G), 7 (BR/W), 8 G/W), 9 (G) while moving manual shaft through each position.

Lever position	Terminal No.	
P	3 - 7	1 - 2
R	3 - 8	
N	3 - 9	1 - 2
D	3 - 6	
2	3 - 5	
1	3 - 4	



– If NG, check again with manual control cable disconnected from manual shaft of A/T assembly. Refer to step a.
– If OK on step b, adjust manual control cable. Refer to AT-647, "Control Cable Adjustment" .
– If NG on step b, remove park/neutral position (PNP) switch from A/T and check continuity of park/neutral position (PNP) switch terminals. Refer to step a.
– If OK on step d, adjust park/neutral position (PNP) switch. Refer to AT-646, "Park/Neutral Position (PNP) Switch Adjustment" .
– If NG on step d, replace park/neutral position (PNP) switch.

- Harness for short or open between ignition switch and park/neutral position (PNP) switch (Main harness)
- Harness for short or open between park/neutral position (PNP) switch and TCM (Main harness)

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

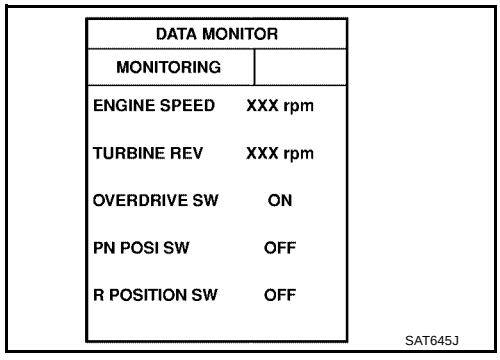
5. CHECK OVERDRIVE CONTROL SWITCH CIRCUIT (WITH CONSULT-II)

With CONSULT-II

1. Turn ignition switch to ON position.
   (Do not start engine.)
2. Select “TCM INPUT SIGNALS” in “DATA MONITOR” mode for “A/T” with CONSULT-II.
3. Read out “OVERDRIVE SW”.
   Check the signal of the overdrive control switch is indicated properly.
   (Overdrive control switch “ON” displayed on CONSULT-II means overdrive “OFF”.)

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

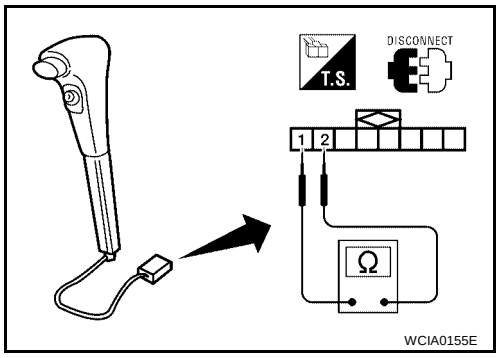


6. DETECT MALFUNCTIONING ITEM

Check the following items:

- Overdrive control switch M44.
- Check continuity between terminals 1 and 2.

Switch position	Continuity
ON	No
OFF	Yes



- Harness for short or open between TCM and overdrive control switch (Main harness)
- Harness of ground circuit for overdrive control switch (Main harness) for short or open

OK or NG

OK >> GO TO 7.
NG >> Repair or replace damaged parts.

7. CHECK THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]

- Perform throttle position sensor [accelerator pedal position (APP) sensor] inspection. Refer to AT-563, "DTC P1705 THROTTLE POSITION SENSOR [ACCELERATOR PEDAL POSITION (APP) SENSOR]" .

OK or NG

OK >> GO TO 8.
NG >> Repair or replace damaged parts.

8. CHECK TCM INSPECTION

1. Perform TCM input/output inspection. Refer to AT-487, "Input/Output Signal Chart" .

OK or NG

OK >> INSPECTION END.
NG >> Inspect TCM terminals and related wiring harnesses for damage or loose connections. Repair or replace damaged parts.

A/T SHIFT LOCK SYSTEM

PFP:34950

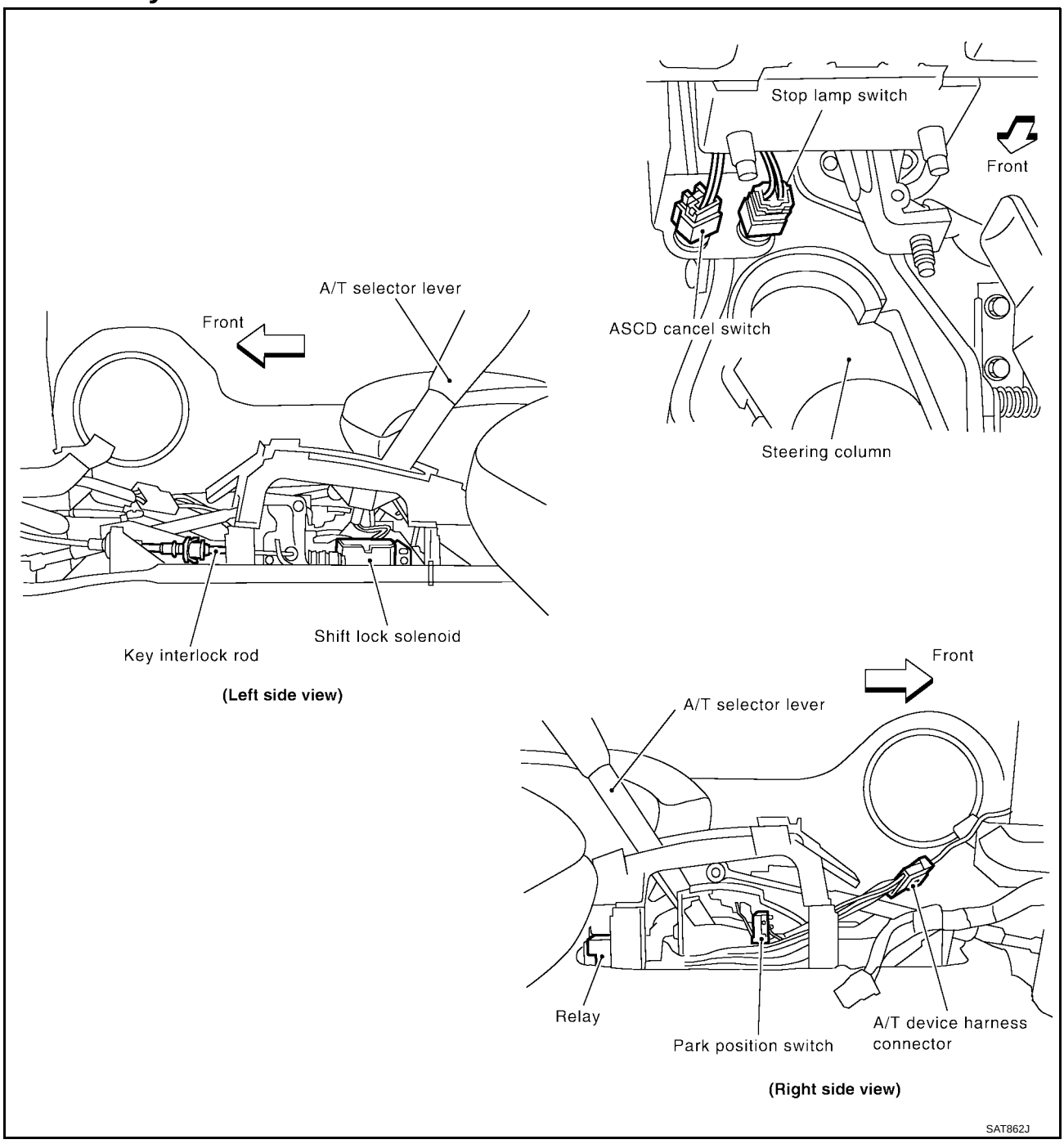
Description

ECS0066W

- The mechanical key interlock mechanism also operates as a shift lock:
  With the key switch turned to ON, the selector lever cannot be shifted from “P” (parking) to any other position unless the brake pedal is depressed.
  With the key removed, the selector lever cannot be shifted from “P” to any other position.
  The key cannot be removed unless the selector lever is placed in “P”.
- The shift lock and key interlock mechanisms are controlled by the ON-OFF operation of the shift lock solenoid and by the operation of the rotator and slider located inside the key cylinder.

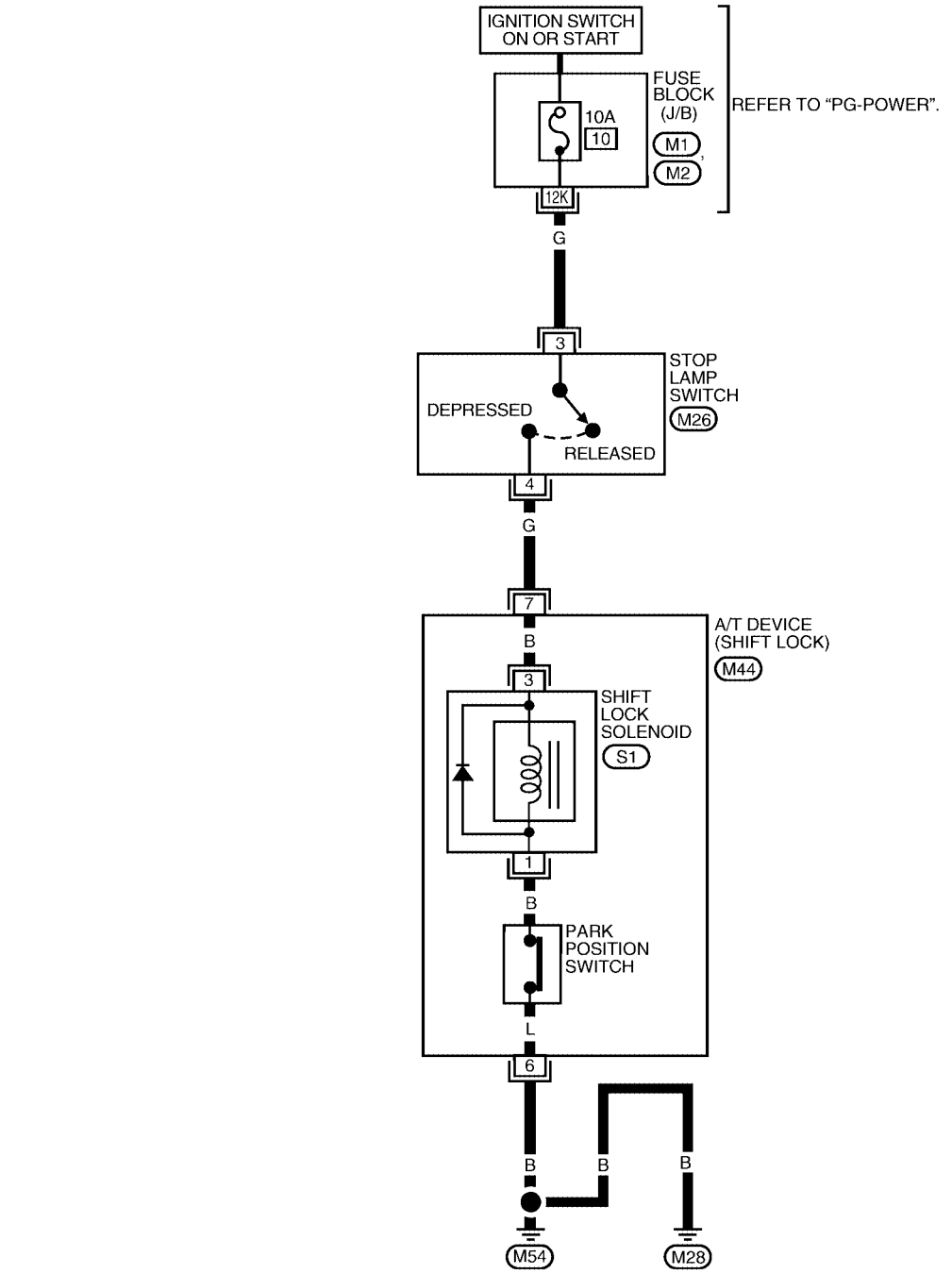
Shift Lock System Electrical Parts Location

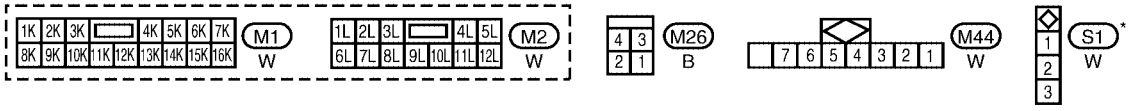
ECS0066X



Wiring Diagram — SHIFT —

ECS0066Y





★: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" OF PG SECTION.

WCWA0076E

Diagnostic Procedure

ECS0066Z

SYMPTOM 1:

- **Selector lever cannot be moved from “P” position with key in ON position and brake pedal applied.**
- **Selector lever can be moved from “P” position with key in ON position and brake pedal released.**
- **Selector lever can be moved from “P” position when key is removed from key cylinder.**

SYMPTOM 2:

Ignition key cannot be removed when selector lever is set to “P” position. It can be removed when selector lever is set to any position except “P”.

1. CHECK KEY INTERLOCK CABLE

Check key interlock cable for damage.

OK or NG

OK >> GO TO 2.
NG >> Repair key interlock cable. Refer to AT-642, "Components" .

2. CHECK SELECTOR LEVER POSITION

Check selector lever position for damage.

OK or NG

OK >> GO TO 3.
NG >> Check selector lever. Refer to AT-647, "Control Cable Adjustment" .

3. CHECK POWER SOURCE

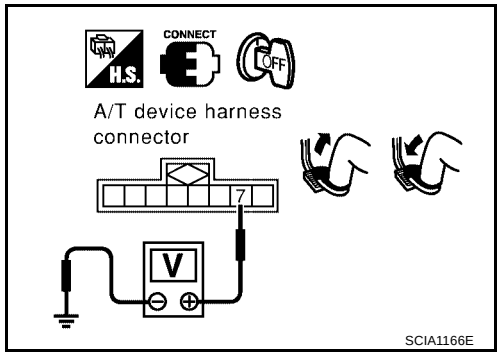
Turn ignition switch to “OFF” position.
(Do not start engine.)

- Check voltage between A/T device harness connector M44 terminal 7 (G) and ground.

Voltage:

Brake pedal depressed: Battery voltage

Brake pedal released: 0V



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

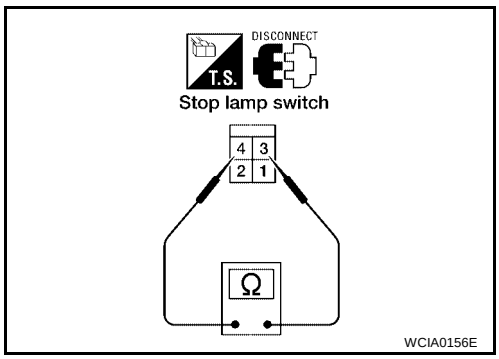
4. DETECT MALFUNCTIONING ITEM

Check the following items.

1. Harness for open or short between fuse block (J/B) connector M1 terminal 12K and stop lamp switch harness connector M26 terminal 3.
2. Harness for open or short stop lamp switch harness connector M26 terminal 4 and A/T device harness connector M44 terminal 7 (G).
3. 10A fuse [10, located in the fuse block (J/B)].
4. Check continuity between stop lamp switch harness connector M26 terminals 3 (G) and 4 (G).

Condition	Continuity
When brake pedal is depressed	Yes
When brake pedal is released	No

Check stop lamp switch after adjusting brake pedal —refer to BR-12, "STOP LAMP SWITCH AND ASCD CANCEL SWITCH CLEARANCE"



OK or NG

OK >> GO TO 5.
NG >> Repair or replace damaged parts.

5. CHECK GROUND CIRCUIT

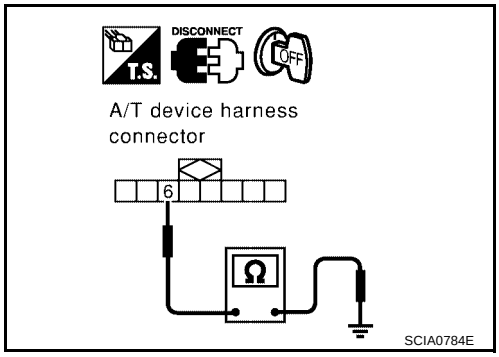
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T device harness connector.
3. Check continuity between A/T device harness M44 terminal 6 (B) and ground.

Continuity should exist

Continuity should exist.
If OK, check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit in harness.



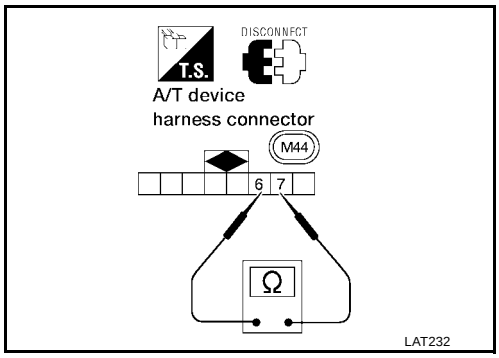
6. CHECK PARK POSITION SWITCH

Check continuity between A/T device harness conector M44 terminals 6 (B) and 7 (G).

Brake pedal	Operation sound
Depressed	No
Released	Yes

OK or NG

OK >> GO TO 7.
NG >> Replace park position switch.



7. CHECK SHIFT LOCK SOLENOID

1. Connect A/T device harness connector.
2. Turn ignition switch to "ON" position.
3. Check operation sound.

Condition	Brake pedal	Operation sound
When ignition switch is turned to "ON" position and selector lever is in the "P" position.	Depressed	Yes
	Released	No

OK or NG

OK >> GO TO 8.
NG >> Replace shift lock solenoid.

8. CHECK SHIFT LOCK OPERATION

1. Reconnect shift lock harness connector.
2. Turn ignition switch from “OFF” to “ON” position. (Do not start engine.)
3. Recheck shift lock operation.

OK or NG

OK >> INSPECTION END
NG >> GO TO 9.

9. CHECK A/T DEVICE INSPECTION

1. Perform A/T device input/output signal inspection test.
2. If NG, recheck harness connector connection.

OK or NG

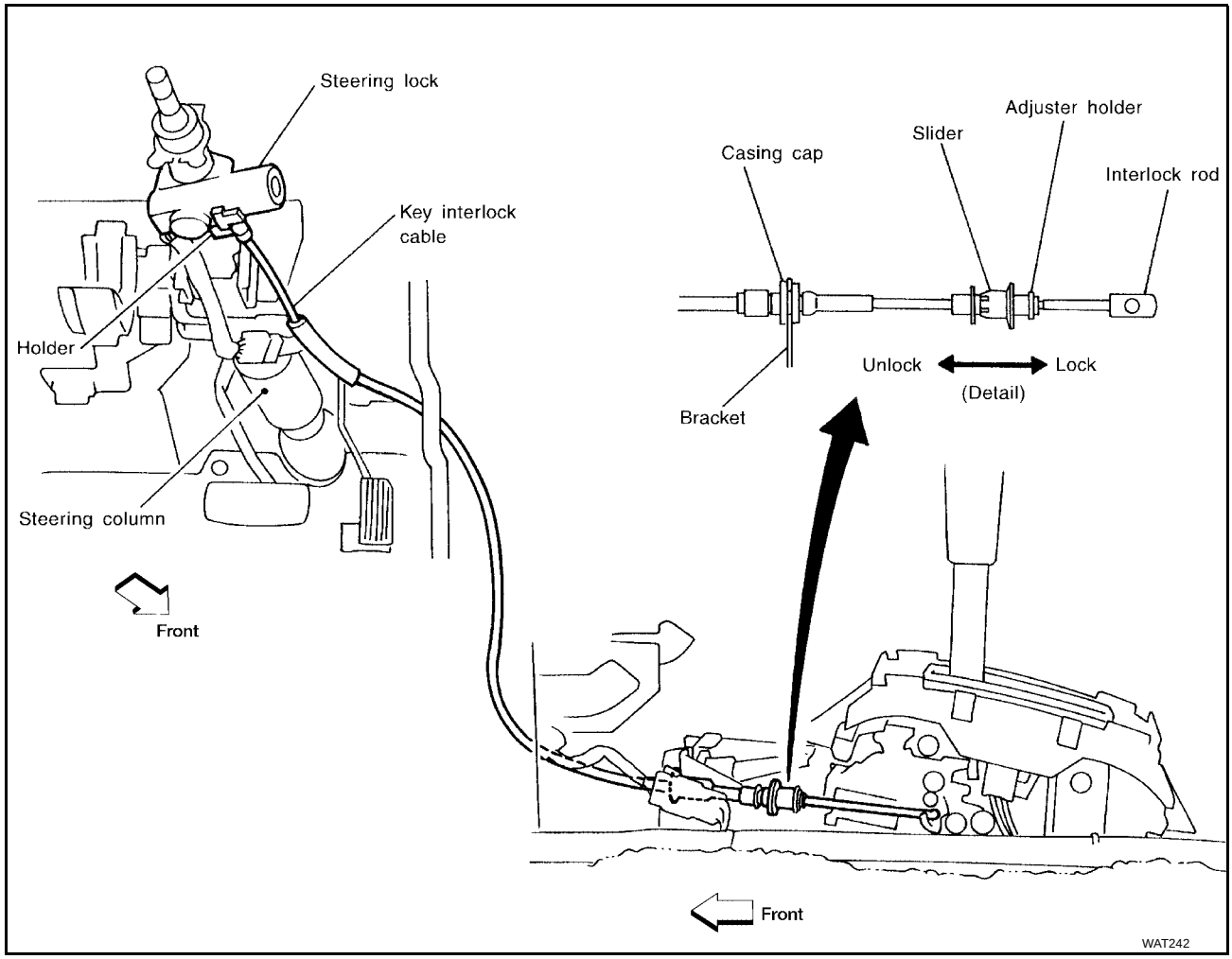
OK >> INSPECTION END
NG >> Repair or replace damaged parts.

KEY INTERLOCK CABLE

PFP:34908

Components

ECS00670



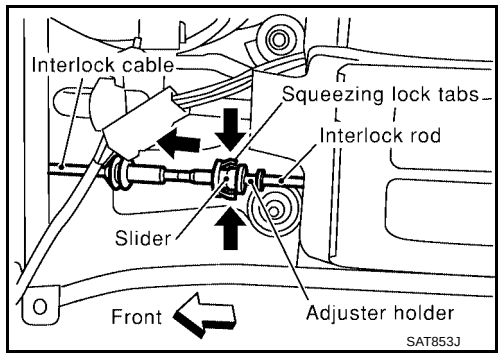
CAUTION:

- **Install key interlock cable in such a way that it will not be damaged by sharp bends, twists or interference with adjacent parts.**
- **After installing key interlock cable to control device, make sure that casing cap and bracket are firmly secured in their positions.**

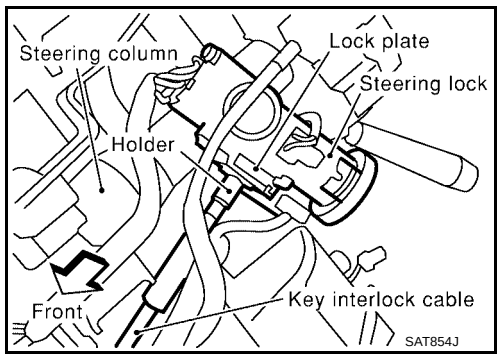
Removal

ECS00671

1. Unlock slider by squeezing lock tabs on slider from adjuster holder and remove interlock rod from cable.



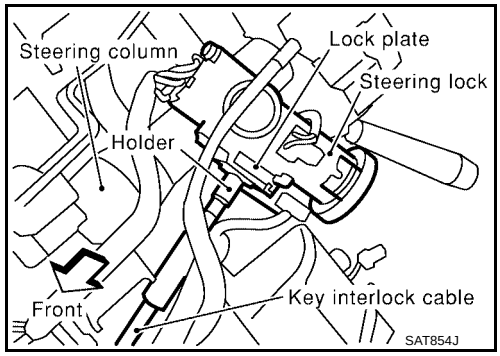
2. Remove lock plate from steering lock assembly and remove key interlock cable.



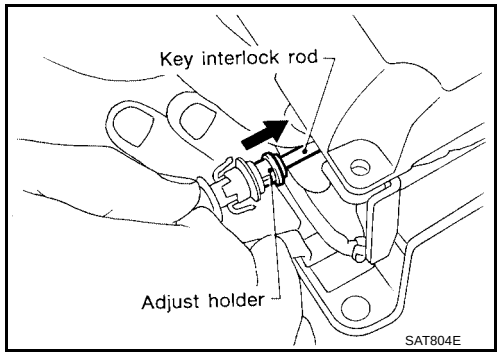
Installation

ECS00672

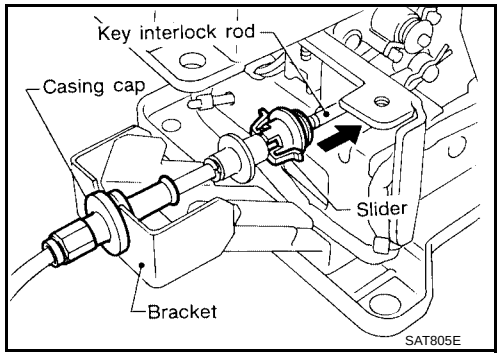
1. Turn ignition key to lock position.
2. Set A/T selector lever to P position.
3. Set key interlock cable to steering lock assembly and install lock plate.
4. Clamp cable to steering column and attach to control cable with band.



5. Insert interlock rod into adjuster holder.



6. Install casing cap to bracket.
7. Move slider in order to connect adjuster holder to interlock rod.



ON-VEHICLE SERVICE

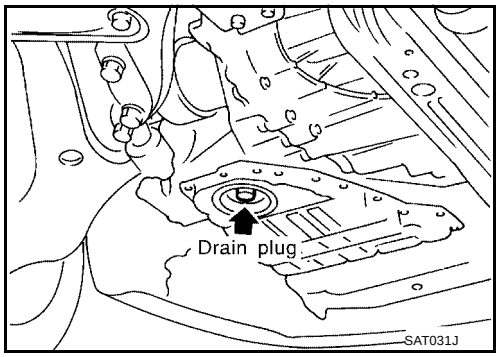
PFP:00000

Control Valve Assembly and Accumulators

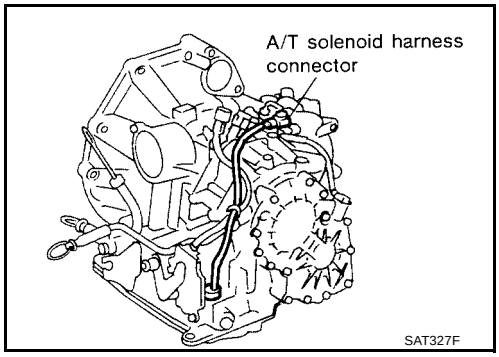
ECS00673

REMOVAL

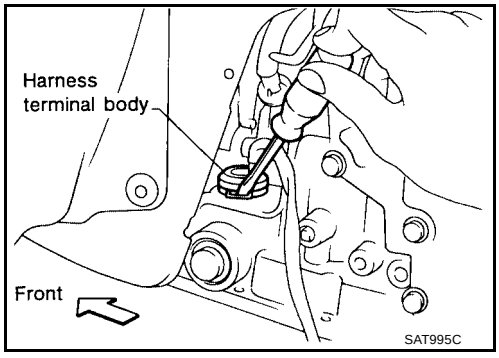
1. Drain ATF from transaxle.
2. Remove oil pan and gasket.
   - **Always replace oil pan bolts as they are self-sealing bolts.**



3. Disconnect A/T solenoid harness connector.



4. Remove snap ring from terminal cord assembly harness terminal body.
5. Remove terminal cord assembly harness from transmission case by pushing on terminal body.

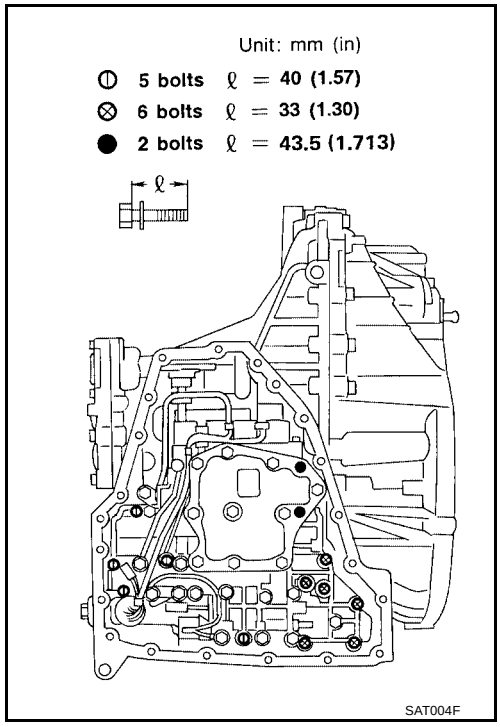


6. Remove control valve assembly by removing fixing bolts **I** , **X** and ●.

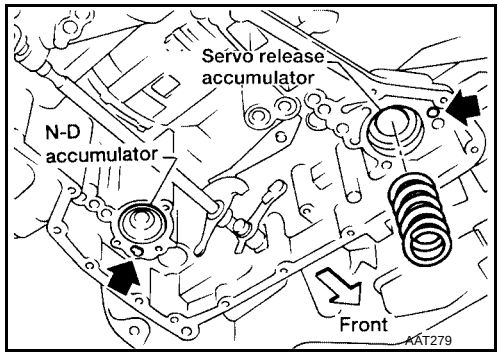
Bolt length, number and location are shown in the illustration.

- **Be careful not to drop manual valve and servo release accumulator return spring.**

7. Disassemble and inspect control valve assembly if necessary. Refer to AT-679, "Control Valve Assembly" .

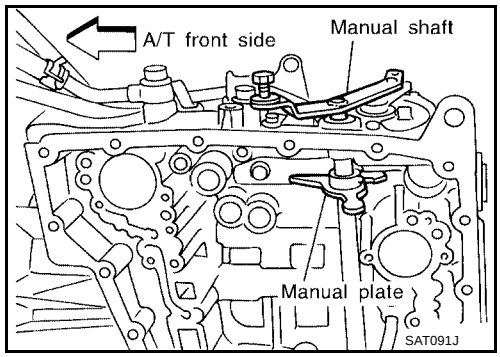


8. Remove servo release and N-D accumulators by applying compressed air if necessary.
   - **Hold each piston with a rag.**



INSTALLATION

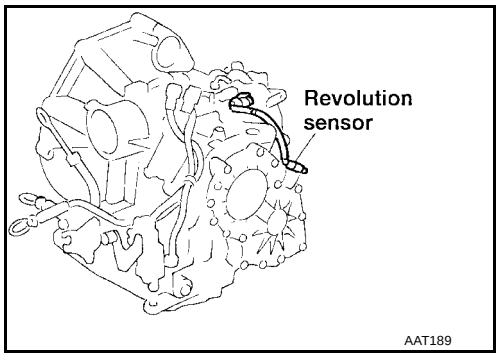
- **Set manual shaft in Neutral, then align manual plate with groove in manual valve.**
- **After installing control valve assembly, make sure that selector lever can be moved to all positions.**



Revolution Sensor Replacement

ECS00674

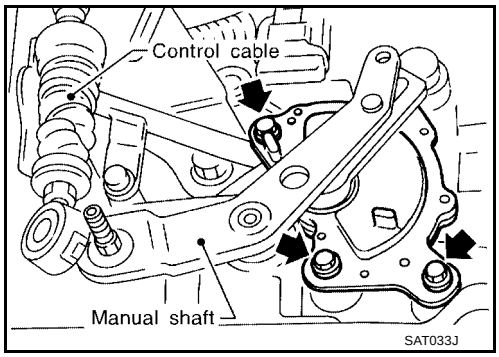
1. Remove under cover.
2. Remove revolution sensor from A/T.
3. Reinstall any part removed.
   - **Always use new sealing parts.**



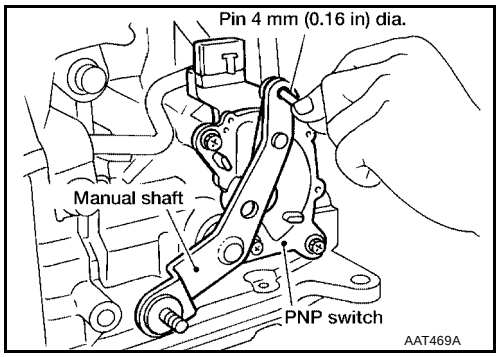
Park/Neutral Position (PNP) Switch Adjustment

ECS00675

1. Remove control cable from manual shaft.
2. Set manual shaft in N position.
3. Loosen park/neutral position (PNP) switch fixing bolts.



4. Insert pin into adjustment holes in both park/neutral position (PNP) switch and manual shaft as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of park/neutral position (PNP) switch. Refer to AT-494, "Diagnostic Procedure" .



Control Cable Adjustment

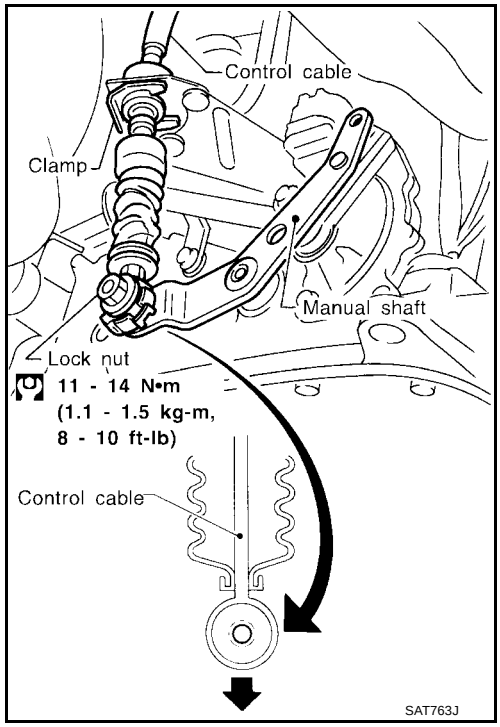
ECS00676

Move selector lever from the P position to the 1 position. You should be able to feel the detents in each position. If the detents cannot be felt or the pointer indicating the position is improperly aligned, the control cable needs adjustment.

1. Place selector lever in P position.
2. Loosen control cable lock nut and place manual shaft in P position.

   CAUTION:
   Turn wheels more than 1/4 rotations and apply the park lock.
3. Push control cable in the direction of the arrow shown in the illustration by specified force.

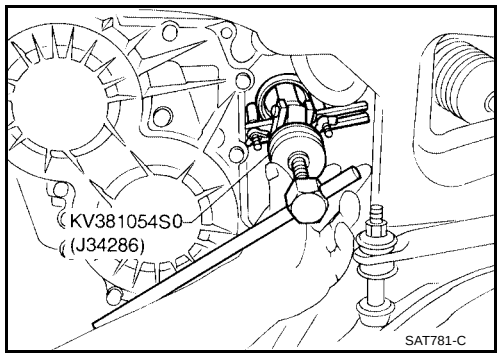
   Specified force : 4.9 - 9.8 N (0.5 - 1.0 kg, 1.1 - 2.2 lb)
4. Tighten control cable lock nut.
5. Move selector lever from P to 1 position again. Make sure that selector lever moves smoothly.
   - **Make sure that the starter operates when the selector lever is placed in the N or P position.**
   - **Make sure that the transmission is locked properly when the selector lever is placed in the P position.**



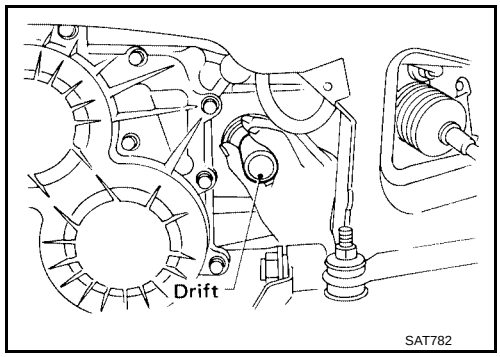
Differential Side Oil Seal Replacement

ECS00677

1. Remove drive shaft assembly. Refer to FAX-14, "Removal" .
2. Remove oil seal.



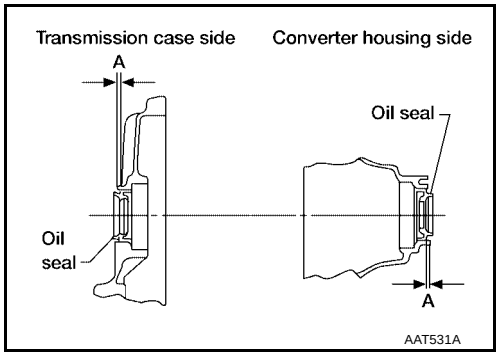
3. Install oil seal.
   - **Apply ATF before installing.**



- **Install oil seals so dimension A is within specification**

  A : –0.5 mm (–0.02 in) to 0.5 mm (0.02 in)

4. Reinstall any part removed.



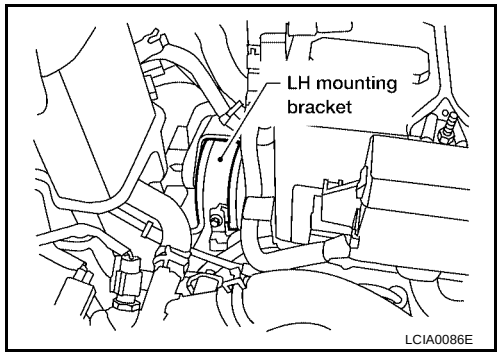
REMOVAL AND INSTALLATION

PFP:00000

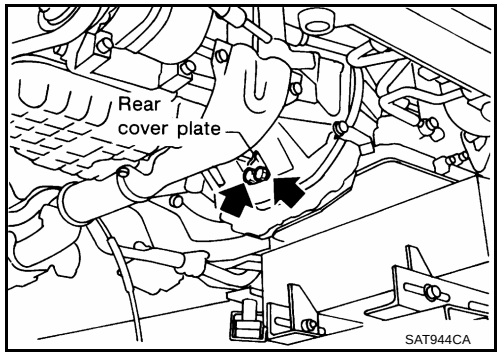
Removal

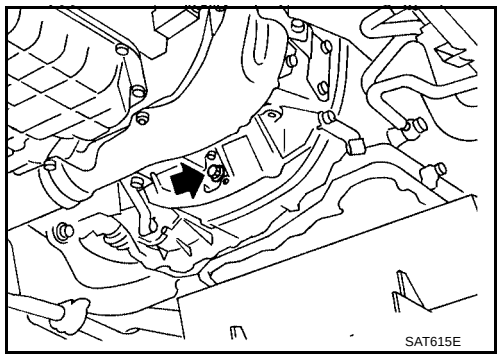
ECS00678

1. Remove battery and bracket.
2. Remove air duct and air cleaner assembly, refer to EM-103, "REMOVAL" .
3. Disconnect terminal cord assembly harness connector and park/neutral position (PNP) switch harness connectors.
4. Disconnect harness connectors of mass air flow sensor, intake air temperature sensor, revolution sensor, turbine revolution sensor, vehicle speed sensor and ground cable.
5. Remove LH mounting bracket from transaxle and body.
6. Disconnect control cable at transaxle side.
7. Remove drive shafts, refer to FAX-14, "Removal" .
8. Drain ATF.
9. Remove push clips and engine undercover.
10. Disconnect fluid cooler piping.
11. Disconnect and remove starter motor from transaxle, refer to SC-21, "Removal" .

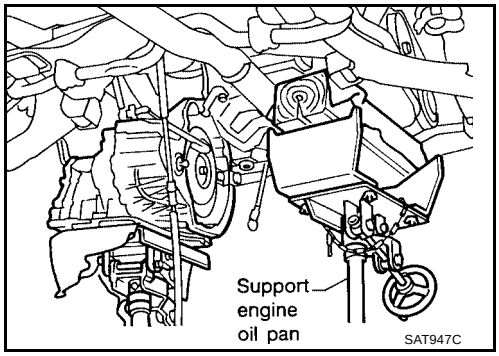


12. Support engine by placing a jack under oil pan.
    - **Do not place jack under oil pan drain plug.**
13. Remove center member.
14. Remove rear cover plate and bolts securing torque converter to drive plate.
    - **Rotate crankshaft for access to securing bolts.**





15. Support transaxle with a jack.
16. Remove bolts fixing A/T to engine.
17. Lower transaxle while supporting it with a jack.



Installation

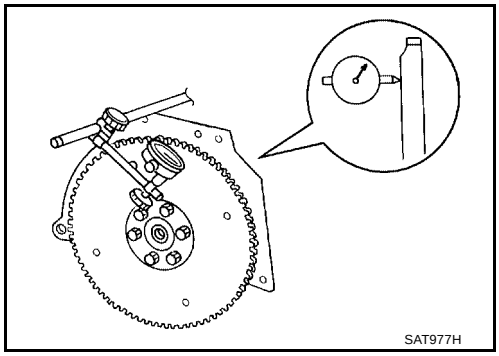
ECS00679

- Drive plate runout

  CAUTION:
  Do not allow any magnetic materials to contact the ring gear teeth.

  Maximum allowable runout:

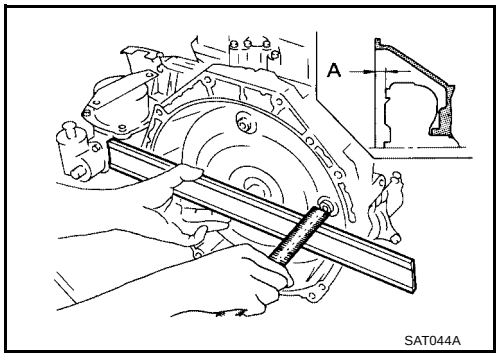
  EM-186, "SERVICE DATA AND SPECIFICATIONS (SDS)".



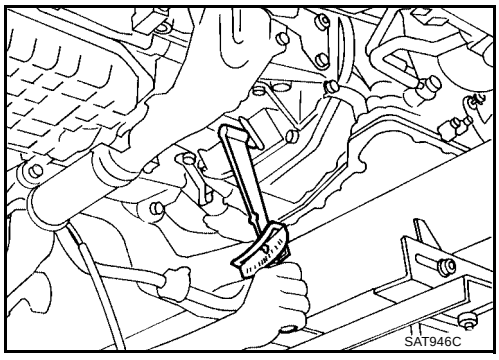
- If this runout is out of allowance, replace drive plate and ring gear.

- When connecting torque converter to transaxle, measure distance “A” to be certain that they are correctly assembled.

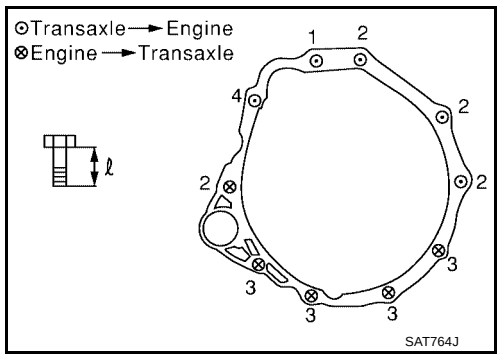
  Distance “A” : 14 mm (0.55 in) or more



- Install bolts fixing converter to drive plate.
- **With converter installed, rotate crankshaft several turns to check that transaxle rotates freely without binding.**



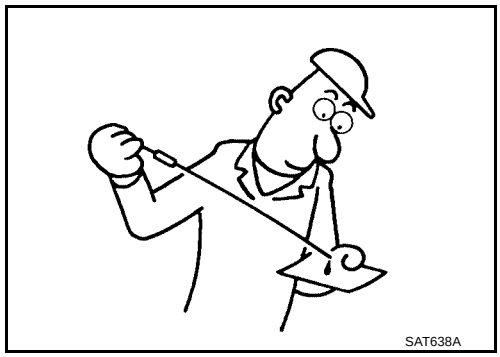
- Tighten bolts securing transaxle.
- Tighten LH mounting bracket bolts to the specified torque. Refer to EM-156, "Removal and Installation" .
- Tighten center member bolts to the specified torque. Refer to EM-156, "Removal and Installation" .
- Tighten rear plate cover bolts to the specified torque. Refer to EM-112, "OIL PAN AND OIL STRAINER" .



SAT764J

Bolt No.	Tightening torque N-m (kg-m, ft-lb)	l mm (in)
1	70 - 79 (7.1 - 8.1, 52 - 58)	65 (2.56)
2	70 - 79 (7.1 - 8.1, 52 - 58)	52 (2.05)
3	70 - 79 (7.1 - 8.1, 52 - 58)	40 (1.57)
4	78 - 98 (7.9 - 10.0, 58 - 72)	124 (4.88)

- Reinstall any part removed.
- Check fluid level in transaxle.
- Move selector lever through all positions to be sure that transaxle operates correctly.
  With parking brake applied, rotate engine at idling. Move selector lever through N to D, to 2, to 1 and to R position. A slight shock should be felt by hand gripping selector each time transaxle is shifted.
- Perform road test. Refer to AT-457, "Road Test" .


SAT638A

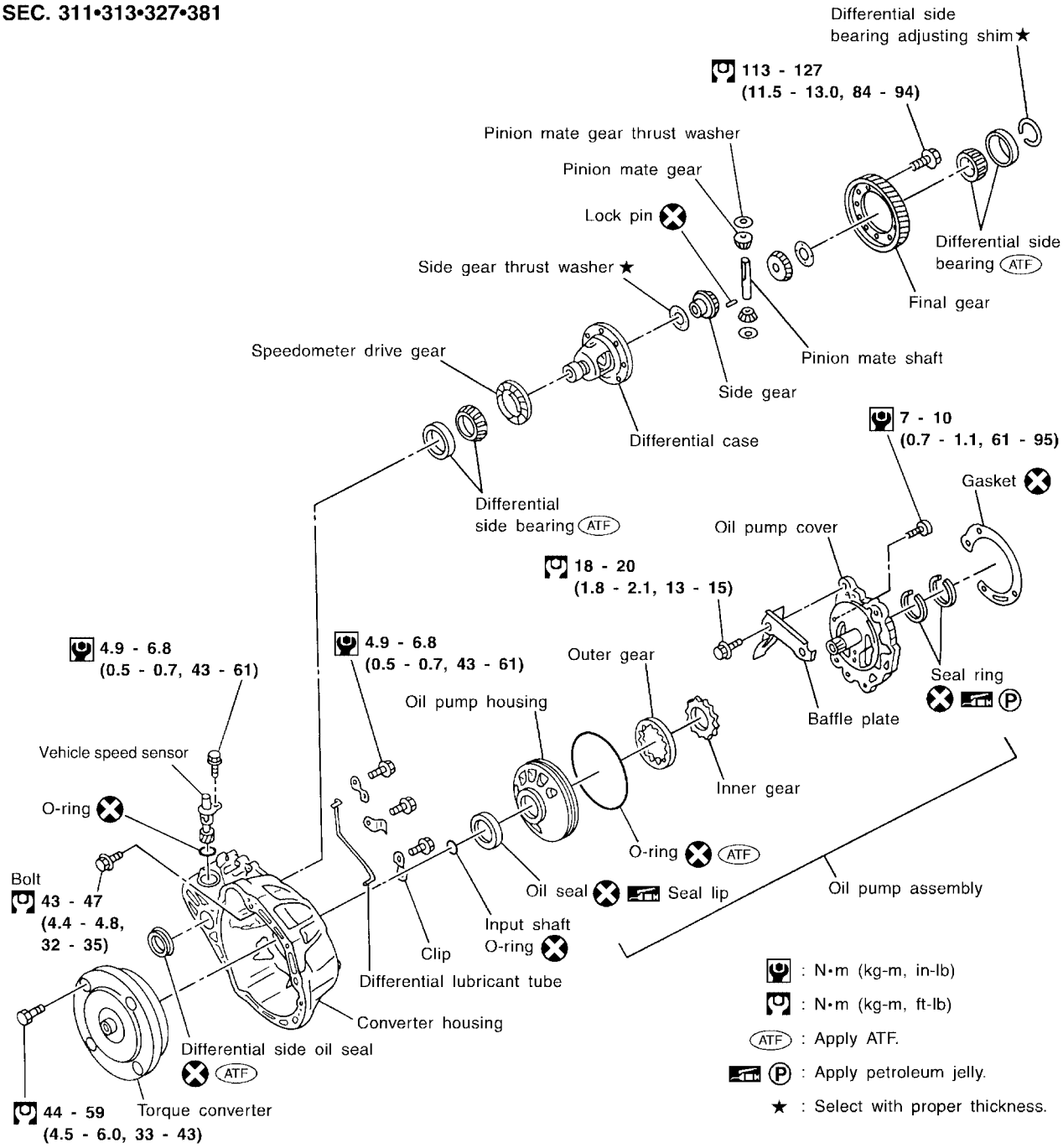
OVERHAUL

PFP:00000

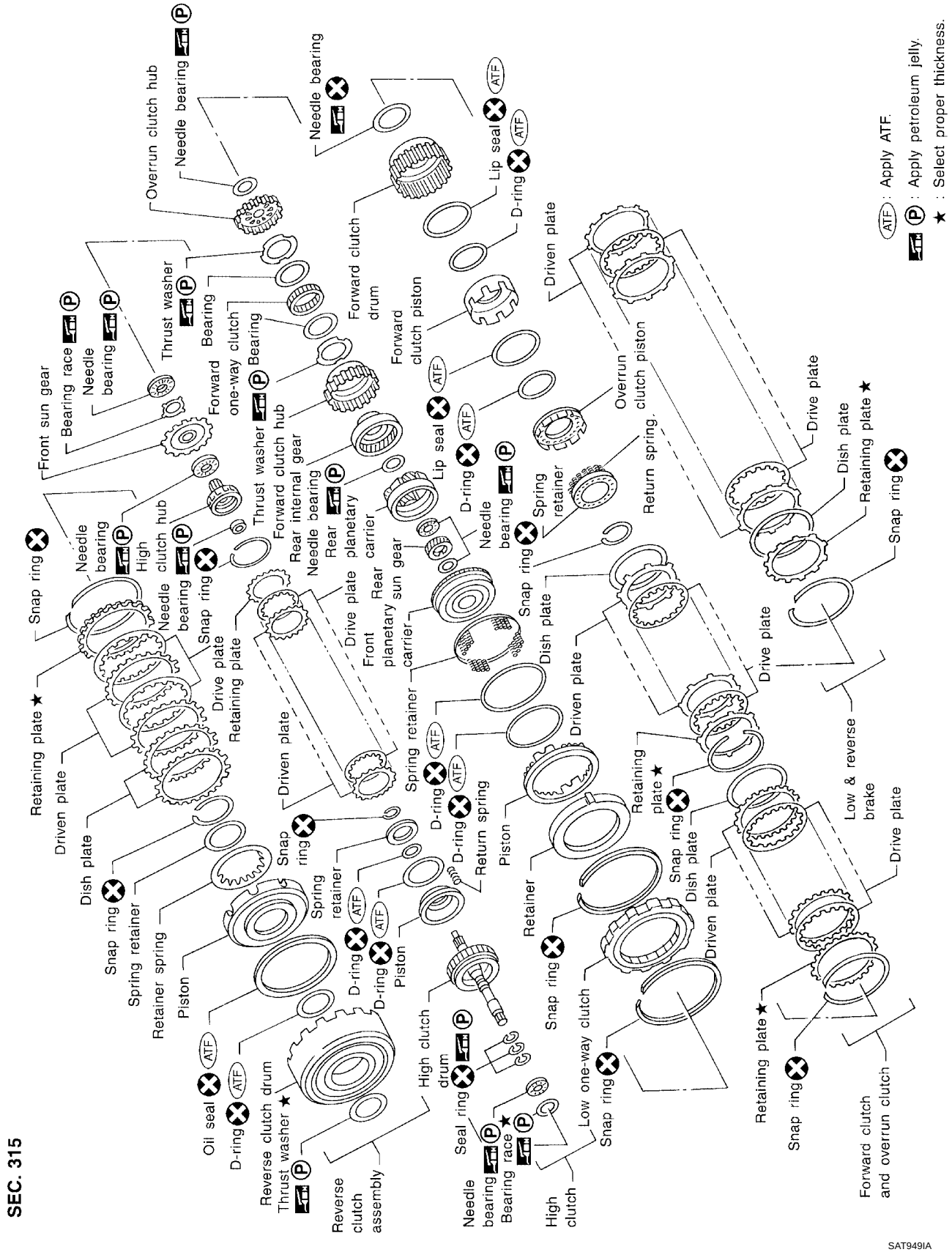
Components

ECS0067A

SEC. 311•313•327•381

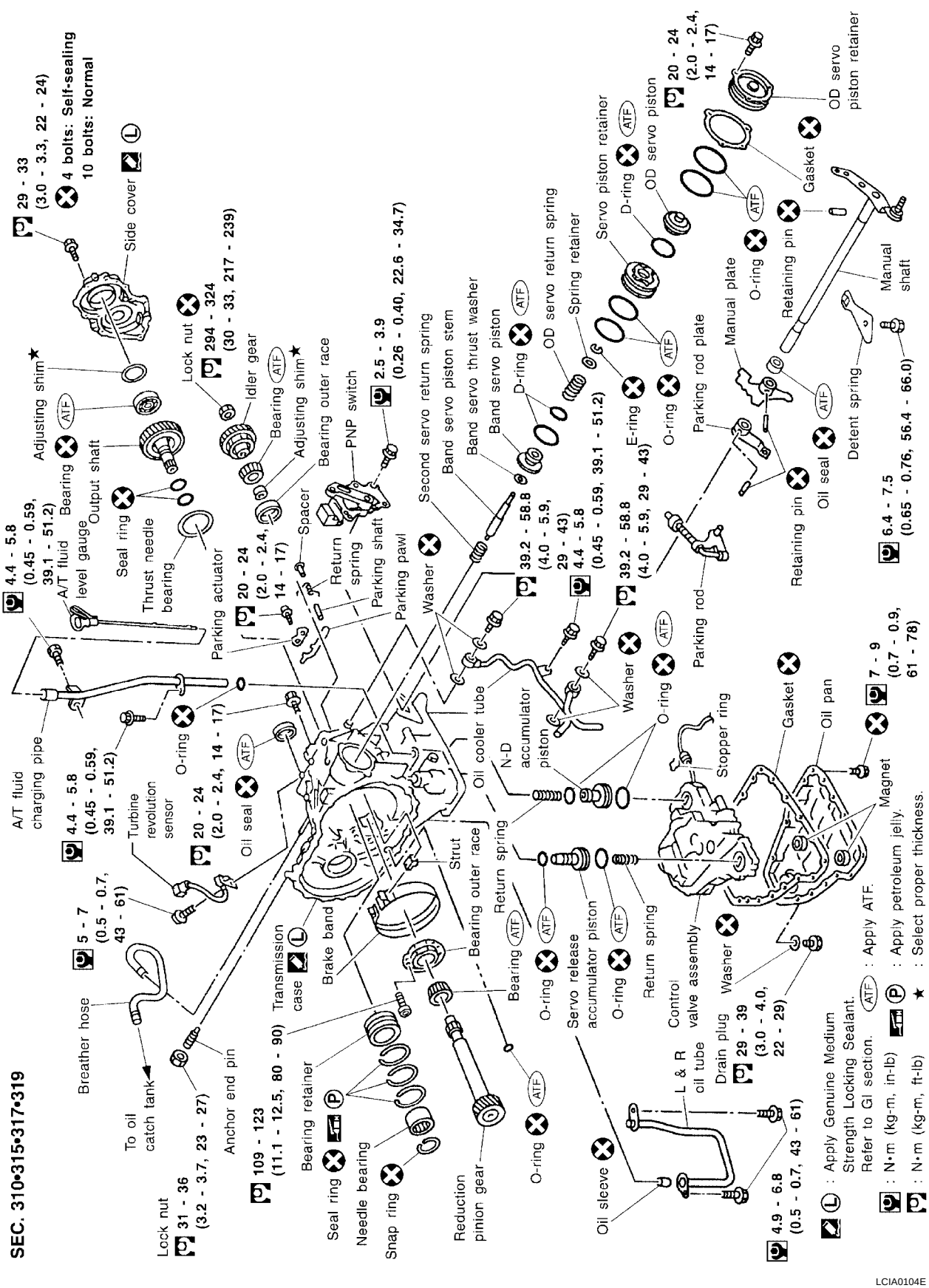


LCIA0103E



SEC. 315

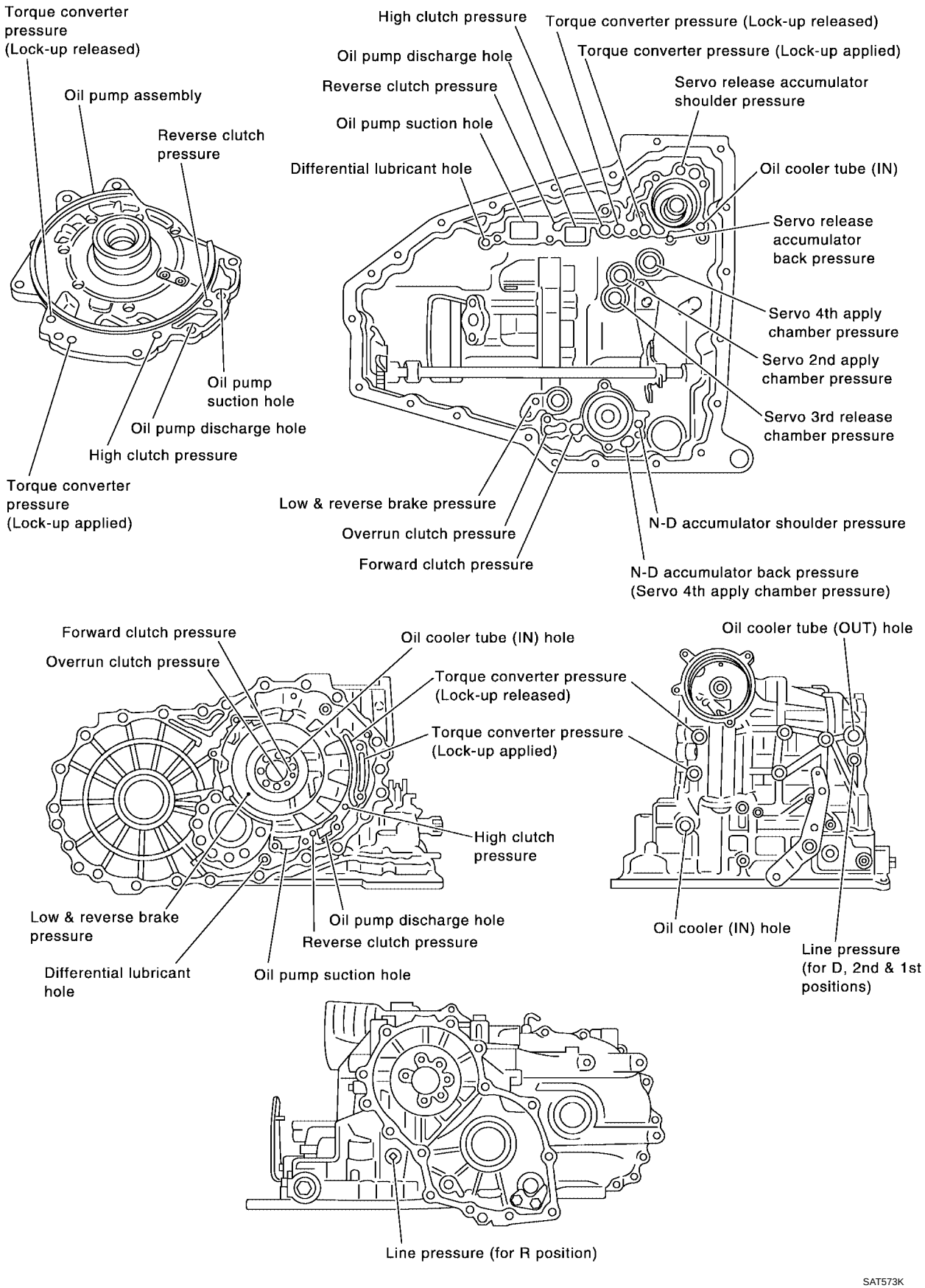
SAT949IA


SEC. 310•315•317•319
29 - 33 (3.0 - 3.3, 22 - 24)
4 bolts: Self-sealing
10 bolts: Normal
Side cover
Adjusting shim
Bearing
A/T fluid level gauge
Output shaft
Seal ring
Thrust needle bearing
Parking actuator
Lock nut 294 - 324 (30 - 33, 217 - 239)
Idler gear
Bearing
Adjusting shim
Bearing outer race
Spacer
Return spring
Parking shaft
Parking pawl
PNP switch
2.5 - 3.9 (0.26 - 0.40, 22.6 - 34.7)
Second servo return spring
Band servo piston stem
Band servo thrust washer
Band servo piston
D-ring
OD servo return spring
Spring retainer
Servo piston retainer
D-ring
OD servo piston
20 - 24 (2.0 - 2.4, 14 - 17)
OD servo piston retainer
Gasket
Manual plate
O-ring
Retaining pin
Manual shaft
Detent spring
Oil seal
Retaining pin
Parking rod plate
Parking rod
E-ring
O-ring
Washer
Oil pan
Gasket
Stopper ring
Control valve assembly
Washer
Magnet
Oil cooler tube
N-D accumulator piston
Return spring
Servo release accumulator piston
Return spring
O-ring
Bearing
Strut
Bearing outer race
Reduction pinion gear
Oil sleeve
L & R oil tube
Drain plug
Needle bearing
Snap ring
Seal ring
Bearing retainer
Brake band
Transmission case
Oil seal
O-ring
Turbine revolution sensor
Breather hose
To oil catch tank
Lock nut
Anchor end pin
A/T fluid charging pipe
A/T fluid level gauge
Bearing
Adjusting shim
Output shaft
Seal ring
Thrust needle bearing
Parking actuator
Lock nut
Idler gear
Bearing
Adjusting shim
Bearing outer race
Spacer
Return spring
Parking shaft
Parking pawl
PNP switch
Second servo return spring
Band servo piston stem
Band servo thrust washer
Band servo piston
D-ring
OD servo return spring
Spring retainer
Servo piston retainer
D-ring
OD servo piston
OD servo piston retainer
Gasket
Manual plate
O-ring
Retaining pin
Manual shaft
Detent spring
Oil seal
Retaining pin
Parking rod plate
Parking rod
E-ring
O-ring
Washer
Oil pan
Gasket
Stopper ring
Control valve assembly
Washer
Magnet
Oil cooler tube
N-D accumulator piston
Return spring
Servo release accumulator piston
Return spring
O-ring
Bearing
Strut
Bearing outer race
Reduction pinion gear
Oil sleeve
L & R oil tube
Drain plug
Needle bearing
Snap ring
Seal ring
Bearing retainer
Brake band
Transmission case
Oil seal
O-ring
Turbine revolution sensor
Breather hose
To oil catch tank
Lock nut
Anchor end pin
A/T fluid charging pipe
4.4 - 5.8 (0.45 - 0.59, 39.1 - 51.2)
5 - 7 (0.5 - 0.7, 43 - 61)
4.4 - 5.8 (0.45 - 0.59, 39.1 - 51.2)
20 - 24 (2.0 - 2.4, 14 - 17)
20 - 24 (2.0 - 2.4, 14 - 17)
39.2 - 58.8 (4.0 - 5.9, 29 - 43)
4.4 - 5.8 (0.45 - 0.59, 39.1 - 51.2)
39.2 - 58.8 (4.0 - 5.9, 29 - 43)
6.4 - 7.5 (0.65 - 0.76, 56.4 - 66.0)
7 - 9 (0.7 - 0.9, 61 - 78)
29 - 39 (3.0 - 4.0, 22 - 29)
4.9 - 6.8 (0.5 - 0.7, 43 - 61)
31 - 36 (3.2 - 3.7, 23 - 27)
109 - 123 (11.1 - 12.5, 80 - 90)
: Apply Genuine Medium Strength Locking Sealant. Refer to GI section.
: Apply ATF.
: Apply petroleum jelly.
: Select proper thickness.
: N•m (kg-m, in-lb)
: N•m (kg-m, ft-lb)

LCIA0104E

Oil Channel

ECS0067B



Locations of Adjusting Shims, Needle Bearings, Thrust Washers and Snap Rings

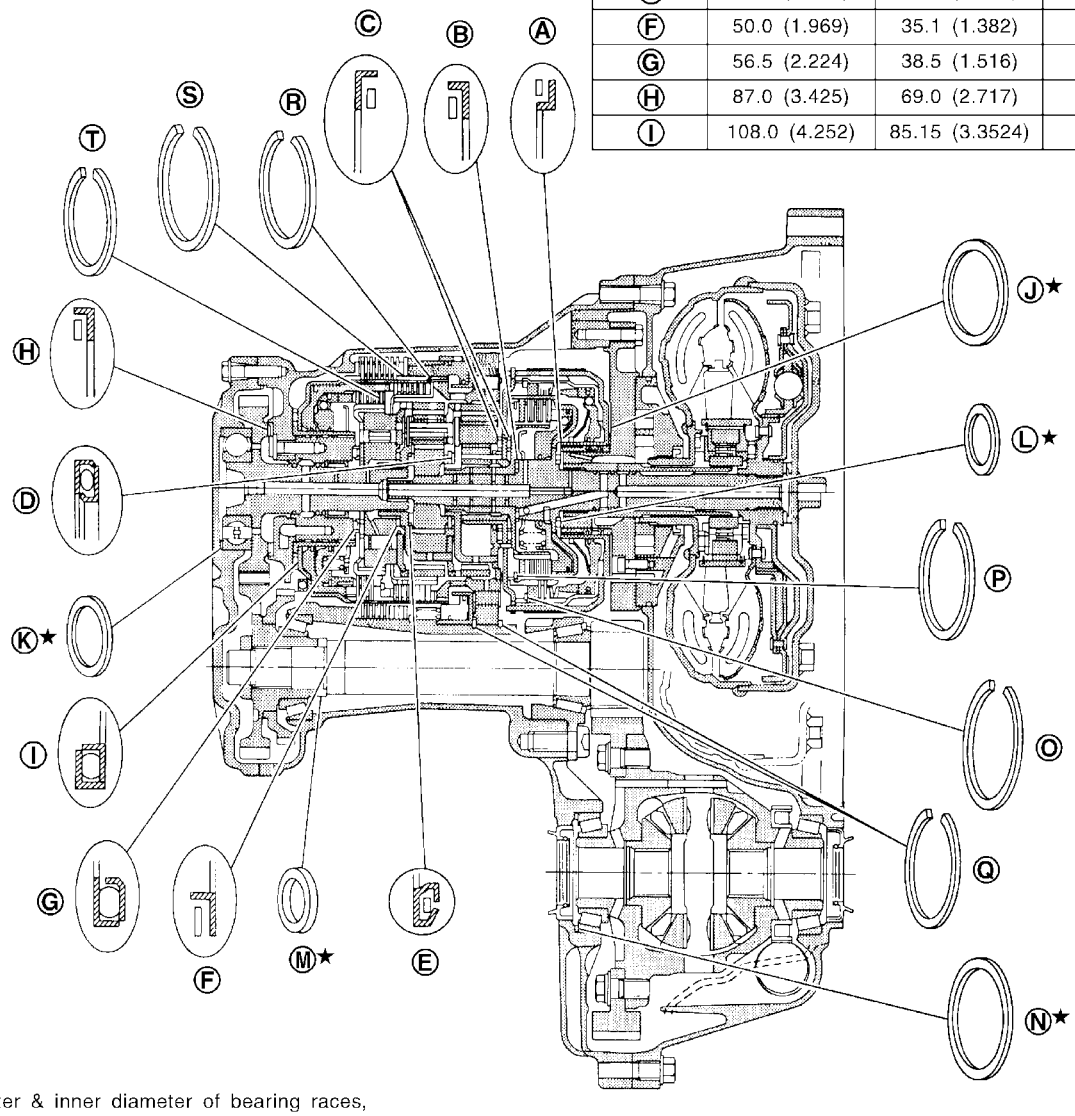
ECS0067C

Outer diameter of thrust washers

Item number	Outer diameter mm (in)	Parts number*
Ⓙ★	76.0 (2.992)	31508 80X13 - 31508 80X20
Ⓚ★	80.0 (3.150)	31438 80X60 - 31438 80X70

Outer and inner diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)	Parts number*
Ⓐ	50.0 (1.969)	35.1 (1.382)	31407 80X10
Ⓑ	42.0 (1.654)	23.7 (0.933)	31407 80X01
Ⓒ	70.0 (2.756)	50.0 (1.969)	31407 80X09
Ⓓ	51.0 (2.008)	33.1 (1.303)	31407 80X02
Ⓔ	48.0 (1.890)	30.0 (1.181)	31407 80X03
Ⓕ	50.0 (1.969)	35.1 (1.382)	31407 80X10
Ⓖ	56.5 (2.224)	38.5 (1.516)	31407 80X08
Ⓗ	87.0 (3.425)	69.0 (2.717)	31407 80X07
Ⓘ	108.0 (4.252)	85.15 (3.3524)	31407 80X06



Outer & inner diameter of bearing races, adjusting shims and adjusting spacer

Item number	Outer diameter mm (in)	Inner diameter mm (in)	Parts number*
Ⓛ★	51.0 (2.008)	36.0 (1.417)	31435 80X00 - 31439 80X14
Ⓜ★	38.0 (1.496)	28.1 (1.106)	31439 85X01 - 31439 85X06 31439 83X11 - 31439 83X24 31439 81X00 - 31439 81X24 31439 81X46 - 31439 81X49 31439 81X60 - 31439 81X74
Ⓝ★	75.0 (2.953)	67.0 (2.638)	31438 80X00 - 31439 80X11

★ : Select proper thickness.

* : Always check with the Parts Department for the latest parts information.

Outer diameter of snap rings

Item number	Outer diameter mm (in)	Parts number*
Ⓞ	150 (5.91)	31506 80X13
Ⓟ	119.1 (4.689)	31506 80X06
Ⓠ	182.8 (7.197)	31506 80X08
Ⓡ	144.8 (5.701)	31506 80X03
Ⓢ	173.8 (6.843)	31506 80X09
Ⓣ	133.9 (5.272)	31506 80X01

SAT565K

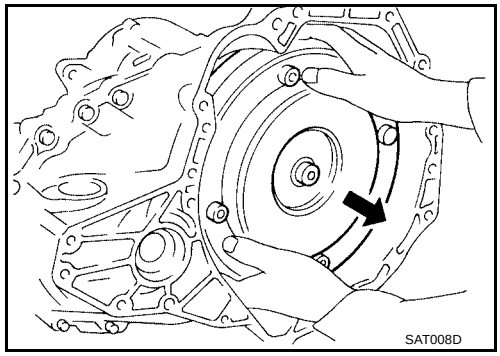
DISASSEMBLY

PFP:31020

Disassembly

ECS0067D

1. Drain ATF through drain plug.
2. Remove torque converter.

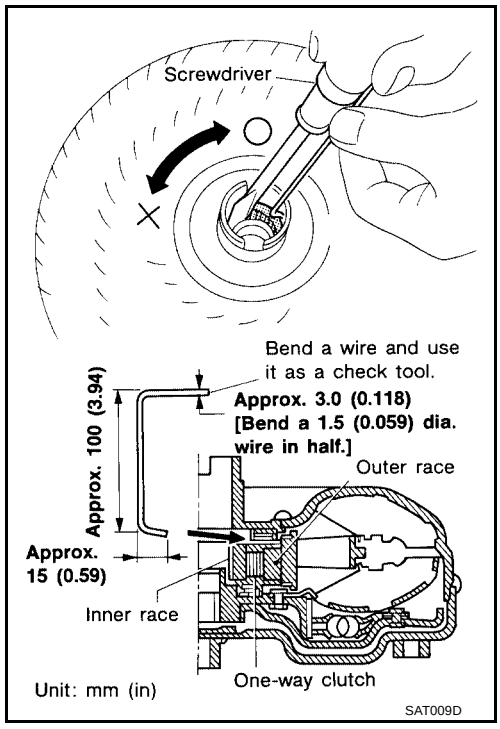


3. Check torque converter one-way clutch using check tool.

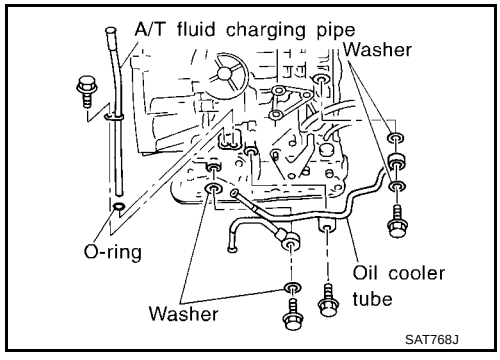
a. Insert check tool into the groove of bearing support built into one-way clutch outer race.

b. When fixing bearing support with check tool, rotate one- way clutch spline using screwdriver.

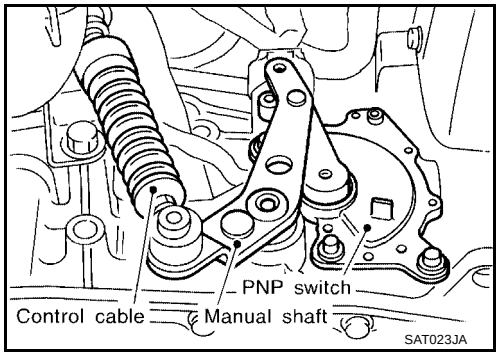
c. Check that inner race rotates clockwise only. If not, replace torque converter assembly.



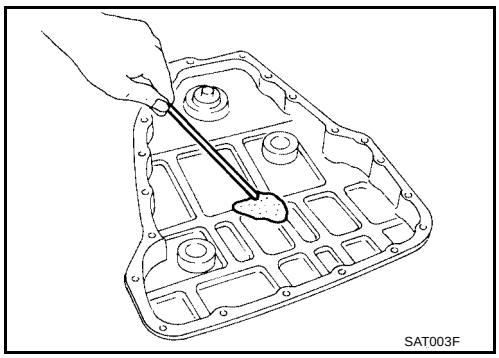
4. Remove A/T fluid charging pipe and fluid cooler tube.



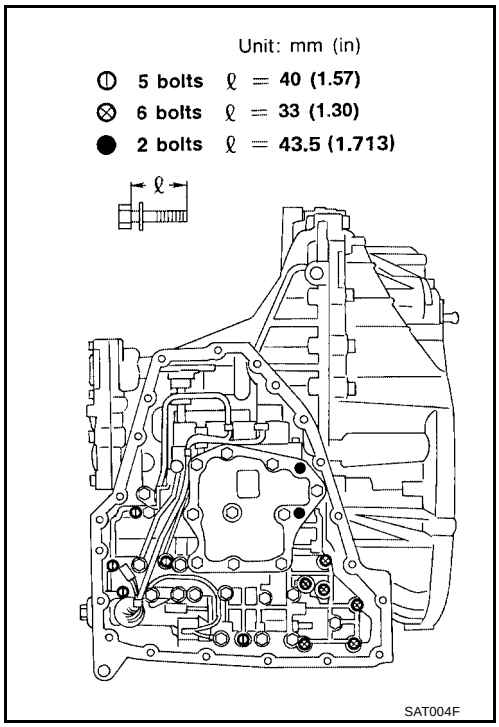
5. Set manual shaft to position P.
6. Remove park/neutral position (PNP) switch.



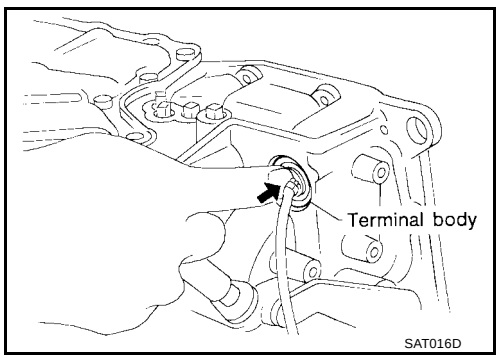
7. Remove oil pan and oil pan gasket.
   - **Always replace oil pan bolts as they are self-sealing bolts.**
8. Check foreign materials in oil pan to help determine causes of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up. Varnish can cause valves, servo, and clutches to stick and can inhibit pump pressure.
   - **If frictional material is detected, replace radiator after repair of A/T. Refer to CO-30, "RADIATOR" .**
9. Remove control valve assembly according to the following procedures.



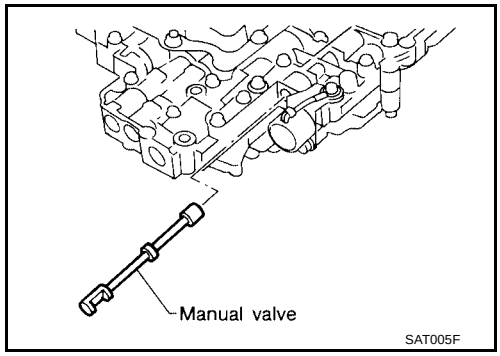
a. Remove control valve assembly mounting bolts **I** , **X** and ●.
b. Remove snap ring from terminal cord assembly connector.



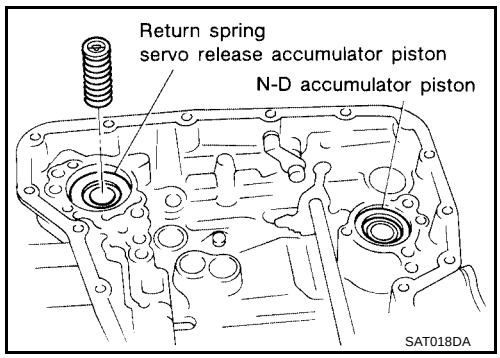
c. Push terminal body into transmission case and draw out solenoid harness.



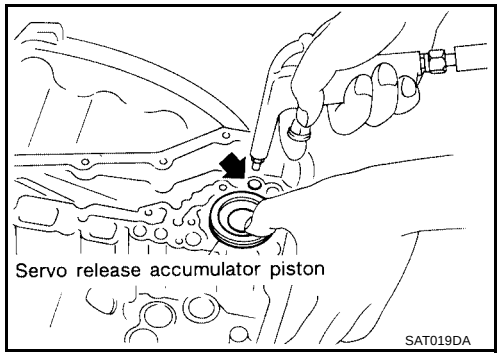
10. Remove manual valve from control valve assembly.



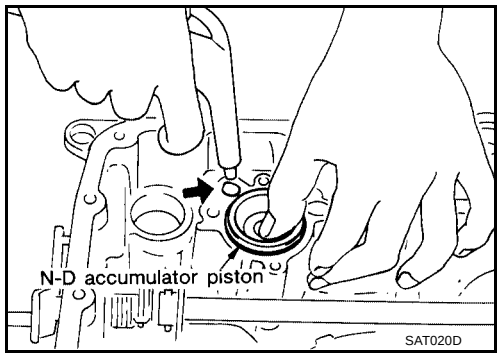
11. Remove return spring from servo release accumulator piston.



12. Remove servo release accumulator piston with compressed air.

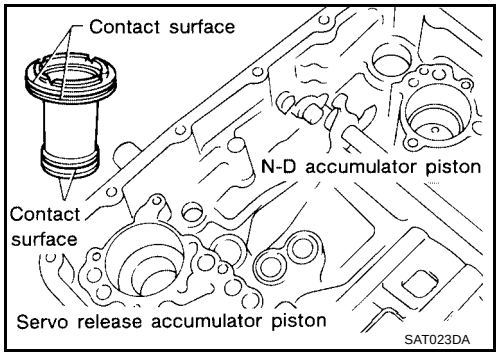


13. Remove O-rings from servo release accumulator piston.
14. Remove N-D accumulator piston and return spring with compressed air.

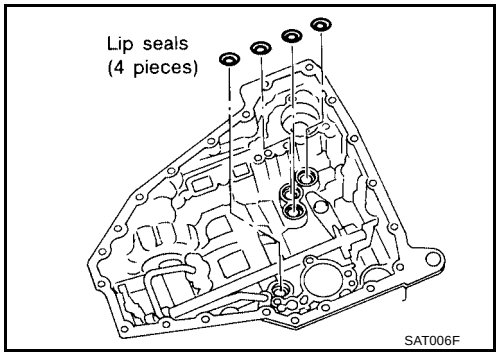


15. Remove O-rings from N-D accumulator piston.

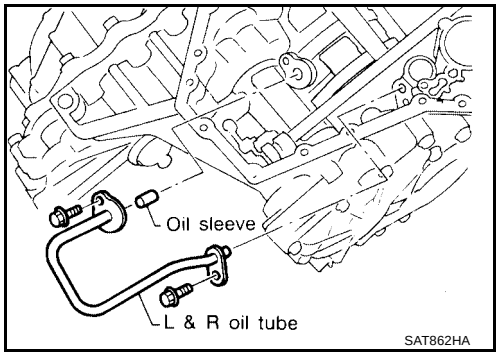
16. Check accumulator pistons and contact surface of transmission case for damage.



17. Check accumulator return springs for damage and free length.
18. Remove lip seals.

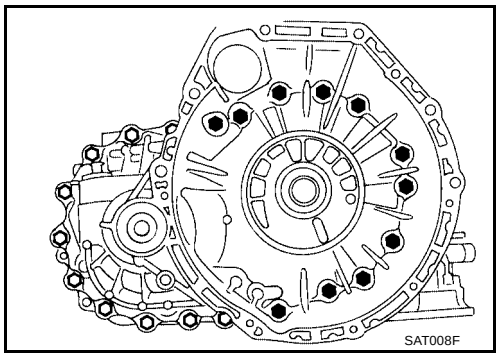


19. Remove L & R oil tube and oil sleeve.

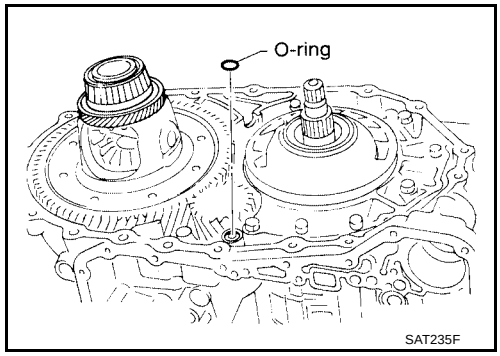


20. Remove converter housing according to the following procedures.

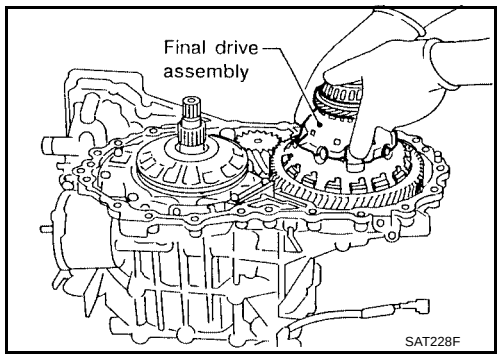
a. Remove converter housing mounting bolts.
b. Remove converter housing by tapping it lightly.



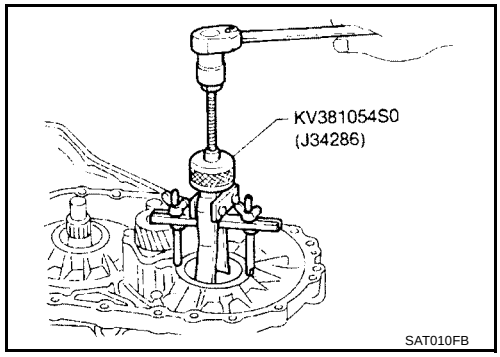
c. Remove O-ring from differential oil port.



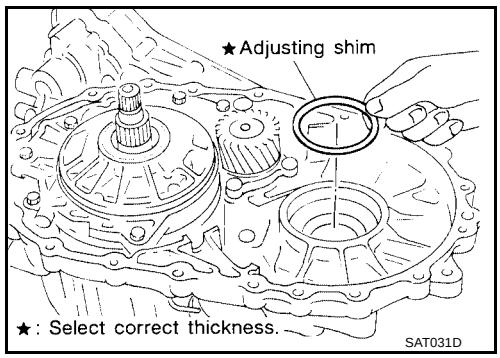
21. Remove final drive assembly from transmission case.



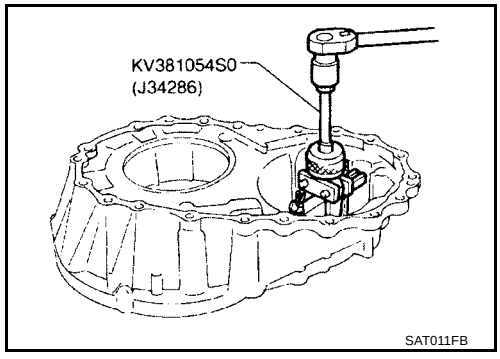
22. Remove differential side bearing outer race and side bearing adjusting shim from transmission case.



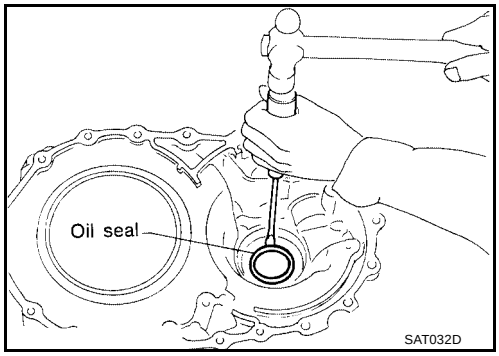
23. Remove differential side bearing adjusting shim from transmission case.



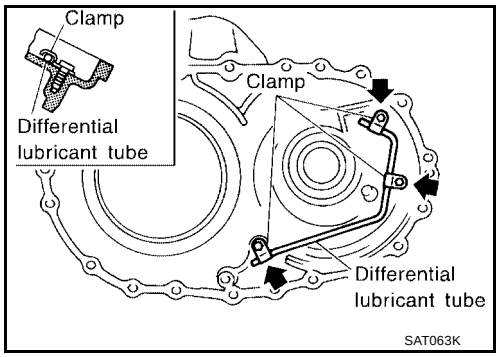
24. Remove differential side bearing outer race from converter housing.



25. Remove oil seal with screwdriver from converter housing.
    - **Be careful not to damage case.**

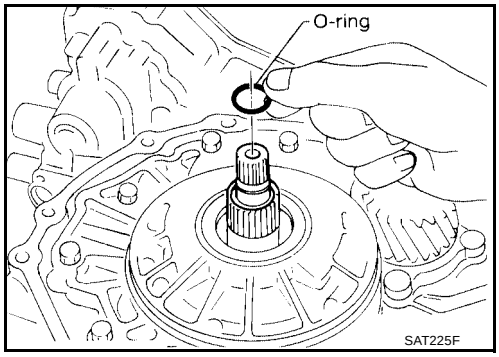


26. Remove differential lubricant tube from converter housing.

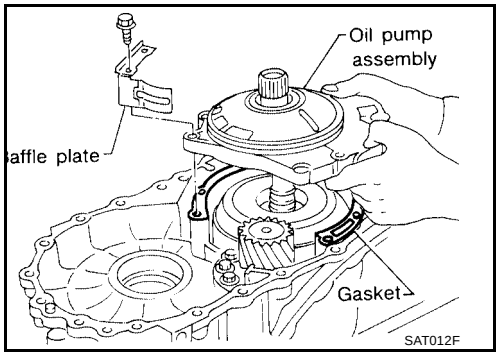


27. Remove oil pump according to the following procedures.

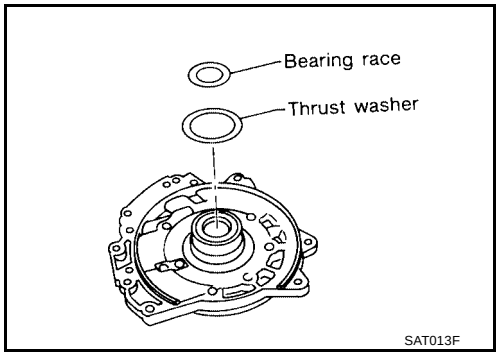
a. Remove O-ring from input shaft.



b. Remove oil pump assembly, baffle plate and gasket from transmission case.



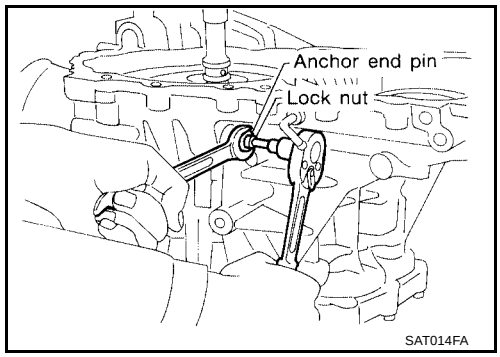
c. Remove thrust washer and bearing race from oil pump assembly.



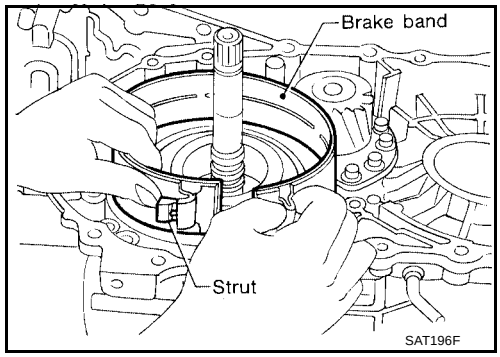
28. Remove brake band according to the following procedures.

a. Loosen lock nut, then back off anchor end pin.

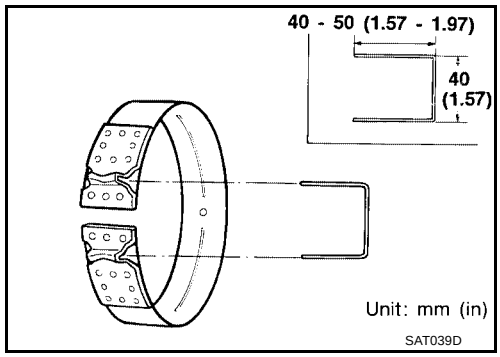
- **Do not reuse anchor end pin.**



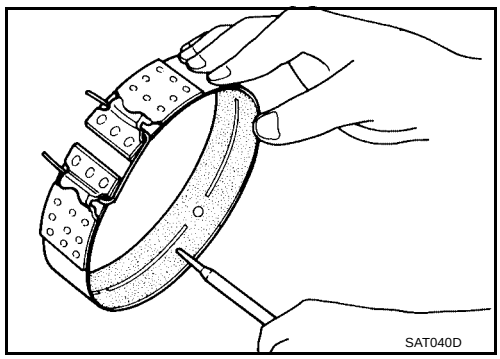
b. Remove brake band and strut from transmission case.



- **To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When removing the brake band, always secure it with a clip as shown. Leave the clip in position after removing the brake band.**

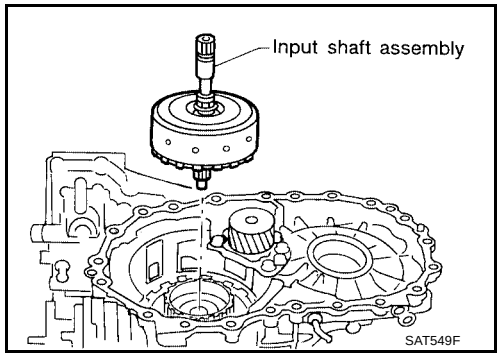


c. Check brake band facing for damage, cracks, wear or burns.

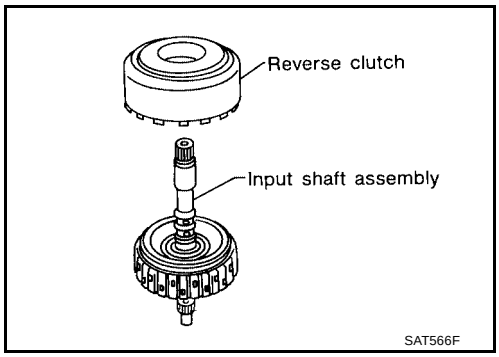


29. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures.

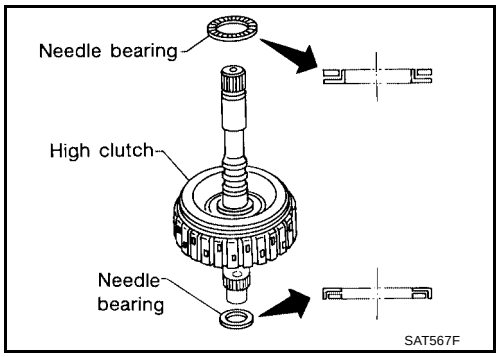
a. Remove input shaft assembly (high clutch) with reverse clutch.



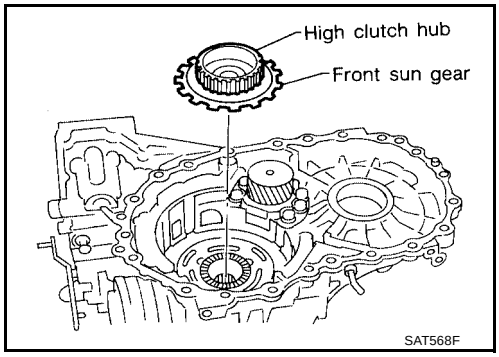
b. Remove input shaft assembly (high clutch) from reverse clutch.



c. Remove needle bearings from high clutch drum and check for damage or wear.

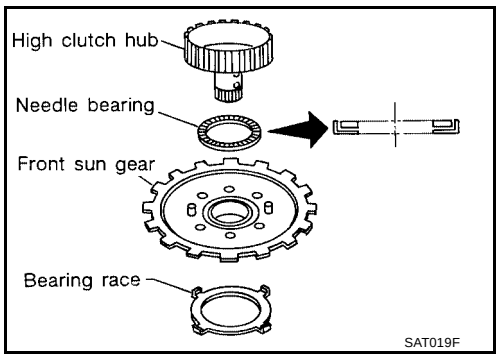


d. Remove high clutch hub and front sun gear from transmission case.

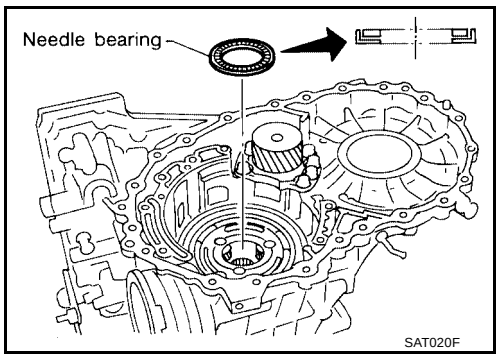


e. Remove front sun gear and needle bearing from high clutch hub and check for damage or wear.

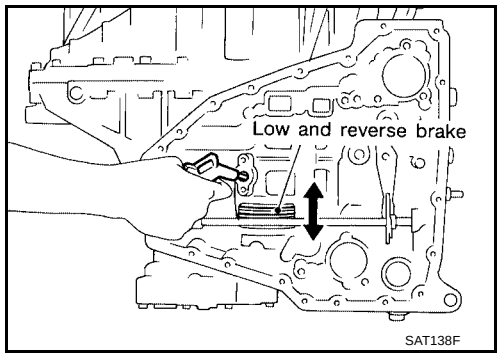
f. Remove bearing race from front sun gear and check for damage or wear.



30. Remove needle bearing from transmission case and check for damage or wear.

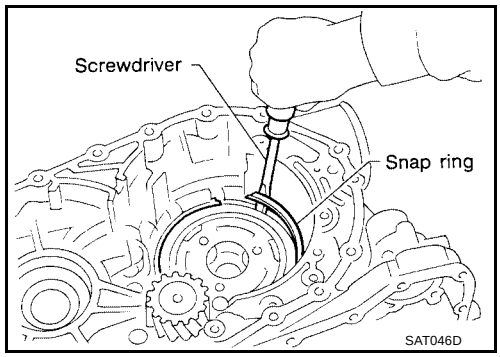


31. Apply compressed air and check to see that low and reverse brake operates.

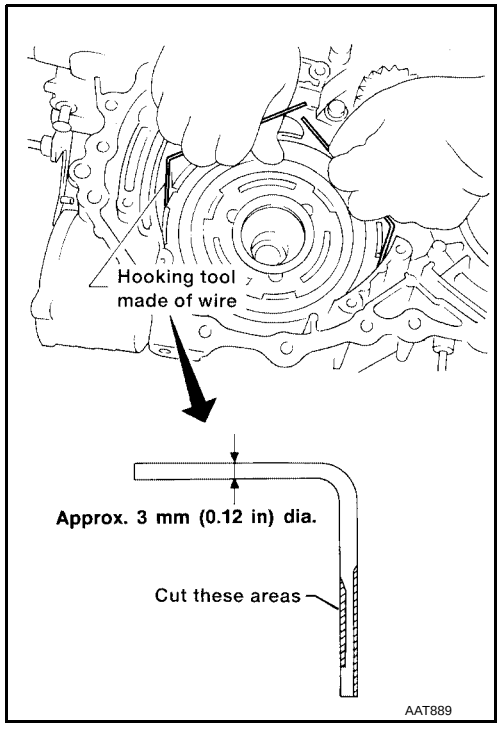


32. Remove low one-way clutch and front planetary carrier assembly according to the following procedures.

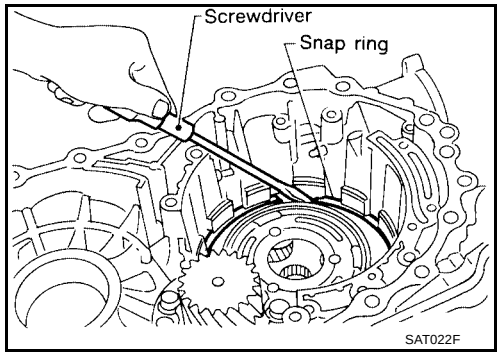
a. Remove snap ring with flat-bladed screwdriver.



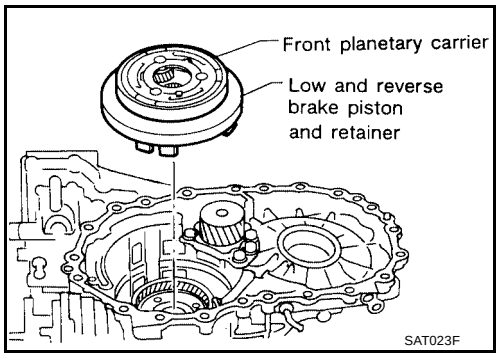
b. Remove low one-way clutch with a hook made of wire.



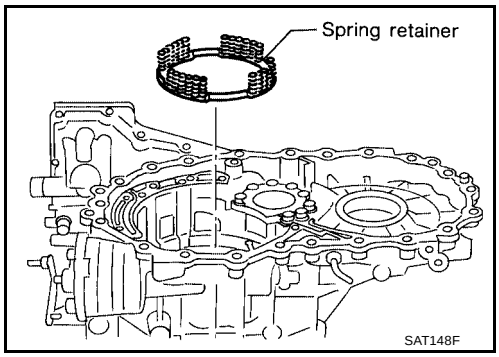
c. Remove snap ring with flat-bladed screwdriver.



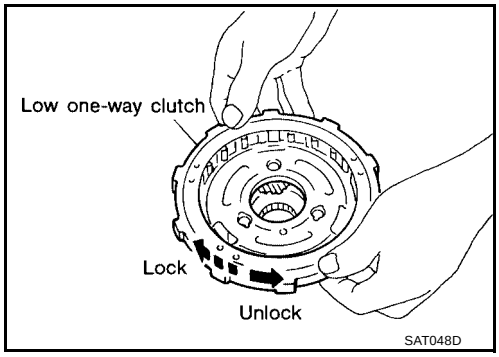
d. Remove front planetary carrier with low and reverse brake piston and retainer.



e. Remove low and reverse brake spring retainer.
- **Do not remove return springs from spring retainer.**

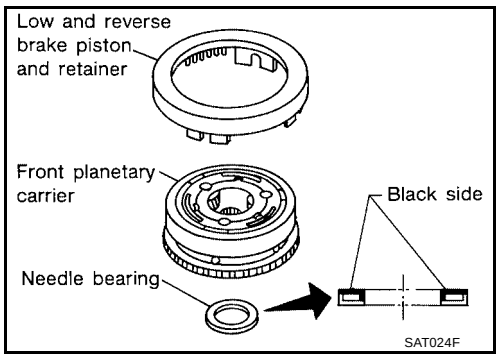


f. Check that low one-way clutch rotates in the direction of the arrow and locks in the opposite direction.



g. Remove needle bearing, low and reverse brake piston and retainer from front planetary carrier.

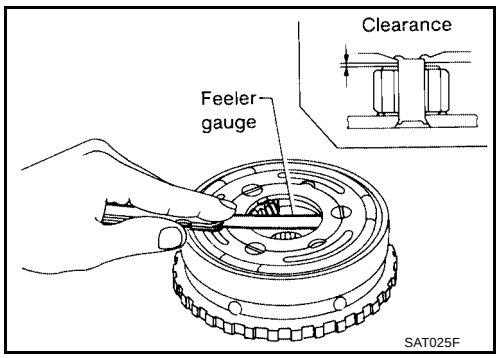
h. Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.



i. Check clearance between planetary gears and planetary carrier with feeler gauge.

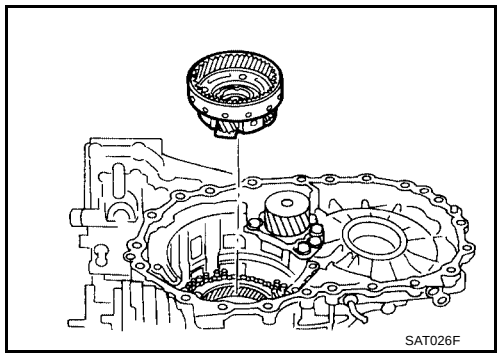
Standard clearance	**: 0.20 - 0.70 mm (0.0079 - 0.0276 in)**
Allowable limit	**: 0.80 mm (0.0315 in)**

Replace front planetary carrier if the clearance exceeds allowable limit.

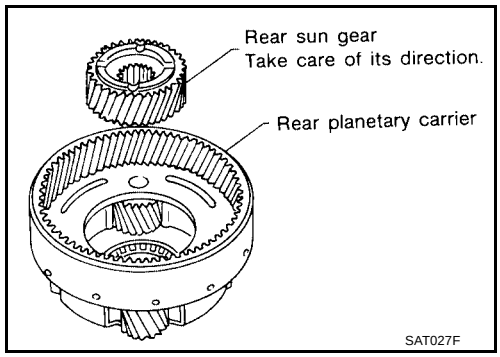


33. Remove rear planetary carrier assembly and rear sun gear according to the following procedures.

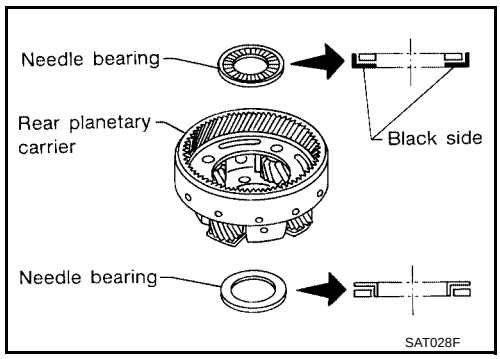
a. Remove rear planetary carrier assembly from transmission case.



b. Remove rear sun gear from rear planetary carrier.



c. Remove needle bearings from rear planetary carrier assembly.

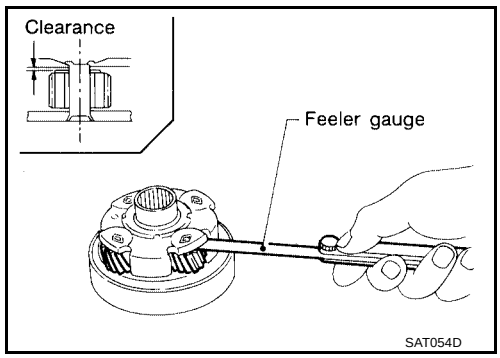


d. Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.

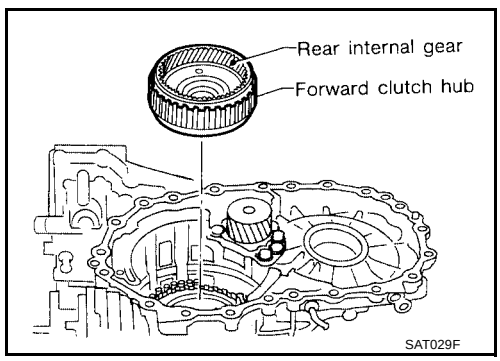
e. Check clearance between pinion washer and rear planetary carrier with feeler gauge.

Standard clearance	**: 0.20 - 0.70 mm (0.0079 - 0.0276 in)**
Allowable limit	**: 0.80 mm (0.0315 in)**

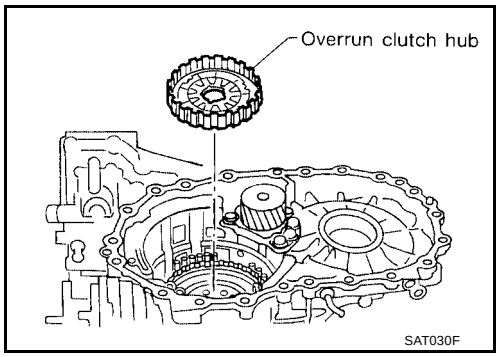
Replace rear planetary carrier if the clearance exceeds allowable limit.



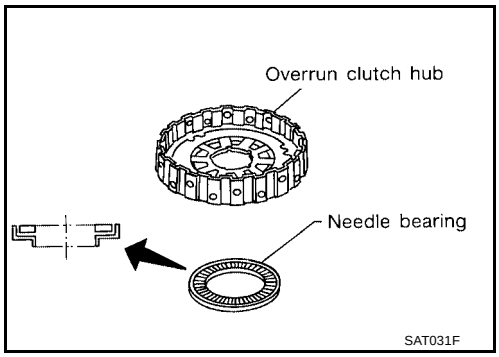
34. Remove rear internal gear and forward clutch hub from transmission case.



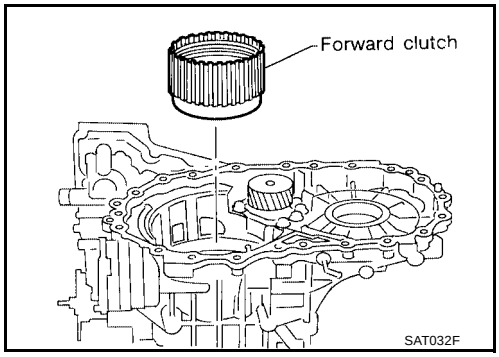
35. Remove overrun clutch hub from transmission case.



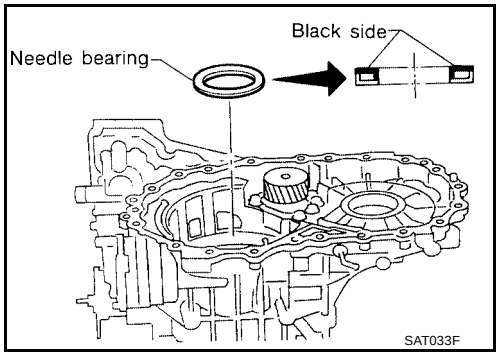
36. Remove needle bearing from overrun clutch hub and check for damage or wear.



37. Remove forward clutch assembly from transmission case.



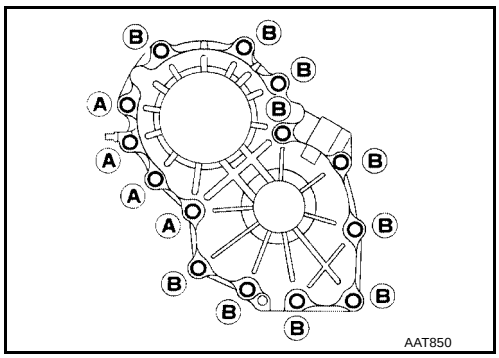
38. Remove needle bearing from transmission case.



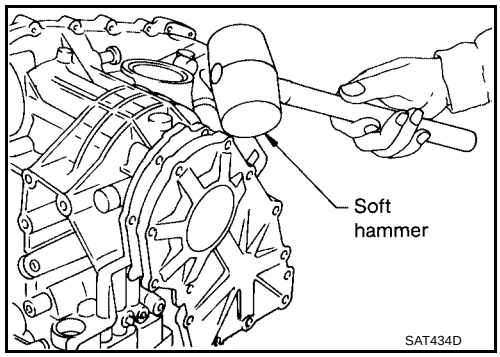
39. Remove output shaft assembly according to the following procedures.

a. Remove side cover bolts.

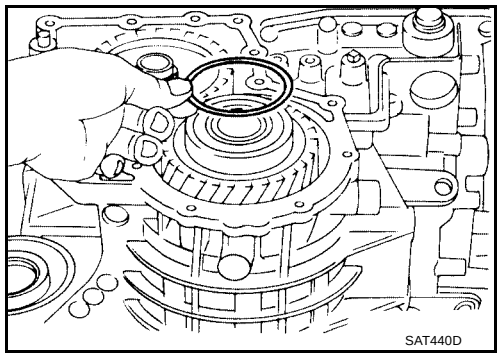
- **Do not mix bolts A and B.**
- **Always replace bolts A as they are self-sealing bolts.**



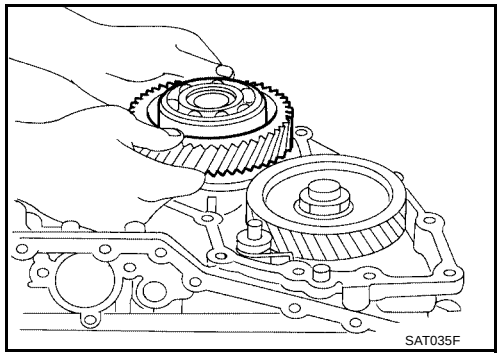
b. Remove side cover by lightly tapping it with a soft hammer.
   - **Be careful not to drop output shaft assembly. It might come out when removing side cover.**



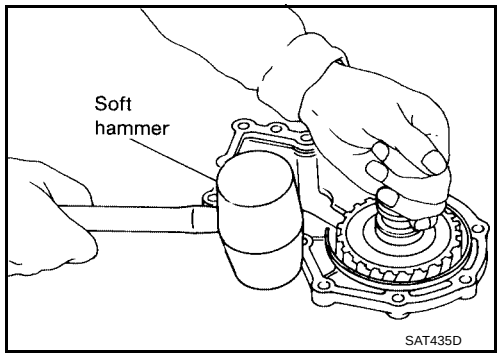
c. Remove adjusting shim.



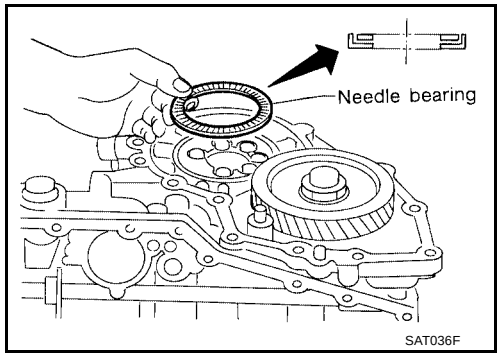
d. Remove output shaft assembly.



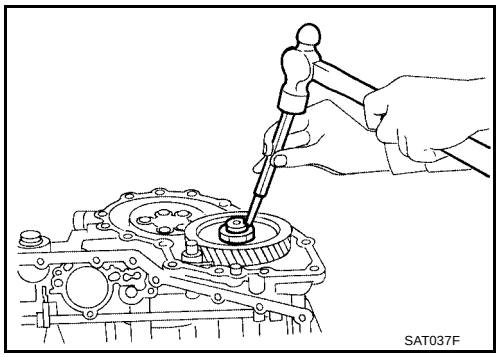
   - If output shaft assembly came off with side cover, tap cover with a soft hammer to separate.



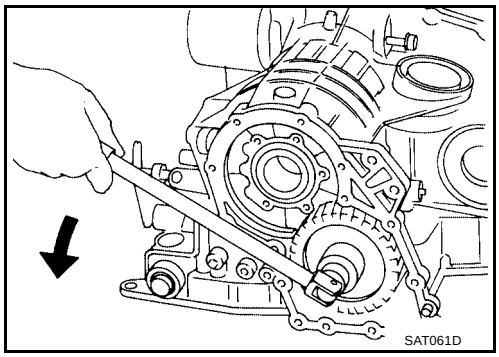
e. Remove needle bearing.



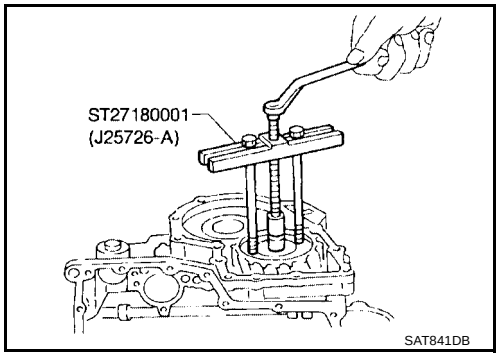
40. Disassemble reduction pinion gear according to the following procedures.
a. Set manual shaft to position P to fix idler gear.
b. Unlock idler gear lock nut using a pin punch.



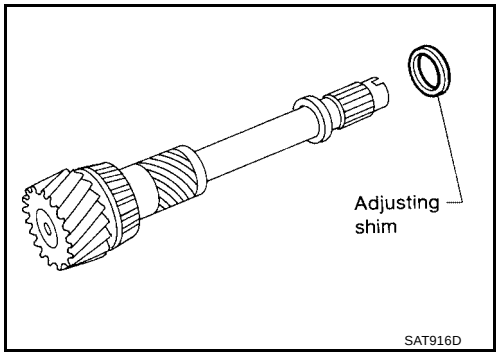
c. Remove idler gear lock nut.
- **Do not reuse idler gear lock nut.**



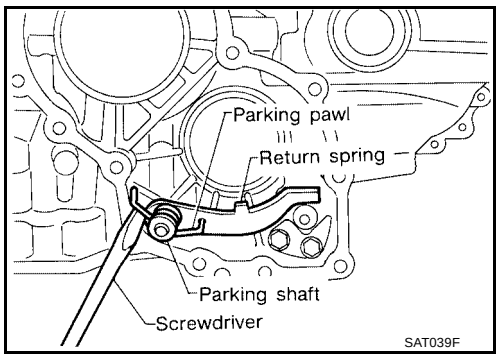
d. Remove idler gear with puller.



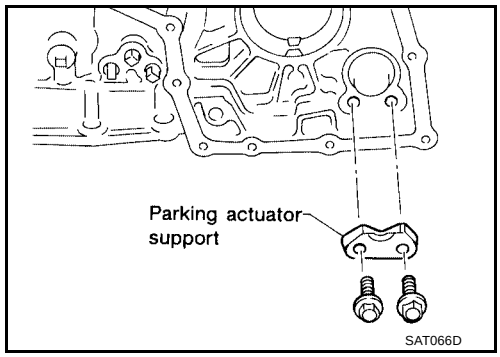
e. Remove reduction pinion gear.
f. Remove adjusting shim from reduction pinion gear.



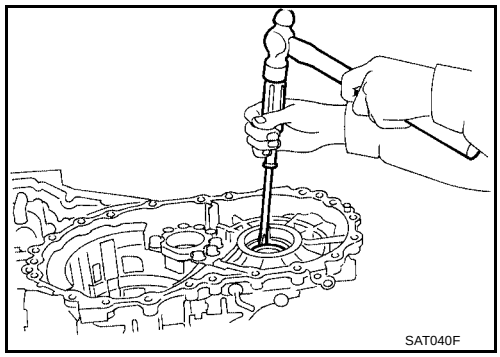
41. Remove return spring from parking shaft with screwdriver.
42. Draw out parking shaft and remove parking pawl from transmission case.
43. Check parking pawl and shaft for damage or wear.



44. Remove parking actuator support from transmission case.
45. Check parking actuator support for damage or wear.



46. Remove side oil seal with screwdriver from transmission case.



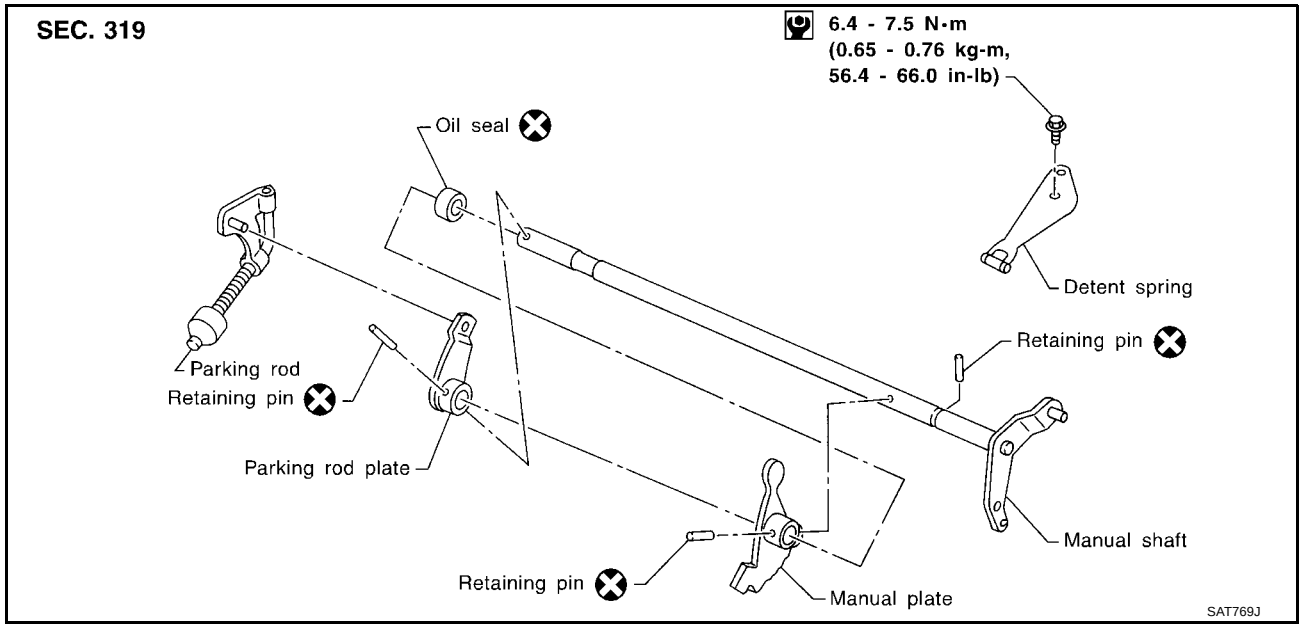
REPAIR FOR COMPONENT PARTS

PFP:00000

Manual Shaft

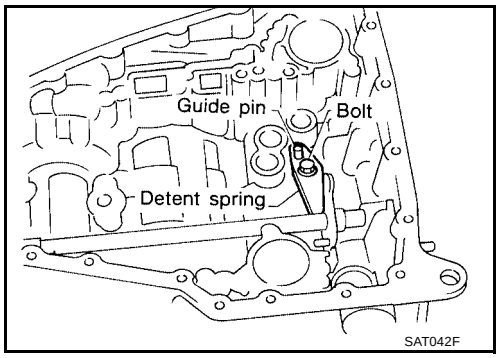
ECS0067E

COMPONENTS

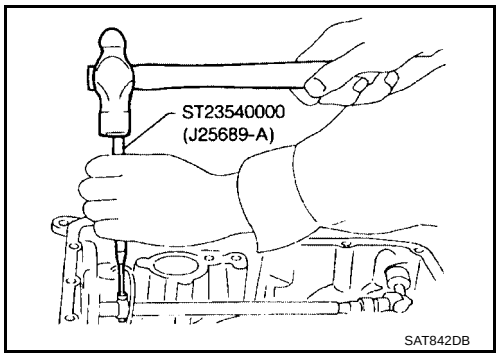


REMOVAL

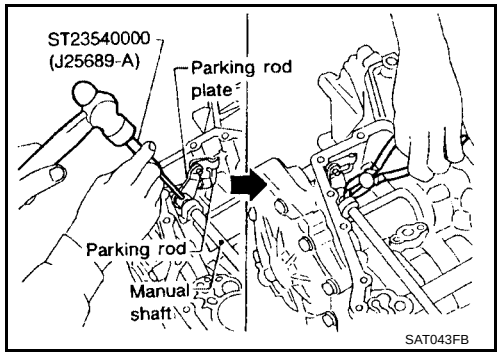
1. Remove detent spring from transmission case.



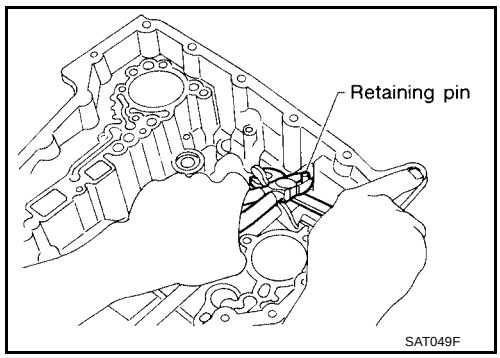
2. Drive out manual plate retaining pin.



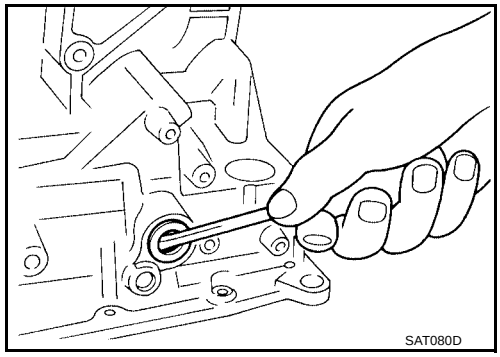
3. Drive and pull out parking rod plate retaining pin.
4. Remove parking rod plate from manual shaft.
5. Draw out parking rod from transmission case.



6. Pull out manual shaft retaining pin.
7. Remove manual shaft and manual plate from transmission case.



8. Remove manual shaft oil seal.

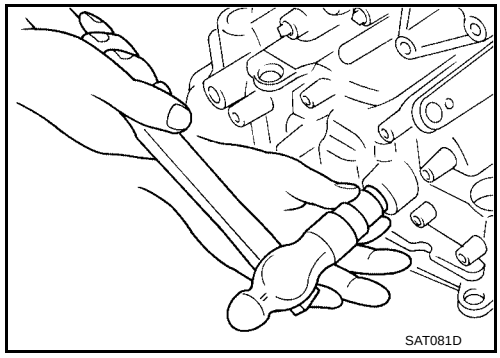


INSPECTION

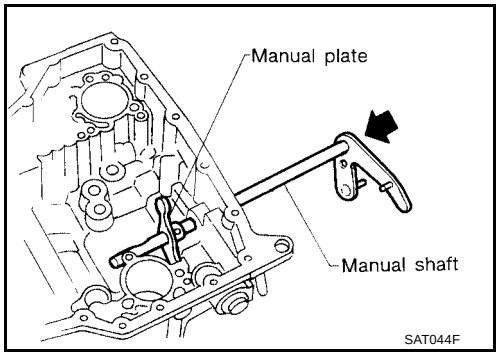
- Check component parts for wear or damage. Replace if necessary.

INSTALLATION

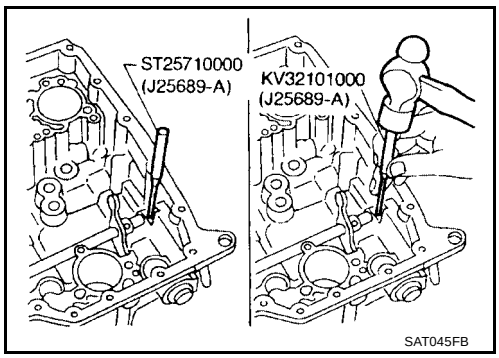
1. Install manual shaft oil seal.
   - **Apply ATF to outer surface of oil seal.**



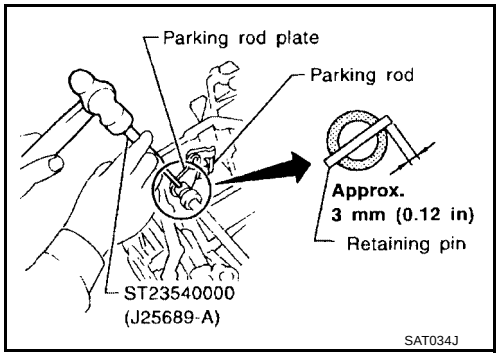
2. Install manual shaft and manual plate.



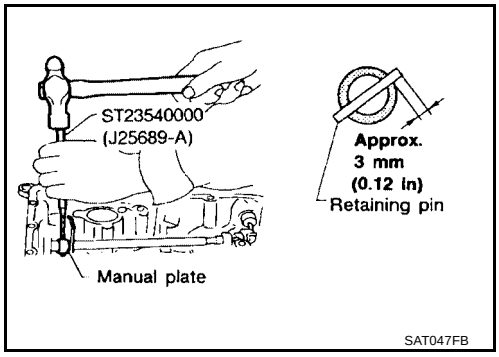
3. Align groove of manual shaft and hole of transmission case.
4. Install manual shaft retaining pin up to bottom of hole.



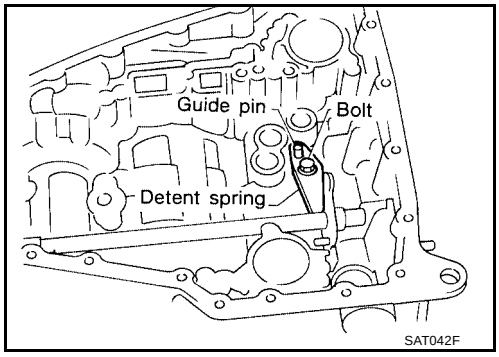
5. Install parking rod to parking rod plate.
6. Set parking rod assembly onto manual shaft and drive retaining pin.
   - **Both ends of pin should protrude.**



7. Drive manual plate retaining pin.
   - **Both ends of pin should protrude.**



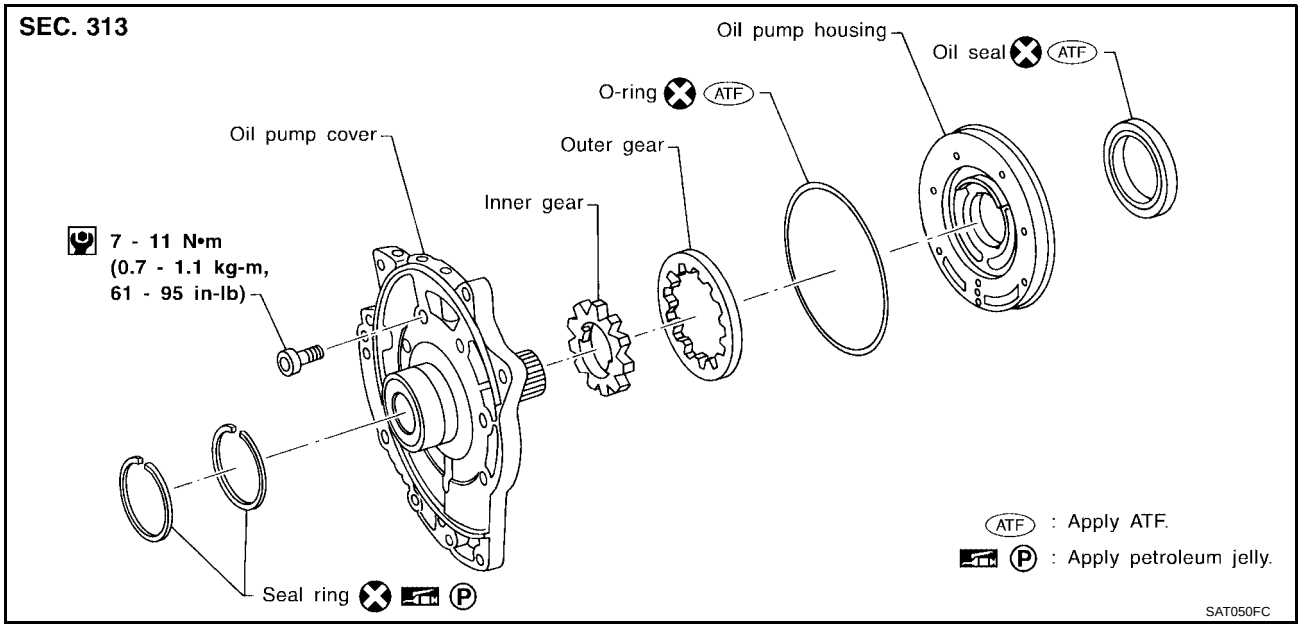
8. Install detent spring. Tighten detent spring bolts to the specified torque. Refer to AT-672, "COMPONENTS" .



Oil Pump

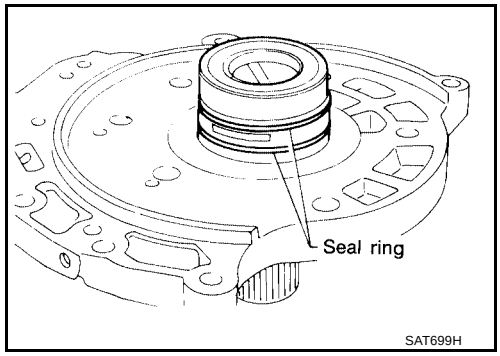
ECS0067F

COMPONENTS

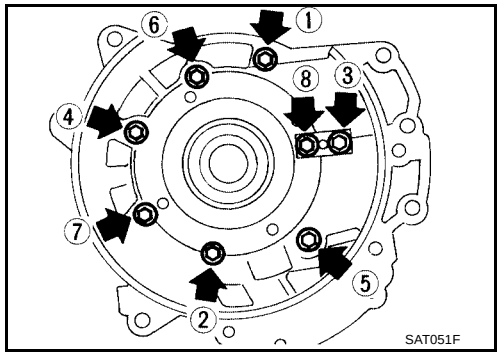


DISASSEMBLY

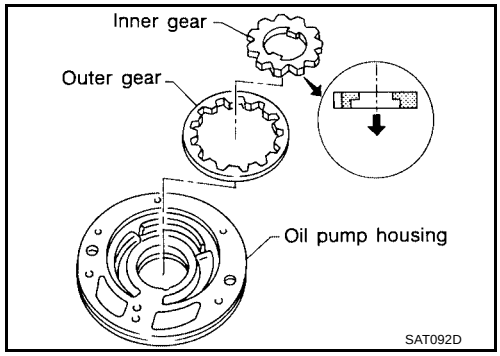
1. Remove seal rings.



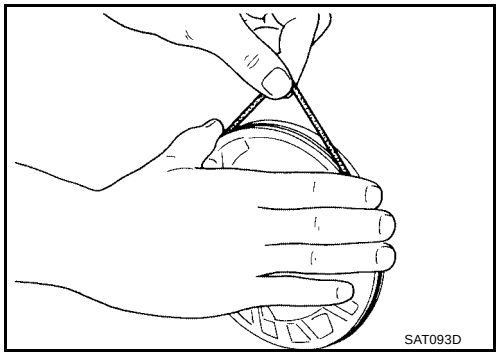
2. Loosen bolts in a crisscross pattern and remove oil pump cover.



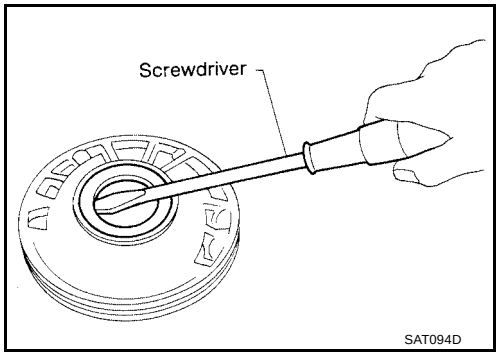
3. Remove inner and outer gear from oil pump housing.



4. Remove O-ring from oil pump housing.



5. Remove oil pump housing oil seal.



INSPECTION

Oil Pump Housing, Oil Pump Cover, Inner Gear and Outer Gear

- Check for wear or damage.

Side Clearances

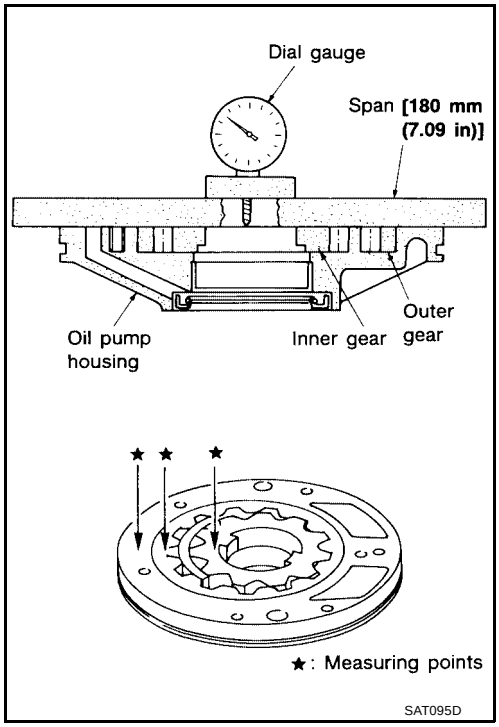
- Measure side clearance of inner and outer gears in at least four places around each outside edge. Maximum measured values should be within specified positions.

  Standard clearance **: 0.030 - 0.050 mm (0.0012 - 0.0020 in)**

- If clearance is less than standard, select inner and outer gear as a set so that clearance is within specifications.

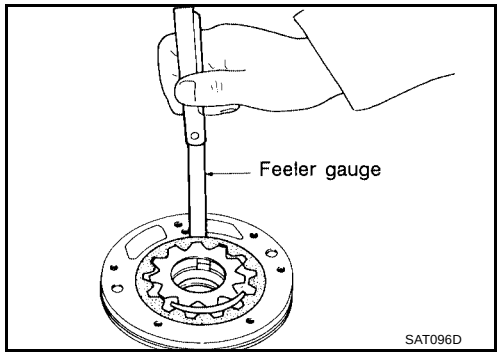
  Inner and outer gear **: Refer to AT-757, "OIL PUMP" .**

- If clearance is more than standard, replace whole oil pump assembly except oil pump cover.



- Measure clearance between outer gear and oil pump housing.

Standard clearance : **0.111 - 0.181 mm (0.0044 - 0.0071 in)**
Allowable limit : **0.181 mm (0.0071 in)**

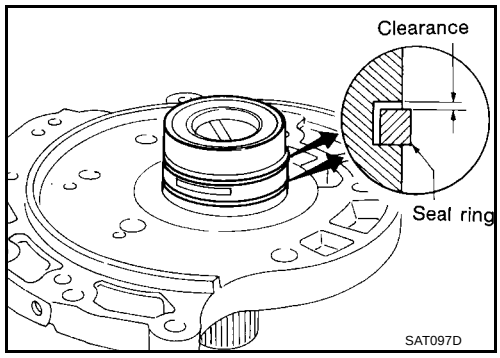


- If not within allowable limit, replace whole oil pump assembly except oil pump cover.

SEAL RING CLEARANCE

- Measure clearance between seal ring and ring groove.

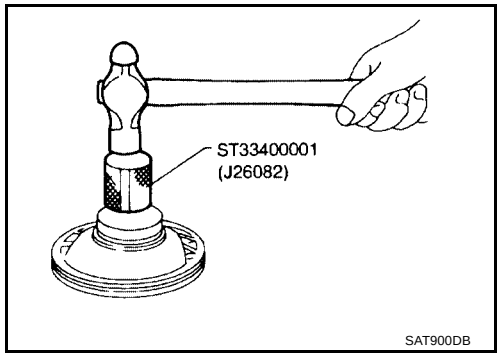
Standard clearance : **0.1 - 0.25 mm (0.0039 - 0.0098 in)**
Allowable limit : **0.25 mm (0.0098 in)**



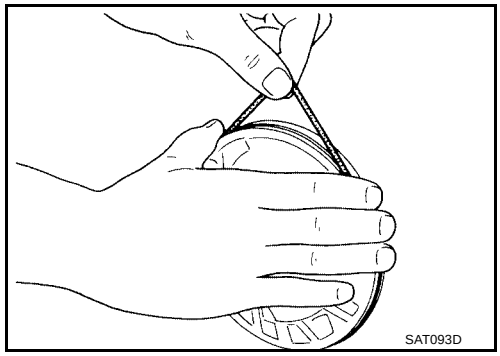
- If not within allowable limit, replace oil pump cover assembly.

ASSEMBLY

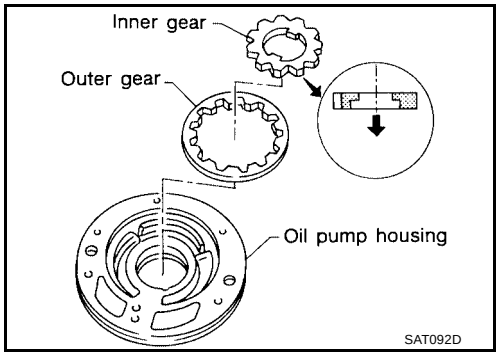
1. Install oil seal on oil pump housing.



2. Install O-ring on oil pump housing.
   - **Apply ATF to O-ring.**



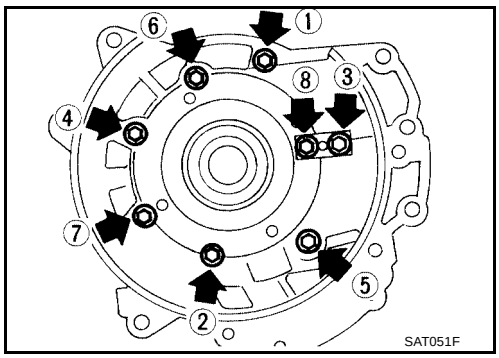
3. Install inner and outer gears on oil pump housing.
   - **Be careful of direction of inner gear.**



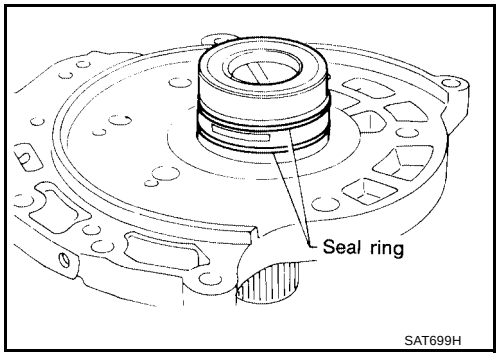
4. Install oil pump cover on oil pump housing.

a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.

b. Tighten bolts in a crisscross pattern. Tighten oil pump cover bolts to the specified torque. Refer to AT-675, "COMPONENTS" .



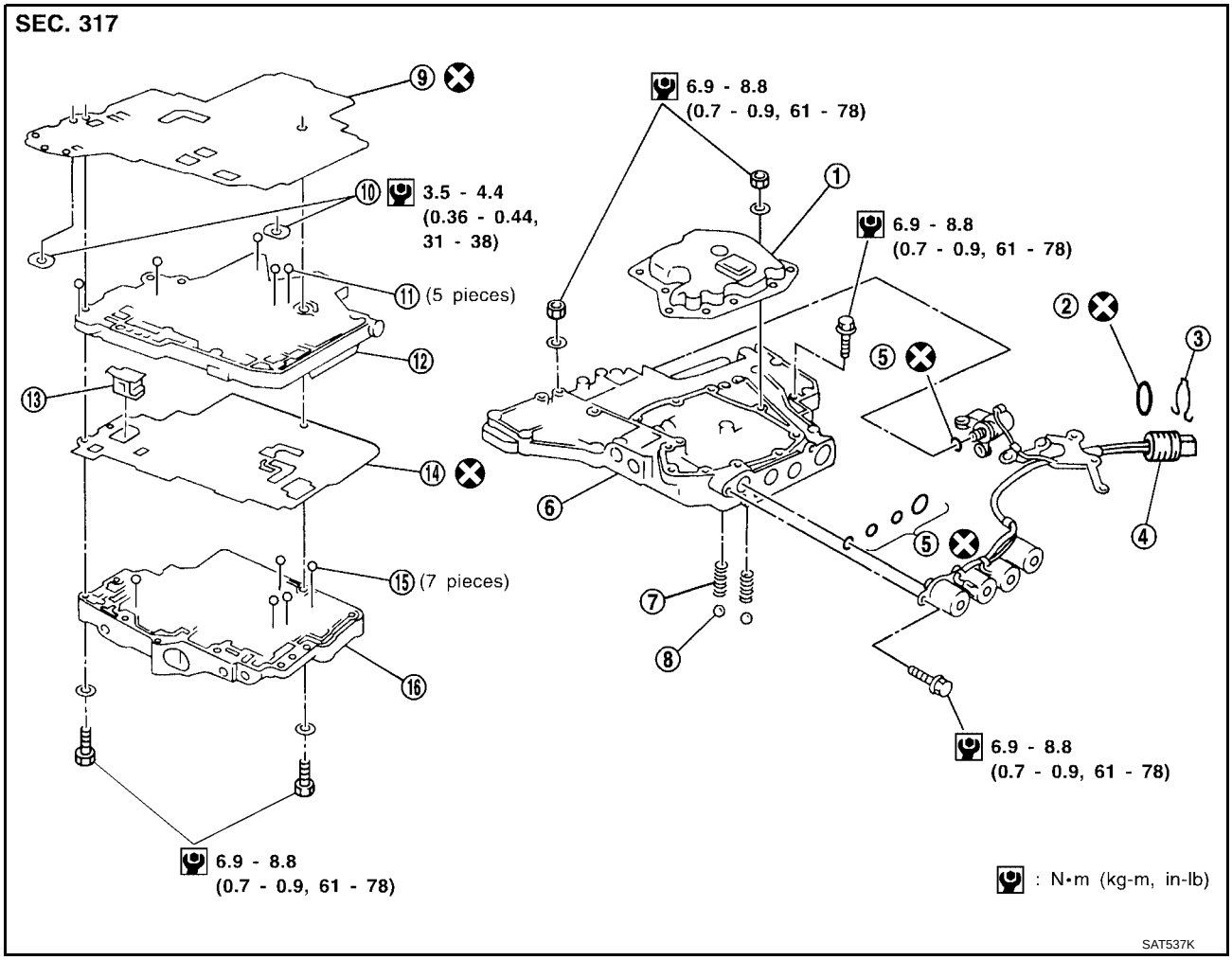
5. Install new seal rings carefully after packing ring groove with petroleum jelly.
   - **Do not spread gap of seal ring excessively while installing. The ring may be deformed.**



Control Valve Assembly

ECS0067G

COMPONENTS



1.	Oil strainer	2.	O-ring	3.	Snap ring
	Terminal body	5.	O-rings	6.	Control valve lower body
7.	Oil cooler relief valve spring	8.	Check ball	9.	Separating plate
10	Support plate	11	Steel ball	12	Control valve inter body
13	Pilot filter	14	Separating plate	15	Steel ball
16	Control valve upper body				

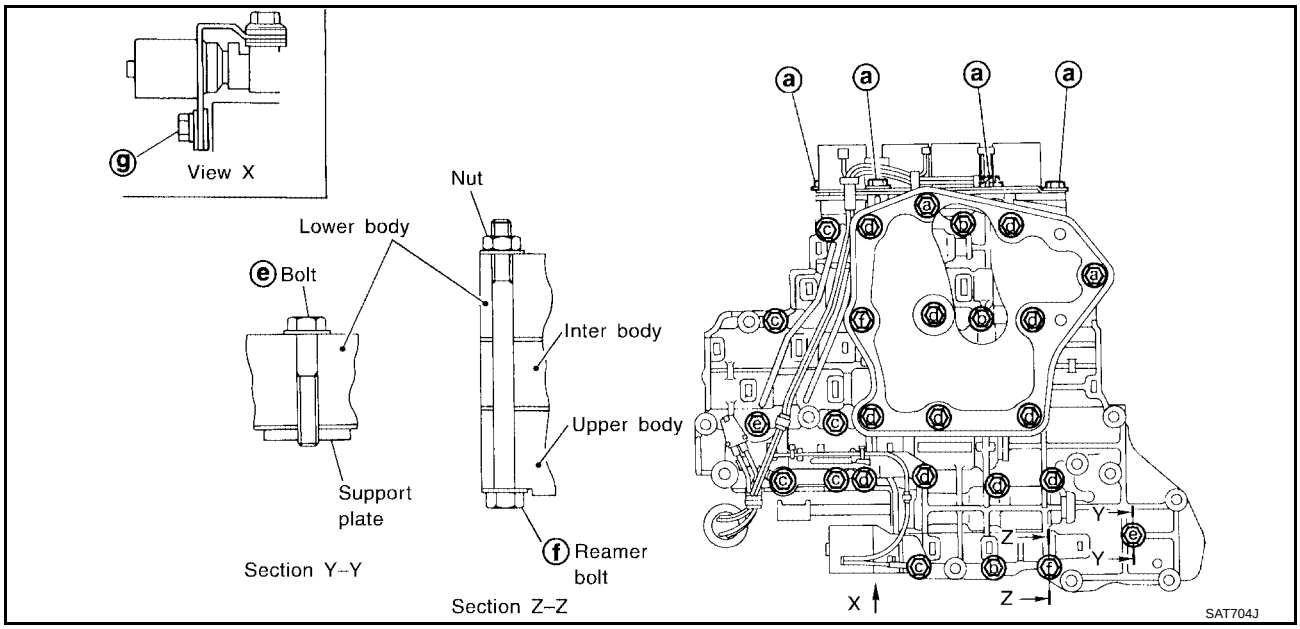
DISASSEMBLY

Disassemble upper, inter and lower bodies.

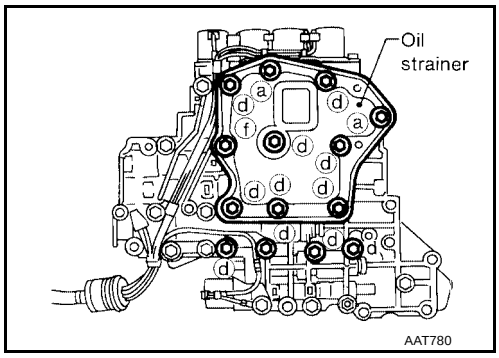
Bolt length, number and location:

Bolt symbol	a	b	c	d	e	f	g
Bolt length " ℓ " mm (in)	13.5 (0.531)	58.0 (2.283)	40.0 (1.575)	66.0 (2.598)	33.0 (1.299)	78.0 (3.071)	18.0 (0.709)
Number of bolts	6	3	6	11	2	2	1

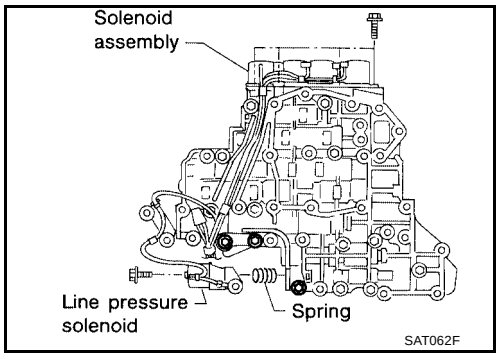
f: Reamer bolt and nut.



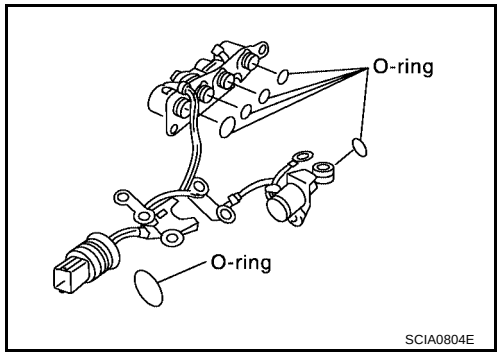
1. Remove bolts **a** , **d** and nut **f** and remove oil strainer from control valve assembly.



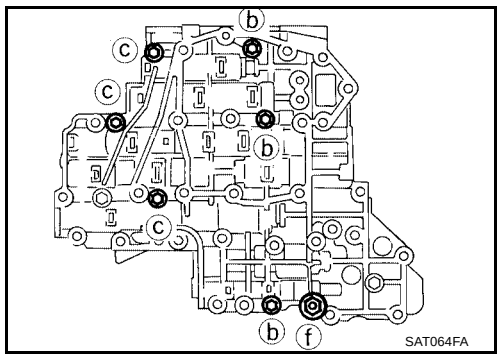
2. Remove solenoid valve assembly and line pressure solenoid valve from control valve assembly.



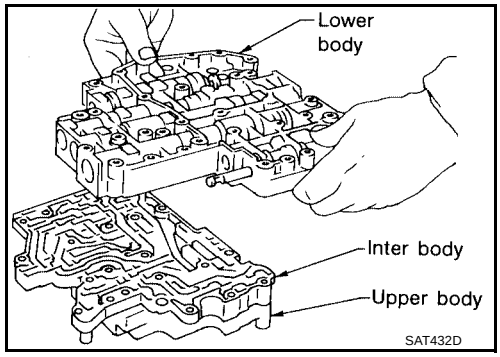
3. Remove O-rings from solenoid valves and terminal body.



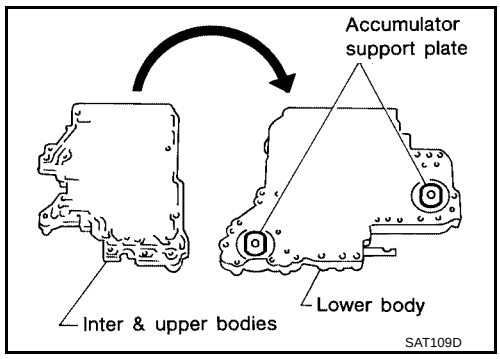
4. Place upper body facedown, and remove bolts **b** , **c** and nut **f** .



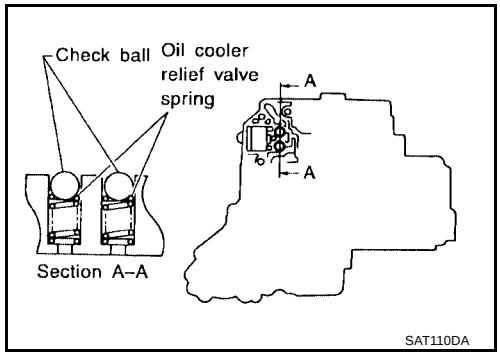
5. Remove inter body from lower body.



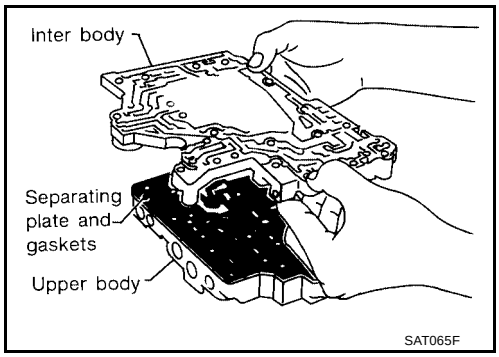
6. Turn over lower body, and remove accumulator support plate.



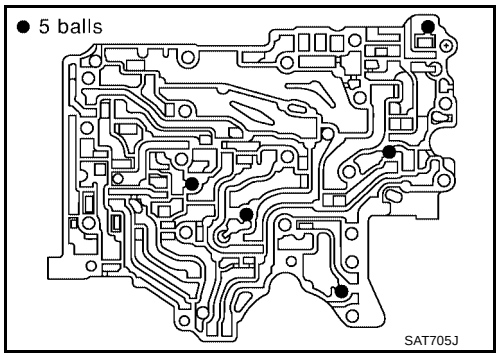
7. Remove bolts **e** , separating plate and separating gasket from lower body.
8. Remove check balls and oil cooler relief valve springs from lower body.
   - **Be careful not to lose check balls and oil cooler relief valve springs.**



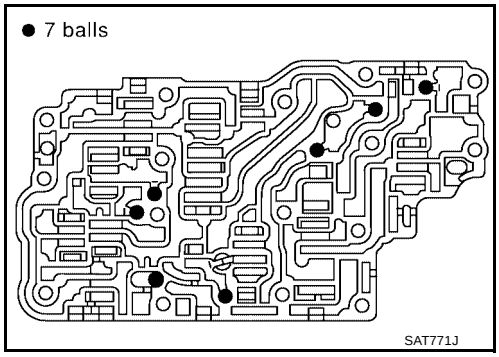
9. Remove inter body from upper body.



10. Check to see that steel balls are properly positioned in inter body and then remove them.
    - **Be careful not to lose steel balls.**



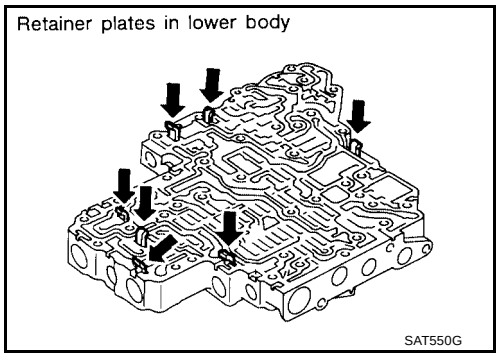
11. Check to see that steel balls are properly positioned in upper body and then remove them.
    - **Be careful not to lose steel balls.**



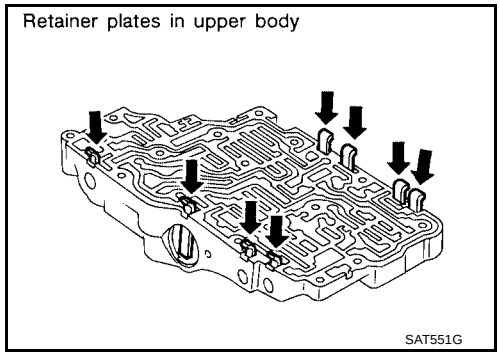
INSPECTION

Lower and Upper Bodies

- Check to see that retainer plates are properly positioned in lower body.



- Check to see that retainer plates are properly positioned in upper body.
- **Be careful not to lose these parts.**

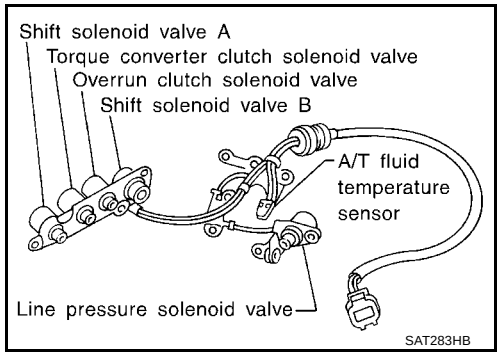


Oil Strainer

- Check wire netting of oil strainer for damage.

Shift Solenoid Valves “A” and “B”, Line Pressure Solenoid Valve, Torque Converter Clutch Solenoid Valve and Overrun Clutch Solenoid Valve

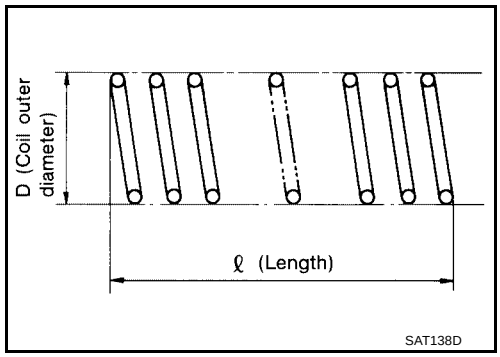
- Measure resistance.
- For shift solenoid valve A, refer to AT-556 .
- For shift solenoid valve B, refer to AT-561 .
- For line pressure solenoid valve, refer to AT-550 .
- For torque converter clutch solenoid valve, refer to AT-537 .
- For overrun clutch solenoid valve, refer to AT-571 .



Oil Cooler Relief Valve Spring

- Check springs for damage or deformation.
- Measure free length and outer diameter.

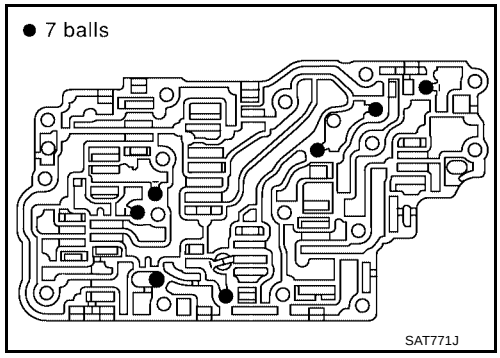
Inspection standard : Refer to AT-753, "CONTROL VALVE AND PLUG RETURN SPRINGS" .



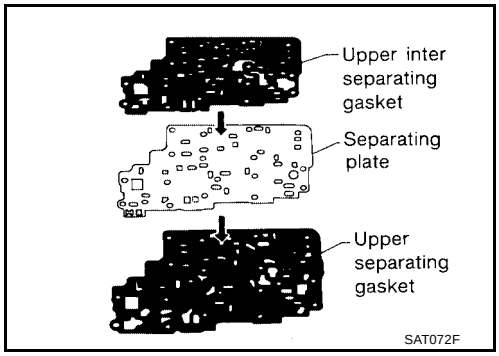
ASSEMBLY

1. Install upper, inter and lower body.

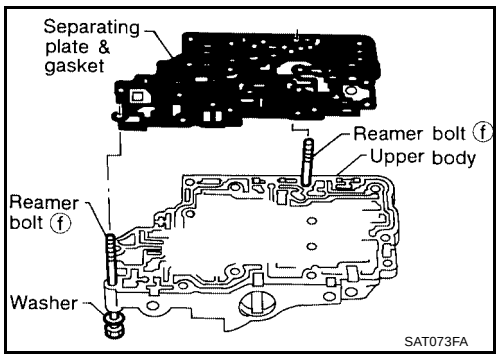
a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



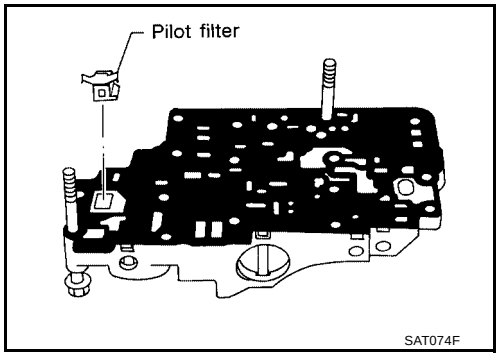
b. Install upper separating gasket, upper inter separating gasket and upper separating plate in order shown in illustration.



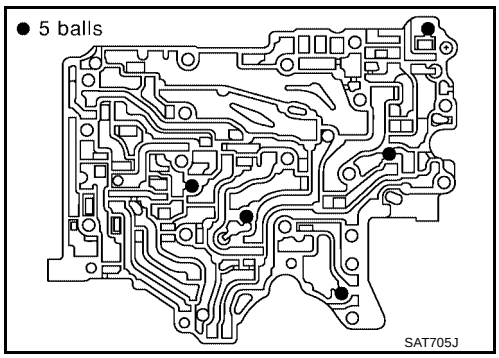
c. Install reamer bolts **f** from bottom of upper body. Using reamer bolts as guides, install separating plate and gaskets as a set.



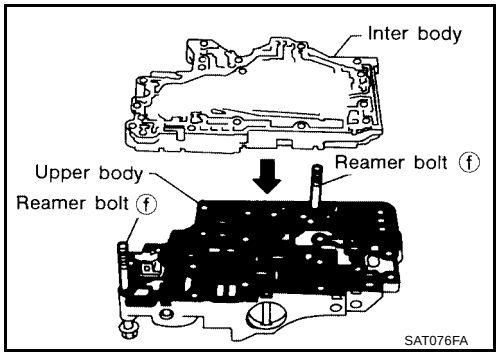
d. Install pilot filter.



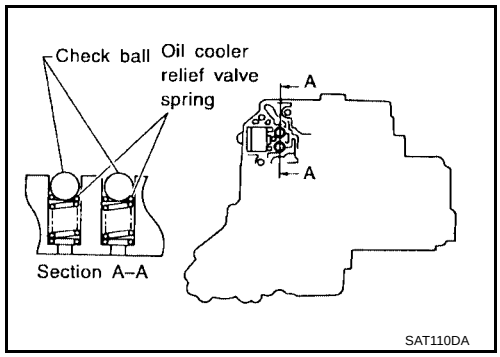
e. Place lower body as shown in illustration (side of inter body face up). Install steel balls in their proper positions.



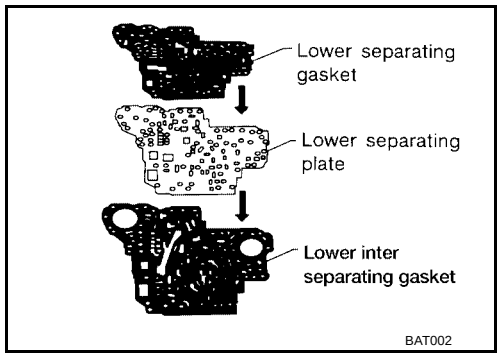
f. Install inter body on upper body using reamer bolts **f** as guides.
   - **Be careful not to dislocate or drop steel balls.**



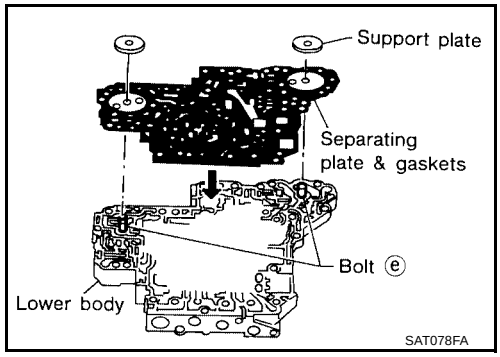
g. Install check balls and oil cooler relief valve springs in their proper positions in lower body.



h. Install lower separating gasket, lower inter separating gasket and lower separating plate in order shown in illustration.

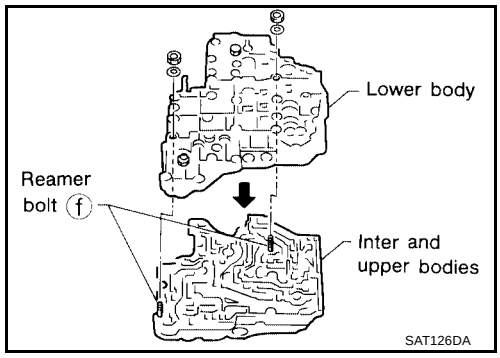


i. Install bolts **e** from bottom of lower body. Using bolts **e** as guides, install separating plate and gaskets as a set.

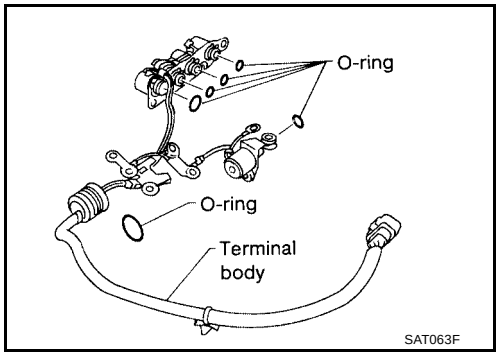


j. Temporarily install support plates on lower body.

k. Install lower body on inter body using reamer bolts **f** as guides and tighten reamer bolts **f** slightly.



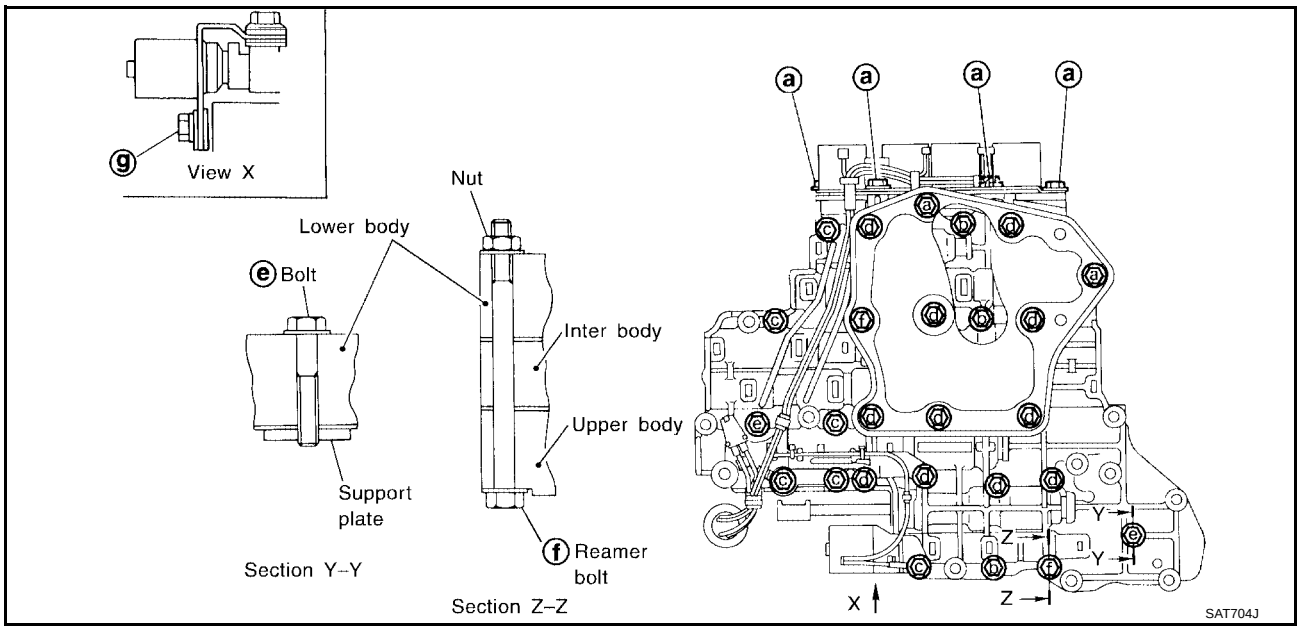
2. Install O-rings to solenoid valves and terminal body.
   - **Apply ATF to O-rings.**



3. Install and tighten bolts.

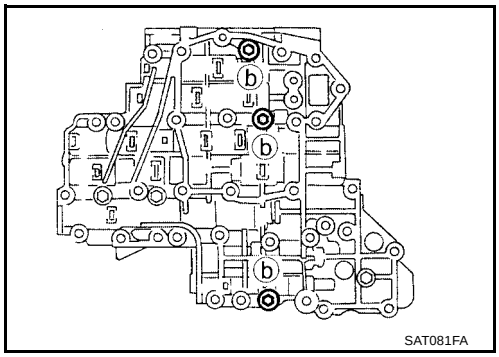
Bolt length, number and location:

Bolt symbol	a	b	c	d	e	f	g
Bolt length "ℓ" mm (in)	13.5 (0.531)	58.0 (2.283)	40.0 (1.575)	66.0 (2.598)	33.0 (1.299)	78.0 (3.071)	18.0 (0.709)
Number of bolts	6	3	6	11	2	2	1

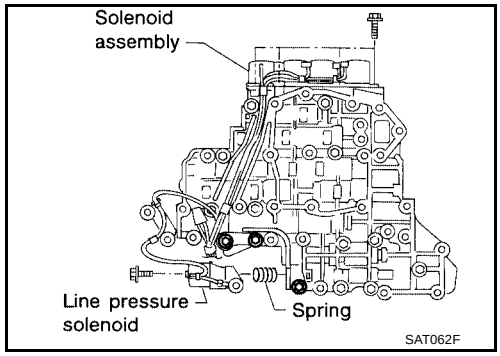


a. Install and tighten bolts **b** to specified torque.

: 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)

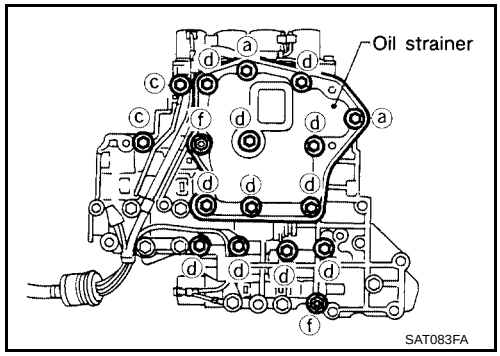


b. Install solenoid valve assembly and line pressure solenoid valve to lower body.



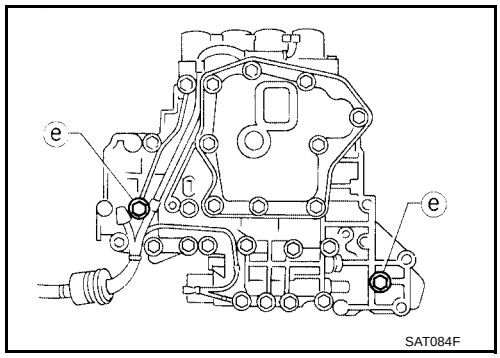
c. Set oil strainer, then tighten bolts **a** , **c** , **d** and nuts **f** to specified torque.

: 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)



d. Tighten bolts **e** to specified torque.

: 3.4 - 4.4 N·m (0.35 - 0.45 kg-m, 30.4 - 39.1 in-lb)



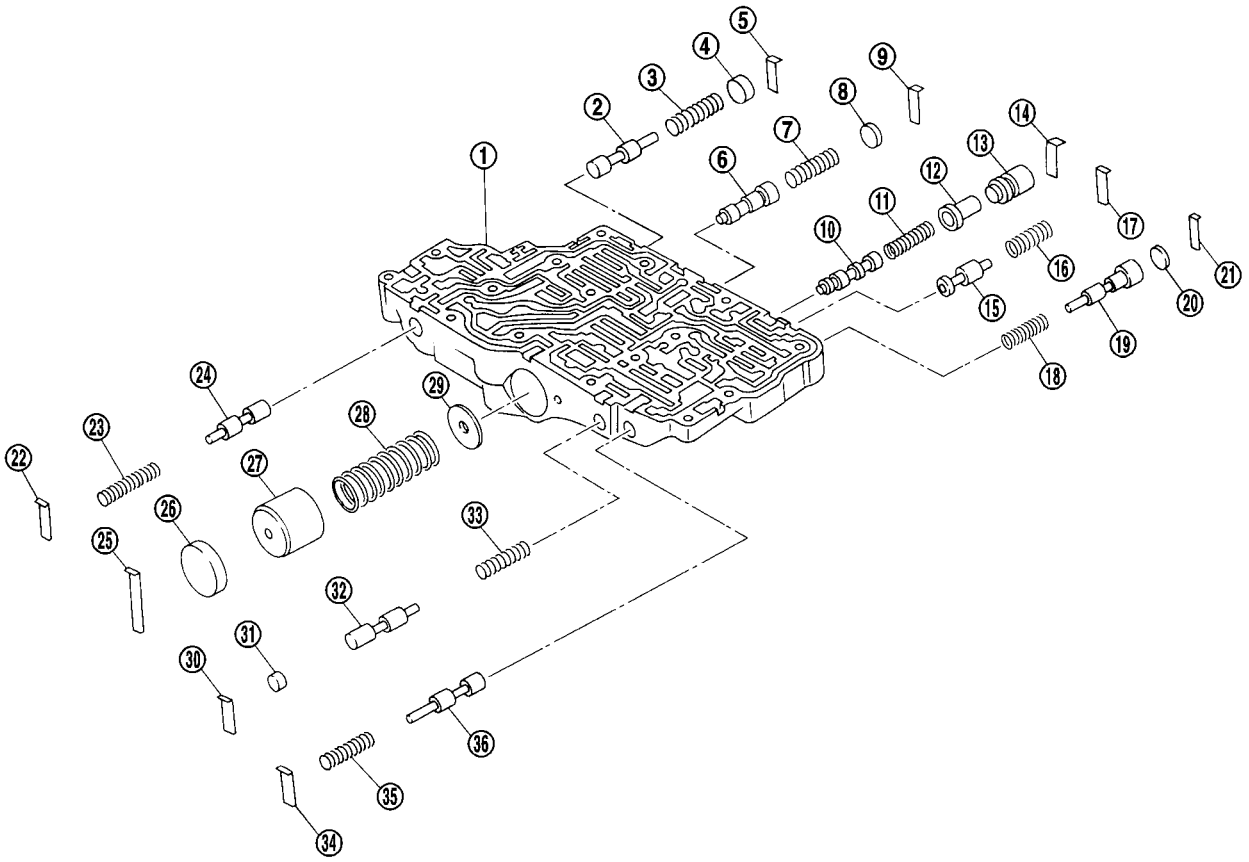
Control Valve Upper Body

ECS0067H

COMPONENTS

Apply ATF to all components before installation.

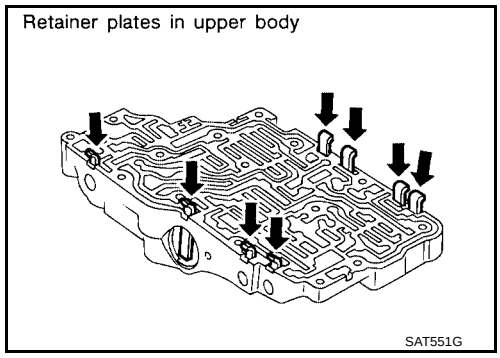
SEC. 317



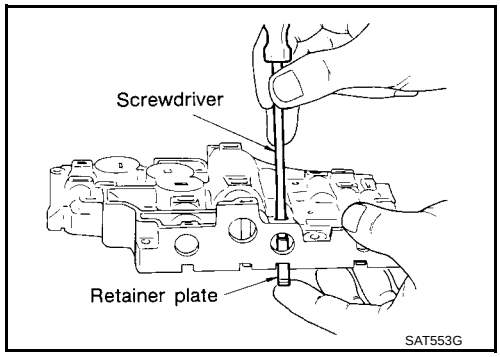
1. Upper body	2. Cooler check valve	3. Return spring
4. Plug	5. Retainer plate	6. 1-2 accumulator valve
7. Return spring	8. Plug	9. Retainer plate
10. Torque converter clutch control valve	11. Return spring	12. Torque converter clutch control plug
13. Torque converter clutch control sleeve	14. Retainer plate	15. Torque converter relief valve
16. Return spring	17. Retainer plate	18. Return spring
19. Overrun clutch reducing valve	20. Plug	21. Retainer plate
22. Retainer plate	23. Return spring	24. Pilot valve
25. Retainer plate	26. Plug	27. 1-2 accumulator piston
28. Return spring	29. 1-2 accumulator retainer plate	30. Retainer plate
31. Plug	32. 1st reducing valve	33. Return spring
34. Retainer plate	35. Return spring	36. 3-2 timing valve

DISASSEMBLY

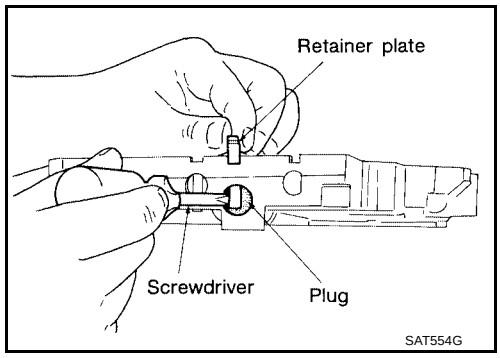
1. Remove valves at retainer plates.
   - **Do not use a magnetic pick-up tool.**



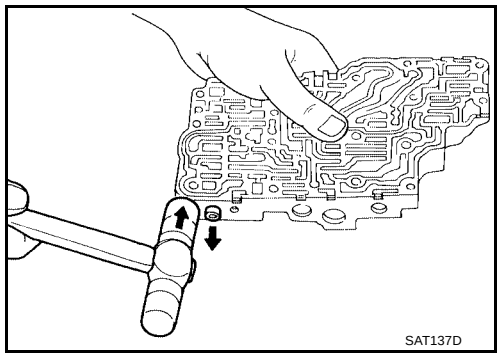
a. Use a screwdriver to remove retainer plates.



b. Remove retainer plates while holding spring, plugs or sleeves.
   - **Remove plugs slowly to prevent internal parts from jumping out.**



c. Place mating surface of valve body face down, and remove internal parts.
   - **If a valve is hard to remove, place valve body face down and lightly tap it with a soft hammer.**
   - **Be careful not to drop or damage valves and sleeves.**

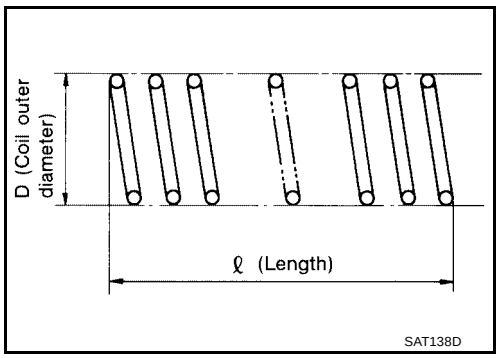


INSPECTION

Valve Spring

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.

  Inspection standard : **Refer to** **AT-753, "CONTROL VALVE AND PLUG RETURN SPRINGS"** **.**



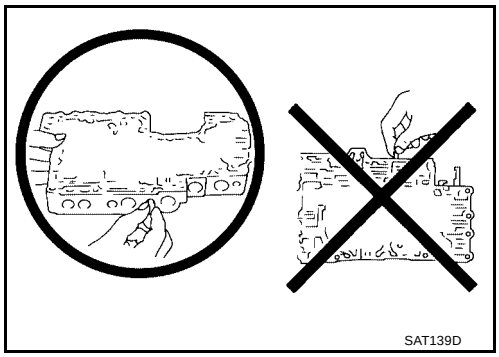
- Replace valve springs if deformed or fatigued.

Control Valves

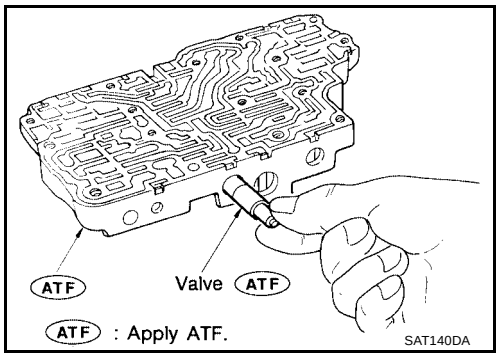
- Check sliding surfaces of valves, sleeves and plugs.

ASSEMBLY

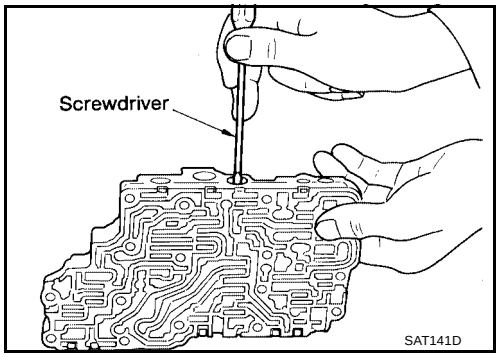
- **Lay control valve body down when installing valves. Do not stand the control valve body upright.**



1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.
   - **Be careful not to scratch or damage valve body.**

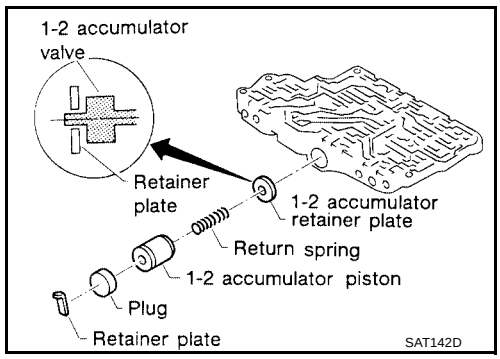


   - Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.

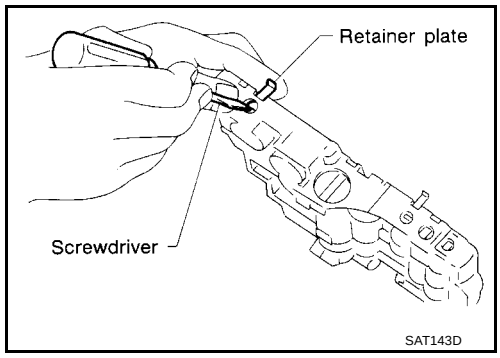


1-2 Accumulator Valve

- Install 1-2 accumulator valve. Align 1-2 accumulator retainer plate from opposite side of control valve body.
- Install return spring, 1-2 accumulator piston and plug.



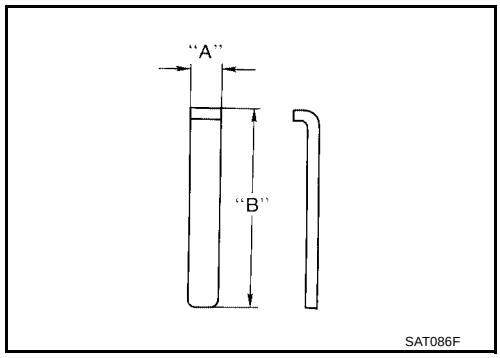
1. Install retainer plates.
   - While pushing plug or return spring, install retainer plate.



Retainer Plate (Upper Body)

Unit: mm (in)

No.	Name of control valve	Width A	Length B
22	Pilot valve	6.0 (0.236)	21.5 (0.846)
30	1st reducing valve		
34	3-2 timing valve		
17	Torque converter relief valve		
9	1-2 accumulator valve		38.5 (1.516)
25	1-2 accumulator piston valve		
21	Overrun clutch reducing valve		24.0 (0.945)
5	Cooler check valve		
14	Torque converter clutch control valve		28.0 (1.102)



- Install proper retainer plates.
  Refer to AT-687, "Control Valve Upper Body" .

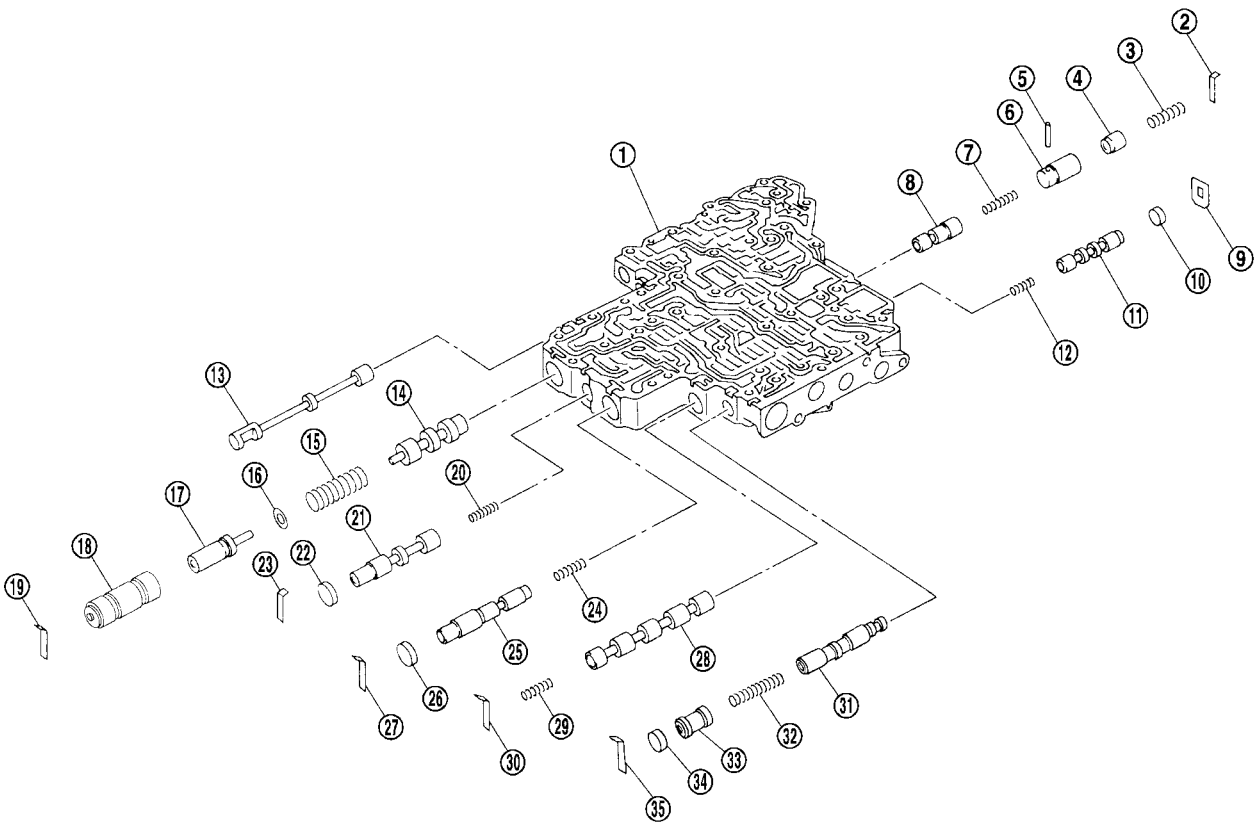
Control Valve Lower Body

ECS0067I

COMPONENTS

Apply ATF to all components before installation.

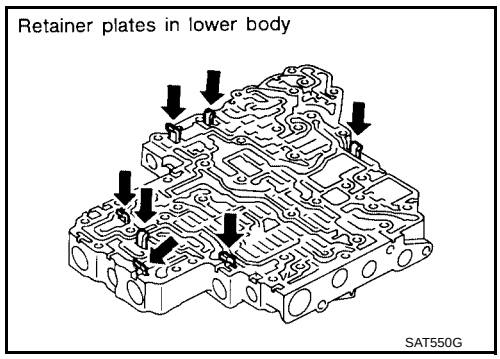
SEC. 317



1. Lower body
2. Retainer plate
3. Return spring
4. Piston
5. Parallel pin
6. Sleeve
7. Return spring
8. Pressure modifier valve
9. Retainer plate
10. Plug
11. Shift valve B
12. Return spring
13. Manual valve
14. Pressure regulator valve
15. Return spring
16. Spring seat
17. Plug
18. Sleeve
19. Retainer plate
20. Return spring
21. Overrun clutch control valve
22. Plug
23. Retainer plate
24. Return spring
25. Accumulator control valve
26. Plug
27. Retainer plate
28. Shift valve A
29. Return spring
30. Retainer plate
31. Shuttle valve
32. Return spring
33. Plug
34. Plug
35. Retainer plate

DISASSEMBLY

- Remove valves at retainer plate.
  For removal procedures, refer to AT-689, "DISASSEMBLY" .



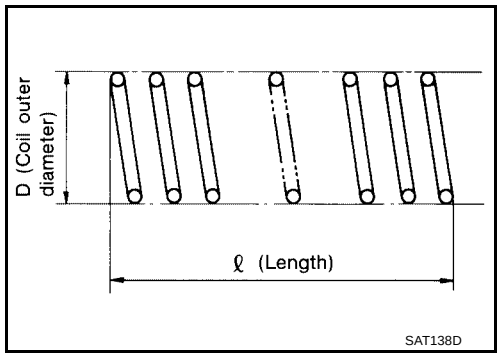
INSPECTION

Valve Springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.

  Inspection standard : Refer to AT-753, "CONTROL VALVE AND PLUG RETURN SPRINGS" .

- Replace valve springs if deformed or fatigued.

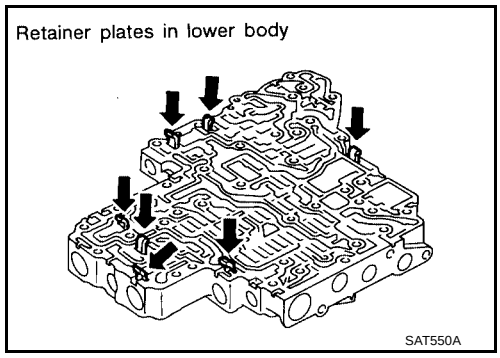


Control Valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

ASSEMBLY

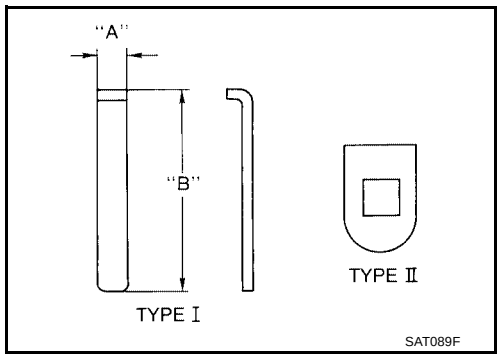
- Install control valves.
  For installation procedures, refer to AT-690, "ASSEMBLY" .



Retainer Plate (Lower Body)

Unit: mm (in)

No.	Name of control valve and plug	Width A	Length B	Type
19	Pressure regulator valve	6.0 (0.236)	28.0 (1.102)	I
27	Accumulator control valve			
30	Shift valve A			
23	Overrun clutch control valve			
2	Pressure modifier valve			
35	Shuttle valve			
9	Shift valve B	—	—	II

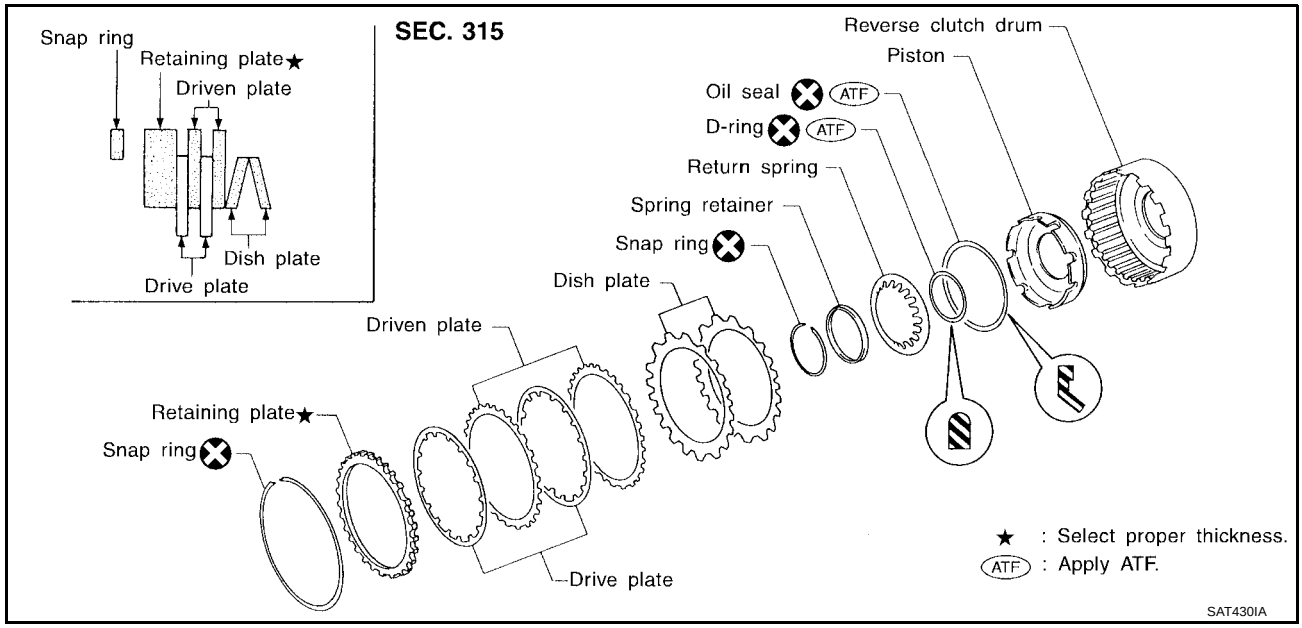


- Install proper retainer plates.
  Refer to AT-691, "Control Valve Lower Body" .

Reverse Clutch

ECS0067J

COMPONENTS



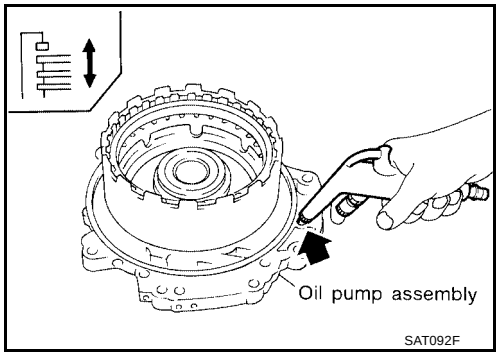
DISASSEMBLY

1. Check operation of reverse clutch

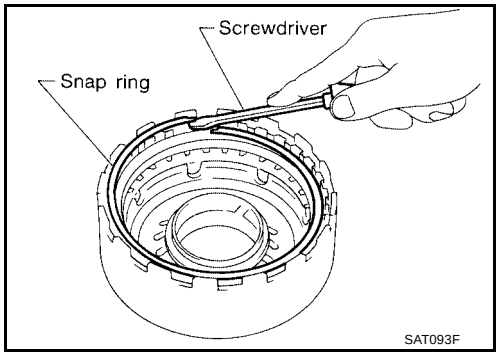
a. Install seal ring onto drum support of oil pump cover and install reverse clutch assembly. Apply compressed air to oil hole.

b. Check to see that retaining plate moves to snap ring.

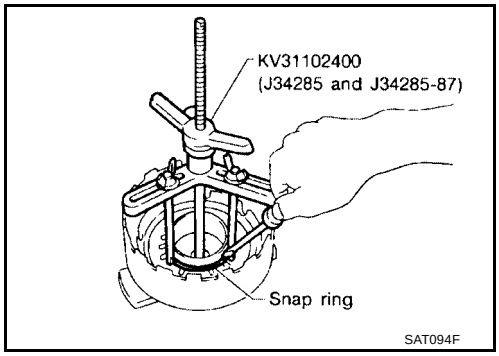
c. If retaining plate does not contact snap ring:
   - D-ring might be damaged.
   - Oil seal might be damaged.
   - Fluid might be leaking past piston check ball.



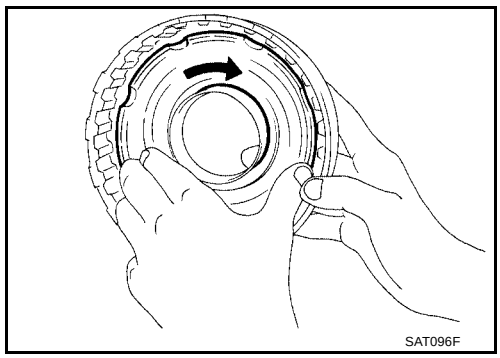
2. Remove snap ring.
3. Remove drive plates, driven plates, retaining plate, and dish plates.



4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
   - **Set Tool directly over springs.**
   - **Do not expand snap ring excessively.**
5. Remove spring retainer and return springs.



6. Remove piston from reverse clutch drum by turning it.
7. Remove D-ring and oil seal from piston.


SAT096F

INSPECTION

Reverse Clutch Snap Ring, Spring Retainer and Return Springs

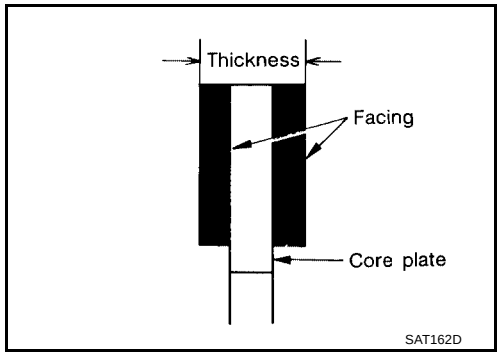
- Check for deformation, fatigue or damage.
  If necessary, replace.

Reverse Clutch Drive Plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:
Standard value : 1.6 mm (0.063 in)
Wear limit : 1.4 mm (0.055 in)

- If not within wear limit, replace.



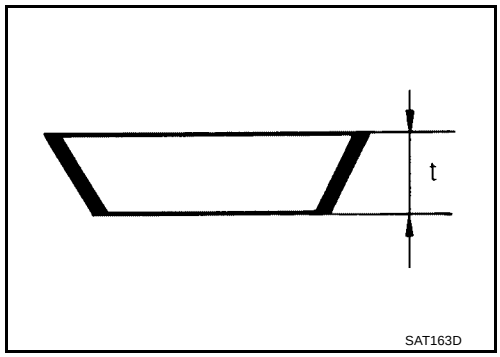
SAT162D

Reverse Clutch Dish Plates

- Check for deformation or damage.
- Measure thickness of dish plate.

Thickness of dish plate : 3.08 mm (0.1213 in)

- If deformed or fatigued, replace.



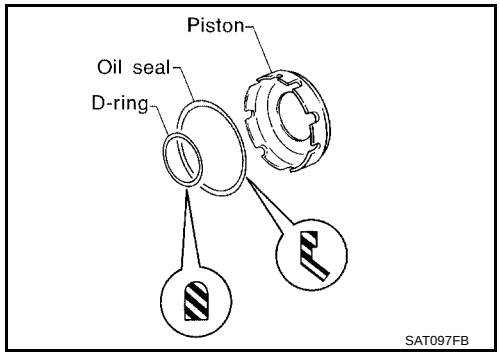
SAT163D

Reverse Clutch Piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.

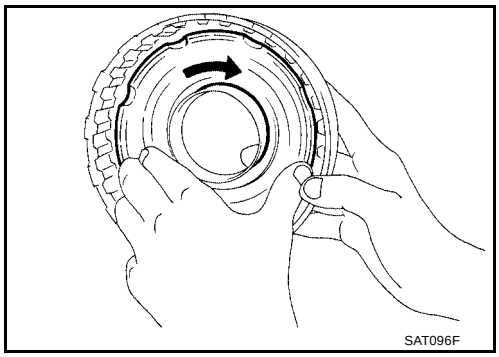
ASSEMBLY

1. Install D-ring and oil seal on piston.
   - **Take care with the direction of oil seal.**
   - **Apply ATF to both parts.**

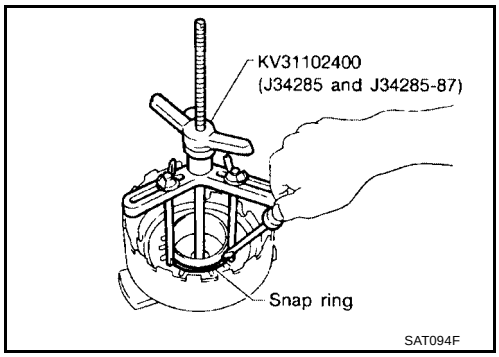


SAT097FB

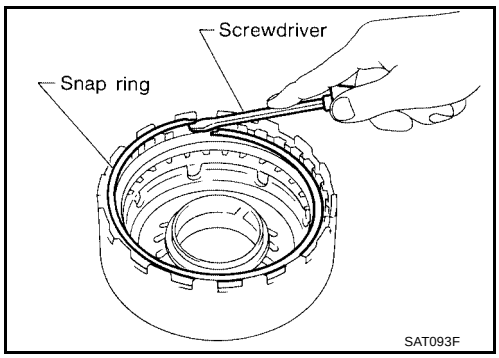
2. Install piston assembly by turning it slowly.
   - **Apply ATF to inner surface of drum.**



3. Install return springs and spring retainer on piston.

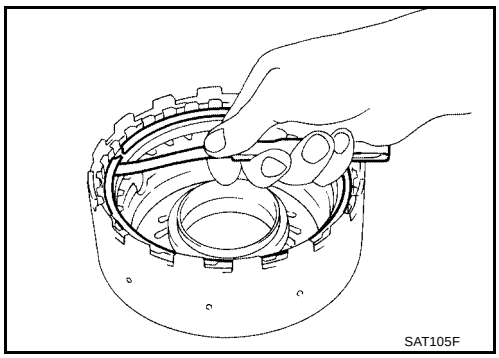


4. Set Tool on spring retainer and install snap ring while compressing return springs.
   - **Set Tool directly over return springs.**
5. Install drive plates, driven plates, retaining plate and dish plates.
   - **Take care with order of plates.**
6. Install snap ring.

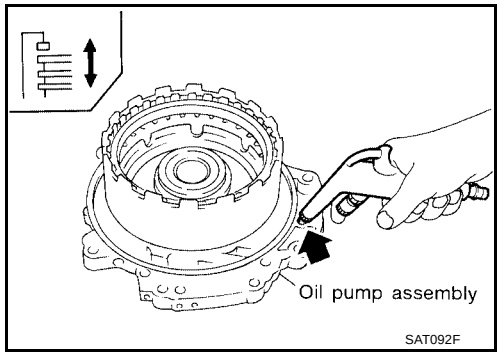


7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance	
Standard	**: 0.5 - 0.8 mm (0.020 - 0.031 in)**
Allowable limit	**: 1.2 mm (0.047 in)**
Retaining plate	**: Refer to AT-754, "REVERSE CLUTCH" .**



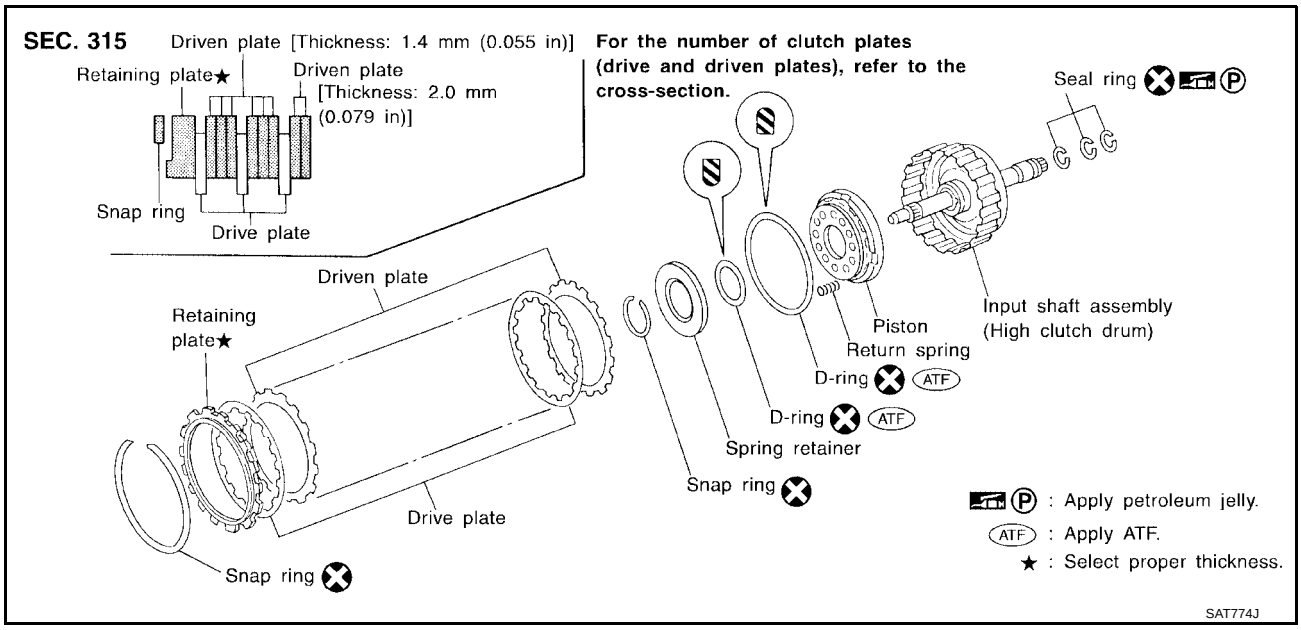
8. Check operation of reverse clutch.
Refer to AT-694, "DISASSEMBLY" .



High Clutch

ECS0067K

COMPONENTS



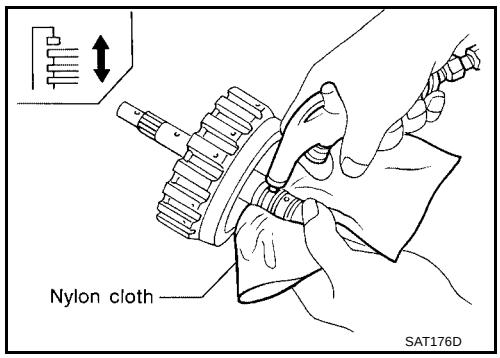
DISASSEMBLY

1. Check operation of high clutch.

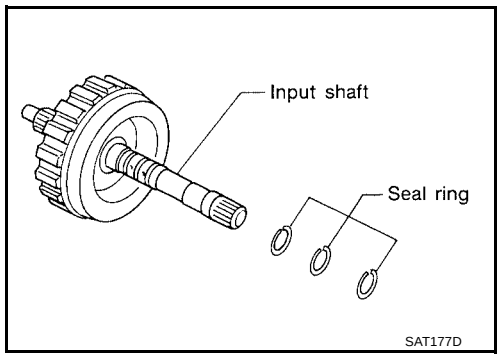
a. Apply compressed air to oil hole of input shaft with nylon cloth.
- **Stop up hole on opposite side of input shaft with nylon cloth.**

b. Check to see that retaining plate moves to snap ring.

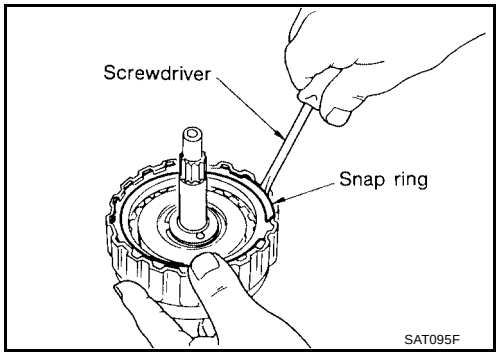
c. If retaining plate does not contact snap ring:
- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.



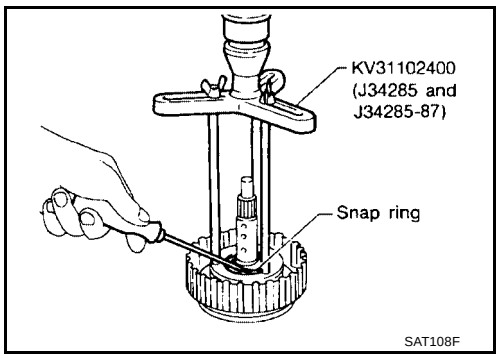
2. Remove seal rings from input shaft.
- **Always replace when removed.**



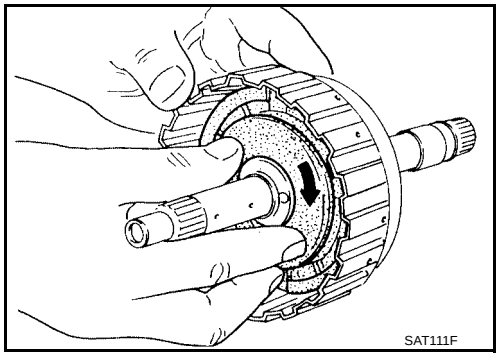
3. Remove snap ring.
4. Remove drive plates, driven plates and retaining plate.



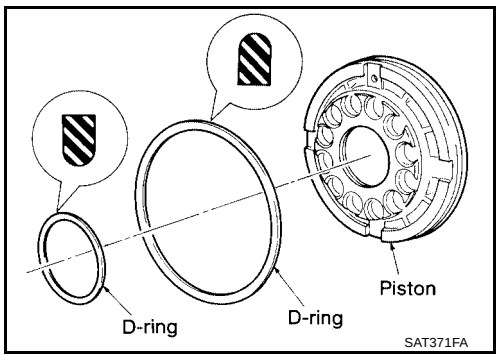
5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
   - **Set Tool directly over springs.**
   - **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.



7. Remove piston from high clutch drum by turning it.



8. Remove D-rings from piston.



INSPECTION

High Clutch Snap Ring, Spring Retainer and Return Springs

- Check for deformation, fatigue or damage.
  If necessary, replace.
- **When replacing spring retainer and return springs, replace them as a set.**

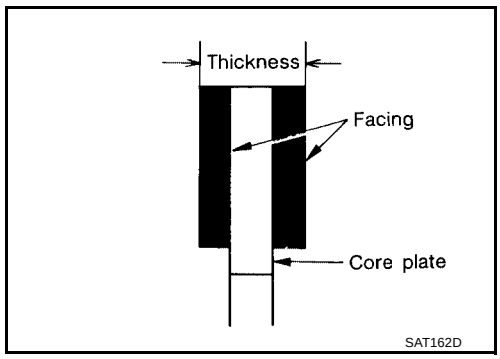
High Clutch Drive Plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

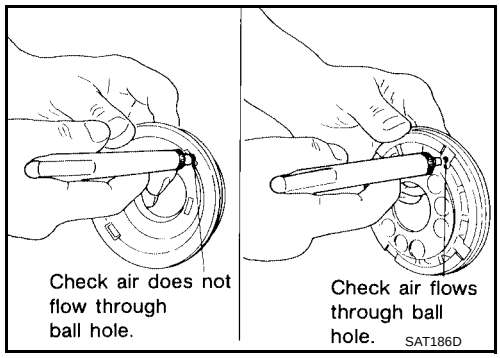
Standard value	**: 1.6 mm (0.063 in)**
Wear limit	**: 1.4 mm (0.055 in)**

- If not within wear limit, replace.



High Clutch Piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.

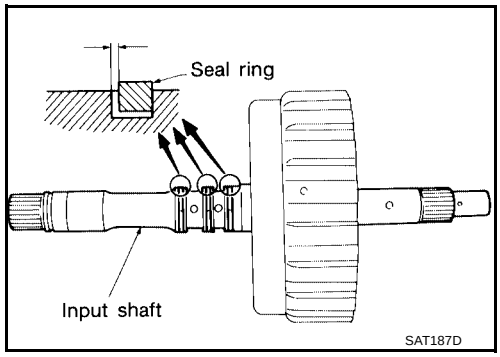


Seal Ring Clearance

- Install new seal rings onto input shaft.
- Measure clearance between seal ring and ring groove.

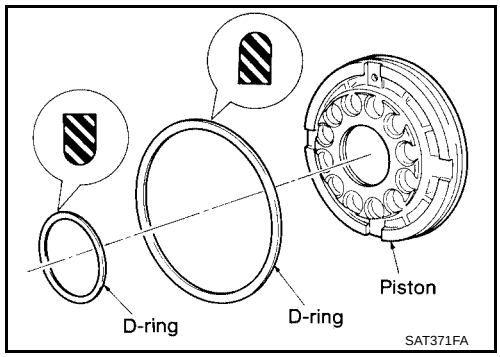
Standard clearance	**: 0.08 - 0.23 mm (0.0031 - 0.0091 in)**
Allowable limit	**: 0.23 mm (0.0091 in)**

- If not within allowable limit, replace input shaft assembly.

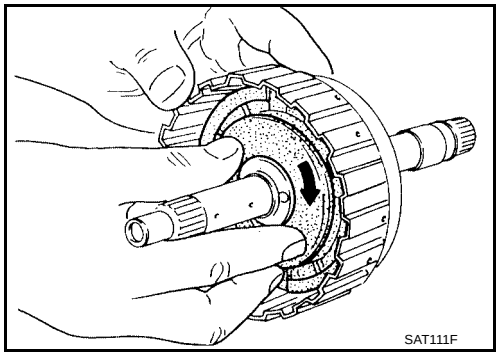


ASSEMBLY

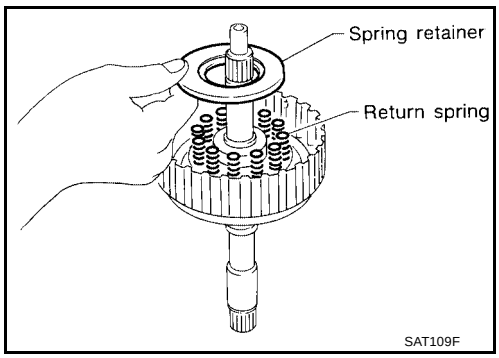
1. Install D-rings on piston.
   - **Apply ATF to both parts.**



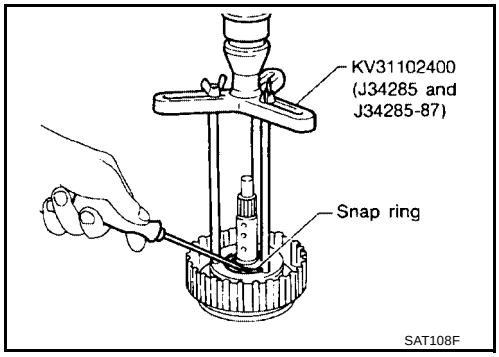
2. Install piston assembly by turning it slowly.
   - **Apply ATF to inner surface of drum.**



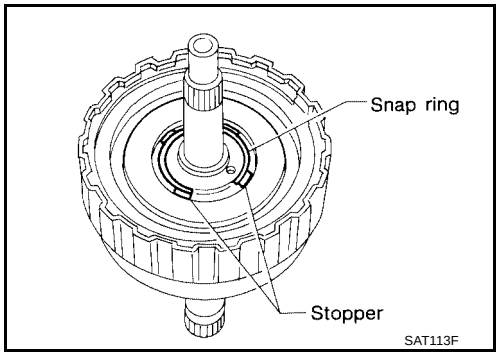
3. Install return springs and spring retainer on piston.



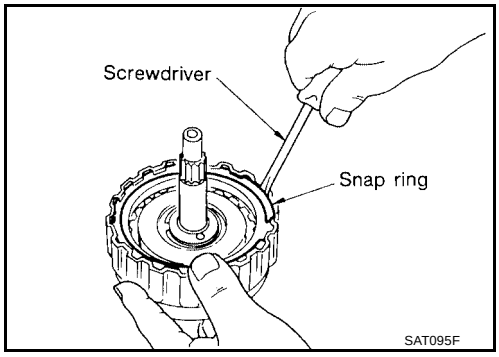
4. Set Tool on spring retainer and install snap ring while compressing return springs.
   - **Set Tool directly over return springs.**



   - **Do not align snap ring gap with spring retainer stopper.**



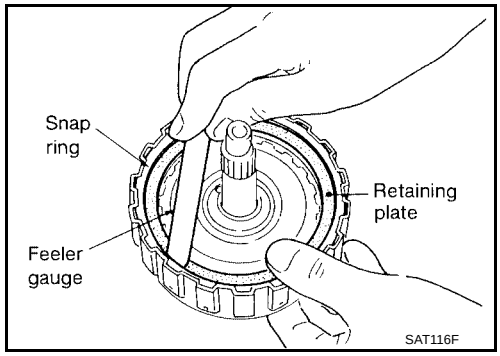
5. Install drive plates, driven plates and retaining plate.
   - **Take care with the order and direction of plates.**



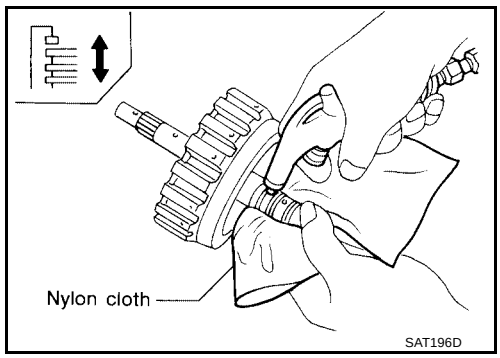
6. Install snap ring.
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance

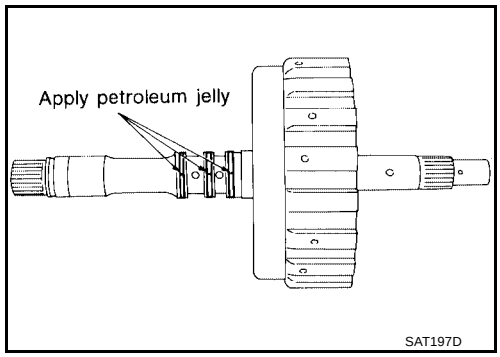
Standard	**: 1.8 - 2.2 mm (0.071 - 0.087 in)**
Allowable limit	**: 2.8 mm (0.110 in)**
Retaining plate	**: Refer to AT-754, "HIGH CLUTCH" .**



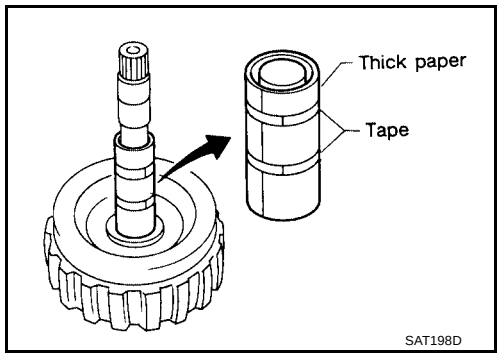
8. Check operation of high clutch.
Refer to AT-697, "DISASSEMBLY" .



9. Install seal rings to input shaft.
   - **Apply petroleum jelly to seal rings.**
   - **Always replace when removed.**



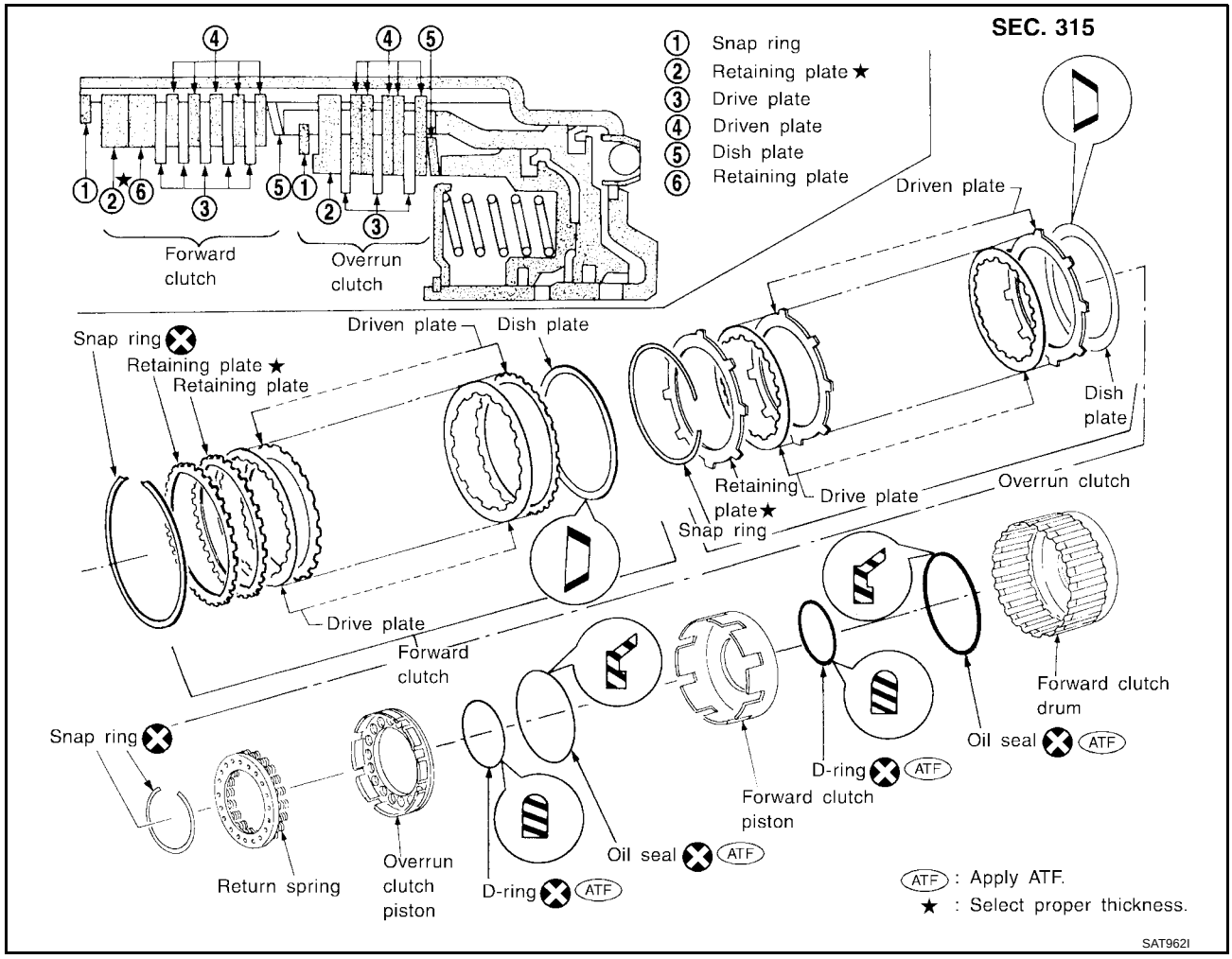
   - **Roll paper around seal rings to prevent seal rings from spreading.**



Forward And Overrun Clutches

ECS0067L

COMPONENTS



DISASSEMBLY

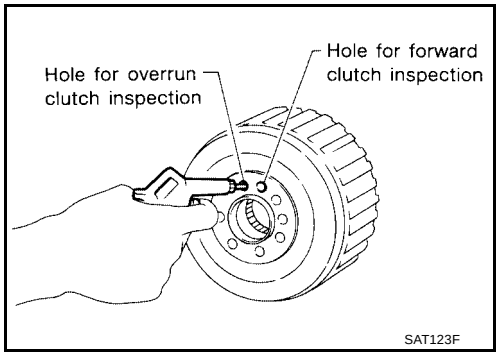
1. Check operation of forward clutch and overrun clutch.

a. Install bearing retainer on forward clutch drum.

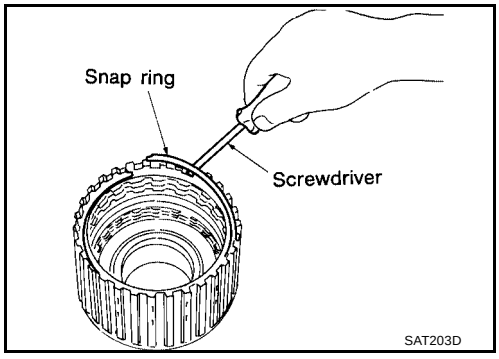
b. Apply compressed air to oil hole of forward clutch drum.

c. Check to see that retaining plate moves to snap ring.

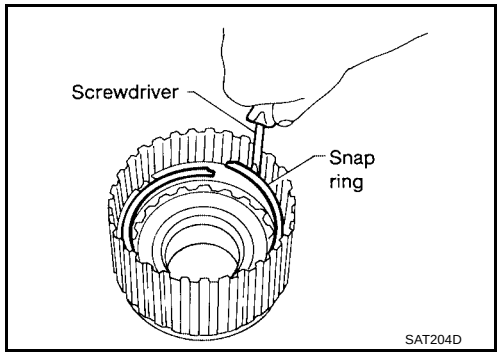
d. If retaining plate does not contact snap ring:
   - D-ring might be damaged.
   - Oil seal might be damaged.
   - Fluid might be leaking past piston check ball.



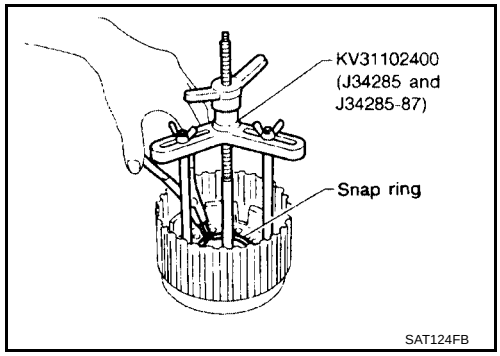
2. Remove snap ring for forward clutch.
3. Remove drive plates, driven plates, retaining plate and dish plate for forward clutch.



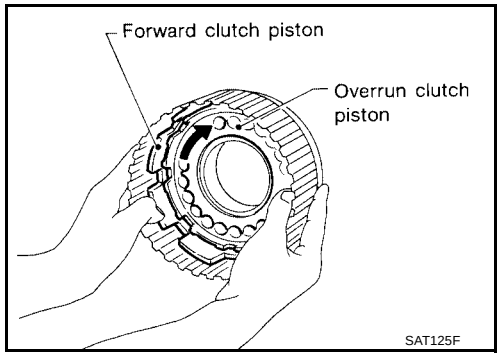
4. Remove snap ring for overrun clutch.
5. Remove drive plates, driven plates, retaining plate and dish plate for overrun clutch.



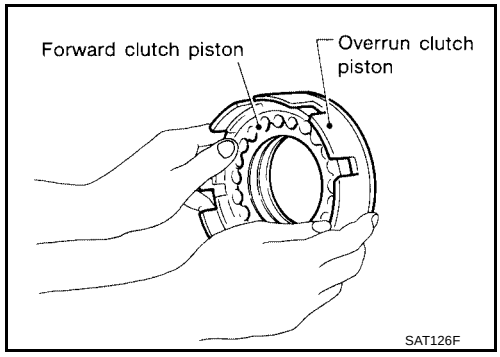
6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
   - **Set Tool directly over return springs.**
   - **Do not expand snap ring excessively.**
7. Remove spring retainer and return springs.
   - **Do not remove return springs from spring retainer.**



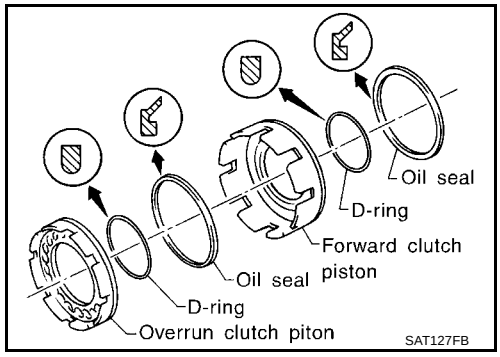
8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.



9. Remove overrun clutch piston from forward clutch piston by turning it.



10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.



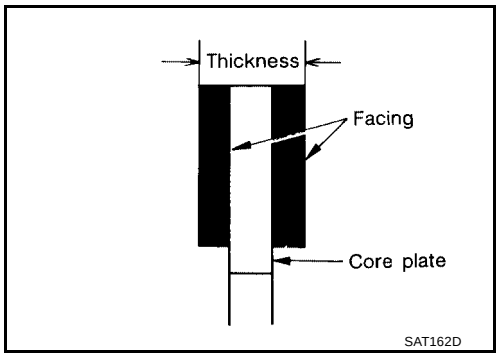
INSPECTION

Snap Rings, Spring Retainer and Return Springs

- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**

Forward Clutch and Overrun Clutch Drive Plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.



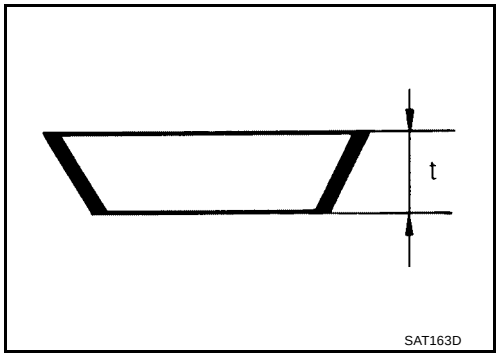
Thickness of drive plate:

Forward clutch	
Standard value	**: 1.6 mm (0.063 in)**
Wear limit	**: 1.4 mm (0.055 in)**
Overrun clutch	
Standard value	**: 1.6 mm (0.063 in)**
Wear limit	**: 1.4 mm (0.055 in)**

- If not within wear limit, replace.

Forward Clutch and Overrun Clutch Dish Plates

- Check for deformation or damage.
- Measure thickness of dish plate.



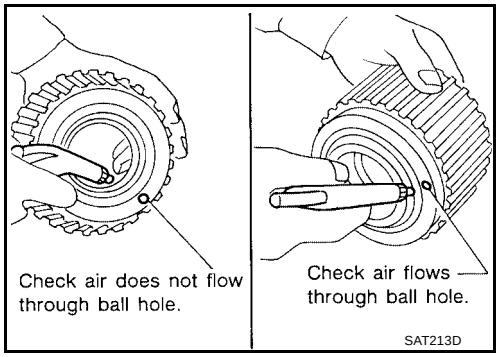
Thickness of dish plate

Forward clutch	**: 2.7 mm (0.106 in)**
Overrun clutch	**: 2.7 mm (0.106 in)**

- If deformed or fatigued, replace.

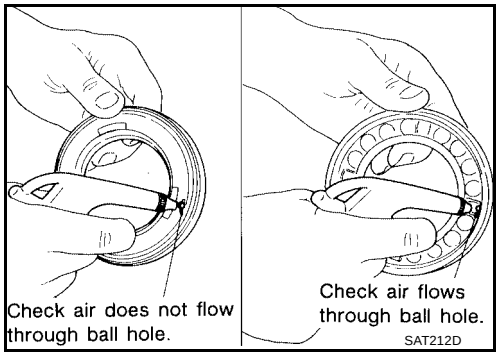
Forward Clutch Drum

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole from outside of forward clutch drum. Make sure air leaks past ball.
- Apply compressed air to oil hole from inside of forward clutch drum. Make sure there is no air leakage.



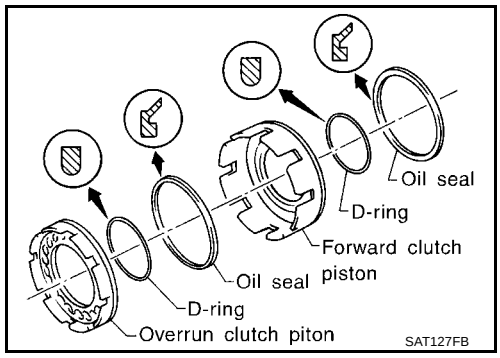
Overrun Clutch Piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side. Make sure that air leaks past ball.

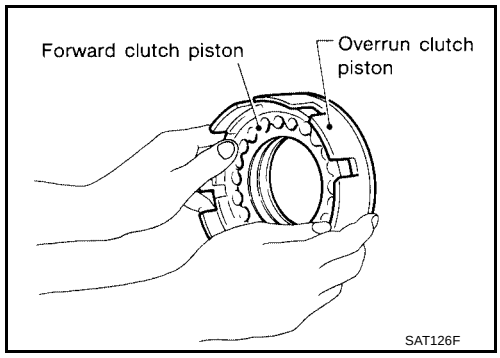


ASSEMBLY

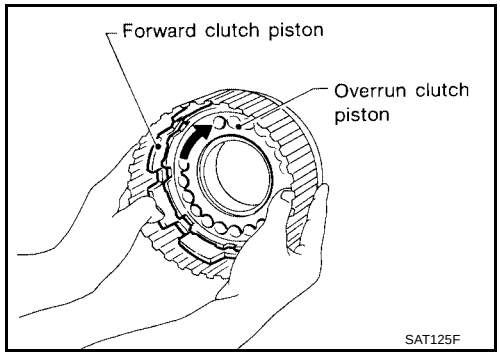
1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.
   - **Take care with direction of oil seal.**
   - **Apply ATF to both parts.**



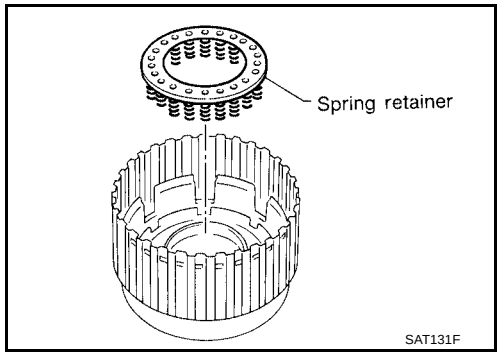
2. Install overrun clutch piston assembly on forward clutch piston by turning it slowly.
   - **Apply ATF to inner surface of forward clutch piston.**



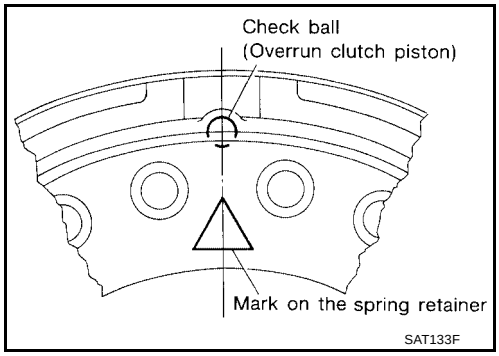
3. Install forward clutch piston assembly on forward clutch drum by turning it slowly.
   - **Apply ATF to inner surface of drum.**



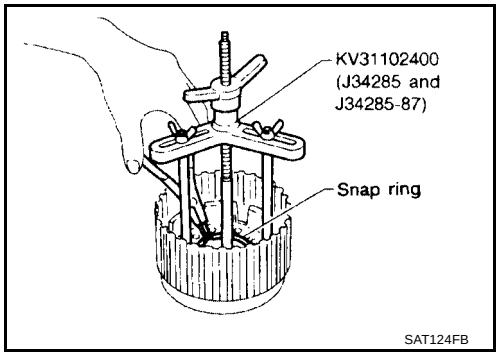
4. Install return spring on overrun clutch piston.



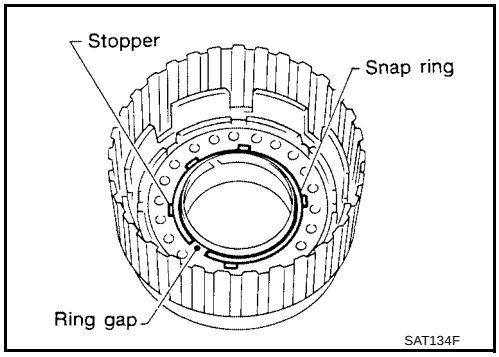
- Align the mark on spring retainer with check ball in overrun clutch piston.



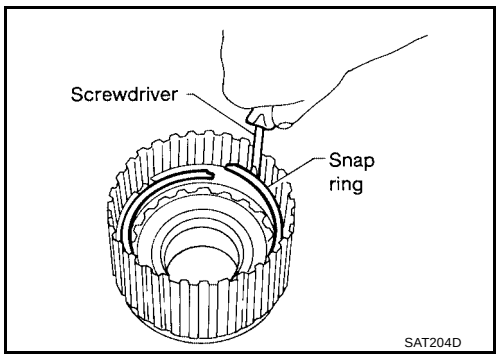
5. Set Tool on spring retainer and install snap ring while compressing return springs.
   - **Set Tool directly over return springs.**



   - **Do not align snap ring gap with spring retainer stopper.**



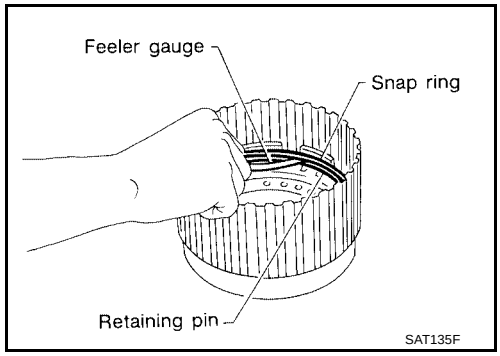
6. Install drive plates, driven plates, retaining plate and dish plate for overrun clutch.
   - **Take care with order of plates.**



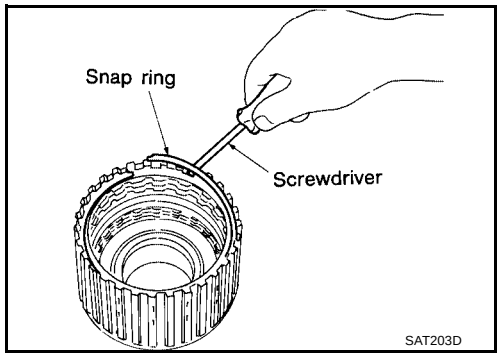
7. Install snap ring for overrun clutch.

8. Measure clearance between overrun clutch retaining plate and snap ring.
If not within allowable limit, select proper retaining plate.

Specified clearance	
Standard	**: 0.7 - 1.1 mm (0.028 - 0.043 in)**
Allowable limit	**: 1.7 mm (0.067 in)**
Overrun clutch retaining plate	**Refer to AT-755, "OVERRUN CLUTCH" .**

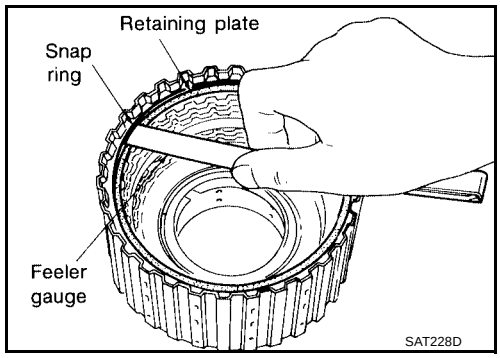


9. Install drive plates, driven plates, retaining plate and dish plate for forward clutch.
   - **Take care with order of plates.**
10. Install snap ring for forward clutch.

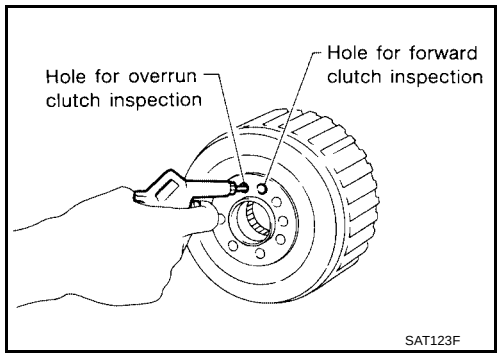


11. Measure clearance between forward clutch retaining plate and snap ring.
If not within allowable limit, select proper retaining plate.

Specified clearance	
Standard	**: 0.45 - 0.85 mm (0.0177 - 0.0335 in)**
Allowable limit	**: 1.85 mm (0.0728 in)**
Forward clutch retaining plate	**: Refer to AT-754, "FORWARD CLUTCH" .**



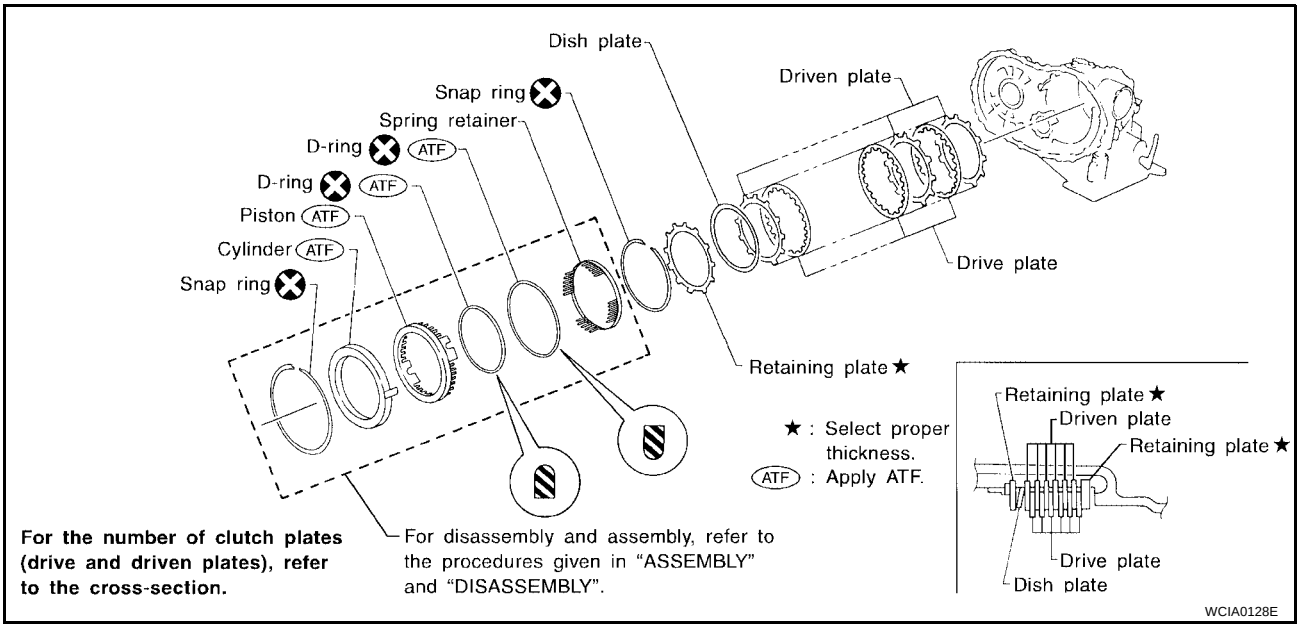
12. Check operation of forward clutch.
Refer to AT-702, "DISASSEMBLY" .
13. Check operation of overrun clutch.
Refer to AT-702, "DISASSEMBLY" .



Low & Reverse Brake

ECS0067M

COMPONENTS



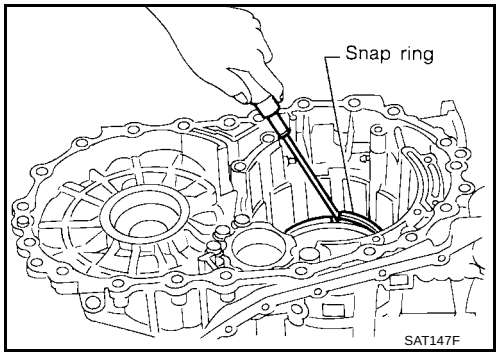
DISASSEMBLY

1. Check operation of low & reverse brake.

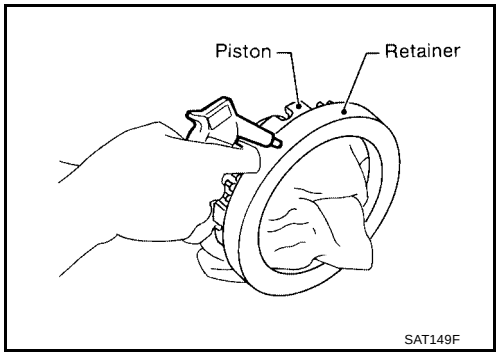
a. Apply compressed air to oil hole of transmission case.

b. Check to see that retaining plate moves to snap ring.

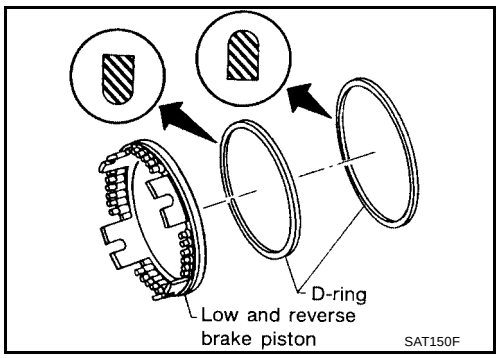
c. If retaining plate does not contact snap ring:
   - D-ring might be damaged.
   - Fluid might be leaking past piston check ball.



2. In order to remove piston, apply compressed air to oil hole of retainer while holding piston.
   - **Apply air gradually and allow piston to come out evenly.**



3. Remove D-rings from piston.



INSPECTION

Low and Reverse Brake Snap Ring, Spring Retainer and Return Springs

- Check for deformation, fatigue or damage.
  If necessary, replace.
- **When replacing spring retainer and return springs, replace them as a set.**

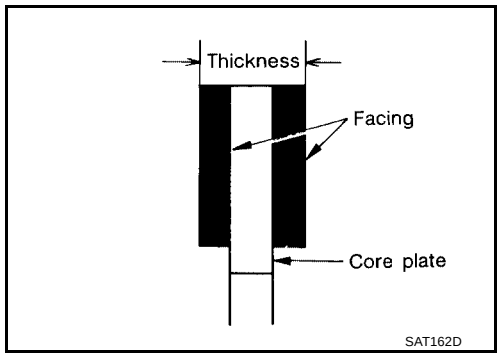
Low and Reverse Brake Drive Plate

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate

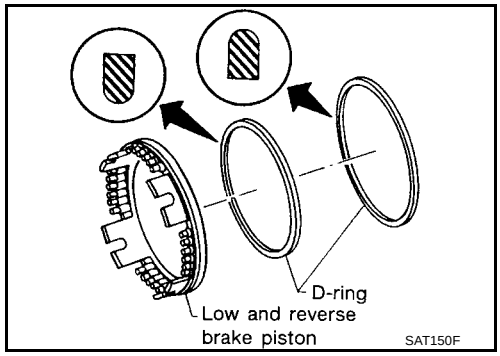
Standard value	**: 1.8 mm (0.071 in)**
Wear limit	**: 1.6 mm (0.063 in)**

- If not within wear limit, replace.

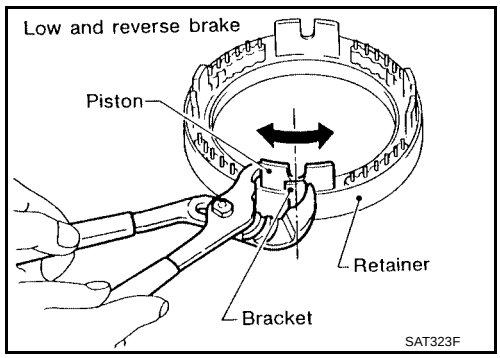


ASSEMBLY

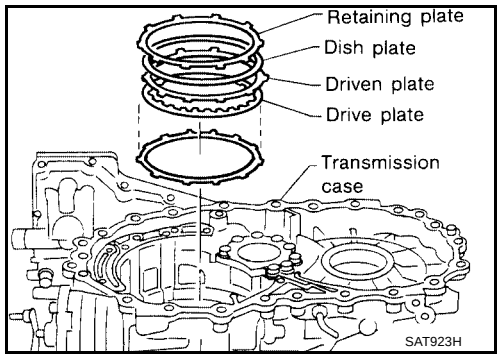
1. Install D-rings on piston.
   - **Apply ATF to both parts.**



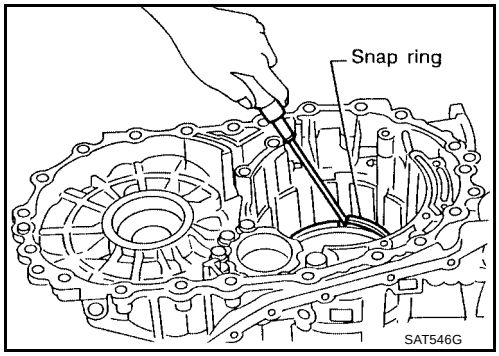
2. Set and align piston with retainer.
   - **This operation is required in order to engage the protrusions of piston to return springs correctly.**
     Further procedures are given in "ASSEMBLY". Refer to AT-729, "ASSEMBLY" .



3. Install driven plates, drive plates, retaining plate and dish plate on transmission case.
   - **Take care with order of plates and direction of dish plate.**



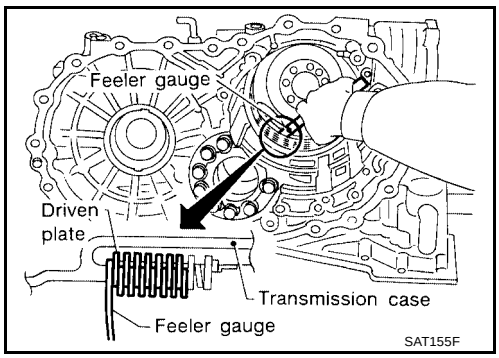
4. Install snap ring.



5. Measure clearance between driven plate and transmission case. If not within allowable limit, select proper retaining plate. (front side)

Specified clearance

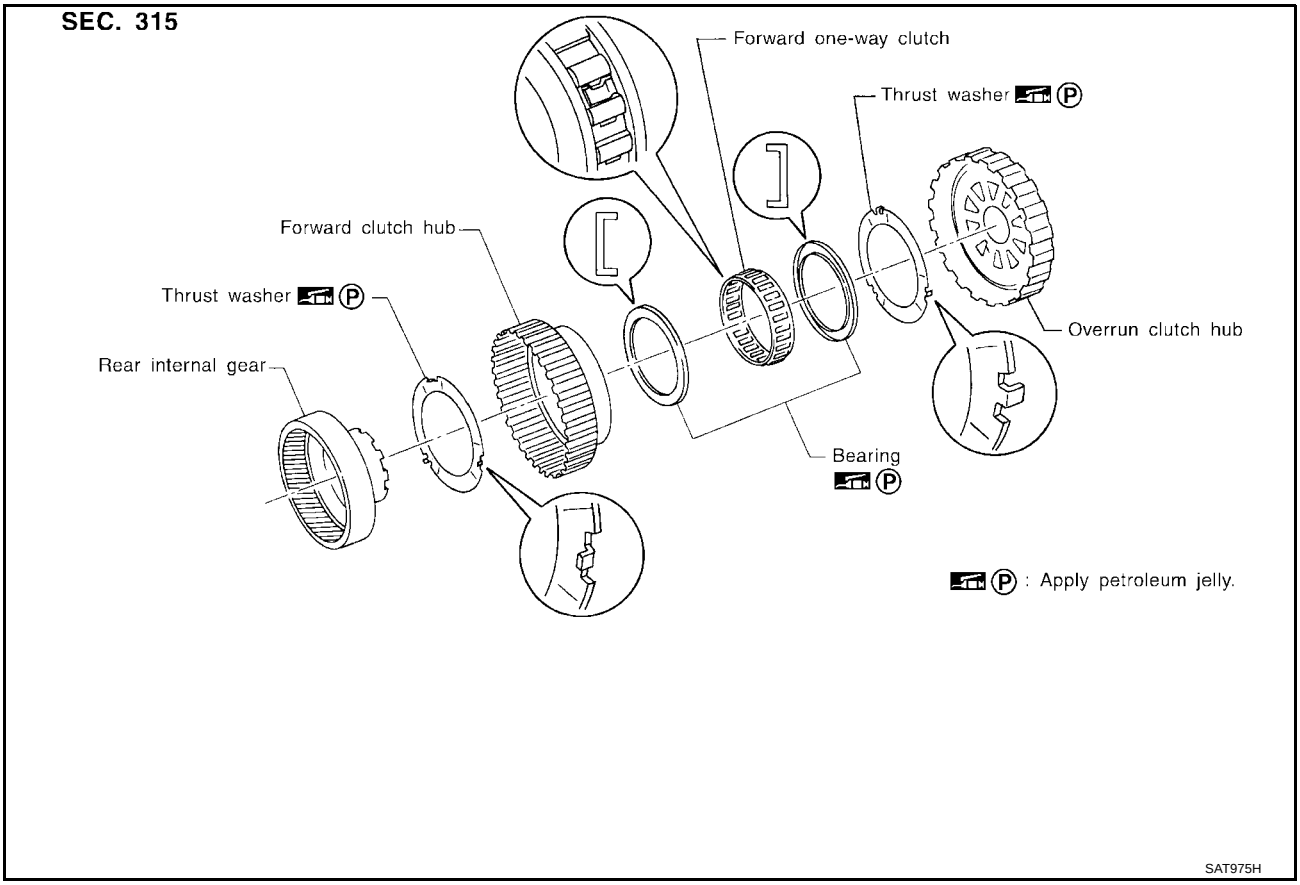
Standard	**: 1.7 - 2.1 mm (0.067 - 0.083 in)**
Allowable limit	**: 3.3 mm (0.130 in)**
Retaining plate	**Refer to AT-755, "LOW & REVERSE BRAKE" .**



Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub

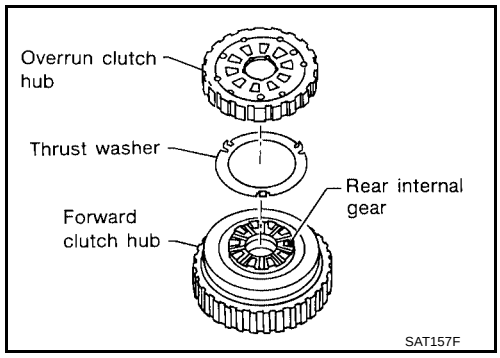
ECS0067N

COMPONENTS

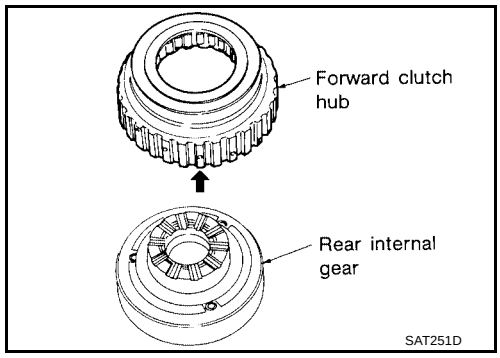


DISASSEMBLY

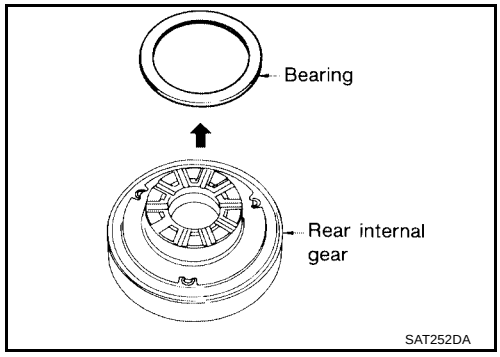
1. Remove overrun clutch hub and thrust washer from forward clutch hub.



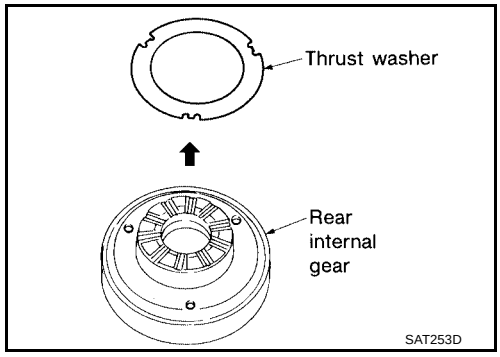
2. Remove forward clutch hub from rear internal gear.



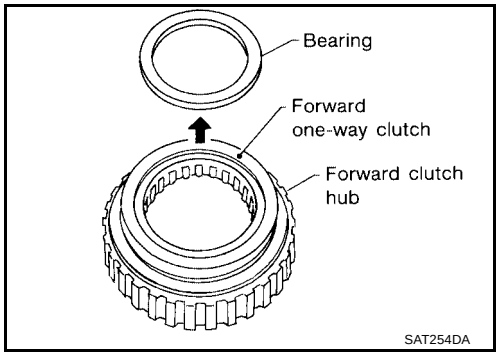
3. Remove bearing from rear internal gear.



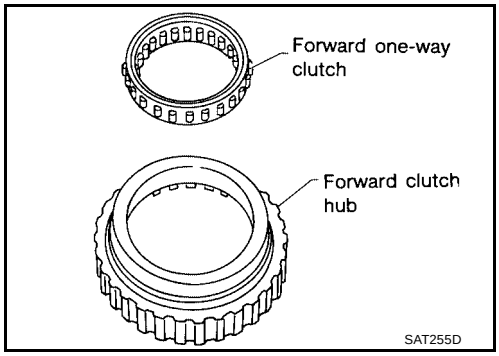
4. Remove thrust washer from rear internal gear.



5. Remove bearing from forward one-way clutch.



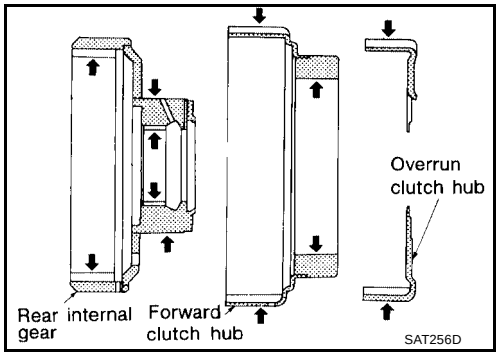
6. Remove forward one-way clutch from forward clutch hub.



INSPECTION

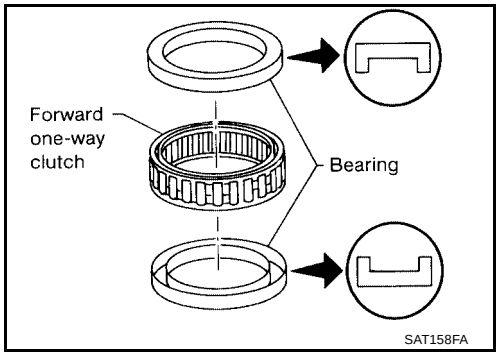
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub

- Check rubbing surfaces for wear or damage.



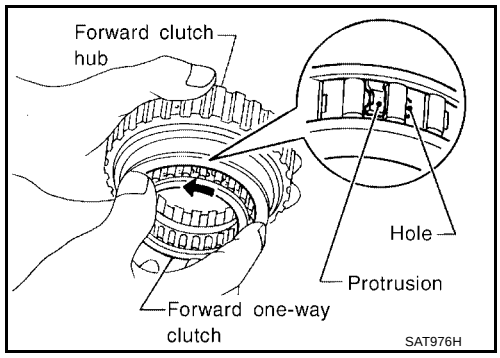
Bearings and Forward One-Way Clutch

- Check bearings for deformation and damage.
- Check forward one-way clutch for wear and damage.

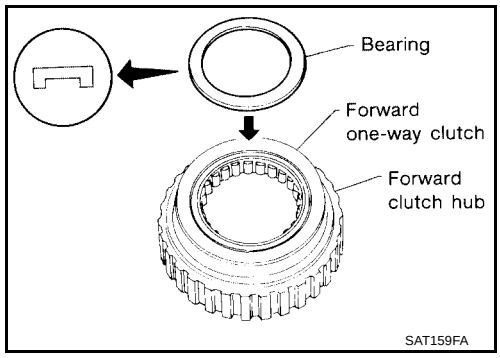


ASSEMBLY

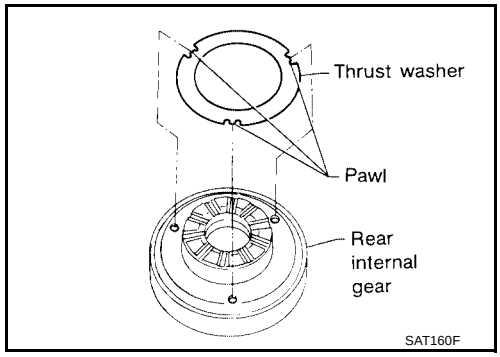
1. Install forward one-way clutch on forward clutch.
   - **Take care with the direction of forward one-way clutch.**



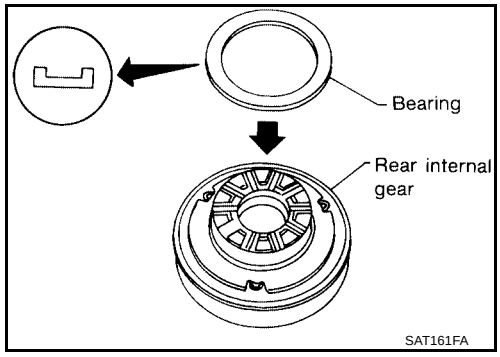
2. Install bearing on forward one-way clutch.
   - **Apply petroleum jelly to bearing.**



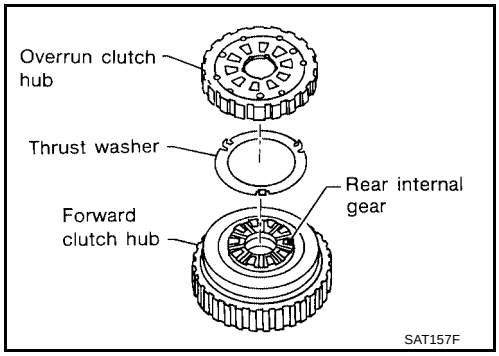
3. Install thrust washer on rear internal gear.
   - **Apply petroleum jelly to thrust washer.**
   - **Align hooks of thrust washer with holes of rear internal gear.**



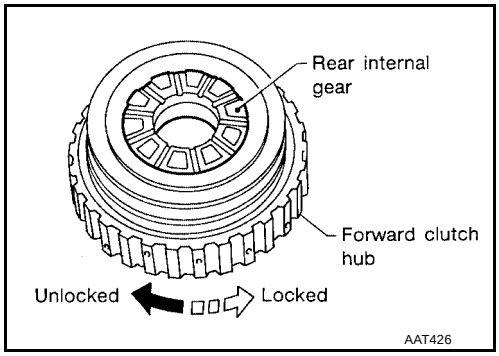
4. Install bearing on rear internal gear.
   - **Apply petroleum jelly to bearing.**



5. Install thrust washer and overrun clutch hub.
   - **Apply petroleum jelly to thrust washer.**
   - **Align hooks of thrust washer with holes of overrun clutch hub.**
   - **Align projections of rear internal gear with holes of overrun clutch hub.**



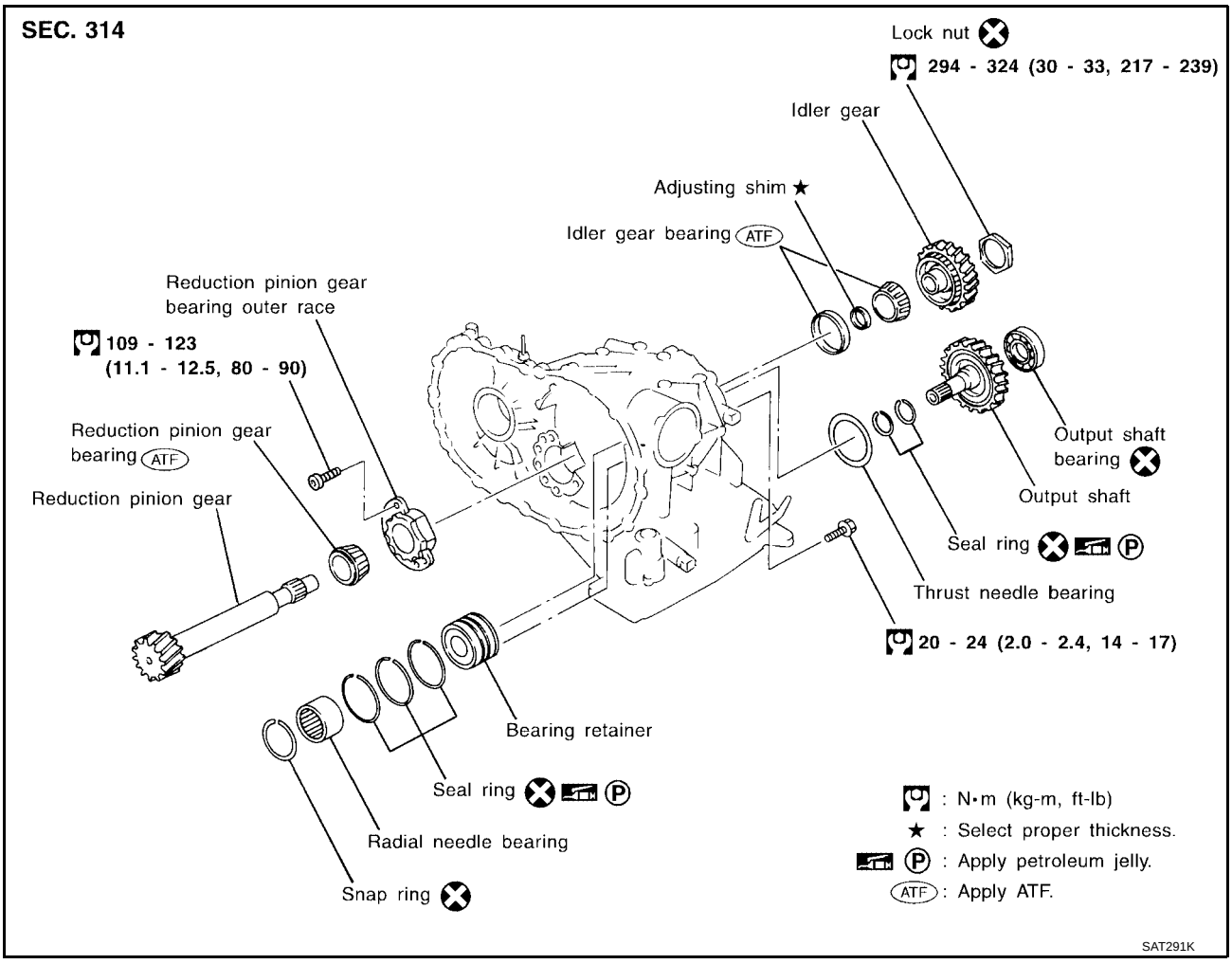
6. Install forward clutch hub on rear internal gear.
   - **Check operation of forward one-way clutch.**
     Hold rear internal gear and turn forward clutch hub.
     Check forward clutch hub for correct locking and unlocking directions.
   - **If not as shown in illustration, check installation direction of forward one-way clutch.**



Output Shaft, Idler Gear, Reduction Pinion Gear and Bearing Retainer

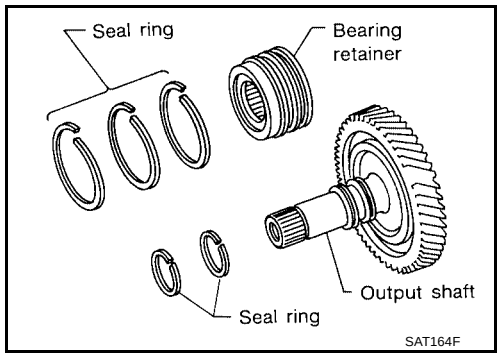
ECS0067O

COMPONENTS

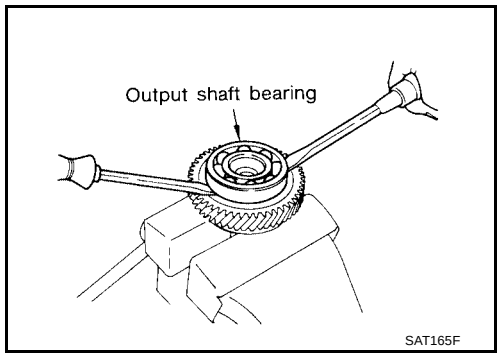


DISASSEMBLY

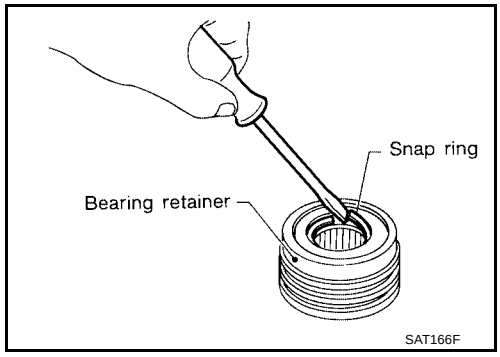
1. Remove seal rings from output shaft and bearing retainer.



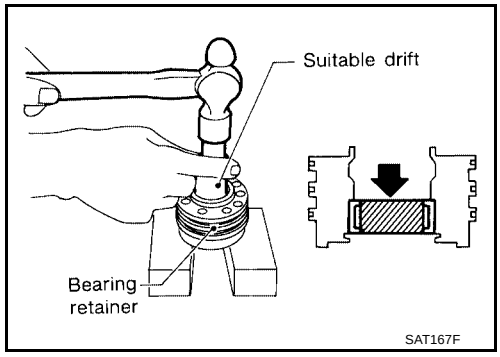
2. Remove output shaft bearing with screwdrivers.
   - **Always replace bearing with a new one when removed.**
   - **Do not damage output shaft.**



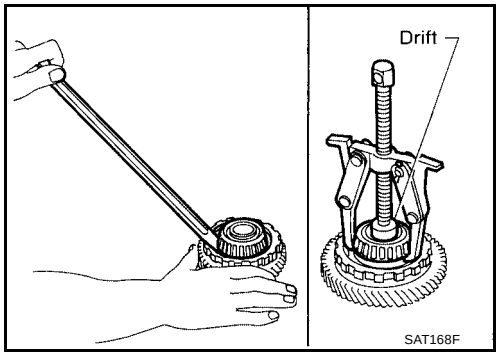
3. Remove snap ring from bearing retainer.



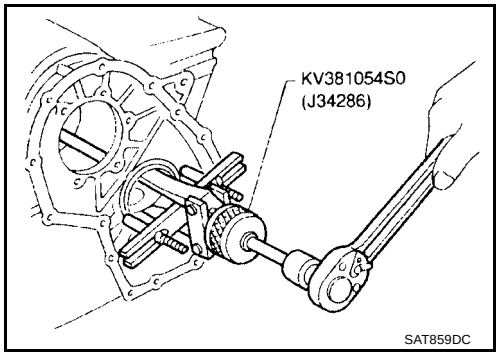
4. Remove needle bearing from bearing retainer.



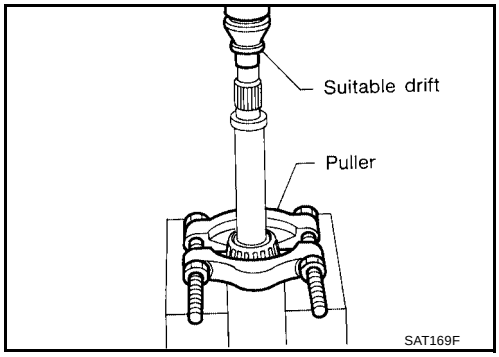
5. Remove idler gear bearing inner race from idler gear.



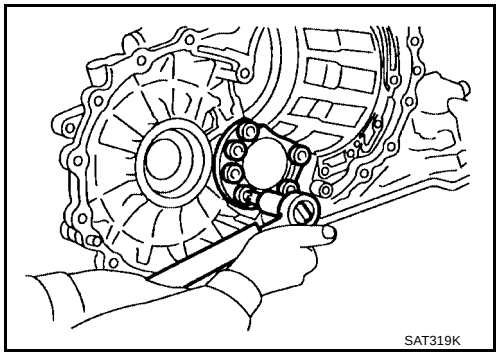
6. Remove idler gear bearing outer race from transmission case.



7. Press out reduction pinion gear bearing inner race from reduction pinion gear.



8. Remove reduction pinion gear bearing outer race from transmission case.



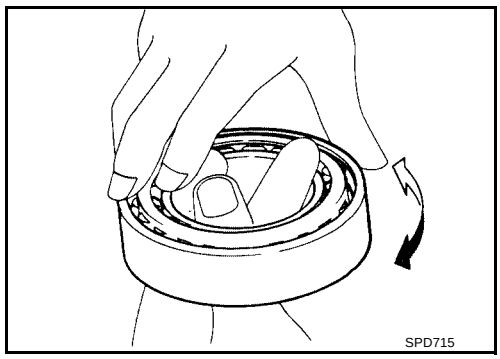
INSPECTION

Output Shaft, Idler Gear and Reduction Pinion Gear

- Check shafts for cracks, wear or bending.
- Check gears for wear, chips and cracks.

Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**

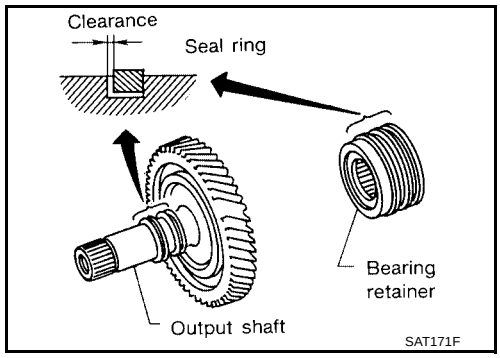


Seal Ring Clearance

- Install new seal rings to output shaft.
- Measure clearance between seal ring and ring groove of output shaft.

Standard clearance : 0.10 - 0.25 mm (0.0039 - 0.0098 in)

Allowable limit : 0.25 mm (0.0098 in)



- If not within allowable limit, replace output shaft.
- Install new seal rings to bearing retainer.
- Measure clearance between seal ring and ring groove of bearing retainer.

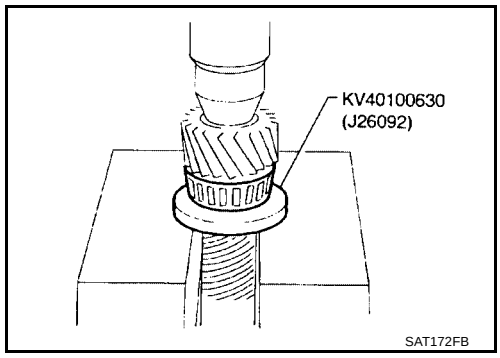
Standard clearance : 0.10 - 0.30 mm (0.0039 - 0.0118 in)

Allowable limit : 0.30 mm (0.0118 in)

- If not within allowable limit, replace bearing retainer.

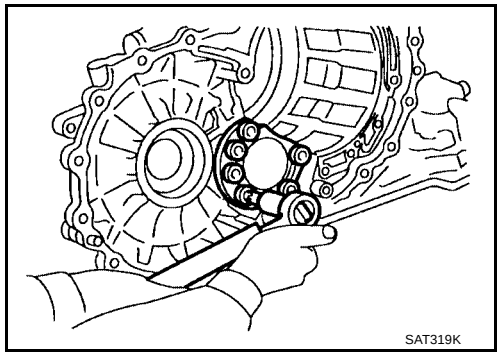
ASSEMBLY

1. Press reduction pinion gear bearing inner race on reduction pinion gear.

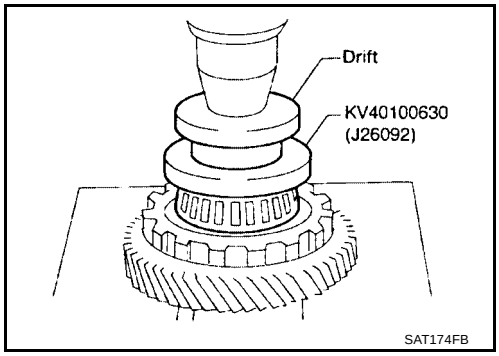


2. Install reduction pinion gear bearing outer race on transmission case.

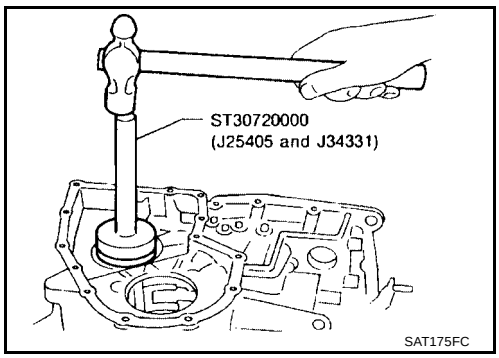
: 109 - 123 N·m (11.1 - 12.5 kg-m, 80 - 90 ft-lb)



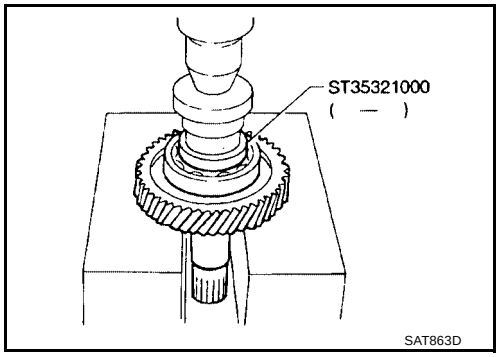
3. Press idler gear bearing inner race on idler gear.



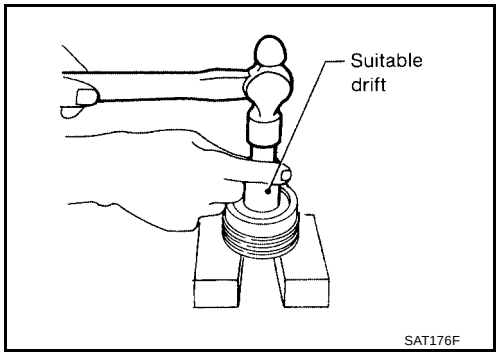
4. Install idler gear bearing outer race on transmission case.



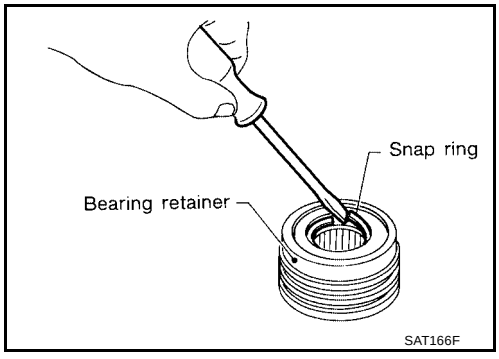
5. Press output shaft bearing on output shaft.



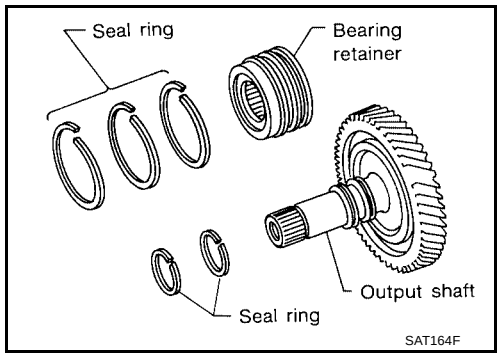
6. Press needle bearing on bearing retainer.



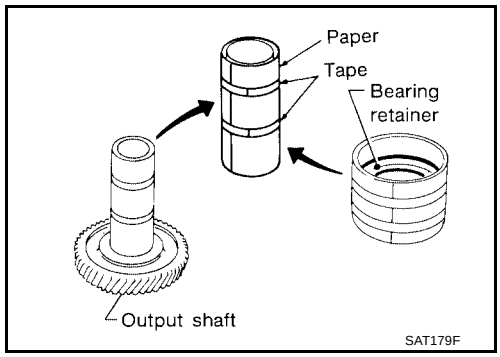
7. Install snap ring to bearing retainer.



8. After packing ring grooves with petroleum jelly, carefully install new seal rings on output shaft and bearing retainer.



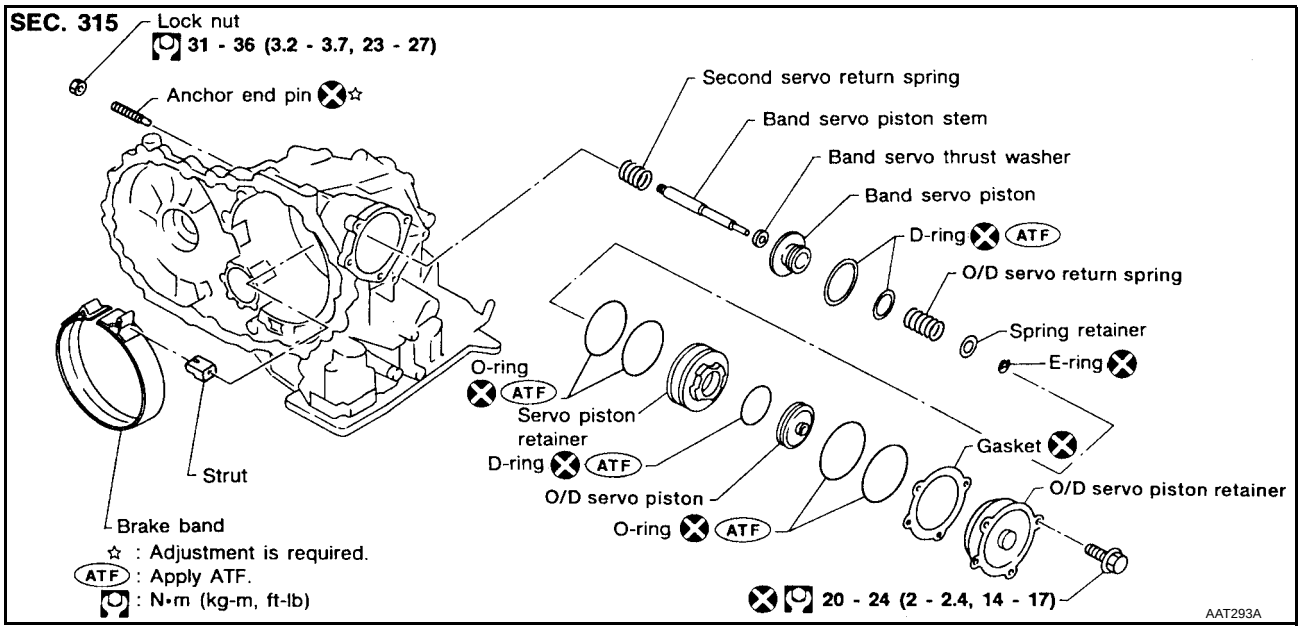
- **Roll paper around seal rings to prevent seal rings from spreading.**



Band Servo Piston Assembly

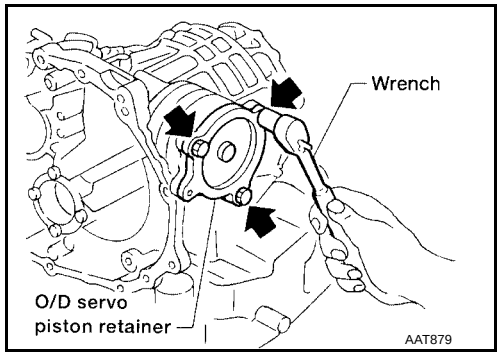
ECS0067P

COMPONENTS

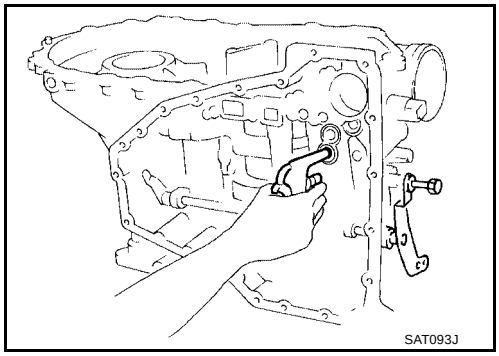


DISASSEMBLY

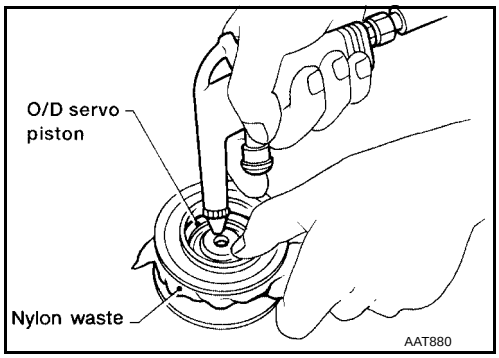
1. Remove band servo piston fixing bolts.



2. Apply compressed air to oil hole in transmission case to remove O/D servo piston retainer and band servo piston assembly.
   - **Hold band servo piston assembly with a rag or nylon waste.**

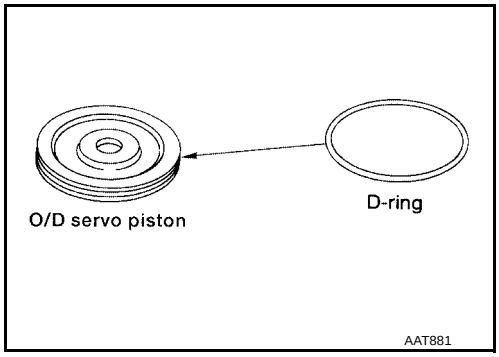

SAT093J

3. Apply compressed air to oil hole in O/D servo piston retainer to remove O/D servo piston from retainer.
   - **Hold O/D band servo piston while applying compressed air.**



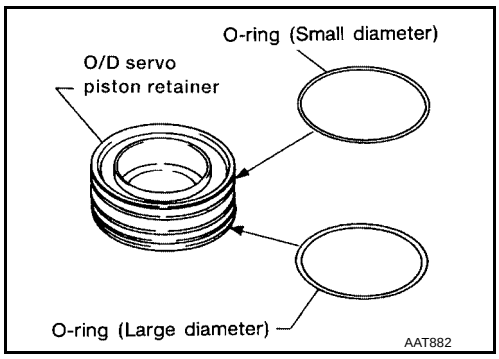
AAT880

4. Remove D-ring from O/D servo piston.



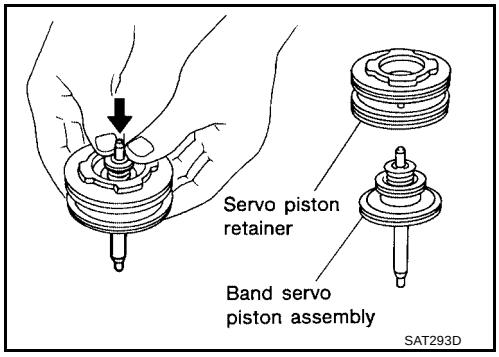
AAT881

5. Remove O-rings from O/D servo piston retainer.



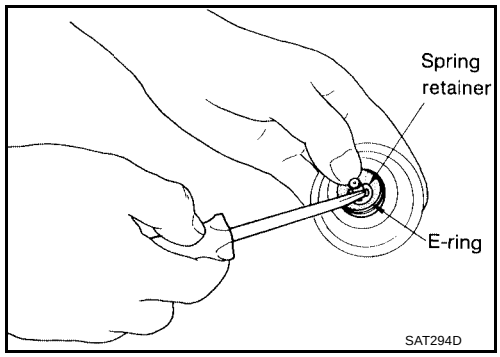
AAT882

6. Remove band servo piston assembly from servo piston retainer by pushing it forward.

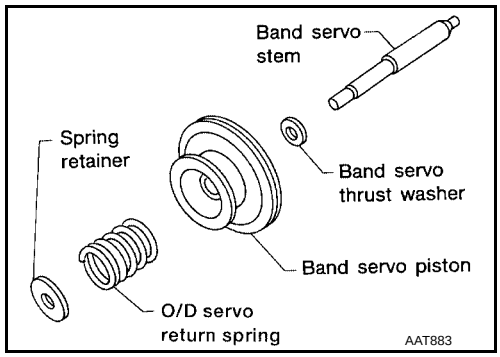


SAT293D

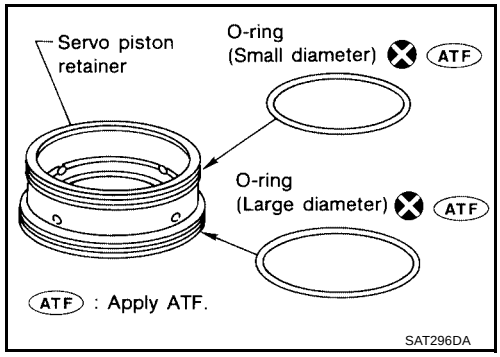
7. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.



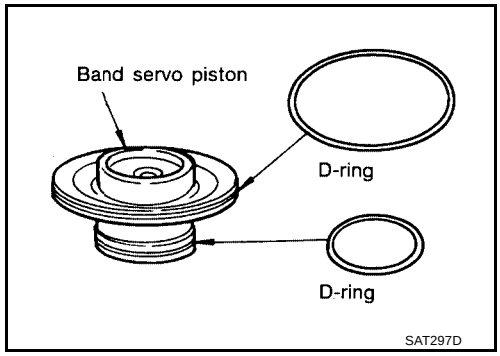
8. Remove O/D servo return spring, band servo thrust washer and band servo piston stem from band servo piston.



9. Remove O-rings from servo piston retainer.



10. Remove D-rings from band servo piston.



INSPECTION

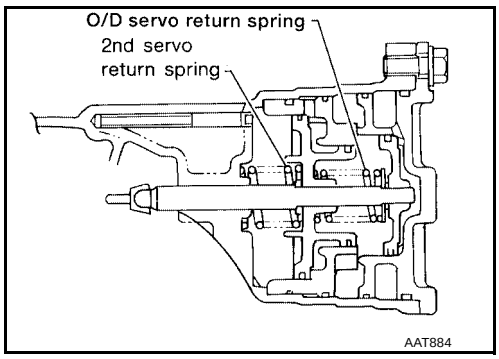
Pistons, Retainers and Piston Stem

- Check frictional surfaces for abnormal wear or damage.

Return Springs

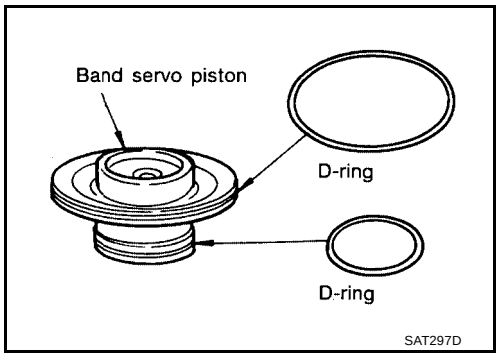
- Check for deformation or damage.
- Measure free length and outer diameter.

Inspection standard : Refer to AT-758, "RETURN SPRING" .

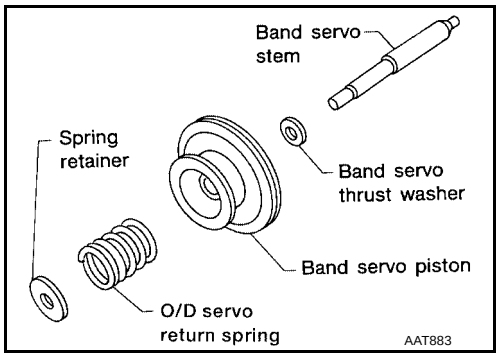


ASSEMBLY

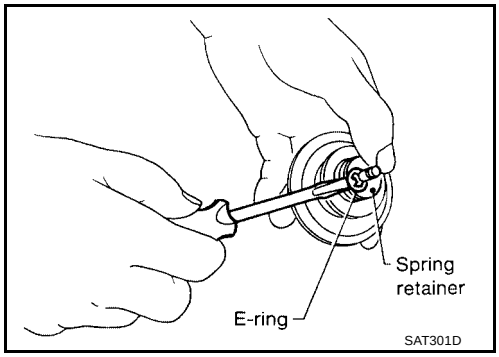
1. Install D-rings to servo piston retainer.
   - **Apply ATF to D-rings.**
   - **Pay attention to position of each O-ring.**



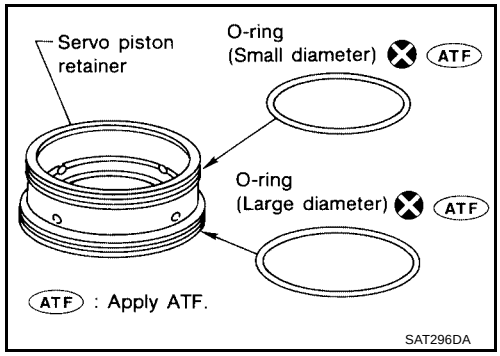
2. Install band servo piston stem, band servo thrust washer, O/D servo return spring and spring retainer to band servo piston.



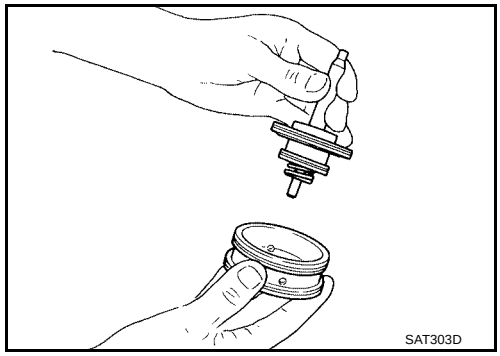
3. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



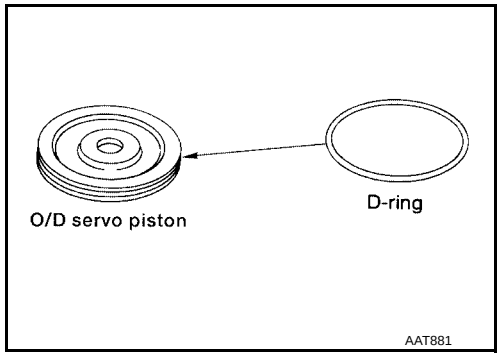
4. Install O-rings to servo piston retainer.
   - **Apply ATF to O-rings.**
   - **Pay attention to position of each O-ring.**



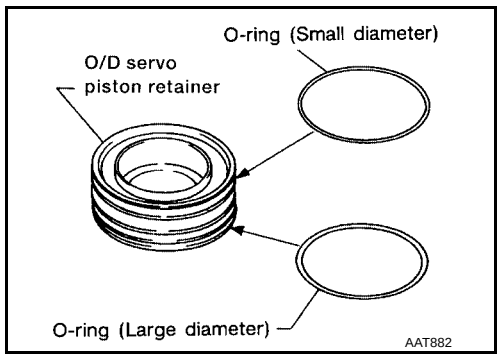
5. Install band servo piston assembly to servo piston retainer by pushing it inward.



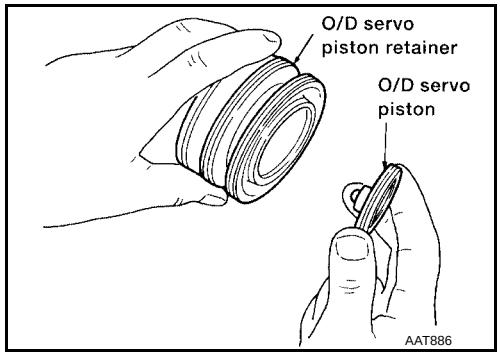
6. Install D-ring to O/D servo piston.
   - **Apply ATF to D-ring.**



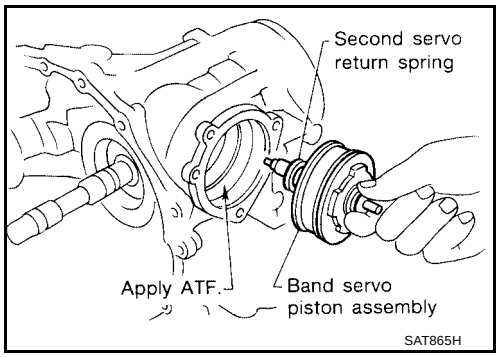
7. Install O-rings to O/D servo piston retainer.
   - **Apply ATF to O-rings.**
   - **Pay attention to position of each O-ring.**



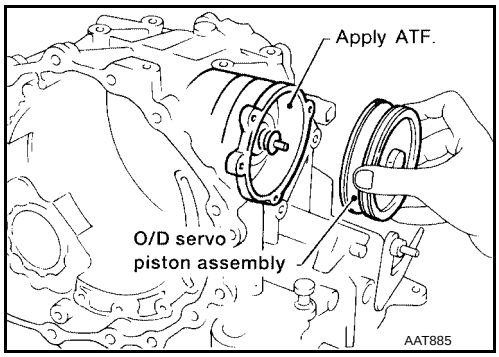
8. Install O/D servo piston to O/D servo piston retainer.



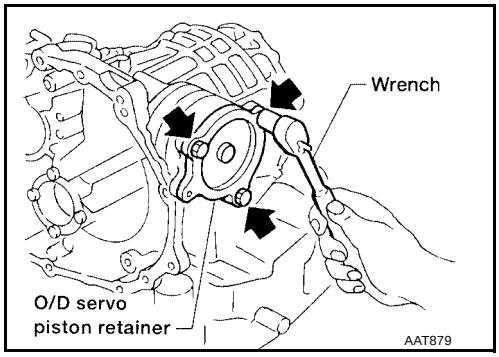
9. Install band servo piston assembly and 2nd servo return spring to transmission case.
   - **Apply ATF to O-ring of band servo piston and transmission case.**



10. Install O/D servo piston assembly to transmission case.
    - **Apply ATF to O-ring of band servo piston and transmission case.**



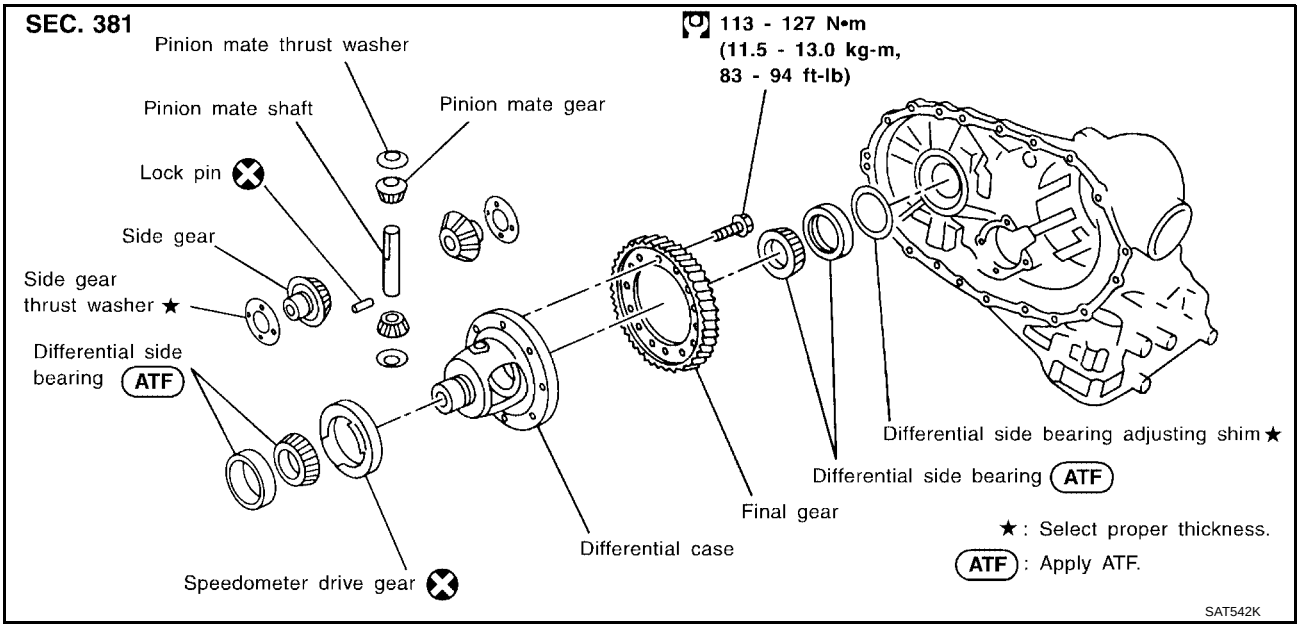
11. Install O/D servo piston retainer to transmission case. Refer to AT-722, "ASSEMBLY" .



Final Drive

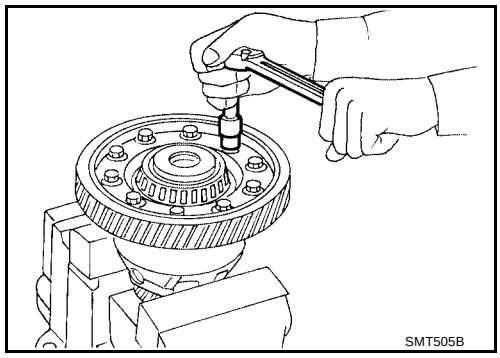
ECS0067Q

COMPONENTS

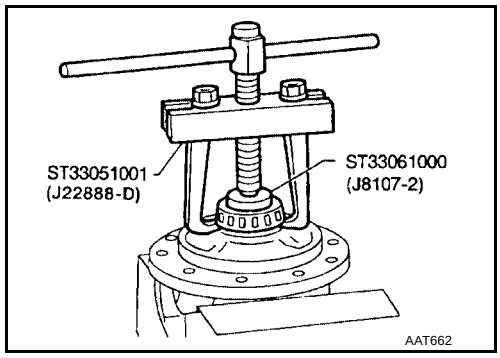


DISASSEMBLY

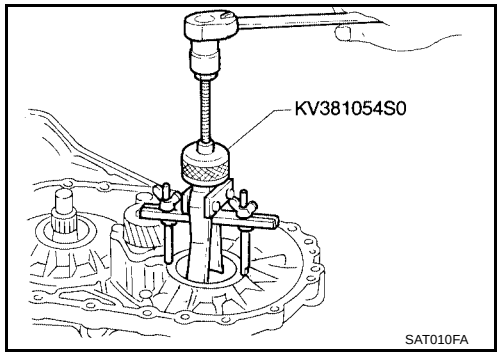
1. Remove final gear.



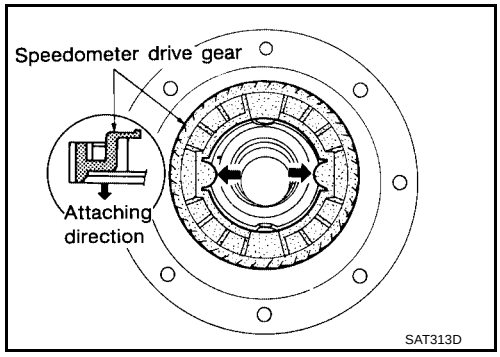
2. Press out differential side bearings.
   - **Be careful not to mix up the right and left bearings.**



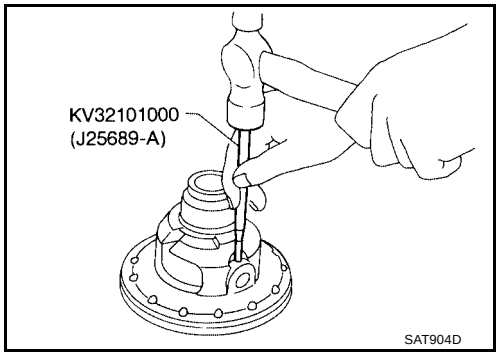
3. Remove differential side bearing outer race and side bearing adjusting shim from transaxle case.



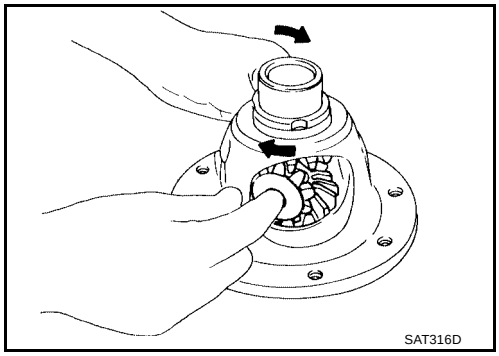
4. Remove speedometer drive gear.



5. Drive out pinion mate shaft lock pin.



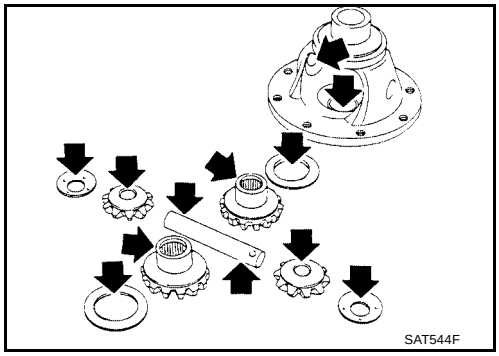
6. Draw out pinion mate shaft lock pin.
7. Remove pinion mate gears and side gears.



INSPECTION

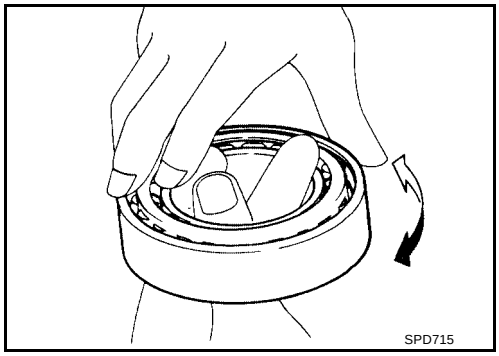
Gear, Washer, Shaft and Case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



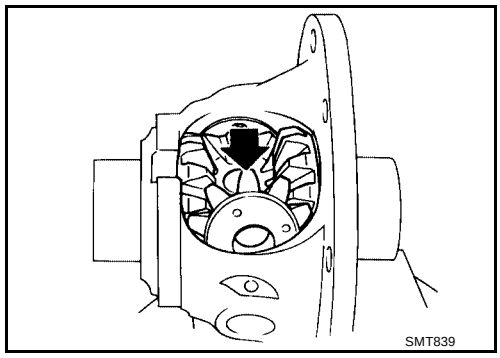
Bearings

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**

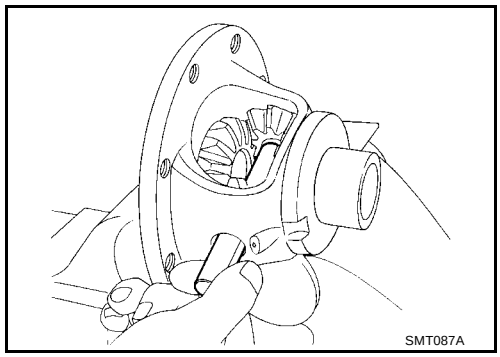


ASSEMBLY

1. Attach side gear thrust washers to side gears, then install pinion mate thrust washers and pinion mate gears in place.
   - **Apply ATF to any parts.**

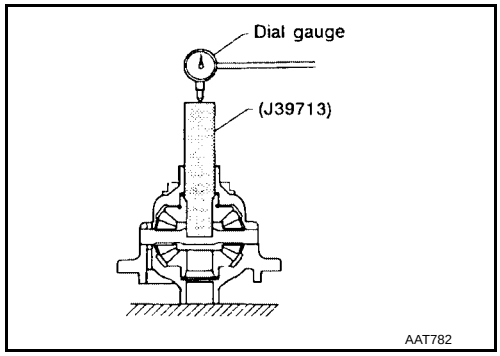


2. Insert pinion mate shaft.
   - **When inserting, be careful not to damage pinion mate thrust washers.**



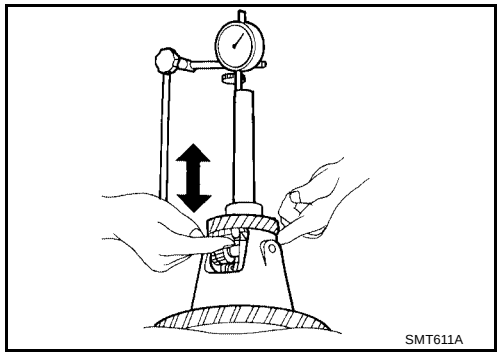
3. Measure clearance between side gear and differential case with washers following the procedure below:

a. Set Tool and dial indicator on side gear.



b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

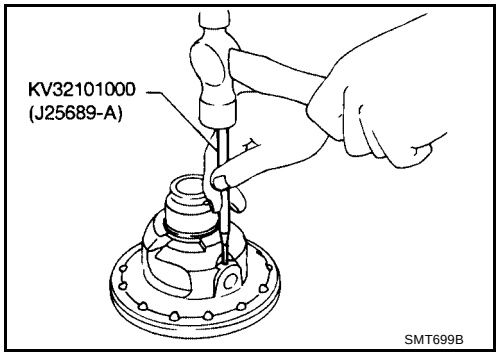
Clearance between side gear and differential case with washer	**: 0.1 - 0.2 mm (0.004 - 0.008 in)**



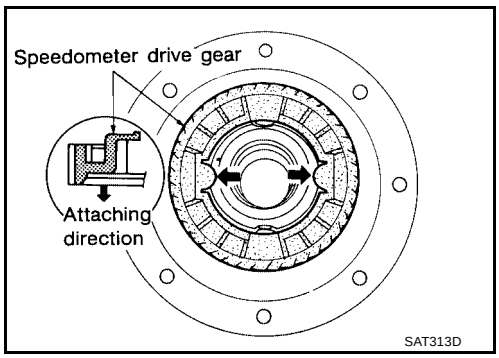
c. If not within specification, adjust clearance by changing thickness of differential side gear thrust washers.

Differential side gear thrust washers	**: Refer to AT-756, "DIFFERENTIAL SIDE GEAR THRUST WASHERS" .**

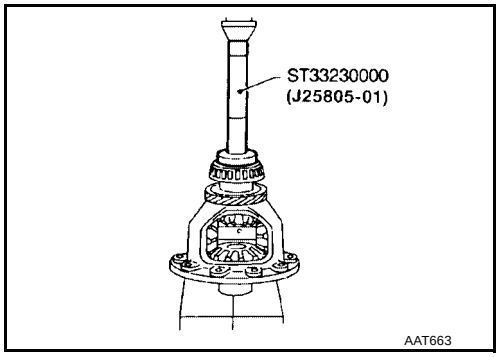
4. Install lock pin.
   - **Make sure that lock pin is flush with case.**



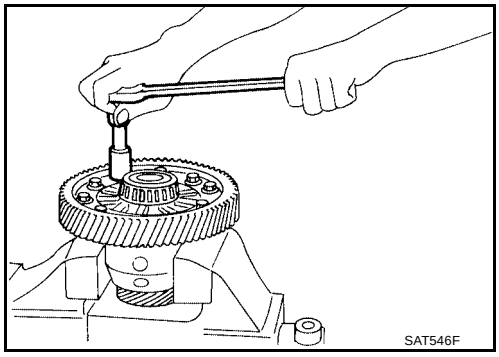
5. Install speedometer drive gear on differential case.
   - **Align the projection of speedometer drive gear with the groove of differential case.**



6. Press on differential side bearings.



7. Install final gear and tighten fixing bolts in a crisscross pattern. Tighten final gear bolts to the specified torque. Refer to AT-724, "COMPONENTS" .



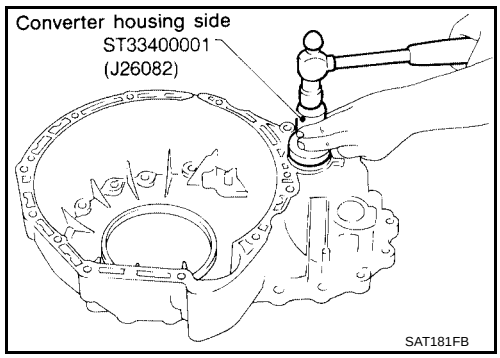
ASSEMBLY

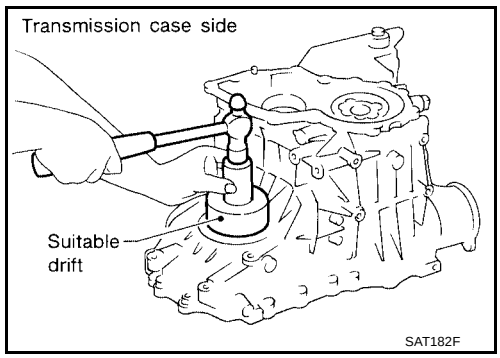
PFP:00000

Assembly (1)

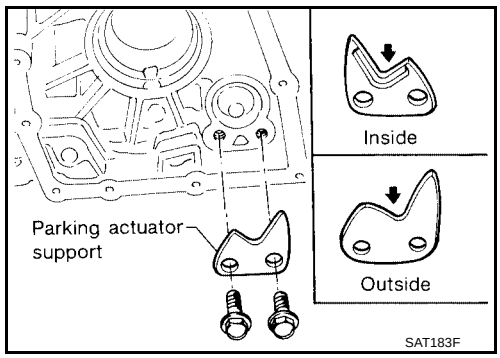
ECS0067R

1. Install differential side oil seals on transmission case and converter housing.

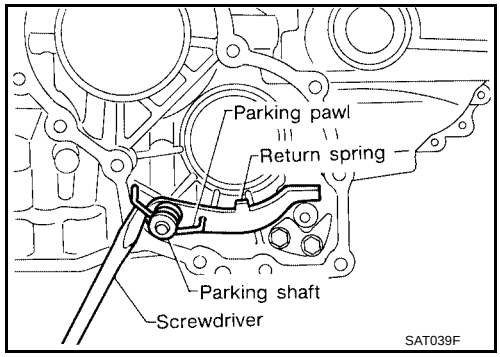




2. Install parking actuator support to transmission case. Tighten parking actuator support bolts to the specified torque. Refer to AT-652, "OVERHAUL" .
   - **Pay attention to direction of parking actuator support.**



3. Install parking pawl on transmission case and fix it with parking shaft.
4. Install return spring.

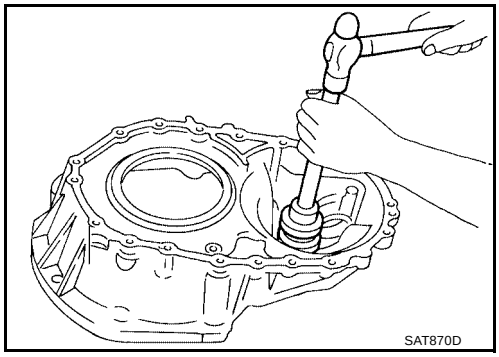


Adjustment (1)

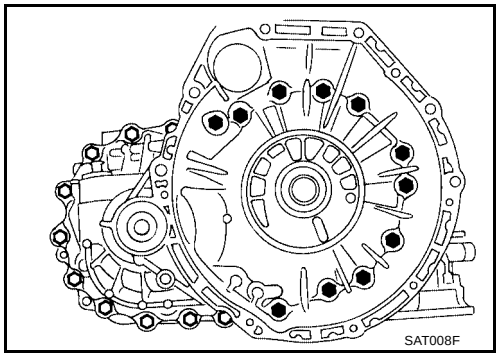
ECS0067S

DIFFERENTIAL SIDE BEARING PRELOAD

1. Install differential side bearing outer race without adjusting shim on transmission case.
2. Install differential side bearing outer race on converter housing.

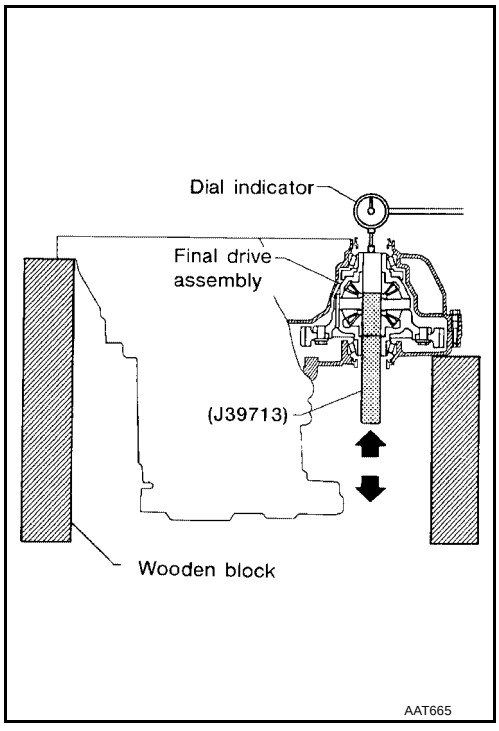


3. Place final drive assembly on transmission case.
4. Install transmission case on converter housing. Tighten transmission case fixing bolts to the specified torque. Refer to AT-652, "OVERHAUL" .

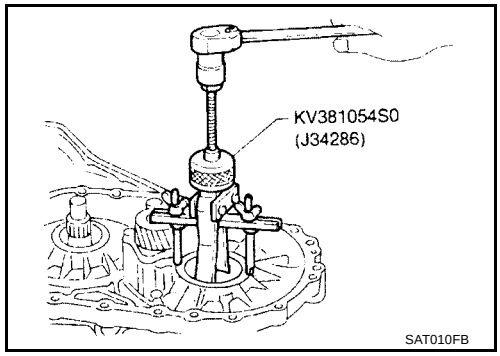


5. Attach dial indicator on differential case at converter housing side.
6. Insert Tool into differential side gear from transmission case side.
7. Move Tool up and down and measure dial indicator deflection.
8. Select proper thickness of differential side bearing adjusting shim(s).
   Suitable shim thickness = Dial indicator deflection + Specified bearing preload

Differential side bearing preload adjusting shim	**: Refer to AT-756, "DIFFERENTIAL SIDE BEARING PRELOAD ADJUSTING SHIMS" .**
Bearing preload	**: 0.05 - 0.09 mm (0.0020 - 0.0035 in)**



9. Remove converter housing from transmission case.
10. Remove final drive assembly from transmission case.
11. Remove differential side bearing outer race from transmission case.
12. Reinstall differential side bearing outer race and shim(s) selected from SDS table on transmission case.
13. Reinstall converter housing on transmission case and tighten transmission case fixing bolts to the specified torque. Refer to AT-652, "OVERHAUL" .

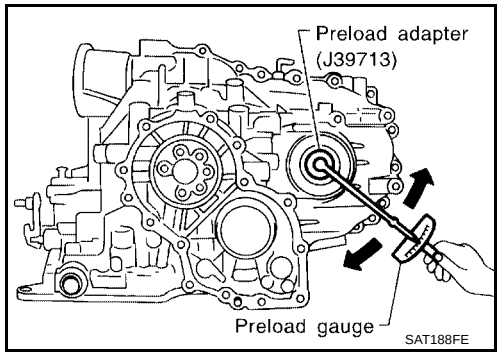


14. Insert Tool and measure turning torque of final drive assembly.
    - **Turn final drive assembly in both directions several times to seat bearing rollers correctly.**

      Turning torque of final drive assembly (New bearing): 0.78 - 1.37 N·m (8.0 - 14.0 kg-cm, 6.9 - 12.2 in-lb)

    - **When old bearing is used again, turning torque will be slightly less than the above.**
    - **Make sure torque is close to the specified range.**

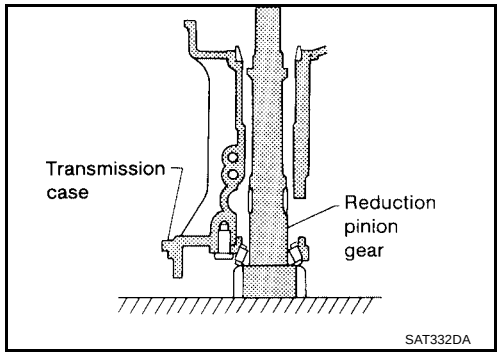
      Preload adapter: J39713



REDUCTION PINION GEAR BEARING PRELOAD

1. Remove transmission case and final drive assembly from converter housing.
2. Select proper thickness of reduction pinion gear bearing adjusting shim using the following procedures.

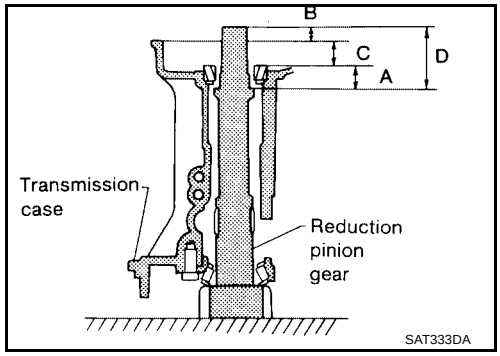
a. Place reduction pinion gear on transmission case as shown.



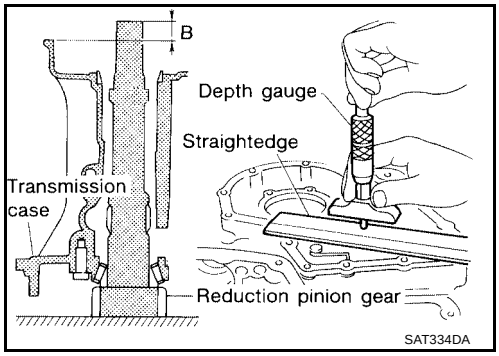
b. Place idler gear bearing on transmission case.
c. Measure dimensions “B” “C” and “D” and calculate dimension “A”.

A = D – (B + C)

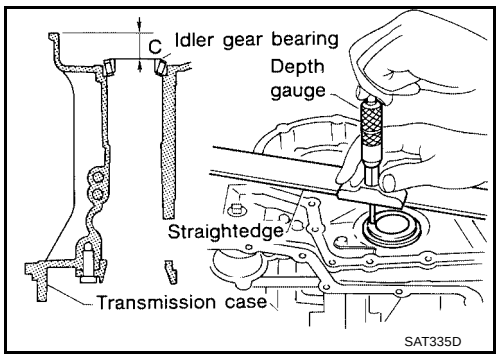
“A”: Distance between the surface of idler gear bearing inner race and the adjusting shim mating surface of reduction pinion gear.



- Measure dimension “B” between the end of reduction pinion gear and the surface of transmission case.
- **Measure dimension “B” in at least two places.**

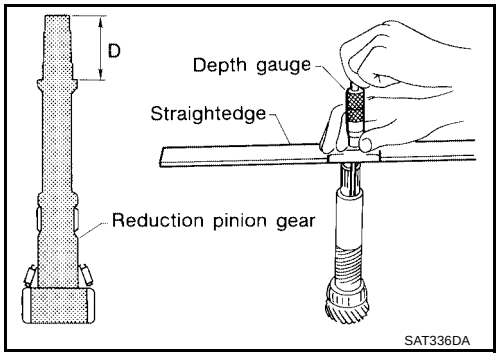


- Measure dimension “C” between the surface of idler gear bearing inner race and the surface of transmission case.
- **Measure dimension “C” in at least two places.**



- Measure dimension “D” between the end of reduction pinion gear and the adjusting shim mating surface of reduction pinion gear.
- **Measure dimension “D” in at least two places.**
- Calculate dimension “A”.

A = D – (B + C)



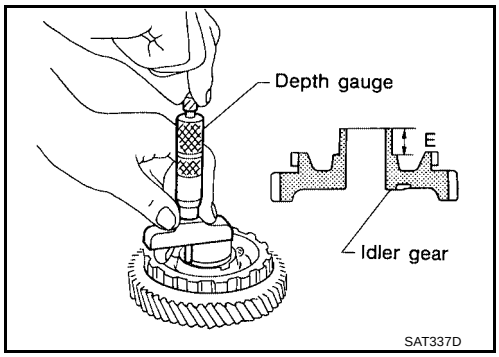
d. Measure dimension “E” between the end of idler gear and the idler gear bearing inner race mating surface of idler gear.
   - **Measure dimension “E” in at least two places.**

e. Select proper thickness of reduction pinion gear bearing adjusting shim.

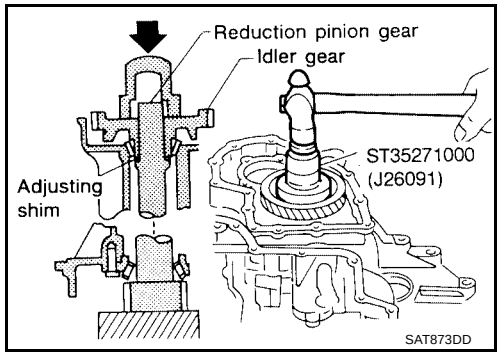
Proper shim thickness = A – E – 0.05 mm (0.0020 in)*

(*: Bearing preload)

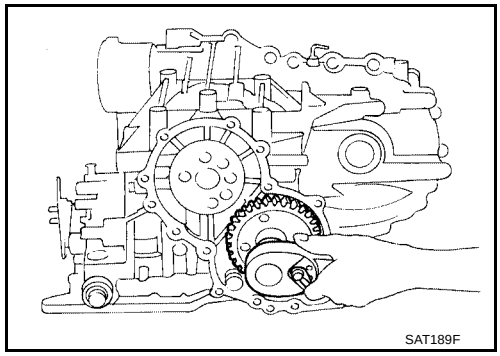
Reduction pinion gear bearing adjusting shim : **Refer to AT-757, "REDUCTION PINION GEAR BEARING ADJUSTING SHIMS" .**



3. Install reduction gear and reduction gear bearing adjusting shim selected in step 2-e on transmission case.
4. Press idler gear bearing inner race on idler gear.
5. Press idler gear on reduction gear.
   - **Press idler gear until idler gear fully contacts adjusting shim.**



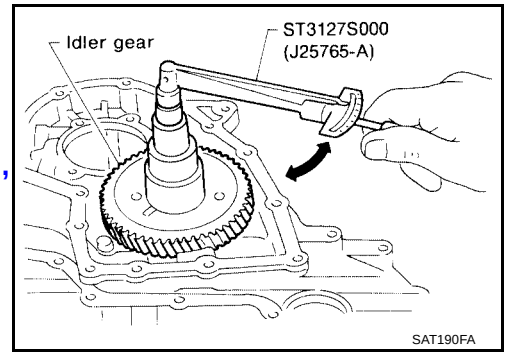
6. Tighten idler gear lock nut to the specified torque. Refer to AT-652, "OVERHAUL" .
   - **Lock idler gear with parking pawl when tightening lock nut.**



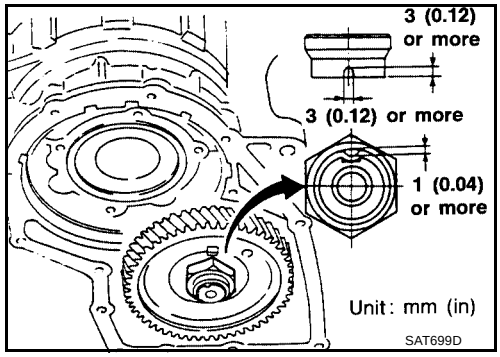
7. Measure turning torque of reduction pinion gear.
   - **When measuring turning torque, turn reduction pinion gear in both directions several times to seat bearing rollers correctly.**

     Turning torque of reduction pinion gear : 0.05 - 0.39 N·m (0.5 - 4.0 kg-cm, 0.43 - 3.47 in-lb)

   - **If turning torque is out of specification, decrease or increase thickness of reduction pinion gear bearing adjusting shim.**

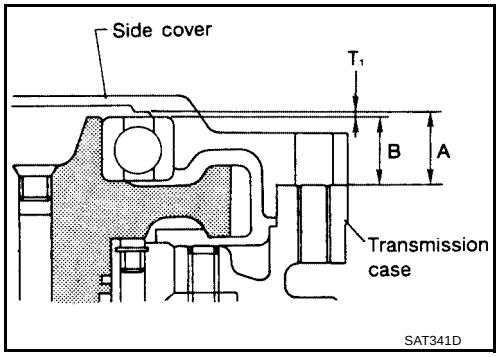


8. After properly adjusting turning torque, clinch idler gear lock nut as shown.

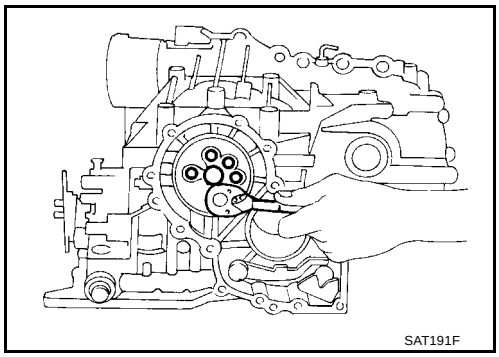


OUTPUT SHAFT END PLAY

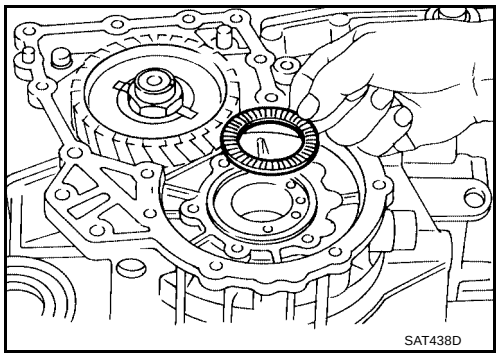
- Measure clearance between side cover and the end of the output shaft bearing.
- Select proper thickness of adjusting shim so that clearance is within specifications.



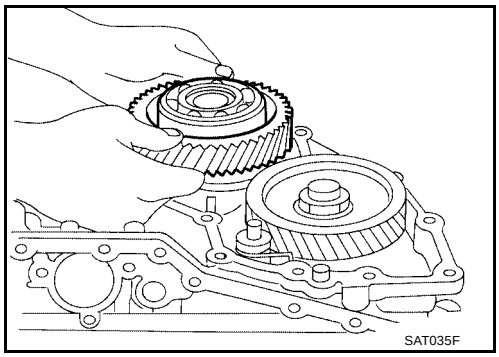
1. Install bearing retainer for output shaft.



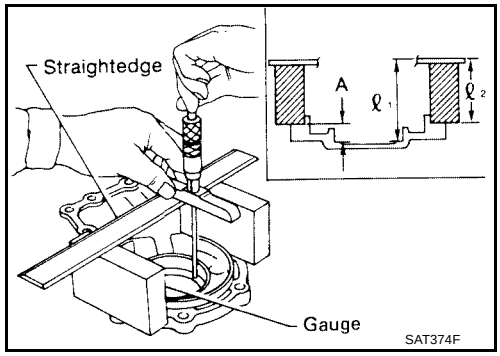
2. Install output shaft thrust needle bearing on bearing retainer.



3. Install output shaft on transmission case.



4. Measure dimensions "ℓ_1" and "ℓ_2" at side cover and then calculate dimension "A".
   - Measure dimension "**ℓ_1" and "ℓ_2" in at least two places.**

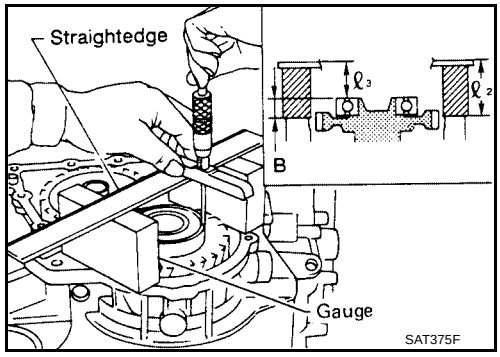


   "A" : **Distance between transmission case fitting surface and adjusting shim mating surface.**

   A = $\ell_1 - \ell_2$

   ℓ_2 : **Height of gauge**

5. Measure dimensions "ℓ_2" and "ℓ_3" and then calculate dimension "B".
   - Measure "**ℓ_2" and "ℓ_3" in at least two places.**

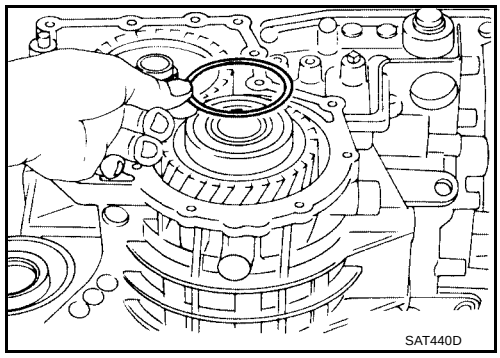


   "B" : **Distance between the end of output shaft bearing outer race and the side cover fitting surface of transmission case.**

   B = $\ell_2 - \ell_3$

   ℓ_2 : **Height of gauge**

6. Select proper thickness of adjusting shim so that output shaft end play (clearance between side cover and output shaft bearing) is within specifications.



   Output shaft end play (A – B) : **0 - 0.15 mm (0 - 0.0059 in)**

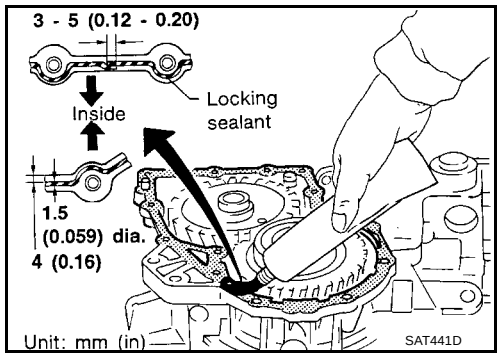
   Output shaft end play adjusting shims : **Refer to AT-759, "OUTPUT SHAFT ADJUSTING SHIMS" .**

7. Install adjusting shim on output shaft bearing.

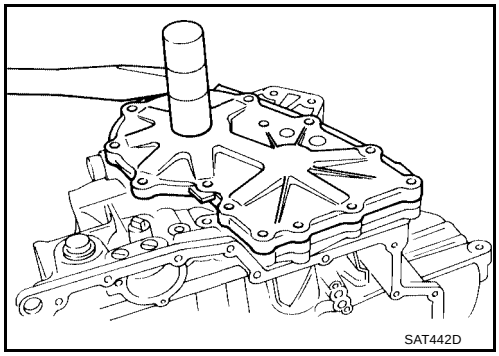
Assembly (2)

ECS0067T

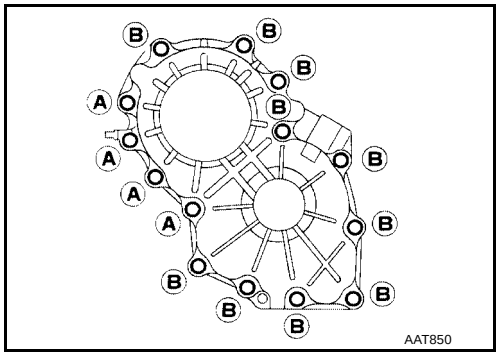
1. Apply anaerobic liquid gasket to transmission case as shown in illustration. Refer to GI-44, "Recommended Chemical Products and Sealants"



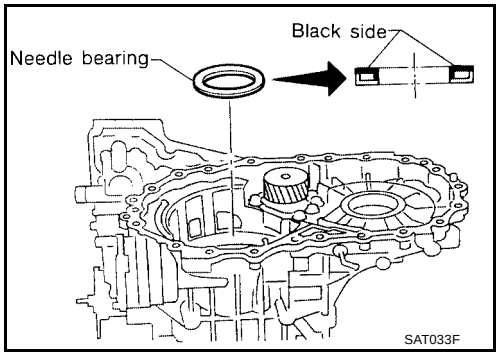
2. Set side cover on transmission case.
   - **Apply locking sealant to the mating surface of transmission case.**



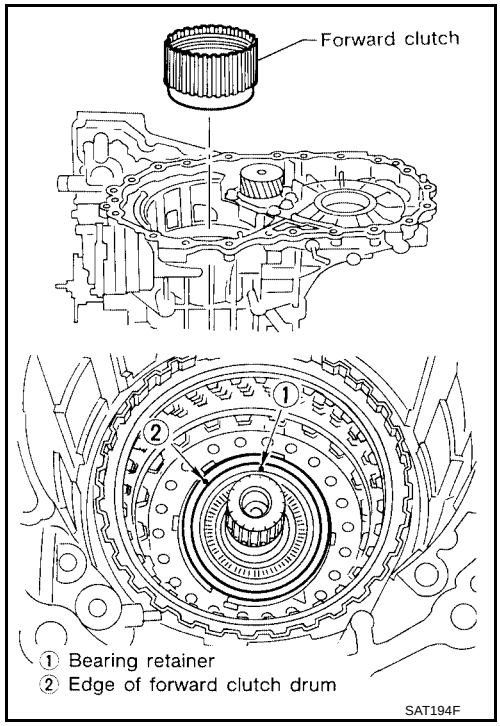
3. Tighten side cover fixing bolts to specified torque. Refer to AT-652, "OVERHAUL" .
   - **Do not mix bolts A and B.**
   - **Always replace bolts A as they are self-sealing bolts.**



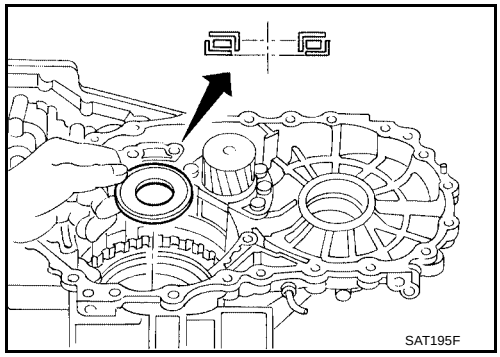
4. Remove paper rolled around bearing retainer.
5. Install thrust washer on bearing retainer.
   - **Apply petroleum jelly to thrust washer.**



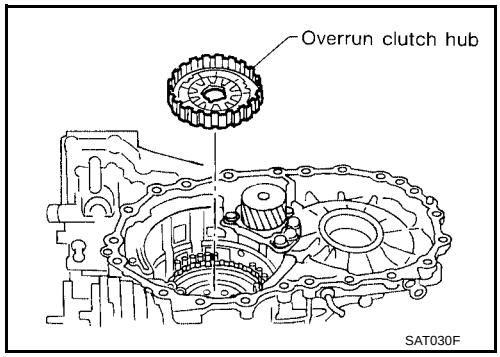
6. Install forward clutch assembly.
   - **Align teeth of low & reverse brake drive plates before installing.**
   - **Make sure that bearing retainer seal rings are not spread.**
   - **If forward clutch assembly is correctly seated, points 1 and 2 are at almost same level.**



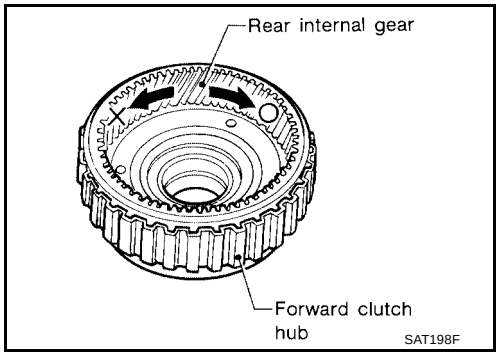
7. Install thrust needle bearing on bearing retainer.
   - **Apply petroleum jelly to thrust needle bearing.**
   - **Pay attention to direction of thrust needle bearing.**



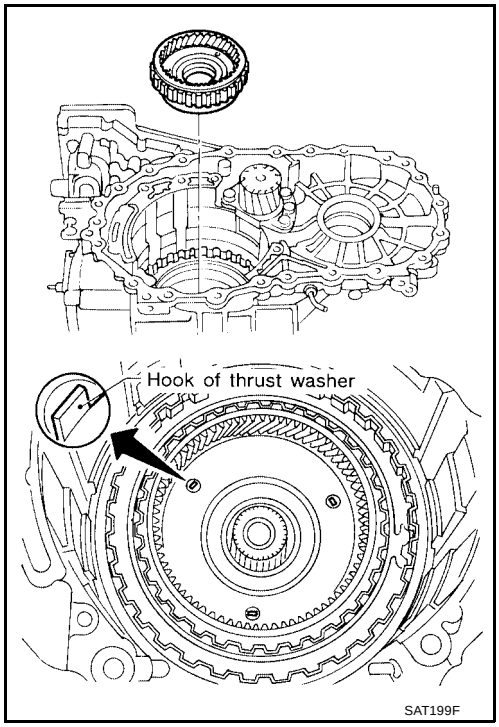
8. Install overrun clutch hub.
   - **Apply petroleum jelly to thrust washers.**
   - **Align teeth of overrun clutch drive plates before installing.**



9. Hold forward clutch hub and turn rear internal gear.
   Check overrun clutch hub for correct directions of lock and unlock.
   - **If not shown as illustrated, check installed direction of forward one-way clutch.**

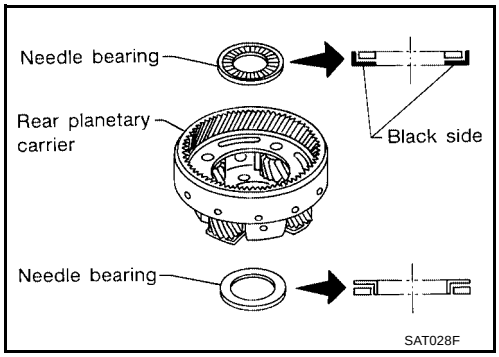


10. Install forward clutch hub and rear internal gear assembly.
    - **Align teeth of forward clutch drive plates before installing.**
    - **Check that three hooks of thrust washer are correctly aligned after installing.**

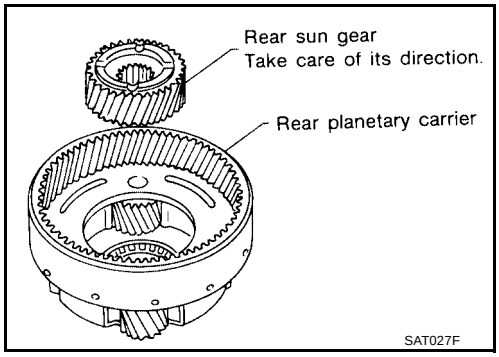


11. Install rear planetary carrier assembly and rear sun gear according to the following procedures.

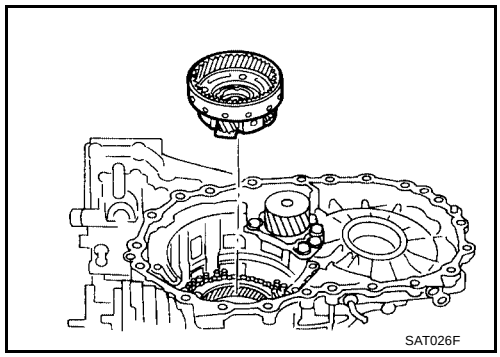
a. Install needle bearings on rear planetary carrier.
   - **Apply petroleum jelly to needle bearings.**
   - **Pay attention to direction of needle bearings.**



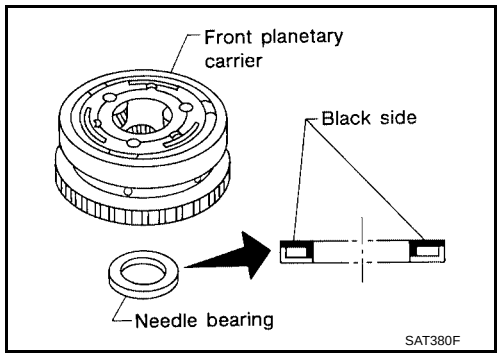
b. Install rear sun gear on rear planetary carrier.
   - **Pay attention to direction of rear sun gear.**



c. Install rear planetary carrier on transmission case.

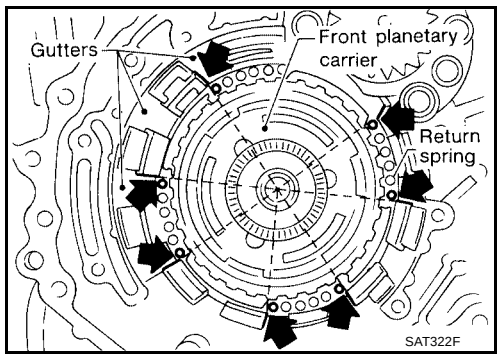


12. Install thrust needle bearing on front planetary carrier, then install them together on transmission case.
    - **Apply petroleum jelly to thrust needle bearing.**
    - **Pay attention to direction of thrust needle bearing.**

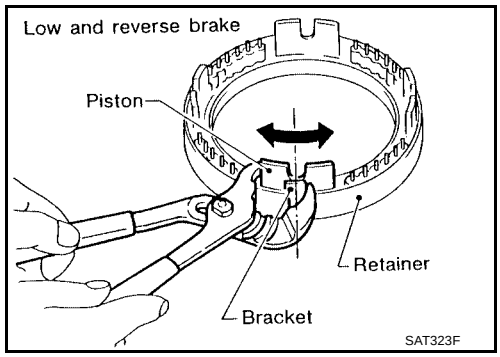


13. Install low and reverse brake piston according to the following procedures.

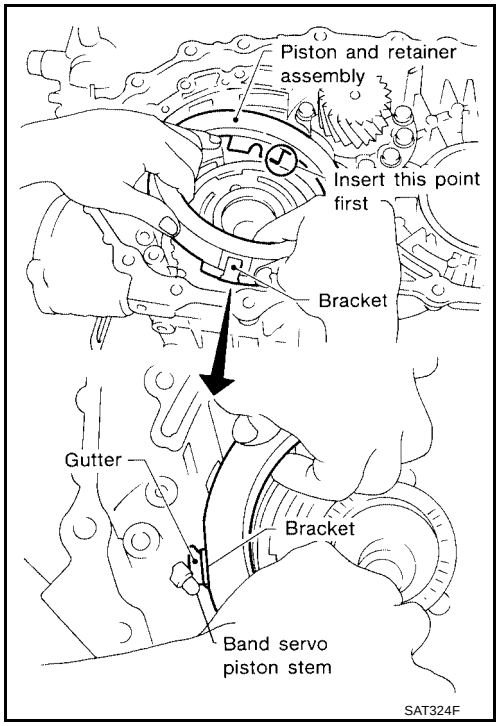
a. Set and align return springs to transmission case gutters as shown in illustration.



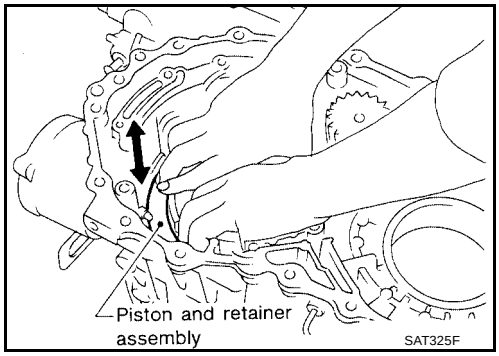
b. Set and align piston with retainer.



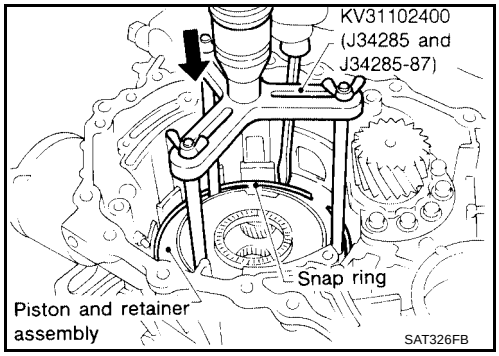
c. Install piston and retainer assembly on the transmission case.
   - **Align bracket to specified gutter as indicated in illustration.**



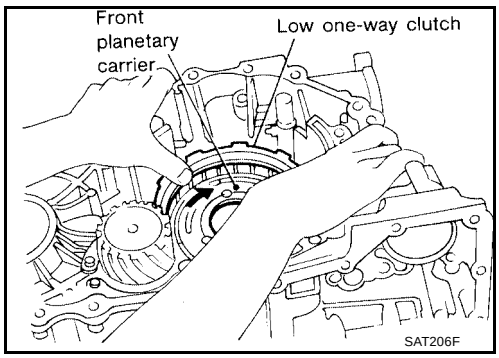
d. Check that each protrusion of piston is correctly set to corresponding return spring as follows.
   - **Push piston and retainer assembly evenly and confirm they move smoothly.**
   - **If they can not move smoothly, remove piston and retainer assembly and align return spring correctly as instructed in step "a".**



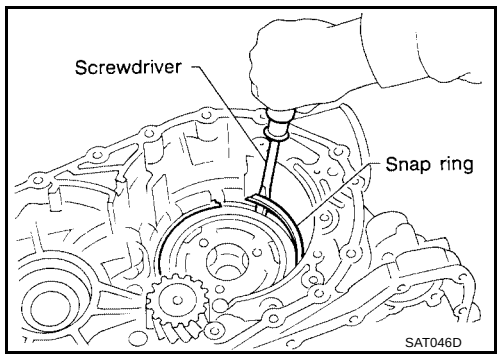
e. Push down piston and retainer assembly and install snap ring.



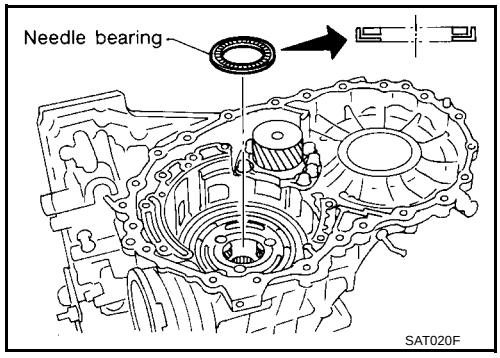
14. Install low one-way clutch to front planetary carrier by turning carrier in the direction of the arrow shown.



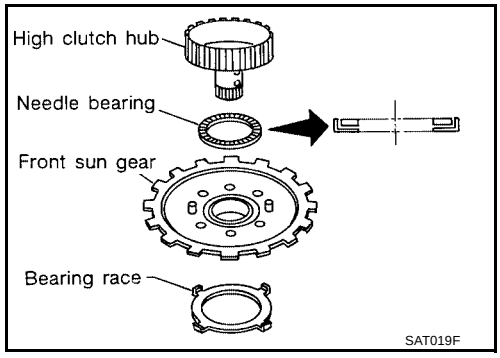
15. Install snap ring with screwdriver.
    - **Forward clutch and bearing must be correctly installed for snap ring to fit into groove of transmission case.**



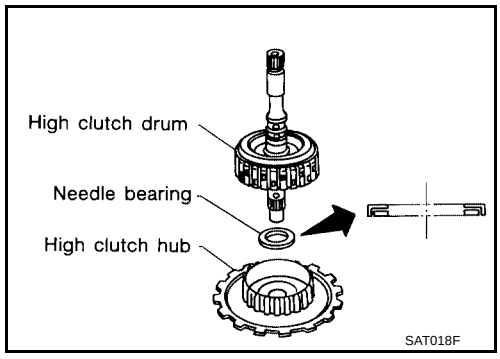
16. Install needle bearing on transmission case.
    - **Apply petroleum jelly to needle bearing.**
    - **Pay attention to direction of needle bearing.**



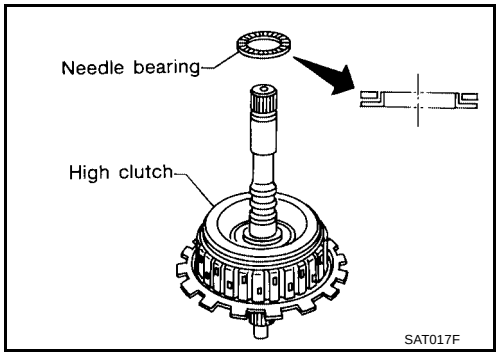
17. Install bearing race, needle bearing and high clutch hub on front sun gear.
    - **Apply petroleum jelly to needle bearing.**
    - **Pay attention to direction of needle bearing.**



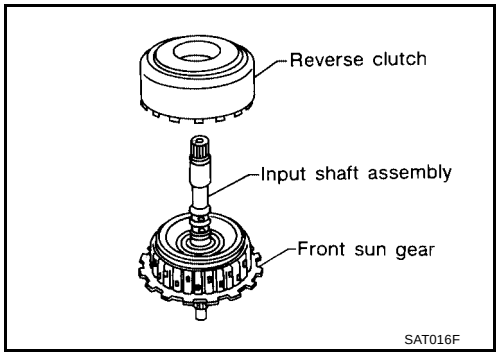
18. Install needle bearing and high clutch drum on high clutch hub.



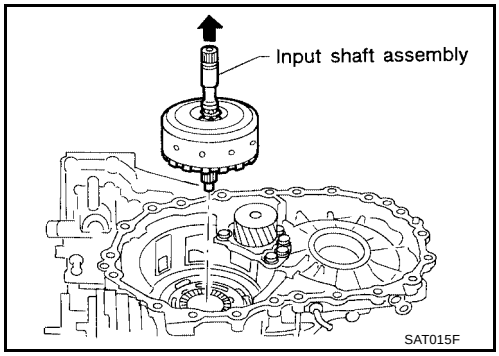
19. Install needle bearing on high clutch drum.
    - **Apply petroleum jelly to needle bearing.**
    - **Pay attention to direction of needle bearing.**



20. Remove paper rolled around input shaft.
21. Install input shaft assembly in reverse clutch.
    - **Align teeth of reverse clutch drive plates before installing.**



22. Install reverse clutch assembly on transmission case.
    - **Align teeth of high clutch drive plates before installing.**



Adjustment (2)

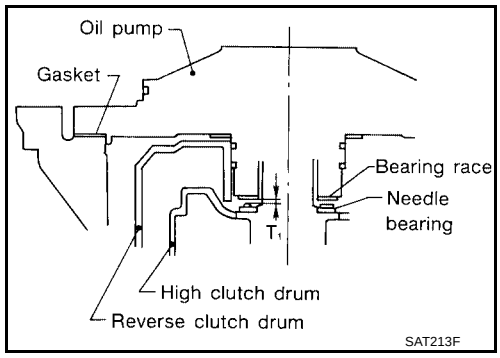
ECS0067U

When any parts listed below are replaced, adjust total end play and reverse clutch end play.

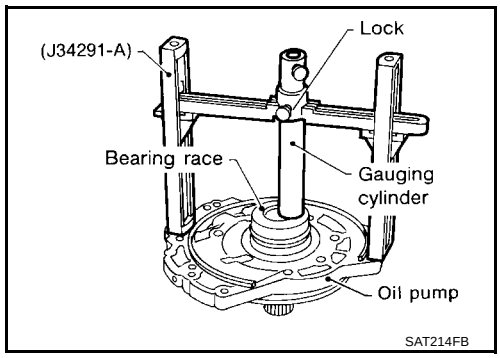
Part name	Total end play	Reverse clutch end play
Transmission case	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	—	●

TOTAL END PLAY

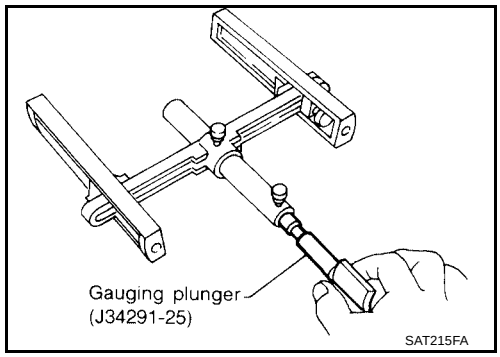
1. Adjust total end play "T_1 ".



a. With original bearing race installed, place Tool onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly. The gauging cylinder should rest on top of bearing race. Lock gauging cylinder in place with set screw.



b. Install gauging plunger into cylinder.



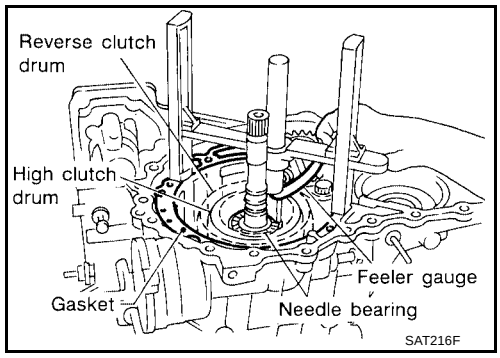
c. With needle bearing installed on high clutch drum, place Tool legs on machined surface of transmission case (with gasket). Then allow plunger to rest on needle bearing.

d. Measure gap between cylinder and plunger. This measurement should give exact total end play.

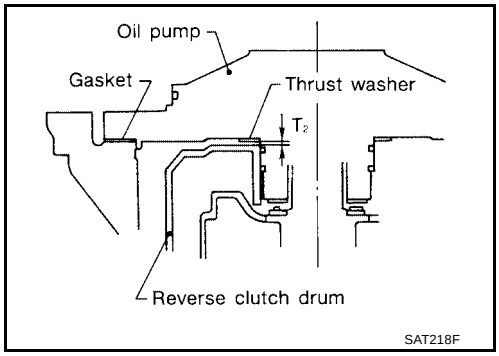
Total end play "T_1 " **: 0.25 - 0.55 mm (0.0098 - 0.0217 in)**

- If end play is out of specification, decrease or increase thickness of bearing race as necessary.

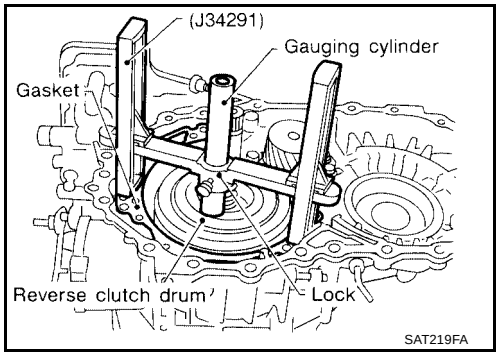
Available bearing race for adjusting total end play **: Refer to AT-759, "BEARING RACE FOR ADJUSTING TOTAL END PLAY" .**



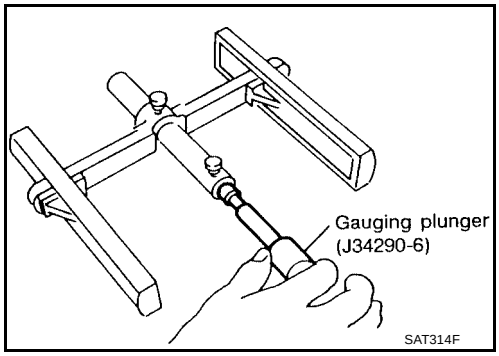
2. Adjust reverse clutch drum end play “T_2 ”.

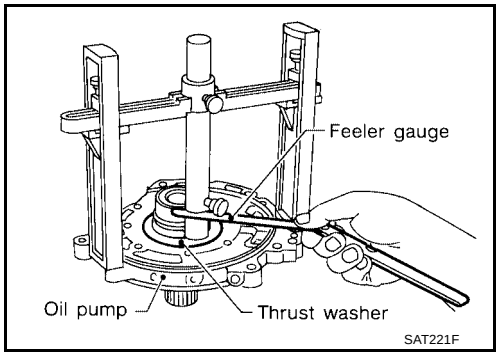


a. Place Tool on machined surface of transmission case (with gasket). Then allow gauging cylinder to rest on reverse clutch drum. Lock cylinder in place with set screw.



b. Install gauging plunger into cylinder.





c. With original thrust washer installed on oil pump, place Tool legs onto machined surface of oil pump assembly. Then allow plunger to rest on thrust washer.

d. Measure gap between cylinder and plunger with feeler gauge. This measurement should give exact reverse clutch drum end play.

Reverse clutch drum end play “T_2 ” **: 0.55 - 0.90 mm (0.0217 - 0.0354 in)**

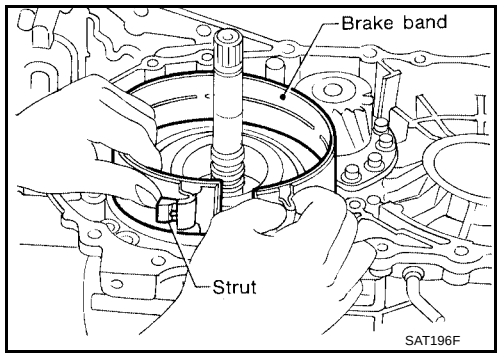
- If end play is out of specification, decrease or increase thickness of thrust washer as necessary.

Available thrust washer for adjusting reverse clutch drum end play	**: Refer to AT-759, "THRUST WASHERS FOR ADJUSTING REVERSE CLUTCH DRUM END PLAY" .**

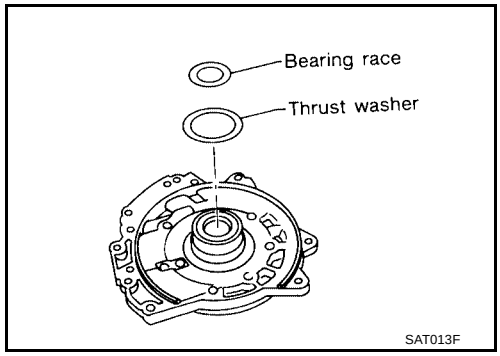
Assembly (3)

ECS0067V

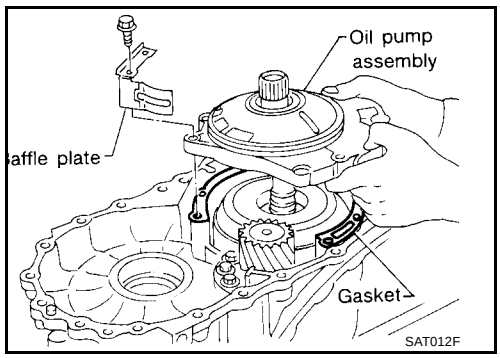
1. Install anchor end pin and lock nut on transmission case.
2. Place brake band on outside of reverse clutch drum. Tighten anchor end pin just enough so that brake band is evenly fitted on reverse clutch drum.



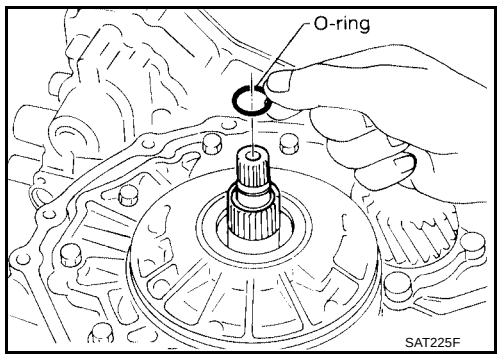
3. Place bearing race selected in total end play adjustment step on oil pump cover.
   - **Apply petroleum jelly to bearing race.**
4. Place thrust washer selected in reverse clutch end play step on reverse clutch drum.
   - **Apply petroleum jelly to thrust washer.**



5. Install oil pump assembly, baffle plate and gasket on transmission case.
6. Tighten oil pump fixing bolts to the specified torque.



7. Install O-ring to input shaft.
   - **Apply ATF to O-ring.**



8. Adjust brake band.

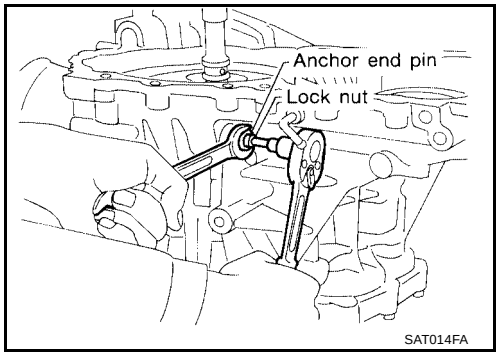
a. Tighten anchor end pin to the specified torque.

Anchor end pin **: Refer to AT-756, "BRAKE BAND" .**

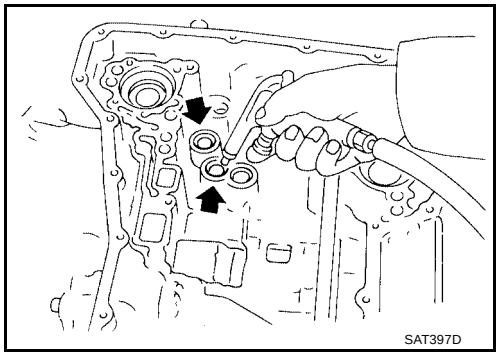
b. Back off anchor end pin two and a half turns.

c. While holding anchor end pin, tighten lock nut.

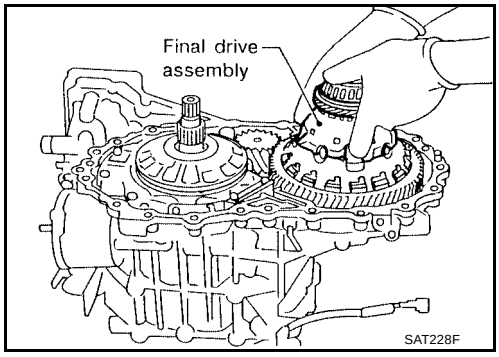
Lock nut **: Refer to AT-756, "BRAKE BAND" .**



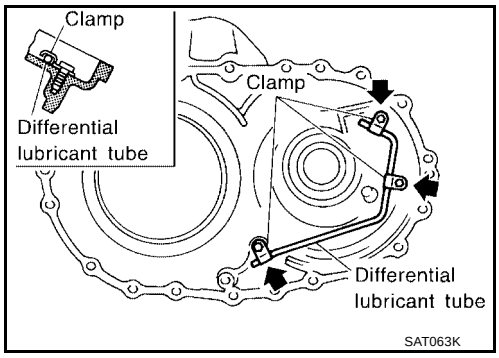
9. Apply compressed air to oil holes of transmission case and check operation of brake band.



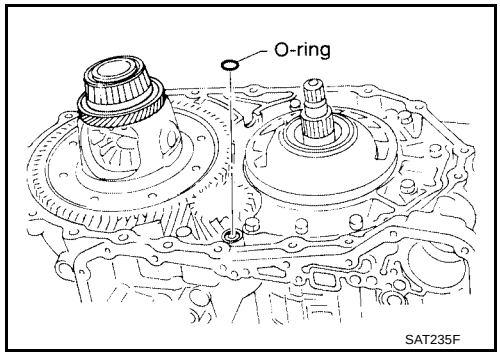
10. Install final drive assembly on transmission case.



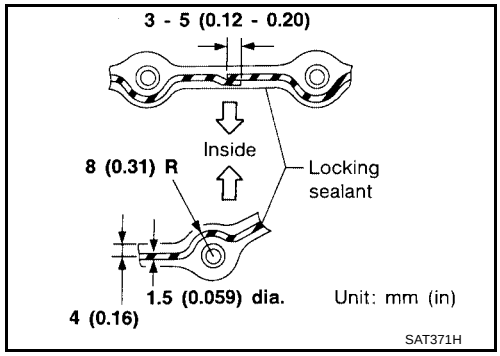
11. Install differential lubricant tube on converter housing. Tighten differential lubricant tube bolts to the specified torque. Refer to AT-652, "OVERHAUL" .



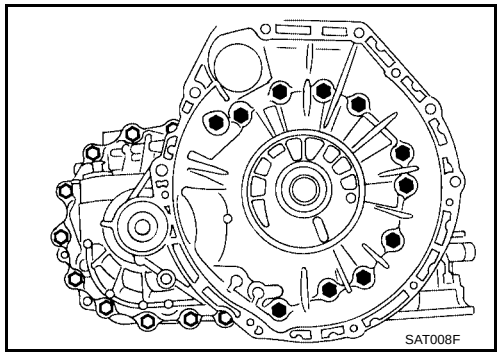
12. Install O-ring on differential oil port of transmission case.



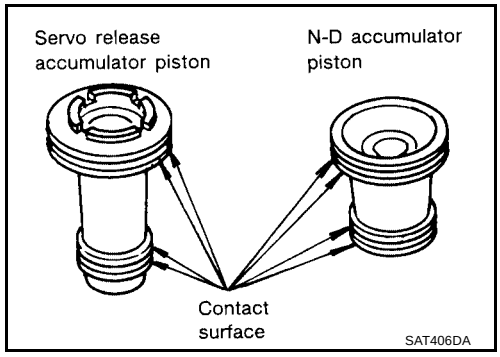
13. Install converter housing on transmission case.
    - **Apply locking sealant to mating surface of converter housing.**



    - **Tighten converter housing bolts to the specified torque. Refer to AT-652, "OVERHAUL" .**

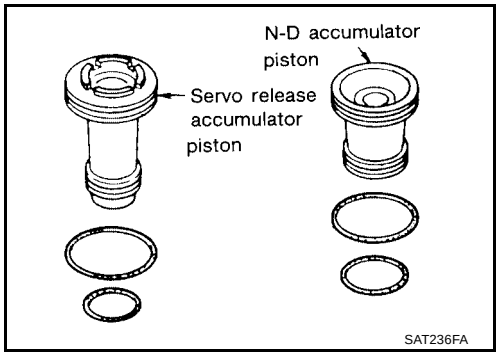


14. Install accumulator piston.
a. Check contact surface of accumulator piston for damage.



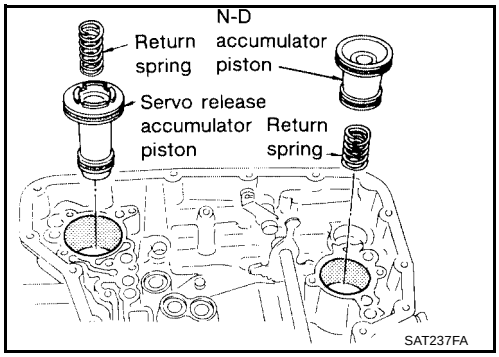
b. Install O-rings on accumulator piston.
- **Apply ATF to O-rings.**

Accumulator piston O-rings : Refer to AT-753, "O-RING"

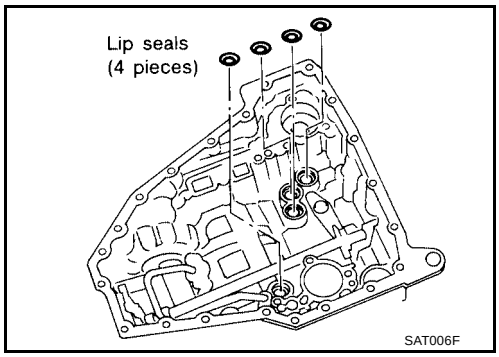


c. Install accumulator pistons and return springs on transmission case.
- **Apply ATF to inner surface of transmission case.**

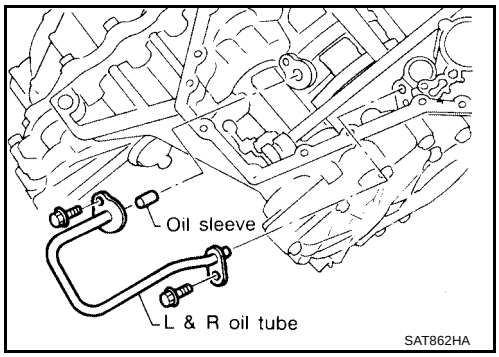
Return springs : Refer to AT-754, "RETURN SPRING" .



15. Install lip seals for band servo oil holes on transmission case.
- **Apply petroleum jelly to lip seals.**



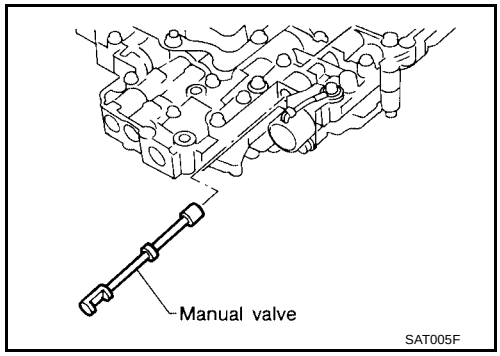
16. Install L & R oil tube and oil sleeve. Tighten L & R oil tube bolts to the specified torque. Refer to AT-652, "OVERHAUL" .



17. Install control valve assembly.

a. Insert manual valve into control valve assembly.

- **Apply ATF to manual valve.**

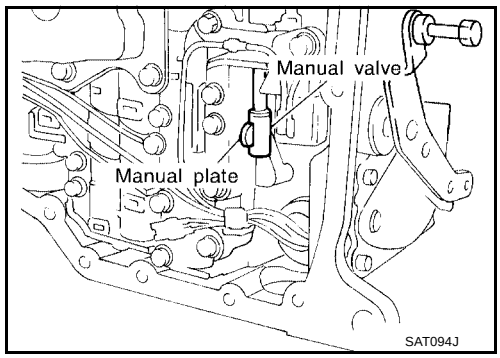


b. Set manual shaft in Neutral position.

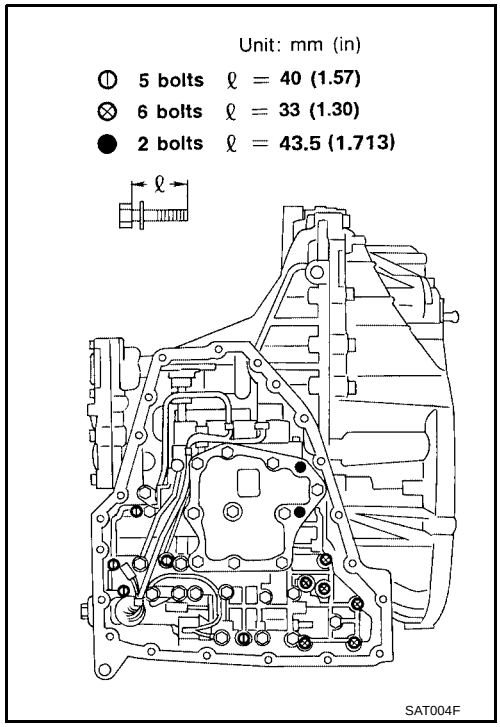
c. Install control valve assembly on transmission case while aligning manual valve with manual plate.

d. Pass terminal cord assembly connector through transmission case and install terminal body on transmission case by pushing it.

e. Install snap ring to terminal cord assembly connector.



f. Tighten bolts **I** , **X** and ●.



Bolt length, number and location:

Bolt	I	X	●
Bolt length " ℓ " mm (in)	40 (1.57)	33 (1.30)	43.5 (1.713)
Number of bolts	5	6	2

18. Install oil pan.

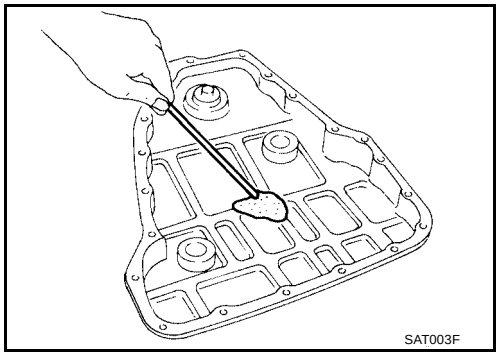
a. Attach a magnet to oil pan.

b. Install new oil pan gasket on transmission case.

c. Install oil pan on transmission case.

- **Always replace oil pan bolts as they are self-sealing bolts.**
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

d. Tighten oil pan bolts and drain plug to the specified torque. Refer to AT-652, "OVERHAUL" .

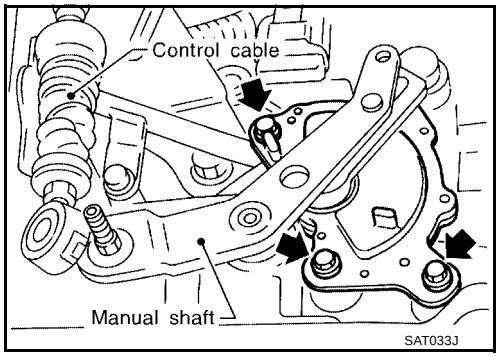


19. Install park/neutral position (PNP) switch.

a. Set manual shaft in P position.

b. Temporarily install park/neutral position (PNP) switch on manual shaft.

c. Move selector lever to N position.



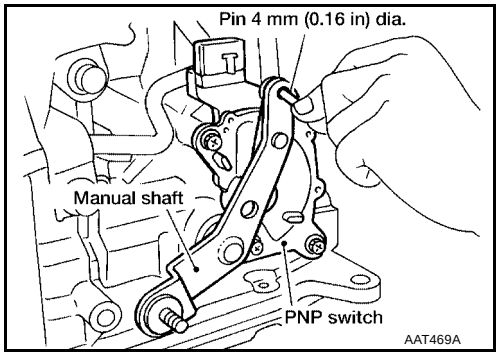
d. Use a 4 mm (0.16 in) pin for this adjustment.

i. Insert the pin straight into the manual shaft adjustment hole.

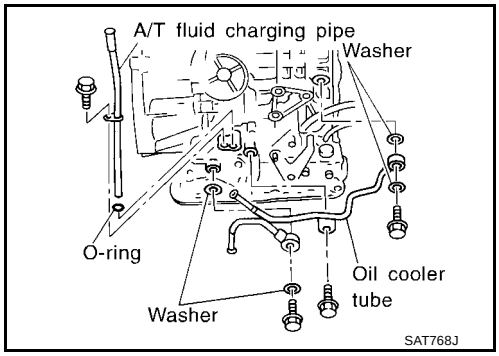
ii. Rotate park/neutral position (PNP) switch until the pin can also be inserted straight into hole in park/neutral position (PNP) switch.

e. Tighten park/neutral position (PNP) switch fixing bolts. Refer to AT-652, "OVERHAUL" .

f. Remove pin from adjustment hole after adjusting park/neutral position (PNP) switch.



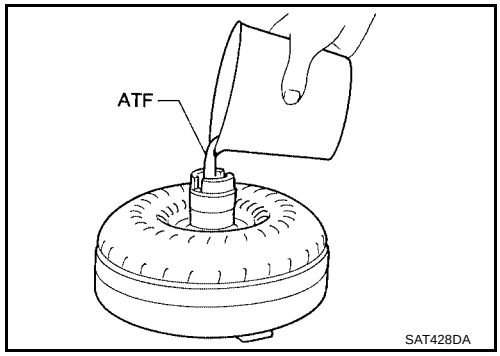
20. Install A/T fluid charging pipe and fluid cooler tube to transmission case. Tighten A/T fluid charging pipe and fluid cooler tube bolts to the specified torque. Refer to AT-652, "OVERHAUL" .



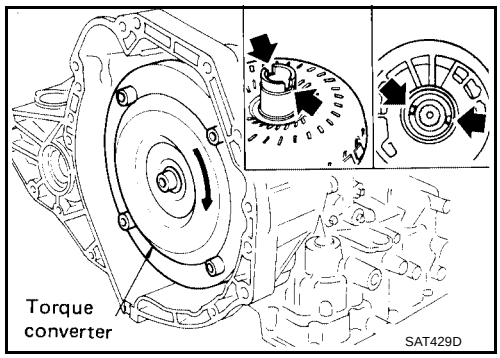
21. Install torque converter.

a. Pour ATF into torque converter.

- **Approximately 1 liter (1-1/8 US qt, 7/8 Imp qt) of fluid is required for a new torque converter.**
- **When reusing old torque converter, add the same amount of fluid as was drained.**

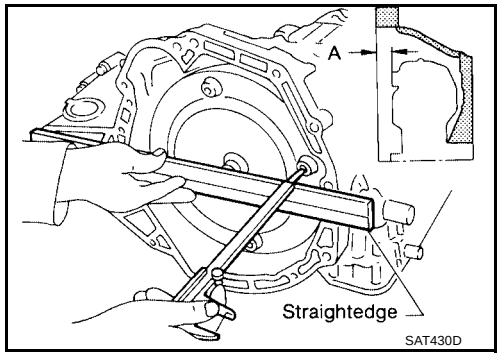


b. Install torque converter while aligning notches of torque converter with notches of oil pump.



c. Measure distance “A” to check that torque converter is in proper position.

Distance A : 14 mm (0.55 in) or more



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

ECS0067W

Engine		QR25DE
Automatic transaxle model		RE4F04B
Automatic transaxle assembly	Model code number	85X63
Transaxle gear ratio	1st	2.785
	2nd	1.545
	3rd	1.000
	4th	0.694
	Reverse	2.272
	Final drive	4.087
Recommended fluid		Nissan Matic “D” (Continental U.S. and Alaska) or Canada Nissan Automatic Transmission Fluid*
Fluid capacity ℓ (US qt, Imp qt)		8.5 (9, 7.5)

*: Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .

Shift Schedule

ECS0067X

VEHICLE SPEED WHEN SHIFTING GEARS THROTTLE POSITION

Throttle position	Shift pattern	Vehicle speed km/h (MPH)					
		$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$
Full throttle	Comfort	52 - 60 (32 - 37)	97 - 105 (60 - 66)	153 - 161 (95 - 100)	149 - 157 (93 - 98)	87 - 95 (41 - 54)	41 - 49 (25 - 30)
	Auto power	52 - 60 (32 - 37)	97 - 105 (60 - 66)	153 - 161 (95 - 100)	149 - 157 (93 - 98)	87 - 95 (41 - 54)	41 - 49 (25 - 30)
Half throttle	Comfort	37 - 45 (23 - 28)	67 - 75 (42 - 47)	119 - 127 (74 - 79)	90 - 98 (56 - 61)	39 - 47 (24 - 27)	24 - 32 (15 - 20)
	Auto power	39 - 47 (24 - 29)	73 - 81 (45 - 50)	119 - 127 (74 - 79)	90 - 98 (56 - 61)	46 - 54 (26 - 34)	24 - 32 (15 - 20)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Unit: km/h (MPH)

Selector lever position	D_4 (O/D ON) position		D_3 (O/D OFF) position	
Shift pattern	Comfort	Auto power	Comfort	Auto power
Lock-up "ON"	62 - 70 (38 - 43)	62 - 70 (38 - 43)	86 - 94 (53 - 58)	86 - 94 (53 - 58)
Lock-up "OFF"	51 - 59 (31 - 36)	51 - 59 (31 - 36)	83 - 91 (52 - 57)	83 - 91 (52 - 57)

NOTE:

- Lock-up vehicle speed indicates the speed in D_4 (O/D ON) position.
- Perform lock-up inspection after warming up engine.
- Lock-up vehicle speed may vary depending on the driving conditions and circumstances.

Stall Revolution

ECS0067Y

Engine	Stall revolution rpm
QR25DE	2,350 - 2,800

Line Pressure

ECS0067Z

Engine speed rpm	Line pressure kPa (kg/cm^2 , psi)	
	D, 2 and 1 positions	R position
Idle	500 (5.1, 73)	778 (7.9, 113)
Stall	1,223 (12.6, 179)	1,918 (19.6, 278)

Control Valves

ECS00680

CONTROL VALVE AND PLUG RETURN SPRINGS

Unit: mm (in)

Parts			Item		
			Part No.*	Free length	Outer diameter
Upper body	23	Pilot valve spring	31742-80L13	38.98 (1.535)	8.9 (0.350)
	7	1-2 accumulator valve spring	31742-80L15	20.5 (0.807)	6.95 (0.274)
	28	1-2 accumulator piston spring	31742-80L14	55.26 (2.176)	19.6 (0.772)
	33	1st reducing valve spring	31742-80L08	27.0 (1.063)	7.0 (0.276)
	35	3-2 timing valve spring	31736-01X00	23.0 (0.906)	6.65 (0.262)
	18	Overrun clutch reducing valve spring	31742-80L09	37.5 (1.476)	6.9 (0.272)
	16	Torque converter relief valve spring	31742-80L10	31.0 (1.220)	9.0 (0.354)
	11	Torque converter clutch control valve	31742-80L16	56.98 (2.243)	6.5 (0.256)
	3	Cooler check valve spring	31742-85X01	29.4 (1.157)	6.0 (0.236)
Lower body	15	Pressure regulator valve spring	31742-80L01	45.0 (1.772)	15.0 (0.591)
	20	Overrun clutch control valve spring	31762-80L00	21.7 (0.854)	7.0 (0.276)
	24	Accumulator control valve spring	31742-80L02	22.0 (0.866)	6.5 (0.256)
	29	Shift valve A spring	31762-80L00	21.7 (0.854)	7.0 (0.276)
	32	Shuttle valve spring	31762-41X04	51.0 (2.008)	5.65 (0.222)
	12	Shift valve B spring	31762-80L00	21.7 (0.854)	7.0 (0.276)
	7	Pressure modifier valve spring	31742-80L13	30.5 (1.201)	9.8 (0.386)
	3		31742-80L04	32.0 (1.260)	6.9 (0.272)
	—	Oil cooler relief valve spring	31742-80L12	17.02 (0.670)	8.0 (0.315)

*: Always check with the Parts Department for the latest parts information.

Accumulator

ECS00681

O-RING

Unit: mm (in)

Accumulator	Part No.*	Inner diameter (Small)	Part No.*	Inner diameter (Large)
Servo release accumulator	31526-41X03	26.9 (1.059)	31526-41X02	44.2 (1.740)
N-D accumulator	31526-31X08	34.6 (1.362)	31672-21X00	39.4 (1.551)

*: Always check with the Parts Department for the latest parts information.

RETURN SPRING

Unit: mm (in)

Accumulator	Part number*	Free length	Outer diameter
Servo release accumulator	31605-85X00	62.8 (2.473)	21 (0.827)
N-D accumulator	31605-80L03	43.5 (1.713)	28.0 (1.102)

*: Always check with the Parts Department for the latest parts information.

Clutch and Brakes

ECS00682

REVERSE CLUTCH

Model code number		85X63	
Number of drive plates		2	
Number of driven plates		2	
Drive plate thickness mm (in)	Standard	1.6 (0.063)	
	Allowable limit	1.4 (0.055)	
Driven plate thickness mm (in)	Standard	1.8 (0.070)	
Clearance mm (in)	Standard	0.5 - 0.8 (0.020 - 0.031)	
	Allowable limit	1.2 (0.047)	
Thickness of retaining plates		Thickness mm (in)	Part number*
		6.6 (0.260) 6.8 (0.268) 7.0 (0.276) 7.2 (0.283) 7.4 (0.291) 7.6 (0.299) 7.8 (0.307)	31537-80L00 31537-80L01 31537-80L02 31537-80L03 31537-80L04 31537-80L05 31537-80L06

*: Always check with the Parts Department for the latest parts information.

HIGH CLUTCH

Model code number		85X63	
Number of drive plates		3	
Number of driven plates		7*2 + 1*3	
Drive plate thickness mm (in)	Standard	1.6 (0.063)	
	Allowable limit	1.4 (0.055)	
Driven plate thickness mm (in)	Standard	*2	*3
		1.4 (0.055)	2.0 (0.079)
Clearance mm (in)	Standard	1.8 - 2.2 (0.071 - 0.087)	
	Allowable limit	2.8 (0.110)	
Thickness of retaining plates		Thickness mm (in)	Part number*
		3.2 (0.126) 3.4 (0.134) 3.6 (0.142) 3.8 (0.150) 4.0 (0.157)	31537-80L20 31537-80L21 31537-80L22 31537-80L23 31537-80L24

*: Always check with the Parts Department for the latest parts information.

FORWARD CLUTCH

Model code number		85X63
Number of drive plates		5
Number of driven plates		5
Drive plate thickness mm (in)	Standard	1.6 (0.063)
	Allowable limit	1.4 (0.055)

Driven plate thickness mm (in)	Standard	1.8 (0.071)	
Clearance mm (in)	Standard	0.45 - 0.85 (0.0177 - 0.0335)	
	Allowable limit	1.85 (0.0728)	
Thickness of retaining plates		Thickness mm (in)	Part number*
		3.2 (0.126)	31537-80L18
		3.4 (0.134)	31537-80L17
		3.6 (0.142)	31537-80L12
		3.8 (0.150)	31537-80L13
		4.0 (0.157)	31537-80L14
		4.2 (0.165)	31537-80L15
		4.4 (0.173)	31537-80L16

*: Always check with the Parts Department for the latest parts information.

OVERRUN CLUTCH

Model code number		85X63	
Number of drive plates		3	
Number of driven plates		5	
Drive plate thickness mm (in)	Standard	1.6 (0.063)	
	Allowable limit	1.4 (0.055)	
Driven plate thickness mm (in)	Standard	1.8 (0.071)	
Clearance mm (in)	Standard	0.7 - 1.1 (0.028 - 0.043)	
	Allowable limit	1.7 (0.067)	
Thickness of retaining plates		Thickness mm (in)	Part number*
		3.0 (0.118)	31537-80L07
		3.2 (0.126)	31537-80L08
		3.4 (0.134)	31537-80L09
		3.6 (0.142)	31537-80L10
		3.8 (0.150)	31537-80L11

*: Always check with the Parts Department for the latest parts information.

LOW & REVERSE BRAKE

Model code number		85X63	
Number of drive plates		6	
Number of driven plates		6	
Drive plate thickness mm (in)	Standard	1.8 (0.071)	
	Allowable limit	1.6 (0.063)	
Driven plate thickness mm (in)	Standard	1.8 (0.071)	
Clearance mm (in)	Standard	1.7 - 2.1 (0.067 - 0.083)	
	Allowable limit	3.3 (0.130)	
Thickness of retaining plates		Thickness mm (in)	Part number*
		2.0 (0.079)	31667-80L00
		2.2 (0.087)	31667-80L01
		2.4 (0.094)	31667-80L02
		2.6 (0.102)	31667-80L03
		2.8 (0.110)	31667-80L04
		3.0 (0.118)	31667-80L05
		3.2 (0.126)	31667-80L06
		3.4 (0.134)	31667-80L07

*: Always check with the Parts Department for the latest parts information.

CLUTCH AND BRAKE RETURN SPRINGS

Unit: mm (in)

Parts	Part number*	Free length	Outer diameter
Forward clutch (Overrun clutch) (22 pcs)	31505-80L00	21.4 (0.843)	10.3 (0.406)
High clutch (10 pcs)	31505-80L02	22.5 (0.886)	10.8 (0.425)
Low & reverse brake (24 pcs)	31505-80L01	24.1 (0.949)	6.6 (0.260)

*: Always check with the Parts Department for the latest parts information.

BRAKE BAND

Anchor end pin tightening torque N-m (kg-m, in-lb)	4.0 - 5.8 (0.4 - 0.6, 36 - 52)
Number of returning revolutions for anchor end pin	2.5
Lock nut tightening torque N-m (kg-m, ft-lb)	31 - 36 (3.2 - 3.7, 23 - 27)

Final Drive

ECS00683

DIFFERENTIAL SIDE GEAR CLEARANCE

Clearance between side gear and differential case with washer mm (in)	0.1 - 0.2 (0.004 - 0.008)

DIFFERENTIAL SIDE GEAR THRUST WASHERS

Thickness mm (in)	Part number*
0.75 (0.0295)	38424-81X00
0.80 (0.0315)	38424-81X01
0.85 (0.0335)	38424-81X02
0.90 (0.0354)	38424-81X03
0.95 (0.0374)	38424-81X04

*: Always check with the Parts Department for the latest parts information.

DIFFERENTIAL SIDE BEARING PRELOAD ADJUSTING SHIMS

Thickness mm (in)	Part number*
0.48 (0.0189)	31438-80X00
0.52 (0.0205)	31438-80X01
0.56 (0.0220)	31438-80X02
0.60 (0.0236)	31438-80X03
0.64 (0.0252)	31438-80X04
0.68 (0.0268)	31438-80X05
0.72 (0.0283)	31438-80X06
0.76 (0.0299)	31438-80X07
0.80 (0.0315)	31438-80X08
0.84 (0.0331)	31438-80X09
0.88 (0.0346)	31438-80X10
0.92 (0.0362)	31438-80X11

*: Always check with the Parts Department for the latest parts information.

BEARING PRELOAD

Differential side bearing preload mm (in)	0.05 - 0.09 (0.0020 - 0.0035)

TURNING TORQUE

Turning torque of final drive assembly N-m (kg-cm, in-lb)	0.78 - 1.37 (8.0 - 14.0, 6.9 - 12.2)

Planetary Carrier and Oil Pump

ECS00684

PLANETARY CARRIER

Clearance between planetary carrier and pinion washer mm (in)	Standard	0.20 - 0.70 (0.0079 - 0.0276)
	Allowable limit	0.80 (0.0315)

OIL PUMP

Oil pump side clearance mm (in)		0.030 - 0.050 (0.0012 - 0.0020)	
Thickness of inner gears and outer gears		Inner gear	
		Thickness mm (in)	Part number*
		11.99 - 12.0 (0.4720 - 0.4724) 11.98 - 11.99 (0.4717 - 0.4720) 11.97 - 11.98 (0.4713 - 0.4717)	31346-80L00 31346-80L01 31346-80L02
		Outer gear	
		Thickness mm (in)	Part number*
		11.99 - 12.0 (0.4720 - 0.4724) 11.98 - 11.99 (0.4717 - 0.4720) 11.97 - 11.98 (0.4713 - 0.4717)	31347-80L00 31347-80L01 31347-80L02
Clearance between oil pump housing and outer gear mm (in)	Standard	0.111 - 0.181 (0.0044 - 0.0071)	
	Allowable limit	0.181 (0.0071)	
Oil pump cover seal ring clearance mm (in)	Standard	0.1 - 0.25 (0.0039 - 0.0098)	
	Allowable limit	0.25 (0.0098)	

*: Always check with the Parts Department for the latest parts information.

Input Shaft

ECS00685

SEAL RING CLEARANCE

Input shaft seal ring clearance mm (in)	Standard	0.08 - 0.23 (0.0031 - 0.0091)
	Allowable limit	0.23 (0.0091)

SEAL RING

Outer diameter mm (in)	Inner diameter mm (in)	Width mm (in)	Part number*
26 (1.024)	22.4 (0.882)	1.971 (0.078)	31525-80X02

*: Always check with the Parts Department for the latest parts information.

Reduction Pinion Gear

ECS00686

TURNING TORQUE

Turning torque of reduction pinion gear N-m (kg-cm, in-lb)	0.05 - 0.39 (0.5 - 4.0, 0.43 - 3.47)

REDUCTION PINION GEAR BEARING ADJUSTING SHIMS

NO.	Thickness mm (in)	Part number	NO.	Thickness mm (in)	Part number*
1	5.00 (0.1969)	31439-81X00	18	5.34 (0.2102)	31439-81X17
2	5.02 (0.1976)	31439-81X01	19	5.36 (0.2110)	31439-81X18
3	5.04 (0.1984)	31439-81X02	20	5.38 (0.2118)	31439-81X19
4	5.06 (0.1992)	31439-81X03	21	5.40 (0.2126)	31439-81X20
5	5.08 (0.2000)	31439-81X04	22	5.42 (0.2134)	31439-81X21
6	5.10 (0.2008)	31439-81X05	23	5.44 (0.2142)	31439-81X22
7	5.12 (0.2016)	31439-81X06	24	5.46 (0.2150)	31439-81X23
8	5.14 (0.2024)	31439-81X07	25	5.48 (0.2157)	31439-81X24
9	5.16 (0.2031)	31439-81X08	26	5.50 (0.2165)	31439-81X46
10	5.18 (0.2039)	31439-81X09	27	5.52 (0.2173)	31439-81X47
11	5.20 (0.2047)	31439-81X10	28	5.54 (0.2181)	31439-81X48
12	5.22 (0.2055)	31439-81X11	29	5.56 (0.2189)	31439-81X49
13	5.24 (0.2063)	31439-81X12	30	5.58 (0.2197)	31439-81X60
14	5.26 (0.2071)	31439-81X13	31	5.60 (0.2205)	31439-81X61
15	5.28 (0.2079)	31439-81X14	32	5.62 (0.2213)	31439-81X62

NO.	Thickness mm (in)	Part number	NO.	Thickness mm (in)	Part number*
16	5.30 (0.2087)	31439-81X15	33	5.64 (0.2220)	31439-81X63
17	5.32 (0.2094)	31439-81X16	34	5.66 (0.2228)	31439-81X64
35	5.68 (0.2236)	31439-81X65	50	4.70 (0.1850)	31439-83X10
36	5.70 (0.2244)	31439-81X66	51	4.72 (0.1858)	31439-83X11
37	5.72 (0.2252)	31439-81X67	52	4.74 (0.1866)	31439-83X12
38	5.74 (0.2260)	31439-81X68	53	4.76 (0.1874)	31439-83X13
39	5.76 (0.2268)	31439-81X69	54	4.78 (0.1882)	31439-83X14
40	5.78 (0.2276)	31439-81X70	55	4.80 (0.1890)	31439-83X15
41	5.80 (0.2283)	31439-81X71	56	4.82 (0.1898)	31439-83X16
42	5.82 (0.2291)	31439-81X72	57	4.84 (0.1906)	31439-83X17
43	5.84 (0.2299)	31439-81X73	58	4.86 (0.1913)	31439-83X18
44	5.86 (0.2307)	31439-81X74	59	4.88 (0.1921)	31439-83X19
45	4.60 (0.1811)	31439-85X05	60	4.90 (0.1929)	31439-83X20
46	4.62 (0.1819)	31439-85X06	61	4.92 (0.1937)	31439-83X21
47	4.64 (0.1827)	31439-85X07	62	4.94 (0.1945)	31439-83X22
48	4.66 (0.1835)	31439-85X08	63	4.96 (0.1953)	31439-83X23
49	4.68 (0.1843)	31439-85X09	64	4.98 (0.1961)	31439-83X24

*: Always check with the Parts Department for the latest parts information.

Band Servo

ECS00687

RETURN SPRING

Unit: mm (in)

Return spring	Part number*	Free length	Outer diameter
2nd servo return spring	31605-80L05	32.5 (1.280)	25.9 (1.020)
OD servo return spring	31605-80L06	62.6 (2.465)	21.7 (0.854)

*: Always check with the Parts Department for the latest parts information.

Output Shaft

ECS00688

SEAL RING CLEARANCE

Output shaft seal ring clearance mm (in)	Standard	0.10 - 0.25 (0.0039 - 0.0098)
	Allowable limit	0.25 (0.0098)

SEAL RING

Outer diameter mm (in)	Inner diameter mm (in)	Width mm (in)	Part number*
33.71 (1.327)	30.25 (1.191)	1.95 (0.077)	31525-80809

*: Always check with the Parts Department for the latest parts information.

END PLAY

Output shaft end play mm (in)	0 - 0.15 (0 - 0.0059)

OUTPUT SHAFT ADJUSTING SHIMS

Thickness mm (in)	Part number*
0.80 (0.0315)	31438-80X60
0.84 (0.0331)	31438-80X61
0.88 (0.0346)	31438-80X62
0.92 (0.0362)	31438-80X63
0.96 (0.0378)	31438-80X64
1.00 (0.0394)	31438-80X65
1.04 (0.0409)	31438-80X66
1.08 (0.0425)	31438-80X67
1.12 (0.0441)	31438-80X68
1.16 (0.0457)	31438-80X69
1.20 (0.0472)	31438-80X70

*: Always check with the Parts Department for the latest parts information.

Bearing Retainer

ECS00689

SEAL RING CLEARANCE

Bearing retainer seal ring clearance mm (in)	Standard	0.10 - 0.30 (0.0039 - 0.0118)
	Allowable limit	0.30 (0.0118)

Total End Play

ECS0068A

Total end play mm (in)	0.25 - 0.55 (0.0098 - 0.0217)

BEARING RACE FOR ADJUSTING TOTAL END PLAY

Thickness mm (in)	Part number*
0.8 (0.031)	31435-80X00
1.0 (0.039)	31435-80X01
1.2 (0.047)	31435-80X02
1.4 (0.055)	31435-80X03
1.6 (0.063)	31435-80X04
1.8 (0.071)	31435-80X05
2.0 (0.079)	31435-80X06
0.9 (0.035)	31435-80X09
1.1 (0.043)	31435-80X10
1.3 (0.051)	31435-80X11
1.5 (0.059)	31435-80X12
1.7 (0.067)	31435-80X13
1.9 (0.075)	31435-80X14

*: Always check with the Parts Department for the latest parts information.

Reverse Clutch End Play

ECS0068B

Reverse clutch end play mm (in)	0.55 - 0.90 (0.0217 - 0.0354)

THRUST WASHERS FOR ADJUSTING REVERSE CLUTCH DRUM END PLAY

Thickness mm (in)	Part number*
0.80 (0.0315)	31508-80X13
0.95 (0.0374)	31508-80X14
1.10 (0.0433)	31508-80X15
1.25 (0.0492)	31508-80X16
1.40 (0.0551)	31508-80X17
1.55 (0.0610)	31508-80X18
1.70 (0.0669)	31508-80X19
1.85 (0.0728)	31508-80X20

*: Always check with the Parts Department for the latest parts information.

Removal and Installation

ECS0068C

Unit: mm (in)

Distance between end of converter housing and torque converter	14 (0.55)

Shift Solenoid Valves

ECS0068D

Gear position	1	2	3	4
Shift solenoid valve A	ON (Closed)	OFF (Open)	OFF (Open)	ON (Closed)
Shift solenoid valve B	ON (Closed)	ON (Closed)	OFF (Open)	OFF (Open)

Solenoid Valves

ECS0068E

Solenoid valves	Resistance (Approx.) Ω	Terminal No.
Shift solenoid valve A	20 - 30	2
Shift solenoid valve B	5 - 20	1
Overrun clutch solenoid valve	20 - 30	3
Line pressure solenoid valve	2.5 - 5	4
Torque converter clutch solenoid valve	5 - 20	5

A/T Fluid Temperature Sensor

ECS0068F

Remarks: Specification data are reference values.

Monitor item	Condition	Specification (Approximately)	
A/T fluid temperature sensor	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]	1.5V ↓ 0.5V	2.5 kΩ ↓ 0.3 kΩ

Revolution Sensor

ECS0068G

Condition	Judgement standard
When moving at 20 km/h (12 MPH), use the CONSULT-II pulse frequency measuring function.*1 **CAUTION:** **Connect the diagnosis data link cable to the vehicle diagnosis connector.** *1: A circuit tester cannot be used to test this item.	450 Hz (Approx.)
When vehicle is parked.	0V

Dropping Resistor

ECS0068H

Resistance	Approx. 12Ω

Turbine Revolution Sensor

ECS0068I

Condition	Judgement standard
When moving at 20 km/h (12 MPH), use the CONSULT-II pulse frequency measuring function.*1 **CAUTION:** **Connect the diagnosis data link cable to the vehicle diagnosis connector.** *1: A circuit tester cannot be used to test this item.	240 Hz (Approx.)
When vehicle is parked.	Under 1.3V or over 4.5V

SECTION BL

BODY, LOCK & SECURITY SYSTEM

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EIS0014O

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

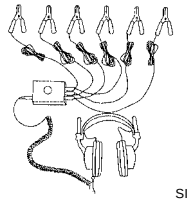
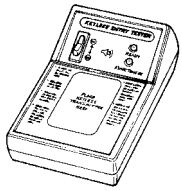
PREPARATION

PFP:00002

Special Service Tools

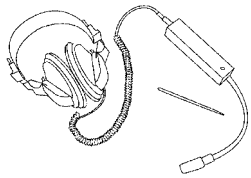
EIS0014P

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
— (J-39570) Chassis ear  SIIA0993E	Locating the noise
— (J-43980) Nissan Squeak and Rattle kit SIIA0994E	Repairing the cause of noise
— (J-43241) Remote Keyless Entry Tester  LEL946A	Used to test keyfobs

Commercial Service Tools

EIS0014Q

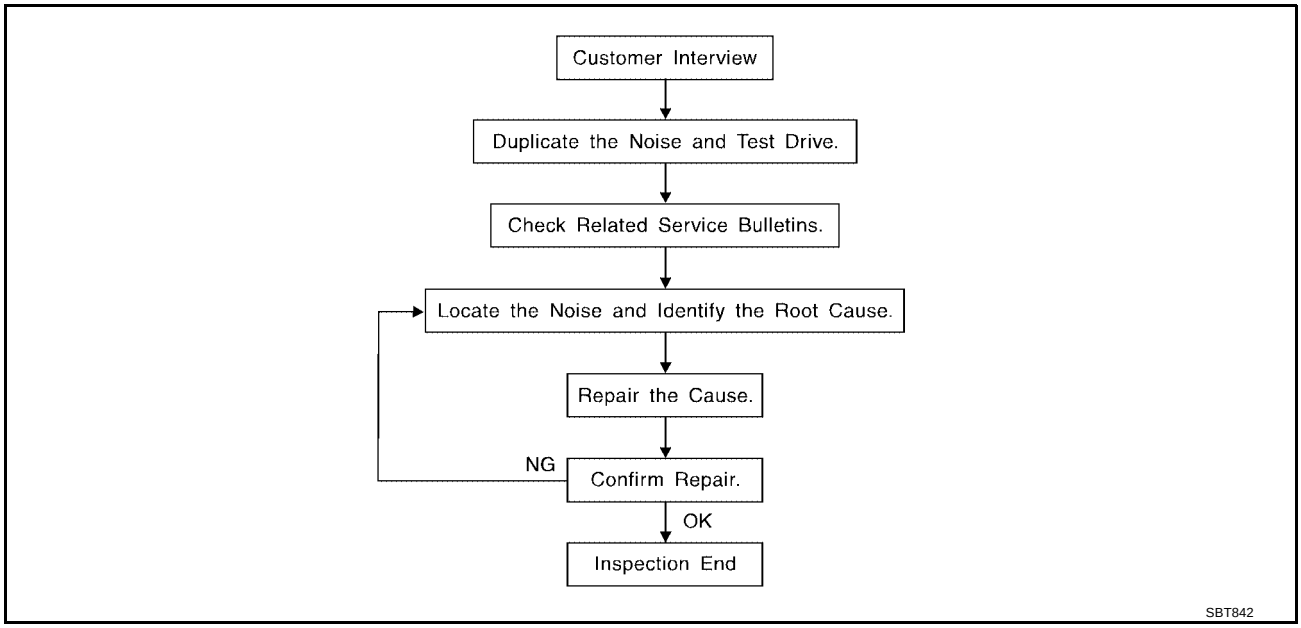
Tool name	Description
Engine ear (J-39565)  SIIA0995E	Locating the noise

SQUEAK AND RATTLE TROUBLE DIAGNOSES

PFP:00003

Work Flow

EIS0014R



CUSTOMER INTERVIEW

Interview the customer, if possible, to determine the conditions that exist when the noise occurs. Use the Diagnostic Worksheet during the interview to document the facts and conditions when the noise occurs and any customer's comments; refer to BL-10, "Diagnostic Worksheet" . This information is necessary to duplicate the conditions that exist when the noise occurs.

- The customer may not be able to provide a detailed description or the location of the noise. Attempt to obtain all the facts and conditions that exist when the noise occurs (or does not occur).
- If there is more than one noise in the vehicle, be sure to diagnose and repair the noise that the customer is concerned about. This can be accomplished by test driving the vehicle with the customer.
- After identifying the type of noise, isolate the noise in terms of its characteristics. The noise characteristics are provided so the customer, service adviser and technician are all speaking the same language when defining the noise.

– Squeak — (Like tennis shoes on a clean floor)
Squeak characteristics include the light contact/fast movement/brought on by road conditions/hard surfaces = higher pitch noise/softer surfaces = lower pitch noises/edge to surface = chirping

– Creak — (Like walking on an old wooden floor)
Creak characteristics include firm contact/slow movement/twisting with a rotational movement/pitch dependent on materials/often brought on by activity.

– Rattle — (Like shaking a baby rattle)
Rattle characteristics include the fast repeated contact/vibration or similar movement/loose parts/missing clip or fastener/incorrect clearance.

– Knock — (Like a knock on a door)
Knock characteristics include hollow sounding/sometimes repeating/often brought on by driver action.

– Tick — (Like a clock second hand)
Tick characteristics include gentle contacting of light materials/loose components/can be caused by driver action or road conditions.

– Thump — (Heavy, muffled knock noise)
Thump characteristics include softer knock/dead sound often brought on by activity.

– Buzz — (Like a bumblebee)
Buzz characteristics include high frequency rattle/firm contact.

- Often the degree of acceptable noise level will vary depending upon the person. A noise that you may judge as acceptable may be very irritating to the customer.
- Weather conditions, especially humidity and temperature, may have a great effect on noise level.

DUPLICATE THE NOISE AND TEST DRIVE

If possible, drive the vehicle with the customer until the noise is duplicated. Note any additional information on the Diagnostic Worksheet regarding the conditions or location of the noise. This information can be used to duplicate the same conditions when you confirm the repair.
If the noise can be duplicated easily during the test drive, to help identify the source of the noise, try to duplicate the noise with the vehicle stopped by doing one or all of the following:

1. Close a door.
2. Tap or push/pull around the area where the noise appears to be coming from.
3. Rev the engine.
4. Use a floor jack to recreate vehicle “twist”.
5. At idle, apply engine load (electrical load, half-clutch on M/T model, drive position on A/T model).
6. Raise the vehicle on a hoist and hit a tire with a rubber hammer.

- Drive the vehicle and attempt to duplicate the conditions the customer states exist when the noise occurs.
- If it is difficult to duplicate the noise, drive the vehicle slowly on an undulating or rough road to stress the vehicle body.

CHECK RELATED SERVICE BULLETINS

After verifying the customer concern or symptom, check ASIST for Technical Service Bulletins (TSBs) related to that concern or symptom.
If a TSB relates to the symptom, follow the procedure to repair the noise.

LOCATE THE NOISE AND IDENTIFY THE ROOT CAUSE

1. Narrow down the noise to a general area. To help pinpoint the source of the noise, use a listening tool (Chassis Ear: J-39570, Engine Ear: J-39565 and mechanics stethoscope).
2. Narrow down the noise to a more specific area and identify the cause of the noise by:
   - Removing the components in the area that you suspect the noise is coming from.
     Do not use too much force when removing clips and fasteners, otherwise clips and fasteners can be broken or lost during the repair, resulting in the creation of new noise.
   - Tapping or pushing/pulling the component that you suspect is causing the noise.
     Do not tap or push/pull the component with excessive force, otherwise the noise will be eliminated only temporarily.
   - Feeling for a vibration with your hand by touching the component(s) that you suspect is (are) causing the noise.
   - Placing a piece of paper between components that you suspect are causing the noise.
   - Looking for loose components and contact marks.

   Refer to BL-7, "Generic Squeak and Rattle Troubleshooting" .

REPAIR THE CAUSE

- If the cause is a loose component, tighten the component securely.
- If the cause is insufficient clearance between components:

– Separate components by repositioning or loosening and retightening the component, if possible.
– Insulate components with a suitable insulator such as urethane pads, foam blocks, felt cloth tape or urethane tape. A Nissan Squeak and Rattle Kit (J-43980) is available through your authorized Nissan Parts Department.

CAUTION:
Do not use excessive force as many components are constructed of plastic and may be damaged. Always check with the Parts Department for the latest parts information.

The following materials are contained in the Nissan Squeak and Rattle Kit (J-43980). Each item can be ordered separately as needed.
URETHANE PADS [1.5 mm (0.059 in) thick]
Insulates connectors, harness, etc.
76268-9E005: 100 x 135 mm (3.94 x 5.31 in)/76884-71L01: 60 x 85 mm (2.36 x 3.35 in)/76884-71L02: 15 x 25 mm (0.59 x 0.98 in)
INSULATOR (Foam blocks)
Insulates components from contact. Can be used to fill space behind a panel.

73982-9E000: 45 mm (1.77 in) thick, 50 x 50 mm (1.97 x 1.97 in)/73982-50Y00: 10 mm (0.39 in) thick, 50 x 50 mm (1.97 x 1.97 in)
INSULATOR (Light foam block)
80845-71L00: 30 mm (1.18 in) thick, 30 x 50 mm (1.18 x 1.97 in)
FELT CLOTH TAPE
Used to insulate where movement does not occur. Ideal for instrument panel applications.
68370-4B000: 15 x 25 mm (0.59 x 0.98 in) pad/68239-13E00: 5 mm (0.20 in) wide tape roll
The following materials, not found in the kit, can also be used to repair squeaks and rattles.
UHMW (TEFLON) TAPE
Insulates where slight movement is present. Ideal for instrument panel applications.
SILICONE GREASE
Used in place of UHMW tape that will be visible or not fit.
Note: Will only last a few months.
SILICONE SPRAY
Use when grease cannot be applied.
DUCT TAPE
Use to eliminate movement.

CONFIRM THE REPAIR

Confirm that the cause of a noise is repaired by test driving the vehicle. Operate the vehicle under the same conditions as when the noise originally occurred. Refer to the notes on the Diagnostic Worksheet.

Generic Squeak and Rattle Troubleshooting

EIS0014S

Refer to Table of Contents for specific component removal and installation information.

INSTRUMENT PANEL

Most incidents are caused by contact and movement between:

1. The cluster lid A and instrument panel
2. Acrylic lens and combination meter housing
3. Instrument panel to front pillar garnish
4. Instrument panel to windshield
5. Instrument panel mounting pins
6. Wiring harnesses behind the combination meter
7. A/C defroster duct and duct joint

These incidents can usually be located by tapping or moving the components to duplicate the noise or by pressing on the components while driving to stop the noise. Most of these incidents can be repaired by applying felt cloth tape or silicone spray (in hard to reach areas). Urethane pads can be used to insulate wiring harness.

CAUTION:
Do not use silicone spray to isolate a squeak or rattle. If you saturate the area with silicone, you will not be able to recheck the repair.

CENTER CONSOLE

Components to pay attention to include:

1. Shifter assembly cover to finisher
2. A/C control unit and upper/lower cluster lid C
3. Wiring harnesses behind audio and A/C control unit

The instrument panel repair and isolation procedures also apply to the center console.

DOORS

Pay attention to the:

1. Finisher and inner panel making a slapping noise
2. Inside handle escutcheon to door finisher
3. Wiring harnesses tapping
4. Door striker out of alignment causing a popping noise on starts and stops

Tapping or moving the components or pressing on them while driving to duplicate the conditions can isolate many of these incidents. You can usually insulate the areas with felt cloth tape or insulator foam blocks from the Nissan Squeak and Rattle Kit (J-43980) to repair the noise.

TRUNK

Trunk noises are often caused by a loose jack or loose items put into the trunk by the owner.
In addition look for:

1. Trunk lid bumpers out of adjustment
2. Trunk lid striker out of adjustment
3. The trunk lid torsion bars knocking together
4. A loose license plate or bracket

Most of these incidents can be repaired by adjusting, securing or insulating the item(s) or component(s) causing the noise.

SUNROOF/HEADLINER

Noises in the sunroof/headliner area can often be traced to one of the following:

1. Sunroof lid, rail, linkage or seals making a rattle or light knocking noise
2. Sun visor shaft shaking in the holder
3. Front or rear windshield touching headliner and squeaking

Again, pressing on the components to stop the noise while duplicating the conditions can isolate most of these incidents. Repairs usually consist of insulating with felt cloth tape.

SEATS

When isolating seat noises it is important to note the position the seat is in and the load placed on the seat when the noise is present. These conditions should be duplicated when verifying and isolating the cause of the noise.
Cause of seat noise include:

1. Headrest rods and holders
2. A squeak between the seat pad cushion and frame
3. The rear seat back lock and bracket

These noises can be isolated by moving or pressing on the suspected components while duplicating the conditions under which the noise occurs. Most of these incidents can be repaired by repositioning the component or applying urethane tape to the contact area.

UNDERHOOD

Some interior noises may be caused by components under the hood or on the engine wall. The noise is then transmitted into the passenger compartment.
Causes of transmitted underhood noises include:

1. Any component mounted to the engine wall
2. Components that pass through the engine wall
3. Engine wall mounts and connectors
4. Loose radiator mounting pins
5. Hood bumpers out of adjustment
6. Hood striker out of adjustment

These noises can be difficult to isolate since they cannot be reached from the interior of the vehicle. The best method is to secure, move or insulate one component at a time and test drive the vehicle. Also, engine RPM or load can be changed to isolate the noise. Repairs can usually be made by moving, adjusting, securing, or insulating the component causing the noise.

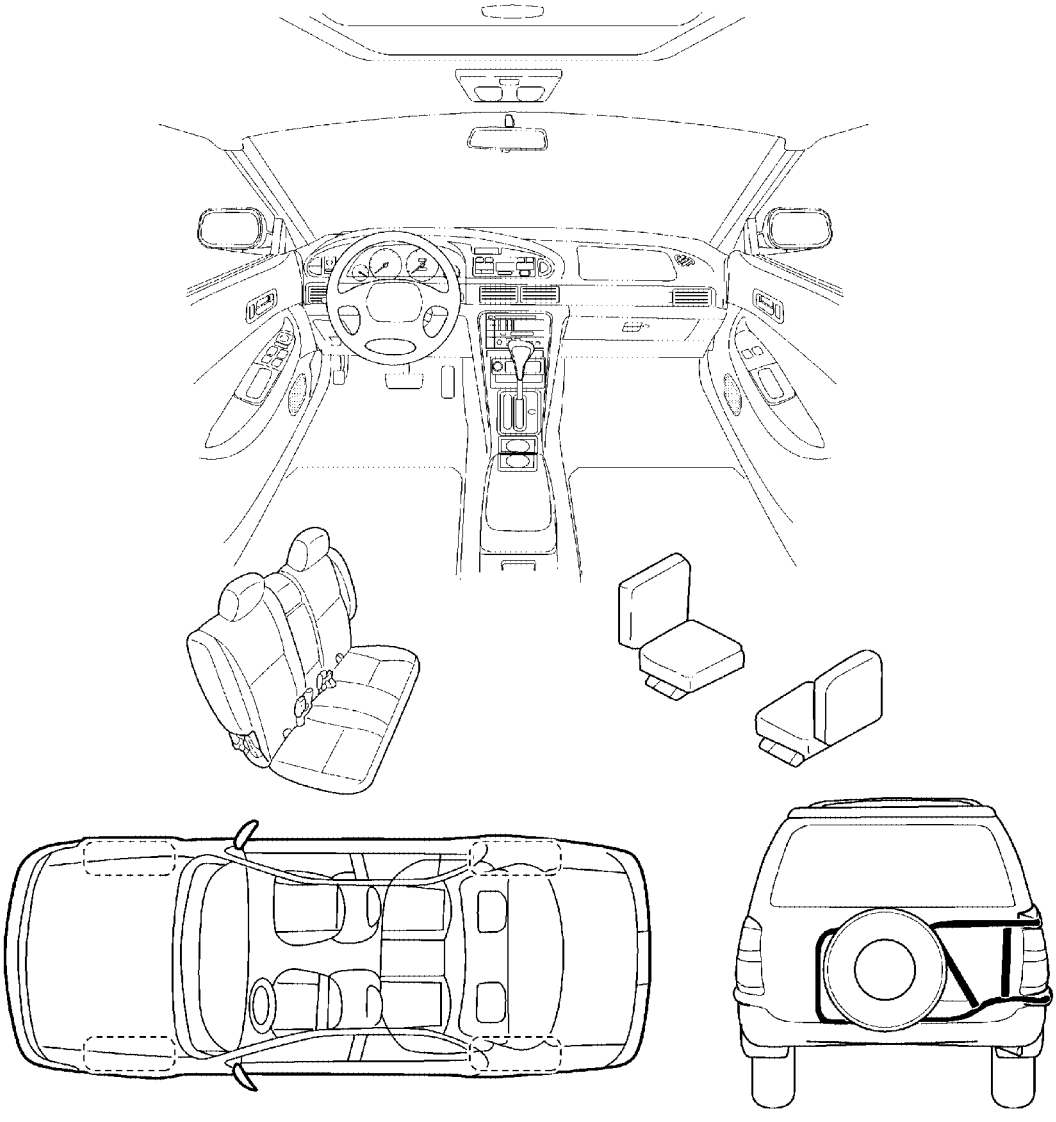
Diagnostic Worksheet

EIS0014T

SQUEAK & RATTLE DIAGNOSTIC WORKSHEET

Dear Nissan Customer:
We are concerned about your satisfaction with your Nissan vehicle. Repairing a squeak or rattle sometimes can be very difficult. To help us fix your Nissan right the first time, please take a moment to note the area of the vehicle where the squeak or rattle occurs and under what conditions. You may be asked to take a test drive with a service advisor or technician to ensure we confirm the noise you are hearing.

I. WHERE DOES THE NOISE COME FROM? (circle the area of the vehicle)
The illustrations are for reference only, and may not reflect the actual configuration of your vehicle.



Continue to the back of the worksheet and briefly describe the location of the noise or rattle. In addition, please indicate the conditions which are present when the noise occurs.

SBT843

SQUEAK & RATTLE DIAGNOSTIC WORKSHEET- page 2

Briefly describe the location where the noise occurs:

_____

_____

II. WHEN DOES IT OCCUR? (check the boxes that apply)

❑ anytime
❑ 1st time in the morning
❑ only when it is cold outside
❑ only when it is hot outside
❑ after sitting out in the sun
❑ when it is raining or wet
❑ dry or dusty conditions
❑ other: _____

III. WHEN DRIVING:

❑ through driveways
❑ over rough roads
❑ over speed bumps
❑ only at about _____ mph
❑ on acceleration
❑ coming to a stop
❑ on turns : left, right or either (circle)
❑ with passengers or cargo
❑ other: _____
❑ after driving _____ miles or _____ minutes

IV. WHAT TYPE OF NOISE?

❑ squeak (like tennis shoes on a clean floor)
❑ creak (like walking on an old wooden floor)
❑ rattle (like shaking a baby rattle)
❑ knock (like a knock on a door)
❑ tick (like a clock second hand)
❑ thump (heavy, muffled knock noise)
❑ buzz (like a bumble bee)

TO BE COMPLETED BY DEALERSHIP PERSONNEL
Test Drive Notes:

_____

_____

	YES	NO	Initials of person performing
Vehicle test driven with customer	❑	❑	_____
- Noise verified on test drive	❑	❑	
- Noise source located and repaired	❑	❑	_____
- Follow up test drive performed to confirm repair	❑	❑	_____

VIN: _____ Customer Name: _____

W.O. #: _____ Date: _____

This form must be attached to Work Order

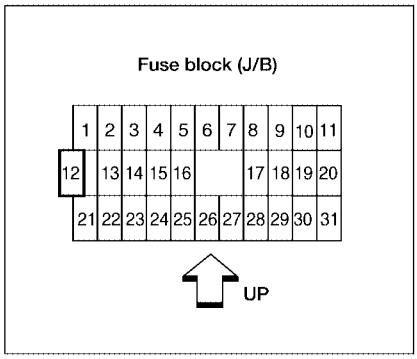
SBT844

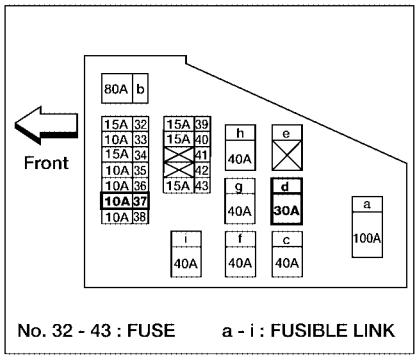
POWER DOOR LOCK

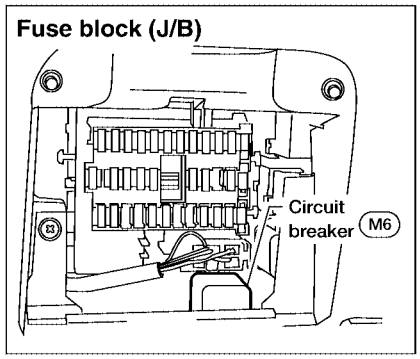
PFP:24814

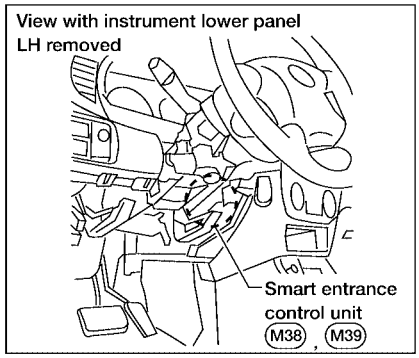
Component Parts and Harness Connector Location

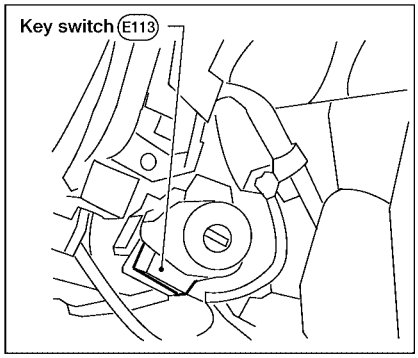
EIS0014U

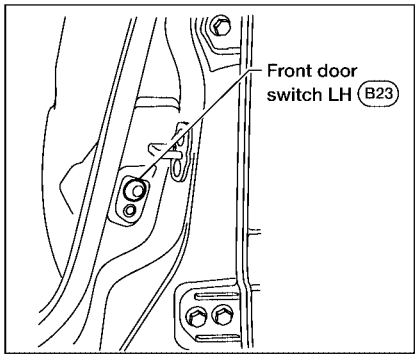


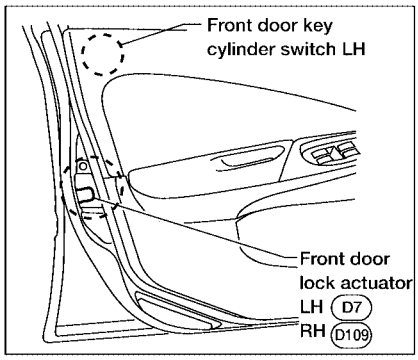


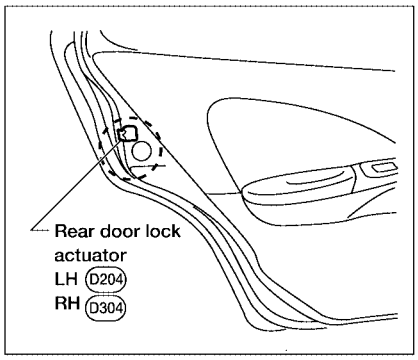


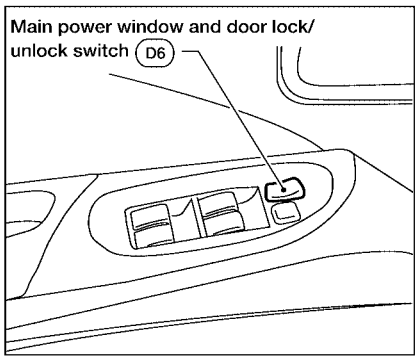


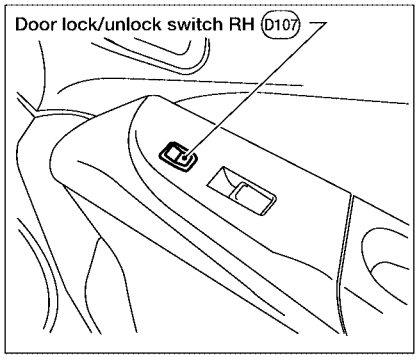












WIIA0005E

System Description

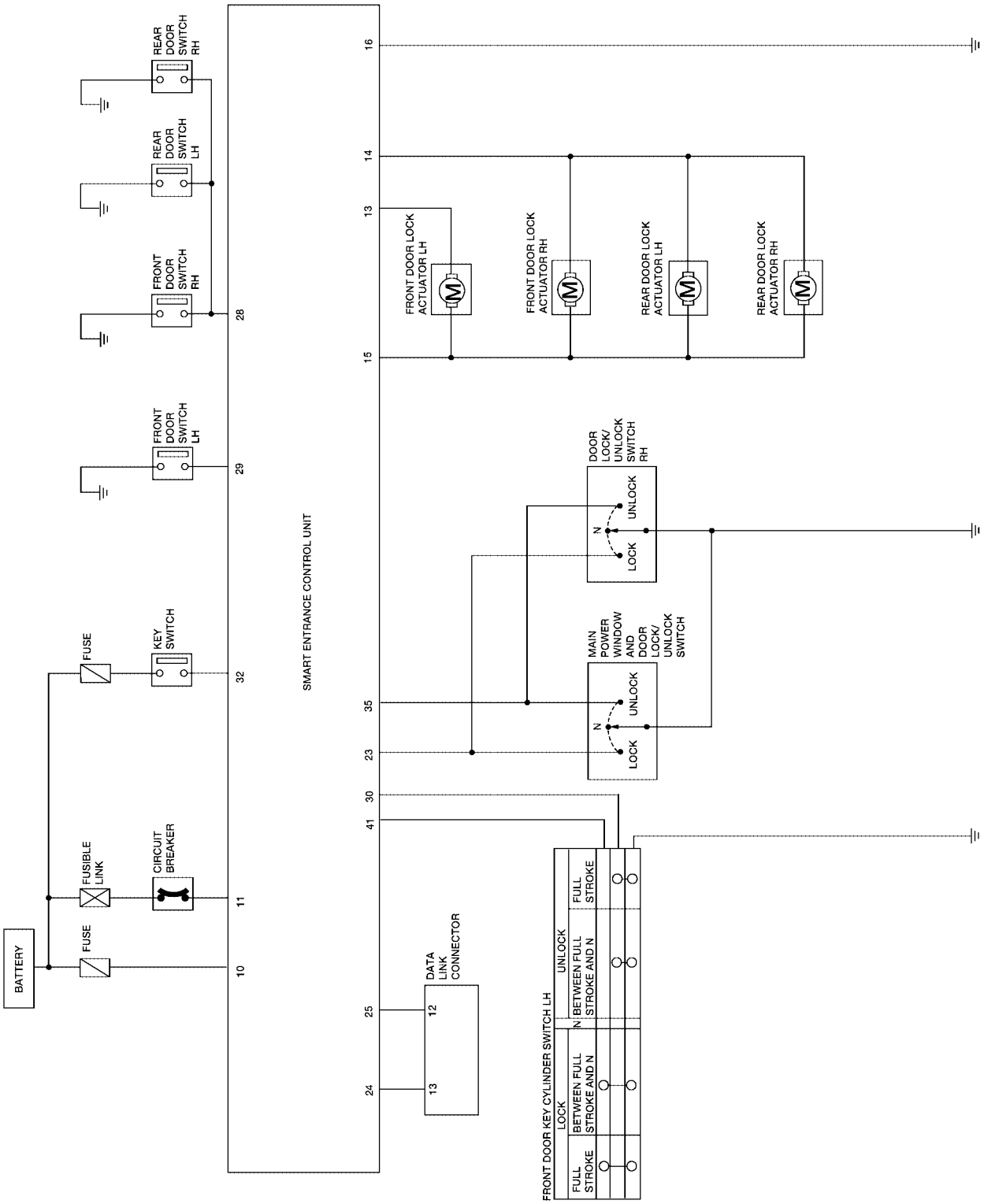
EIS0014V

OPERATION

- The lock/unlock switches (LH and RH) on door trim can lock and unlock all doors.
- With the door key inserted in the key cylinder on front LH, turning it to “LOCK”, will lock all doors; turning it to “UNLOCK” once unlocks the corresponding door; turning it to “UNLOCK” again within 5 seconds after the first unlock operation unlocks all of the other doors. (Signals from door key cylinder switch.)
- If the ignition key is in the ignition key cylinder and one or more of the doors are open, setting the lock/unlock switch (LH or RH) to “LOCK” locks the doors once but then immediately unlocks them (KEY REMINDER DOOR SYSTEM).

Schematic

EIS0014W

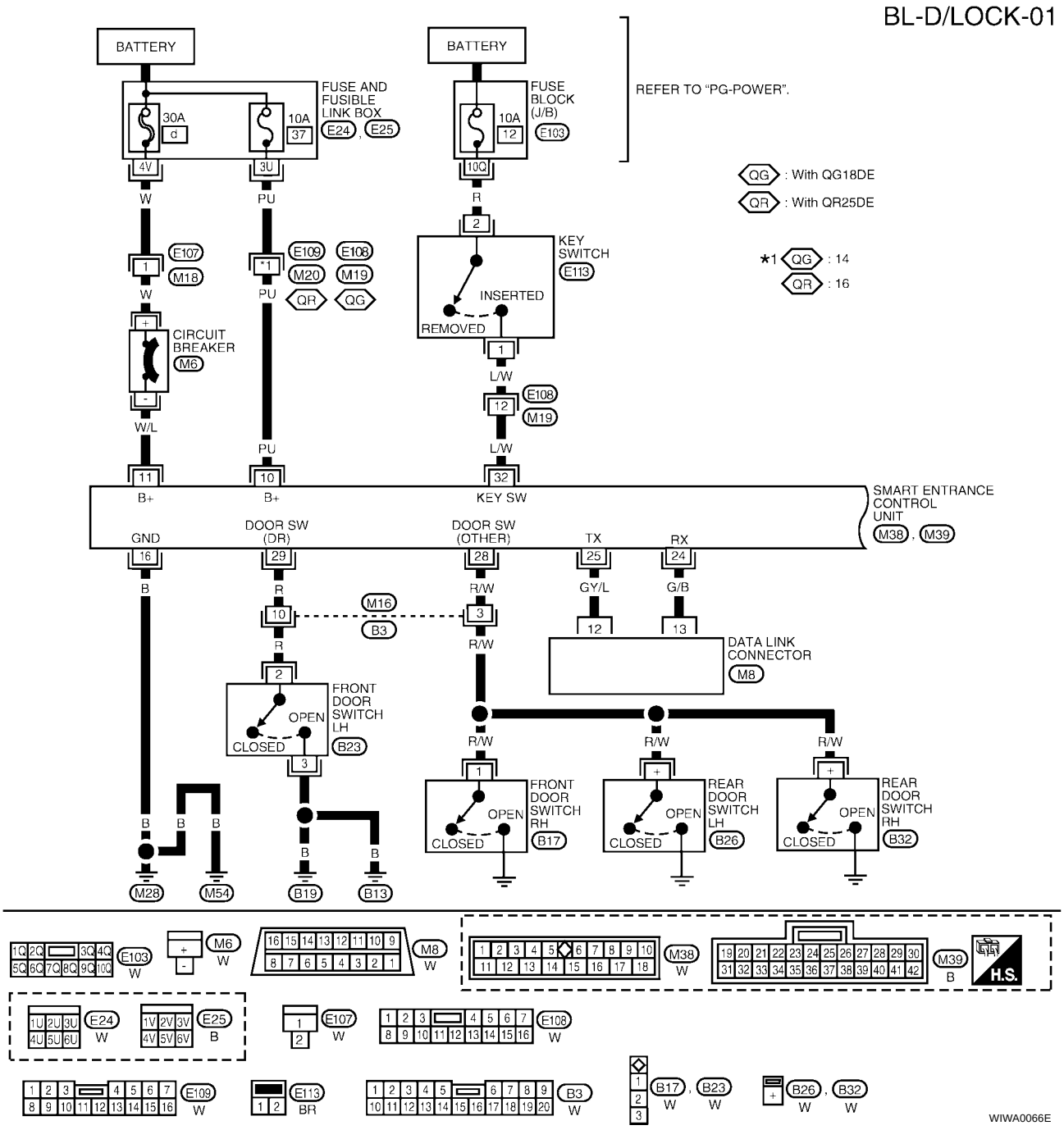


WIWA0014E

Wiring Diagram — D/LOCK —

EIS0014X

FIG. 1



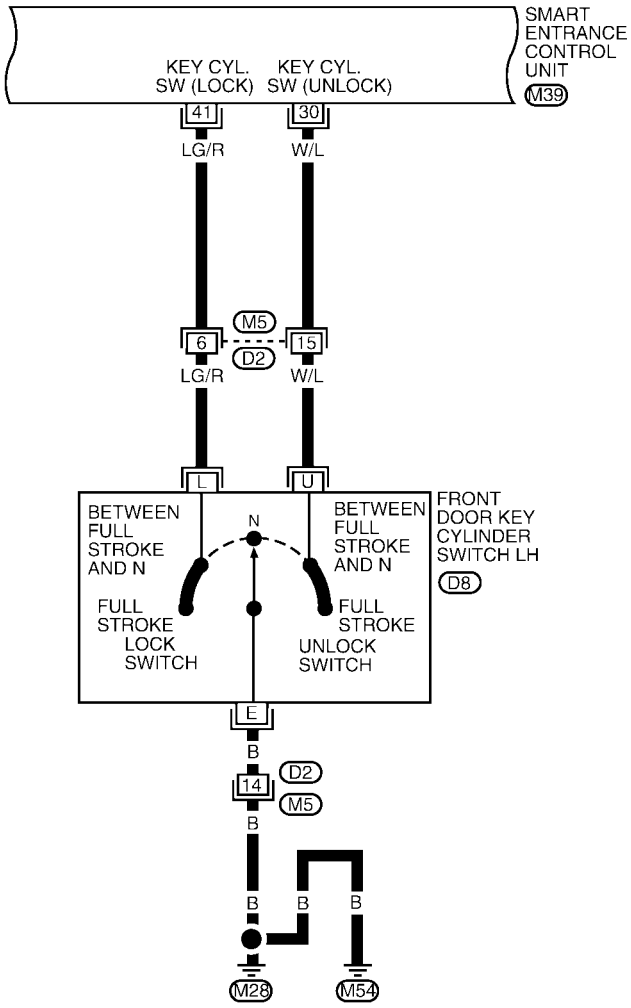
SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

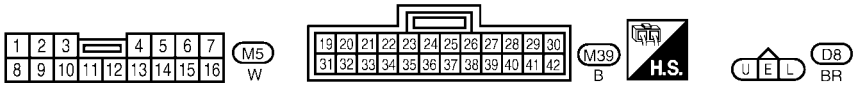
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	PU	POWER SOURCE (FUSE)	—	12V
11	W/L	POWER SOURCE (CIRCUIT BREAKER)	—	12V
16	B	GROUND	—	—
28	R/W	OTHER DOOR SWITCHES	OFF (CLOSED)	5V
			ON (OPEN)	0V
29	R	FRONT DOOR SWITCH LH	OFF (CLOSED)	5V
			ON (OPEN)	0V
32	L/W	IGNITION KEY SWITCH (INSERT)	IGNITION KEY IS INSERTED	12V
			IGNITION KEY IS REMOVED	0V
33	G	IGNITION SWITCH (ON)	IGNITION KEY IS IN ON POSITION	12V
		IGNITION SWITCH (START)	IGNITION KEY IS IN START POSITION	12V

LEL606

FIG. 2

BL-D/LOCK-02





WIWA0067E

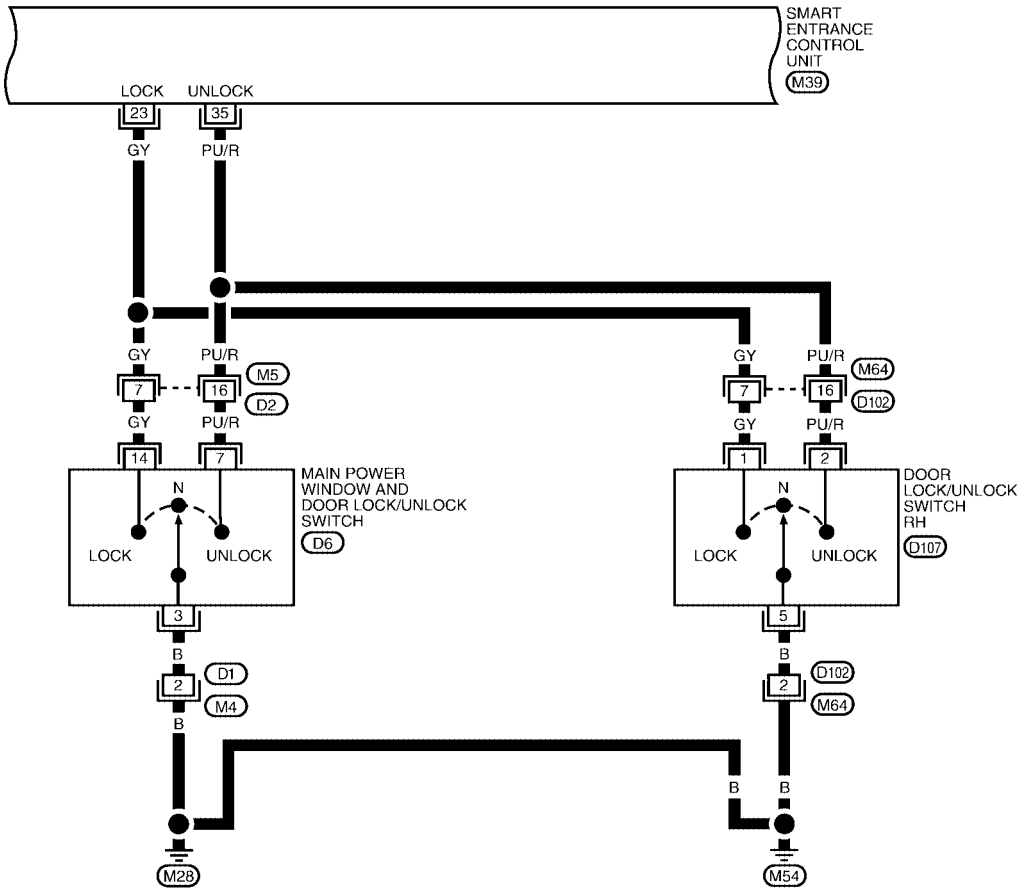
SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

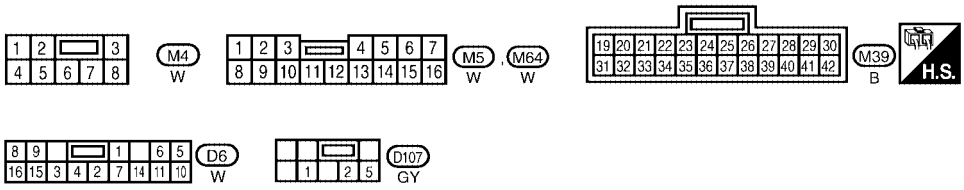
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
30	W/L	DOOR KEY CYLINDER UNLOCK SWITCH	OFF (NEUTRAL)	5V
			ON (UNLOCKED)	0V
41	LG/R	DOOR KEY CYLINDER LOCK SWITCH	OFF (NEUTRAL)	5V
			ON (LOCKED)	0V

LEL607

FIG. 3

BL-D/LOCK-03





WIWA0021E

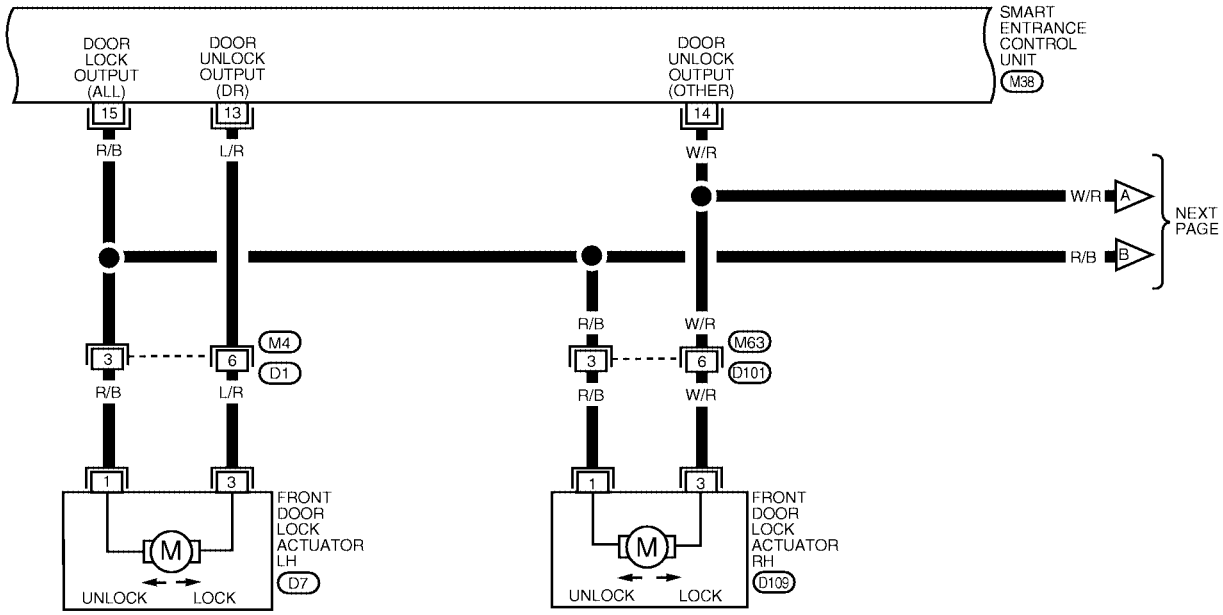
SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
23	GY	DOOR LOCK & UNLOCK SWITCHES	NEUTRAL	5V
			LOCKS	0V
35	PU/R	DOOR LOCK & UNLOCK SWITCHES	NEUTRAL	5V
			UNLOCKS	0V

LEL608

FIG. 4

BL-D/LOCK-04



WIWA0022E

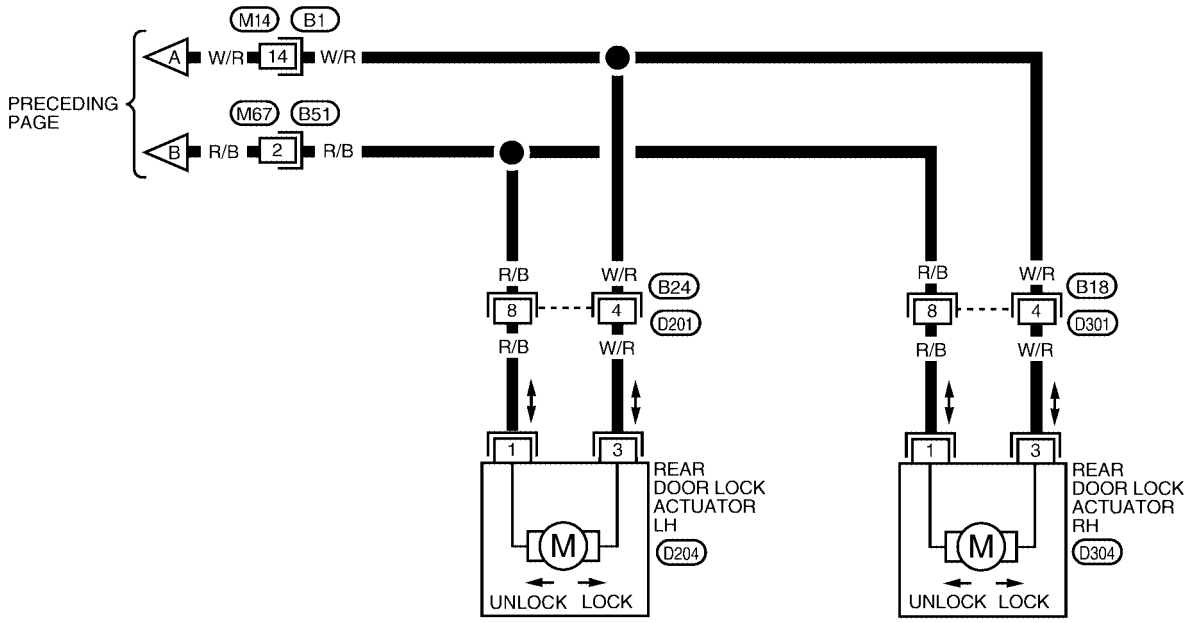
SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

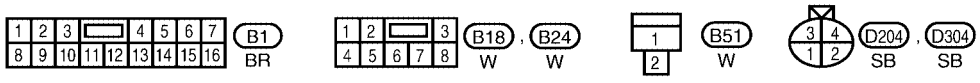
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
13	L/R	DRIVER DOOR LOCK ACTUATOR	DOOR LOCK/ UNLOCK SWITCH (FREE)	0V
			DOOR LOCK/ UNLOCK SWITCH (UNLOCKED)	12V
14	W/R	PASSENGER AND REAR DOORS LOCK ACTUATORS	DOOR LOCK/ UNLOCK SWITCH (FREE)	0V
			DOOR LOCK/ UNLOCK SWITCH (UNLOCKED)	12V
15	R/B	DOOR LOCK ACTUATORS	DOOR LOCK/ UNLOCK SWITCH (FREE)	0V
			DOOR LOCK/ UNLOCK SWITCH (LOCKED)	12V
36	Y/G	DOOR UNLOCK SENSOR LH	DRIVER DOOR: LOCKED	5V
			DRIVER DOOR: UNLOCKED	0V

LEL609

FIG. 5

BL-D/LOCK-05





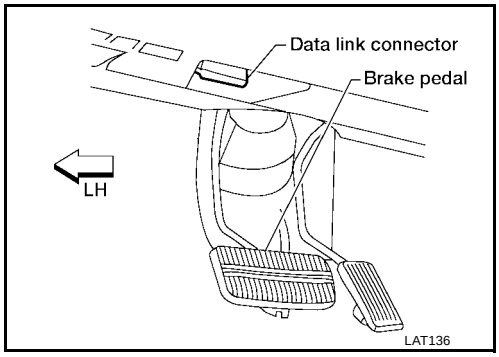
WIWA0068E

CONSULT-II Inspection Procedure

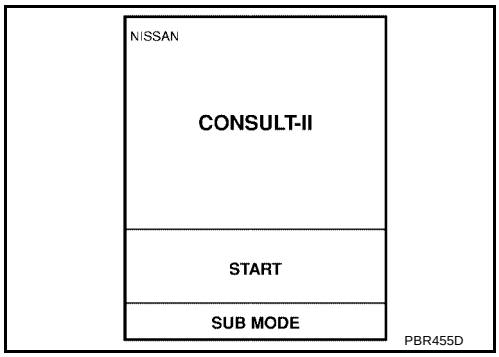
EIS0014Y

“DOOR LOCK”

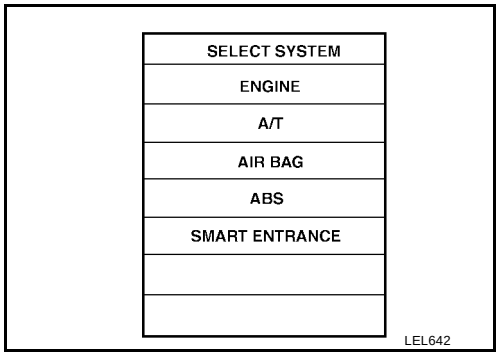
1. Turn ignition switch “OFF”.



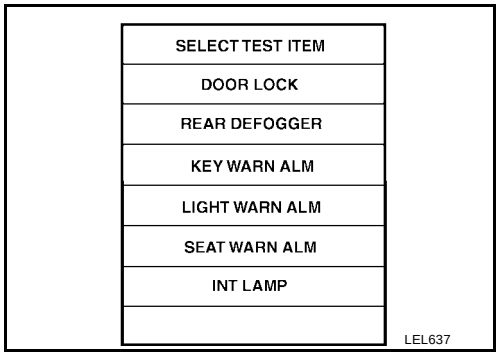
2. Connect “CONSULT-II” to the data link connector.
3. Turn ignition switch “ON”.



4. Touch “START”.
5. Touch “SMART ENTRANCE”.

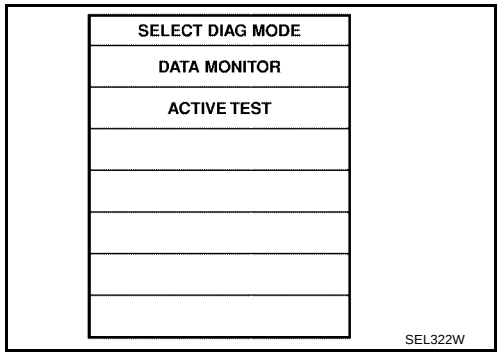


6. Touch “DOOR LOCK”.



7. Select diagnosis mode.

“DATA MONITOR” and “ACTIVE TEST” are available.



CONSULT-II Application Items

EIS0014Z

“DOOR LOCK”

Data Monitor

Monitored Item	Description
KEY ON SW	Indicates [ON/OFF] condition of key switch.
LOCK SW DR/AS	Indicates [ON/OFF] condition of lock signal from lock/unlock switch LH and RH.
UNLK SW DR/AS	Indicates [ON/OFF] condition of unlock signal from lock/unlock switch LH and RH.
KEY CYL LK SW	Indicates [ON/OFF] condition of lock signal from key cylinder.
KEY CYL UN SW	Indicates [ON/OFF] condition of unlock signal from key cylinder.
DOOR SW-ALL	Indicates [ON/OFF] condition of door switch (All).
LK BUTTON/SIG	Indicates [ON/OFF] condition of lock signal from keyfob.
UN BUTTON/SIG	Indicates [ON/OFF] condition of unlock signal from keyfob.
UN BUTTON ON	Indicates [ON/OFF] condition of second unlock signal from keyfob within 5 seconds after first unlock operation.

Active Test

Test Item	Description
ALL D/LK MTR	This test is able to check all door lock actuators lock operation. These actuators lock when “ON” on CONSULT-II screen is touched.
DR D/UN MTR	This test is able to check front door lock actuator LH unlock operation. The actuator unlocks when “ON” on CONSULT-II screen is touched.
NON DR D/UN	This test is able to check door lock actuators (except front door lock actuator LH) unlock operation. These actuators unlock when “ON” on CONSULT-II screen is touched.

Trouble Diagnoses
EIS00150

SYMPTOM CHART

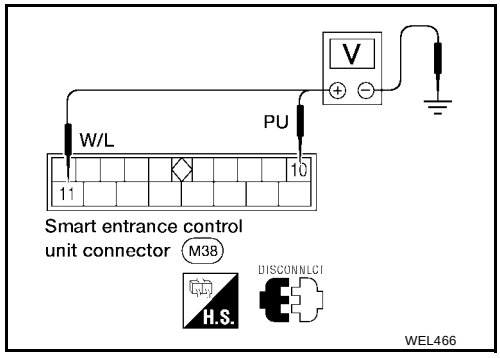
REFERENCE PAGE (BL-)	BL-23	BL-24	BL-25	BL-26	BL-28	BL-29
SYMPTOM	MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK	DOOR SWITCH CHECK	KEY SWITCH (INSERT) CHECK	DOOR LOCK/UNLOCK SWITCH CHECK	FRONT DOOR KEY CYLINDER SWITCH CHECK	DOOR LOCK ACTUATOR CHECK
Key reminder door system does not operate properly.	X	X	X			X
Specific door lock actuator does not operate.	X					X
Power door lock does not operate with door lock and unlock switch (LH and RH) on door trim.	X			X		
Power door lock does not operate with front door key cylinder operation.	X				X	

X: Applicable

MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK

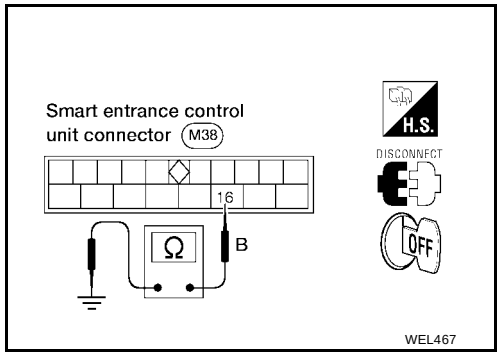
Main Power Supply Circuit Check

Terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
10	Ground	Battery voltage	Battery voltage	Battery voltage
11				



Ground Circuit Check

Terminals	Continuity
16 - Ground	Yes

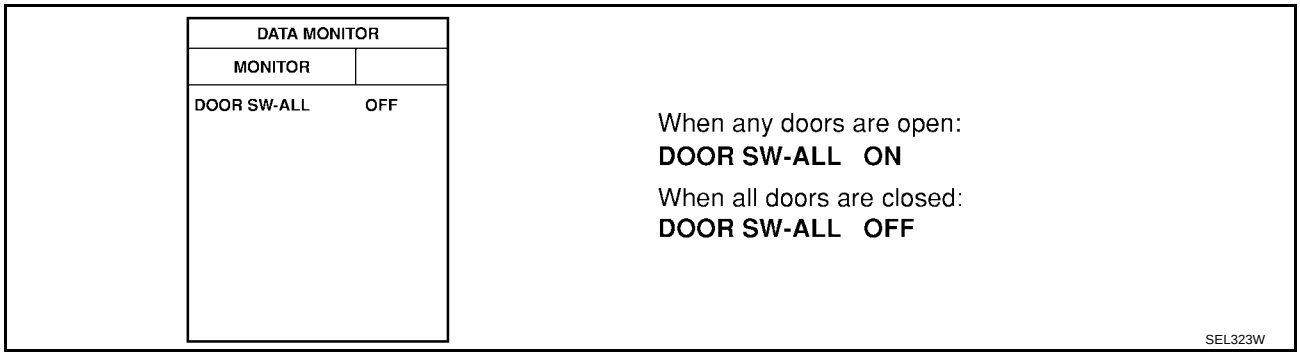


DOOR SWITCH CHECK

1. CHECK DOOR SWITCHES INPUT SIGNAL

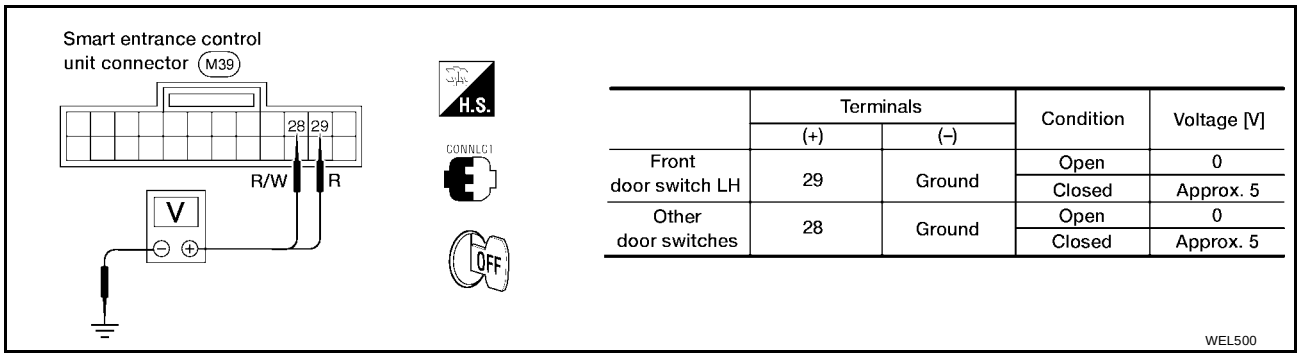
With CONSULT-II

Check door switches (“DOOR SW-ALL”) in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminals 28 or 29 and ground.



	Terminals		Condition	Voltage [V]
	(+)	(−)		
Front door switch LH	29	Ground	Open	0
			Closed	Approx. 5
Other door switches	28	Ground	Open	0
			Closed	Approx. 5

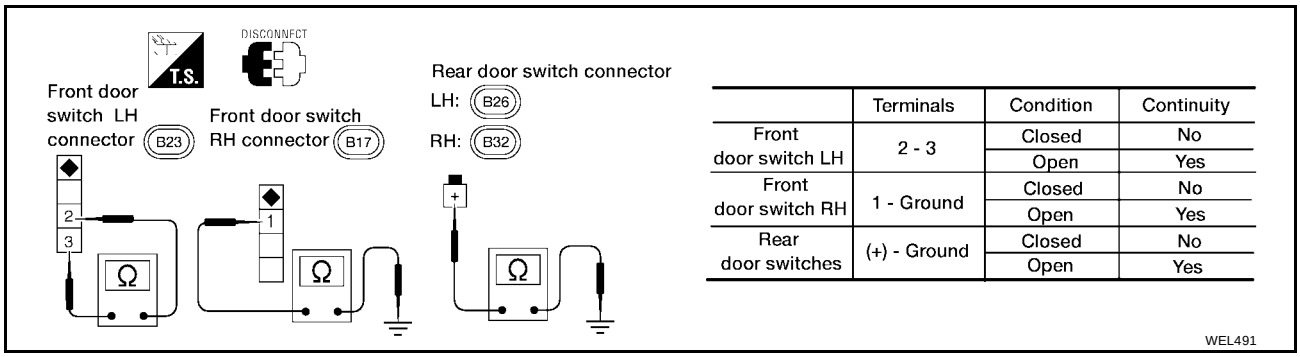
Refer to BL-15, "FIG. 1" .

OK or NG

OK >> Door switch is OK.
NG >> GO TO 2.

2. CHECK DOOR SWITCHES

1. Disconnect door switch harness connector.
2. Check continuity between door switch connector terminals.



	Terminals	Condition	Continuity
Front door switch LH	2 - 3	Closed	No
		Open	Yes
Front door switch RH	1 - Ground	Closed	No
		Open	Yes
Rear door switches	(+) - Ground	Closed	No
		Open	Yes

OK or NG

OK >> Check the following.
- Door switch ground circuit or door switch ground condition
- Harness for open or short between smart entrance control unit and door switch

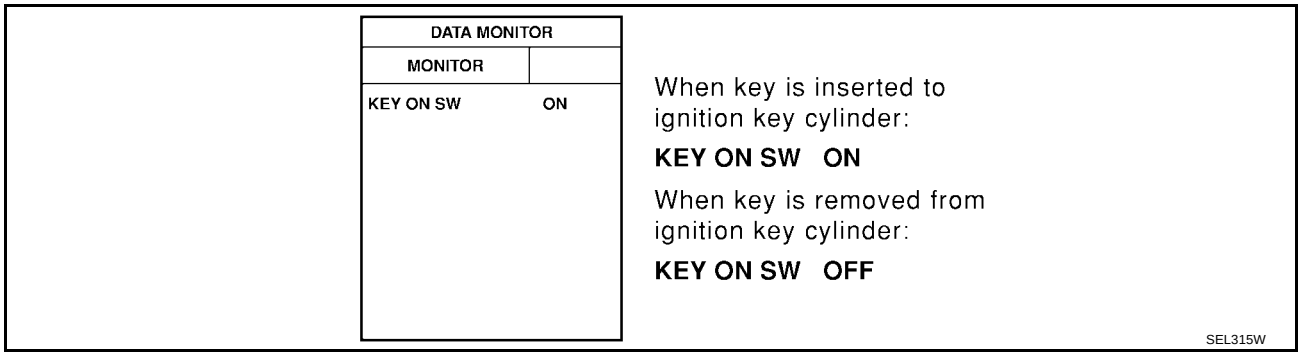
NG >> Replace door switch.

KEY SWITCH (INSERT) CHECK

1. CHECK KEY SWITCH INPUT SIGNAL

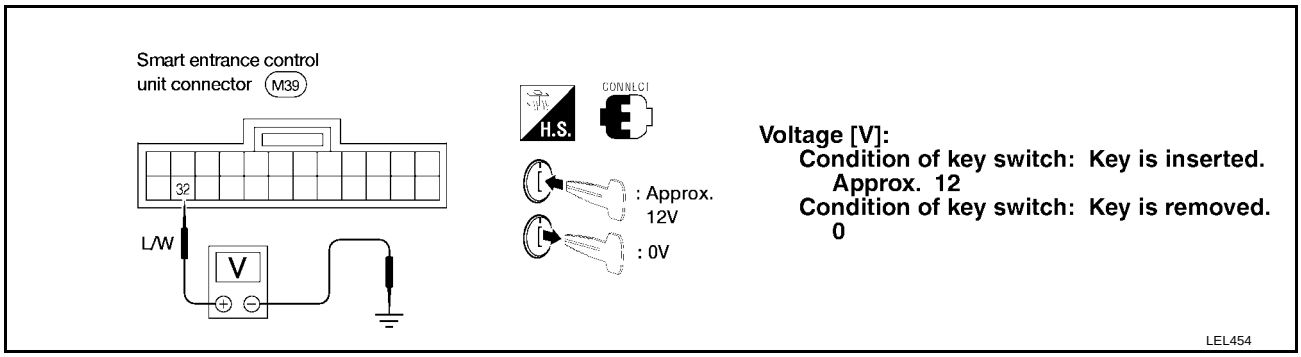
With CONSULT-II

Check key switch (“KEY ON SW”) in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 32 and ground.



Refer to BL-15, "FIG. 1" .

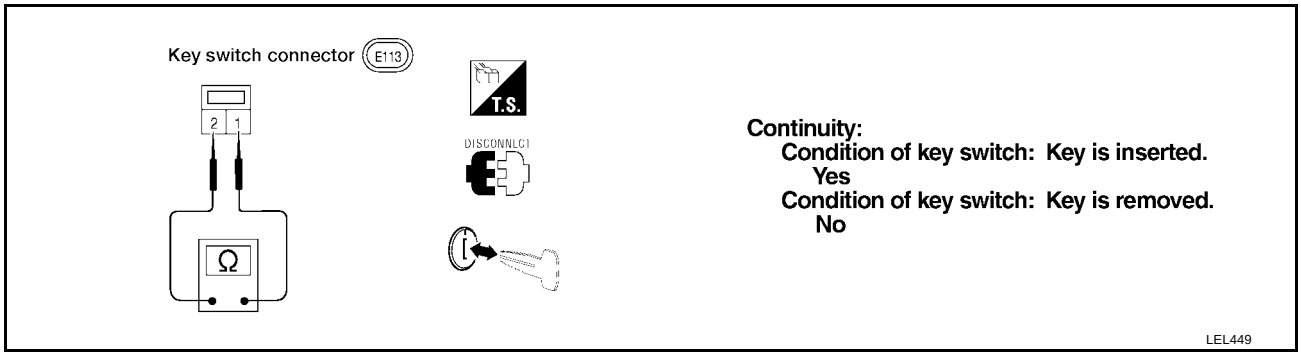
OK or NG

OK >> Key switch is OK.

NG >> GO TO 2.

2. CHECK KEY SWITCH

Check continuity between key switch connector terminals 1 and 2.



OK or NG

OK >> Check the following.

- 10A fuse [No. 12, located in fuse block (J/B)]
- Harness for open or short between key switch and fuse
- Harness for open or short between smart entrance control unit and key switch

NG >> Replace key switch.

DOOR LOCK/UNLOCK SWITCH CHECK

1. CHECK DOOR LOCK/UNLOCK SWITCH INPUT SIGNAL

With CONSULT-II

Check door lock/unlock switch (“LOCK SW DR/AS”/“UNLK SW DR/AS”) in “DATA MONITOR” mode with CONSULT-II.

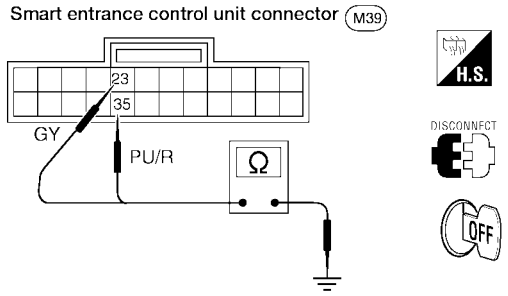
DATA MONITOR	
MONITOR	
LOCK SW DR/AS	OFF
UNLK SW DR/AS	OFF

When lock/unlock switch is turned to LOCK:
LOCK SW DR/AS ON
When lock/unlock switch is turned to UNLOCK:
UNLK SW DR/AS ON

SEL341W

Without CONSULT-II

1. Disconnect smart entrance control unit harness connector.
2. Check continuity between smart entrance control unit harness connector terminal 23 or 35 and ground.



Terminals	Door lock/unlock switch (LH or RH) condition	Continuity
23 - Ground	Lock	Yes
	N and Unlock	No
35 - Ground	Unlock	Yes
	N and Lock	No

WEL501

Refer to BL-17, "FIG. 3" .

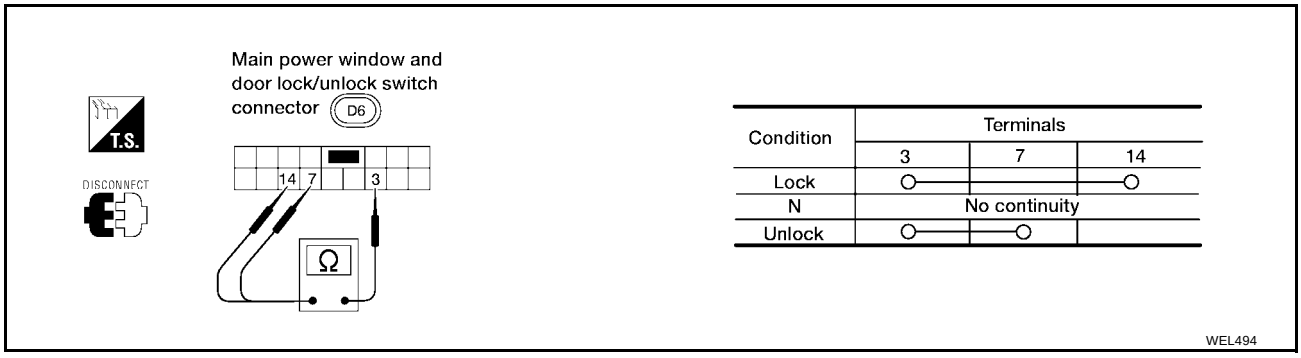
OK or NG

OK >> Door lock/unlock switch is OK.
NG >> GO TO 2.

2. CHECK DOOR LOCK/UNLOCK SWITCH

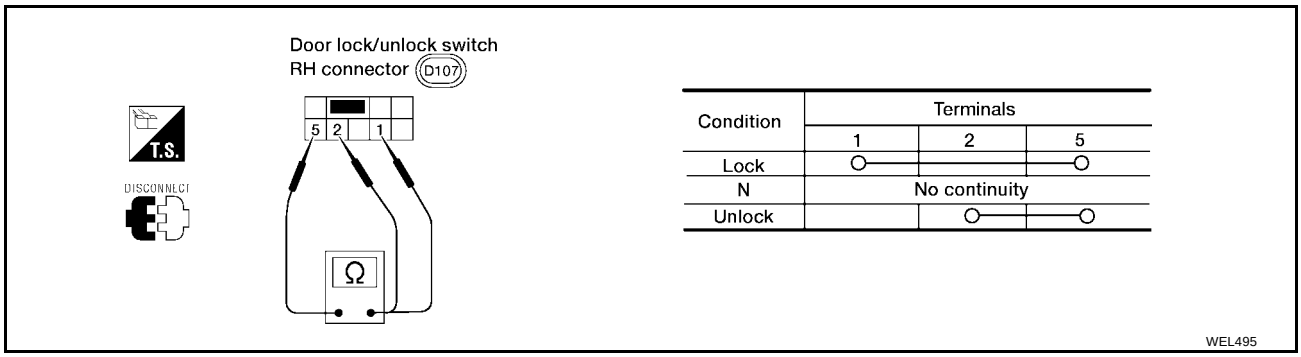
1. Disconnect door lock/unlock switch harness connector.
2. Check continuity between each door lock/unlock switch terminals.

– Main power window and door lock/unlock switch



Condition	Terminals		
	3	7	14
Lock	○		○
N	No continuity		
Unlock	○	○	

– Door lock/unlock switch RH



Condition	Terminals		
	1	2	5
Lock	○		○
N	No continuity		
Unlock		○	○

OK or NG

OK >> Check the following.
- Ground circuit for door lock/unlock switch
- Harness for open or short between door lock/unlock switch and smart entrance control unit connector

NG >> Replace door lock/unlock switch.

FRONT DOOR KEY CYLINDER SWITCH CHECK

1. CHECK FRONT DOOR KEY CYLINDER SWITCH INPUT SIGNAL (LOCK/UNLOCK SIGNAL)

With CONSULT-II

Check front door key cylinder switch (“KEY CYL LK-SW”/“KEY CYL UN-SW”) in “DATA MONITOR” mode with CONSULT-II.

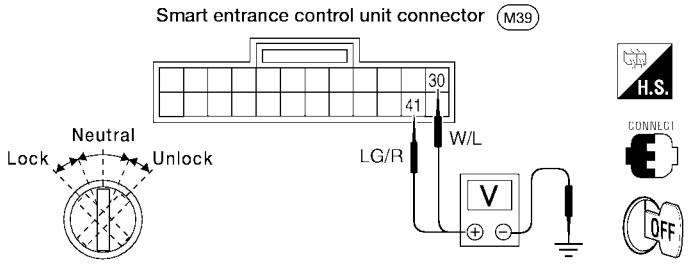
DATA MONITOR	
MONITOR	
KEY CYL LK-SW	OFF
KEY CYL UN-SW	OFF

When key inserted in front key cylinder is turned to LOCK:
KEY CYL LK-SW ON
When key inserted in front key cylinder is turned to UNLOCK:
KEY CYL UN-SW ON

SEL342W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminals 30 or 41 and ground.



Terminals (+)	Terminals (–)	Key position	Voltage [V]
41	Ground	Neutral/Unlock	Approx. 5
		Lock	0
30	Ground	Neutral/Lock	Approx. 5
		Unlock	0

WEL502

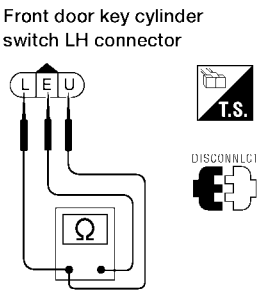
Refer to BL-16, "FIG. 2" .

OK or NG

OK >> Door key cylinder switch is OK.
NG >> GO TO 2.

2. CHECK DOOR KEY CYLINDER SWITCH

1. Disconnect door key cylinder switch harness connector.
2. Check continuity between door key cylinder switch connector D8 terminals L, E, and U, E.



Ⓔ : Ground terminal
Ⓤ : Door unlock switch terminal
Ⓛ : Door lock switch terminal

Terminals	Key position	Continuity
Ⓛ - Ⓔ	Neutral/Unlock	No
	Lock	Yes
Ⓤ - Ⓔ	Neutral/Lock	No
	Unlock	Yes

LEL101A

OK or NG

OK >> Check the following.
- Door key cylinder switch ground circuit
- Harness for open or short between smart entrance control unit and door key cylinder switch

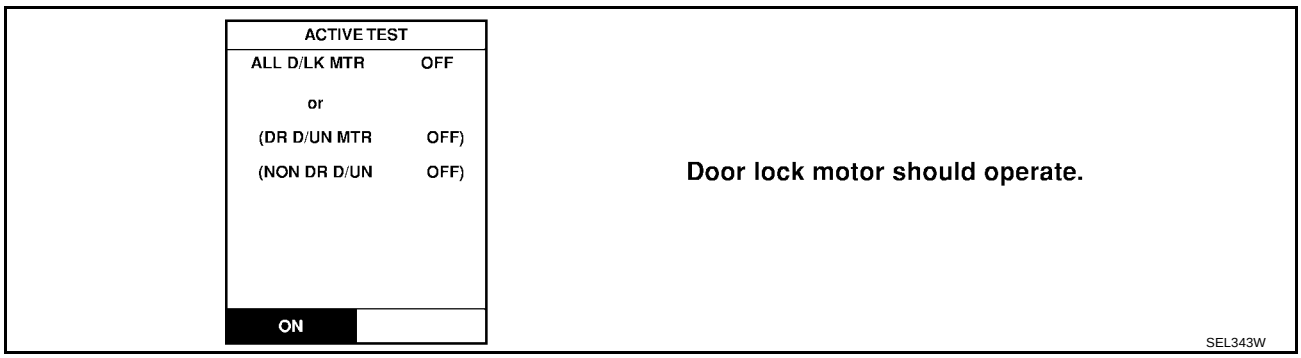
NG >> Replace door key cylinder switch.

DOOR LOCK ACTUATOR CHECK

1. CHECK DOOR LOCK ACTUATOR OPERATION

With CONSULT-II

1. Select “ACTIVE TEST” in “DOOR LOCK” with CONSULT-II.
2. Select “ALL D/LK MTR” and touch “ON”.
3. Then, select “DR D/UN MTR” and touch “ON”.
4. Select “NON DR D/UN” and touch “ON”.



NOTE:
If CONSULT-II is not available, skip this procedure and go to the next step.

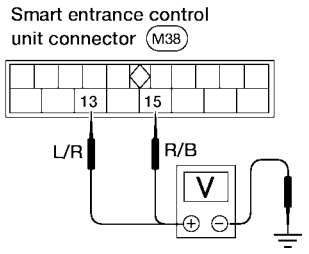
OK or NG

OK >> Door lock actuator is OK.
NG >> GO TO 2.

2. CHECK DOOR LOCK ACTUATOR CIRCUIT

Check voltage for door lock actuator.

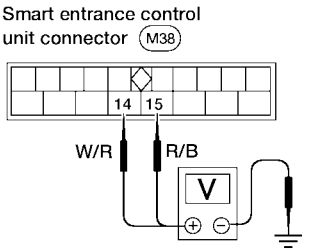
- Door lock actuator front LH



Door lock/unlock switch condition	Terminals (+)	Terminals (–)	Voltage [V]
Lock	15	Ground	Approx. 12
Unlock	13	Ground	

WEL504

- Door lock actuator front RH and rear



Door lock/unlock switch condition	Terminals (+)	Terminals (–)	Voltage [V]
Lock	15	Ground	Approx. 12
Unlock	14	Ground	

WEL505

Refer to BL-18, "FIG. 4" .

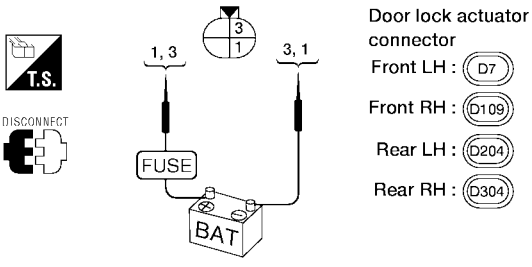
OK or NG

OK >> GO TO 3.

NG >> Replace smart entrance control unit. (Before replacing the smart entrance control unit, perform BL-26, "DOOR LOCK/UNLOCK SWITCH CHECK" .)

3. CHECK DOOR LOCK ACTUATOR

1. Disconnect door lock actuator harness connector.
2. Apply 12V direct current to door lock actuator and check operation.



Door lock actuator operation:
Terminals between (+): 1 and (-): 3
Unlocked → Locked
Terminals between (+): 3 and (-): 1
Locked → Unlocked

WEL499

OK or NG

OK >> Check harness for open or short between smart entrance control unit connector and door lock actuator.

NG >> Replace door lock actuator.

DOOR

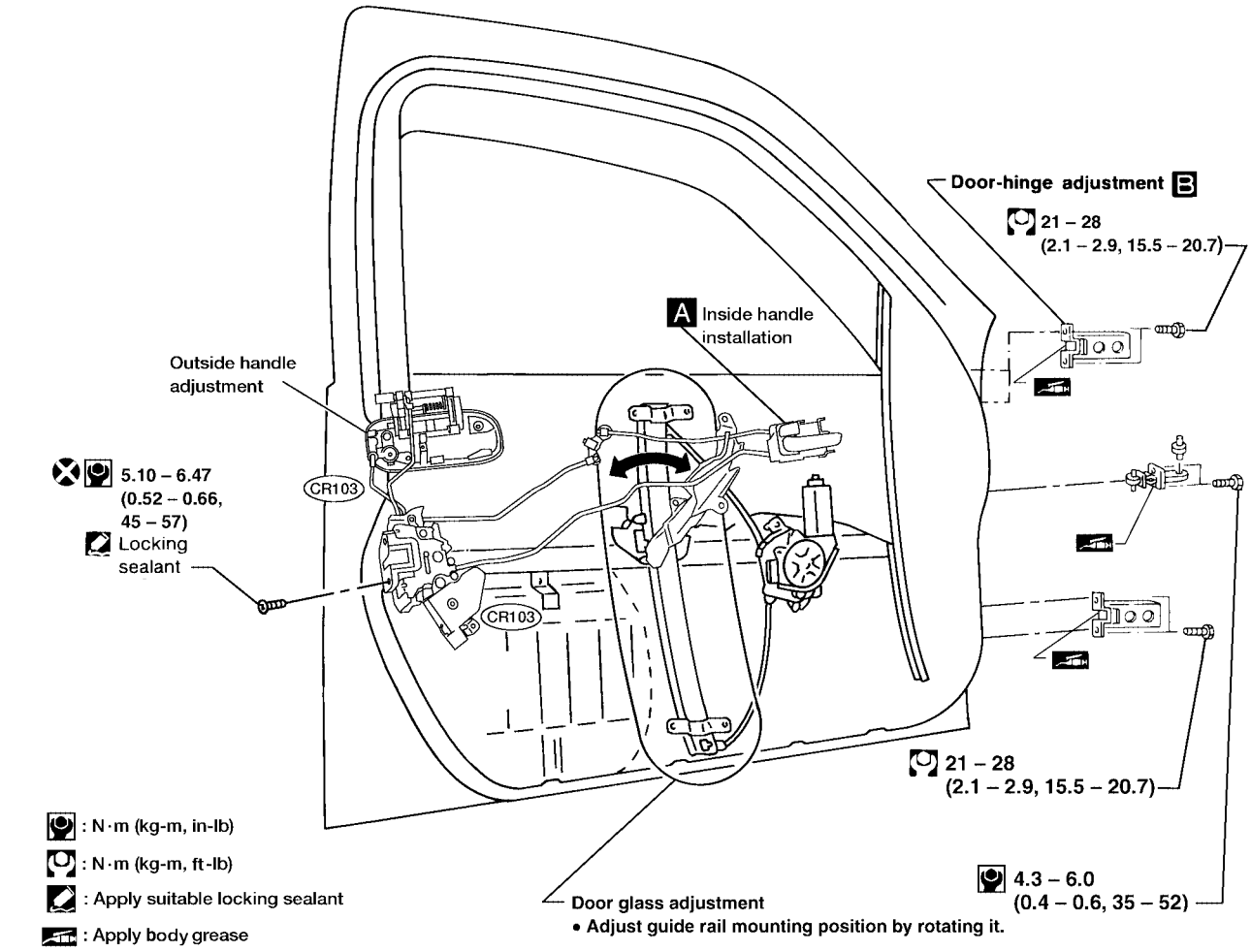
PFP:80100

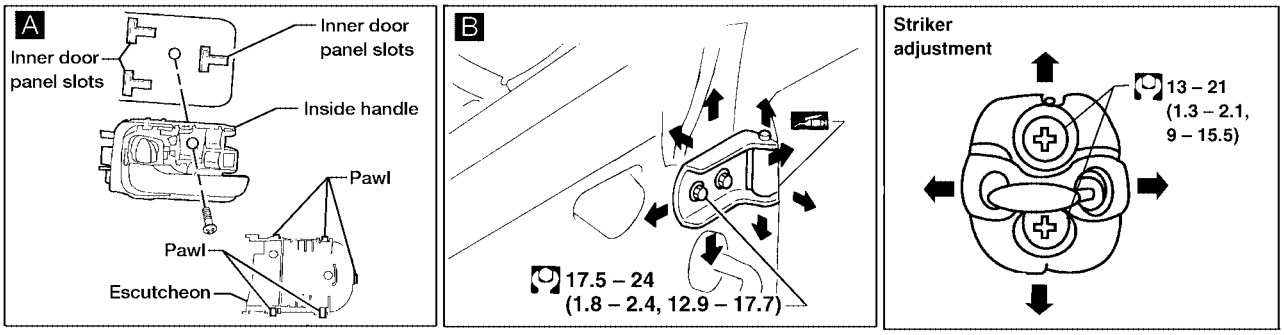
Front Door

EIS00151

- For removal of door finisher, refer to EI-31, "Removal and Installation" .
- After adjusting the door or door lock, check the door lock operation.

SEC. 800•803•805





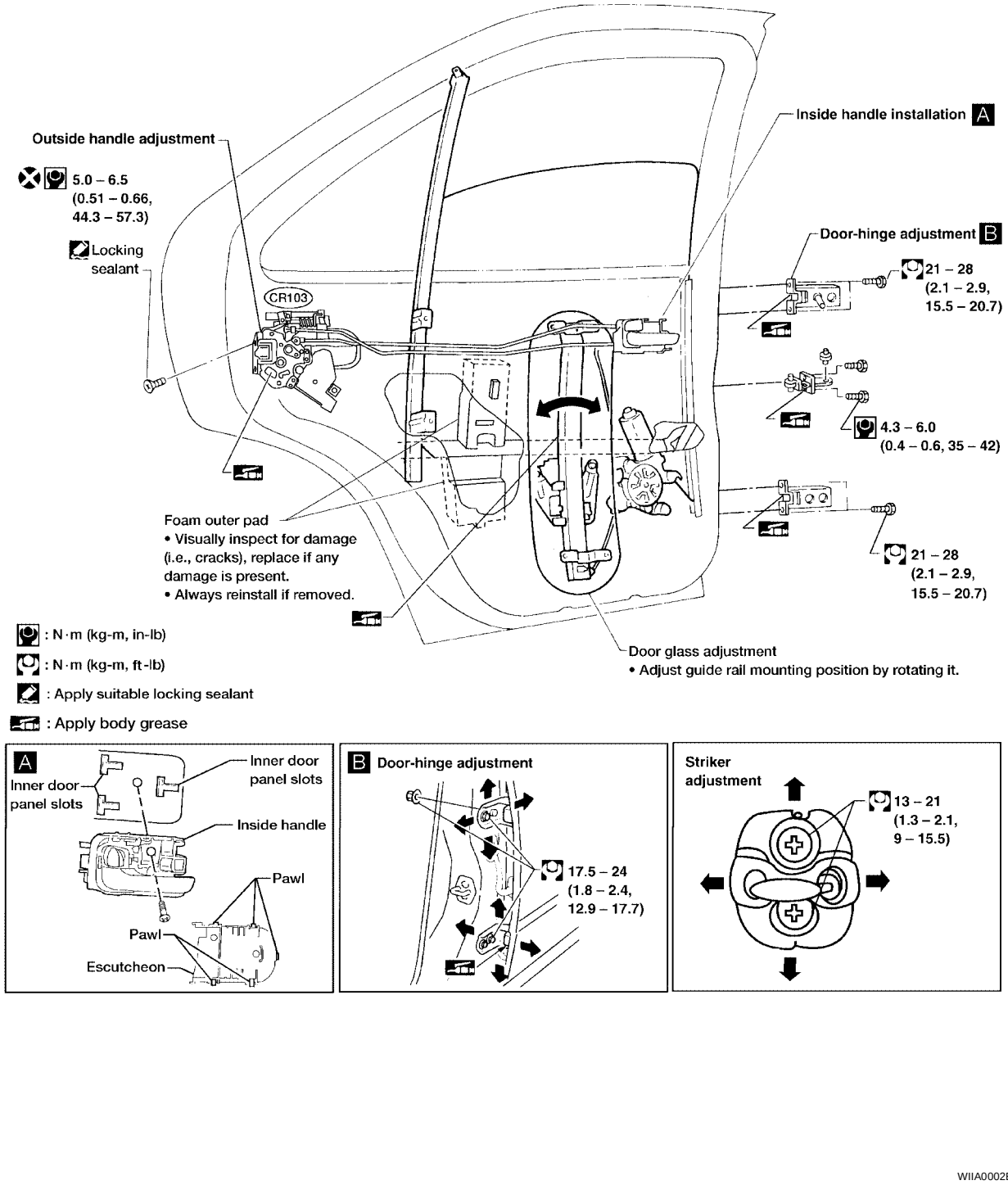
WIIA0006E

Rear Door

EIS00152

- For removal of door finisher, refer to EI-31, "Removal and Installation" .

- After adjusting the door or door lock, check the door lock operation.



WIIA0002E

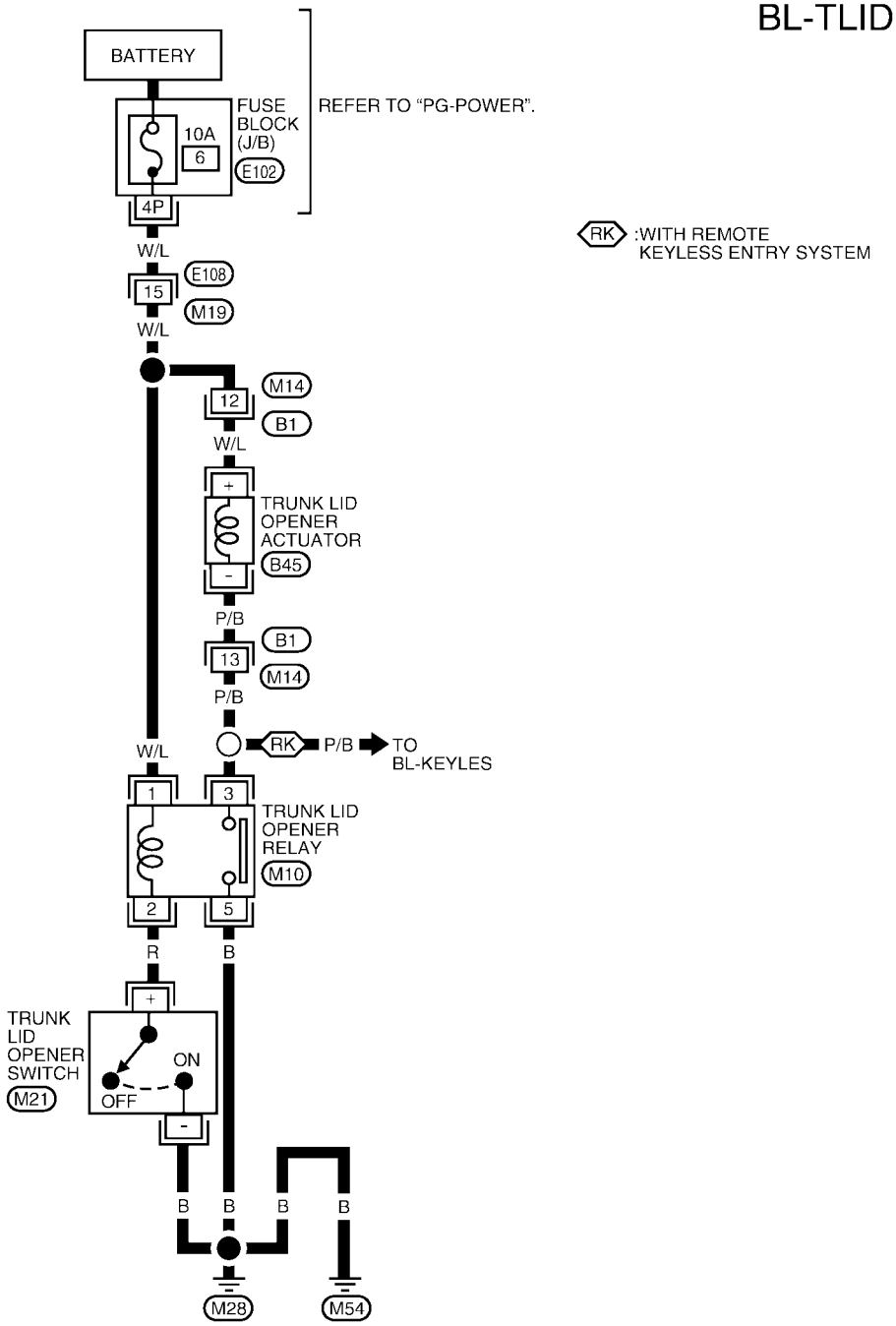
TRUNK LID OPENER

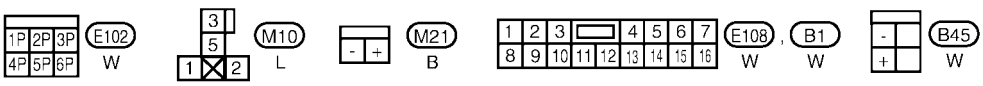
PFP:84640

Wiring Diagram — TLID —

EIS00153

BL-TLID-01





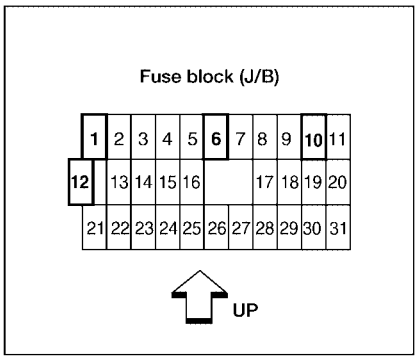
WIWA0077E

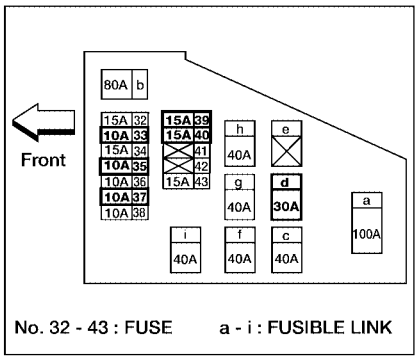
REMOTE KEYLESS ENTRY SYSTEM

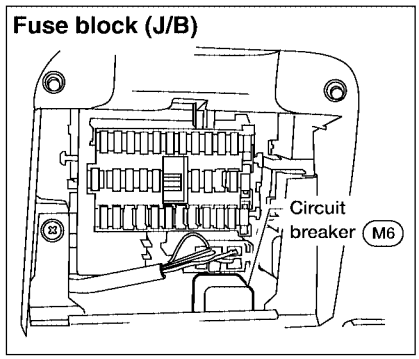
PFP:28596

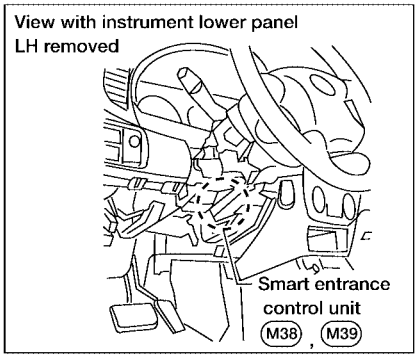
Component Parts and Harness Connector Location

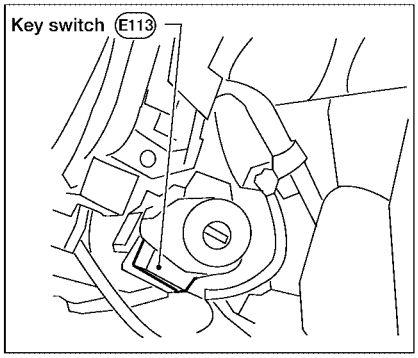
EIS00154

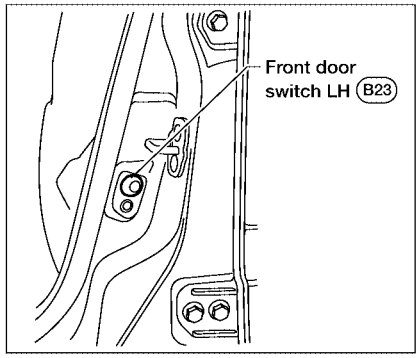


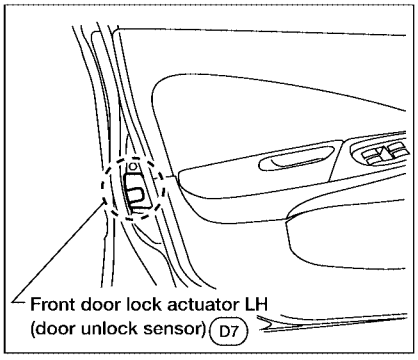


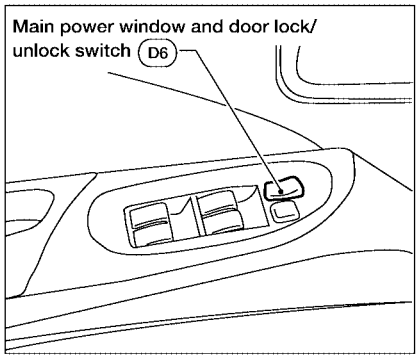


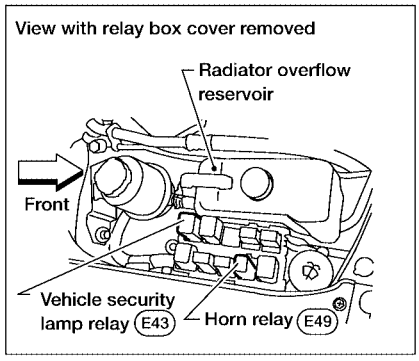


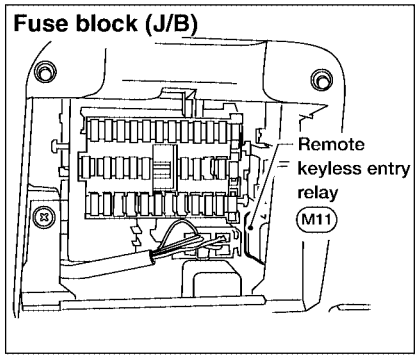












WIIA0007E

System Description

EIS00155

INPUTS

Power is supplied at all times:

- to key switch terminal 2
- through 10A fuse [No. 12, located in the fuse block (J/B)].

When the key switch is ON (ignition key is inserted in key cylinder), power is supplied:

- through key switch terminal 1
- to smart entrance control unit terminal 32.

When the front door switch LH is ON (door is OPEN), ground is supplied:

- to smart entrance control unit terminal 29
- through front door switch LH terminal 2
- to front door switch LH terminal 3
- through body grounds B13 and B19.

When the front door switch RH and rear door switches are ON (doors are OPEN), ground is supplied:

- to smart entrance control unit terminal 28
- through front door switch RH terminal 1 and rear door switches terminal +
- to front door switch RH case ground and rear door switches case grounds.

When main power window and door lock/unlock switch is LOCKED, ground is supplied:

- to smart entrance control unit terminal 23
- through main power window and door lock/unlock switch terminal 14 and
- through body grounds M28 and M54.

When main power window and door lock/unlock switch is UNLOCKED, ground is supplied:

- to smart entrance control unit terminal 35
- through main power window and door lock/unlock switch terminal 7 and
- through body grounds M28 and M54.

When front door unlock sensor LH is UNLOCKED, ground is supplied:

- to smart entrance control unit terminal 36
- through front door unlock sensor LH terminal 2
- to front door unlock sensor LH terminal 4
- through body grounds M28 and M54.

Keyfob signal is input to smart entrance control unit (the antenna of the system is combined with smart entrance control unit).
The remote keyless entry system controls operation of the:

- power door locks
- trunk lid opener
- interior lamp
- panic alarm
- hazard and horn reminder.

OPERATED PROCEDURE

Power Door Lock Operation

Smart entrance control unit receives a LOCK signal from keyfob. Smart entrance control unit locks all doors with input of LOCK signal from keyfob.
When an UNLOCK signal is sent from keyfob once, driver door will be unlocked.
Then, if an UNLOCK signal is sent from keyfob again within 5 seconds, all other doors will be unlocked.

Hazard and Horn Reminder

Power is supplied at all times:

- to remote keyless entry relay terminals 1, 3 and 6
- through 15A fuse [No. 5, located in the fuse block (J/B)], and
- to horn relay terminals 1 and 5

- through 10A fuse (No. 33, located in the fuse and fusible link box).

When smart entrance control unit receives LOCK or UNLOCK signal from keyfob, ground is supplied:

- to remote keyless entry relay terminal 2
- through smart entrance control unit terminal 7, and
- to horn relay terminal 2
- through smart entrance control unit terminal 19.

Remote keyless entry relay and horn relay are now energized, and hazard warning lamp flashes and horn sounds as a reminder.
The hazard and horn reminder has C mode (horn chirp mode) and S mode (non-horn chirp mode).

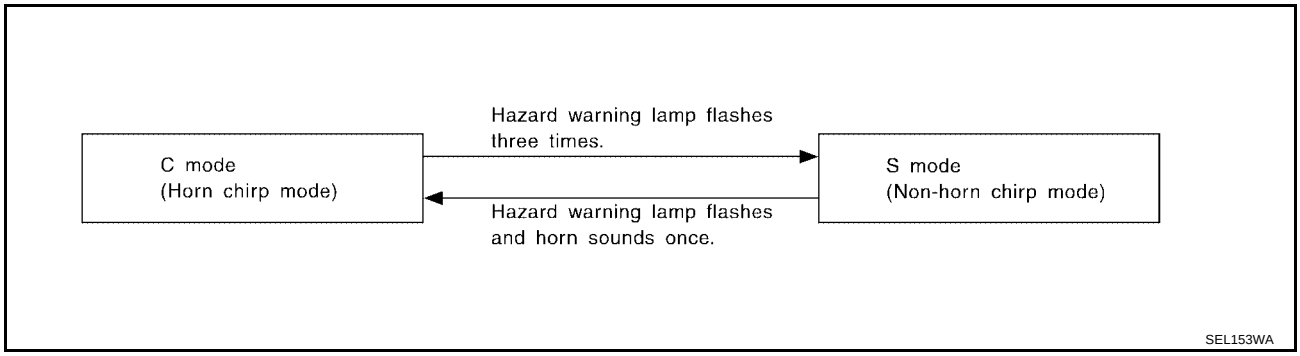
Operating function of hazard and horn reminder

	C mode (Horn chirp mode)		S mode (Non-horn chirp mode)	
	Hazard warning lamp flash	Horn sound	Hazard warning lamp flash	Horn sound
Lock	Twice	Once	Twice	—
Unlock	Once	—	—	—

How to change hazard and horn reminder mode

With CONSULT-II
Hazard and horn reminder can be changed using “WORK SUPPORT” mode in “MULTI REMOTE ENT”.

Without CONSULT-II
When LOCK and UNLOCK signals are sent from the keyfob for more than 2 seconds at the same time, the hazard and horn reminder mode is changed and hazard warning lamp flashes and horn sounds as follows:



Interior Lamp Operation

When the following input signals are both supplied:

- front door switch LH CLOSED (when driver door is closed);
- driver door LOCKED;

remote keyless entry system turns on interior lamp (for 30 seconds) with input of UNLOCK signal from keyfob.
For detailed description, refer to LT-35, "INTERIOR, MAP, VANITY AND TRUNK ROOM LAMPS" .

Panic Alarm Operation

When key switch is OFF (when ignition key is not inserted in key cylinder), remote keyless entry system turns on and off horn and headlamp intermittently with input of PANIC ALARM signal from keyfob.
The alarm automatically turns off after 25 seconds or when smart entrance control unit receives any signal from keyfob.
For detailed description, refer to BL-69, "PANIC ALARM OPERATION" .

Trunk Lid Operation

Power is supplied at all times:

- through 10A fuse [No. 6, located in the fuse block (J/B)]
- to trunk lid opener actuator terminal +.

When a TRUNK OPEN signal is sent with key OFF (ignition key removed from key cylinder) from keyfob, ground is supplied:

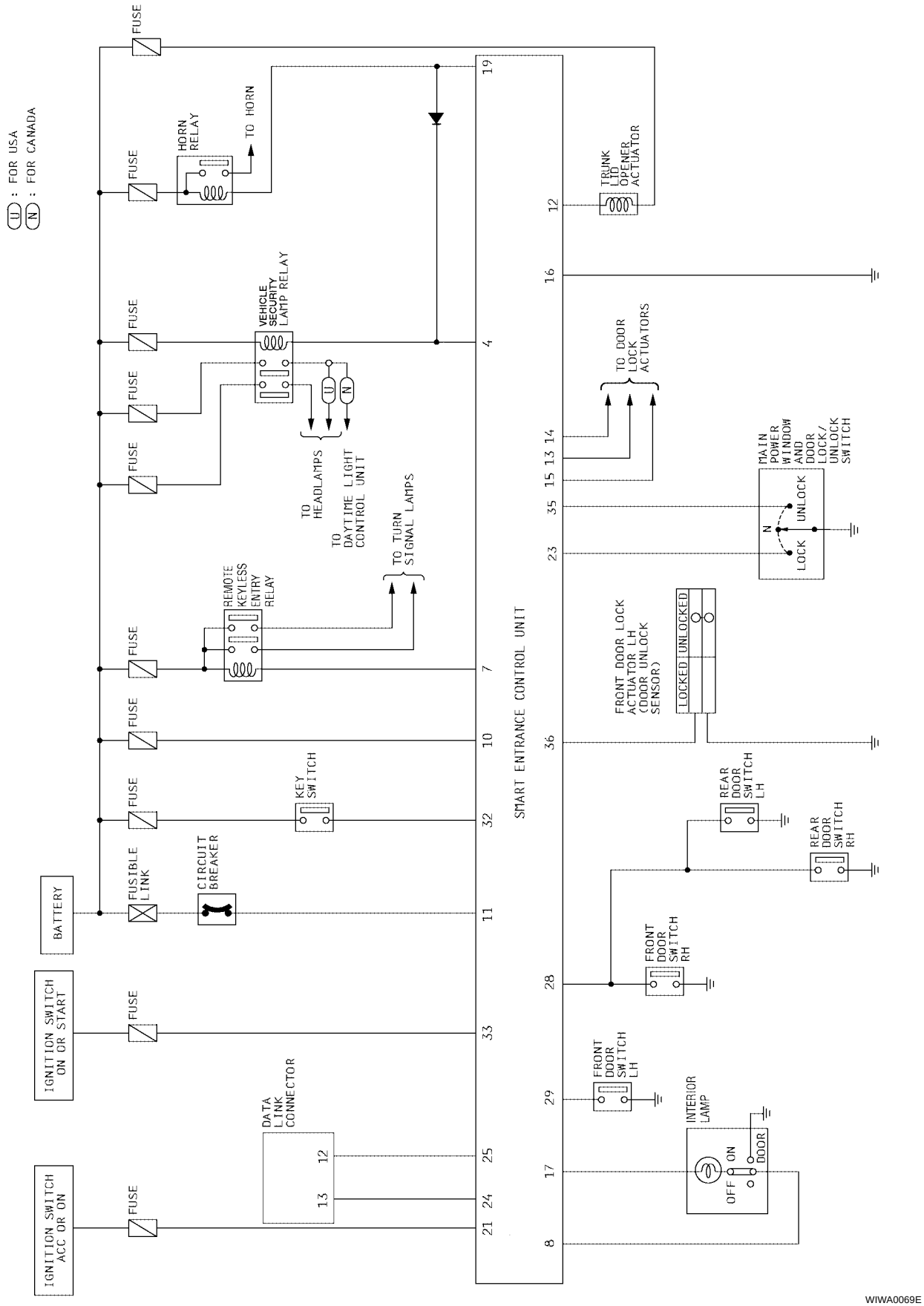
- to trunk lid opener actuator terminal -

- through smart entrance control unit terminal 12.

Then power and ground are supplied, trunk lid opener actuator opens trunk lid.

Schematic

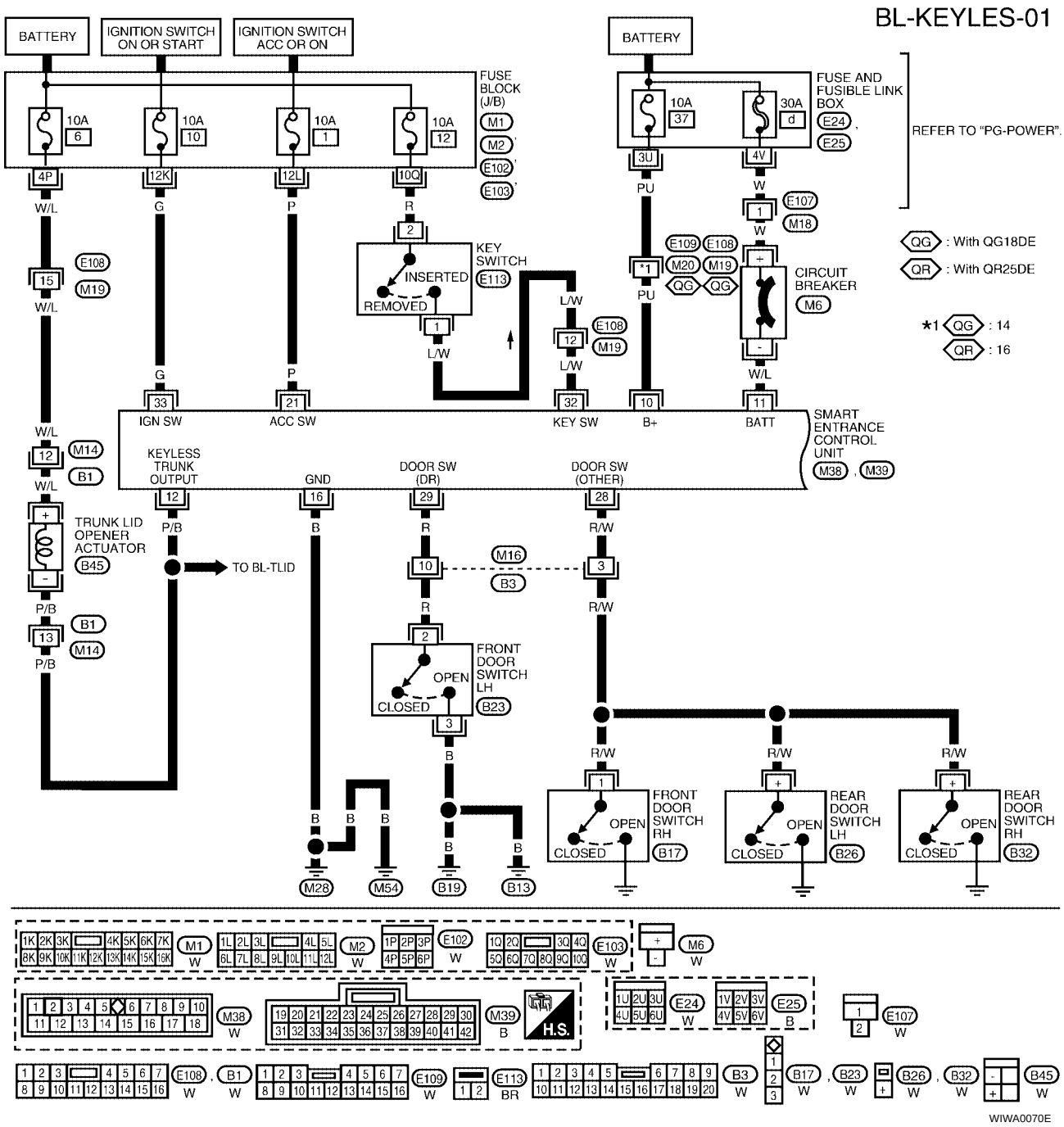
EIS00156



Wiring Diagram — KEYLES —

EIS00157

FIG. 1



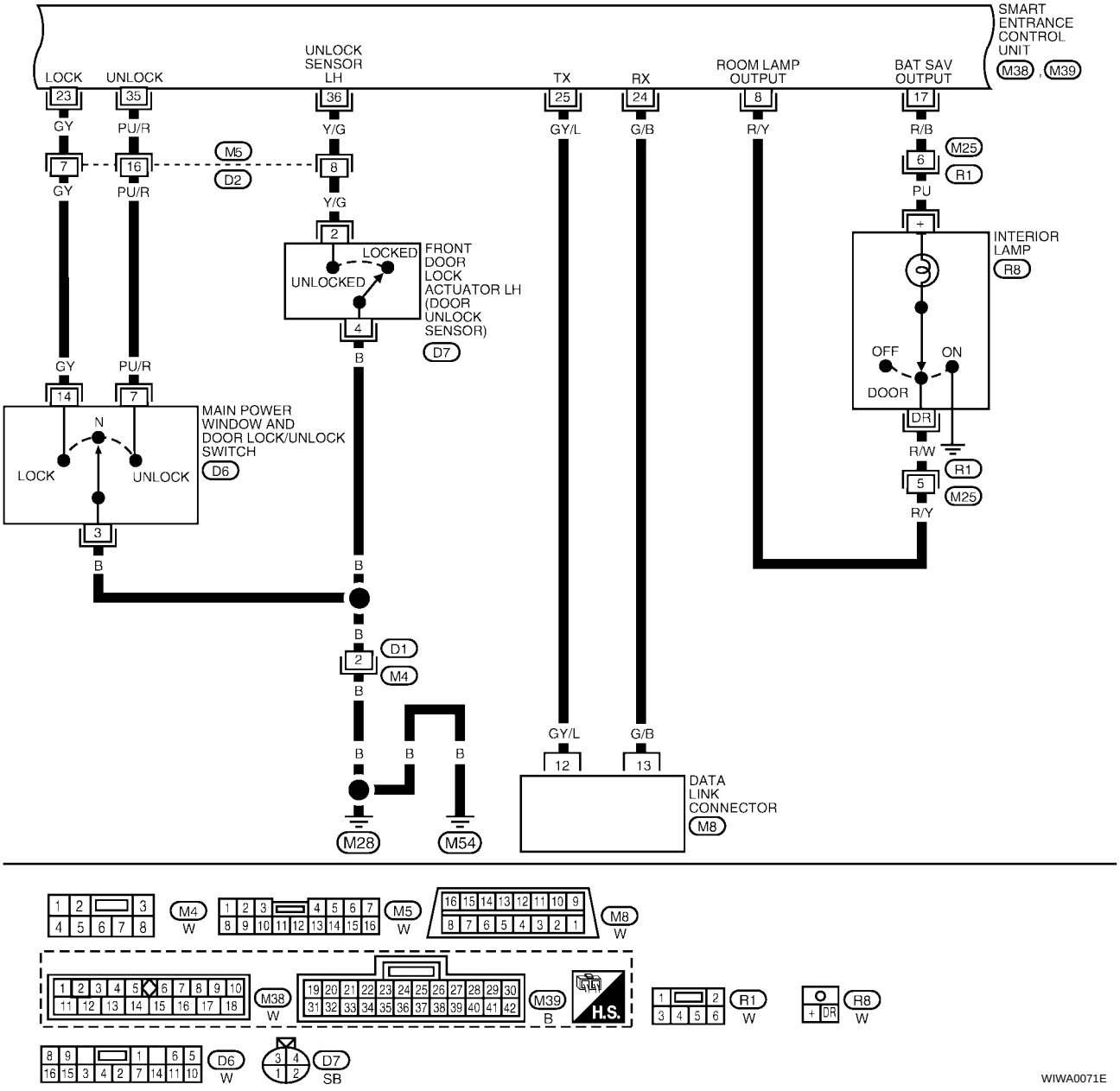
SMART ENTRANCE CONTROL UNIT AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	PU	POWER SOURCE (FUSE)	—	12V
11	W/L	POWER SOURCE (CIRCUIT BREAKER)	—	12V
12	P/B	TRUNK LID OPENER ACTUATOR	ON (OPEN)	0V
			OFF (CLOSED)	12V
16	B	GROUND	—	—
21	P	IGNITION SWITCH (ACC, ON)	ACC OR ON POSITION	12V
28	R/W	OTHER DOOR SWITCHES	OFF (CLOSED)	5V
			ON (OPEN)	0V
29	R	FRONT DOOR SWITCH LH	OFF (CLOSED)	5V
			ON (OPEN)	0V
32	L/W	IGNITION KEY SWITCH (INSERT)	IGNITION KEY IS INSERTED	12V
			IGNITION KEY IS REMOVED	0V
33	G	IGNITION SWITCH (ON)	IGNITION KEY IS IN ON POSITION	12V
		IGNITION SWITCH (START)	IGNITION KEY IS IN START POSITION	12V

LEL610

FIG. 2

BL-KEYLES-02



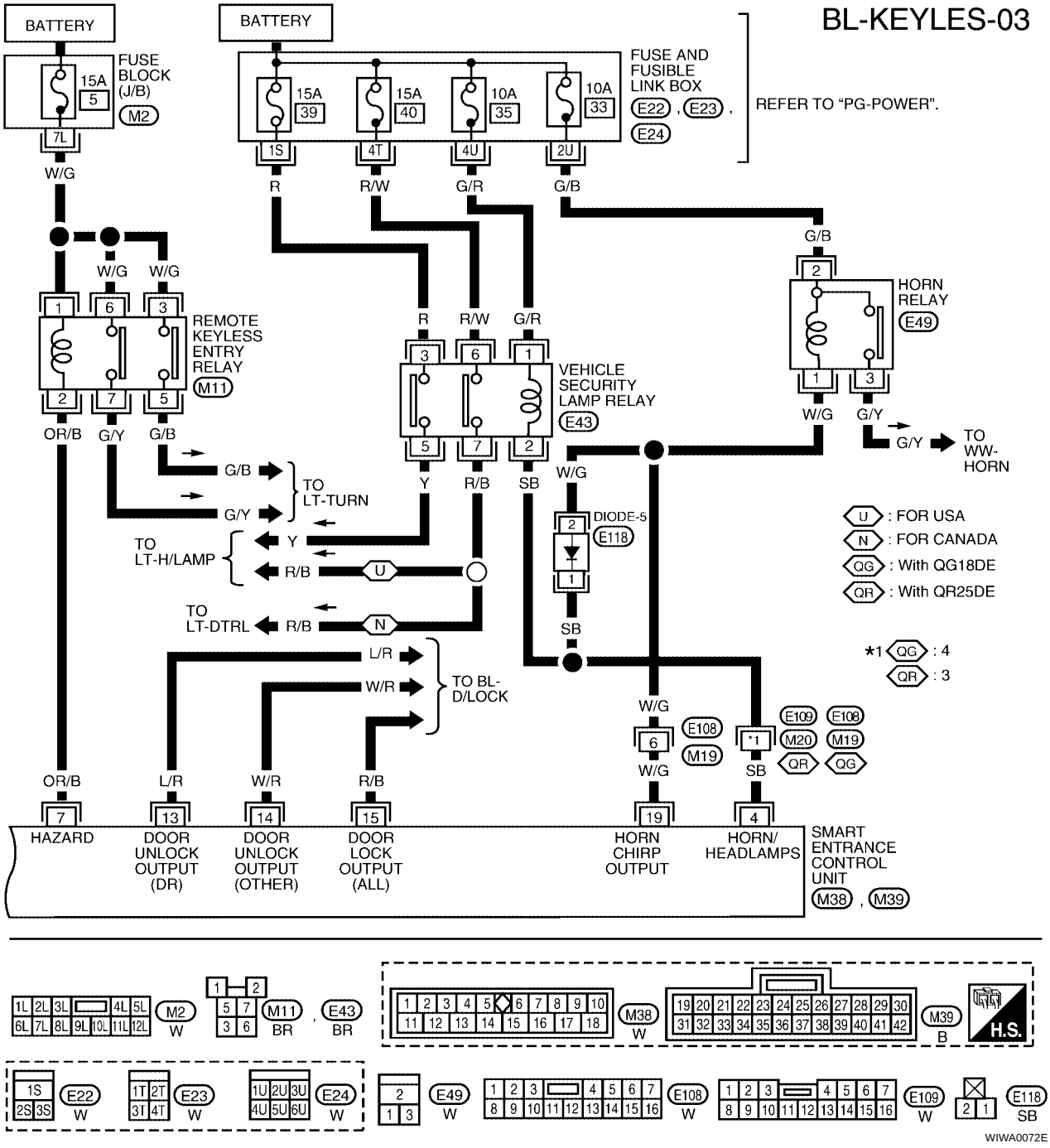
WIWA0071E

SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
8	R/Y	INTERIOR LAMP	LAMP SWITCH IN DOOR POSITION	12V
17	R/B	BATTERY SAVER (INTERIOR LAMP)	BATTERY SAVER DOES NOT OPERATE	12V
			BATTERY SAVER OPERATES	0V
23	GY	DOOR LOCK & UNLOCK SWITCHES	NEUTRAL	5V
			LOCKS	0V
35	PU/R	DOOR LOCK & UNLOCK SWITCHES	NEUTRAL	5V
			UNLOCKS	0V
36	Y/G	DOOR UNLOCK SENSOR LH	DRIVER DOOR: LOCKED	5V
			DRIVER DOOR: UNLOCKED	0V

LEL611

FIG. 3



WIWA0072E

SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
4	SB	VEHICLE SECURITY HORN RELAY AND VEHICLE SECURITY LAMP RELAY	WHEN PANIC ALARM IS OPERATED USING REMOTE CONTROLLER OR WHEN ALARM IS ACTIVATED	12V TO 0V
7	OR/B	MULTI-REMOTE CONTROL RELAY	WHEN DOORS ARE LOCKED USING REMOTE CONTROLLER	12V TO 0V
19	W/G	HORN RELAY	WHEN DOORS ARE LOCKED USING REMOTE CONTROLLER WITH HORN CHIRP MODE	12V TO 0V

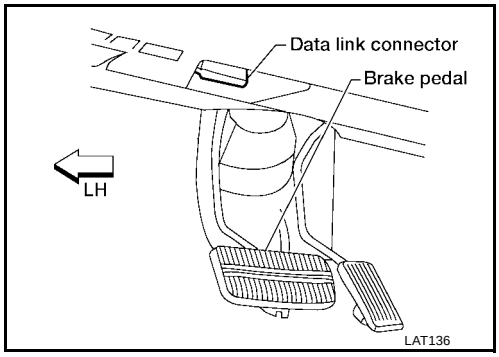
WEL104A

CONSULT-II Inspection Procedure

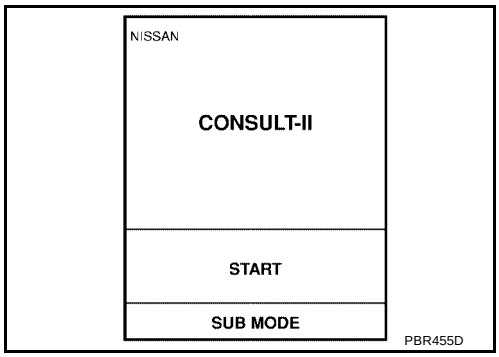
EIS00158

“MULTI REMOTE ENT”

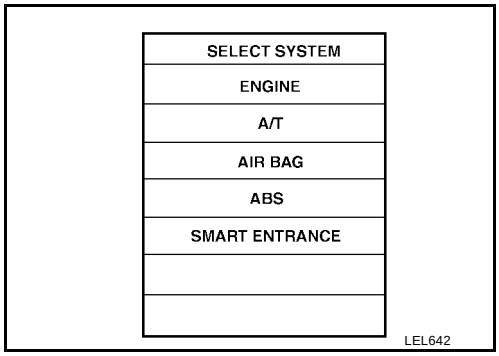
1. Turn ignition switch “OFF”.



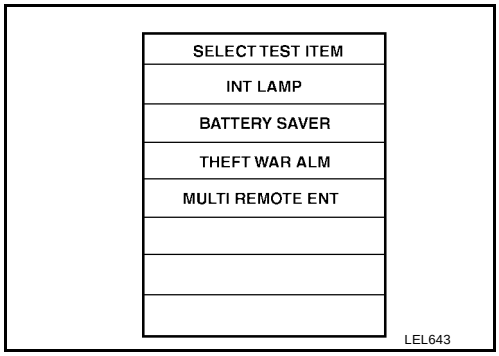
2. Connect “CONSULT-II” to the data link connector.
3. Turn ignition switch “ON”.



4. Touch “START”.
5. Touch “SMART ENTRANCE”.

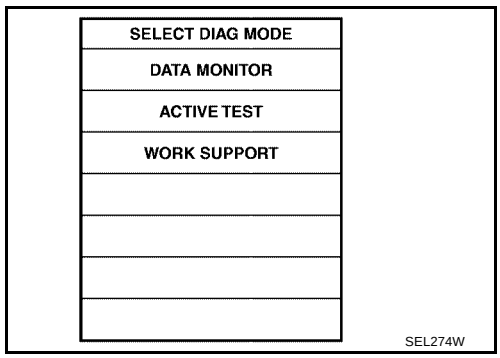


6. Touch “MULTI REMOTE ENT”.



7. Select diagnosis mode.

"DATA MONITOR", "ACTIVE TEST" and "WORK SUPPORT" are available.



CONSULT-II Application Items

EIS00159

"MULTI REMOTE ENT"

Data Monitor

Monitored Item	Description
ACC ON SW	Indicates [ON/OFF] condition of ignition switch in ACC position.
KEY ON SW	Indicates [ON/OFF] condition of key switch.
DOOR SW-DR	Indicates [ON/OFF] condition of front door switch LH.
DOOR SW-ALL	Indicates [ON/OFF] condition of door switch (All).
LOCK SW DR/AS	Indicates [ON/OFF] condition of lock signal from lock/unlock switch LH and RH.
UNLK SW DR/AS	Indicates [ON/OFF] condition of unlock signal from lock/unlock switch LH and RH.
KEY CYL LK SW	Indicates [ON/OFF] condition of lock signal from key cylinder switch.
LK BUTTON/SIG	Indicates [ON/OFF] condition of lock signal from keyfob.
UN BUTTON/SIG	Indicates [ON/OFF] condition of unlock signal from keyfob.
TRUNK BTN/SIG	Indicates [ON/OFF] condition of trunk open signal from keyfob.
PANIC BTN	Indicates [ON/OFF] condition of panic signal from keyfob.
UN BUTTON ON	Indicates [ON/OFF] condition of second unlock signal from keyfob within 5 seconds after first unlock operation.
LK/UN BTN ON	Indicates [ON/OFF] condition of lock/unlock signal at the same time from keyfob.

Active Test

Test Item	Description
INT/IGN ILLUM	This test is able to check interior lamp operation. The interior lamp is turned on when "ON" on CONSULT-II screen is touched.
HAZARD	This test is able to check hazard reminder operation. The hazard lamps turn on when "ON" on CONSULT-II screen is touched.
ALARM	This test is able to check panic alarm operation. The alarm activates for 0.5 seconds after "ON" on CONSULT-II screen is touched.
MULTI REM HRN	This test is able to check horn reminder operation. The horn sounds for 0.02 seconds after "ON" on CONSULT-II screen is touched.
TRUNK OUTPUT	This test is able to check trunk lid opener actuator operation. The trunk is unlocked when "ON" on CONSULT-II screen is touched.

Work Support

Test Item	Description
REMO CONT ID CONFIR	It can be checked whether keyfob ID code is registered or not in this mode.
REMO CONT ID REGIST	Keyfob ID code can be registered.
REMO CONT ID ERASUR	Keyfob ID code can be erased.
HZRD REM SET	Hazard and horn reminder mode can be changed in this mode. The reminder mode will be changed when "MODE SET" on CONSULT-II screen is touched.

Trouble Diagnoses

EIS0015A

SYMPTOM CHART

NOTE:

- Always check keyfob battery before replacing keyfob.
- The panic alarm operation and trunk lid opener operation of remote keyless entry system do not activate with the ignition key inserted in the ignition key cylinder.
- Use Remote Keyless Entry Tester J-43241 (follow instructions on tester) to check operation of keyfob before replacing keyfob.

Symptom	Diagnoses/service procedure	Reference page (BL-)
All functions of remote keyless entry system do not operate.	1. Keyfob battery and function check Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-46
	2. Power supply and ground circuit for smart entrance control unit check	BL-47
	3. Replace keyfob. Refer to ID Code Entry Procedure. NOTE: If the result of keyfob function check with CONSULT-II is OK, keyfob is not malfunctioning. Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-60
The new ID of keyfob cannot be entered.	1. Keyfob battery and function check Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-46
	2. Key switch (insert) check	BL-50
	3. Door switch check	BL-49
	4. Door lock/unlock switch LH check	BL-51
	5. Power supply and ground circuit for smart entrance control unit check	BL-47
	6. Replace keyfob. Refer to ID Code Entry Procedure. NOTE: If the result of keyfob function check with CONSULT-II is OK, keyfob is not malfunctioning. Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-60
Door lock or unlock does not function. [If the power door lock system does not operate manually, check power door lock system. Refer to BL-22, "Trouble Diagnoses" .)	1. Keyfob battery and function check Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-46
	2. Replace keyfob. Refer to ID Code Entry Procedure. NOTE: If the result of keyfob function check with CONSULT-II is OK, keyfob is not malfunctioning. Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-60
Hazard and horn reminder does not activate properly when pressing lock or unlock button of keyfob.	1. Keyfob battery and function check Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-46
	2. Hazard reminder check	BL-56
	3. Horn reminder check* *: Horn chirp can be activated or deactivated. First check the horn chirp setting. Refer to BL-35, "Hazard and Horn Reminder" .	BL-58
	4. Door switch check	BL-49
	5. Replace keyfob. Refer to ID Code Entry Procedure. NOTE: If the result of keyfob function check with CONSULT-II is OK, keyfob is not malfunctioning. Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-60
Interior lamp illumination operations do not activate properly.	1. Interior lamp operation check	BL-59
	2. Door switch check	BL-49
	3. Front LH door unlock sensor check	BL-53

Symptom	Diagnoses/service procedure	Reference page (BL-)
Panic alarm (horn and headlamp) does not activate when panic alarm button is continuously pressed. Keyfob check (use Remote Keyless Entry Tester J-43241).	1. Keyfob battery and function check	BL-46
	2. Vehicle security operation check. Refer to BL-77, "PRELIMINARY CHECK" .	BL-77
	3. Key switch (insert) check	BL-50
	4. Replace keyfob. Refer to ID Code Entry Procedure. NOTE: If the result of keyfob function check with CONSULT-II is OK, keyfob is not malfunctioning. Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-60
Trunk lid does not open when trunk opener button is continuously pressed.	1. Keyfob battery and function check	BL-46
	2. Trunk lid opener actuator check	BL-55
	3. Key switch (insert) check	BL-50
	4. Replace keyfob. Refer to ID Code Entry Procedure. NOTE: If the result of keyfob function check with CONSULT-II is OK, keyfob is not malfunctioning. Keyfob check (use Remote Keyless Entry Tester J-43241).	BL-60

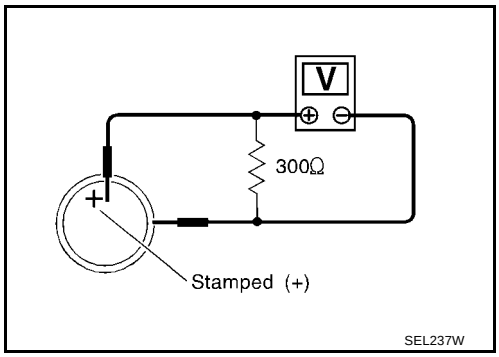
KEYFOB BATTERY AND FUNCTION CHECK

1. CHECK KEYFOB BATTERY

Remove battery (refer to BL-63, "Keyfob Battery Replacement") and measure voltage across battery positive and negative terminals, (+) and (–).

Voltage [V] : 2.5 - 3.0

NOTE:
Keyfob does not function if battery is not set correctly.



OK or NG

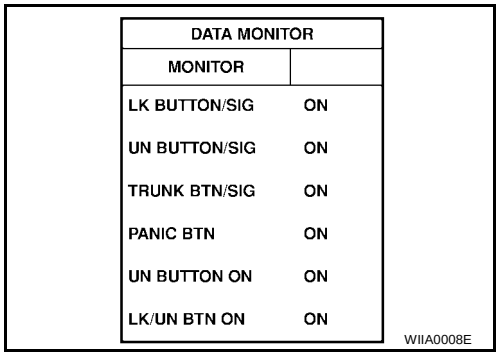
OK >> GO TO 2.
NG >> Replace battery.

2. CHECK KEYFOB FUNCTION

With CONSULT-II

Check keyfob function (“LK BUTTON/SIG”, “UN BUTTON/SIG”, “TRUNK BTN/SIG”, “PANIC BTN”, “UN BUTTON ON” and “LK/UN BTN ON”) in “DATA MONITOR” mode with CONSULT-II. When pushing each button of keyfob, the corresponding monitor item should be turned as follows.

Condition	Monitor item	
Pushing LOCK	LK BUTTON/SIG	ON
Pushing UNLOCK	UN BUTTON/SIG	ON
Pushing TRUNK	TRUNK BTN/SIG	ON
Pushing PANIC	PANIC BTN/SIG	ON
Pushing UNLOCK within 5 seconds after pushing UNLOCK	UN BUTTON ON	ON
Pushing LOCK and UNLOCK at the same time	LK/UN BTN ON	ON



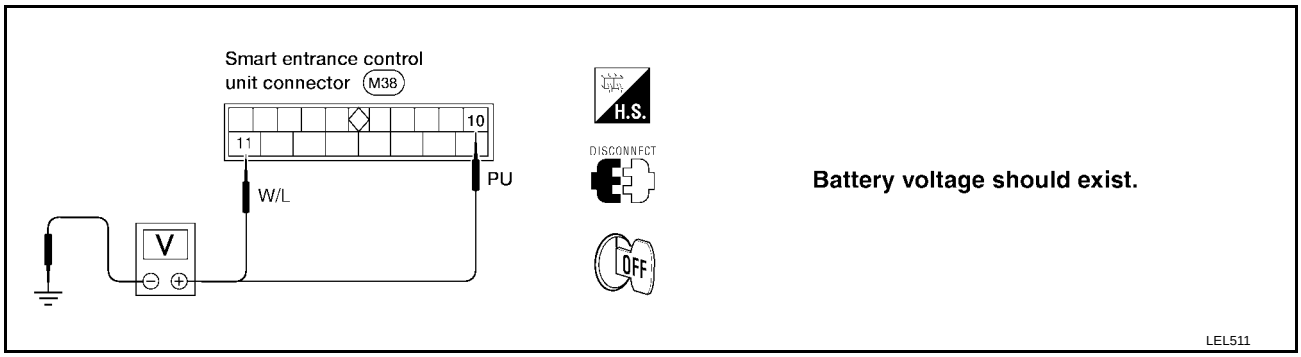
OK or NG

OK >> Keyfob is OK. Further inspection is necessary. Refer to BL-44, "SYMPTOM CHART" .
NG >> Replace keyfob. Refer to BL-60, "ID Code Entry Procedure" .

POWER SUPPLY AND GROUND CIRCUIT CHECK

1. CHECK MAIN POWER SUPPLY CIRCUIT FOR SMART ENTRANCE CONTROL UNIT

1. Disconnect smart entrance control unit harness connector.
2. Check voltage between smart entrance control unit harness connector terminals 10, 11 and ground.



Refer to BL-39, "FIG. 1" .

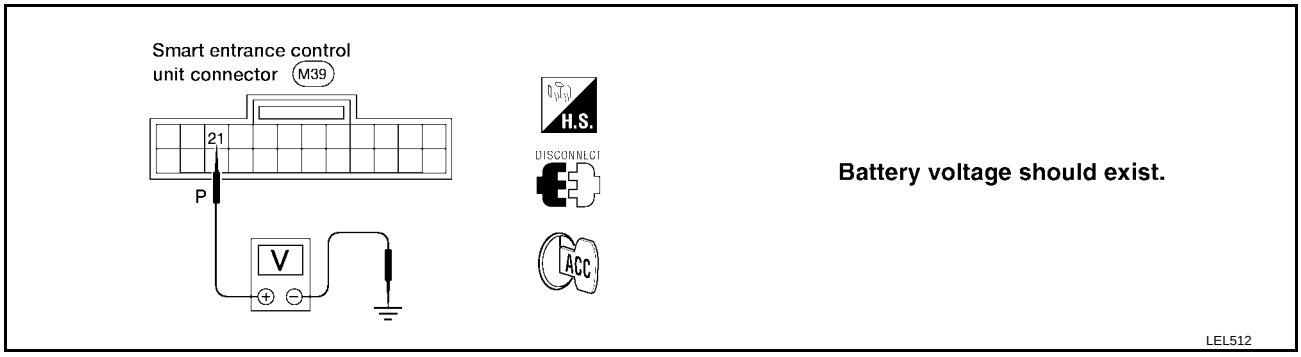
OK or NG

OK >> GO TO 2.
NG >> Check the following.

- 30A fusible link (letter **d** , located in fuse and fusible link box)
- 10A fuse (No. 37, located in fuse and fusible link box)
- M6 circuit breaker
- Harness for open or short between smart entrance control unit and fuse

2. CHECK IGNITION SWITCH “ACC” CIRCUIT

1. Disconnect smart entrance control unit harness connector.
2. Check voltage between smart entrance control unit harness connector terminal 21 and ground while ignition switch is “ACC”.



Refer to BL-39, "FIG. 1" .

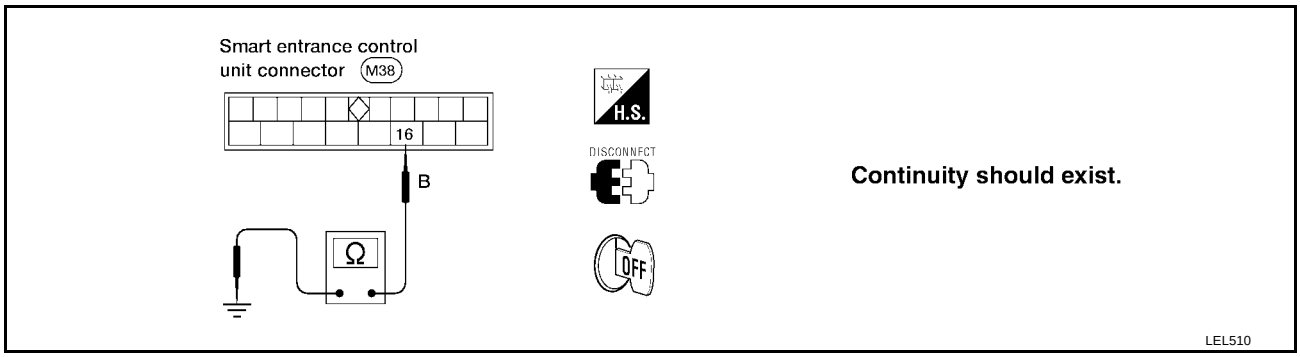
OK or NG

OK >> GO TO 3.
NG >> Check the following.

- 10A fuse [No. 1, located in fuse block (J/B)]
- Harness for open or short between smart entrance control unit and fuse

3. CHECK GROUND CIRCUIT FOR SMART ENTRANCE CONTROL UNIT

Check continuity between smart entrance control unit harness connector terminal 16 and ground.



Refer to BL-39, "FIG. 1" .

OK or NG

OK >> Power supply and ground circuits are OK.
NG >> Check ground harness.

DOOR SWITCH CHECK

1. CHECK DOOR SWITCH INPUT SIGNAL

With CONSULT-II

Check door switches (“DOOR SW-ALL”) in “DATA MONITOR” mode with CONSULT-II.

DATA MONITOR	
MONITOR	
DOOR SW-ALL	OFF

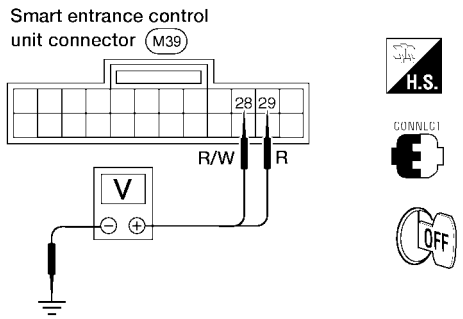
When any doors are open:
DOOR SW-ALL ON

When all doors are closed:
DOOR SW-ALL OFF

SEL323W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminals 28 or 29 and ground.



	Terminals		Condition	Voltage [V]
	(+)	(−)		
Front door switch LH	29	Ground	Open	0
			Closed	Approx. 5
Other door switches	28	Ground	Open	0
			Closed	Approx. 5

WEL500

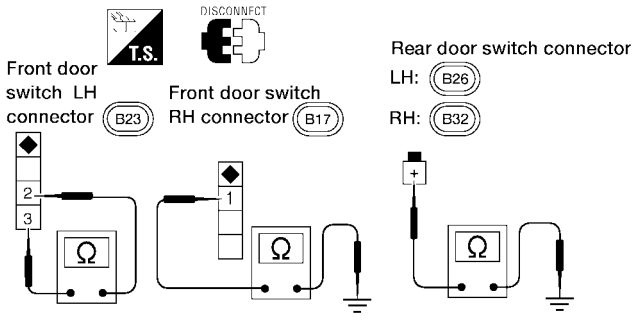
Refer to BL-39, "FIG. 1" .

OK or NG

OK >> Door switch is OK.
NG >> GO TO 2.

2. CHECK DOOR SWITCH

1. Disconnect door switch harness connector.
2. Check continuity between door switch terminals.



	Terminals	Condition	Continuity
Front door switch LH	2 - 3	Closed	No
		Open	Yes
Front door switch RH	1 - Ground	Closed	No
		Open	Yes
Rear door switches	(+) - Ground	Closed	No
		Open	Yes

WEL491

OK or NG

OK >> Check the following.
- Door switch ground circuit or door switch ground condition
- Harness for open or short between smart entrance control unit and door switch

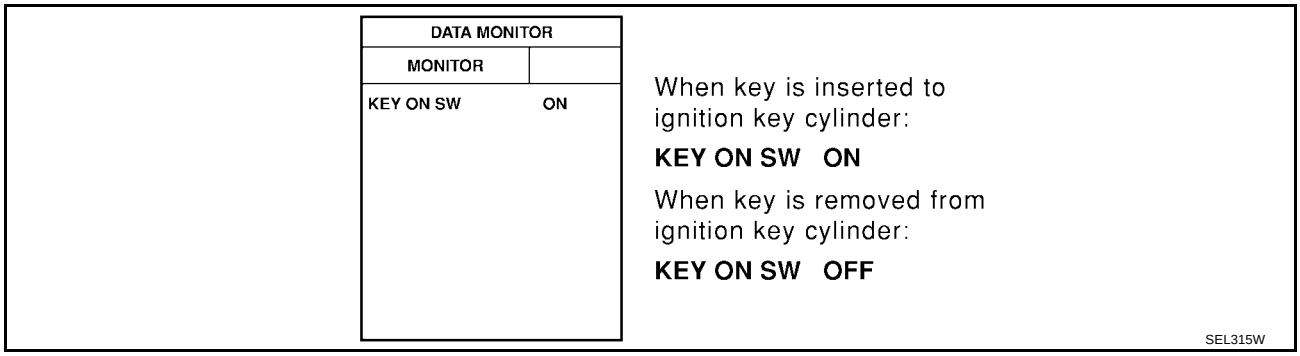
NG >> Replace door switch.

KEY SWITCH (INSERT) CHECK

1. CHECK KEY SWITCH INPUT SIGNAL

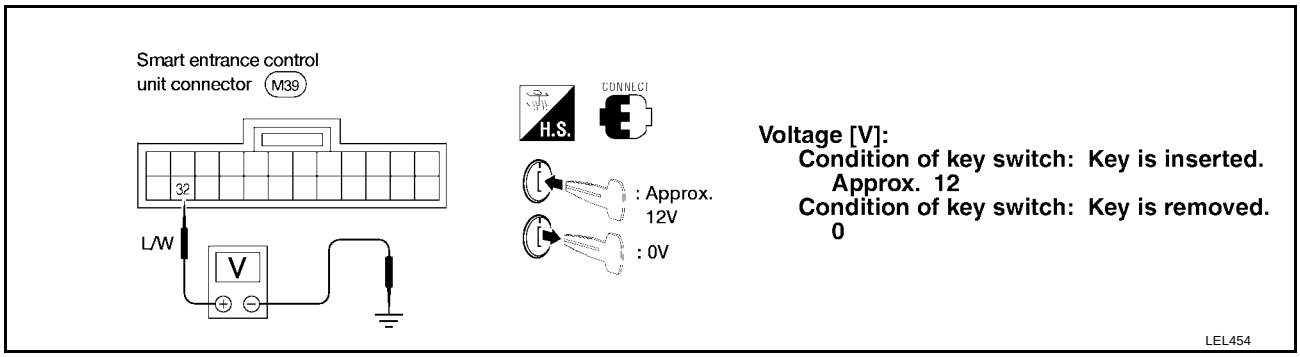
With CONSULT-II

Check key switch (“KEY ON SW”) in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

Check voltage between control unit terminal 32 and ground.



Refer to BL-39, "FIG. 1" .

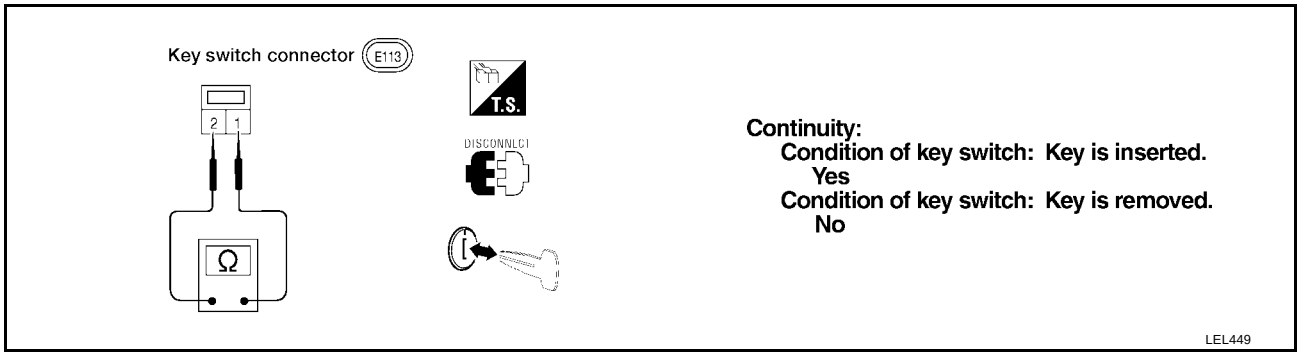
OK or NG

OK >> Key switch is OK.

NG >> GO TO 2.

2. CHECK KEY SWITCH

Check continuity between key switch terminals 1 and 2.



OK or NG

OK >> Check the following.

- 10A fuse [No. 12, located in fuse block (J/B)]
- Harness for open or short between key switch and fuse
- Harness for open or short between smart entrance control unit and key switch

NG >> Replace key switch.

DOOR LOCK/UNLOCK SWITCH LH CHECK

1. CHECK DOOR LOCK/UNLOCK SWITCH INPUT SIGNAL

With CONSULT-II

Check door lock/unlock switch (“LOCK SW DR/AS”/“UNLK SW DR/AS”) in “DATA MONITOR” mode with CONSULT-II.

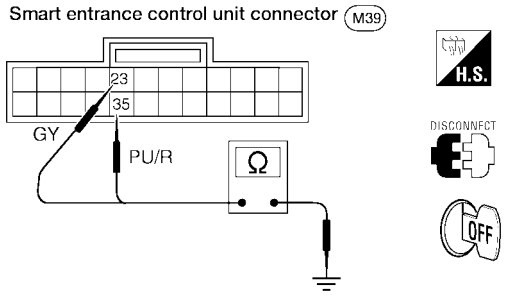
DATA MONITOR	
MONITOR	
LOCK SW DR/AS	OFF
UNLK SW DR/AS	OFF

When lock/unlock switch is turned to LOCK:
LOCK SW DR/AS ON
When lock/unlock switch is turned to UNLOCK:
UNLK SW DR/AS ON

SEL341W

Without CONSULT-II

1. Disconnect smart entrance control unit harness connector.
2. Check continuity between smart entrance control unit harness connector terminal 23 or 35 and ground.



Terminals	Door lock/unlock switch (LH or RH) condition	Continuity
23 - Ground	Lock	Yes
	N and Unlock	No
35 - Ground	Unlock	Yes
	N and Lock	No

WEL501

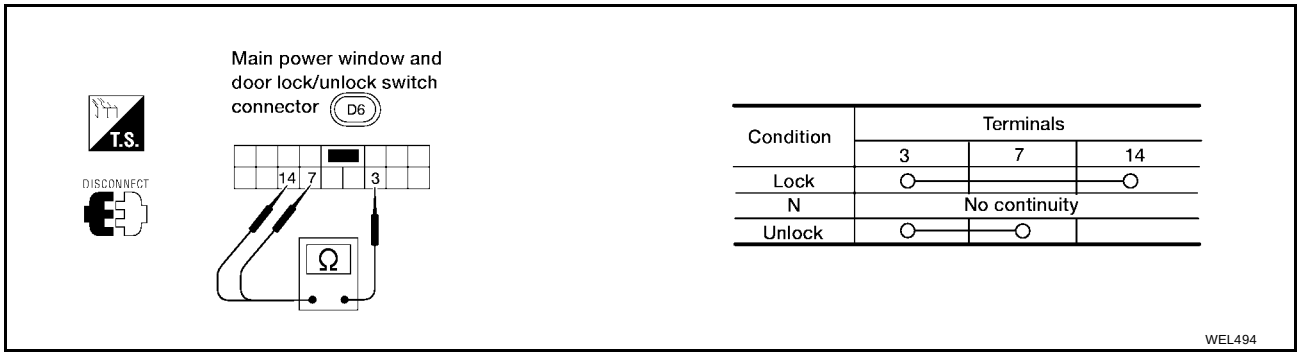
Refer to BL-40, "FIG. 2" .

OK or NG

OK >> Door lock/unlock switch is OK.
NG >> GO TO 2.

2. CHECK DOOR LOCK/UNLOCK SWITCH

1. Disconnect door lock/unlock switch harness connector.
2. Check continuity between door lock/unlock switch LH terminals.



Condition	Terminals		
	3	7	14
Lock	○		○
N	No continuity		
Unlock	○	○	

OK or NG

OK >> Check the following.
- Ground circuit for door lock/unlock switch
- Harness for open or short between door lock/unlock switch and smart entrance control unit connector

NG >> Replace door lock/unlock switch.

FRONT LH DOOR UNLOCK SENSOR CHECK

1. CHECK FRONT LH DOOR UNLOCK SENSOR INPUT SIGNAL

With CONSULT-II

1. Select “DATA MONITOR” mode in “INT LAMP” with CONSULT-II.
2. Check front LH door unlock sensor (“LOCK SIG DR”) in “DATA MONITOR” mode.

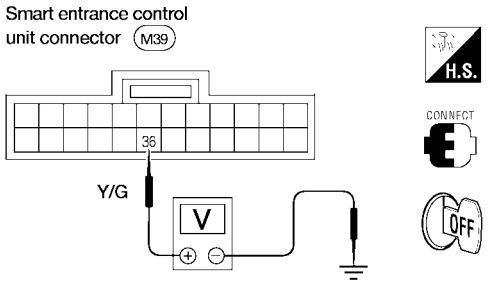
DATA MONITOR	
MONITOR	
LOCK SIG DR	OFF

When front LH door is locked:
LOCK SIG DR OFF
When front LH door is unlocked:
LOCK SIG DR ON

SEL344W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 36 and ground.



	Terminals		Condition	Voltage [V]
	(+)	(–)		
Front LH door	36	Ground	Locked	Approx. 5
			Unlocked	0

LEL452

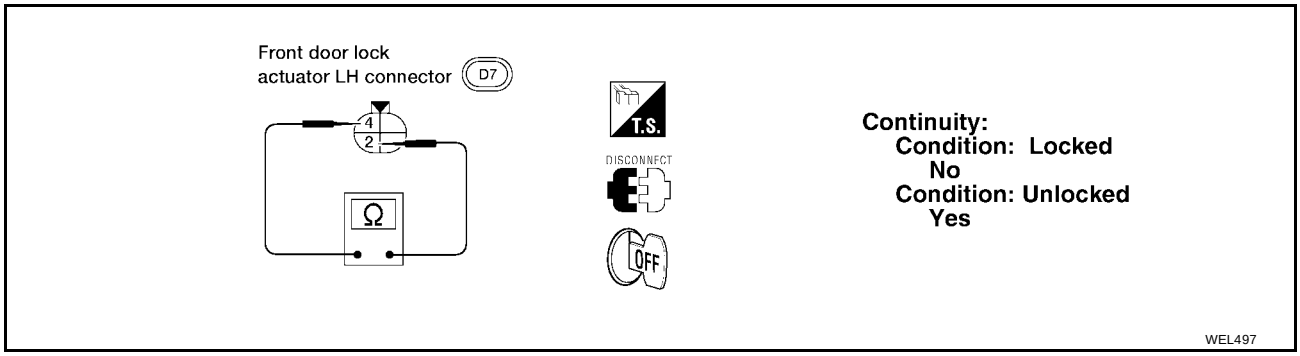
Refer to BL-40, "FIG. 2" .

OK or NG

OK >> Door unlock sensor is OK.
NG >> GO TO 2.

2. CHECK FRONT LH DOOR UNLOCK SENSOR

1. Disconnect front LH door unlock sensor harness connector.
2. Check continuity between door unlock sensor terminals.



OK or NG

OK >> Check the following.
- Door unlock sensor ground circuit
- Harness for open or short between smart entrance control unit and door unlock sensor

NG >> Replace door unlock sensor.

TRUNK LID OPENER ACTUATOR CHECK

1. CHECK TRUNK LID OPENER

Check trunk lid opener operation with trunk lid opener switch.
NOTE: First check trunk lid opener cancel lever position.

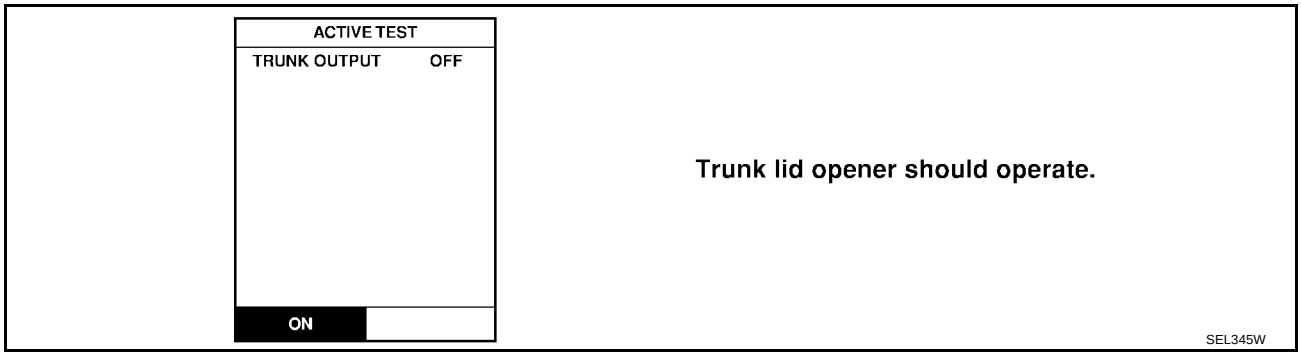
Does trunk lid open?

Yes >> GO TO 2.
No >> Check trunk lid opener actuator and the circuit.

2. CHECK TRUNK LID OPENER ACTUATOR OPERATION

With CONSULT-II

1. Select “ACTIVE TEST” in “MULTI REMOTE ENT” with CONSULT-II.
2. Select “TRUNK OUTPUT” and touch “ON”.



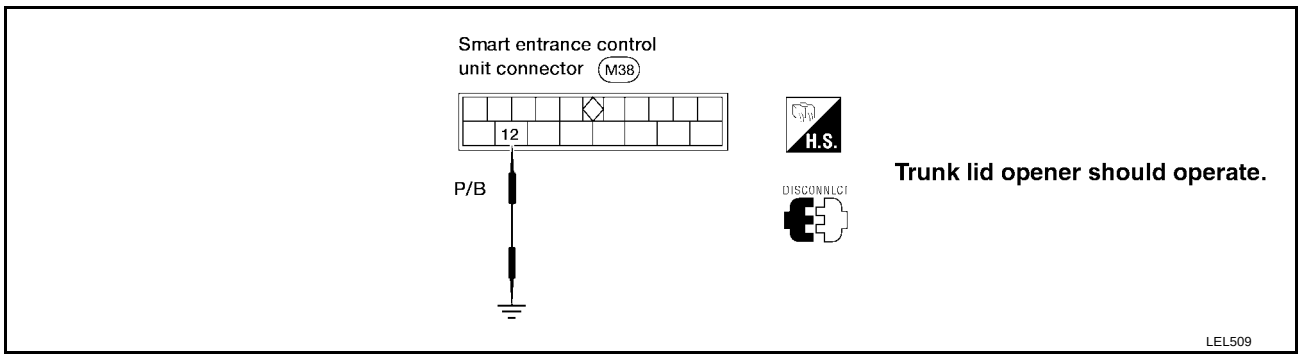
NOTE: If CONSULT-II is not available, skip this procedure and go to the next step.

OK or NG

OK >> Trunk lid opener actuator circuit is OK.
NG >> GO TO 3.

3. CHECK TRUNK LID OPENER ACTUATOR CIRCUIT

1. Disconnect smart entrance control unit harness connector.
2. Apply ground to smart entrance control unit harness connector terminal 12.



Refer to BL-39, "FIG. 1" .

Does trunk lid open?

Yes >> Replace smart entrance control unit.
No >> Check harness for open or short between smart entrance control unit and trunk lid opener actuator.

HAZARD REMINDER CHECK

1. CHECK HAZARD INDICATOR

Check if hazard indicator flashes with hazard switch.

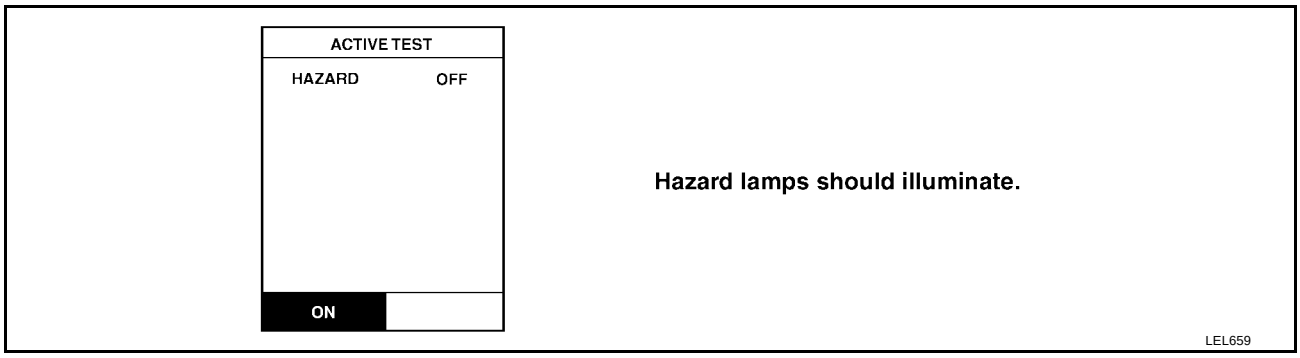
Does hazard indicator operate?

Yes >> GO TO 2.
No >> Check hazard indicator circuit.

2. CHECK HAZARD REMINDER OPERATION

With CONSULT-II

1. Select “ACTIVE TEST” in “MULTI REMOTE ENT” with CONSULT-II.
2. Select “HAZARD” and touch “ON”.



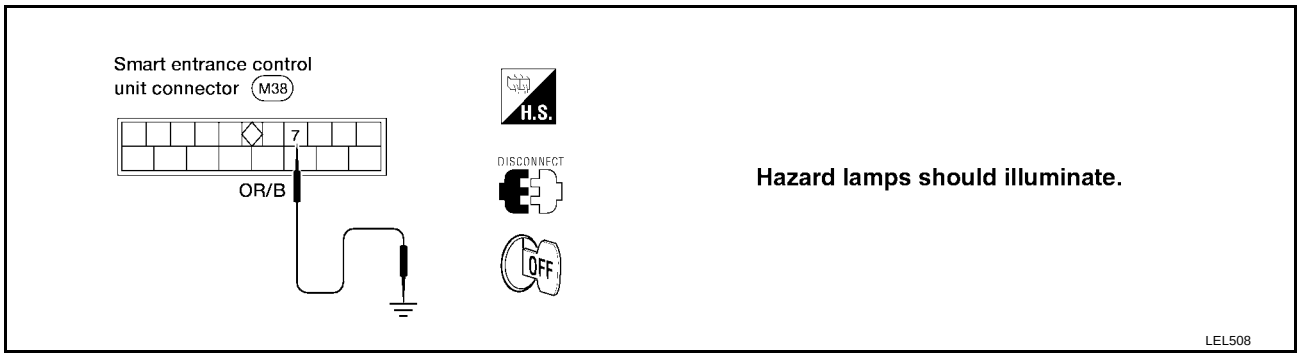
NOTE: If CONSULT-II is not available, skip this procedure and go to the next step.

OK or NG

OK >> Hazard reminder operation is OK.
NG >> GO TO 3.

3. CHECK HAZARD REMINDER OPERATION

1. Disconnect smart entrance control unit harness connector.
2. Apply ground to smart entrance control unit harness connector terminal 7.



Refer to BL-41, "FIG. 3" .

OK or NG

OK >> Replace smart entrance control unit.
NG >> GO TO 4.

4. CHECK REMOTE KEYLESS ENTRY RELAY

Check remote keyless entry relay.

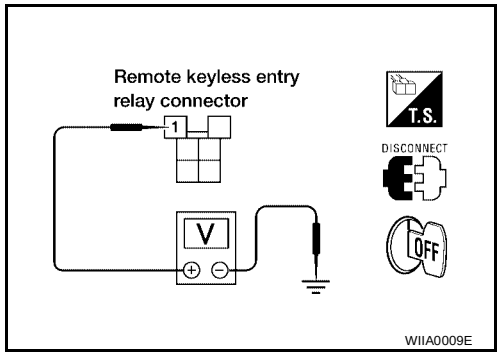
OK or NG

OK >> GO TO 5.
NG >> Replace remote keyless entry relay.

5. CHECK POWER SUPPLY FOR REMOTE KEYLESS ENTRY RELAY

1. Disconnect remote keyless entry relay harness connector.
2. Check voltage between remote keyless entry relay harness connector M11 terminal 1 (W/G) and ground.

Battery voltage should exist.



OK or NG

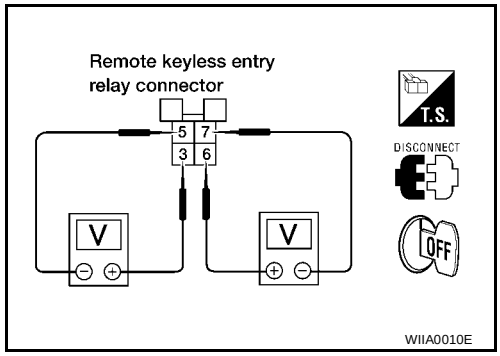
OK >> GO TO 6.
NG >> Check the following.

- 15A fuse [No. 5, located in fuse block (J/B)]
- Harness for open or short between remote keyless entry relay and fuse

6. CHECK REMOTE KEYLESS ENTRY RELAY CIRCUIT

1. Disconnect remote keyless entry relay harness connector.
2. Check voltage between remote keyless entry relay harness connector M11 terminals 3 (W/G) and 5 (G/B).
3. Check voltage between remote keyless entry relay harness connector M11 terminals 6 (W/G) and 7 (G/Y).

Battery voltage should exist.



OK or NG

OK >> Check harness for open or short between smart entrance control unit and remote keyless entry relay.
NG >> Check the following.

- Harness for open or short between remote keyless entry relay and fuse
- Harness for open or short between remote keyless entry relay and turn signal lamps

HORN REMINDER CHECK

1. CHECK HORN

Check if horn sounds with horn switch.

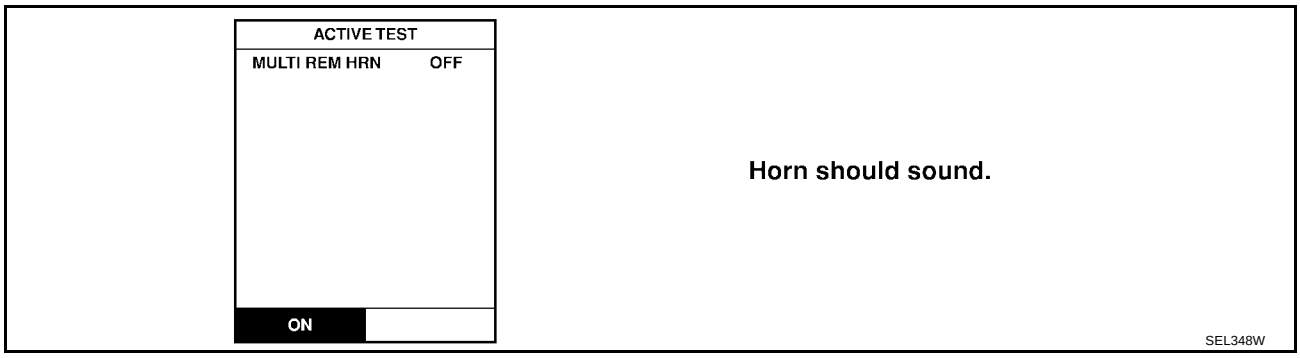
Does horn operate?

Yes >> GO TO 2.
No >> Check horn circuit.

2. CHECK HORN REMINDER OPERATION

With CONSULT-II

1. Select “ACTIVE TEST” in “MULTI REMOTE ENT” with CONSULT-II.
2. Select “MULTI REM HRN” and touch “ON”.



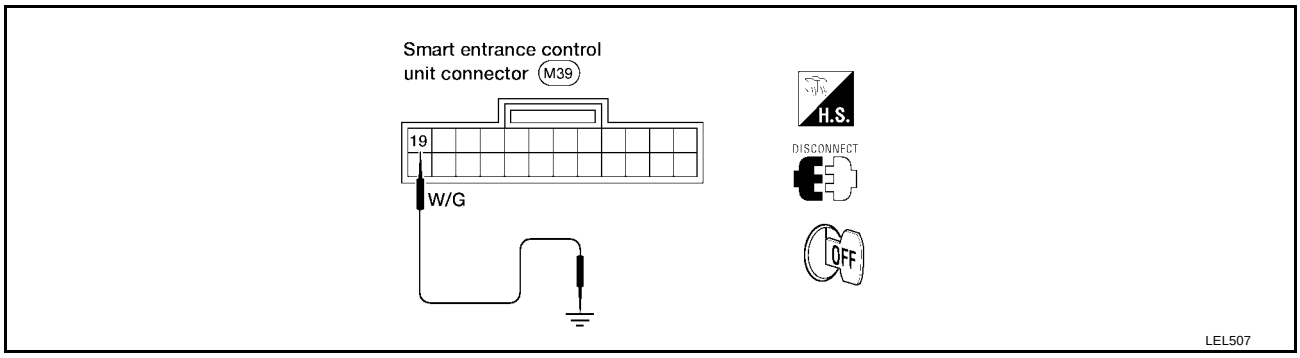
NOTE: If CONSULT-II is not available, skip this procedure and go to the next step.

OK or NG

OK >> Horn reminder operation is OK.
NG >> GO TO 3.

3. CHECK HORN REMINDER OPERATION

1. Disconnect smart entrance control unit harness connector.
2. Apply ground to smart entrance control unit harness connector terminal 19.



Refer to BL-41, "FIG. 3" .

Does horn sound?

Yes >> Replace smart entrance control unit.
No >> Check harness for open or short between smart entrance control unit and horn relay.

INTERIOR LAMP OPERATION CHECK

1. CHECK INTERIOR LAMP

Check if the interior lamp switch is in the “ON” position and the lamp illuminates.

Does interior lamp illuminate?

Yes >> GO TO 2.

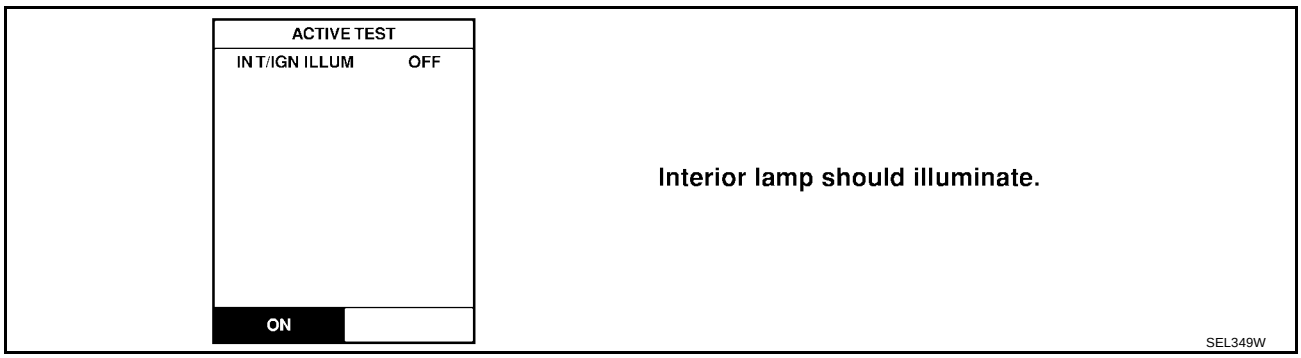
No >> Check the following.

- Harness for open or short between smart entrance control unit and interior lamp
- Interior lamp

2. CHECK INTERIOR LAMP OPERATION

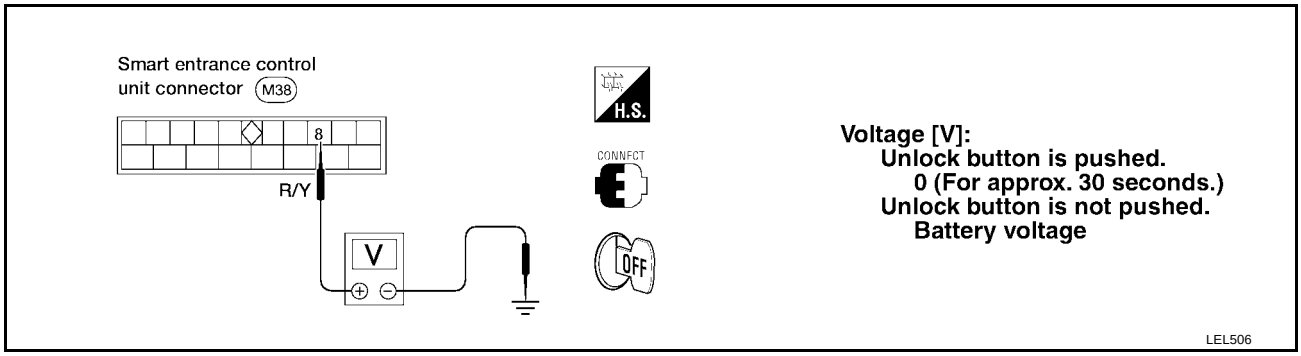
With CONSULT-II

1. Select “ACTIVE TEST” in “MULTI REMOTE ENT” with CONSULT-II.
2. Select “INT/IGN ILLUM” and touch “ON”.



Without CONSULT-II

Push unlock button of keyfob with all doors closed, and check voltage between smart entrance control unit harness connector terminal 8 and ground.



Refer to BL-40, "FIG. 2" .

OK or NG

OK >> System is OK.

NG >> Check harness open or short between smart entrance control unit and interior lamp.

ID Code Entry Procedure

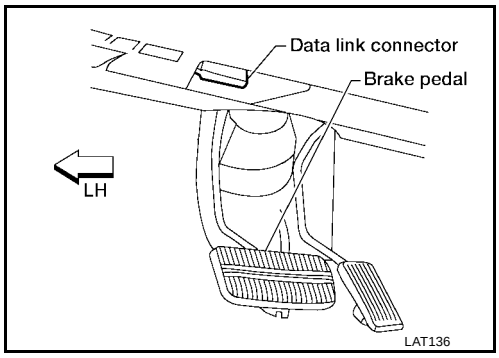
EIS0015B

KEYFOB ID SET UP WITH CONSULT-II

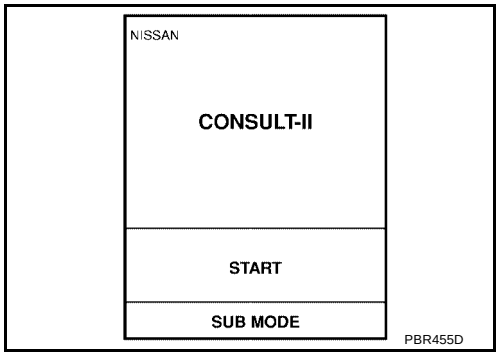
NOTE:

If a keyfob is lost, the ID code of the lost keyfob must be erased to prevent unauthorized use. When the ID code of a lost keyfob is not known, all keyfob ID codes should be erased. After all ID codes are erased, the ID codes of all remaining and/or new keyfobs must be re-registered.

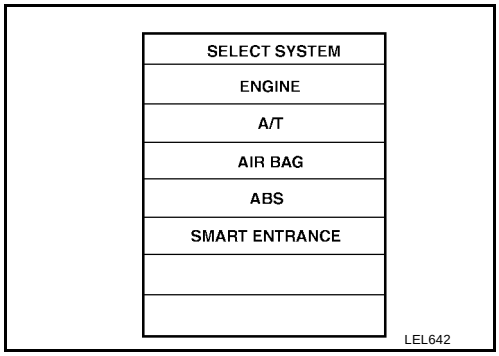
1. Turn ignition switch “OFF”.



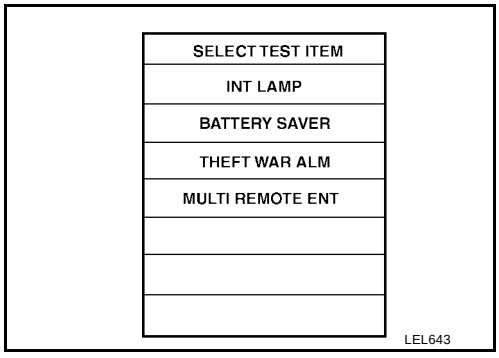
2. Connect “CONSULT-II” to the data link connector.
3. Turn ignition switch “ON”.



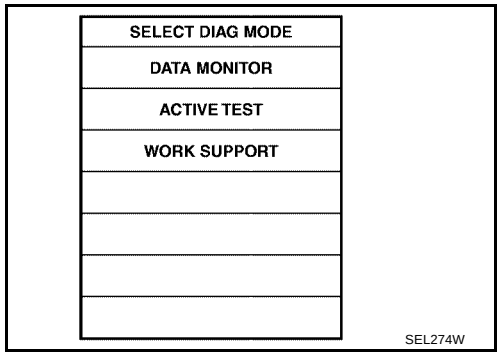
4. Touch “START”.
5. Touch “SMART ENTRANCE”.



6. Touch “MULTI REMOTE ENT”.



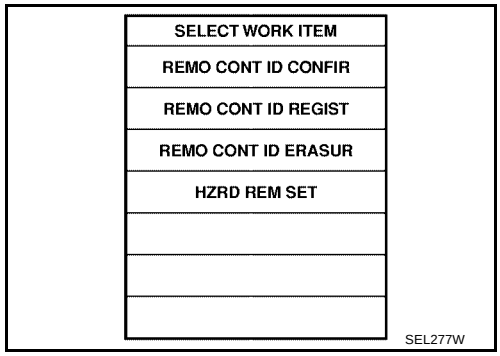
7. Touch “WORK SUPPORT”.



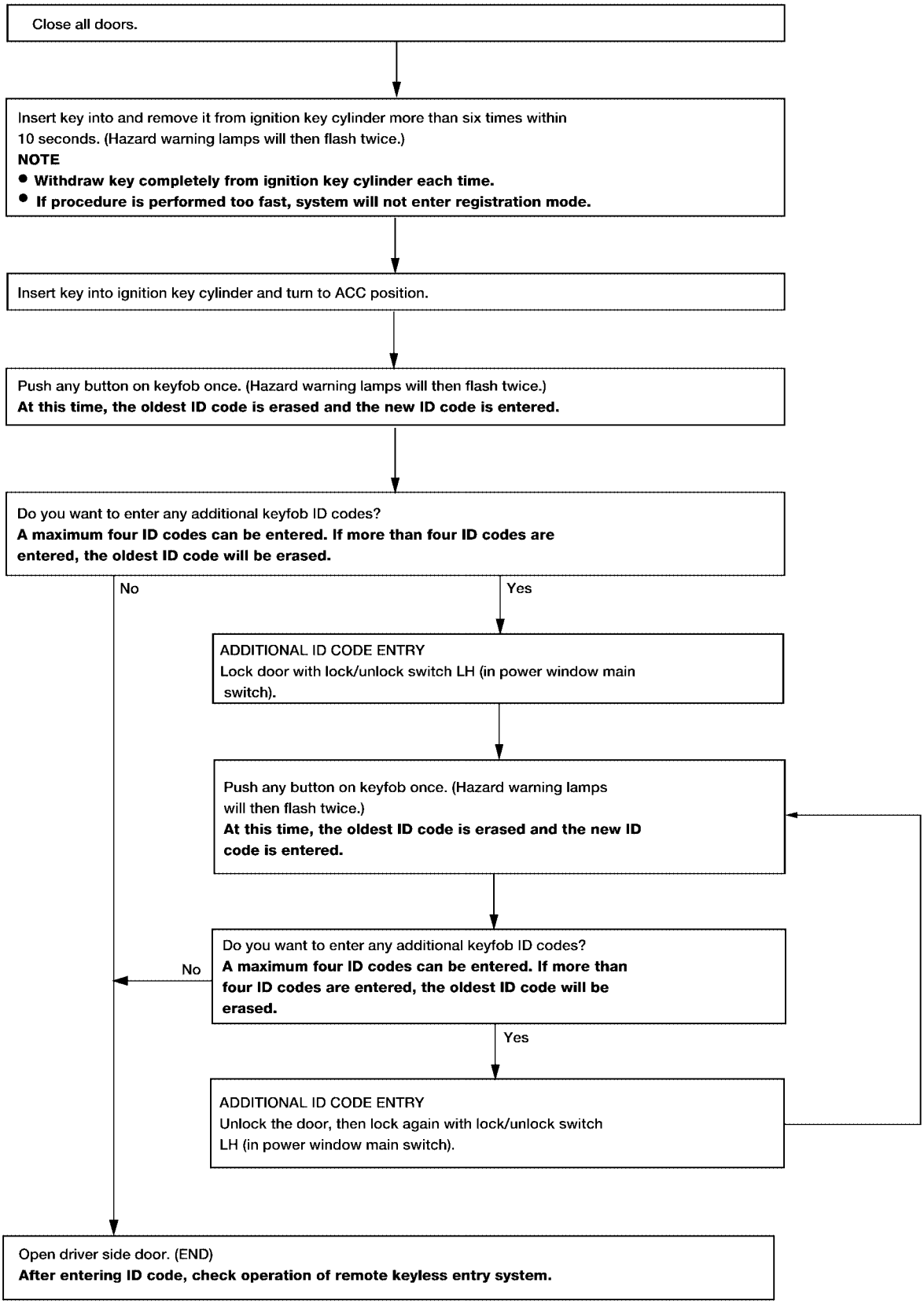
8. The items are shown that can be set up.
   - “REMO CONT ID CONFIR”
     Use this mode to confirm if a keyfob ID code is registered or not.
   - “REMO CONT ID REGIST”
     Use this mode to register a keyfob ID code.

   NOTE:
   Register the ID code when keyfob or smart entrance control unit is replaced, or when additional keyfob is required.

   - “REMO CONT ID ERASUR”
     Use this mode to erase a keyfob ID code.
   - “HZRD REM SET”
     Use this mode to activate or deactivate the hazard and horn reminder.



KEYFOB ID SET UP WITHOUT CONSULT-II



WIIA0011E

NOTE:

- If a keyfob is lost, the ID code of the lost keyfob must be erased to prevent unauthorized use. A specific ID code can be erased with CONSULT-II. However, when the ID code of a lost keyfob is not known, all keyfob ID codes should be erased. After all ID codes are erased, the ID codes of all remaining and/or new keyfobs must be re-registered.
  To erase all ID codes in memory, register one ID code (keyfob) four times. After all ID codes are erased, the ID codes of all remaining and/or new keyfobs must be re-registered.
- When registering an additional keyfob, the existing ID codes in memory may or may not be erased. If four ID codes are stored in memory, when an additional code is registered, only the oldest code is erased. If less than four ID codes are stored in memory, when an additional ID code is registered, the new ID code is added and no ID codes are erased.
- If you need to activate more than two additional new keyfobs, repeat the procedure “Additional ID code entry” for each new keyfob.
- Entry of maximum four ID codes is allowed. When more than four ID codes are entered, the oldest ID code will be erased.
- Even if same ID code that is already in the memory is input, the same ID code can be entered. The code is counted as an additional code.

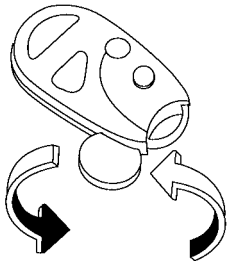
Keyfob Battery Replacement

EIS0015C

NOTE:

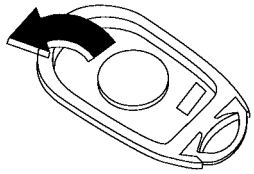
- Be careful not to touch the circuit board or the battery terminal.
- The keyfob is water-resistant. However, if it does get wet, immediately wipe it dry.

1.



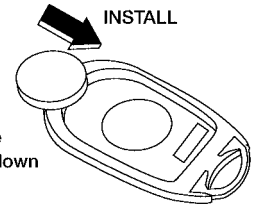
Open the lid using a coin.

2.



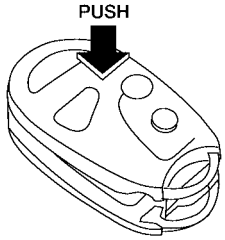
Remove the battery.

3.



Insert the new battery.

4.



Close the lid securely.
Push the keyfob button two or three times to check its operation.

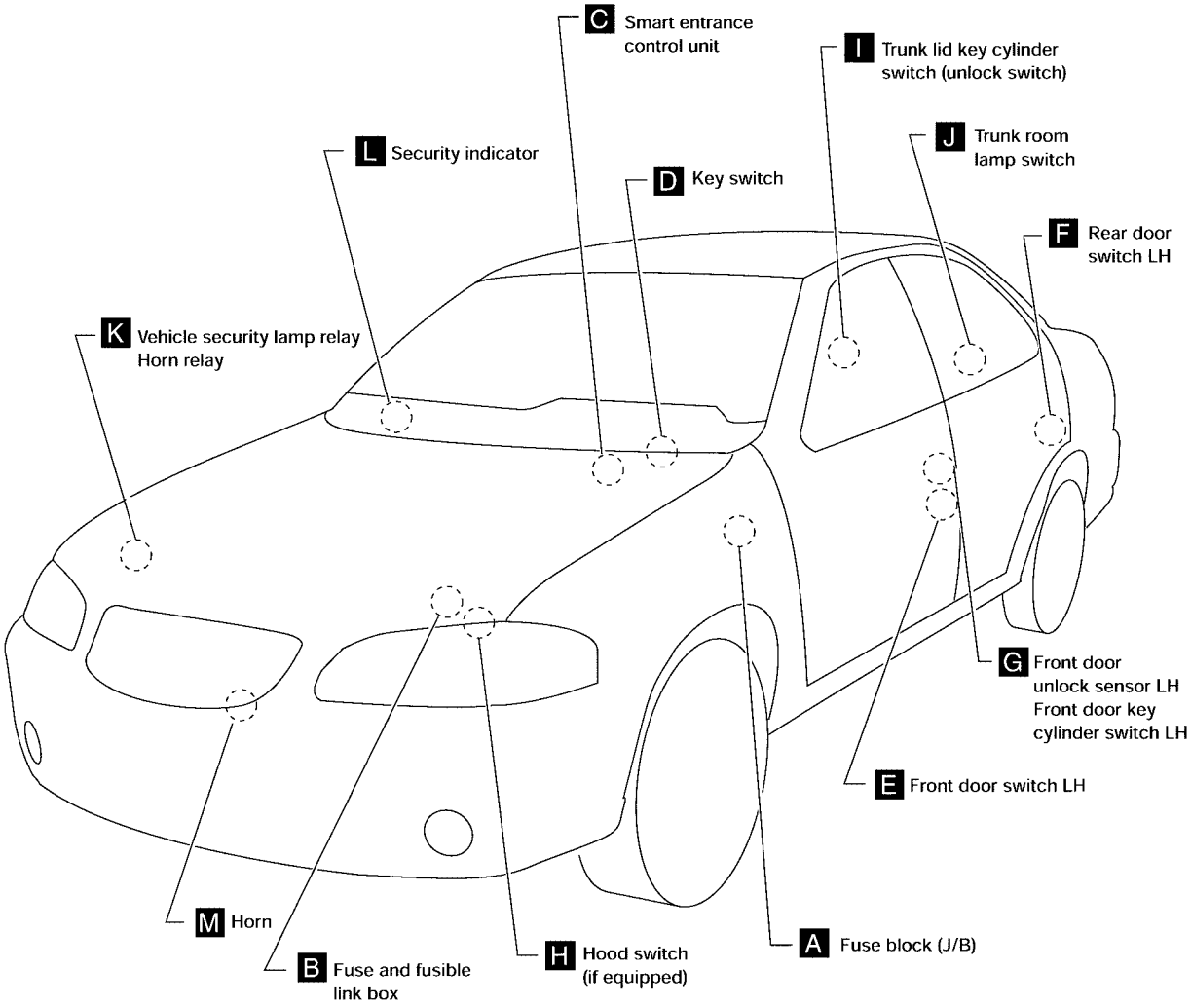
WIIA0012E

VEHICLE SECURITY (THEFT WARNING) SYSTEM

PFP:00100

Component Parts and Harness Connector Location

EIS0015D



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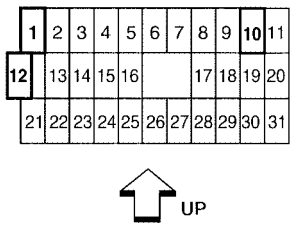
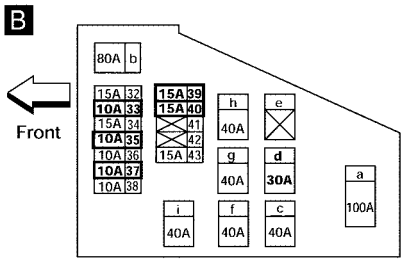
A

Fuse block (J/B)

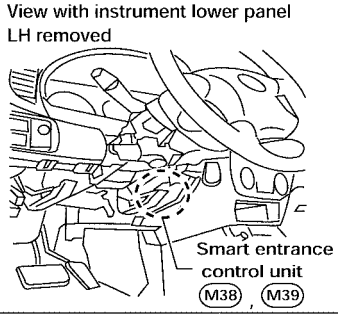


B



No. 32 - 43 : FUSE a - i : FUSIBLE LINK

C



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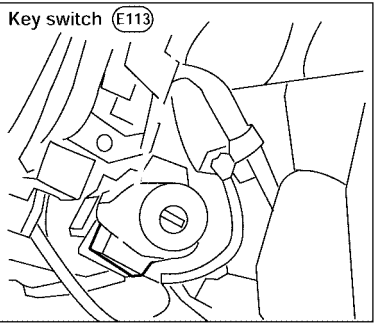

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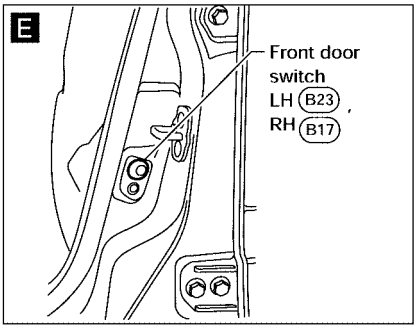

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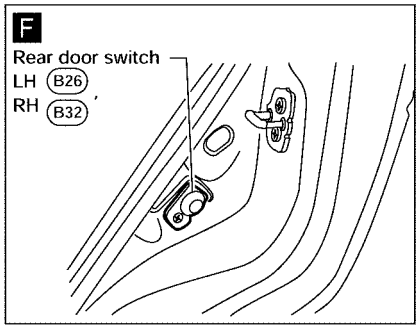

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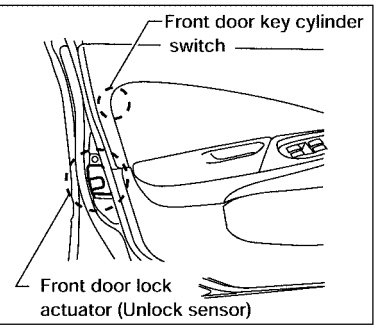

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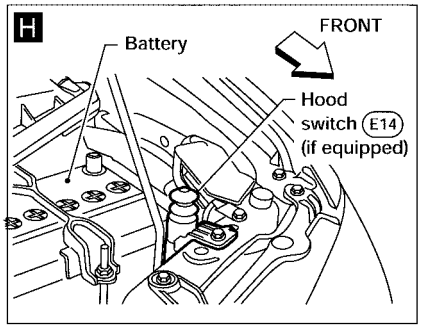

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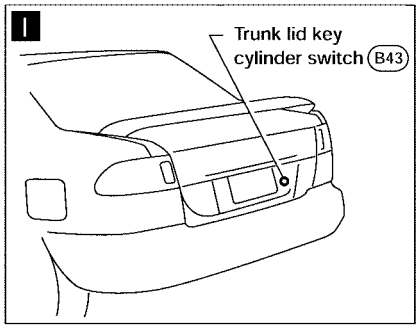

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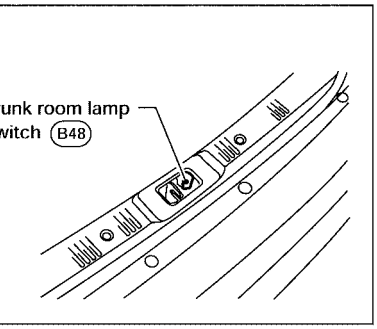
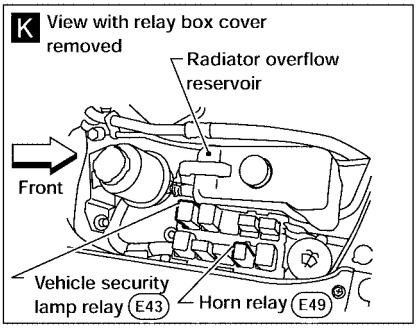


K



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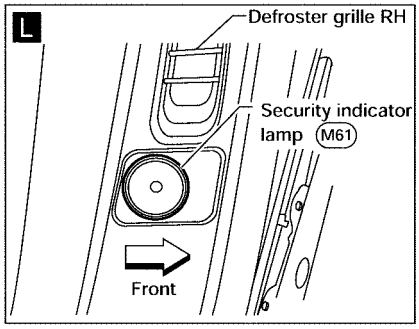

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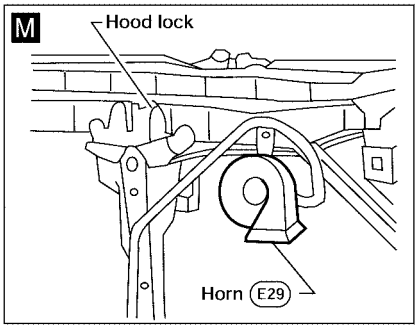


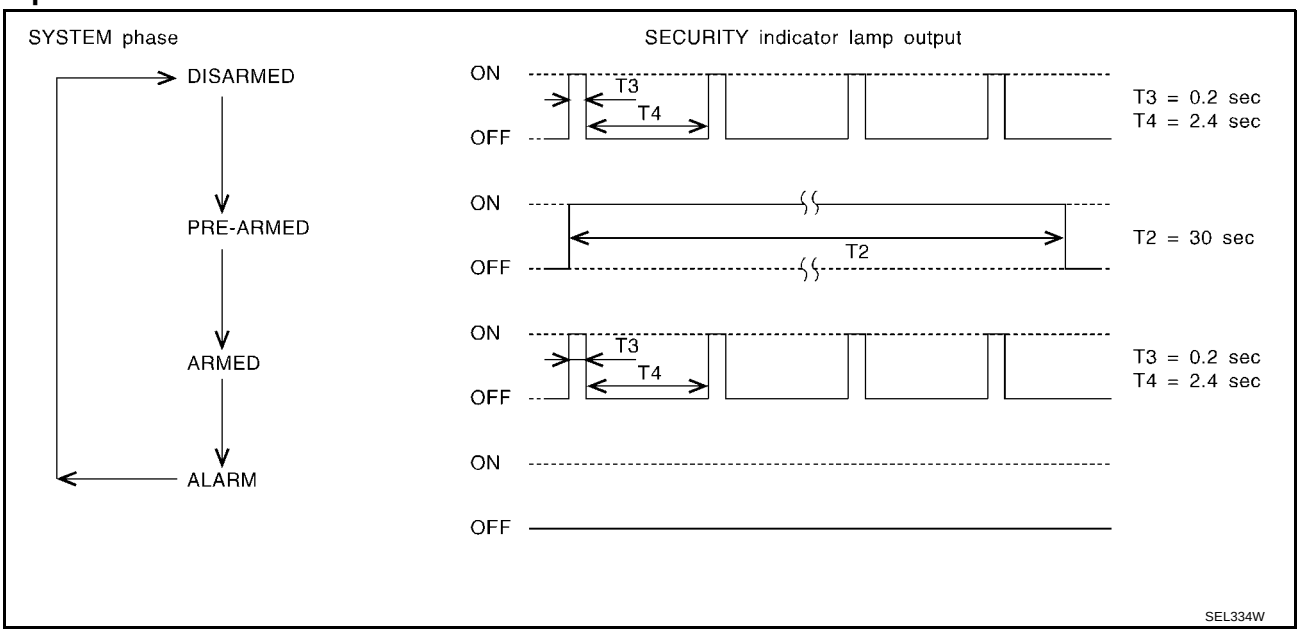
LIIA0595E

System Description

EIS0015E

DESCRIPTION

1. Operation Flow



2. Setting The Vehicle Security System

Initial condition

1. Ignition switch is in OFF position.

Disarmed phase

When the vehicle security system is in the disarmed phase, the security indicator lamp blinks every 2.6 seconds.

Pre-armed phase and armed phase

When the following operation 1 or 2 is performed, the vehicle security system turns into the “pre-armed” phase. (The security indicator lamp illuminates.)

1. Smart entrance control unit receives LOCK signal from key cylinder switch or keyfob after hood, trunk lid and all doors are closed.
2. Hood (if equipped with hood switch), trunk lid and all doors are closed after front doors are locked by key, lock/unlock switch or keyfob.

After about 30 seconds, the system automatically shifts into the “armed” phase (the system is set). (The security indicator lamp blinks every 2.6 seconds.)

3. Canceling The Set Vehicle Security System

When the following 1 or 2 operation is performed, the armed phase is canceled.

1. Unlock the doors with the key or keyfob.
2. Open the trunk lid with the key or keyfob.

4. Activating The Alarm Operation of The Vehicle Security System

Make sure the system is in the armed phase. (The security indicator lamp blinks every 2.6 seconds.)
When the following operation 1 or 2 is performed, the system sounds the horns and flashes the headlamps for about 50 seconds.

1. Engine hood (if equipped with hood switch), trunk lid or any door is opened during armed phase.
2. Disconnecting and connecting the battery connector before canceling armed phase.

POWER SUPPLY AND GROUND

Power is supplied at all times:

- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to security indicator lamp terminal 1 and
- to key switch terminal 2.

Power is supplied at all times:

- through 10A fuse (No. 37, located in the fuse and fusible link box)
- to smart entrance control unit terminal 10.

With the ignition switch in the ON or START position, power is supplied:

- through 10A fuse [No. 10, located in the fuse block (J/B)]
- to smart entrance control unit terminal 33.

With the ignition switch in the ACC or ON position, power is supplied:

- through 10A fuse [No. 1, located in the fuse block (J/B)]
- to smart entrance control unit terminal 21.

Ground is supplied:

- to smart entrance control unit terminal 16
- through body grounds M28 and M54.

INITIAL CONDITION TO ACTIVATE THE SYSTEM

The operation of the vehicle security system is controlled by the doors, hood (if equipped with hood switch) and trunk lid.

Pattern A

To activate the vehicle security system, the smart entrance control unit must receive signals indicating the doors, hood (if equipped with hood switch) and trunk lid are closed.
When a door is open, smart entrance control unit terminal 28 or 29 receives a ground signal from each door switch.
On vehicles equipped with hood switch, when the hood is open, smart entrance control unit terminal 27 receives a ground signal:

- from terminal + of the hood switch
- to terminal - of the hood switch
- through body grounds E7 and E37.

When the trunk lid is open, smart entrance control unit terminal 38 receives a ground signal:

- from terminal + of the trunk room lamp switch
- to terminal - of the trunk room lamp switch
- through body grounds B13 and B19.

When smart entrance control unit receives LOCK signal from key cylinder switch or keyfob and none of the described conditions exist, the vehicle security system will automatically shift to armed mode.

Pattern B

To activate the vehicle security system, the smart entrance control unit must receive signal indicating any door [including hood (if equipped with hood switch) and trunk lid] is opened.
When the front doors are locked with key, lock/unlock switch or keyfob and then all doors are closed, the vehicle security system will automatically shift to armed mode.

VEHICLE SECURITY SYSTEM ACTIVATION

Pattern A

With all doors closed (including hood and trunk lid), if the key is used to lock doors, smart entrance control unit terminal 41 receives a ground signal:

- from terminal L of the front door key cylinder switch LH
- to terminal E of the front door key cylinder switch LH
- through body grounds M28 and M54.

If this signal, or lock signal from keyfob is received by the smart entrance control unit, the vehicle security system will activate automatically.

NOTE:
Vehicle security system can be set even though all doors are not locked.

Pattern B

With any door open, if lock/unlock switch is used to lock doors, smart entrance control unit terminal 23 receives a ground signal:

- from terminal 14 of main power window and door lock/unlock switch

- to terminal 3 of main power window and door lock/unlock switch, or
- from terminal 1 of door lock/unlock switch RH
- to terminal 5 of door lock/unlock switch RH
- through body grounds M28 and M54.

With any door open, if the key is used to lock doors, smart entrance control unit terminal 41 receives a ground signal:

- from terminal L of the front door key cylinder switch LH
- to terminal E of the front door key cylinder switch LH
- through body grounds M28 and M54.

If these signals and lock signal from keyfob are received by the smart entrance control unit and ground signals of terminals 36 and 37 are interrupted (both front doors locked), the vehicle security system will activate automatically.

NOTE:
Vehicle security system can be set even though the rear door is not locked.
Once the vehicle security system has been activated, smart entrance control unit terminal 31 supplies ground to terminal 2 of the security indicator lamp.
The security indicator lamp will illuminate for approximately 30 seconds and then blink every 2.6 seconds.
Now the vehicle security system is in armed phase.

VEHICLE SECURITY SYSTEM ALARM OPERATION

The vehicle security system is triggered by:

- opening a door
- opening the hood (if equipped with hood switch) or the trunk lid
- detection of battery disconnect and connect.

Once the vehicle security system is in armed phase, if the smart entrance control unit receives a ground signal at terminal 28 or 29 (door switch), 38 (trunk room lamp switch) or 27 [hood switch (if equipped)], the vehicle security system will be triggered. The headlamps flash and the horn sounds intermittently.
Power is supplied at all times:

- through 15A fuse (No. 39, located in fuse and fusible link box)
- to vehicle security lamp relay terminal 3,
- through 15A fuse (No. 40, located in fuse and fusible link box)
- to vehicle security lamp relay terminal 6,
- through 10A fuse (No, 35 located in fuse and fusible link box)
- to vehicle security lamp relay terminal 1
- through 10A fuse (No. 33, located in fuse and fusible link box)
- to horn relay terminals 1 and 5.

When the vehicle security system is triggered, ground is supplied intermittently:

- from smart entrance control unit terminal 4
- to horn relay terminal 2 and
- to vehicle security lamp relay terminal 2.

The headlamps flash and the horn sounds intermittently.
The alarm automatically turns off after about 50 seconds but will reactivate if the vehicle is tampered with again.

VEHICLE SECURITY SYSTEM DEACTIVATION

To deactivate the vehicle security system, a door or trunk lid must be unlocked with the key or keyfob.
When the key is used to unlock the door, smart entrance control unit terminal 30 receives a ground signal:

- from terminal U of front door key cylinder switch LH
- to terminal E of front door key cylinder switch LH
- through body grounds M28 and M54.

When the key is used to open the trunk lid, smart entrance control unit terminal 42 receives a ground signal:

- from terminal + of the trunk lid key cylinder switch (unlock switch)
- to terminal - of the trunk lid key cylinder switch (unlock switch)

- through body grounds B13 and B19.

When the smart entrance control unit receives either one of these signals or unlock signal from keyfob, the vehicle security system is deactivated. (Disarmed phase)

PANIC ALARM OPERATION

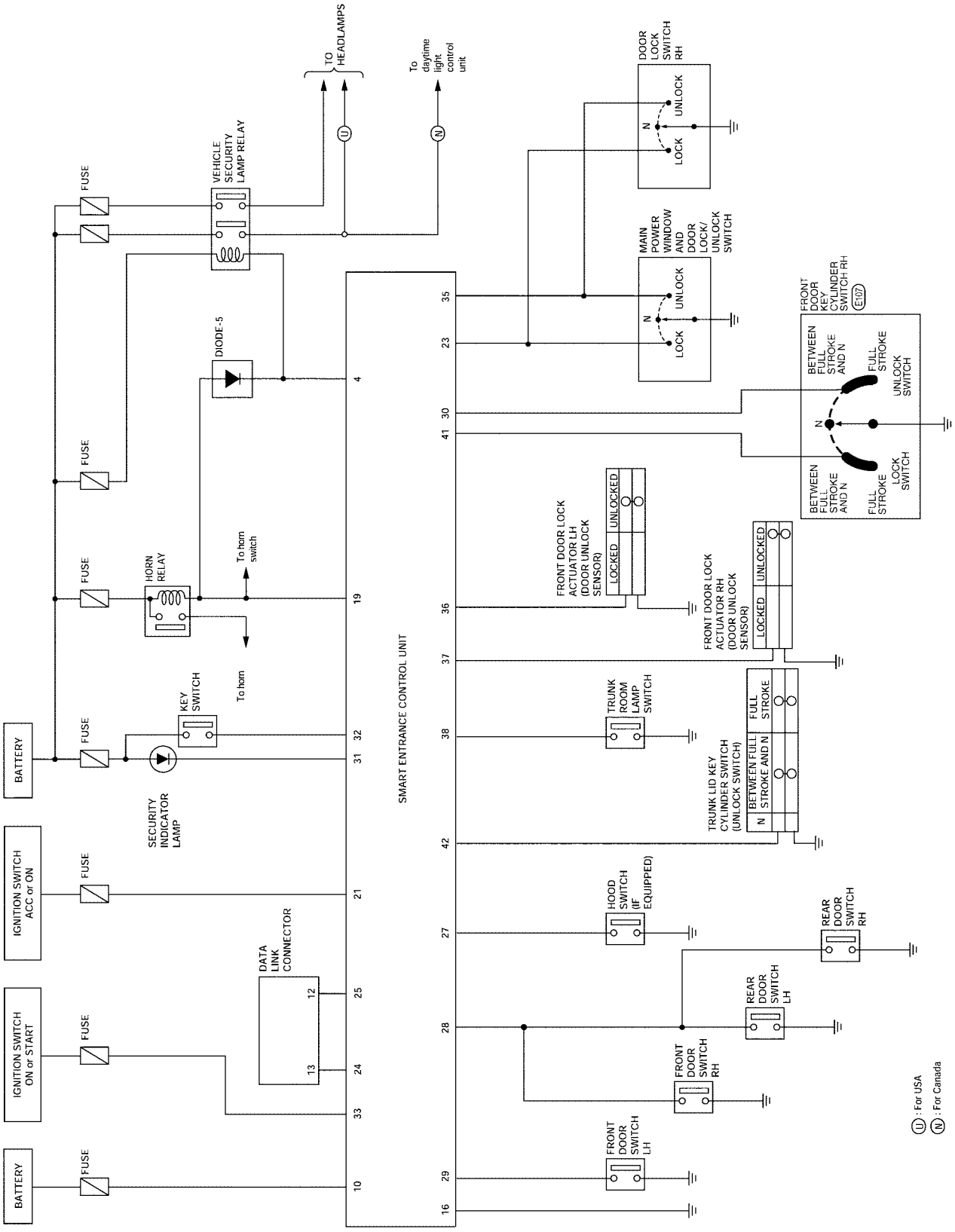
When the remote keyless entry system (panic alarm) is triggered, ground is supplied intermittently:

- from smart entrance control unit terminal 4
- to vehicle security lamp relay terminal 2 and
- to horn relay terminal 2.

The headlamp flashes and the horn sounds intermittently.
The alarm automatically turns off after 25 seconds or when smart entrance control unit receives any signal from keyfob.

Schematic

EIS0015F

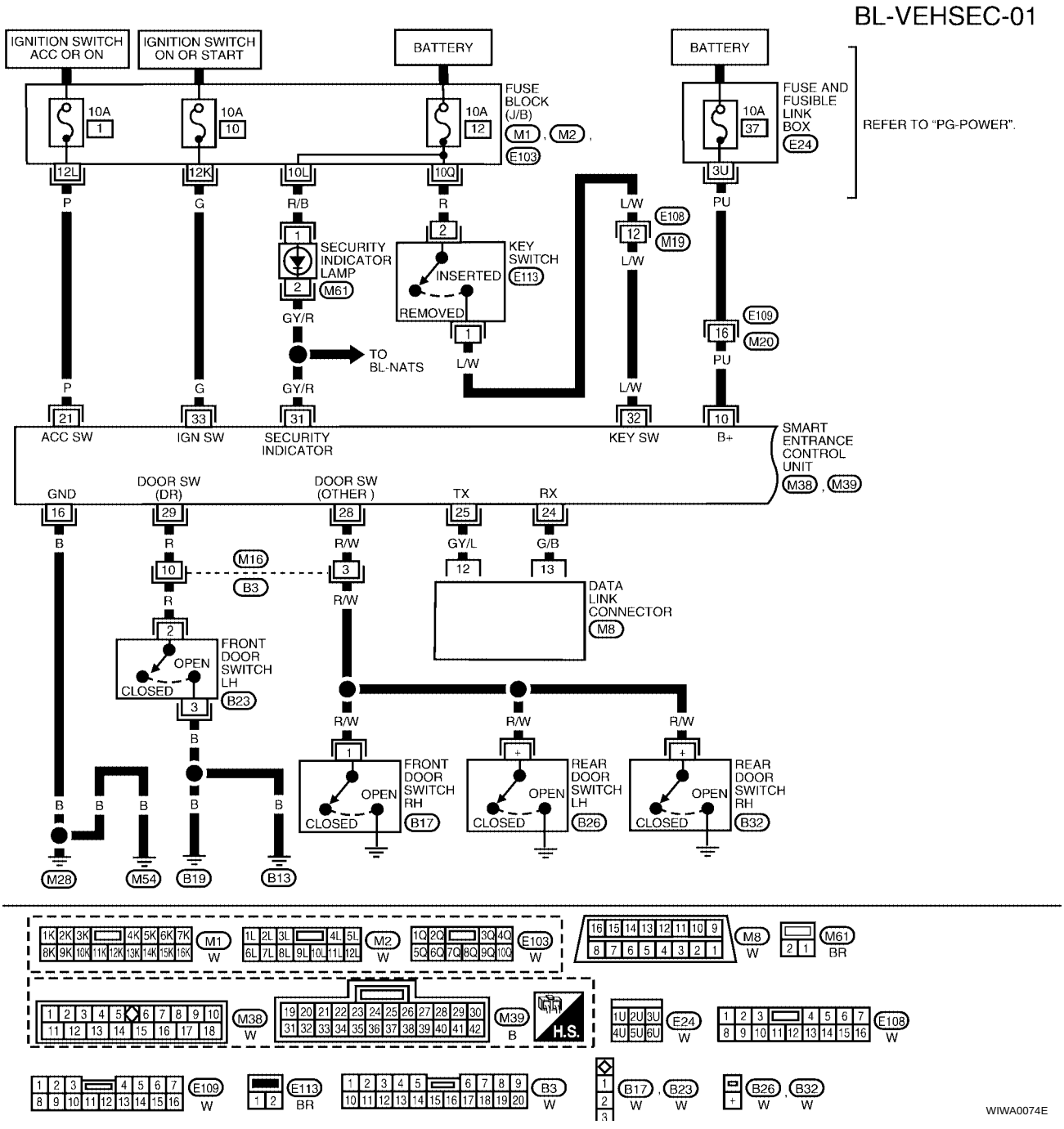


LIWA0120E

Wiring Diagram — VEHSEC —

EIS0015G

FIG. 1



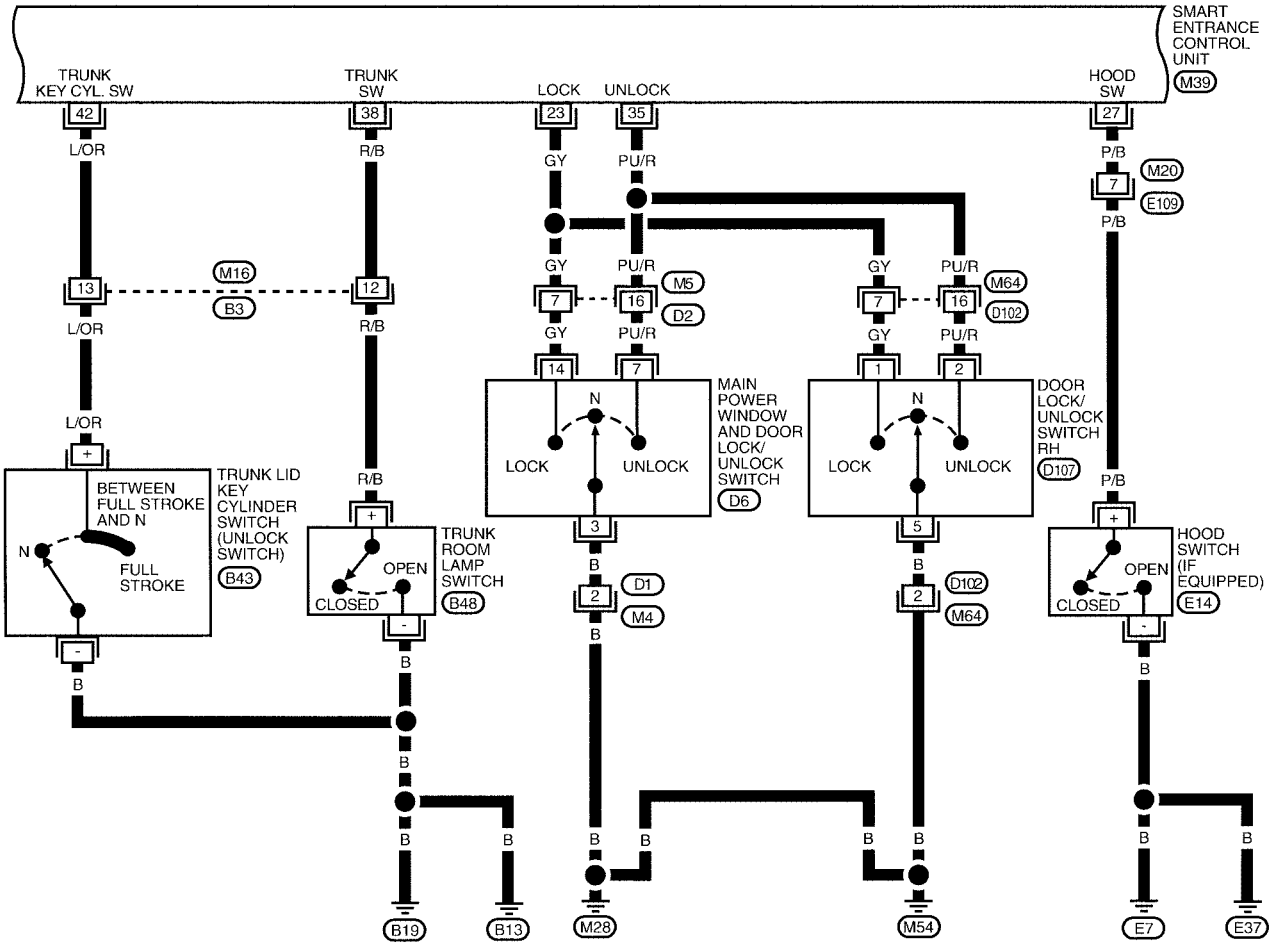
SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

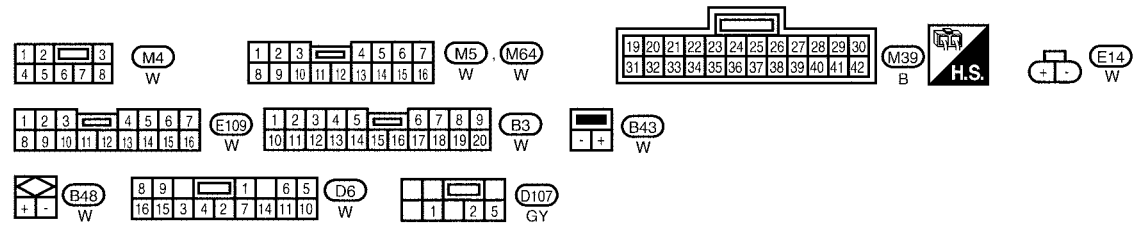
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	PU	POWER SOURCE (FUSE)	—	12V
16	B	GROUND	-------	-------
21	P	IGNITION SWITCH (ACC, ON)	ACC OK ON POSITION	12V
28	R/W	OTHER DOOR SWITCHES	OFF (CLOSED)	5V
			ON (OPEN)	0V
29	R	FRONT DOOR SWITCH LH	OFF (CLOSED)	5V
			ON (OPEN)	0V
32	L/W	IGNITION KEY SWITCH (INSERT)	IGNITION KEY IS INSERTED	12V
			IGNITION KEY IS REMOVED	0V
31	GY/R	VEHICLE SECURITY INDICATOR	GOES OFF	12V
			ILLUMINATES	0V
33	G	IGNITION SWITCH (ON)	IGNITION KEY IS IN ON POSITION	12V
		IGNITION SWITCH (START)	IGNITION KEY IS IN START POSITION	12V

WEL109A

FIG. 2

BL-VEHSEC-02





LIWA0121E

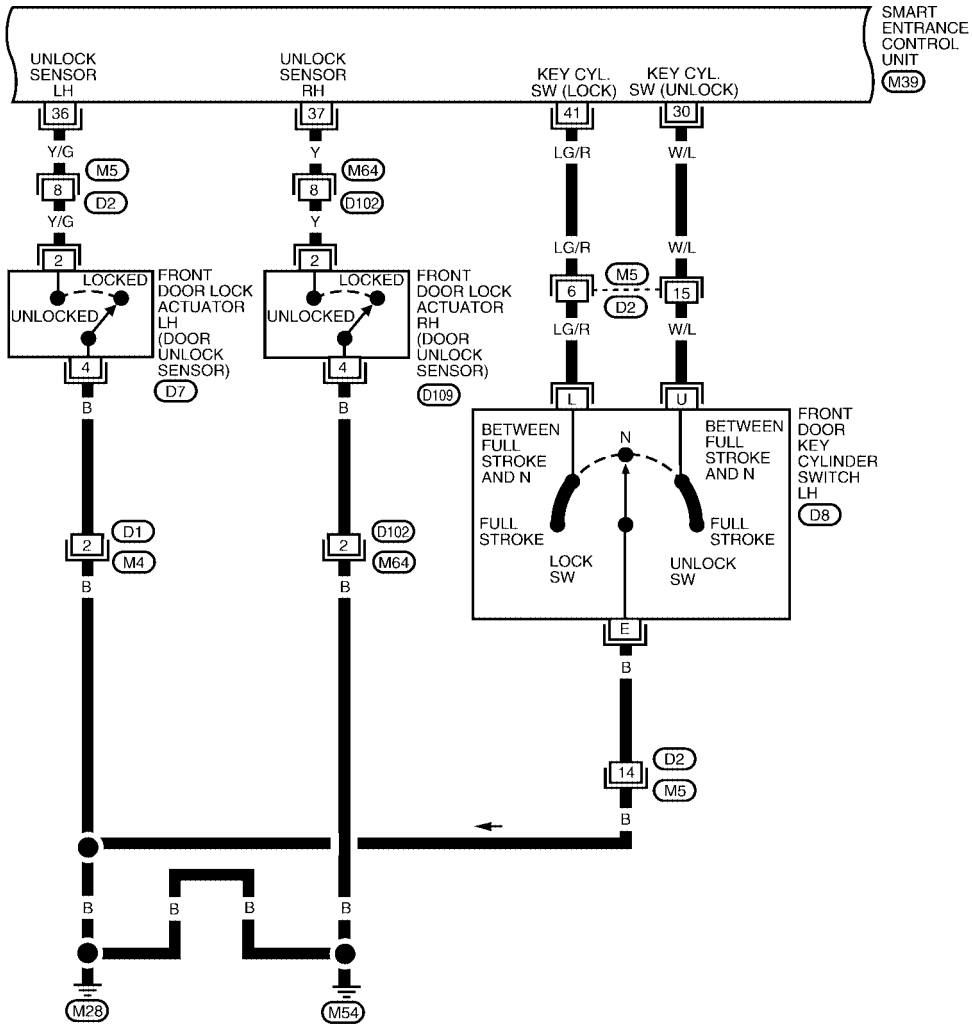
SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

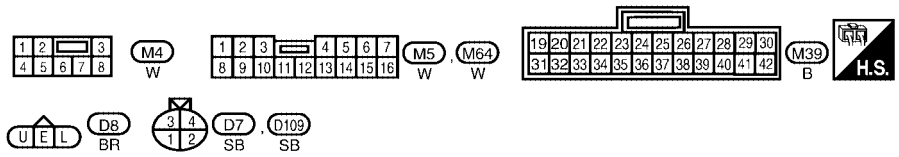
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
23	GY	DOOR LOCK & UNLOCK SWITCHES	NEUTRAL	5V
			LOCKS	0V
27	P/B	HOOD SWITCH (IF EQUIPPED)	ON (OPEN)	0V
			OFF(CLOSED)	5V
35	PU/R	DOOR LOCK & UNLOCK SWITCHES	NEUTRAL	5V
			UNLOCKS	0V
38	R/B	TRUNK ROOM LAMP SWITCH	ON (OPEN)	0V
			OFF (CLOSED)	12V
42	L/OR	TRUNK LID KEY CYLINDER SWITCH	OFF (NEUTRAL)	5V
			ON (UNLOCK)	0V

LIIA0596E

FIG. 3

BL-VEHSEC- 03





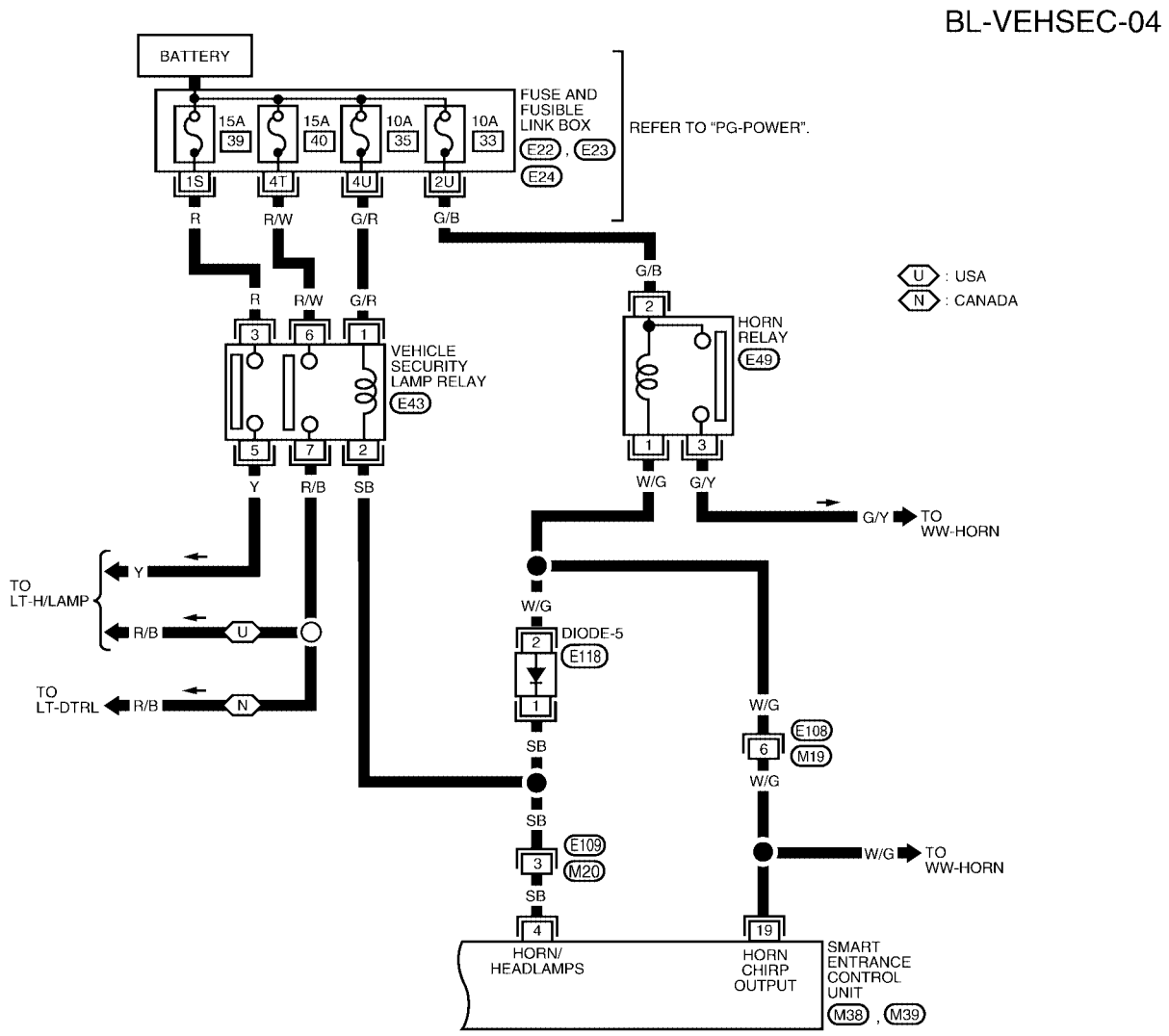
WIWA0039E

SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
30	W/L	DOOR KEY CYLINDER UNLOCK SWITCH	OFF (NEUTRAL)	5V
			ON (UNLOCKED)	0V
36	Y/G	DOOR UNLOCK SENSOR LH	DRIVER DOOR: LOCKED	5V
			DRIVER DOOR: UNLOCKED	0V
37	Y	DOOR UNLOCK SENSOR RH	PASSENGER DOOR: LOCKED	5V
			PASSENGER DOOR: UNLOCKED	0V
41	LG/R	DOOR KEY CYLINDER LOCK SWITCH	OFF (NEUTRAL)	5V
			ON (LOCKED)	0V

LEL615

FIG. 4



SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
4	SB	VEHICLE SECURITY HORN RELAY AND VEHICLE SECURITY WARNING LAMP RELAY	WHEN PANIC ALARM IS OPERATED USING REMOTE CONTROLLER OR WHEN ALARM IS ACTIVATED	12V TO 0V

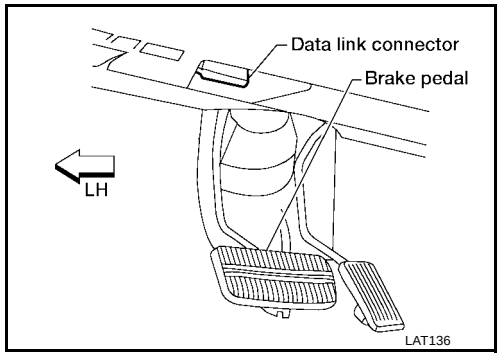
WEL114A

CONSULT-II Inspection Procedure

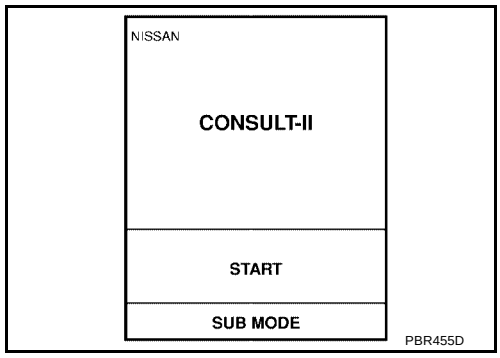
EIS0015H

“THEFT WAR ALM”

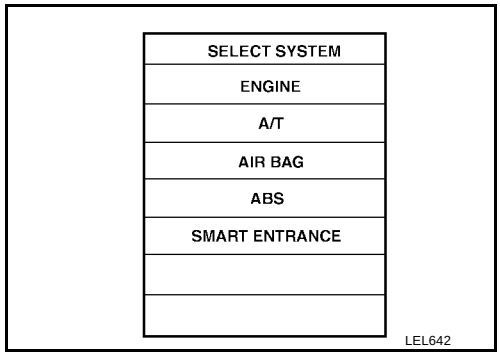
1. Turn ignition switch “OFF”.



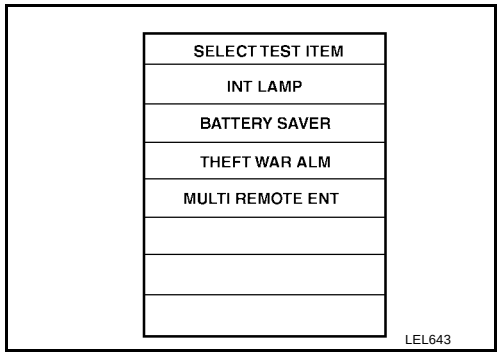
2. Connect “CONSULT-II” to the data link connector.
3. Turn ignition switch “ON”.



4. Touch “START”.
5. Touch “SMART ENTRANCE”.

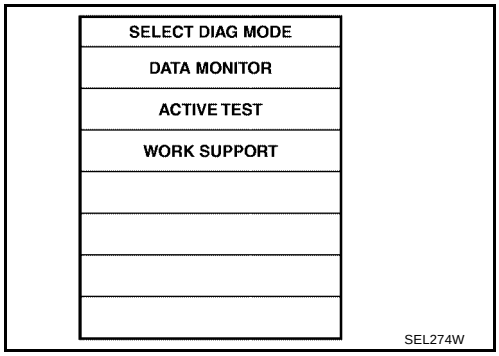


6. Touch “THEFT WAR ALM”.



7. Select diagnosis mode.

"DATA MONITOR", "ACTIVE TEST" and "WORK SUPPORT" are available.



CONSULT-II Application Item

EIS0015I

"THEFT WAR ALM"

Data Monitor

Monitored Item	Description
IGN ON SW	Indicates [ON/OFF] condition of ignition switch.
ACC ON SW	Indicates [ON/OFF] condition of ignition switch in ACC position.
KEY CYL LK SW	Indicates [ON/OFF] condition of lock signal from key cylinder switch.
KEY CYL UN SW	Indicates [ON/OFF] condition of unlock signal from key cylinder switch.
DOOR SW-ALL	Indicates [ON/OFF] condition of door switch (All).
LOCK SIG DR	Indicates [ON/OFF] condition of front door unlock sensor LH.
LOCK SIG AS	Indicates [ON/OFF] condition of front door unlock sensor RH.
TRUNK SW	Indicates [ON/OFF] condition of trunk switch.
TRUNK KEY SW	Indicates [ON/OFF] condition of trunk key cylinder switch.
HOOD SWITCH (if equipped)	Indicates [ON/OFF] condition of hood switch.
LOCK SW DR/AS	Indicates [ON/OFF] condition of lock signal from door lock/unlock switch LH and RH.
UNLK SW DR/AS	Indicates [ON/OFF] condition of unlock signal from door lock/unlock switch LH and RH.
LK BUTTON/SIG	Indicates [ON/OFF] condition of lock signal from keyfob.
UN BUTTON/SIG	Indicates [ON/OFF] condition of unlock signal from keyfob.
TRUNK BTN/SIG	Indicates [ON/OFF] condition of trunk open signal from keyfob.

Active Test

Test Item	Description
THEFT IND	This test is able to check security indicator lamp operation. The lamp will be turned on when "ON" on CONSULT-II screen is touched.
THEFT WAR ALM	This test is able to check theft warning alarm operation. The alarm will be activated for 0.5 seconds after "ON" on CONSULT-II screen is touched.

Work Support

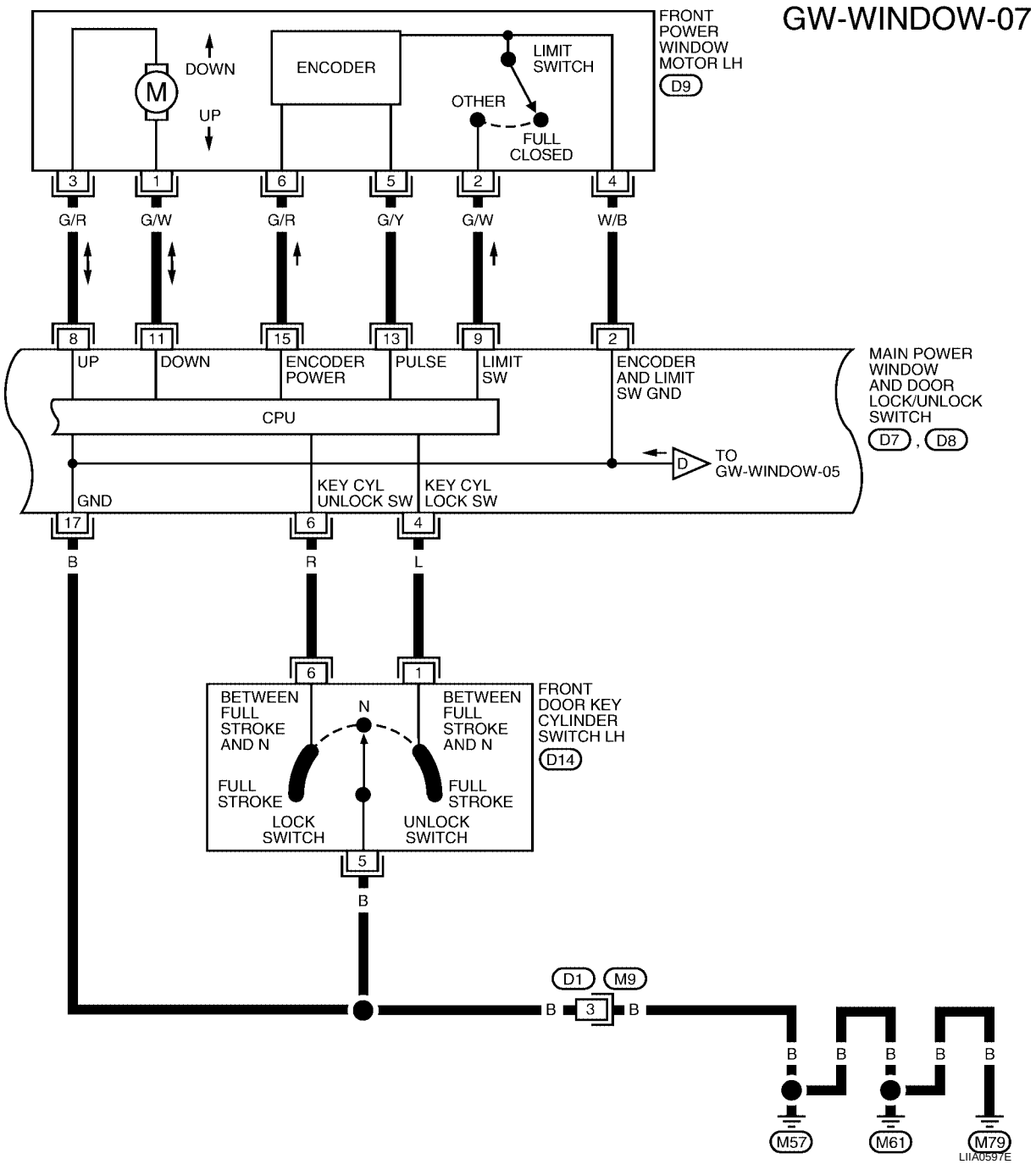
Test Item	Description
THEFT ALM TRG	The switch which triggered theft warning alarm is recorded. This mode is able to confirm and erase the record of theft warning alarm. The trigger data can be erased by touching "CLEAR" on CONSULT-II screen.

Trouble Diagnoses

EIS0015J

PRELIMINARY CHECK

The system operation is canceled by turning ignition switch to “ACC” at any step between START and ARMED in the following flow chart.



For details of “Pattern A” and “Pattern B” vehicle security system settings, refer to BL-67, "INITIAL CONDITION TO ACTIVATE THE SYSTEM" .

*: Refer to BL-95, "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)" .

After performing preliminary check, go to symptom chart on next page.

SYMPTOM CHART

REFERENCE PAGE (BL-)			BL-77	BL-79	BL-80	BL-85	BL-87	BL-88	BL-89	BL-90	BL-92	BL-34
SYMPTOM			PRELIMINARY CHECK	POWER SUPPLY AND GROUND CIRCUIT CHECK	DOOR, HOOD AND TRUNK ROOM LAMP SWITCH CHECK	SECURITY INDICATOR LAMP CHECK	FRONT DOOR UNLOCK SENSOR CHECK	DOOR KEY CYLINDER SWITCH CHECK	TRUNK LID KEY CYLINDER SWITCH CHECK	DOOR LOCK/UNLOCK SWITCH CHECK	VEHICLE SECURITY HORN AND HEADLAMP ALARM CHECK	Check "REMOTE KEYLESS ENTRY SYSTEM" system.
1	Security indicator lamp does not illuminate for 30 seconds.		X	X		X						
	Vehicle security system cannot be set by	All items	X	X	X		X					
		Door outside key	X					X				
		Lock/unlock switch	X							X		
		Keyfob	X									X
2	*1 Vehicle security system does not alarm when ...	One of the doors is opened	X		X							
3	Vehicle security alarm does not activate.	Horn or headlamp alarm	X		X						X	
4	Vehicle security system cannot be canceled by	Door outside key	X					X				
		Trunk lid key	X						X			
		Keyfob	X									X

X: Applicable

*1: Make sure the system is in the armed phase.

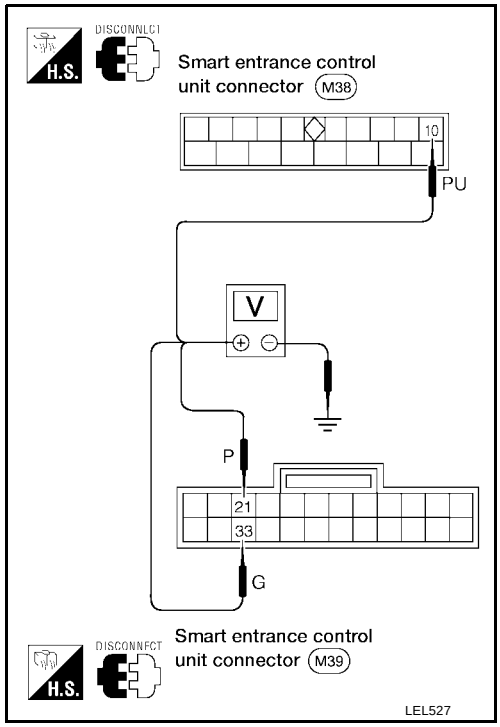
Before starting trouble diagnoses above, perform BL-77, "PRELIMINARY CHECK" .

Symptom numbers in the symptom chart correspond with those of preliminary check.

POWER SUPPLY AND GROUND CIRCUIT CHECK

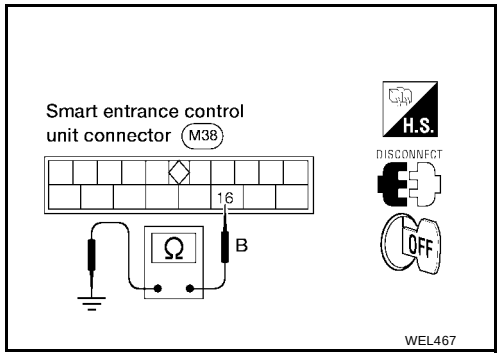
Power Supply Circuit Check

Terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
10	Ground	Battery voltage	Battery voltage	Battery voltage
21	Ground	0V	Battery voltage	Battery voltage
33	Ground	0V	0V	Battery voltage



Ground Circuit Check

Terminals	Continuity
16 - Ground	Yes



DOOR, HOOD AND TRUNK ROOM LAMP SWITCH CHECK

Door Switch Check

1. CHECK DOOR SWITCH INPUT SIGNAL

With CONSULT-II

Check door switches (“DOOR SW-ALL”) in “DATA MONITOR” mode with CONSULT-II.

DATA MONITOR	
MONITOR	
DOOR SW-ALL	OFF

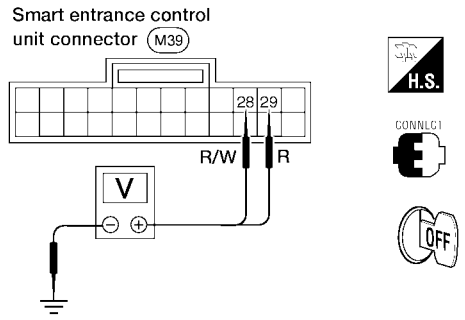
When any doors are open:
DOOR SW-ALL ON

When all doors are closed:
DOOR SW-ALL OFF

SEL323W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminals 28 or 29 and ground.



	Terminals		Condition	Voltage [V]
	(+)	(–)		
Front door switch LH	29	Ground	Open	0
			Closed	Approx. 5
Other door switches	28	Ground	Open	0
			Closed	Approx. 5

WEL500

Refer to BL-71, "FIG. 1" .

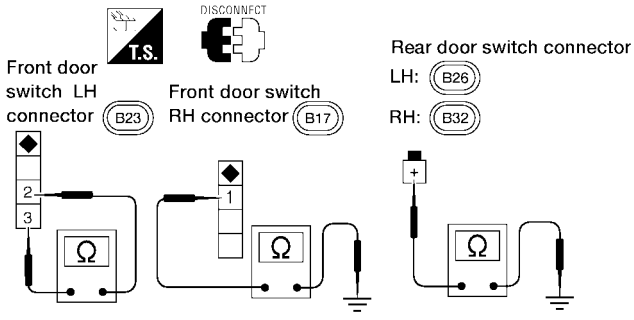
OK or NG

OK >> Door switch is OK. Check hood switch (if equipped), refer to BL-82, "Hood Switch Check (if equipped)" or check trunk room lamp switch, refer to BL-84, "Trunk Room Lamp Switch Check" .

NG >> GO TO 2.

2. CHECK DOOR SWITCH

1. Disconnect door switch connector.
2. Check continuity between door switch terminals.



	Terminals	Condition	Continuity
Front door switch LH	2 - 3	Closed	No
		Open	Yes
Front door switch RH	1 - Ground	Closed	No
		Open	Yes
Rear door switches	(+) - Ground	Closed	No
		Open	Yes

WEL491

OK or NG

OK >> Check the following.
- Door switch ground circuit (Front, rear door) or door switch ground condition
- Harness for open or short between smart entrance control unit and door switch

NG >> Replace door switch.

Hood Switch Check (if equipped)

1. CHECK HOOD SWITCH FITTING CONDITION

Check condition and installation of hood switch.

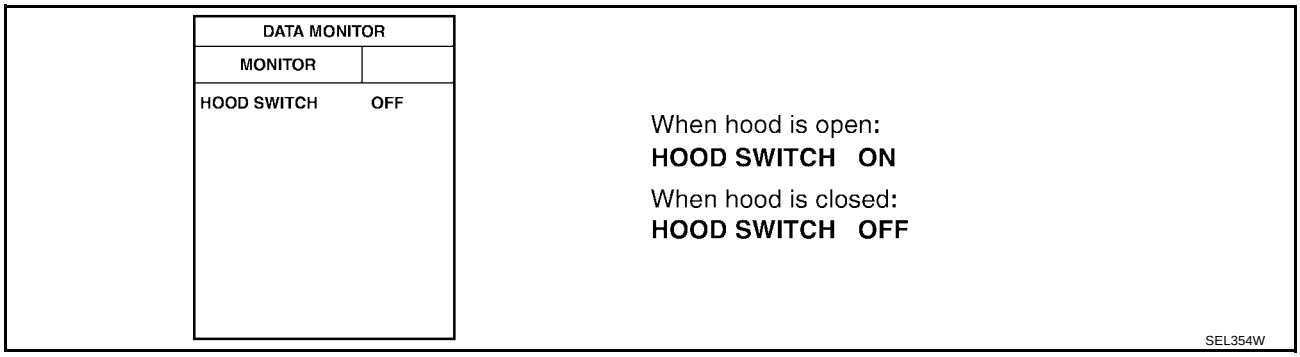
OK or NG

OK >> GO TO 2.
NG >> Adjust installation of hood switch or hood.

2. CHECK HOOD SWITCH INPUT SIGNAL

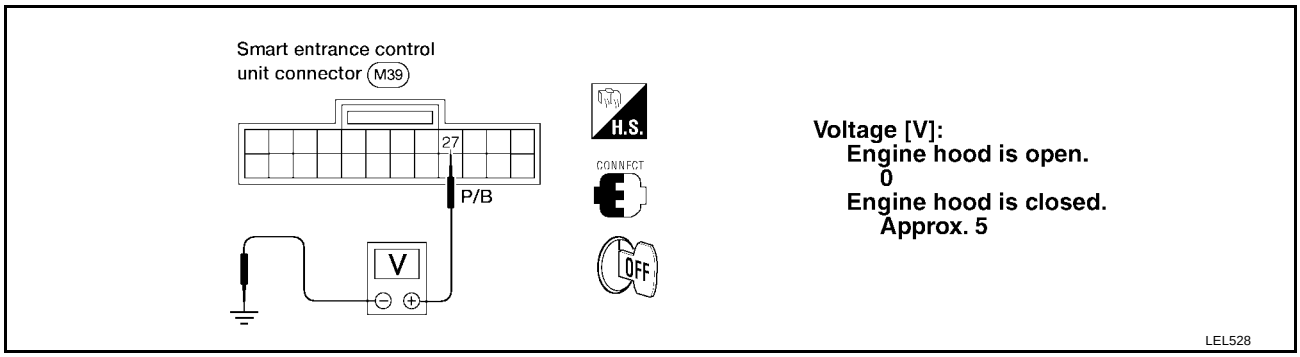
With CONSULT-II

Check hood switch (“HOOD SWITCH”) in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 27 and ground.



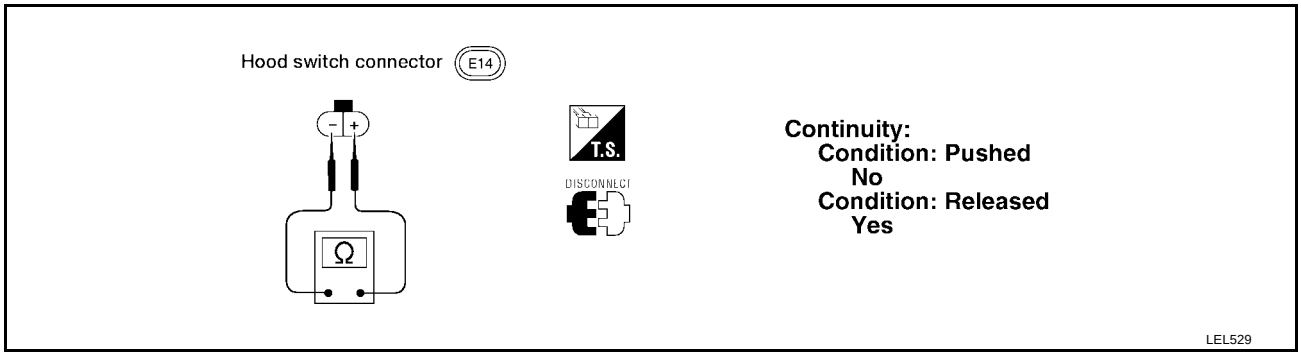
Refer to BL-72, "FIG. 2" .

OK or NG

OK >> Hood switch is OK, and go to trunk room lamp switch check.
NG >> GO TO 3.

3. CHECK HOOD SWITCH

1. Disconnect hood switch connector.
2. Check continuity between hood switch terminals + and –.



OK or NG

OK >> Check the following.
- Hood switch ground circuit
- Harness for open or short between smart entrance control unit and hood switch

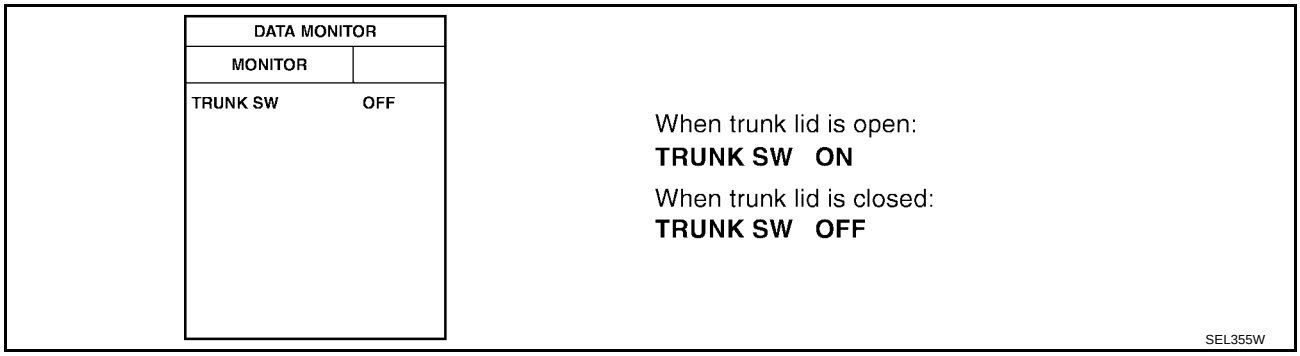
NG >> Replace hood switch.

Trunk Room Lamp Switch Check

1. CHECK TRUNK ROOM LAMP SWITCH INPUT SIGNAL

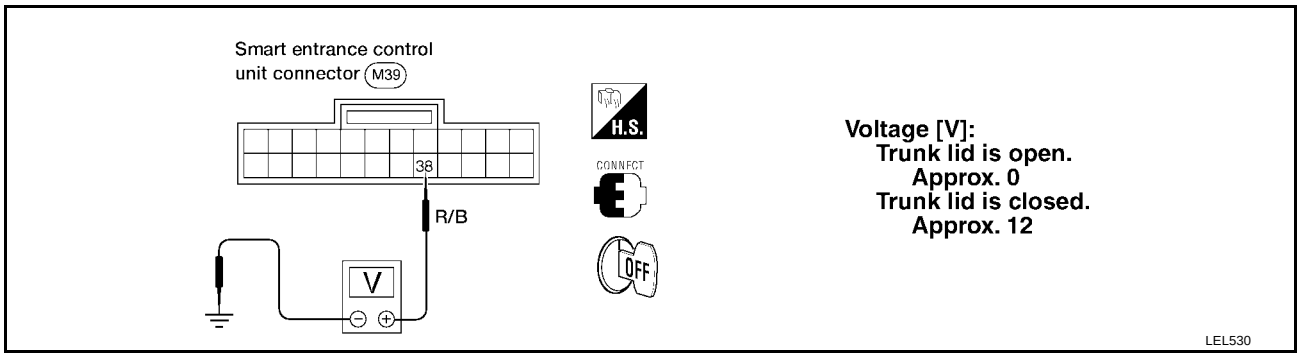
With CONSULT-II

Check trunk room lamp switch (“TRUNK SW”), in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 38 and ground.



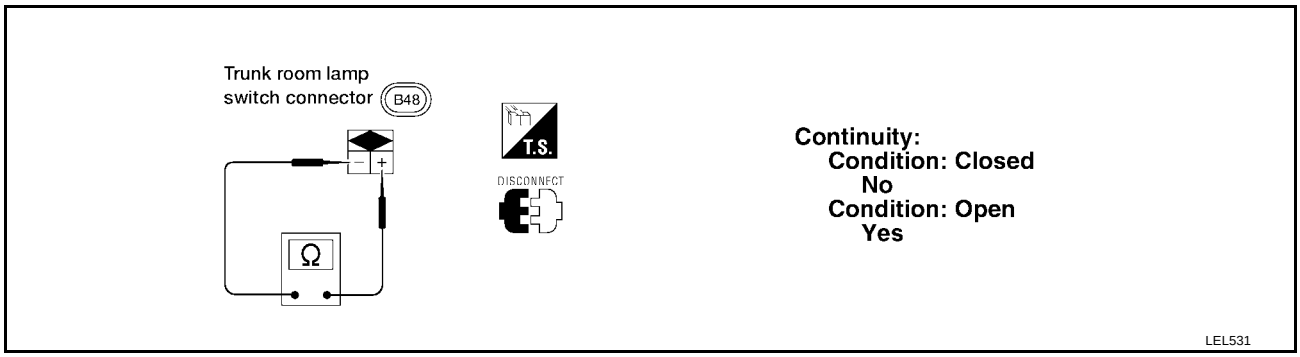
Refer to BL-72, "FIG. 2" .

OK or NG

OK >> Trunk room lamp switch is OK.
NG >> GO TO 2.

2. CHECK TRUNK ROOM LAMP SWITCH

1. Disconnect trunk room lamp switch connector.
2. Check continuity between trunk room lamp switch terminals + and –.



OK or NG

OK >> Check the following.
- Trunk room lamp switch ground circuit
- Harness for open or short between smart entrance control unit and trunk room lamp switch

NG >> Replace trunk room lamp switch.

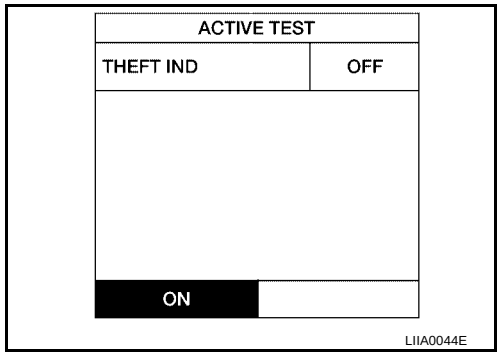
SECURITY INDICATOR LAMP CHECK

1. CHECK INDICATOR LAMP OPERATION

With CONSULT-II

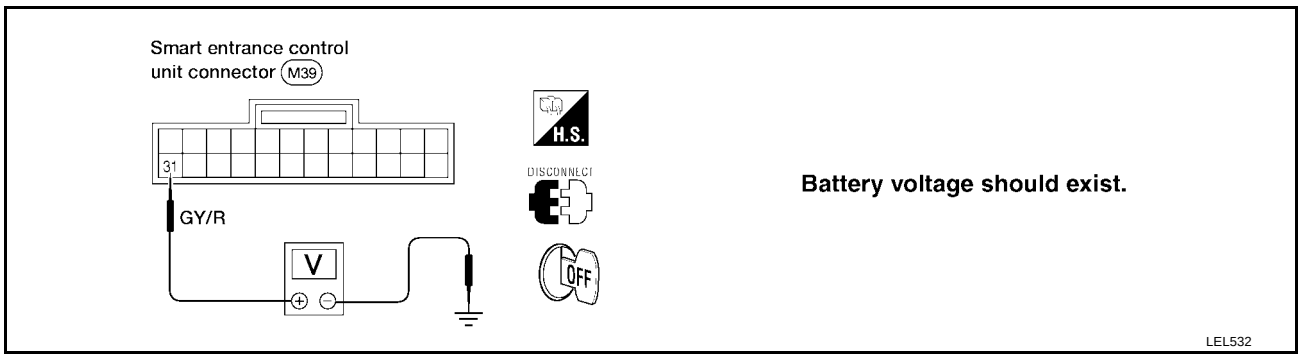
1. Select “ACTIVE TEST” in “THEFT WAR ALM” with CONSULT-II.
2. Select “THEFT IND” and touch “ON”.

Security indicator lamp should illuminate.



Without CONSULT-II

1. Disconnect smart entrance control unit harness connector.
2. Check voltage between smart entrance control unit harness connector terminal 31 and ground.



Refer to BL-71, "FIG. 1" .

OK or NG

OK >> Security indicator lamp is OK.
NG >> GO TO 2.

2. CHECK SECURITY INDICATOR LAMP

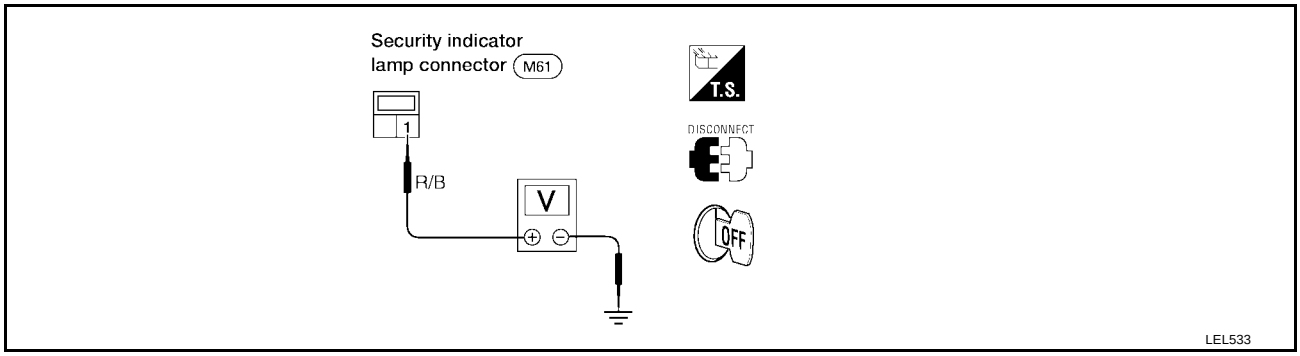
Refer to BL-71, "FIG. 1" .

OK or NG

OK >> GO TO 3.
NG >> Replace security indicator lamp.

3. CHECK POWER SUPPLY CIRCUIT FOR SECURITY INDICATOR LAMP

1. Disconnect security indicator lamp connector.
2. Check voltage between security indicator lamp terminal 1 and ground.



Does battery voltage exist?

Yes >> Check harness for open or short between security indicator lamp and smart entrance control unit.
No >> Check the following.

- 10A fuse [No. 12, located in fuse block (J/B)]
- Harness for open or short between security indicator lamp and fuse

FRONT DOOR UNLOCK SENSOR CHECK

1. CHECK FRONT DOOR UNLOCK SENSOR INPUT SIGNAL

With CONSULT-II

Check front unlock sensor (“LOCK SIG DR”, “LOCK SIG AS”) in “DATA MONITOR” with CONSULT-II.

DATA MONITOR	
MONITOR	
LOCK SIG DR	OFF
LOCK SIG AS	OFF

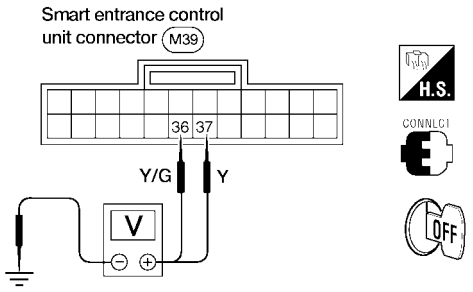
When door is locked:
LOCK SIG DR OFF
LOCK SIG AS OFF

When door is unlocked:
LOCK SIG DR ON
LOCK SIG AS ON

SEL357W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 36 or 37 and ground.



	Terminals (+)	Terminals (–)	Condition	Voltage [V]
Front door LH	36	Ground	Locked	Approx. 5
			Unlocked	0
Front door RH	37	Ground	Locked	Approx. 5
			Unlocked	0

LEL534

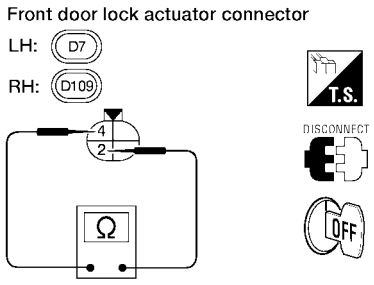
Refer to BL-73, "FIG. 3" .

OK or NG

OK >> Door unlock sensor is OK.
NG >> GO TO 2.

2. CHECK FRONT DOOR UNLOCK SENSOR

1. Disconnect door lock actuator connector.
2. Check continuity between door lock actuator terminals.



Continuity:
Condition: Locked
No
Condition: Unlocked
Yes

LEL535

OK or NG

OK >> Check the following.
- Door unlock sensor ground circuit
- Harness for open or short between smart entrance control unit and door unlock sensor

NG >> Replace door lock actuator.

DOOR KEY CYLINDER SWITCH CHECK

1. CHECK DOOR KEY CYLINDER SWITCH INPUT SIGNAL (LOCK/UNLOCK SIGNAL)

With CONSULT-II

Check front door key cylinder switch (“KEY CYL LK-SW”/“KEY CYL UN-SW”) in “DATA MONITOR” mode with CONSULT-II.

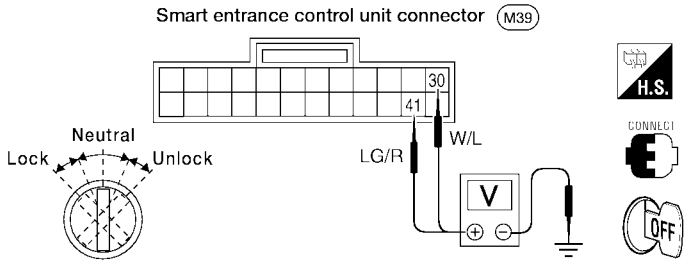
DATA MONITOR	
MONITOR	
KEY CYL LK-SW	OFF
KEY CYL UN-SW	OFF

When key inserted in front key cylinder is turned to LOCK:
KEY CYL LK-SW ON
When key inserted in front key cylinder is turned to UNLOCK:
KEY CYL UN-SW ON

SEL342W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 30 or 41 and ground.



Terminals (+)	Terminals (–)	Key position	Voltage [V]
41	Ground	Neutral/Unlock	Approx. 5
		Lock	0
30	Ground	Neutral/Lock	Approx. 5
		Unlock	0

WEL502

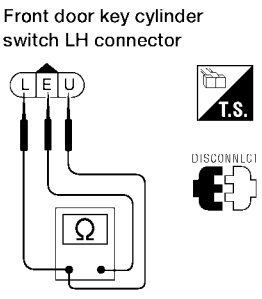
Refer to BL-73, "FIG. 3" .

OK or NG

OK >> Door key cylinder switch is OK.
NG >> GO TO 2.

2. CHECK DOOR KEY CYLINDER SWITCH

1. Disconnect door key cylinder switch connector.
2. Check continuity between door key cylinder switch connector D8 terminals.



Ⓔ : Ground terminal
Ⓤ : Door unlock switch terminal
Ⓛ : Door lock switch terminal

Terminals	Key position	Continuity
Ⓛ - Ⓔ	Neutral/Unlock	No
	Lock	Yes
Ⓤ - Ⓔ	Neutral/Lock	No
	Unlock	Yes

LEL101A

OK or NG

OK >> Check the following.
- Door key cylinder switch ground circuit
- Harness for open or short between smart entrance control unit and door key cylinder switch

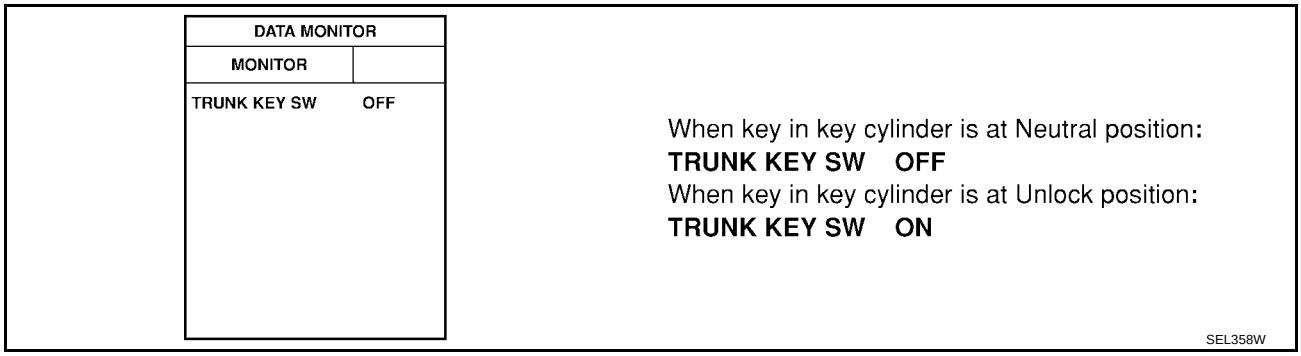
NG >> Replace door key cylinder switch.

TRUNK LID KEY CYLINDER SWITCH CHECK

1. CHECK TRUNK LID KEY CYLINDER SWITCH INPUT SIGNAL (UNLOCK SIGNAL)

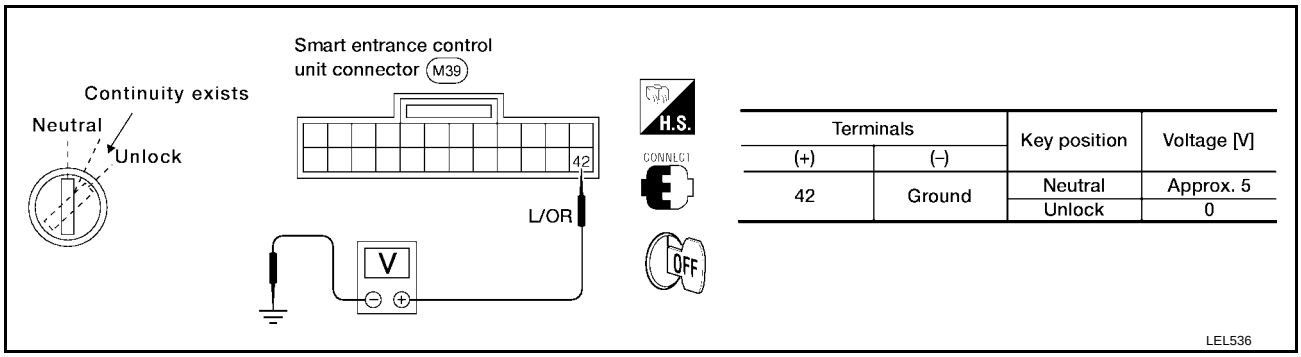
With CONSULT-II

Check trunk lid key cylinder switch (“TRUNK KEY SW”) in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 42 and ground.



Terminals		Key position	Voltage [V]
(+)	(–)		
42	Ground	Neutral	Approx. 5
		Unlock	0

Refer to BL-72, "FIG. 2" .

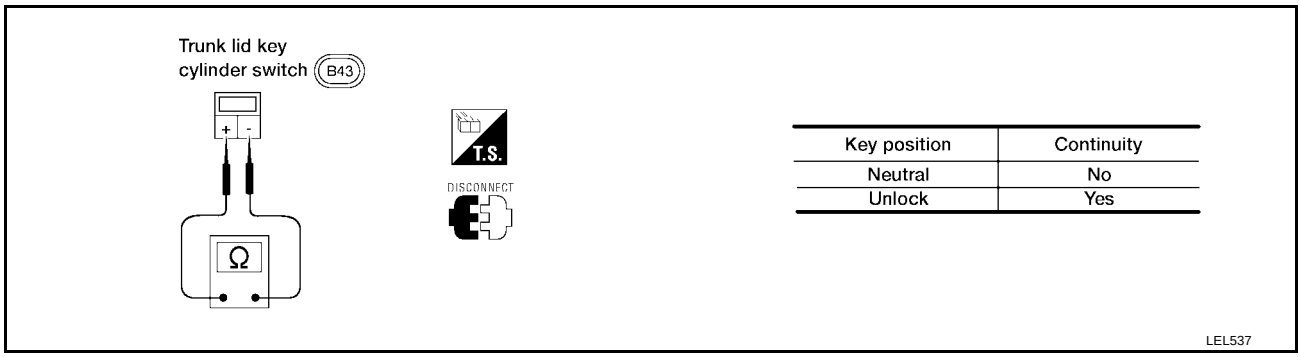
OK or NG

OK >> Trunk lid key cylinder switch is OK.

NG >> GO TO 2.

2. CHECK TRUNK LID KEY CYLINDER SWITCH

1. Disconnect trunk lid key cylinder switch connector.
2. Check continuity between trunk lid key cylinder switch terminals.



Key position	Continuity
Neutral	No
Unlock	Yes

OK or NG

OK >> Check the following.

- Trunk lid key cylinder switch ground circuit
- Harness for open or short between smart entrance control unit and trunk lid key cylinder switch

NG >> Replace trunk lid key cylinder switch.

DOOR LOCK/UNLOCK SWITCH CHECK

1. CHECK DOOR LOCK/UNLOCK SWITCH INPUT SIGNAL

With CONSULT-II

Check door lock/unlock switch (“LOCK SW DR/AS”/“UNLK SW DR/AS”) in “DATA MONITOR” mode with CONSULT-II.

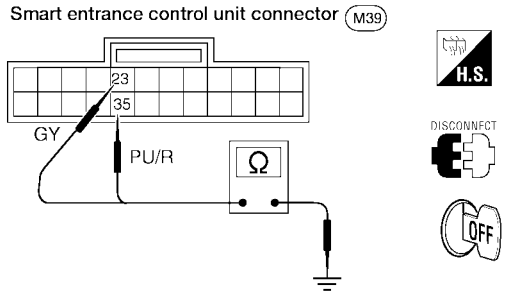
DATA MONITOR	
MONITOR	
LOCK SW DR/AS	OFF
UNLK SW DR/AS	OFF

When lock/unlock switch is turned to LOCK:
LOCK SW DR/AS ON
When lock/unlock switch is turned to UNLOCK:
UNLK SW DR/AS ON

SEL341W

Without CONSULT-II

1. Disconnect smart entrance control unit harness connector.
2. Check continuity between smart entrance control unit harness connector terminal 23 or 35 and ground.



Terminals	Door lock/unlock switch (LH or RH) condition	Continuity
23 - Ground	Lock	Yes
	N and Unlock	No
35 - Ground	Unlock	Yes
	N and Lock	No

WEL501

Refer to BL-72, "FIG. 2" .

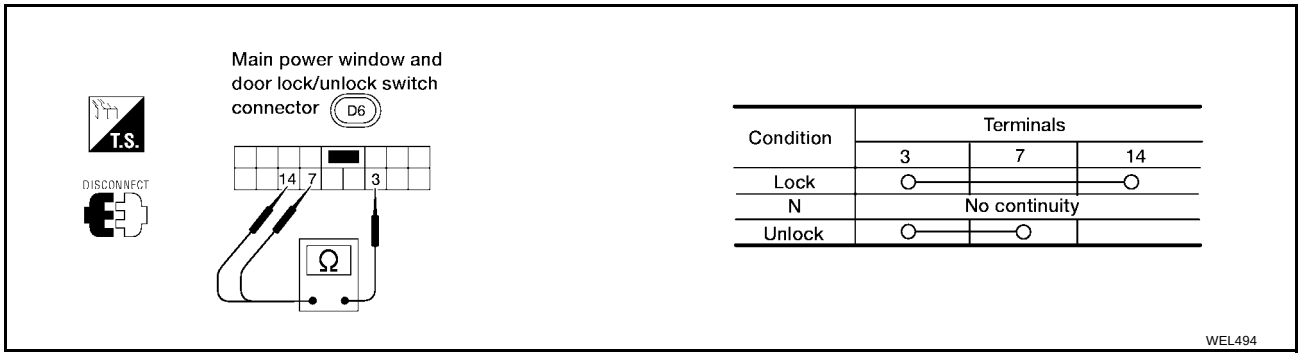
OK or NG

OK >> Door lock/unlock switch is OK.
NG >> GO TO 2.

2. CHECK DOOR LOCK/UNLOCK SWITCH

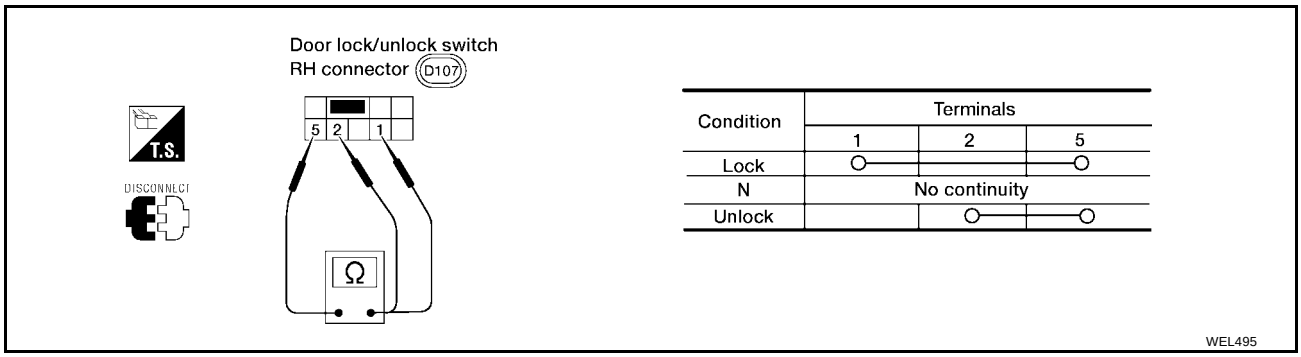
1. Disconnect door lock/unlock switch harness connector.
2. Check continuity between each door lock/unlock switch terminal.

– Main power window and door lock/unlock switch



Condition	Terminals		
	3	7	14
Lock	○		○
N	No continuity		
Unlock	○	○	

– Door lock/unlock switch RH



Condition	Terminals		
	1	2	5
Lock	○		○
N	No continuity		
Unlock		○	○

OK or NG

OK >> Check the following.
- Ground circuit for door lock/unlock switch
- Harness for open or short between door lock/unlock switch and smart entrance control unit

NG >> Replace door lock/unlock switch.

HORN AND HEADLAMP ALARM CHECK

1. CHECK BASE HORN SYSTEM OPERATION

Operate vehicle horn.

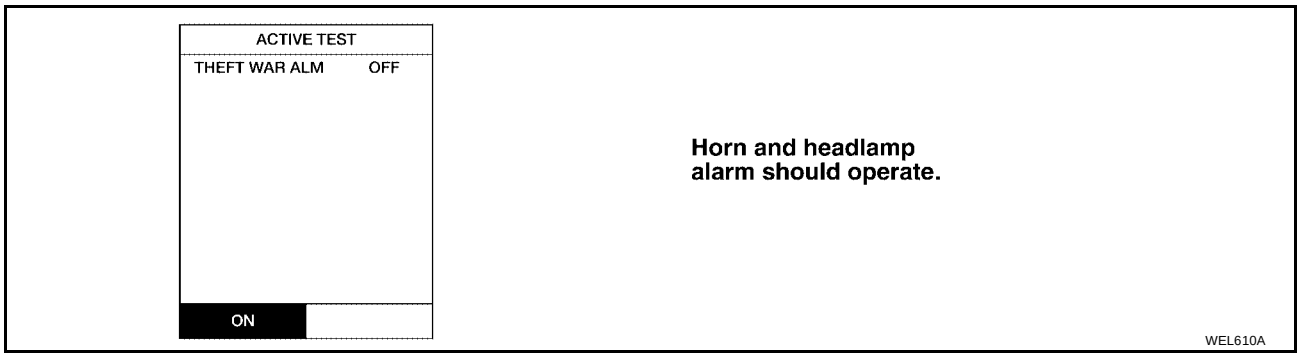
OK or NG

OK >> GO TO 2.
NG >> Check base horn system. Refer to WW-9, "Wiring Diagram — HORN —" .

2. CHECK HORN AND HEADLAMP ALARM OPERATION

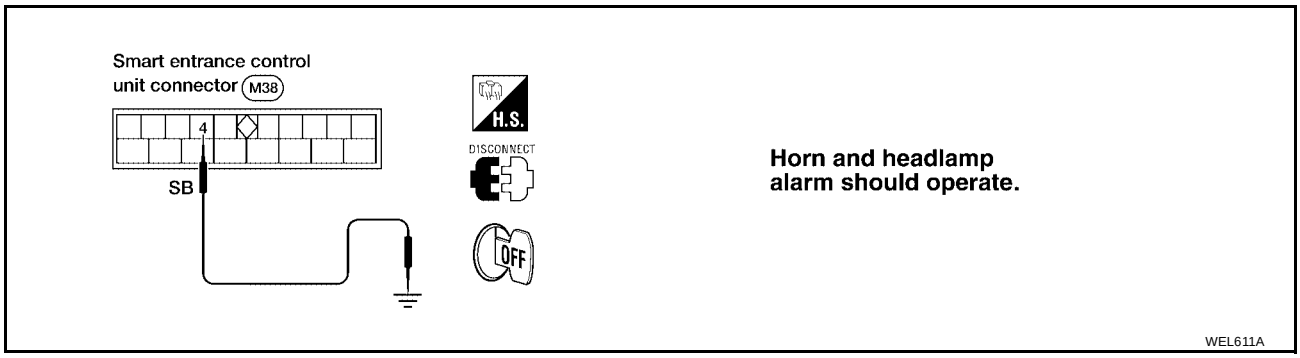
With CONSULT-II

1. Select “ACTIVE TEST” in “THEFT WAR ALM” with CONSULT-II.
2. Select “THEFT WAR ALM” and touch “ON”.



Without CONSULT-II

1. Disconnect smart entrance control unit harness connector.
2. Apply ground to smart entrance control unit harness connector terminal 4.



Refer to BL-74, "FIG. 4" .

OK or NG

OK >> Horn and headlamp alarm is OK.
NG >> GO TO 3.

3. CHECK VEHICLE SECURITY LAMP RELAY

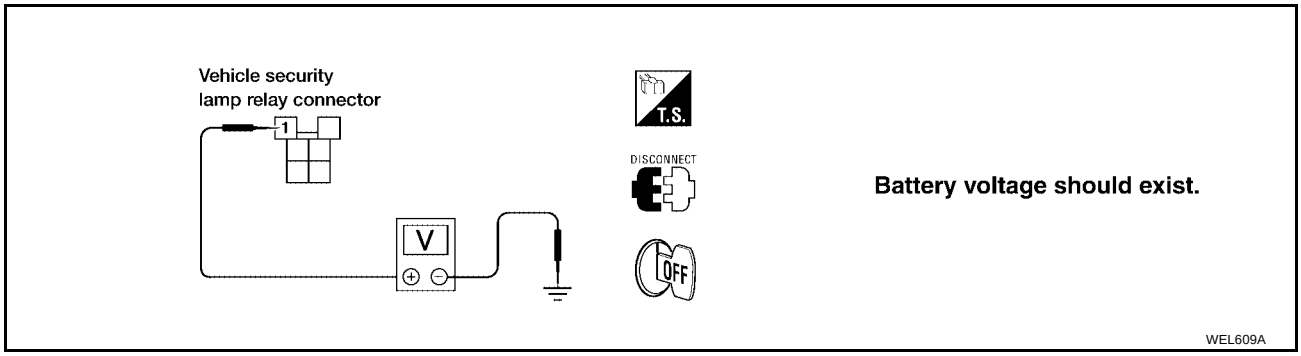
Check vehicle security lamp relay. Refer to BL-94, "VEHICLE SECURITY LAMP RELAY" .

OK or NG

OK >> GO TO 4.
NG >> Replace relay.

4. CHECK POWER SUPPLY FOR VEHICLE SECURITY LAMP RELAY

1. Disconnect vehicle security lamp relay connector.
2. Check voltage between vehicle security lamp relay connector E43 terminal 1 (G/R) and ground.



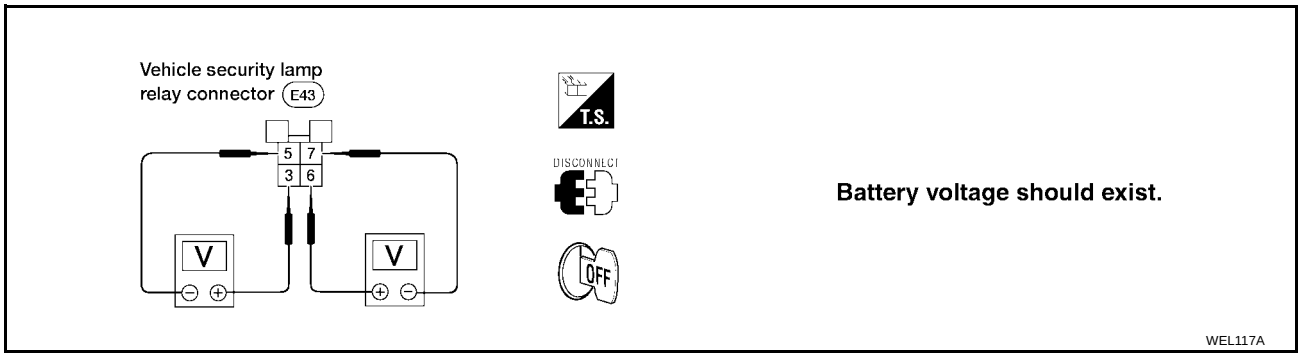
Does battery voltage exist?

Yes >> GO TO 5.
No >> Check the following.

- 10A fuse (No. 35 located in the fuse and fusible link box)
- Harness for open or short between relay and fuse

5. CHECK VEHICLE SECURITY LAMP RELAY CIRCUIT

1. Check voltage between terminals of vehicle security lamp relay connector E43.



OK or NG

OK >> Check the following.

- Harness for open between smart entrance control unit terminal 4 and relay
- Harness for open or short between smart entrance control unit terminal 4 and horn relay
- Diode-4 for open
- Replace smart entrance control unit

NG >> Check the following.

- Harness for open or short between vehicle security lamp relay and fuses
- Harness for open or short between vehicle security lamp relay and headlamp system

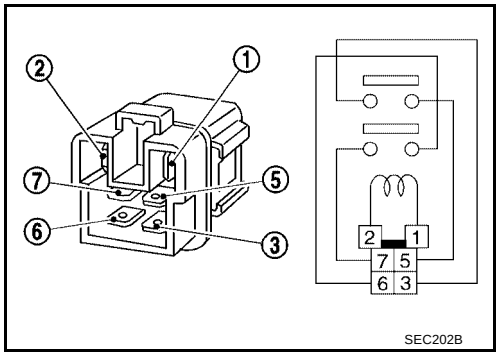
Electrical Components Inspection

EIS0015K

VEHICLE SECURITY LAMP RELAY

Check continuity between terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

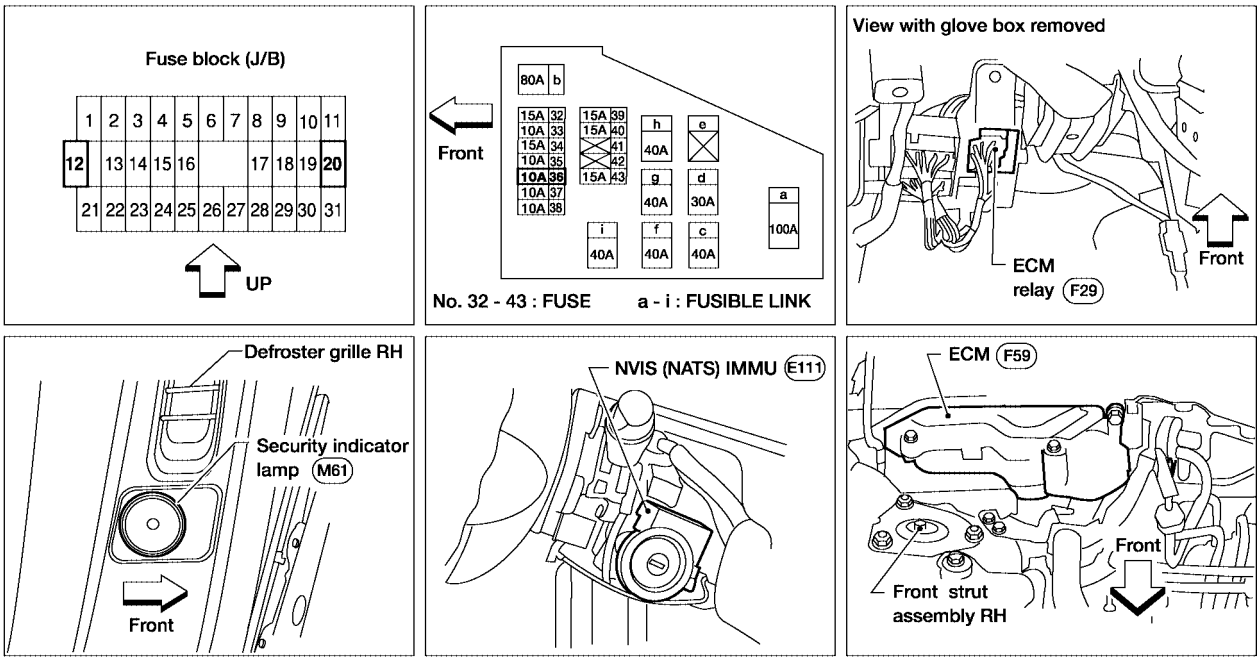


NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)

PFP:25386

Component Parts and Harness Connector Location

EIS0015L



WIIA0195E

NOTE:
If the customer reports a “No Start” condition, request ALL KEYS be brought to Dealer in case of NATS malfunction.

System Description

EIS0015M

NVIS (Nissan Vehicle Immobilizer System—NATS) has the following immobilizer functions:

- Since only NVIS (NATS) ignition keys, whose ID nos. have been registered into the ECM and IMMU of NVIS (NATS), allow the engine to run, operation of a stolen vehicle without a NVIS (NATS) registered key is prevented by NVIS (NATS).
  That is to say, NVIS (NATS) will immobilize the engine if someone tries to start it without the registered key of NVIS (NATS).
- All of the originally supplied ignition key IDs have been NVIS (NATS) registered.
  If requested by the vehicle owner, a maximum of five key IDs can be registered into the NVIS (NATS) components.
- The security indicator lamp blinks when the ignition switch is in “OFF” or “ACC” position. Therefore, NVIS (NATS) warns outsiders that the vehicle is equipped with the system.
- When NVIS (NATS) detects trouble, the security indicator lamp lights up while ignition key is in the “ON” position.
- NVIS (NATS) trouble diagnoses, system initialization and additional registration for other NVIS (NATS) ignition key IDs must be carried out using CONSULT-II hardware and CONSULT-II NVIS (NATS) software. Regarding the procedures for NVIS (NATS) initialization and NVIS (NATS) ignition key ID registration, refer to CONSULT-II OPERATION MANUAL IVIS/NVIS.
- **When servicing a malfunction of the NVIS (indicated by lighting up of Security Indicator Lamp) or registering another NVIS ignition key ID no., it is necessary to re-register original key identification.**

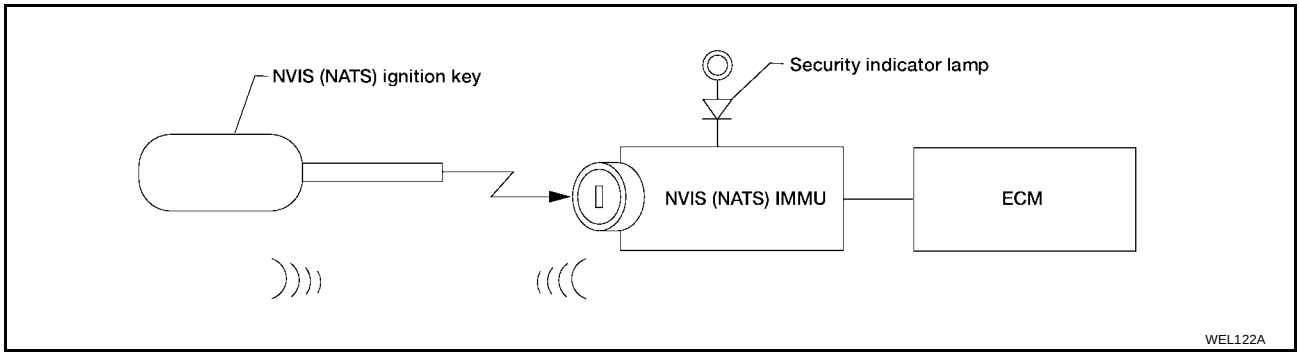
Therefore, be sure to receive ALL KEYS from vehicle owner.

System Composition

EIS0015N

The immobilizer function of the NVIS (NATS) consists of the following:

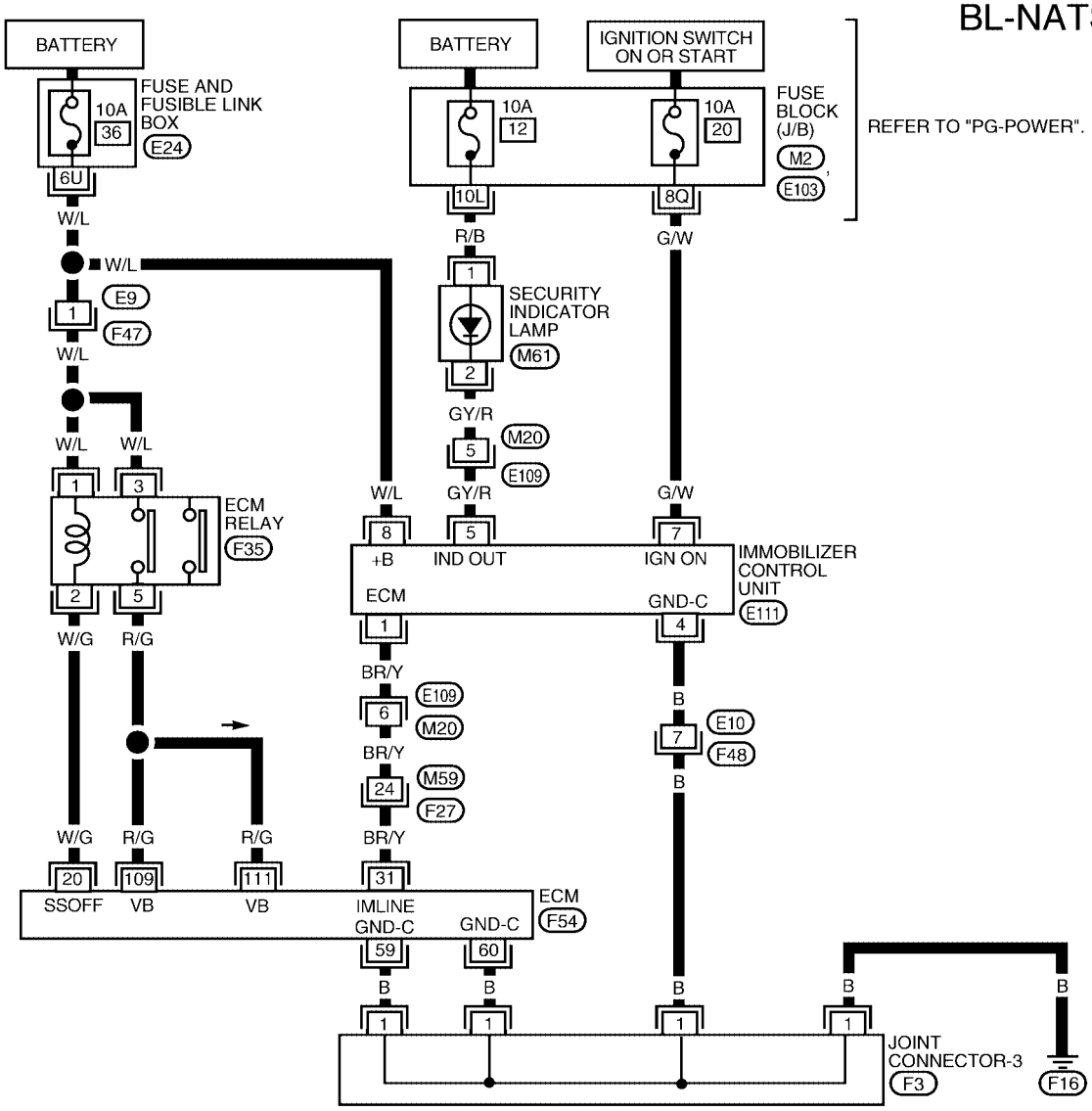
- NVIS (NATS) ignition key
- NVIS (NATS) immobilizer control unit (IMMU) located in the ignition key cylinder
- ECM
- Security indicator lamp

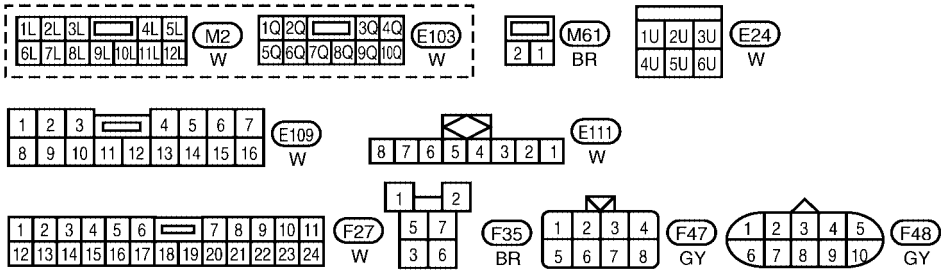


Wiring Diagram — NATS —

EIS0015P

BL-NATS-01





REFER TO THE FOLLOWING.
F3 - JOINT CONNECTOR
F54 - ELECTRICAL UNITS

WIWA0078E

IMMOBILIZER CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

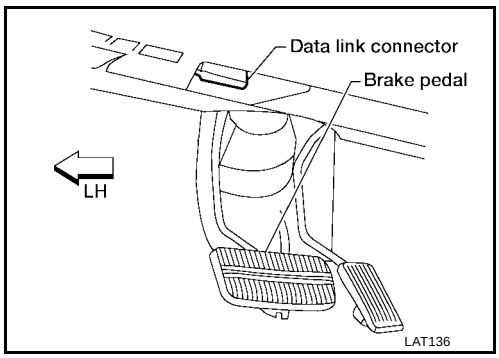
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
4	B	GROUND	—	—
5	GY/R	VEHICLE SECURITY INDICATOR	GOES OFF	12V
			ILLUMINATES	0V
7	G/W	IGNITION SWITCH (ON)	IGNITION KEY IS IN ON POSITION	12V
		IGNITION SWITCH (START)	IGNITION KEY IS IN START POSITION	12V
8	W/L	POWER SOURCE (FUSE)	—	12V

CONSULT-II

EIS0015Q

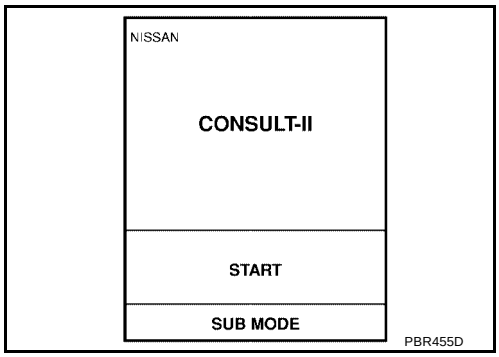
CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.

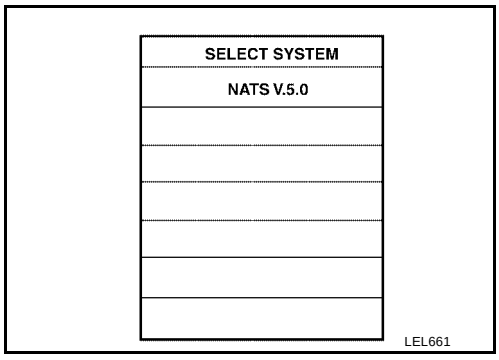


2. Connect “CONSULT-II” to data link connector.
3. Insert NVIS (NATS) program card into CONSULT-II.

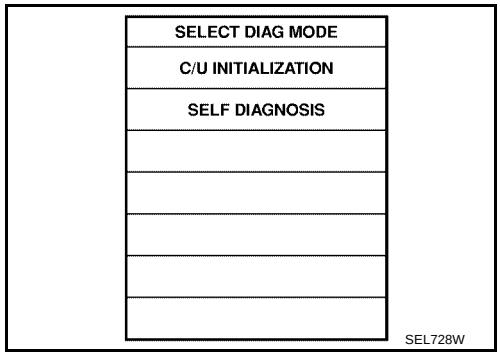
Program card : NATS (AEN02C)



4. Turn ignition switch ON.
5. Touch “START”.
6. Select “NATS V.5.0”.



7. Perform each diagnostic test mode according to each service procedure.



For further information, see the "CONSULT-II OPERATION MANUAL IVIS/NVIS".

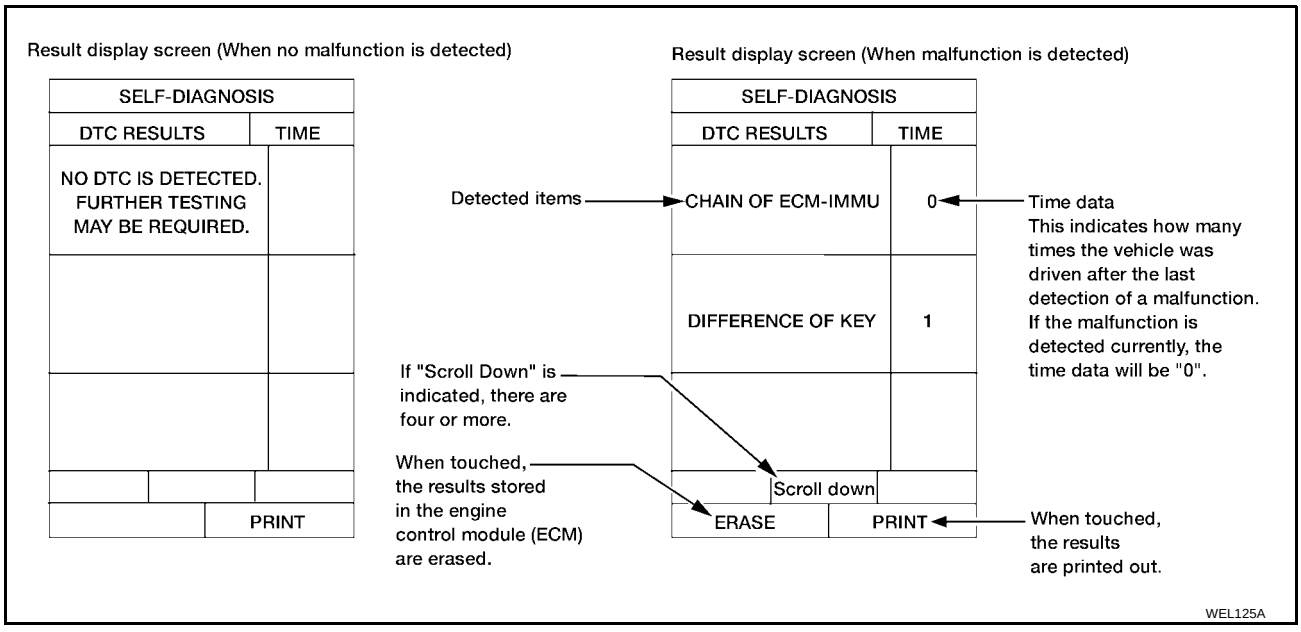
CONSULT-II DIAGNOSTIC TEST MODE FUNCTION

CONSULT-II DIAGNOSTIC TEST MODE	Description
C/U INITIALIZATION	When replacing any of the following three components, C/U initialization is necessary. [NVIS (NATS) ignition key/IMMU/ECM]
SELF DIAGNOSIS	Detected items (screen terms) are as shown in the chart below.

NOTE:

- When any initialization is performed, all IDs previously registered will be erased and all NVIS (NATS) ignition keys must be registered again.
- The engine cannot be started with an unregistered key. In this case, the system may show "DIFFERENCE OF KEY" or "LOCK MODE" as a self-diagnostic result on the CONSULT-II screen.
- In rare cases, "CHAIN OF ECM-IMMU" might be stored as a self-diagnostic result during key registration procedure, even if the system is not malfunctioning.

HOW TO READ SELF-DIAGNOSTIC RESULTS



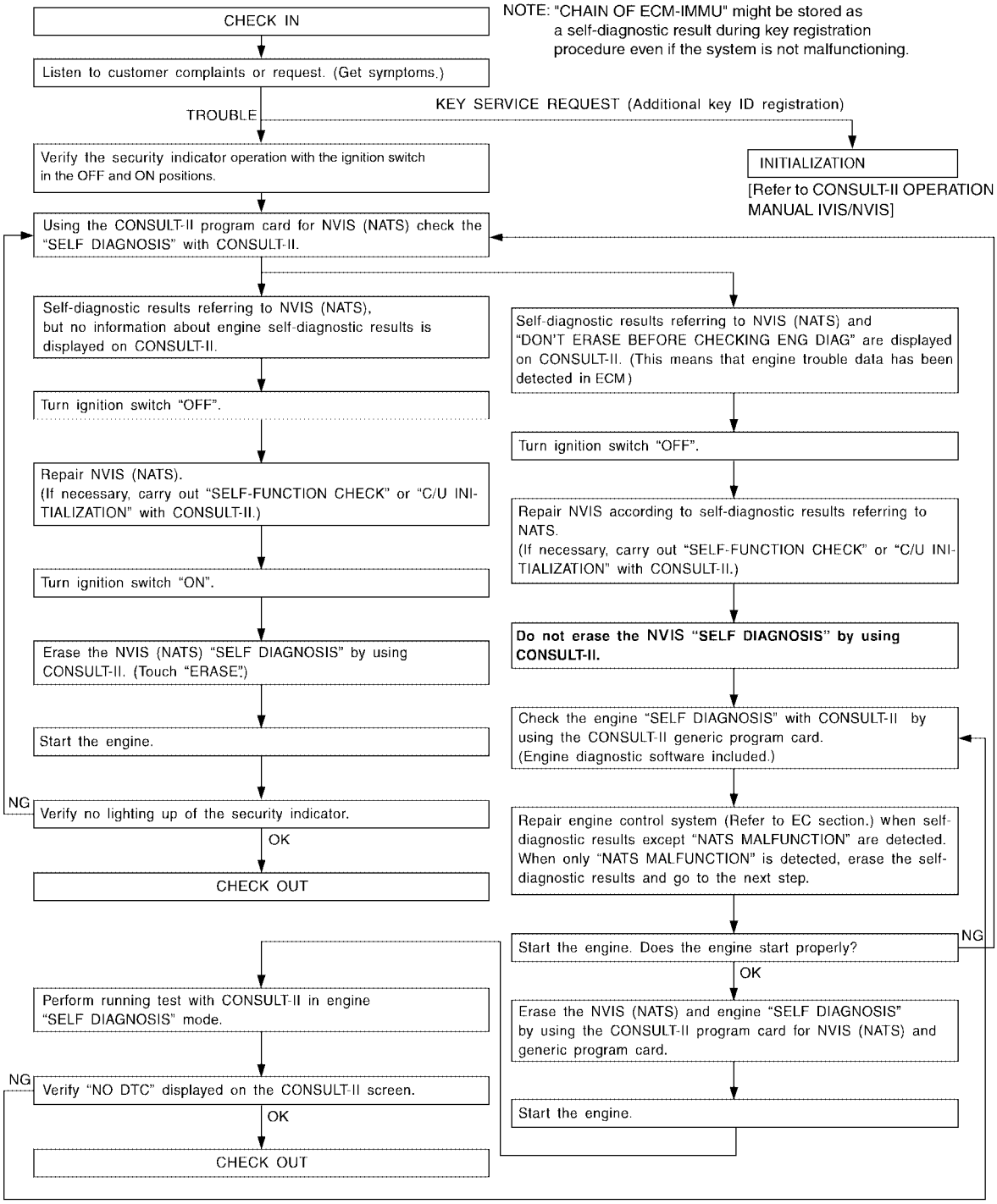
NVIS (NATS) SELF-DIAGNOSTIC RESULTS ITEM CHART

Detected items (NATS program card screen terms)	P No. Code (Self-diagnostic result of "ENGINE"	Malfunction is detected when	Reference page
ECM INT CIRC-IMMU	NATS MALFUNCTION P1613	The malfunction of ECM internal circuit of IMMU communication line is detected.	BL-103
CHAIN OF ECM-IMMU	NATS MALFUNCTION P1612	Communication impossible between ECM and IMMU (In rare cases, "CHAIN OF ECM-IMMU" might be stored during key registration procedure, even if the system is not malfunctioning.)	BL-104
DIFFERENCE OF KEY	NATS MALFUNCTION P1615	IMMU can receive the key ID signal but the result of ID verification between key ID and IMMU is NG.	BL-108
CHAIN OF IMMU-KEY	NATS MALFUNCTION P1614	IMMU cannot receive the key ID signal.	BL-109
ID DISCORD, IMM-ECM	NATS MALFUNCTION P1611	The result of ID verification between IMMU and ECM is NG. System initialization is required.	BL-110
LOCK MODE	NATS MALFUNCTION P1610	When the starting operation is carried out five or more times consecutively under the following conditions, NVIS (NATS) will shift the mode to one which prevents the engine from being started. ● Unregistered ignition key is used. ● IMMU or ECM is malfunctioning.	BL-113
DON'T ERASE BEFORE CHECKING ENG DIAG	—	Any engine trouble codes except NVIS (NATS) trouble codes have been detected in ECM.	BL-101

Trouble Diagnoses

EIS0015R

WORK FLOW



WEL126A

SYMPTOM MATRIX CHART 1 (SELF-DIAGNOSIS RELATED ITEM)

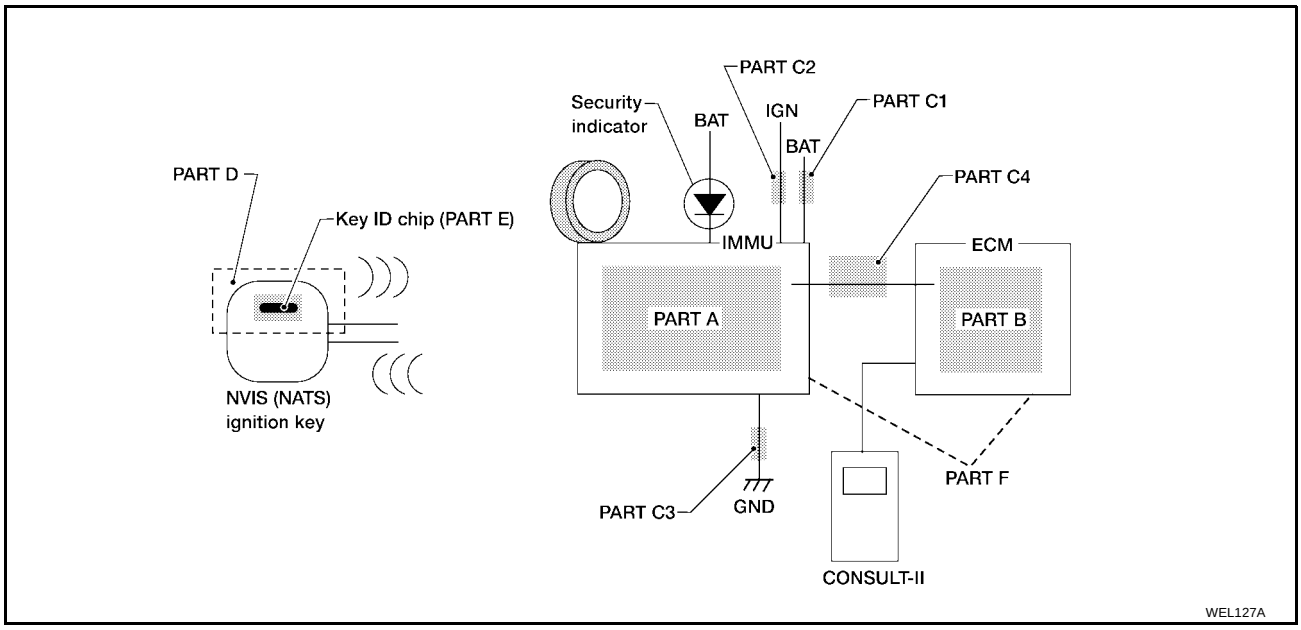
SYMPTOM	Displayed "SELF-DIAG RESULTS" on CONSULT-II screen.	DIAGNOSTIC PROCEDURE (Reference page)	SYSTEM (Malfunctioning part or mode)	REFERENCE PART NO. OF ILLUSTRATION ON NEXT PAGE
	ECM INT CIRC-IMMU	PROCEDURE 1 BL-103	ECM	B
● Security indicator lighting up* ● Engine hard to start			In rare cases, "CHAIN OF ECM-IMMU" might be stored during key registration procedure, even if the system is not malfunctioning.	—
	CHAIN OF ECM-IMMU	PROCEDURE 2 BL-104	Open circuit in battery voltage line of IMMU circuit	C1
			Open circuit in ignition line of IMMU circuit	C2
			Open circuit in ground line of IMMU circuit	C3
			Open circuit in communication line between IMMU and ECM	C4
			Short circuit between IMMU and ECM communication line and battery voltage line	C4
			Short circuit between IMMU and ECM communication line and ground line	C4
			ECM	B
			IMMU	A
	DIFFERENCE OF KEY	PROCEDURE 3 BL-108	Unregistered key	D
			IMMU	A
	CHAIN OF IMMU-KEY	PROCEDURE 4 BL-109	Malfunction of key ID chip	E
			IMMU	A
	ID DISCORD, IMM-ECM	PROCEDURE 5 BL-110	System initialization has not yet been completed.	F
			ECM	F
	LOCK MODE	PROCEDURE 7 BL-113	LOCK MODE	D
● MIL staying ON ● Security indicator lighting up*	DON'T ERASE BEFORE CHECKING ENG DIAG	WORK FLOW BL-101	Engine trouble data and NVIS (NATS) trouble data have been detected in ECM	—

*: When NVIS (NATS) detects trouble, the security indicator lights up while ignition key is in the "ON" position.

SYMPTOM MATRIX CHART 2 (NON SELF-DIAGNOSIS RELATED ITEM)

SYMPTOM	DIAGNOSTIC PROCEDURE (Reference page)	SYSTEM (Malfunctioning part or mode)
Security indicator lamp does not light up.	PROCEDURE 6 BL-111	Security indicator lamp
		Open circuit between fuse and IMMU
		Continuation of initialization mode
		IMMU

DIAGNOSTIC SYSTEM DIAGRAM



DIAGNOSTIC PROCEDURE 1

Self-diagnostic results:
"ECM INT CIRC-IMMU" displayed on CONSULT-II screen

1. Confirm SELF-DIAGNOSTIC RESULTS "ECM INT CIRC-IMMU" displayed on CONSULT-II screen. Ref. part No. B.
2. Replace ECM.
3. Perform initialization with CONSULT-II.
   For initialization, refer to "CONSULT-II OPERATION MANUAL IVIS/NVIS".

SELF DIAGNOSIS	
DTC RESULTS	TIME
ECM INT CIRC-IMMU	0

SEL314W

DIAGNOSTIC PROCEDURE 2

Self-diagnostic results:
“CHAIN OF ECM-IMMU” displayed on CONSULT-II screen

1. CONFIRM SELF-DIAGNOSTIC RESULTS

Confirm SELF-DIAGNOSTIC RESULTS “CHAIN OF ECM-IMMU” displayed on CONSULT-II screen.

NOTE:
In rare cases, “CHAIN OF ECM-IMMU” might be stored during key registration procedure, even if the system is not malfunctioning.

Is CONSULT-II screen displayed as shown?

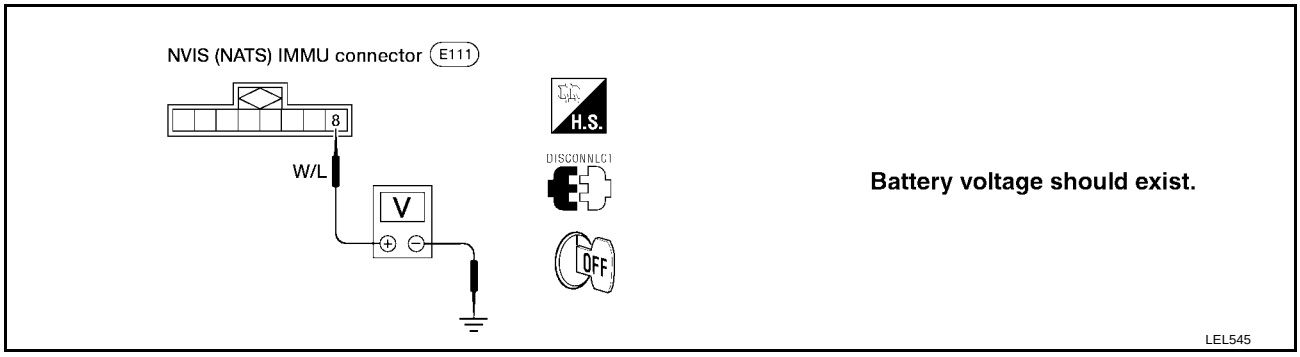
Yes >> GO TO 2.
No >> GO TO BL-102, "SYMPTOM MATRIX CHART 1 (SELF-DIAGNOSIS RELATED ITEM)" .

SELF DIAGNOSIS	
DTC RESULTS	TIME
CHAIN OF ECM-IMMU	0

SEL292W

2. CHECK POWER SUPPLY CIRCUIT FOR NVIS (NATS) IMMU

1. Disconnect NVIS (NATS) IMMU connector.
2. Check voltage between terminal 8 of NVIS (NATS) IMMU and ground with CONSULT-II or tester.



OK or NG

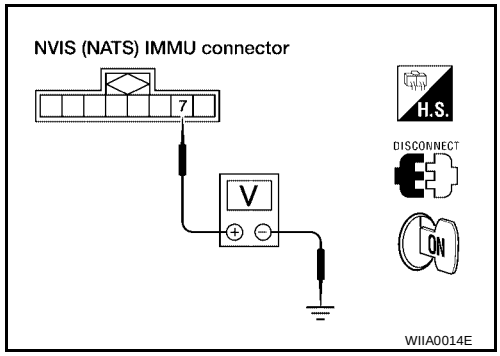
OK >> GO TO 3.
NG >> Check the following

- 10A fuse (No. 36, located in the fuse and fusible link box)
- Harness for open or short between fuse and NVIS (NATS) IMMU connector
  Ref. Part No. C1

3. CHECK IGN SW. ON SIGNAL

1. Turn ignition switch ON.
2. Check voltage between NVIS (NATS) IMMU harness connector E111 terminal 7 (BR) (QG18DE) or (G/W) (QR25DE) and ground with CONSULT-II or tester.

Battery voltage should exist.



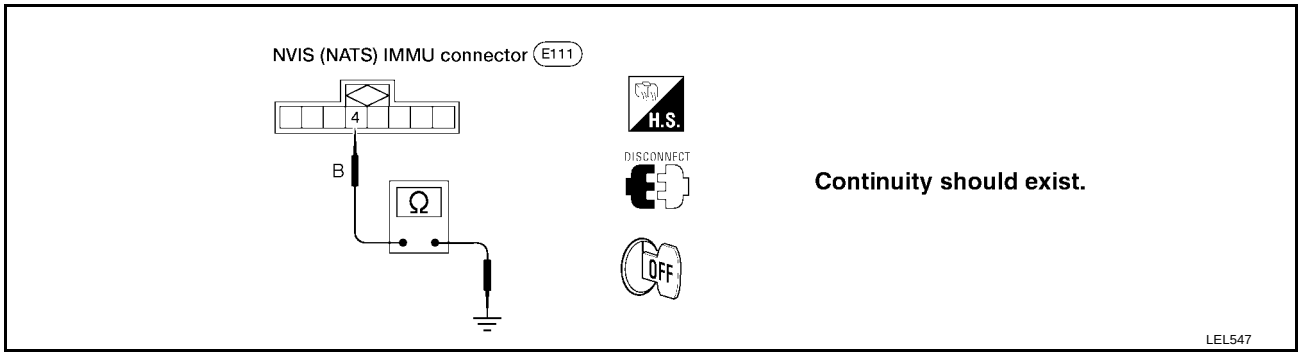
OK or NG

OK >> GO TO 4.
NG >> Check the following

- 10A fuse [No. 20, located in the fuse block (J/B)]
- Harness for open or short between fuse and NVIS (NATS) IMMU connector
  Ref. part No. C2

4. CHECK GROUND CIRCUIT FOR NVIS (NATS) IMMU

1. Turn ignition switch OFF.
2. Check harness continuity between NVIS (NATS) IMMU terminal 4 and ground.



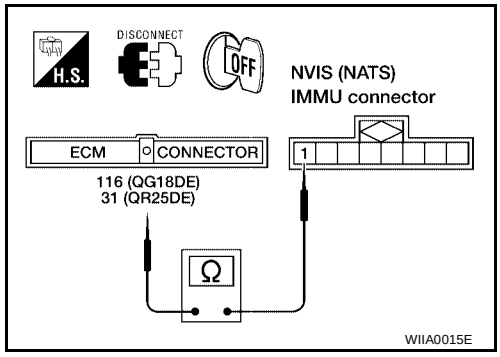
OK or NG

OK >> GO TO 5.
NG >> Repair harness. **Ref. part No. C3**

5. CHECK COMMUNICATION LINE OPEN CIRCUIT

1. Disconnect ECM connector.
2. Check harness continuity between ECM harness connector F22 (QG18DE) or F54 (QR25DE) terminal 116 (QG18DE) or 31 (QR25DE) (BR/Y) and NVIS (NATS) IMMU connector E111 terminal 1 (BR/Y).

Continuity should exist.

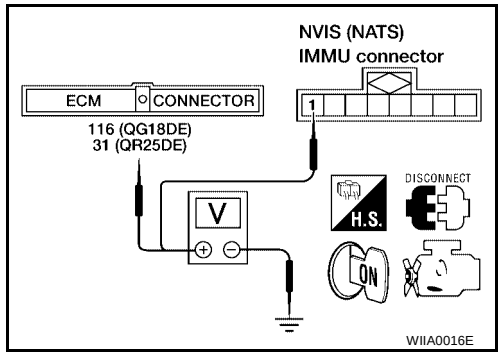


OK or NG

OK >> GO TO 6.
NG >>
- Repair harness or connector.
- **Ref. part No. C4**

6. CHECK COMMUNICATION LINE BATTERY SHORT CIRCUIT

1. Turn ignition switch ON.
2. Check voltage between ECM harness connector F22 (QG18DE) or F54 (QR25DE) terminal 116 (QG18DE) or 31 (QR25DE) (BR/Y) or NVIS (NATS) IMMU harness connector E111 terminal 1 (BR/Y) and ground.



Voltage : 0V

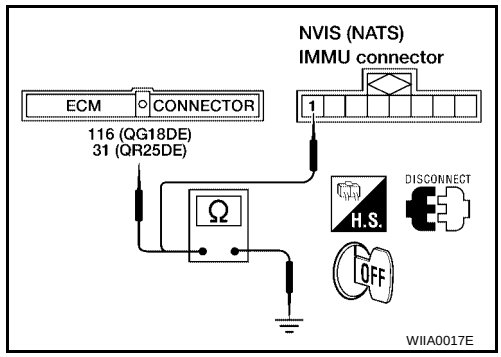
OK or NG

OK >> GO TO 7.

NG >>
- Communication line is short-circuited with battery voltage line or ignition switch ON line.
- Repair harness or connectors.
- **Ref. part No. C4**

7. CHECK COMMUNICATION LINE GROUND SHORT CIRCUIT

1. Turn ignition switch OFF.
2. Check continuity between ECM harness connector F22 (QG18DE) or F54 (QR25DE) terminal 116 (QG18DE) or 31 (QR25DE) (BR/Y) or NVIS (NATS) IMMU connector E111 terminal 1 (BR/Y) and ground.



Continuity should not exist.

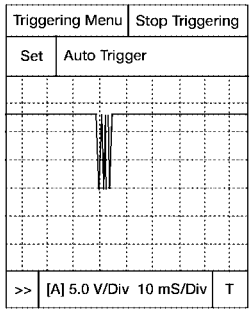
OK or NG

OK >> GO TO 8.

NG >>
- Communication line is short-circuited with ground line.
- Repair harness or connectors.
- **Ref. part No. C4**

8. SIGNAL FROM ECM TO NVIS (NATS) IMMU CHECK

1. Check the signal between ECM terminal 116 and ground with CONSULT-II or oscilloscope when ignition switch is turned “ON”.
2. Make sure signals which are shown in the figure below can be detected during 750 msec. just after ignition switch is turned “ON”.



LEL641

OK or NG

OK >>
- NVIS (NATS) IMMU is malfunctioning.
- Replace NVIS (NATS) IMMU. **Ref. part No. A**
- Perform initialization with CONSULT-II.
- For the operation of initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.

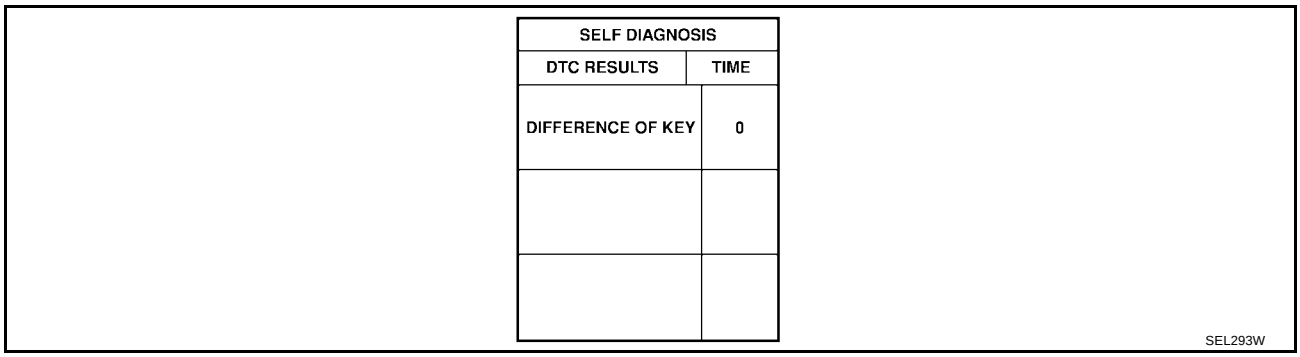
NG >>
- ECM is malfunctioning.
- Replace ECM. **Ref. part No. B**
- Perform initialization with CONSULT-II.
- For the operation of initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.

DIAGNOSTIC PROCEDURE 3

Self-diagnostic results:
“DIFFERENCE OF KEY” displayed on CONSULT-II screen

1. CONFIRM SELF-DIAGNOSTIC RESULTS

Confirm SELF-DIAGNOSTIC RESULTS “DIFFERENCE OF KEY” displayed on CONSULT-II screen.

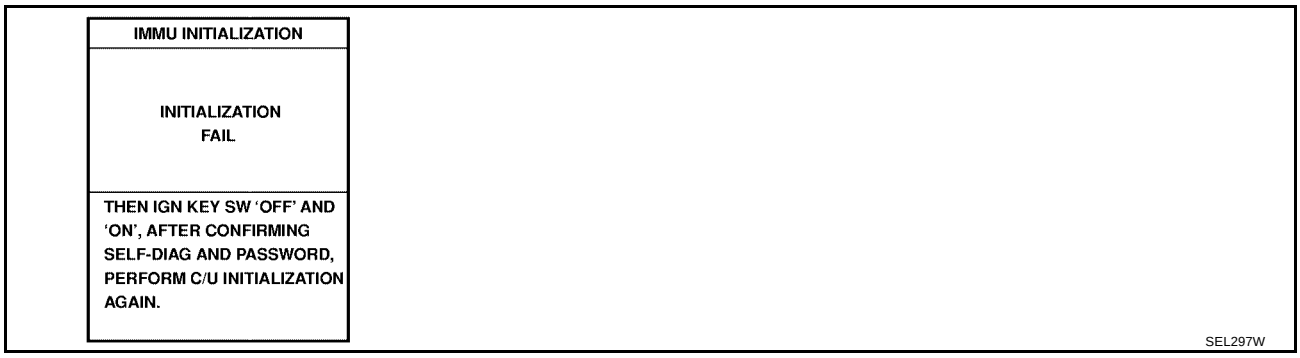


Is CONSULT-II screen displayed as above?

Yes >> GO TO 2.
No >> GO TO SYMPTOM MATRIX CHART 1.

2. PERFORM INITIALIZATION WITH CONSULT-II

Perform initialization with CONSULT-II. Re-register all NVIS (NATS) ignition key IDs.
For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.



NOTE:
If the initialization is not completed or fails, CONSULT-II shows above message on the screen.

Can the system be initialized?

Yes >>
- Start engine. (END)
- (Ignition key ID was unregistered. **Ref. part No. D**)

No >>
- NVIS (NATS) IMMU is malfunctioning.
- Replace NVIS (NATS) IMMU. **Ref. part No. A**
- Perform initialization with CONSULT-II.
- For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.

DIAGNOSTIC PROCEDURE 4

Self-diagnostic results:
“CHAIN OF IMMU-KEY” displayed on CONSULT-II screen

1. CONFIRM SELF-DIAGNOSTIC RESULTS

Confirm SELF-DIAGNOSTIC RESULTS “CHAIN OF IMMU-KEY” displayed on CONSULT-II screen.

SELF DIAGNOSIS	
DTC RESULTS	TIME
CHAIN OF IMMU-KEY	0

SEL294W

Is CONSULT-II screen displayed as above?

Yes >> GO TO 2.
No >> GO TO BL-102, "SYMPTOM MATRIX CHART 1 (SELF-DIAGNOSIS RELATED ITEM)" .

2. CHECK NVIS (NATS) IGNITION KEY ID CHIP

Start engine with another registered NVIS (NATS) ignition key.
Does the engine start?

Yes >>
- Ignition key ID chip is malfunctioning.
- Replace the ignition key.
- **Ref. part No. E**
- Perform initialization with CONSULT-II.
- For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.

No >> GO TO 3.

3. CHECK NVIS (NATS) IMMU INSTALLATION

Check NVIS (NATS) IMMU installation.
Refer to BL-114, "How to Replace NVIS (NATS) IMMU" .

OK or NG

OK >>
- NVIS (NATS) IMMU is malfunctioning.
- Replace NVIS (NATS) IMMU. **Ref. part No. A**
- Perform initialization with CONSULT-II.
- For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.

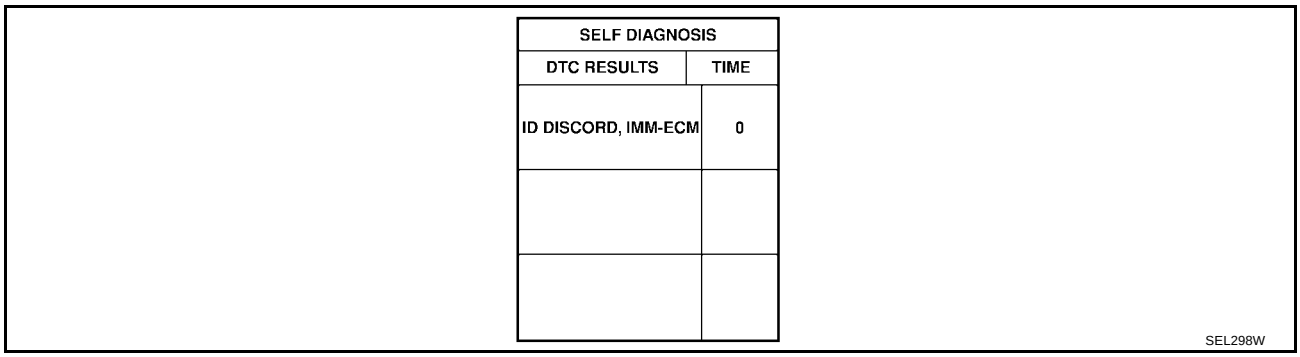
NG >> Reinstall NVIS (NATS) IMMU correctly.

DIAGNOSTIC PROCEDURE 5

Self-diagnostic results:
“ID DISCORD, IMM-ECM” displayed on CONSULT-II screen

1. CONFIRM SELF-DIAGNOSTIC RESULTS

Confirm SELF-DIAGNOSTIC RESULTS “ID DISCORD, IMM-ECM” displayed on CONSULT-II screen.



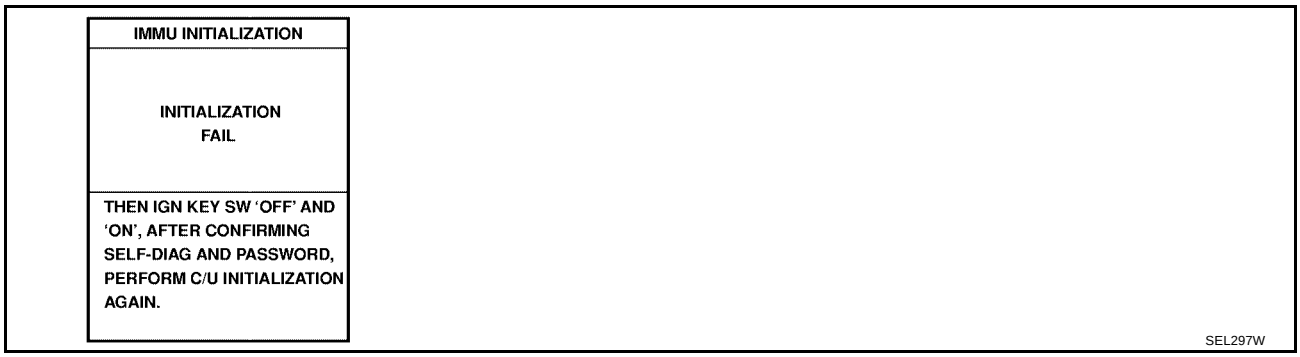
NOTE:
“ID DISCORD IMM-ECM”:
Registered ID of NVIS (NATS) IMMU is in discord with that of ECM.

Is CONSULT-II screen displayed as above?

Yes >> GO TO 2.
No >> GO TO BL-102, "SYMPTOM MATRIX CHART 1 (SELF-DIAGNOSIS RELATED ITEM)" .

2. PERFORM INITIALIZATION WITH CONSULT-II

Perform initialization with CONSULT-II. Re-register all NVIS (NATS) ignition key IDs.
For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.



NOTE:
If the initialization is not completed or fails, CONSULT-II shows above message on the screen.

Can the system be initialized?

Yes >> ● Start engine. (END)
● (System initialization had not been completed. **Ref. part No. F**)

No >> ● ECM is malfunctioning.
● Replace ECM. **Ref. part No. F**
● Perform initialization with CONSULT-II.
● For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.

DIAGNOSTIC PROCEDURE 6

“SECURITY INDICATOR LAMP DOES NOT LIGHT UP”

1. CHECK FUSE

Check 10A fuse [No. 12, located in the fuse block (J/B)].

Is 10A fuse OK?

Yes >> GO TO 2.
No >> Replace fuse.

2. CHECK SECURITY INDICATOR LAMP

1. Install 10A fuse.
2. Perform initialization with CONSULT-II.
   For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.
3. Turn ignition switch OFF.
4. Start engine and turn ignition switch OFF.
5. Check the security indicator lamp lighting.

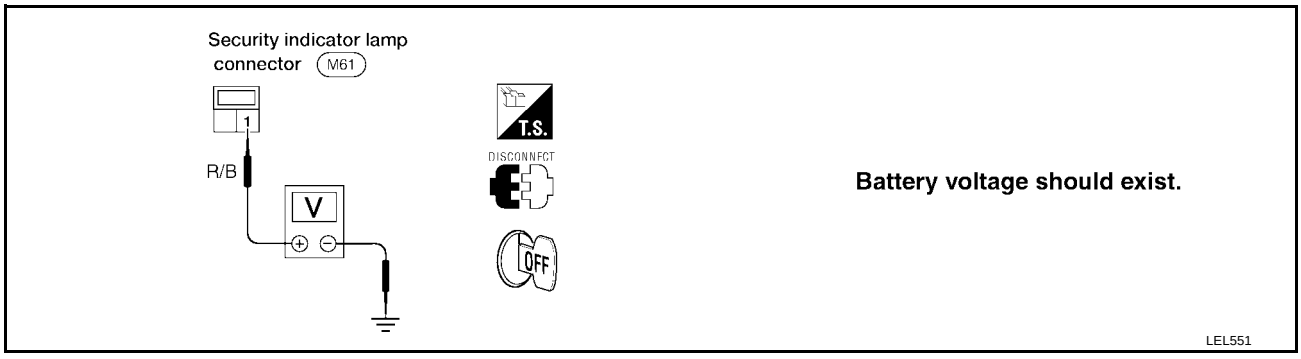
Security indicator lamp should light up.

OK or NG

OK >> INSPECTION END
NG >> GO TO 3.

3. CHECK SECURITY INDICATOR LAMP POWER SUPPLY CIRCUIT

1. Disconnect security indicator lamp connector.
2. Check voltage between security indicator lamp connector terminal 1 and ground.



OK or NG

OK >> GO TO 4.
NG >> Check harness for open or short between fuse and security indicator lamp.

4. CHECK SECURITY INDICATOR LAMP

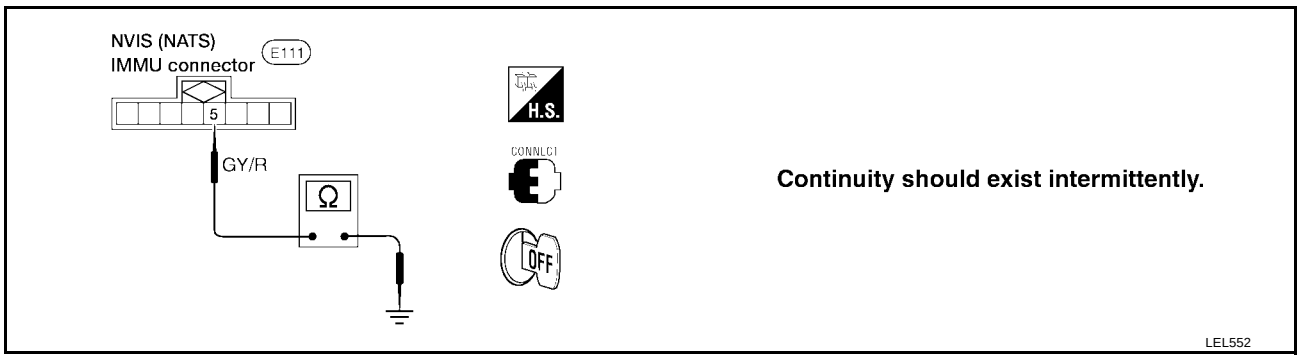
Check security indicator lamp.

Is security indicator lamp OK?

Yes >> GO TO 5.
No >> Replace security indicator lamp.

5. CHECK NVIS (NATS) IMMU FUNCTION

1. Connect NVIS (NATS) IMMU connector.
2. Disconnect security indicator lamp connector.
3. Check continuity between NVIS (NATS) IMMU terminal 5 and ground.



OK or NG

OK >> Check harness for open or short between security indicator lamp and NVIS (NATS) IMMU.

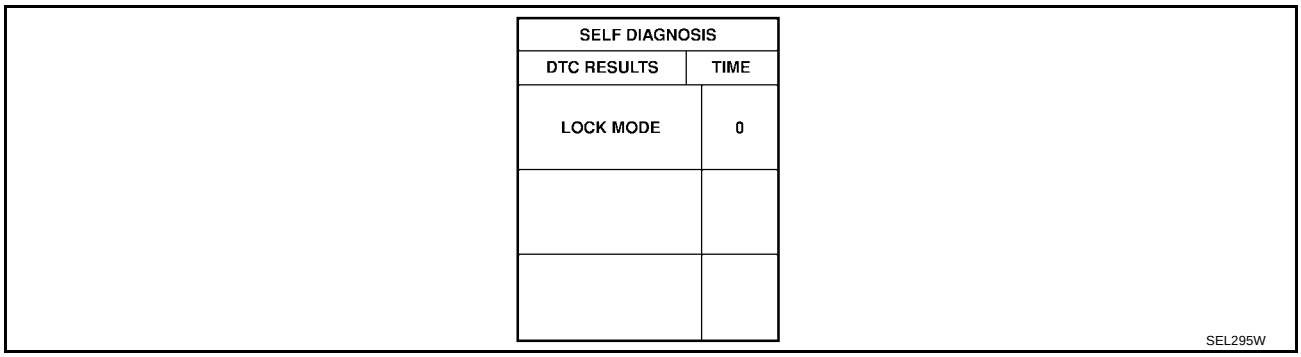
NG >>
- NVIS (NATS) IMMU is malfunctioning.
- Replace NVIS (NATS) IMMU.
- Perform initialization with CONSULT-II.
- For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.

DIAGNOSTIC PROCEDURE 7

Self-diagnostic results:
“LOCK MODE” displayed on CONSULT-II screen

1. CONFIRM SELF-DIAGNOSTIC RESULTS

Confirm SELF-DIAGNOSTIC RESULTS “LOCK MODE” is displayed on CONSULT-II screen.



Is CONSULT-II screen displayed as above?

Yes >> GO TO 2.
No >> GO TO BL-102, "SYMPTOM MATRIX CHART 1 (SELF-DIAGNOSIS RELATED ITEM)" .

2. ESCAPE FROM LOCK MODE

1. Turn ignition switch OFF.
2. Turn ignition switch ON with registered key. (Do not start engine.) Wait 5 seconds.
3. Return the key to OFF position.
4. Repeat steps 2 and 3 twice (total of three cycles).
5. Start the engine.

Does engine start?

Yes >> ● System is OK.
● (Now system is escaped from “LOCK MODE”.)
No >> GO TO 3.

3. CHECK NVIS (NATS) IMMU INSTALLATION

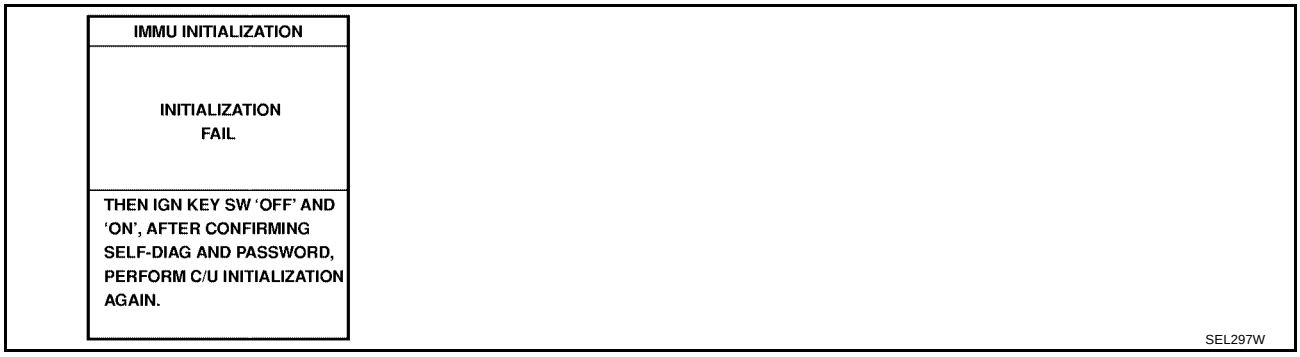
Check NVIS (NATS) IMMU installation. Refer to BL-114, "How to Replace NVIS (NATS) IMMU" .

OK or NG

OK >> GO TO 4.
NG >> Reinstall NVIS (NATS) IMMU correctly.

4. PERFORM INITIALIZATION WITH CONSULT-II

Perform initialization with CONSULT-II.
For initialization, refer to “CONSULT-II OPERATION MANUAL IVIS/NVIS”.



NOTE:
If the initialization is not completed or fails, CONSULT-II shows the above message on the screen.

Can the system be initialized?

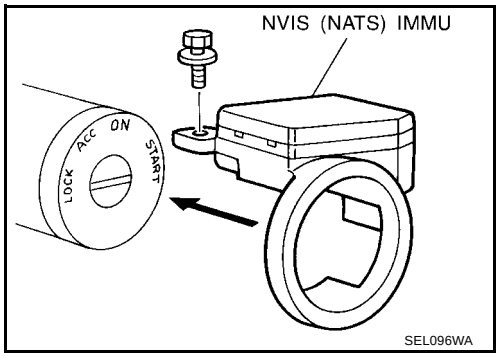
Yes >> System is OK.
No >> Check “CHAIN OF IMMU-KEY”. Refer to BL-109, "DIAGNOSTIC PROCEDURE 4" .

How to Replace NVIS (NATS) IMMU

EIS0015S

NOTE:

- **If NVIS (NATS) IMMU is not installed correctly, NVIS (NATS) system will not operate properly and SELF-DIAG RESULTS on CONSULT-II screen will show “LOCK MODE” or “CHAIN OF IMMU-KEY”.**



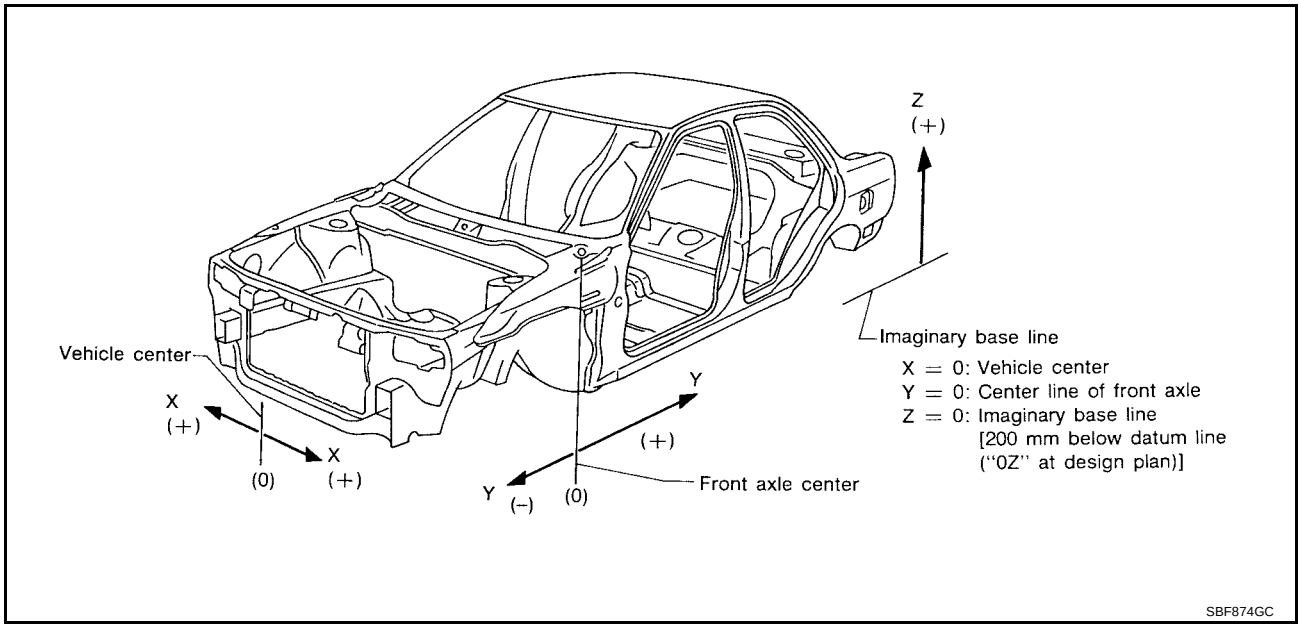
BODY (ALIGNMENT)

PFP:74312

Alignment

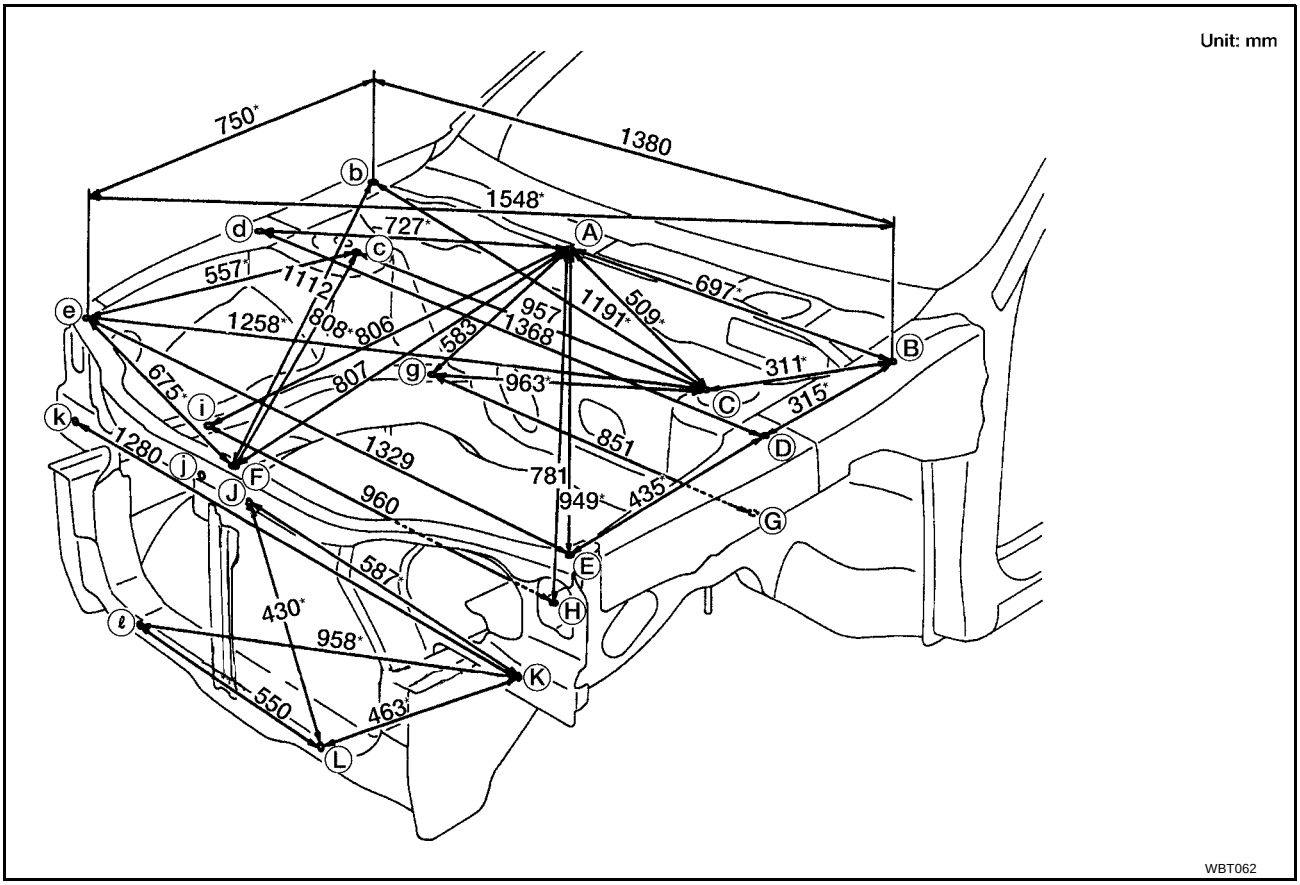
EIS0015T

- All dimensions indicated in figures are actual ones.
- When using a tracking gauge, adjust both pointers to equal length. Then check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) indicates the measuring point value is the same on both sides.
- The coordinates of the measurement points are the distances measured from the standard line of “X”, “Y” and “Z”.

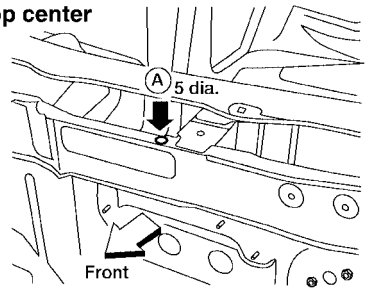


ENGINE COMPARTMENT

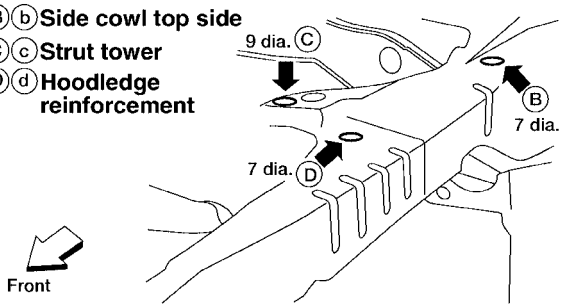
Measurement



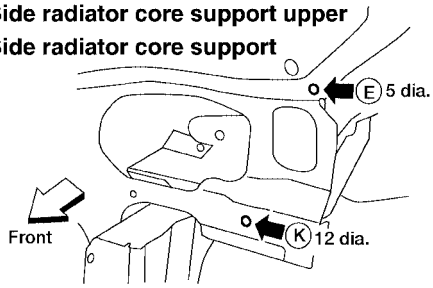
Ⓐ Cowl top center



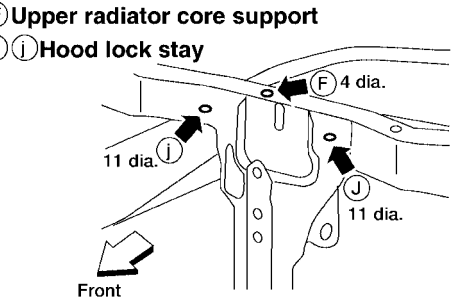
Ⓑ ⓑ Side cowl top side
Ⓒ ⓒ Strut tower
Ⓓ ⓓ Hoodledge reinforcement



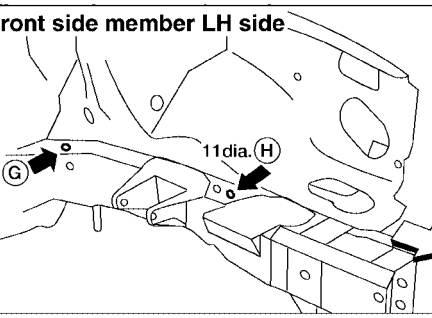
Ⓔ ⓔ Side radiator core support upper
Ⓚ ⓚ Side radiator core support



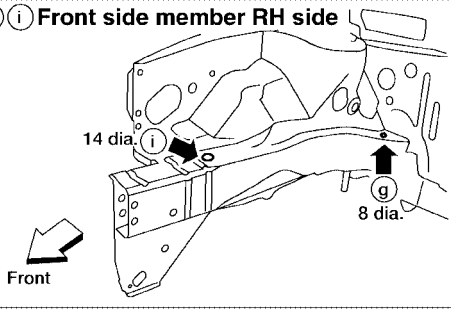
Ⓕ Upper radiator core support
Ⓙ ⓙ Hood lock stay



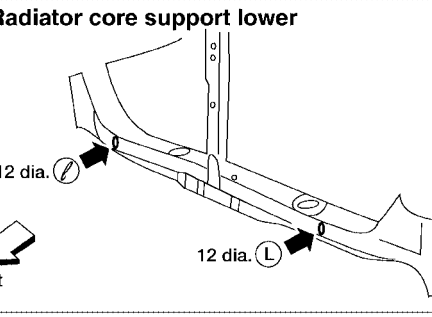
Ⓖ Ⓗ Front side member LH side



ⓖ ⓘ Front side member RH side



Ⓛ Ⓛ Radiator core support lower



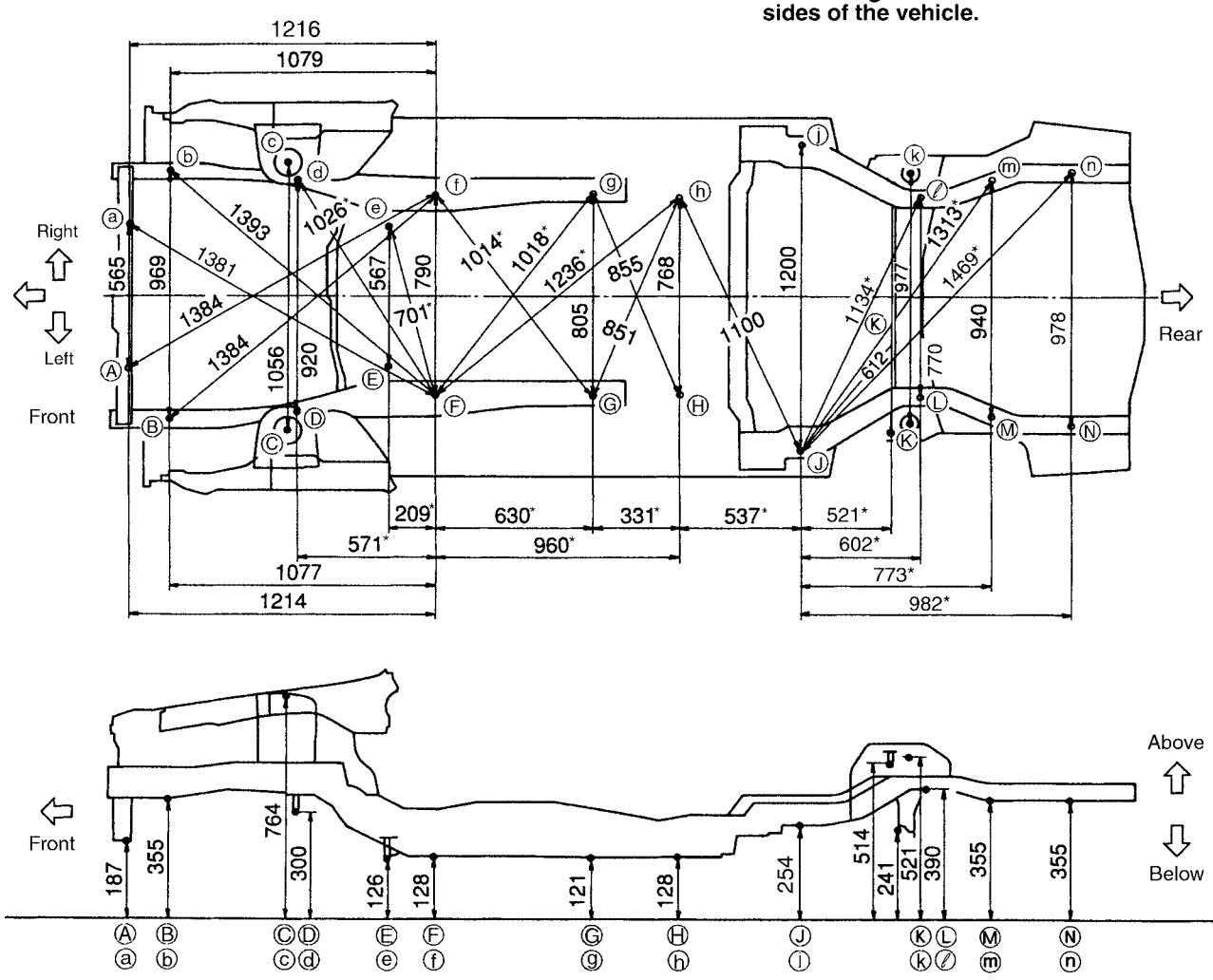
Unit: mm

WBT071

Measurement Points

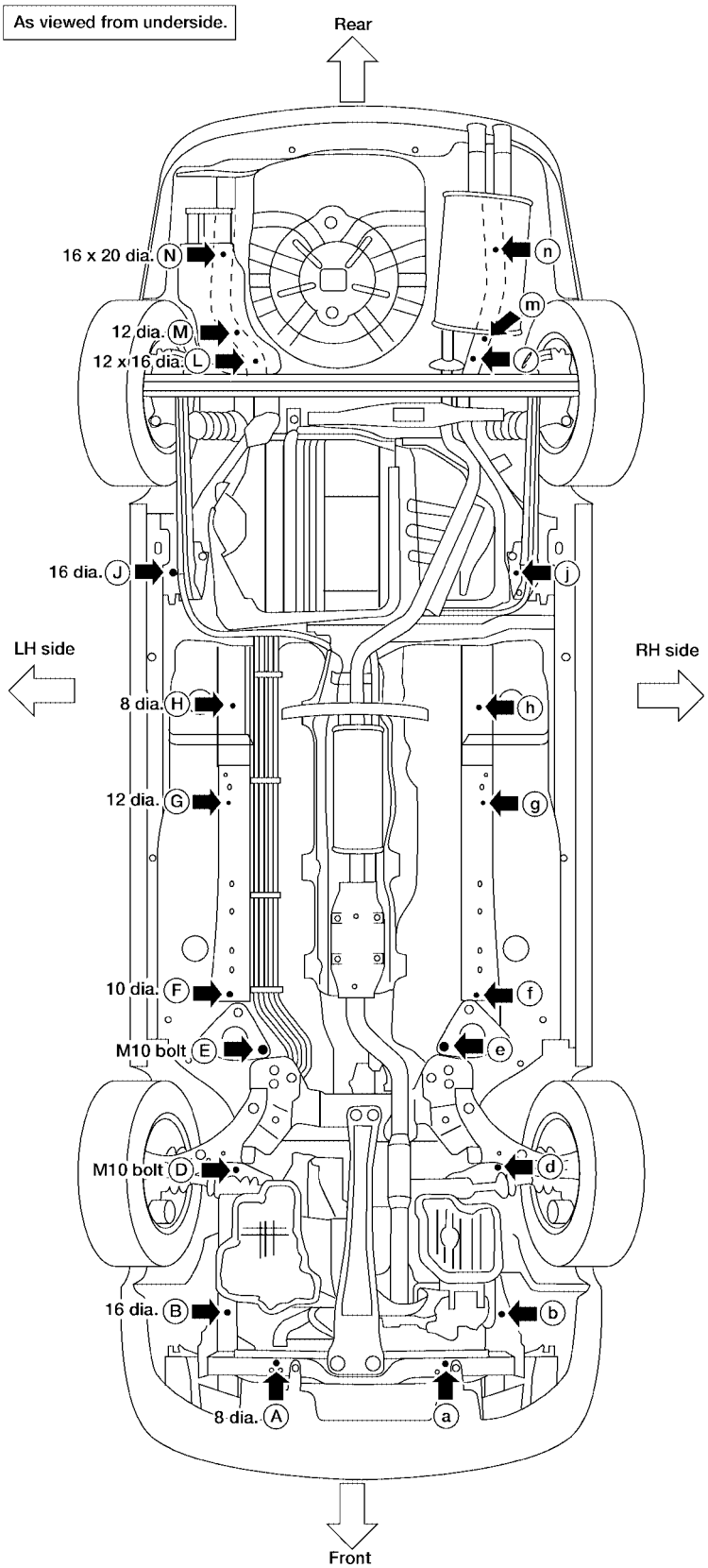
As viewed from underside.

* Figures marked with an * indicates symmetrically identical dimensions on both right- and left-hand sides of the vehicle.



WBT063

UNDERBODY
Measurement



Unit: mm

Coordinates:

Ⓐ, ⓐ
X: 280, -285
Y: 607, -609
Z: 186.8

Ⓑ, ⓑ
X: 477, -492
Y: -450
Z: 355

Ⓒ, ⓒ
X: 528
Y: 18
Z: 764

Ⓓ, ⓓ
X: 460
Y: 60
Z: 300.3

Ⓔ, ⓔ
X: 283.5
Y: 423
Z: 126.5

Ⓕ, ⓕ
X: 395
Y: 600
Z: 127.8

Ⓖ, ⓖ
X: 400, -405
Y: 1230
Z: 120.6

Ⓗ, ⓗ
X: 384
Y: 1560
Z: 128

Ⓙ, ⓙ
X: 600
Y: 2035
Z: 254

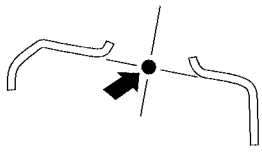
Ⓚ, ⓚ
X: 488.3
Y: 2467.8
Z: 520.6

Ⓛ, ⓛ
X: 385
Y: 2580
Z: 390

Ⓜ, ⓜ
X: 470
Y: 2790
Z: 355

Ⓝ, ⓝ
X: 489
Y: 3016
Z: 355

Front and rear strut tower centers
Ⓒ, ⓒ Ⓚ, ⓚ



Front: 30 dia.
Rear: 68 dia.

WBT064

SECTION BR
BRAKE SYSTEM

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EFS0022M

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

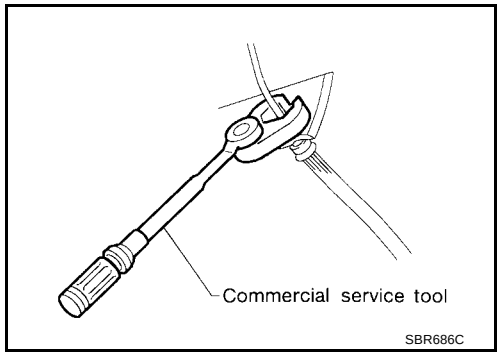
WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Precautions for Brake System

EFS0022N

- **Recommended fluid is brake fluid “DOT 3”.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.**
- **Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of the hydraulic system.**
- **Use flare nut wrench when removing and installing brake tube.**
- **Always torque brake lines when installing.**
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage.**
  Refer to BR-6, "Brake Burnishing Procedure".



WARNING:

- **Clean brake pads and shoes with a waste cloth, then wipe with a dust collector.**

Wiring Diagrams and Trouble Diagnosis

EFS0022O

When you read wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams"
- PG-2, "POWER SUPPLY ROUTING"

When you perform trouble diagnosis, refer to the following:

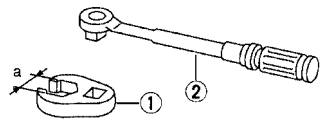
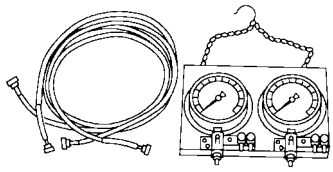
- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"

PREPARATION

PFP:00002

Commercial Service Tools

EFS0022P

Tool name	Description
1 Flare nut crowfoot 2 Torque wrench  S-NT360	Removing and installing brake piping **a: 10 mm (0.39 in)**
Brake fluid pressure gauge  NT151	Measuring brake fluid pressure

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

EFS0022Q

Use the chart below to help you find the cause of the symptom. If necessary, repair or replace these parts.

			Reference page	Pads - damaged	Pads - uneven wear	Shims damaged	Rotor imbalance	Rotor damage	Rotor runout	Rotor deformation	Rotor deflection	Rotor rust	Rotor thickness variation	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	STEERING
			Possible cause and SUSPECTED PARTS	Pads - damaged	Pads - uneven wear	Shims damaged	Rotor imbalance	Rotor damage	Rotor runout	Rotor deformation	Rotor deflection	Rotor rust	Rotor thickness variation	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	STEERING
Symptom	BRAKE	Noise		X	X	X								X	X	X	X	X	X
		Shake					X							X	X	X	X	X	X
		Shimmy, Judder					X	X	X	X	X	X	X		X	X	X	X	X

			Reference page
			BR-19, BR-23
			BR-19, BR-23
			BR-19, BR-23
			—
			—
			BR-21, BR-27
			—
			—
			—
			BR-21, BR-27
			FAX-4, "NVH Troubleshooting Chart"
			FAX-4, "NVH Troubleshooting Chart"
			FSU-4, "NVH Troubleshooting Chart"
			FSU-4, "NVH Troubleshooting Chart"
			FSU-4, "NVH Troubleshooting Chart"
			PS-6, "NVH Troubleshooting Chart"

X: Applicable

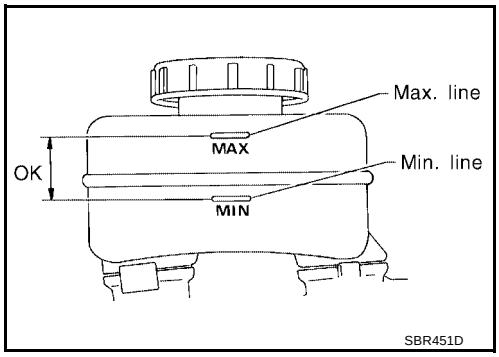
ON-VEHICLE SERVICE

PFP:00000

Checking Brake Fluid Level

EFS0022R

- Check fluid level in reservoir tank. It should be between the "Max" and "Min" lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.
- Release parking brake lever and see if brake warning lamp goes off. If not, check brake system for leaks.



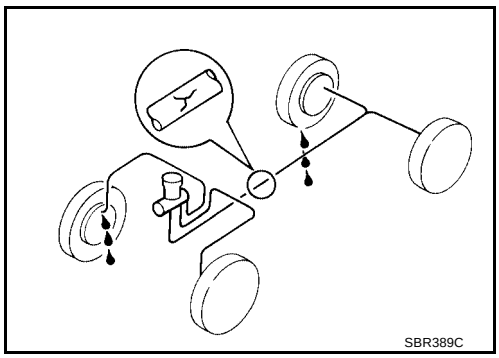
Checking Brake Line

EFS0022S

CAUTION:

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

1. Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.



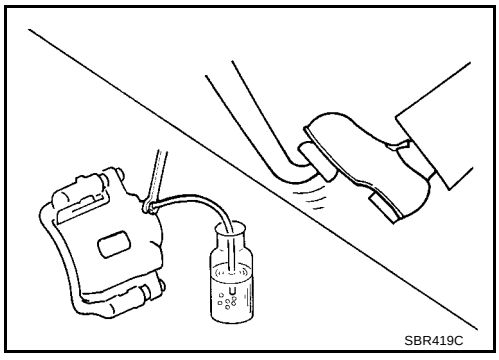
Changing Brake Fluid

EFS0022T

CAUTION:

- **Refill with new brake fluid “DOT 3”.**
- **Always keep fluid level higher than minimum line on reservoir tank.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**

1. Clean inside of reservoir tank, and refill with new brake fluid.
2. Connect a vinyl tube to each air bleeder valve.
3. Drain brake fluid from each air bleeder valve by depressing brake pedal.
4. Refill until brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to BR-7, "Bleeding Brake System" .



Brake Burnishing Procedure

EFS0022U

Burnish the brake contact surfaces according to the following procedure after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage.

CAUTION:

Only perform this procedure under safe road and traffic conditions. Use extreme caution.

1. Drive the vehicle on a straight smooth road at 50 km/h (31 MPH).

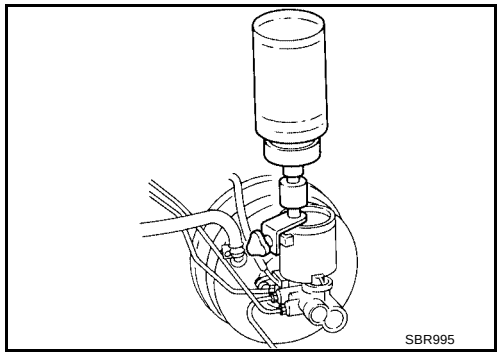
2. Use medium brake pedal/foot effort to bring the vehicle to a complete stop from 50 km/h (31 MPH). Adjust brake pedal/foot pressure so that vehicle stopping time equals 3 to 5 seconds.
3. To cool the brake system, drive the vehicle at 50 km/h (31 MPH) for 1 minute without stopping.
4. Repeat steps 1 to 3, 10 times or more to complete the burnishing procedure.

Bleeding Brake System

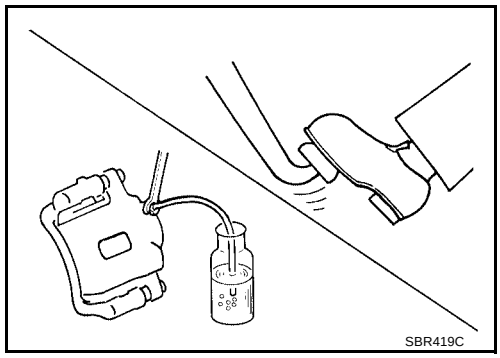
EFS0022V

CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.**
- **Place a container under master cylinder to avoid spillage of brake fluid.**
- **For models with ABS, turn ignition switch OFF and disconnect ABS actuator and electric unit connectors or battery ground cable.**
- **Bleed air in the following order.**
  Right rear brake → Left front brake → Left rear brake → Right front brake


SBR995

1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
4. Close air bleeder valve.
5. Release brake pedal slowly.
6. Repeat steps 2. through 5. until clear brake fluid comes out of air bleeder valve.
7. Tighten air bleeder valve to specification.


SBR419C

Air bleeder valve	
Front and rear disc brake	**: 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)**

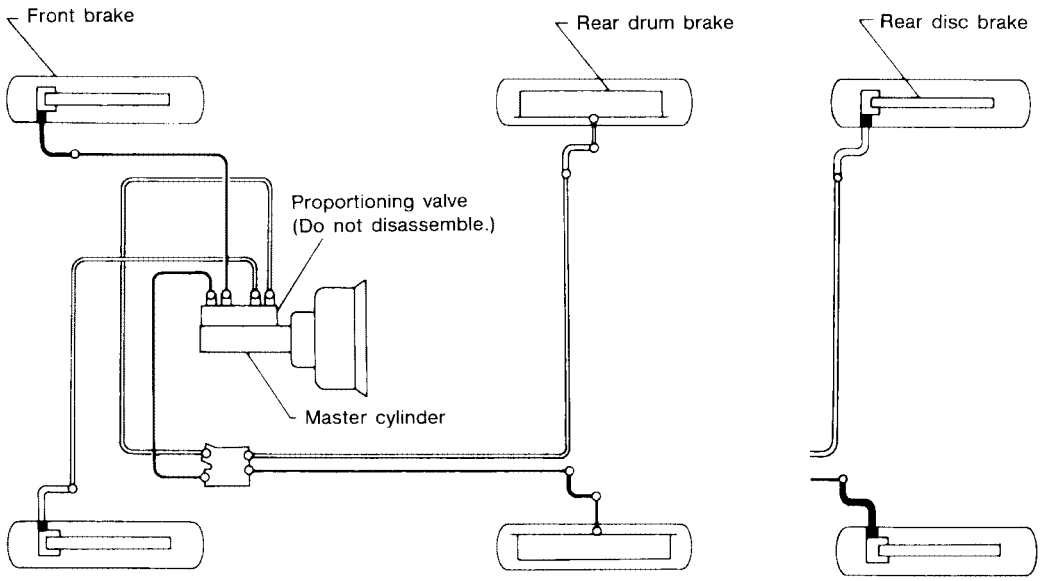
BRAKE HYDRAULIC LINE

PFP:46210

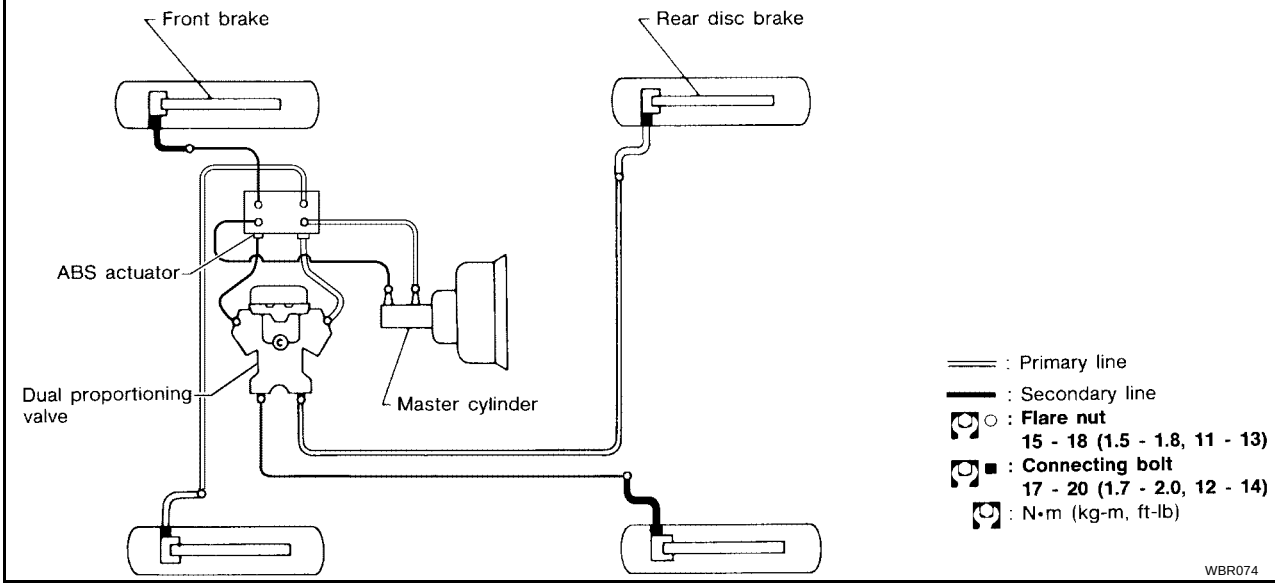
Hydraulic Circuit

EFS0022W

Without anti-lock brake system
(Models with dual proportioning valve built into master cylinder)
(built-in type)



With anti-lock brake system



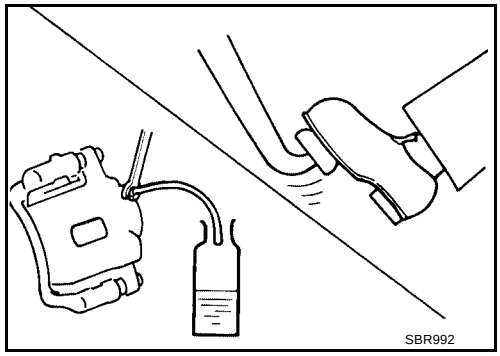
Removal

EFS0022X

CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **All hoses must be free from excessive bending, twisting and pulling.**

1. Connect vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Remove flare nut connecting brake tube and hose, then withdraw lock spring.
4. Cover openings to prevent entrance of dirt whenever disconnecting brake line.



Inspection

EFS0022Y

Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.

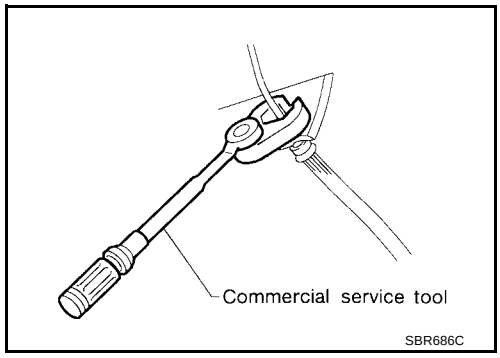
Installation

EFS0022Z

1. Tighten all flare nuts and connecting bolts.

Specification

Flare nut	**: 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)**
Connecting bolt	**: 17 - 20 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)**



2. Refill until new brake fluid comes out of each air bleeder valve.

CAUTION:

- **Refill with new brake fluid “DOT 3”.**
- **Never reuse drained brake fluid.**

3. Bleed air from brake system. Refer to BR-7, "Bleeding Brake System" .

DUAL PROPORTIONING VALVE

PFP:46400

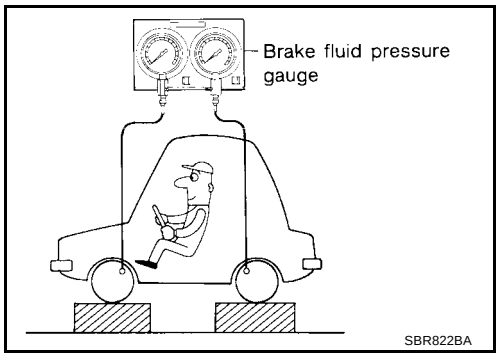
Inspection

EFS00230

CAUTION:

- **Carefully monitor brake fluid level at master cylinder.**
- **Use new brake fluid “DOT 3”.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.**

1. Connect Tool to air bleeders of front and rear brakes on either LH and RH side.
2. Bleed air from the Tool.
3. Check fluid pressure by depressing brake pedal.

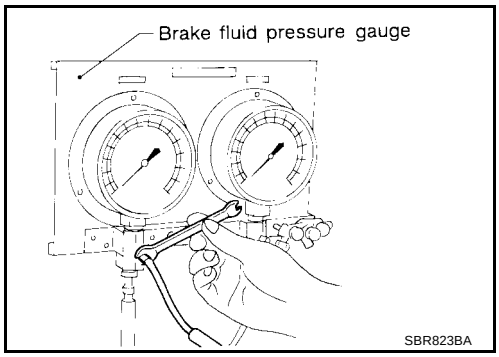


Unit: kPa (kg/cm^2 , psi)

Applied model	All QG18DE	QR25DE without ABS	QR25DE with ABS
Applied pressure (Front brake)	7,355 (75, 1,067)	6,374 (65, 924)	6,374 (65, 924)
Output pressure (Rear brake)	5,099 - 5,492 (52 - 56, 740 - 796)	3,775 - 4,168 (38 - 42, 548 - 604)	4,119 - 4,511 (42 - 46, 597 - 654)

- If output pressure is out of specification, replace dual proportioning valve.

4. Bleed air after disconnecting the Tool. Refer to BR-7, "Bleeding Brake System" .

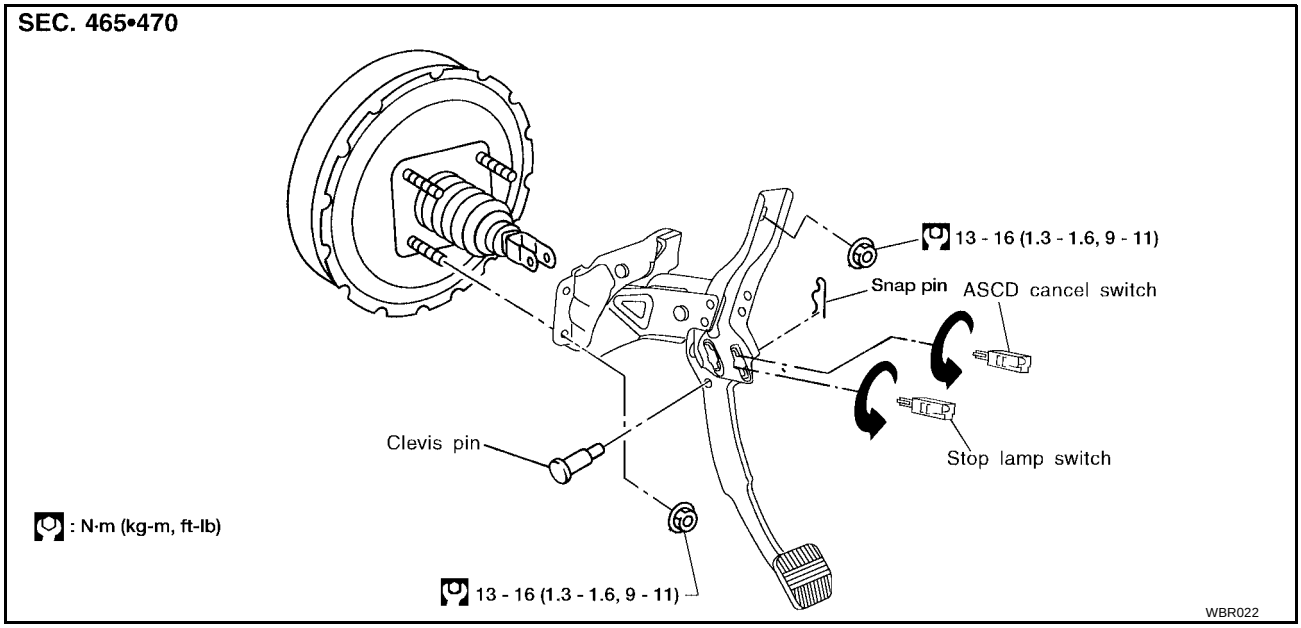


BRAKE PEDAL AND BRACKET

PFP:46501

Removal and Installation

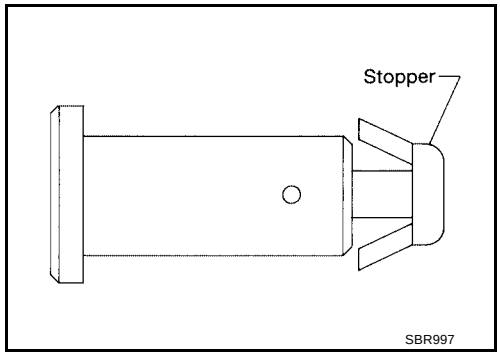
EFS00231



Inspection

EFS00232

- Check brake pedal for following items:
  - Brake pedal bend
  - Clevis pin deformation
  - Crack of any welded portion
  - Crack or deformation of clevis pin stopper



Adjustment

EFS00233

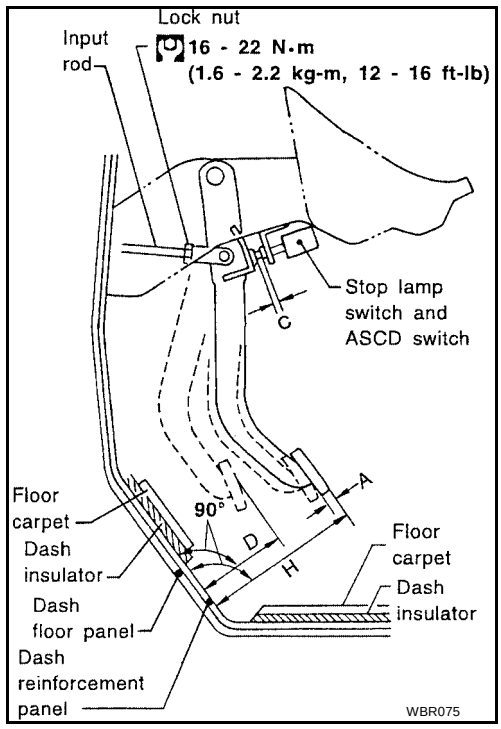
BRAKE PEDAL HEIGHT

- Check brake pedal free height from metal panel and adjust if necessary.

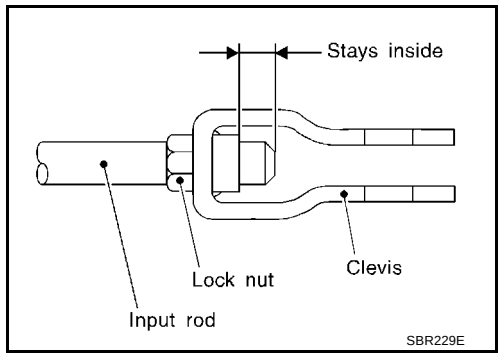
H : Free height
Refer to BR-35, "Brake Pedal" .

D : Depressed height
90 mm (3.54 in)
Under force of 490 N (50 kg, 110 lb)
with engine running

A : Pedal free play at pedal pad
1.0 - 3.0 mm (0.039 - 0.118 in)



1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.
2. Check pedal free play.
   Make sure that stop lamps go off when pedal is released.
3. Check brake pedal's depressed height while engine is running. If lower than specification, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.



STOP LAMP SWITCH AND ASCD CANCEL SWITCH CLEARANCE

1. Twist and pull to remove switch.
2. Pull up on brake pedal pad and hold.
3. Insert switch into retainer until switch plunger is completely depressed.
4. Turn the switch until it locks into place in the brake pedal bracket.

NOTE:
When turning the switch to lock into place, the switch backs off the stopper to the correct clearance automatically.

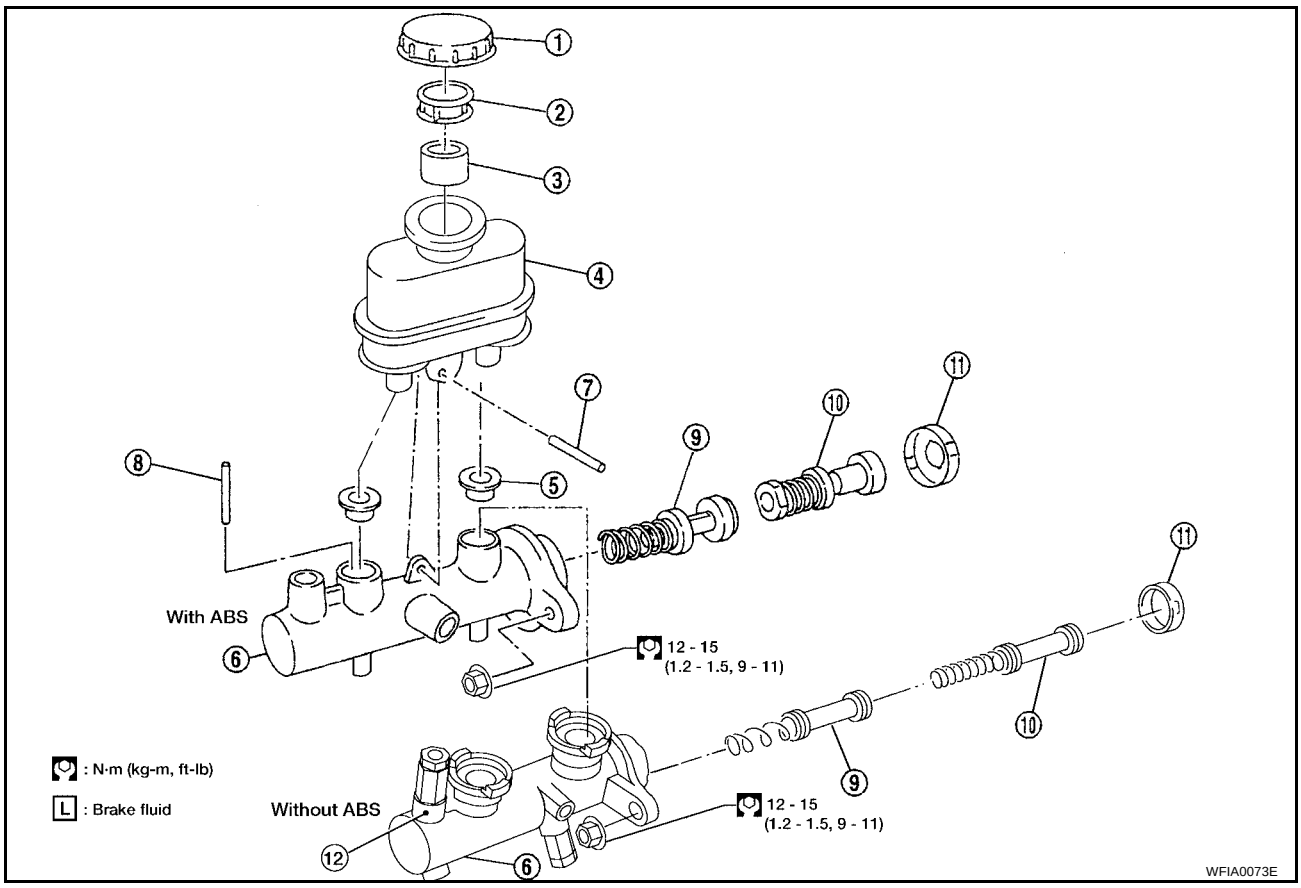
5. Release the brake pedal pad.

MASTER CYLINDER

PFP:46010

Removal

EFS00234



1. Reservoir cap	2. Oil filter	3. Float
4. Reservoir tank	5. Seal	6. Cylinder body
7. Spring pin (with ABS)	8. Piston stopper pin (with ABS)	9. Secondary piston assembly
10. Primary piston assembly	11. Stopper cap	12. Proportioning valve (without ABS)

CAUTION:

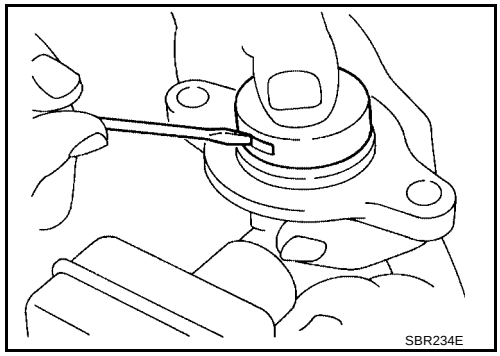
Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake line flare nuts from master cylinder.
4. Remove master cylinder mounting nuts.

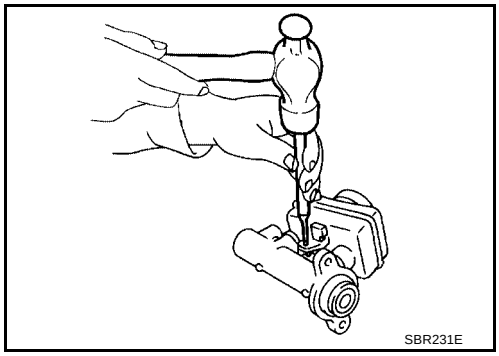
Disassembly

EFS00235

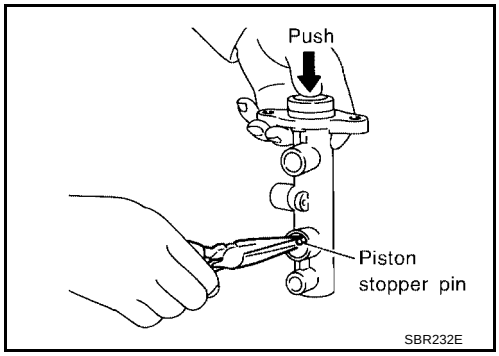
1. Bend claws of stopper cap outward and remove stopper cap.



2. Drive out spring pin from cylinder body (with ABS).
3. Draw out reservoir tank and seals.


SBR231E

4. Remove piston stopper pin while piston is pushed into cylinder (with ABS).
5. Remove piston assemblies.
   - **If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.**



SBR232E

Inspection

EFS00236

Check for the following items.
Replace any part if damaged.
Master cylinder:

- Pin holes or scratches on inner wall.

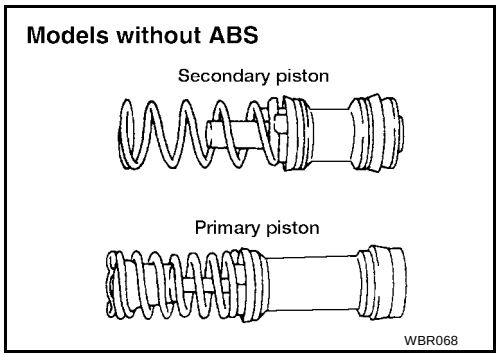
Piston:

- Deformation of or scratches on piston cups.

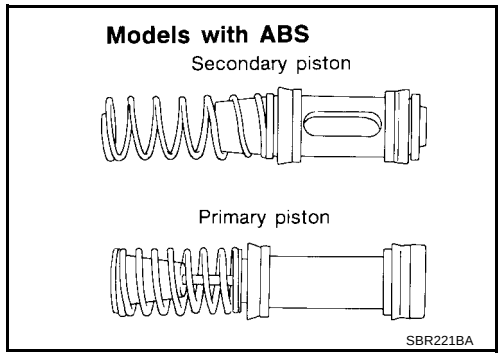
Assembly

EFS00237

1. Insert secondary piston assembly. Then insert primary piston assembly.
   - **Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body (with ABS).**

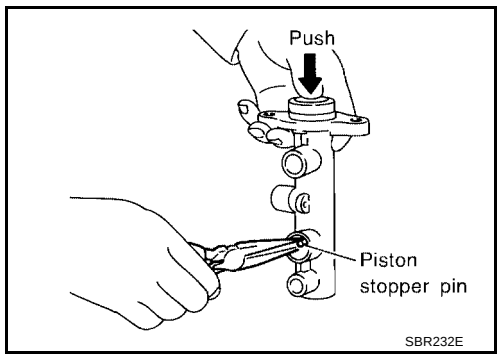


WBR068



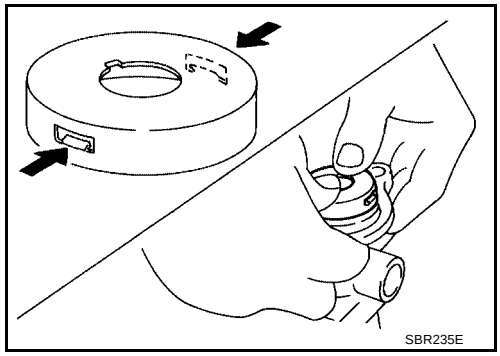
SBR221BA

2. Install piston stopper pin while piston is pushed into cylinder (with ABS).
3. Push reservoir tank seals and reservoir tank into cylinder body.
4. Install spring pin (with ABS).



5. Install stopper cap.

- **Before installing stopper cap, ensure that claws are bent inward.**

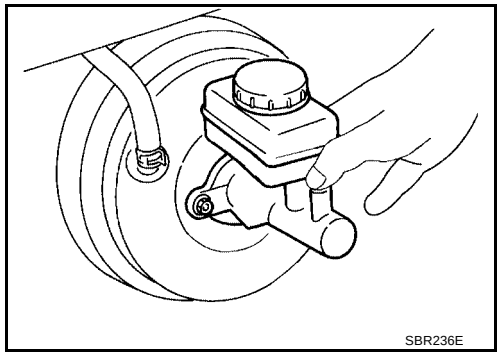


Installation

EFS00238

1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Tighten master cylinder mounting nuts.

Master cylinder : 12 - 15 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)



3. Fill reservoir tank with new brake fluid “DOT 3”.

CAUTION:

- **Refill with new brake fluid “DOT 3”.**
- **Never reuse drained brake fluid.**

4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
6. Fit brake lines to master cylinder.
7. Tighten flare nuts.

Flare nuts : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

8. Bleed air from brake system. Refer to BR-7, "Bleeding Brake System" .

BRAKE BOOSTER

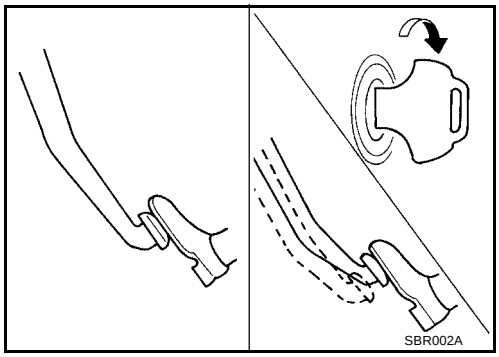
PFP:47200

On-vehicle Service

EFS00239

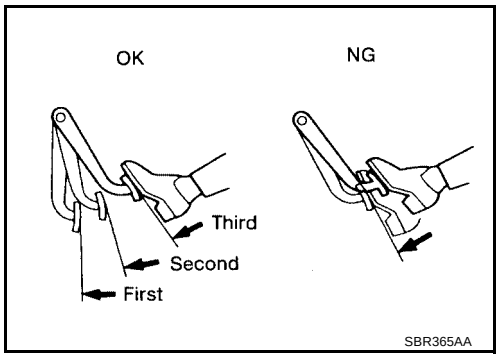
OPERATING CHECK

1. Stop engine and depress brake pedal several times. Check that pedal stroke does not change.
2. Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



AIRTIGHT CHECK

1. Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. The pedal should go further down the first time, and then it should gradually rise thereafter.
2. Depress brake pedal while engine is running, and stop engine with pedal depressed. The pedal stroke should not change after holding pedal down for **30 seconds.**

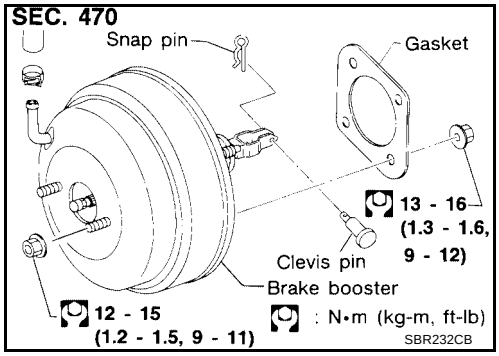


Removal

EFS0023A

CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **Be careful not to deform or bend brake lines, during removal of booster.**



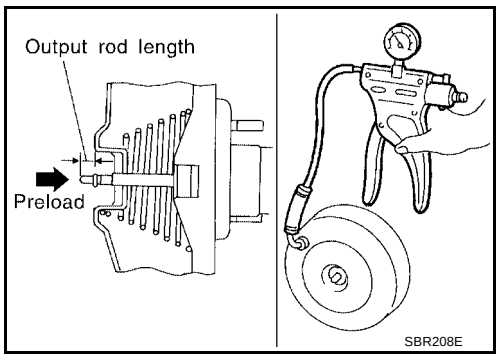
Inspection

EFS0023B

OUTPUT ROD LENGTH CHECK

1. Apply vacuum of –66.7 kPa (–500 mmHg, –19.69 inHg) to brake booster with a hand vacuum pump.
2. Add preload of 19.6 N (2 kg, 4.4 lb) to output rod.
3. Check output rod length.

Specified length : 10.275 - 10.525 mm (0.4045 - 0.4144 in)



Installation

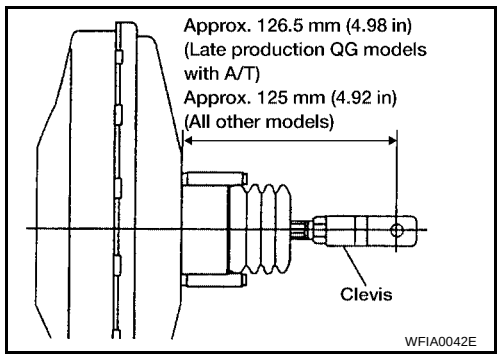
EFS0023C

CAUTION:

- **Be careful not to deform or bend brake lines, during installation of booster.**
- **Replace clevis pin if damaged.**
- **Refill with new brake fluid “DOT 3”.**
- **Never reuse drained brake fluid.**
- **Take care not to damage brake booster mounting bolt thread when installing. Due to the acute angle of installation, the threads can be damaged with the dash panel.**

1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to master cylinder) lightly.
3. Connect brake pedal and booster input rod with clevis pin.
4. Install and tighten brake booster mounting nuts to specification.

Brake booster : 13 - 16 N·m (1.3 - 1.6 kg-m, 9 - 12 ft-lb)



5. Install master cylinder. Refer to BR-15, "Installation" .
6. Connect brake booster vacuum hose.
7. Adjust brake pedal height. Refer to BR-12, "BRAKE PEDAL HEIGHT" .
8. Bleed air from brake system. Refer to BR-7, "Bleeding Brake System" .

VACUUM HOSE

PFP:41920

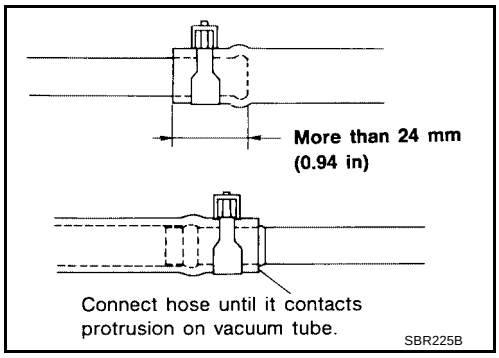
Removal and Installation

EFS0023D

CAUTION:

When installing vacuum hoses, pay attention to the following points:

- **Do not apply any oil or lubricants to vacuum hose with check valve.**
- **Insert vacuum tube into vacuum hose as shown.**
- **Install vacuum hose with the internal check valve oriented in the correct direction. The arrow on the hose should point to the engine connection.**



Inspection

EFS0023E

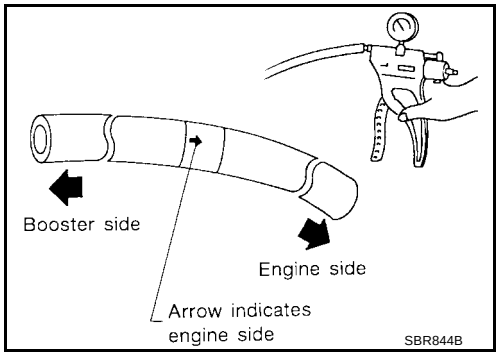
HOSES AND CONNECTORS

Check vacuum lines and connections for airtightness, improper attachment, chafing and deterioration.

CHECK VALVE

Check vacuum with a vacuum pump.

Connect to booster side	Vacuum should exist
Connect to engine side	Vacuum should not exist

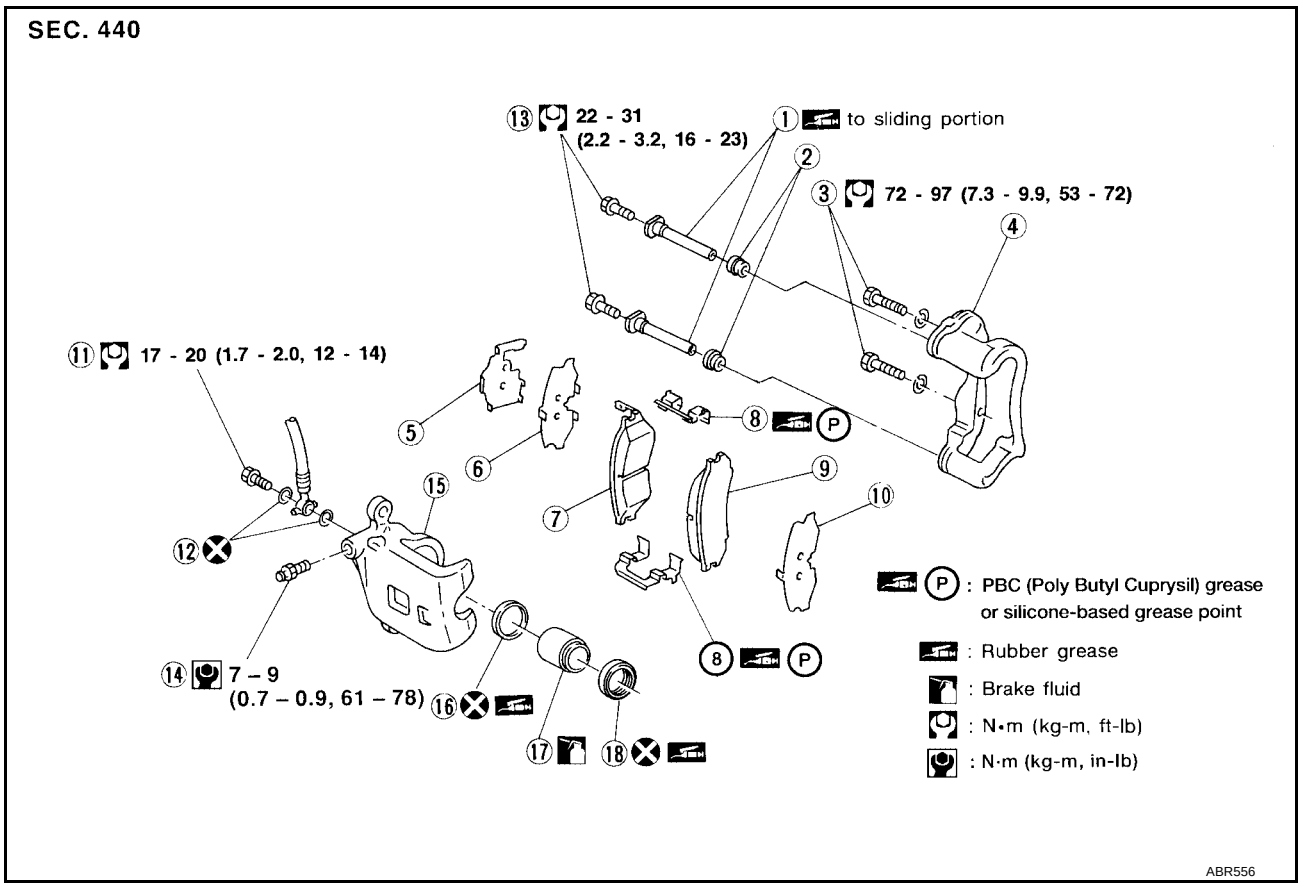


FRONT DISC BRAKE

PFP:41000

Component

EFS0023F



1.	Main pin	2.	Pin boot	3.	Torque member fixing bolt
4.	Torque member	5.	Shim cover	6.	Inner shim
7.	Inner pad	8.	Pad retainer	9.	Outer pad
10.	Outer shim	11.	Connecting bolt	12.	Copper washer
13.	Main pin bolt	14.	Air bleeder valve	15.	Cylinder body
16.	Piston seal	17.	Piston	18.	Piston boot

Pad Replacement

EFS0023G

WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

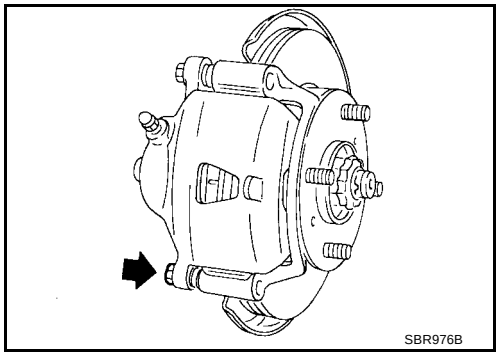
CAUTION:

- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.**
- **If shims are rusted or show peeling of the rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage.**
  Refer to BR-6, "Brake Burnishing Procedure" .

1. Remove master cylinder reservoir cap.

2. Remove wheel and tire. Refer to MA-31, "Tire Rotation" .

3. Remove pin bolt.

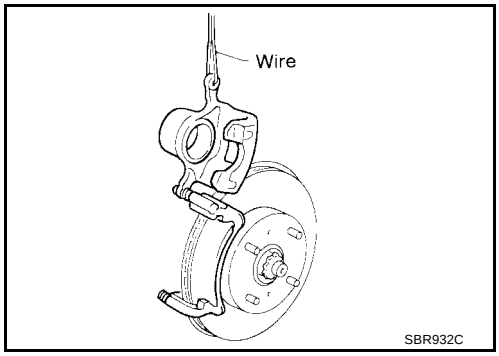


4. Open cylinder body upward. Then remove pad with retainers, inner and outer shims.

Standard pad thickness (CL25VA, CL25VB) : 11 mm (0.43 in)

Pad wear limit (CL25VA, CL25VB) : 2.0 mm (0.079 in)

NOTE:
Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.



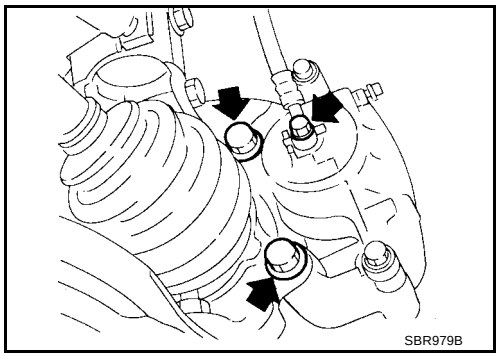
Caliper Removal

EFS0023H

1. Remove wheel and tire. Refer to MA-31, "Tire Rotation" .
2. Remove torque member fixing bolts and brake hose connecting bolt.

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

- **It is not necessary to remove brake hose connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.**

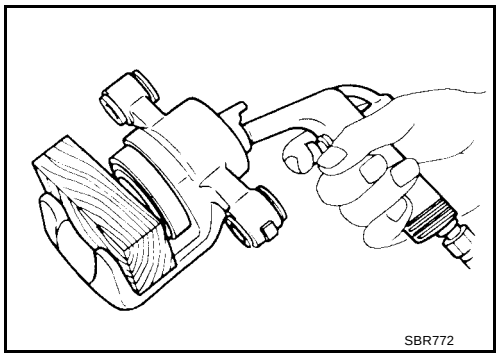


Caliper Disassembly

EFS0023I

1. Push out piston with piston boot with compressed air.

WARNING:
Do not place your fingers in front of piston.

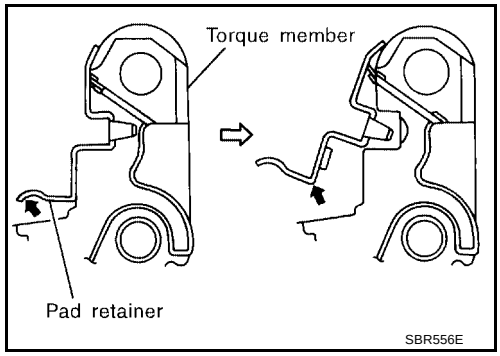


2. Remove piston seal with a suitable tool.

CAUTION:
Do not scratch or score cylinder wall.

3. Remove the pad retainer.

CAUTION:
When removing the pad retainer from the torque member, lift it up and out in the direction of the arrows in the figure.



EFS0023J

Inspection

CALIPER

Cylinder Body

CAUTION:
Use brake fluid to clean. Never use mineral oil.

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

Piston

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

- Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

Slide Pin, Pin Bolt and Pin Boot

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

ROTOR

Rubbing Surface

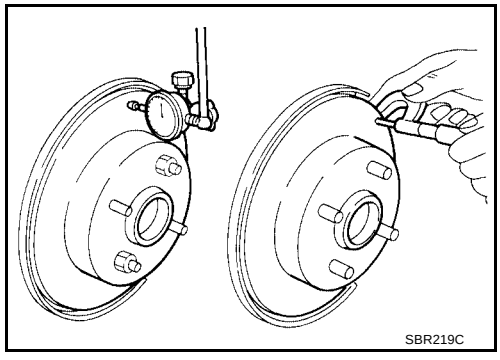
Check rotor for roughness, cracks or chips.

Runout

1. Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

CAUTION:
Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to FAX-5, "Front Wheel Bearing"

Maximum runout : 0.07 mm (0.0028 in)



3. If the runout is out of specification, find minimum runout mounting position as follows:

a. Remove nuts and rotor from wheel hub.
b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
c. Measure runout.
d. Repeat steps a. to c. so that minimum runout position can be found.

4. If the runout is still out of specification, turn rotor with on-car brake lathe (“MAD, DL-8700”, “AMMCO 700 and 705” or equivalent).

Thickness

Thickness variation :Maximum 0.01 mm (0.0004 in)
(At least 8 positions)

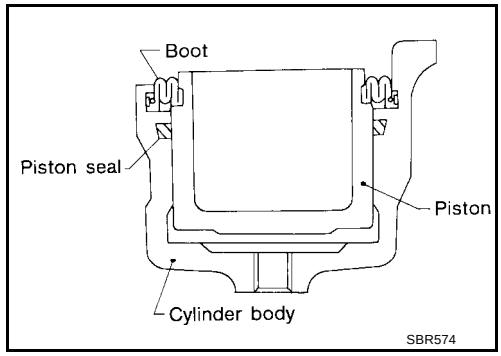
- If rotor thickness variation exceeds the specification, turn rotor with on-car brake lathe.

Rotor thickness repair limit : 20.0 mm (0.787 in)

Caliper Assembly

EFS0023K

1. Insert piston seal into groove in cylinder body.
2. With piston boot fitted to piston, insert piston boot into groove on cylinder body and install piston.
3. Properly secure piston boot.



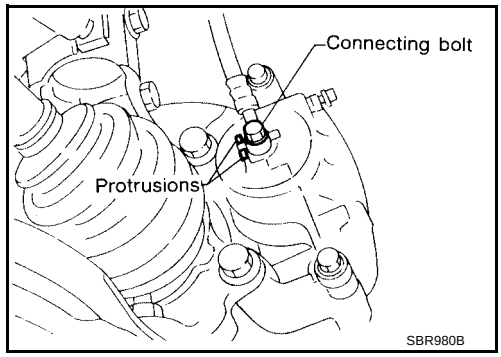
Caliper Installation

EFS0023L

CAUTION:

- **Refill with new brake fluid “DOT 3”.**
- **Never reuse drained brake fluid.**

1. Install brake hose to caliper securely.
2. Install all parts and tighten all bolts. Refer to BR-19, "Component" .
3. Bleed air from brake system. Refer to BR-7, "Bleeding Brake System" .

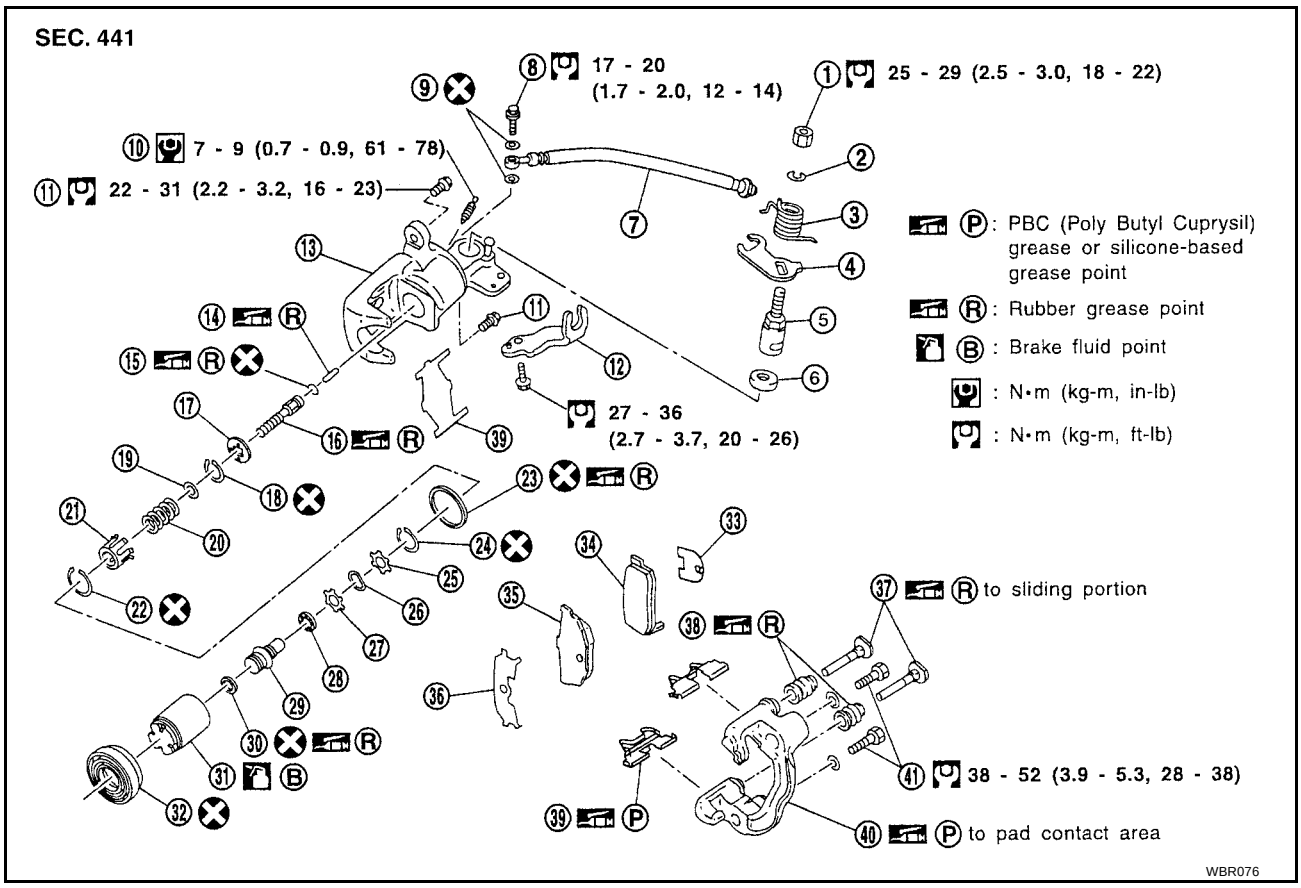


REAR DISC BRAKE

PFP:44000

Component

EFS0023M



1. Nut	2. Washer	3. Return spring
4. Toggle lever	5. Cam	6. Cam boot
7. Brake hose	8. Connecting bolt	9. Copper washers
10. Air bleeder valve	11. Pin bolt	12. Cable guide
13. Cylinder body	14. Strut	15. O-ring
16. Push rod	17. Key plate	18. Ring C
19. Seat	20. Spring	21. Spring cover
22. Ring B	23. Piston seal	24. Ring A
25. Spacer	26. Wave washer	27. Spacer
28. Ball bearing	29. Adjuster	30. Cup
31. Piston	32. Dust seal	33. Inner shim
34. Inner pad	35. Outer pad	36. Outer shim
37. Pin	38. Pin boot	39. Pad retainer
40. Torque member	41. Torque member fixing bolt	

Pad Replacement

EFS0023N

WARNING:

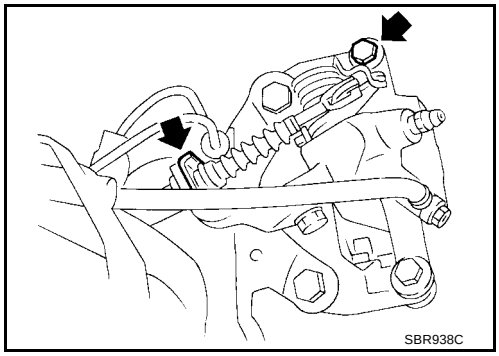
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

CAUTION:

- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.**
- **If shims are rusted or show peeling of rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**

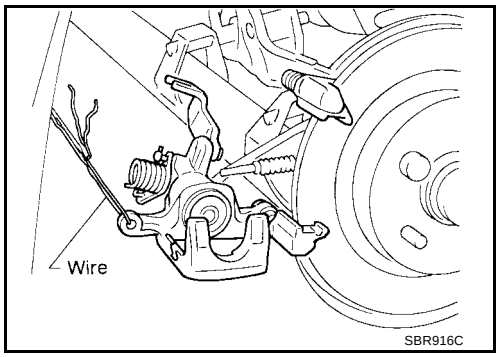
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage.**
  Refer to BR-6, "Brake Burnishing Procedure" .

1. Remove master cylinder reservoir cap.



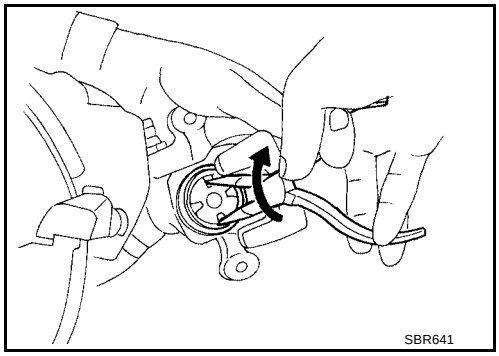
2. Remove wheel and tire. Refer to MA-31, "Tire Rotation" .
3. Remove brake cable mounting bolt and lock spring.
4. Release parking brake control lever, then disconnect cable from the caliper.
5. Remove upper pin bolt.
6. Open cylinder body downward and secure with wire as shown. Then remove pad retainers, and inner and outer shims.

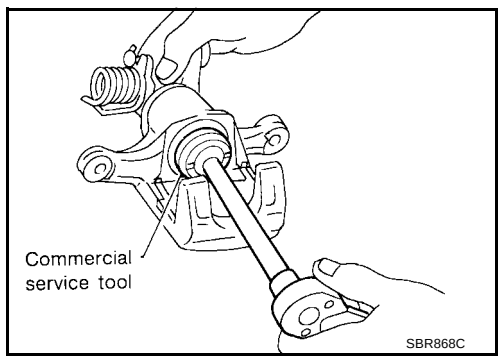
   Standard pad thickness : 10 mm (0.39 in)
   Pad wear limit : 2.0 mm (0.079 in)



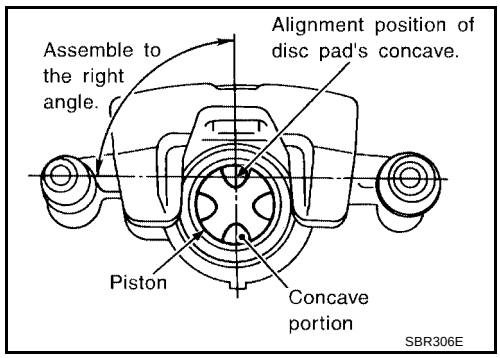
7. When installing new pads, push piston into cylinder body by gently turning piston clockwise, as shown.

   NOTE:
   Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

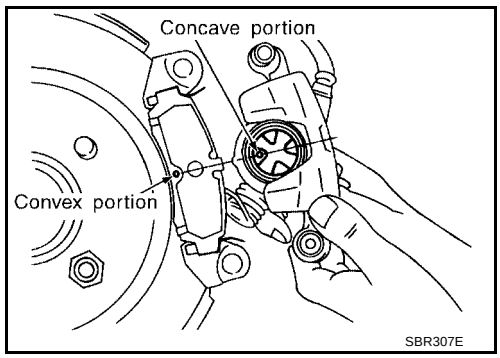




8. Adjust the piston to the right angle as shown.



9. Align the piston's concave to the pad's convex, then install the cylinder body to the torque member as shown.



Caliper Removal

EFS0023O

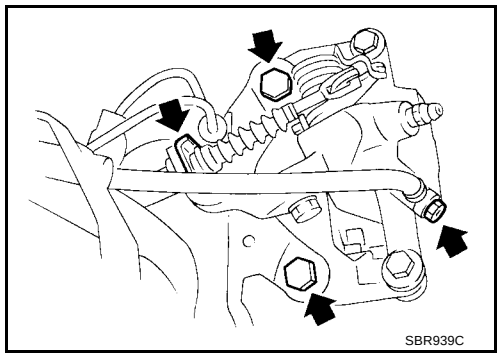
WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

1. Remove wheel and tire. Refer to MA-31, "Tire Rotation" .
2. Remove brake cable mounting bolt and lock spring.
3. Release parking brake control lever, then disconnect cable from the caliper.
4. Remove torque member fixing bolts and brake hose connecting bolt.

   NOTE:

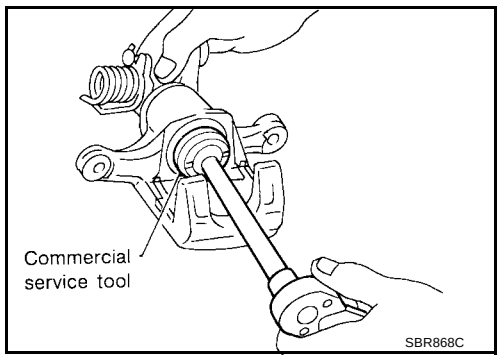
   It is not necessary to remove brake hose connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.
5. Remove caliper assembly.

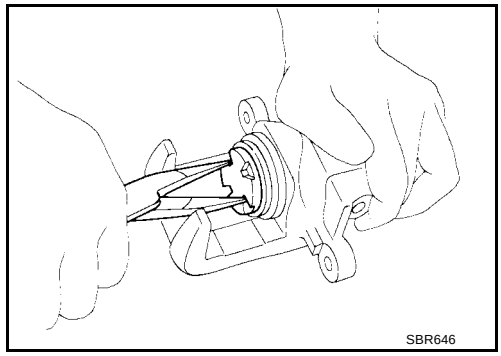


Caliper Disassembly

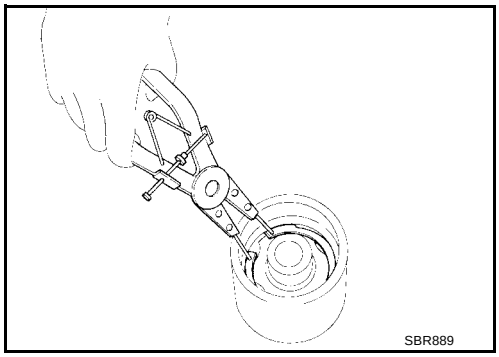
EFS0023P

1. Remove piston by turning it counterclockwise with suitable commercial service tool or long nose pliers.




SBR646

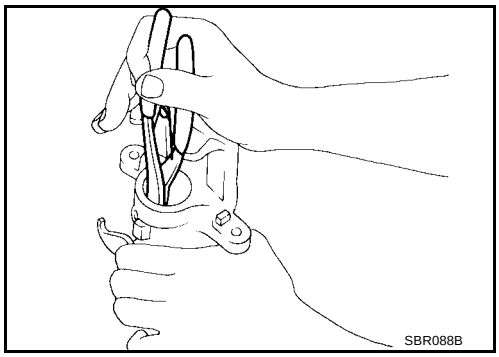
2. Pry off ring A from piston with suitable pliers and remove cup, adjuster, bearing, spacers, and wave washer.


SBR889

3. Disassemble cylinder body.

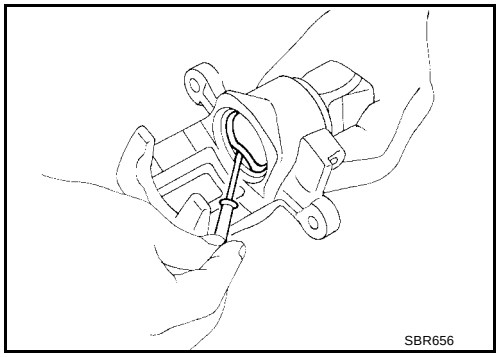
a. Pry off ring B with suitable pliers, then remove spring cover, spring and seat.

b. Pry off ring C, then remove key plate, push rod and rod.

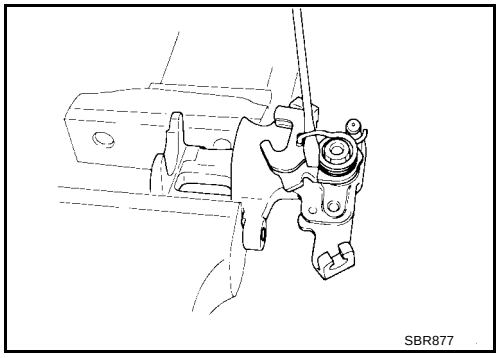

SBR088B

c. Remove piston seal with a suitable tool.

CAUTION:
Be careful not to damage cylinder body.


SBR656

4. Remove return spring, toggle lever and cable guide.


SBR877

Inspection

EFS0023Q

CALIPER

CAUTION:

Use brake fluid to clean cylinder. Never use mineral oil.

Cylinder Body

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper.
  Replace cylinder body if necessary.

Torque Member

Check for wear, cracks or other damage. Replace if necessary.

Piston

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

Check piston for score, rust, wear, damage or presence of foreign materials.
Replace if any of the above conditions are observed.

Pin and Pin Boot

Check for wear, cracks or other damage.
Replace if any of the above conditions are observed.

ROTOR

Rubbing Surface

Check rotor for roughness, cracks or chips.

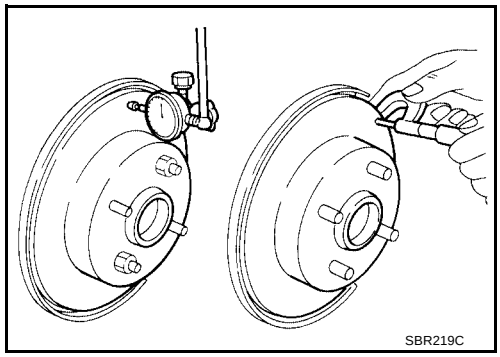
Runout

1. Secure rotor to wheel hub with two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

   CAUTION:

   Make sure that axial end play is within the specifications before measuring. Refer to RAX-5, "Rear Wheel Bearing" .
3. Change relative positions of rotor and wheel hub so that runout is minimized.

Maximum runout : 0.07 mm (0.0028 in)



Thickness

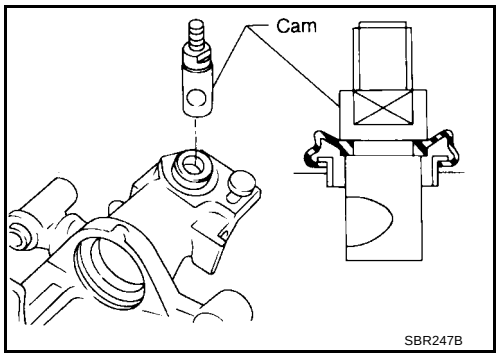
Rotor repair limit

Standard thickness	**: 9 mm (0.35 in)**
Minimum thickness	**: 8 mm (0.31 in)**
Maximum thickness variation (At least 8 portions)	**: 0.02 mm (0.0008 in)**

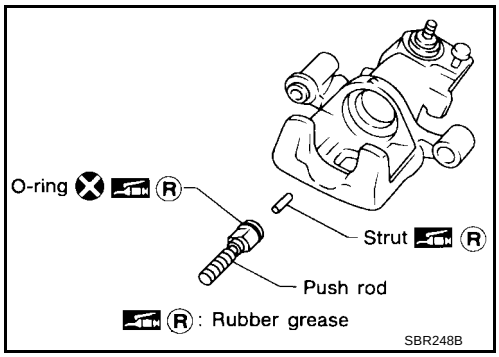
Caliper Assembly

EFS0023R

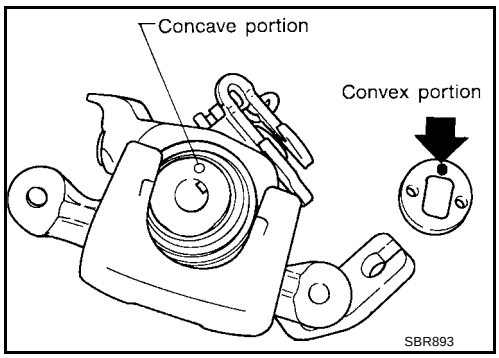
1. Insert cam with depression facing toward open end of cylinder.



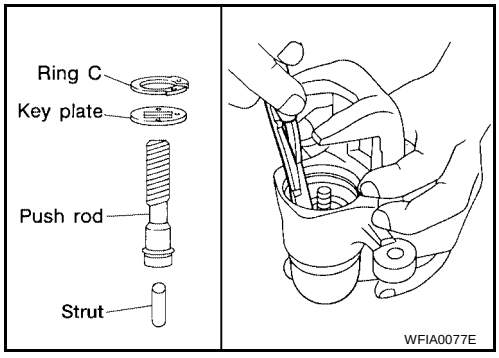
2. Generously apply rubber grease to strut and push rod to make insertion easy.



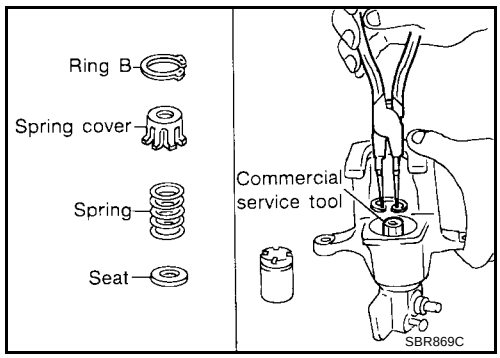
3. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.

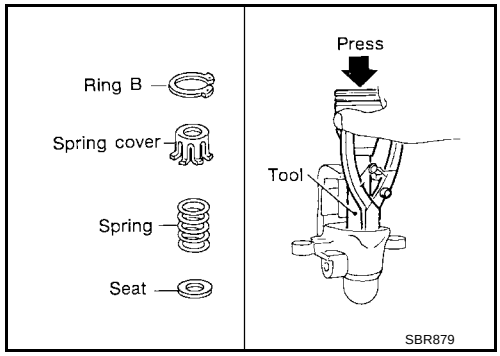


4. Install ring C with a suitable tool.

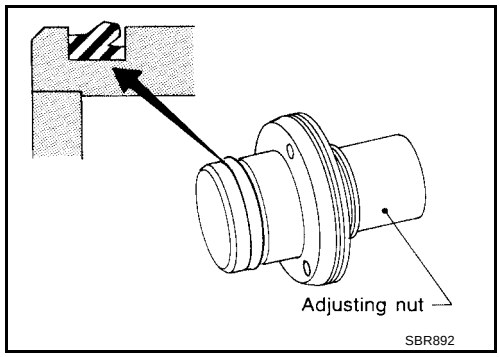


5. Install seat, spring, spring cover and ring B with snap ring pliers and a suitable press and drift.

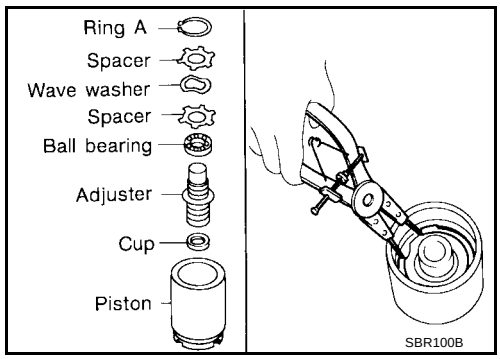




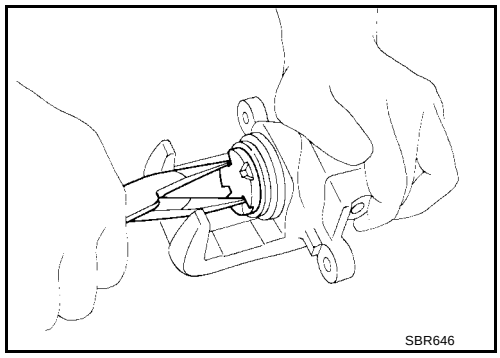
6. Install cup in the specified direction.

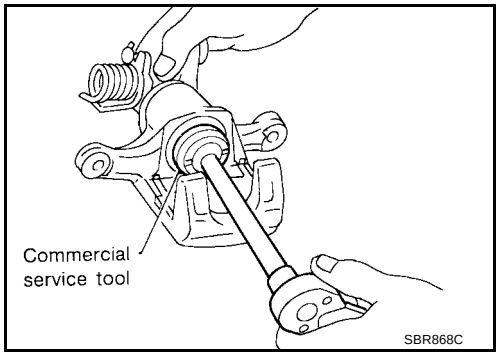


7. Install cup, adjuster, bearing, spacers, washer and ring A with a suitable tool.
8. Insert piston seal into groove on cylinder body.

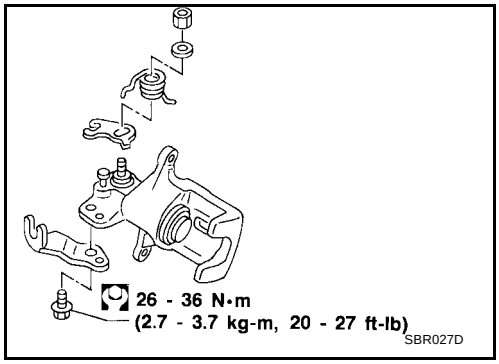


9. With piston boot fitted to piston, insert piston boot into groove on cylinder body and fit piston by turning it clockwise with long nose pliers, or suitable tool.

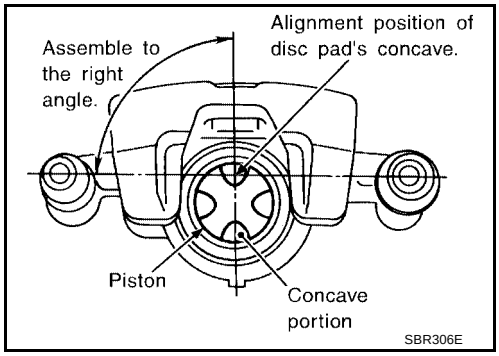




10. Fit toggle lever, return spring and cable guide.



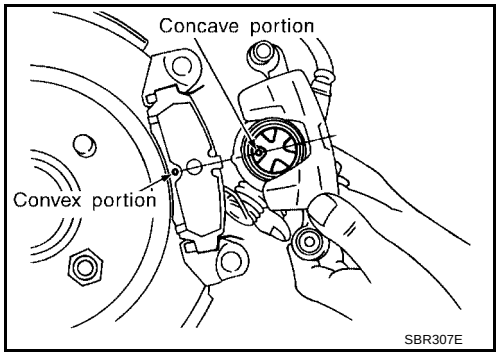
11. Adjust the piston to the right angle as shown.



Caliper Installation

EFS0023S

1. Install caliper assembly.
   - As shown in the figure, align the piston's concave to the pad's convex, then install the cylinder body to the torque member.
2. Install brake hose to caliper securely.
3. Install all parts and tighten all bolts. Refer to BR-23, "Component" .
4. Bleed air from brake system. Refer to BR-7, "Bleeding Brake System" .



CAUTION:

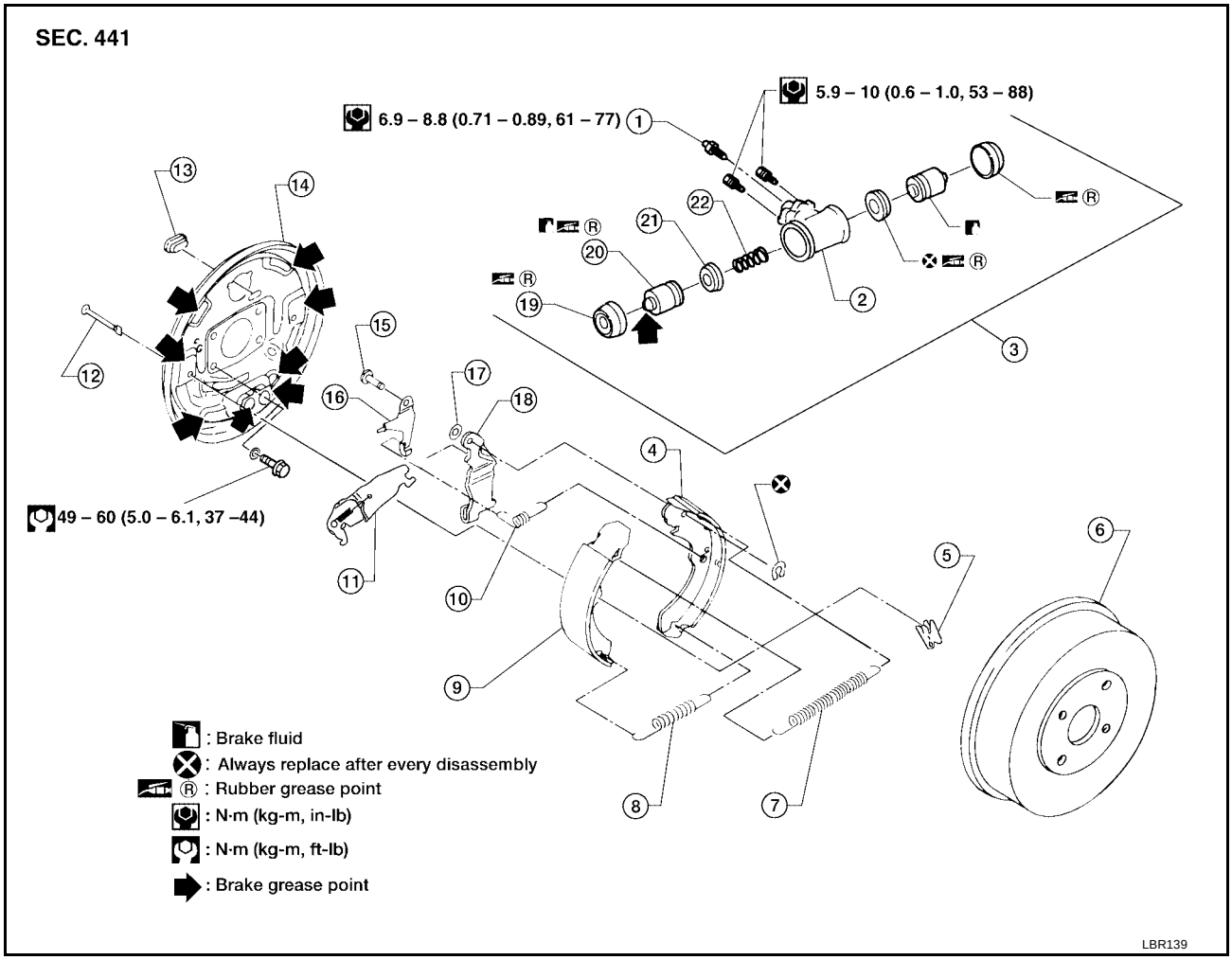
- **Refill with new brake fluid “DOT 3”.**
- **Never reuse drained brake fluid.**

REAR DRUM BRAKE

PFP:43206

Components

EFS0023T



1. Air bleeder valve	2. Cylinder body	3. Wheel cylinder
4. Shoe	5. Shoe hold-down spring	6. Brake drum
7. Return spring	8. Return spring	9. Shoe
10. Adjuster spring	11. Adjuster	12. Shoe hold-down pin
13. Adjuster plug	14. Back plate	15. Retainer
16. Adjusting lever	17. Washer	18. Toggle lever
19. Dust cover	20. Piston	21. Piston cap
22. Spring		

Removal

EFS0023U

WARNING:

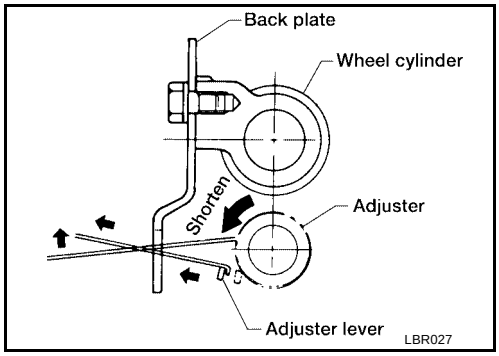
Clean brake lining with a vacuum dust collector to minimize the hazard of airborne materials or other materials.

CAUTION:

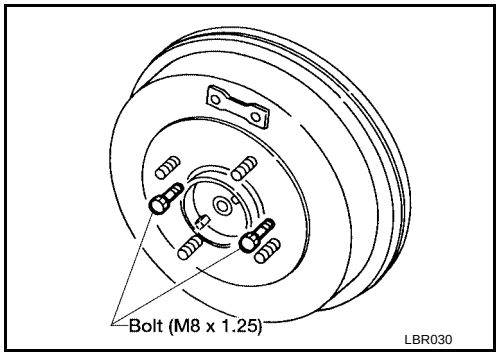
Make sure parking brake lever is completely released.

1. Remove wheel and tire. Refer to MA-31, "Tire Rotation" .

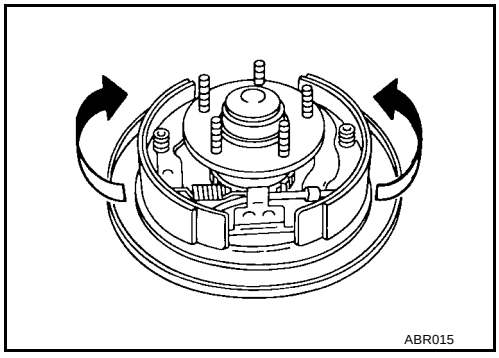
2. Release parking brake lever fully, then remove drum.



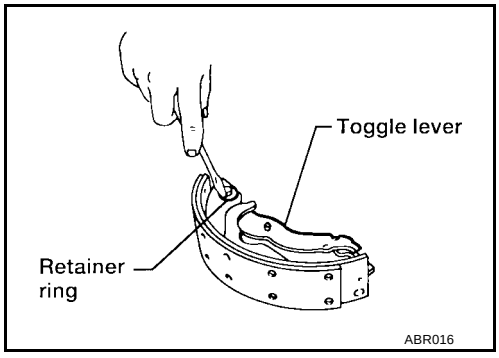
- If drum is hard to remove, remove adjuster plug. Shorten adjuster as shown to make clearance between brake shoe and drum. Install two bolts as shown. Tighten the two bolts gradually.



3. After removing retainer, remove spring by rotating shoes.
   NOTE:
   Be careful not to damage parking brake cable when separating it.
4. Remove adjuster.
5. Disconnect parking brake cable from toggle lever.



6. Remove retainer ring with a suitable tool. Then separate toggle lever and adjusting lever from the brake shoe.

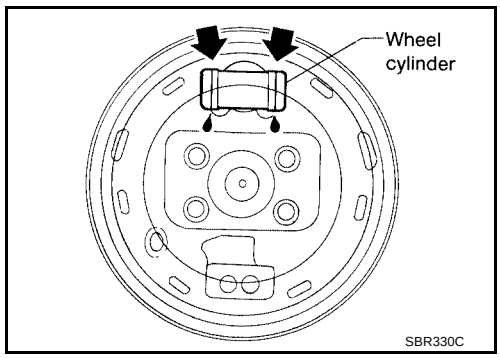


Inspection

EFS0023V

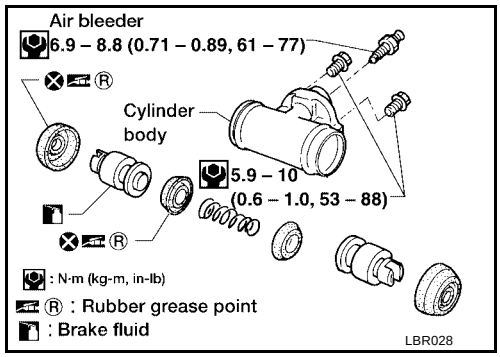
WHEEL CYLINDER

- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.



WHEEL CYLINDER OVERHAUL

- Check all internal parts for wear, rust and damage. Replace if necessary.
- Be careful not to scratch cylinder when installing pistons.

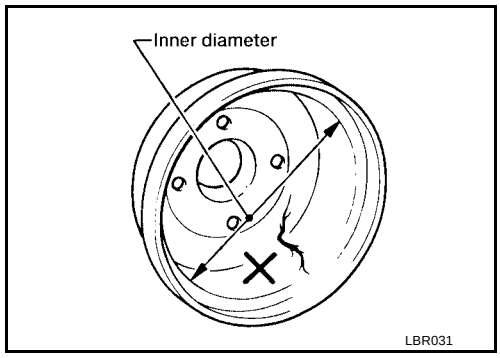


DRUM

Maximum inner diameter : 204.5 mm (8.05 in)

Out-of-roundness : 0.03 mm (0.0012 in) or less

- Contact surface should be fine finished with No. 120 to 150 emery paper.
- Using a drum lathe, resurface brake drum if it shows score, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.

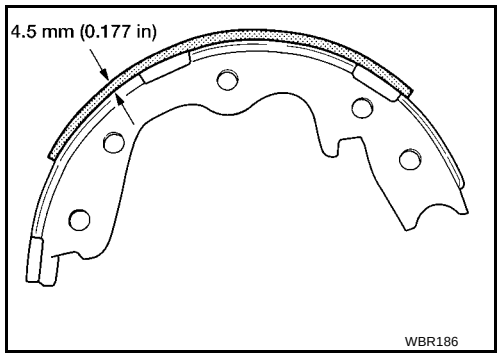


LINING

Check lining thickness.

Standard lining thickness : 4.5 mm (0.177 in)

Lining wear limit : 1.5 mm (0.059 in)

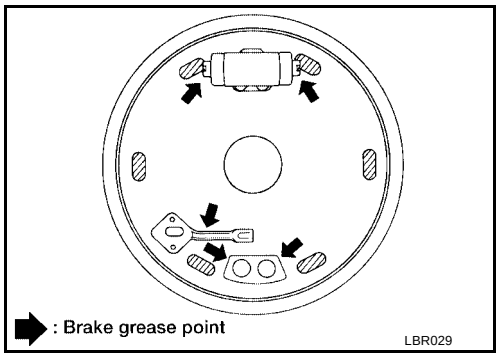


Installation

EFS0023W

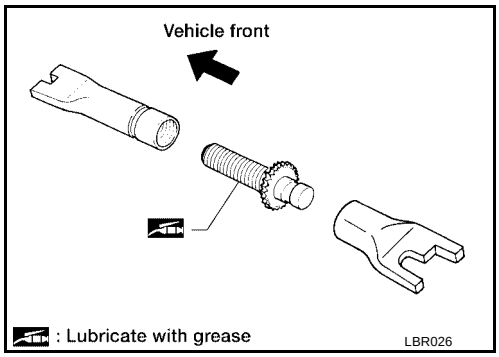
- **Always perform shoe clearance adjustment. Refer to PB-3, "Adjustment" .**
- **Burnish the brake contact surfaces after refinishing or replacing drums, after replacing linings, or if a soft pedal occurs at very low mileage. Refer to BR-6, "Brake Burnishing Procedure" .**

1. Fit toggle lever and adjusting lever to brake shoe with retainer ring.
2. Apply brake grease to the contact areas shown.



3. Shorten adjuster by rotating it.
   - Pay attention to direction of adjuster.

Wheel	Screw
Left	Left-hand thread
Right	Right-hand thread



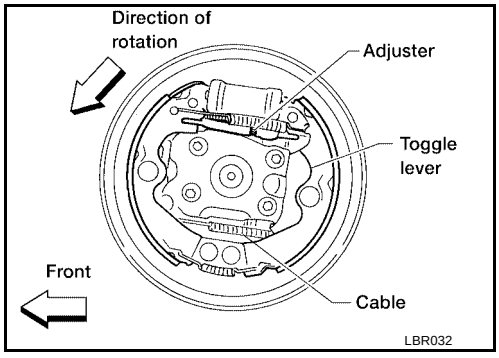
4. Connect parking brake cable to toggle lever.
5. Install all parts.

Be careful not to damage wheel cylinder piston boots.

6. Check that all parts are installed properly.

Pay attention to direction of adjuster assembly.

7. Install brake drum.
8. When installing new wheel cylinder or overhauling wheel cylinder, bleed air from brake system. Refer to BR-7, "Bleeding Brake System" .
9. Adjust parking brake. Refer to PB-3, "Adjustment" .
10. Install wheel and tire. Refer to MA-31, "Tire Rotation" .



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

EFS0023X

Unit: mm (in)

Applied Model		QG18DE	QR25DE
Front brake	Brake model	CL25VA	CL25VB
	Cylinder bore diameter	57.2 (2.252)	
	Pad length × width × thickness	125.6 × 46.0 × 11.0 (4.94 × 1.811 × 0.433)	
	Rotor outer diameter × thickness	257 × 22 (10.12 × 0.87)	280 × 22 (11.02 × 0.87)
Rear brake	Brake model	LT20G	CL9HC
	Cylinder bore diameter/caliper bore diameter	15.87 (5/8) type a 17.45 (11/16) type b	33.96 (1 11/32)
	Lining length × width × thickness	219.4 × 35 × 4.5 (8.64 × 1.38 × 0.177)	89.1 × 39.5 × 10 (3.508 × 1.555 × 0.39)
	Drum inner diameter/Disc diameter × thickness	203.2 (8)	258 × 9 (10.16 × 0.35)
Master cylinder	Cylinder bore diameter	23.81 (15/16)	
Control valve	Valve model	Dual proportioning valve	
	Split point [kPa (kg/cm^2 , psi)] × reducing ratio	1,961 (20,284) × 0.2	2,942 (30,427) × 0.2
Brake booster	Booster model	M215T	
	Diaphragm diameter	Primary: 230 (9.06) Secondary: 205 (8.07)	
Brake fluid	Recommended brake fluid	DOT 3	

Disc Brake

EFS0023Y

Unit: mm (in)

Brake model	CL25VA/CL25VB (Front)	CL9HC (Rear)
Pad wear limit Minimum thickness	2.0 (0.079)	2.0 (0.079)
Rotor repair limit Minimum thickness	20 (0.79)	8.0 (0.31)

Drum Brake

EFS0023Z

Unit: mm (in)

Brake model		LT20G
Lining wear limit	Minimum thickness	1.5 (0.059)
Drum repair limit	Maximum inner diameter	204.5 (8.05)
	Maximum out-of round	0.03 (0.0012)

Brake Pedal

EFS00240

Unit: mm (in)

Free height “H”*	M/T	156 - 166 (6.14 - 6.54)
	A/T	164.9 - 174.9 (6.49 - 6.89)
Depressed height "D" [under force of 490 N (50 kg, 110 lb) with engine running]		90 (3.54)
Pedal free play "A"		1.0 - 3.0 (0.039 - 0.118)

*: Measured from surface of dash reinforcement panel.

SECTION CL
CLUTCH

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QG18DE

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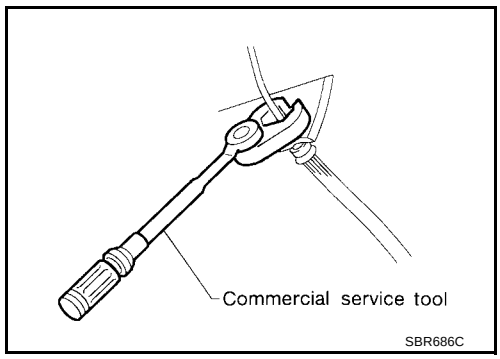
PRECAUTIONS

PFP:00001

Precautions

ECS005RJ

- **The recommended clutch system hydraulic fluid is brake fluid “DOT 3”.**
- **Do not reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If any brake fluid is splashed on painted areas, wash it away with water immediately.**
- **Use a flare nut wrench (commercial service tool) when removing or installing the clutch hydraulic tubes.**



- **Use new brake fluid to clean or wash any parts of the clutch master cylinder and operating cylinder.**
- **Never use any type of mineral oil such as gasoline or kerosene to clean or wash any parts of the clutch system. It will ruin the rubber parts of the hydraulic system.**

WARNING:
After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.

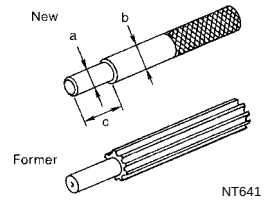
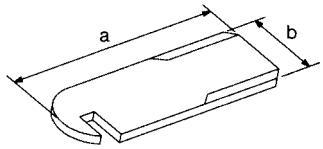
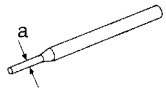
PREPARATION

PFP:00002

Special Service Tools

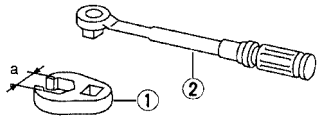
ECS005RK

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
KV30101600 (New) KV30101000 (Former) (J33213) Clutch aligning bar  NT641	Installing clutch cover and clutch disc **a: 15.9 mm (0.626 in) dia.** **b: 17.9 mm (0.705 in) dia.** **c: 40 mm (1.57 in)**
ST20050240 (—) Diaphragm spring adjusting wrench  S-NT404	Adjusting unevenness of diaphragm spring of clutch cover **a: 150 mm (5.91 in)** **b: 25 mm (0.98 in)**
KV32101000 (J25689-A) Pin punch  S-NT410	Removing and installing spring pin **a: 4 mm (0.16 in) dia.**

Commercial Service Tools

ECS005RL

Tool name	Description
1: Flare nut crowfoot 2: Torque wrench  S-NT360	Removing and installing clutch piping **a: 10 mm (0.39 in)**

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

ECS005RM

Use the chart below to help you find the cause of the symptom. The numbers indicate the order of inspection. Check each part in order. If necessary, repair or replace these parts.

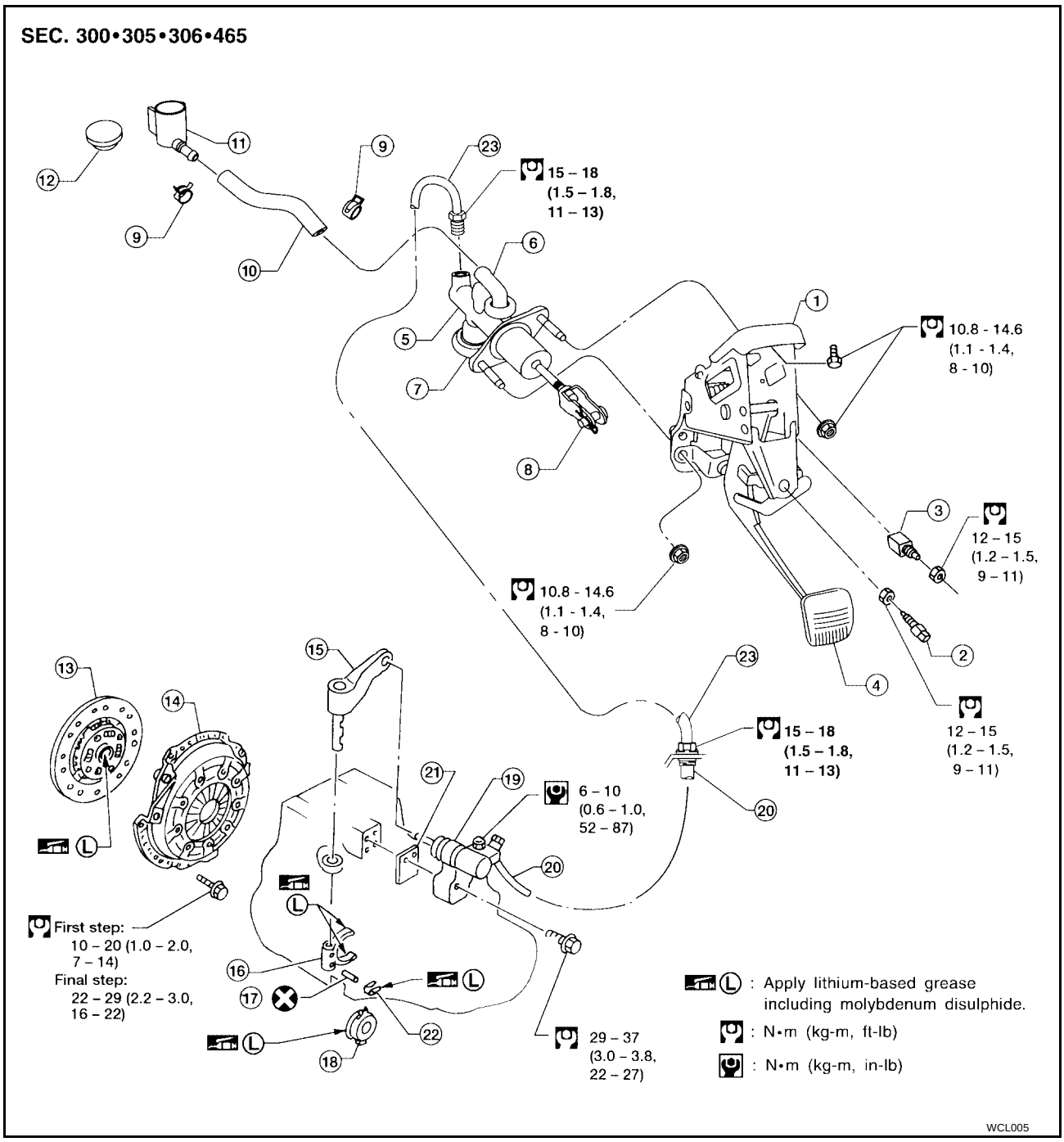
		Reference page	CL-7	CL-7	CL-9	CL-11	EM-63, "Removal and Installation"	CL-14	CL-17							CL-17	CL-18			CL-18
		Suspected parts (possible cause)	Clutch pedal (inspection and adjustment)	Clutch line (air in line)	Master cylinder piston cup (damaged)	Operating cylinder piston cup (damaged)	Engine mounting (loose)	Release bearing (worn, dirty or damaged)	Clutch disc (out of true)	Clutch disc (runout is excessive)	Clutch disc (lining broken)	Clutch disc (dirty or burned)	Clutch disc (oily)	Clutch disc (worn out)	Clutch disc (hardened)	Clutch disc (lack of spline grease)	Diaphragm spring (damaged)	Diaphragm spring (out of tip alignment)	Clutch cover (distortion)	Flywheel (distortion)
Symptom		Clutch grabs/chatters					1			2			2	2	2			2		
		Clutch pedal spongy		1	2	2														
		Clutch noisy						1												
		Clutch slips	1										2	2			3		4	5
		Clutch does not disengage	1	2	3	4			5	5	5	5	5			5	6	6	7	

CLUTCH SYSTEM

PFP:30502

Components

ECS005RN



1. Clutch pedal bracket
2. ASCD clutch switch (if equipped)
3. Clutch interlock switch
4. Clutch pedal
5. Clutch master cylinder
6. Nipple
7. Clutch damper (not serviceable)
8. Clevis
9. Hose clamp
10. Reservoir hose
11. Reservoir tank
12. Reservoir cap
13. Clutch disc
14. Clutch cover
15. Withdrawal lever
16. Clutch lever
17. Spring pin
18. Release bearing
19. Operating cylinder
20. Clutch hose
21. Spacer
22. Release bearing spring
23. Clutch tube

Inspection and Adjustment

ECS005RO

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

1. Check to see if the clutch pedal clevis pin floats freely in the bore of the clutch pedal. It should not be bound by the clevis or clutch pedal.

a. If the pin is not free, check that the ASCD switch or pedal stopper bolt is not applying pressure to the clutch pedal causing the pin to bind. To adjust, loosen the ASCD switch or pedal stopper bolt lock nut and turn the ASCD switch or pedal stopper bolt.

b. Tighten the lock nut.

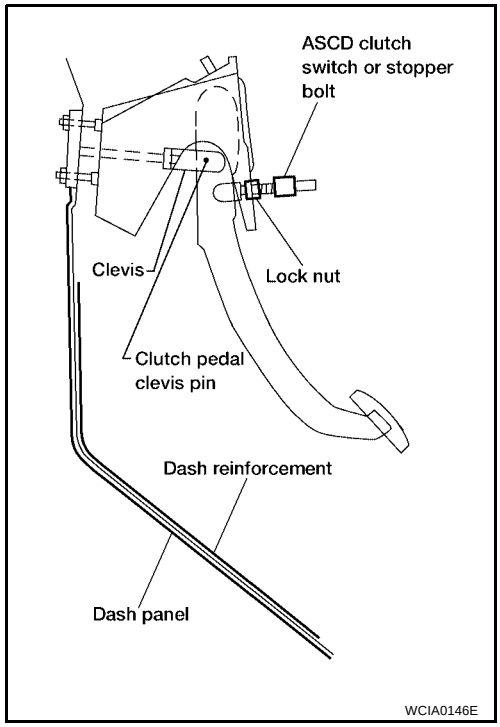
c. Verify that the clutch pedal clevis pin floats freely in the bore of the clutch pedal. It should not be bound by the clevis or clutch pedal.

d. If the pin is still not free, remove the pin and check for deformation or damage. Replace the pin if necessary. Leave the pin removed for step 2.

2. Check the clutch pedal stroke for free range of movement.

a. With the clutch pedal clevis pin removed, manually move the pedal up and down to determine if it moves freely.

b. If any sticking is noted, replace the related parts (clutch pedal, pedal bracket, assist spring, bushing, etc.). Reassemble the pedal and re-verify that the clevis pin floats freely in the bore of the pedal.



3. Adjust the clearance “C” while fully depressing the clutch pedal (with the clutch interlock switch) as shown.

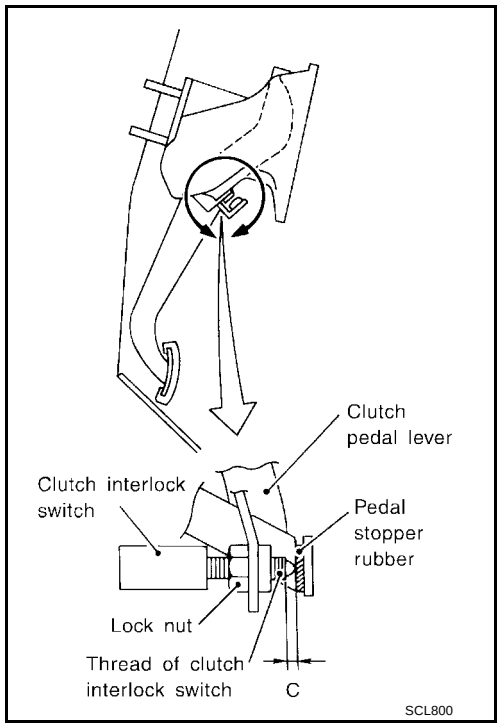
Clearance "C" : 0.1 - 1.0 mm (0.004 - 0.039 in)

4. Check the clutch hydraulic system components (clutch master cylinder, clutch operating cylinder, Clutch withdrawal lever, clutch release bearing, etc.) for sticking or binding.

a. If any sticking or binding is noted, repair or replace the related parts as necessary.

b. If the hydraulic system was necessary, bleed the clutch hydraulic system. Refer to CL-7, "BLEEDING PROCEDURE" .

NOTE:
Do not use a vacuum assist or any other type of power bleeder on this system. Use of a vacuum assist or power bleeder will not purge all of the air from the system.



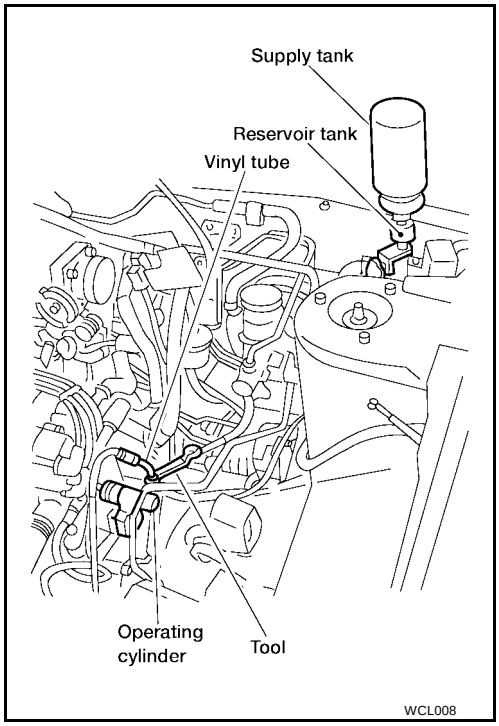
BLEEDING PROCEDURE

CAUTION:
Carefully monitor the fluid level at the clutch master cylinder during the bleeding operation.

NOTE:
Do not use a vacuum assist or any other type of power bleeder on this system. Use of a vacuum assist or power bleeder will not purge all of the air from the system.

1. Top off the clutch master cylinder reservoir with the recommended brake fluid "DOT 3". Then attach the additional supply tank as shown.

   CAUTION:
   Do not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
2. Connect a transparent vinyl tube to the air bleeder valve as shown.
3. Slowly depress the clutch pedal to its full stroke and release it completely. Repeat this operation several times at 2 to 3 seconds intervals.
4. Open the air bleeder valve with the clutch pedal fully depressed.



5. Close the air bleeder valve and tighten to specification.

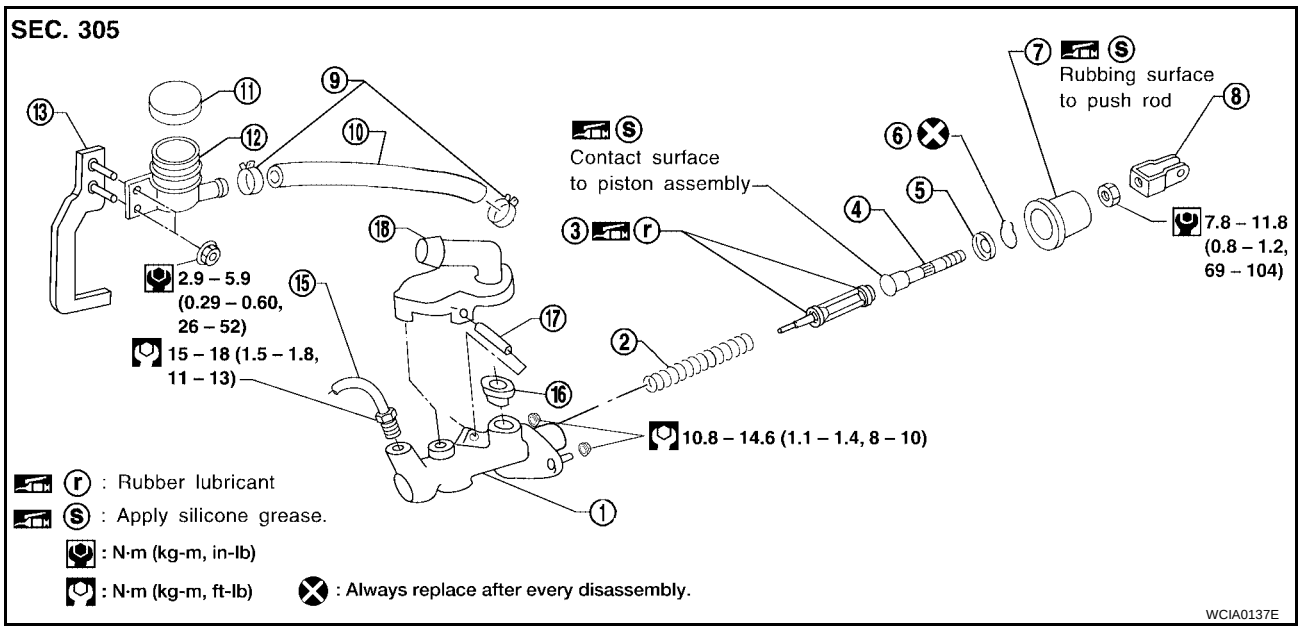
   Air bleeder valve : 5.9 - 9.8 N·m (0.6 - 1.0 kg-m, 52 - 87 in-lb)
6. Release the clutch pedal and wait at least 5 seconds.
7. Repeat steps 3 through 6 above until no more air bubbles are in the brake fluid coming out of the vinyl tube attached to the air bleeder valve.

CLUTCH MASTER CYLINDER

PFP:30610

Components

ECS005RP



1. Cylinder body	2. Return spring	3. Piston assembly seals
4. Push rod	5. Stopper	6. Stopper ring
7. Dust cover	8. Clevis	9. Hose clamps
10. Reservoir hose	11. Reservoir cap	12. Reservoir tank
13. Bracket	14. Clutch damper (not serviceable)	15. Clutch tube
16. Seal	17. Pin	18. Nipple

Removal

ECS005RQ

1. Drain the brake fluid from the clutch hydraulic system.

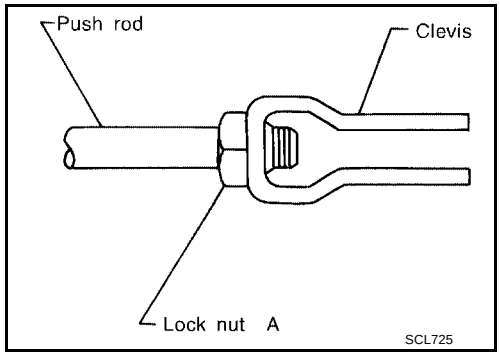
   CAUTION:
   Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
2. Remove the clutch tube flare nut using a flare nut wrench.
3. Remove the reservoir hose.
4. Remove the snap pin from the clevis pin and remove the clutch pedal from the clevis.
5. Remove the master cylinder assembly mounting nuts and reservoir tank bracket mounting nuts to remove master cylinder assembly.

Disassembly

ECS005RS

1. Loosen the push rod lock nut "A" to remove the clevis and the lock nut "A".
2. Remove the dust cover.
3. Remove the stopper ring and stopper, then remove the push rod from the cylinder body. During removal, keep the push rod depressed, to prevent the piston inside the master cylinder from popping out.

   NOTE:
   Discard the stopper ring and use a new ring for assembly.
4. Remove the piston assembly from the cylinder body.
5. Remove the return spring.
6. Remove the pin using a pin punch, then remove the nipple and seal.



Inspection

ECS005RT

Inspect for the following conditions and replace any parts as necessary.

- Damage, wear, rust, and pinholes on the cylinder inner wall
- Damage and deformation of the reservoir tank
- Weak return spring
- Crack or deformation of the dust cover

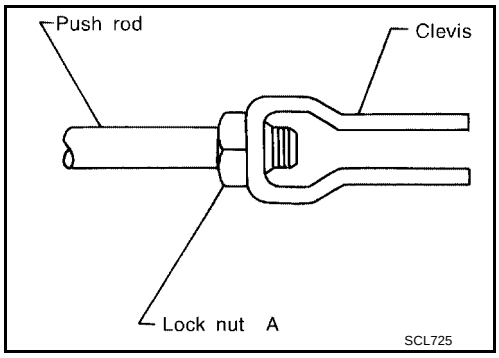
Assembly

ECS005RU

1. Install the return spring.
2. Apply rubber lubricant to the sliding parts of the piston assembly, and insert the piston assembly into the cylinder body.
3. After installing the stopper to push rod, install a new stopper ring while keeping the piston assembly depressed by hand, so that the piston assembly will not pop out.

   CAUTION:
   The stopper ring cannot be reused. Always use a new stopper ring for assembly.
4. Apply silicone grease, and install the dust cover.
5. Install the clevis to push rod, and tighten lock nut "A" to specification.

   Lock nut "A" : 7.8 - 11.8 N·m (0.8 - 1.2 kg-m, 69 - 104 in-lb)
6. Install the seal and nipple to the cylinder body, and install the pin using a pin punch.



Installation

ECS005RR

1. Install the reservoir hose.
2. Connect the clutch tube to the master cylinder assembly, and hand-tighten the flare nut.
3. Install the master cylinder assembly to the cowl, and tighten the mounting nuts to specification.

   Master cylinder mounting nuts : 10.8 - 14.6 N·m (1.1 - 1.4 kg-m, 8 - 10 ft-lb)
4. Tighten the reservoir tank bracket mounting nuts to specification.

   Reservoir tank bracket mounting nuts : 2.9 - 5.9 N·m (0.29 - 0.60 kg-m, 26 - 52 in-lb)
5. Tighten the clutch tube flare nut to specification, using a flare nut torque wrench.

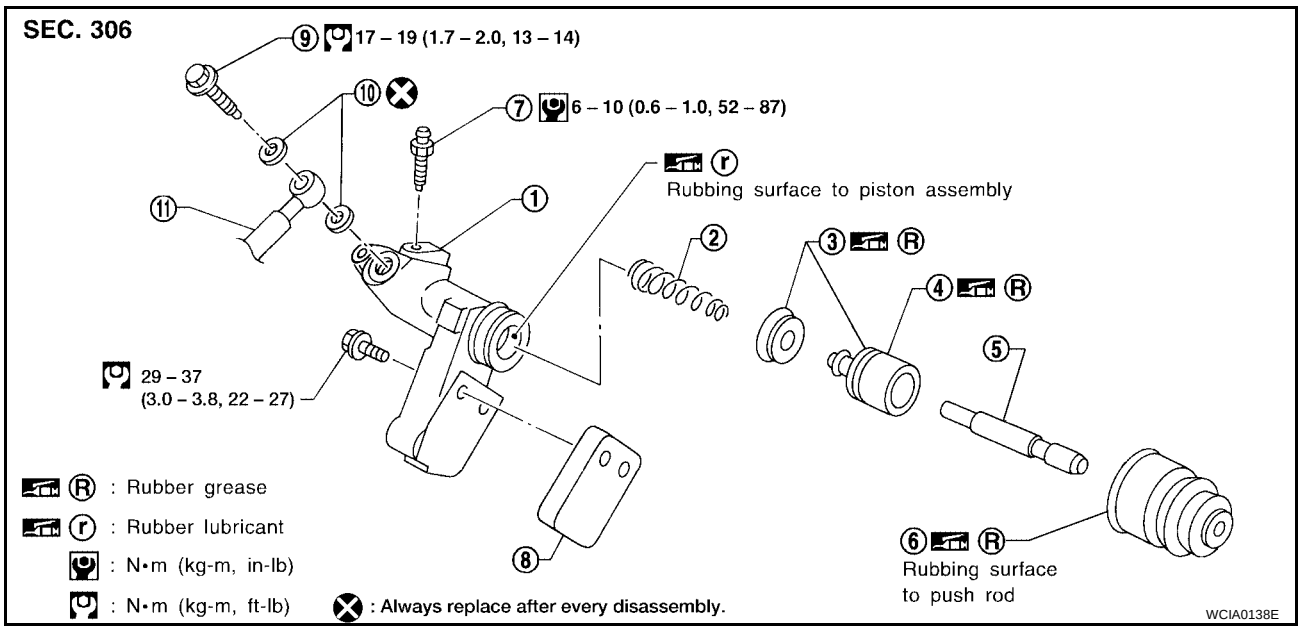
   Clutch tube flare nut : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
6. After installing the clevis pin, install the snap pin to connect the clutch pedal to the push rod.
7. After finishing the component installation, bleed the air from the clutch hydraulic system. Refer to CL-7, "BLEEDING PROCEDURE" .

OPERATING CYLINDER

PFP:30620

Components

ECS005RV



1. Cylinder body
2. Piston spring
3. Piston cup
4. Piston
5. Push rod
6. Dust cover
7. Air bleeder
8. Spacer
9. Union bolt
10. Copper washer
11. Clutch hose

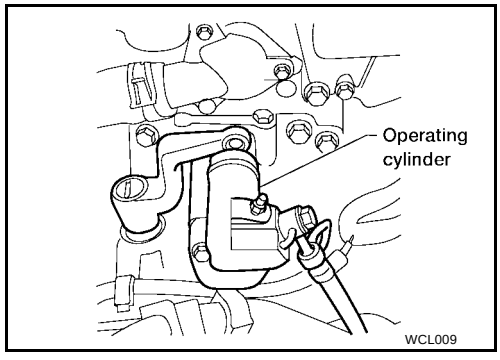
Removal

ECS005RW

1. Drain the brake fluid from the clutch hydraulic system.

   CAUTION:
   Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

2. Remove the union bolt, the two copper washers, and the clutch hose from the operating cylinder. Discard the copper washers.
3. Remove the operating cylinder bolts, and remove the operating cylinder.



Disassembly

ECS005RX

1. Remove the dust cover from the operating cylinder body.
2. Remove the push rod.
3. Remove the piston.
4. Remove the piston cup.
5. Remove the piston spring.
6. Remove the air bleeder.

Inspection

ECS005RY

Inspect for the following, and replace any parts as necessary.

- Damage, foreign material, wear, rust, and pinholes on the cylinder inner surface, piston, and sliding part of piston cup

- Weak piston spring
- Crack or deformation of dust cover

Assembly

ECS005RZ

CAUTION:
To assemble the operating cylinder use the specified rubber grease and rubber lubricant. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

1. Apply rubber lubricant to the overall inside surface of the operating cylinder body.
2. Install the air bleeder, tighten to specification.

Air bleeder : 6 - 10 N·m (0.6 - 1.0 kg-m, 52 - 87 in-lb)

3. Install the piston spring with the tapered spring end pointing toward the piston cup.
4. Apply rubber grease and install the piston cup.
5. Apply rubber grease and install the piston.
6. Install the push rod.
7. Apply rubber grease and install the dust cover.

Installation

ECS005S0

Installation is in the reverse order of removal.

CAUTION:
- **Install the clutch hose without twisting it.**
- **The two copper washers for the union bolt cannot be reused. Use two new copper washers for installation.**
- **After finishing the installation, bleed the air from the clutch hydraulic system. Refer to CL-7, "BLEEDING PROCEDURE" .**

PIPING

PFP:00000

Removal

ECS005S1

1. Remove the engine air cleaner and air duct.
2. Drain the brake fluid from the clutch hydraulic system.

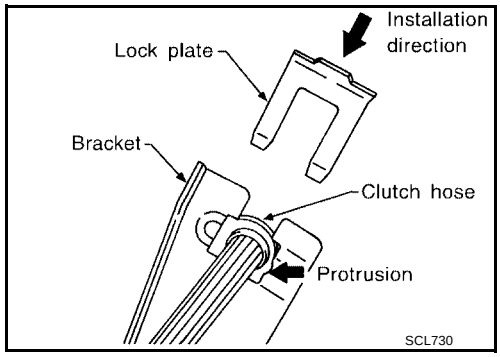
CAUTION:
Be careful not to splash brake fluid on painted areas, it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

3. Remove the flare nut from the operating cylinder body using a flare nut wrench.
4. Remove the union bolt and two copper washers attaching the clutch hose from the operating cylinder. Discard the two copper washers.
5. Remove the clutch hose from the bracket by removing the lock plate.

Installation

ECS005S2

1. When installing the clutch hose into the bracket, position the lock plate in the specified direction as shown to secure the clutch hose.



CAUTION:
Install the clutch hose without twisting or bending it.

2. Tighten the flare nut to specification, using a flare nut wrench.

Flare nut : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

CAUTION:
Be careful not to damage the flare nut and clutch tube.

3. Position the clutch hose and install the union bolt and two new copper washers on to the operating cylinder, and tighten the union bolt to specification.

Union bolt : 17 - 19 N·m (1.7 - 2.0 kg-m, 13 - 14 ft-lb)

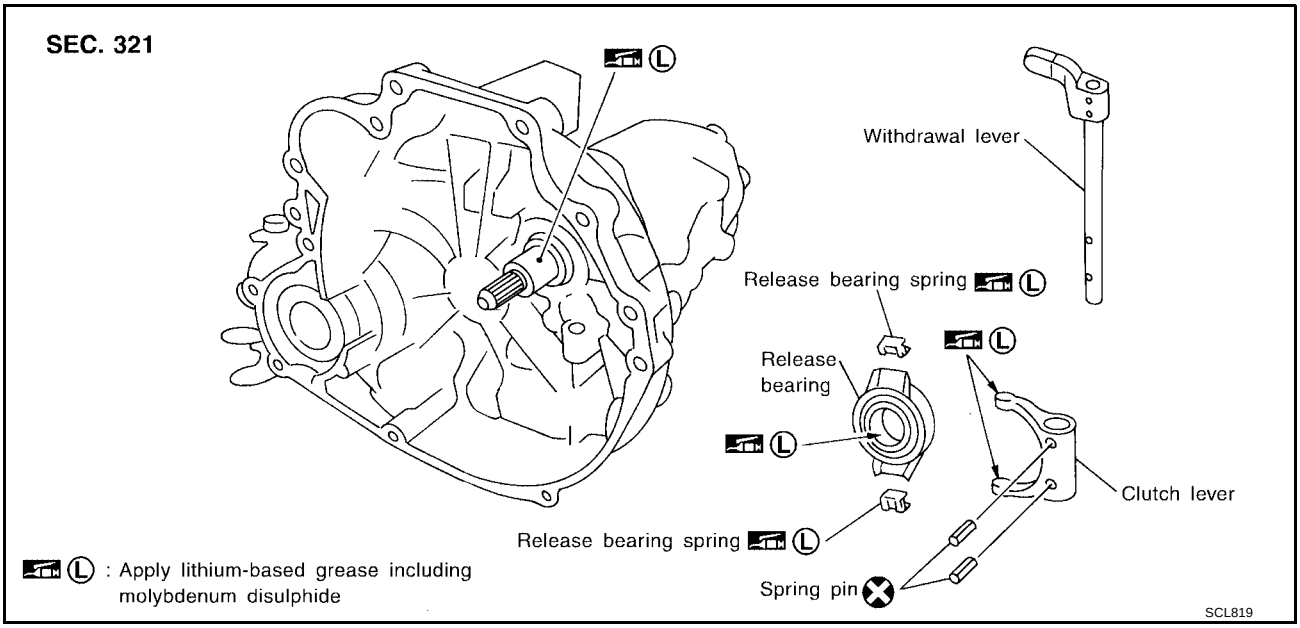
4. Bleed the air from the clutch hydraulic system. Refer to CL-7, "BLEEDING PROCEDURE" .
5. Install the engine air cleaner and air duct.

CLUTCH RELEASE MECHANISM

PFP:30502

Components

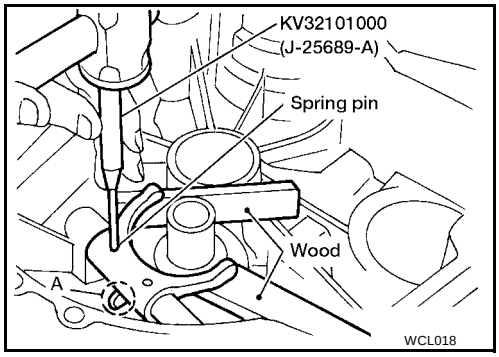
ECS005S3



Removal

ECS005S4

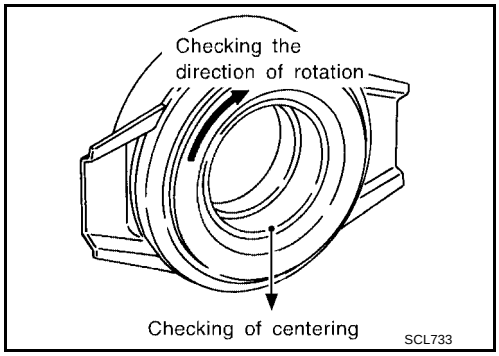
1. Remove the manual transaxle. Refer to MT-16, "Removal and Installation" for RS5F70A, MT-82, "Removal and Installation" for RS5F51A, or MT-143, "Removal and Installation" for RS6F51H.
2. Move the withdrawal lever enough to remove the release bearing and release bearing spring, and remove the release bearing from the clutch lever.
3. Support the clutch lever claws with an appropriate wood block, align the retaining pin with "A" as shown, and drive out the spring pins using a pin punch.
4. Pull out the withdrawal lever and remove the clutch lever from the clutch housing.



Inspection

ECS005S5

- Replace the release bearing if it is seized, damaged, faulty in rotation direction, or has poor alignment.
- Replace the withdrawal lever if the contact surface is worn excessively.
- Replace the clutch lever if its contact surface is worn excessively.



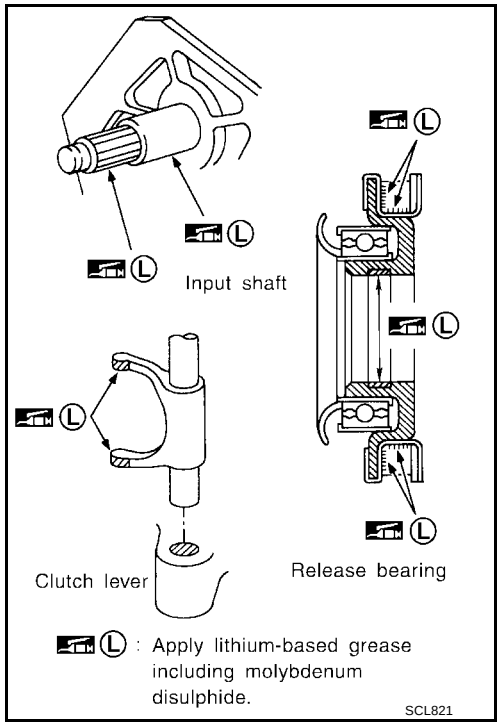
Installation

ECS005S6

CAUTION:

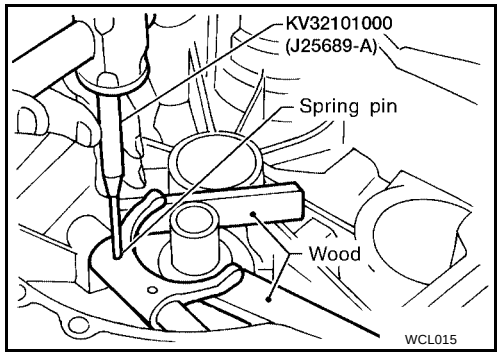
- **Apply grease to the clutch components. Otherwise, abnormal noise, poor clutch disengagement, or clutch damage may occur. Wipe the excess grease off completely, as it may cause the clutch components to slip and shudder.**
- **Keep the clutch disc facing, pressure plate, and flywheel free of oil and grease.**

- **Clean any old grease and abrasive materials off of the grease application areas as shown.**
- **Apply approximately a 1 mm (0.04 in) thick coating of clutch sleeve grease evenly on the sliding part of the clutch lever and the release bearing spring.**
- **Apply just enough clutch sleeve grease to fill up the release bearing inner groove.**
- **Apply the clutch grease to the clutch disc and the input shaft spline. Install the clutch disc to the input shaft, remove the excess grease around the shaft, and remove the clutch disc.**
- **Lightly and evenly apply the clutch sleeve grease on the sliding part of the release bearing. Install the release bearing and remove any excess grease around the bearing, then remove the release bearing.**

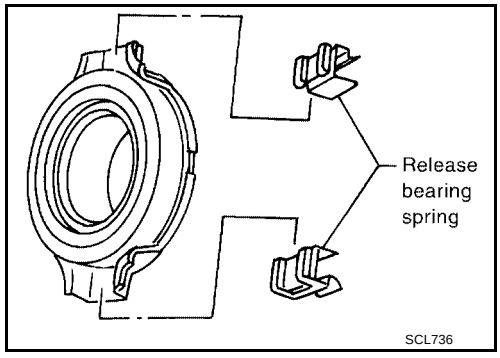


1. Assemble the clutch lever to clutch housing, and insert the withdrawal lever.
2. Support the clutch lever claws with an appropriate wood block, and install new spring pins using a pin punch as shown.

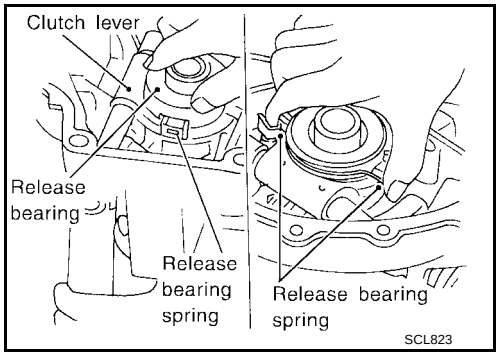
   CAUTION:
   Spring pins cannot be reused.



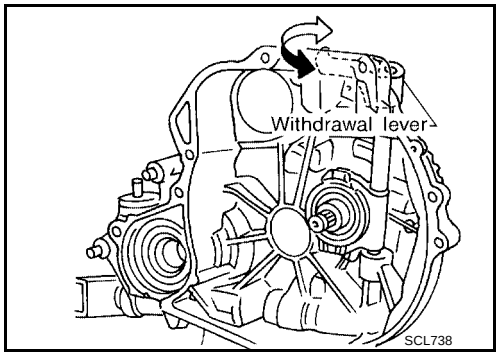
3. Install the release bearing springs on to the release bearing as shown.



4. Operate the withdrawal lever manually, press the clutch spring from both sides, and install the release bearing on to the clutch lever securely.



5. Make sure a click is heard when the release bearing spring is pressed from both sides.
6. Make sure all parts operate smoothly when operating the withdrawal lever.



7. Install the manual transaxle. Refer to MT-16, "Removal and Installation" for RS5F70A, MT-82, "Removal and Installation" for RS5F51A, or MT-143, "Removal and Installation" for RS6F51H.

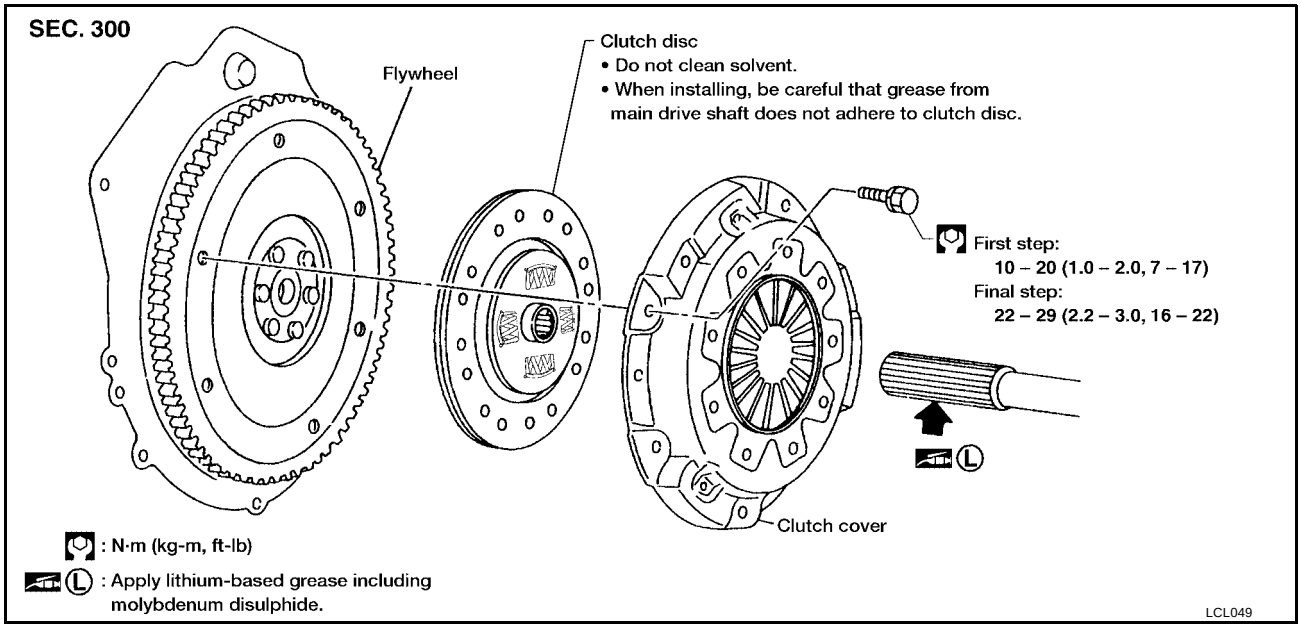
CAUTION:
Remove any excess grease.

CLUTCH DISC, CLUTCH COVER AND FLYWHEEL

PFP:30100

Components

ECS005S7



NOTE:
The following operations are with manual transaxle removed.

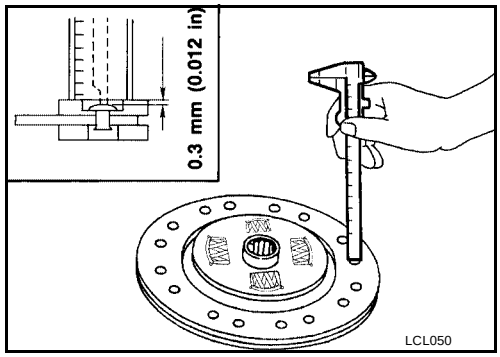
Inspection and Adjustment

ECS005S8

CLUTCH DISC

- Check the clutch disc for wear on the facing surface at the rivets as shown.

  Wear limit of facing surface to rivet head : 0.3 mm (0.012 in)

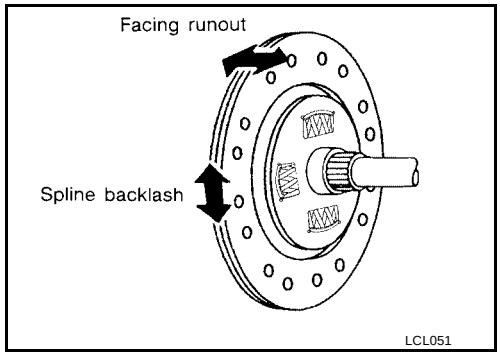


- Check the clutch disc for backlash on the spline and runout on the facing.

  Maximum backlash of spline (at outer edge of disc) : 0.9 mm (0.035 in)

  Runout limit : 1.0 mm (0.039 in)

  Distance of runout check point (from hub center) : 102.5 mm (4.04 in)



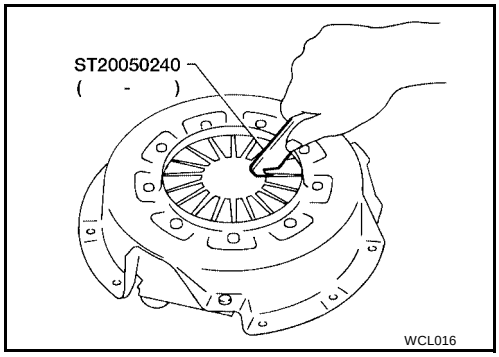
- Check the clutch disc for burns, discoloration, and oil or grease leakage. Replace if necessary.

CLUTCH COVER AND FLYWHEEL

- Check the clutch cover installed for unevenness of the diaphragm spring toe heights.

  Uneven limit : 0.88 mm (0.0346 in)

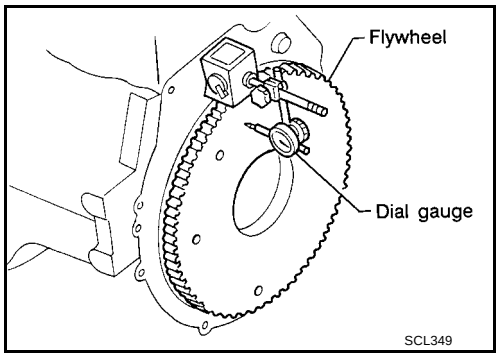
  If the toe heights are greater than the uneven limit, adjust the height with Tool as shown.



FLYWHEEL INSPECTION

- Check the contact surface of flywheel for slight burns or discoloration. Clean the flywheel contact surface with emery paper.
- Check the flywheel runout using a dial gauge as shown.

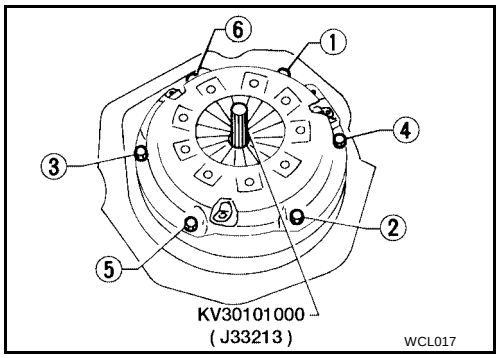
  Maximum allowable runout : Refer to EM-77, "Flywheel Runout" .



Installation

ECS005S9

- Insert Tool into clutch disc hub for proper alignment when installing the clutch cover and disc as shown.



- Tighten the clutch cover bolts in the numerical order as shown, in two steps.

  First step : 10 - 20 N·m (1.0 - 2.0 kg-m, 7 - 14 ft-lb)

  Final step : 22 - 29 N·m (2.2 - 3.0 kg-m, 16 - 22 ft-lb)

  CAUTION:
  Do not to allow grease to contaminate the clutch facing.

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Clutch Control System

ECS005SA

Type of clutch control	Hydraulic

Clutch Master Cylinder

ECS005SB

Unit: mm (in)

Inner diameter	15.87 (5/8)

Clutch Operating Cylinder

ECS005SC

Unit: mm (in)

Inner diameter	19.05 (3/4)

Clutch Disc

ECS005SD

Unit: mm (in)

Engine model	QG18DE
Model	215
Facing size (Outer dia. × inner dia. × thickness)	215 × 145 × 3.5 (8.46 × 5.71 × 0.138)
Thickness of disc assembly with load	7.7 - 8.3 (0.303 - 0.327) with 4,900 N (499.8 kg, 1,101.5 lb)
Wear limit of facing surface to rivet head	0.3 (0.012)
Runout limit of facing	1.0 (0.039)
Distance of runout check point (from the hub center)	102.5 (4.04)
Maximum backlash of spline (at outer edge of disc)	0.9 (0.035)

Clutch Cover

ECS005SE

Unit: mm (in)

Engine model	QG18DE
Model	215
Full-load	4,900 N (499.8 kg, 1,101.5 lb)
Uneven limit of diaphragm spring toe height	0.88 (0.0346)

Clutch Pedal

ECS005SF

Unit: mm (in)

Clearance “C” between pedal stopper rubber and clutch interlock switch threaded end while clutch pedal is fully depressed.	0.1 - 1.0 (0.004 - 0.039)

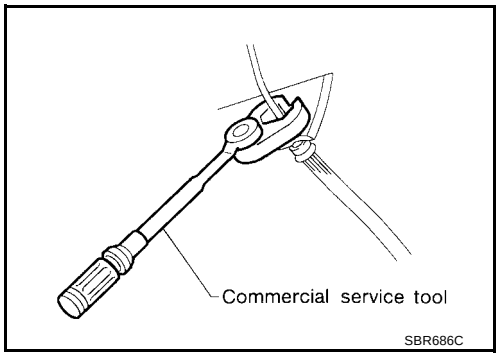
PRECAUTIONS

PFP:00001

Precautions

ECS005SG

- **Recommended fluid is brake fluid “DOT 3”.**
- **Do not reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **Use a flare nut wrench when removing or installing the clutch hydraulic tubes.**
- **Use new brake fluid to clean or wash all parts of the master cylinder and operating cylinder.**
- **Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.**



WARNING:

After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.

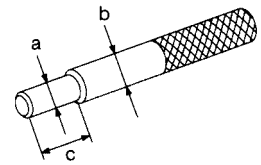
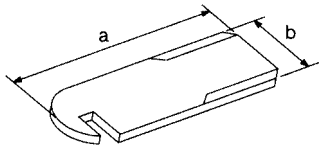
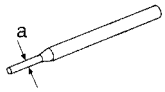
PREPARATION

PFP:00002

Special Service Tools

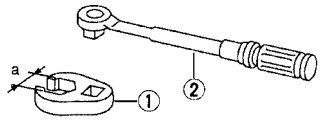
ECS005SH

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
ST2063000 (J26366) Clutch aligning bar  NT405	Installing clutch cover and clutch disc **a: 15.8 mm (0.622 in) dia.** **b: 22.9 mm (0.902 in) dia.** **c: 45 mm (1.772 in)**
ST20050240 (—) Diaphragm spring adjusting wrench  S-NT404	Adjusting unevenness of diaphragm spring of clutch cover **a: 150 mm (5.91 in)** **b: 25 mm (0.98 in)**
KV32101000 (J25689-A) Pin punch  S-NT410	Removing and installing spring pin **a: 4 mm (0.16 in) dia.**

Commercial Service Tools

ECS005SI

Tool name	Description
1 Flare nut crowfoot 2 Torque wrench  S-NT360	Removing and installing clutch piping **a: 10 mm (0.39 in)**

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

ECS005SJ

Use the chart below to help you find the cause of the symptom. The numbers indicate the order of inspection. Check each part in order. If necessary, repair or replace the parts.

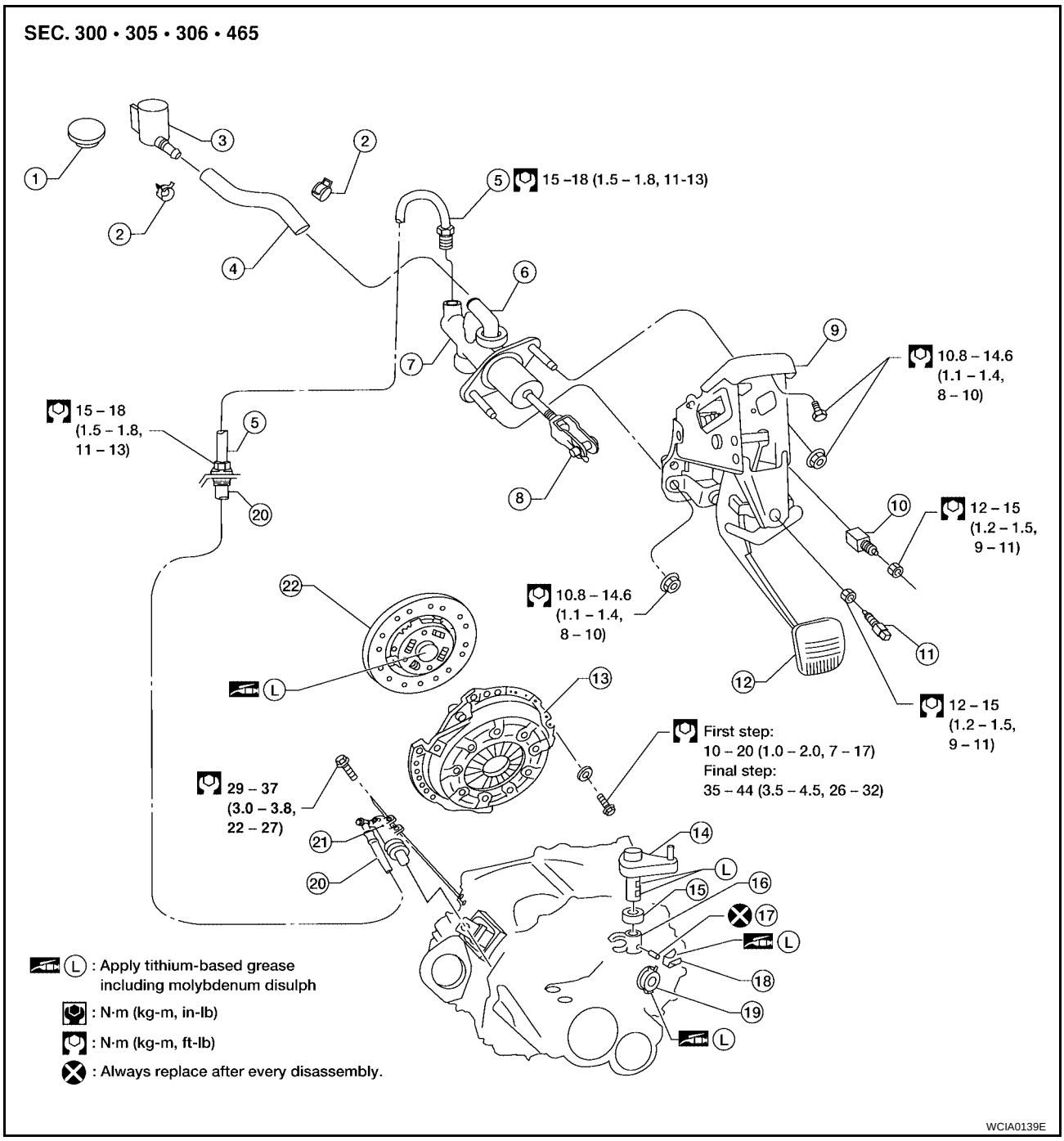
		Reference page	CL-24	CL-24	CL-26	CL-28	EM-63, "Removal and Installation"	CL-31	CL-33							CL-33	CL-34		CL-34
		Suspected parts (possible cause)	Clutch pedal (inspection and adjustment)	Clutch line (air in line)	Master cylinder piston cup (damaged)	Operating cylinder piston cup (damaged)	Engine mounting (Loose)	Release bearing (worn, dirty or damaged)	Clutch disc (out of true)	Clutch disc (runout is excessive)	Clutch disc (lining broken)	Clutch disc (dirty or burned)	Clutch disc (oily)	Clutch disc (worn out)	Clutch disc (hardened)	Clutch disc (lack of spline grease)	Diaphragm spring (damaged)	Diaphragm spring (out of tip alignment)	Clutch cover (distortion)	Flywheel (distortion)
Symptom		Clutch grabs/chatters					1			2			2	2	2			2		
		Clutch pedal spongy		1	2	2														
		Clutch noisy						1												
		Clutch slips	1										2	2			3		4	5
		Clutch does not disengage	1	2	3	4			5	5	5	5	5			5	6	6	7	

CLUTCH SYSTEM

PFP:30502

Components

ECS005SK



1. Reservoir cap
2. Hose clamp
3. Reservoir tank
4. Reservoir hose
5. Clutch tube
6. Nipple
7. Clutch master cylinder
8. Clevis
9. Clutch pedal bracket
10. Clutch interlock switch
11. ASCD clutch switch (if equipped)
12. Clutch pedal
13. Clutch cover
14. Withdrawal lever
15. Spacer
16. Clutch lever
17. Spring pin
18. Release bearing spring
19. Release bearing
20. Clutch hose
21. Operating cylinder
22. Clutch disc

Inspection and Adjustment

ECS006H9

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

1. Check to see if the clutch pedal clevis pin floats freely in the bore of the clutch pedal. It should not be bound by the clevis or clutch pedal.

a. If the pin is not free, check that the ASCD switch or pedal stopper bolt is not applying pressure to the clutch pedal causing the pin to bind. To adjust, loosen the ASCD switch or pedal stopper bolt lock nut and turn the ASCD switch or pedal stopper bolt.

b. Tighten the lock nut.

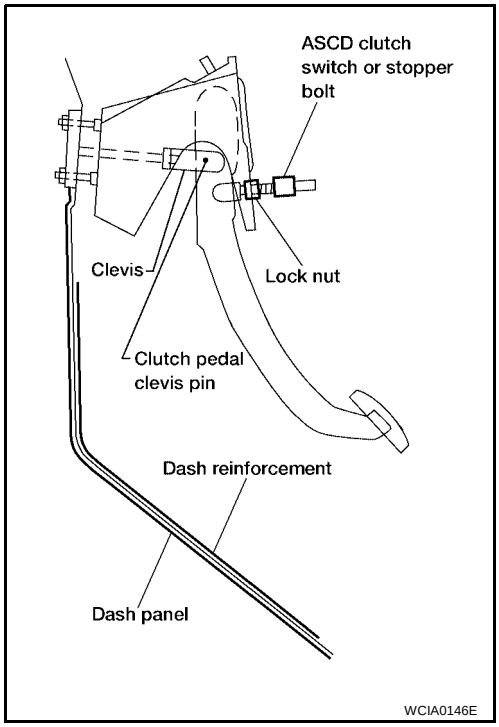
c. Verify that the clutch pedal clevis pin floats freely in the bore of the clutch pedal. It should not be bound by the clevis or clutch pedal.

d. If the pin is still not free, remove the pin and check for deformation or damage. Replace the pin if necessary. Leave the pin removed for step 2.

2. Check the clutch pedal stroke for free range of movement.

a. With the clutch pedal clevis pin removed, manually move the pedal up and down to determine if it moves freely.

b. If any sticking is noted, replace the related parts (clutch pedal, pedal bracket, assist spring, bushing, etc.). Reassemble the pedal and re-verify that the clevis pin floats freely in the bore of the pedal.



3. Adjust the clearance “C” while fully depressing the clutch pedal (with the clutch interlock switch) as shown.

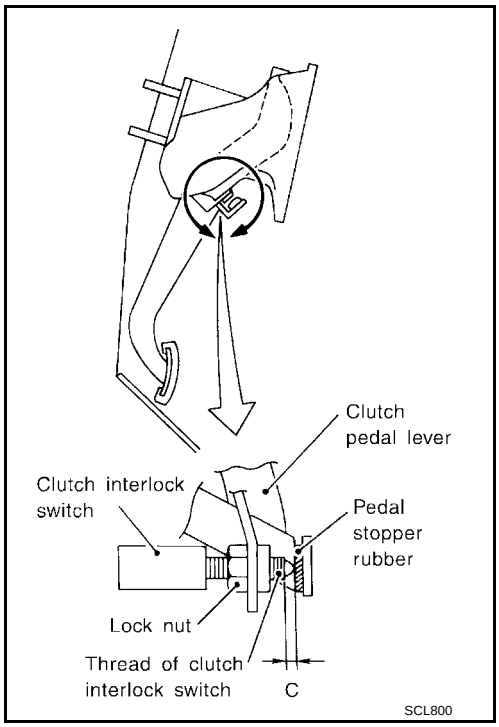
Clearance "C" : 0.1 - 1.0 mm (0.004 - 0.039 in)

4. Check the clutch hydraulic system components (clutch master cylinder, clutch operating cylinder, Clutch withdrawal lever, clutch release bearing, etc.) for sticking or binding.

a. If any sticking or binding is noted, repair or replace the related parts as necessary.

b. If the hydraulic system was necessary, bleed the clutch hydraulic system. Refer to CL-24, "BLEEDING PROCEDURE" .

NOTE:
Do not use a vacuum assist or any other type of power bleeder on this system. Use of a vacuum assist or power bleeder will not purge all of the air from the system.



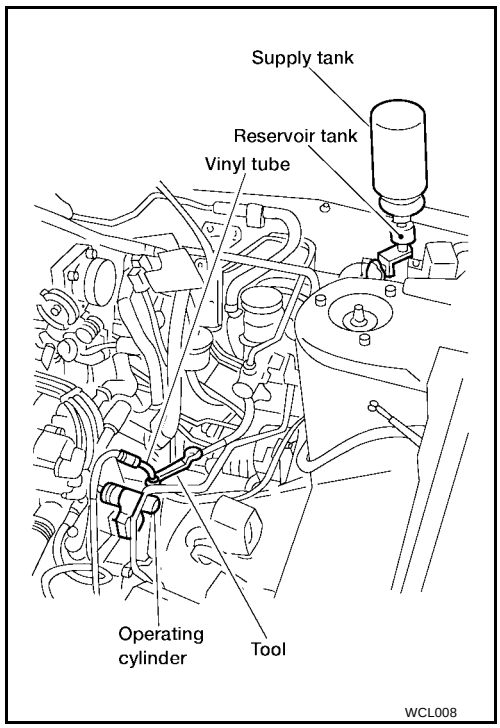
BLEEDING PROCEDURE

CAUTION:
Carefully monitor the fluid level at the clutch master cylinder during the bleeding operation.

NOTE:
Do not use a vacuum assist or any other type of power bleeder on this system. Use of a vacuum assist or power bleeder will not purge all of the air from the system.

1. Top off the clutch master cylinder reservoir with the recommended brake fluid "DOT 3". Then attach the additional supply tank as shown.

   CAUTION:
   Do not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
2. Connect a transparent vinyl tube to the air bleeder valve as shown.
3. Slowly depress the clutch pedal to its full stroke and release it completely. Repeat this operation several times at 2 to 3 seconds intervals.
4. Open the air bleeder valve with the clutch pedal fully depressed.



5. Close the air bleeder valve and tighten to specification.

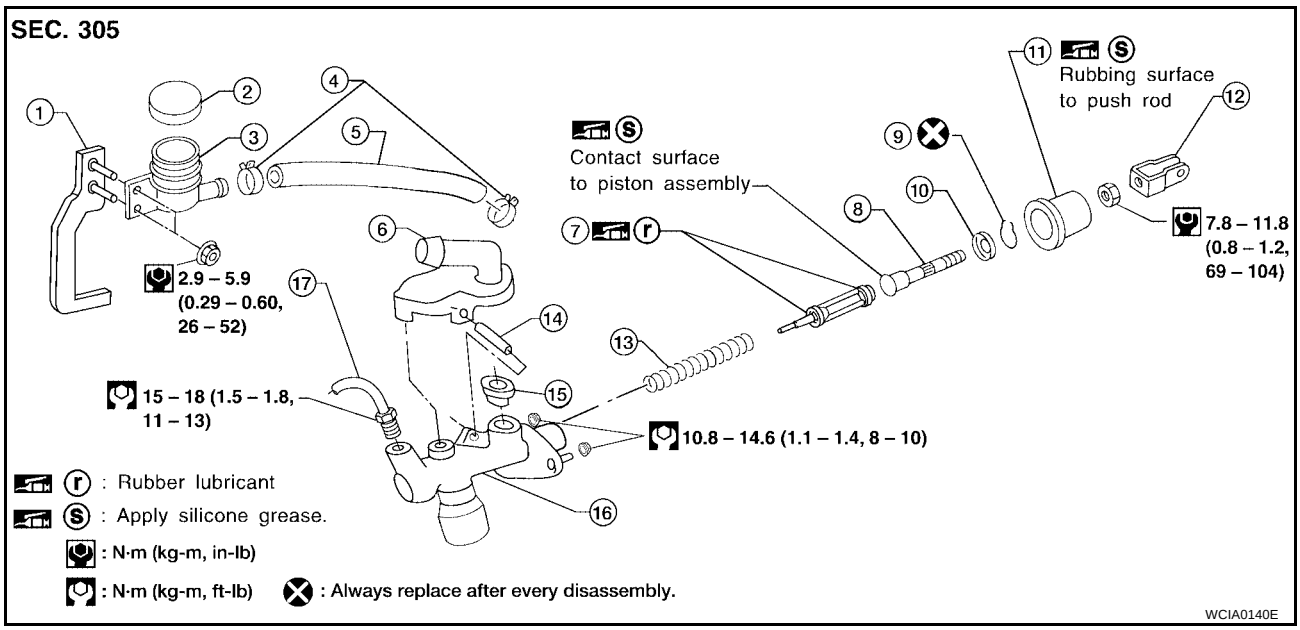
   Air bleeder valve : 5.9 - 9.8 N·m (0.6 - 1.0 kg-m, 52 - 87 in-lb)
6. Release the clutch pedal and wait at least 5 seconds.
7. Repeat steps 3 through 6 above until no more air bubbles are in the brake fluid coming out of the vinyl tube attached to the air bleeder valve.

CLUTCH MASTER CYLINDER

PFP:30610

Components

ECS005SM



1. Bracket	2. Reservoir cap	3. Reservoir tank
4. Hose clamps	5. Reservoir hose	6. Nipple
7. Piston assembly seals	8. Push rod	9. Stopper ring
10. Stopper	11. Dust cover	12. Clevis
13. Return spring	14. Pin	15. Seal
16. Cylinder body	17. Clutch tube	

Removal

ECS005SN

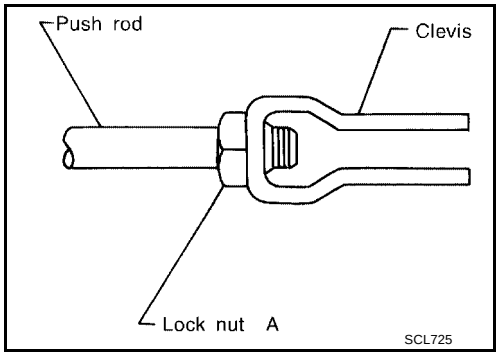
1. Drain the brake fluid from the clutch hydraulic system.

   CAUTION:
   Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
2. Remove the clutch tube flare nut using a flare nut wrench.
3. Remove the reservoir hose.
4. Remove the snap pin from the clevis pin and remove the clutch pedal from the clevis.
5. Unscrew the master cylinder assembly nuts and reservoir tank bracket nuts to remove the master cylinder assembly.

Disassembly

ECS005SP

1. Loosen the push rod lock nut "A" to remove the clevis and lock nut "A".
2. Remove the dust cover.
3. Remove the stopper ring and stopper, and remove the push rod from the cylinder body. During removal, keep the push rod depressed, to prevent the piston inside the master cylinder from popping out. Discard the stopper ring.
4. Remove the piston assembly from the cylinder body.
5. Remove the return spring.
6. Remove the pin using a pin punch, then remove the nipple and seal.



Inspection

ECS005SQ

Inspect for the following, and replace parts if necessary.

- Damage, wear, rust, and pinholes on the cylinder inner wall
- Damage and deformation of the reservoir tank
- Weak spring
- Crack or deformation of the dust cover

Assembly

ECS005SR

1. Install the return spring.
2. Apply rubber lubricant to the sliding parts of the piston assembly, and insert the piston assembly into cylinder body.
3. After installing the stopper on to the push rod, install the new stopper ring while keeping the piston assembly depressed by hand, so that the piston assembly will not pop out.

   CAUTION:
   The stopper ring cannot be reused. Always use a new stopper ring for assembly.
4. Apply silicone grease to the dust cover and install the dust cover.
5. Install the clevis on to push rod, and tighten the lock nut "A" to specification.

   Lock nut "A" : 7.8 - 11.8 N·m (0.8 - 1.2 kg-m, 69 - 104 in-lb)
6. Install the seal and nipple on to the cylinder body, and install the pin using a pin punch.

Installation

ECS005SO

1. Install the reservoir hose.
2. Connect the clutch tube to the master cylinder assembly, and hand-tighten the flare nut.
3. Install the master cylinder assembly to the cowl, and tighten the nuts to specification.

   Master cylinder nuts : 10.8 - 14.6 N·m (1.1 - 1.4 kg-m, 8 - 10 ft-lb)
4. Tighten reservoir tank bracket nuts to specification.

   Reservoir tank bracket nuts : 2.9 - 5.9 N·m (0.29 - 0.60 kg-m, 26 - 52 in-lb)
5. Tighten clutch tube flare nut using a flare nut torque wrench to specification.

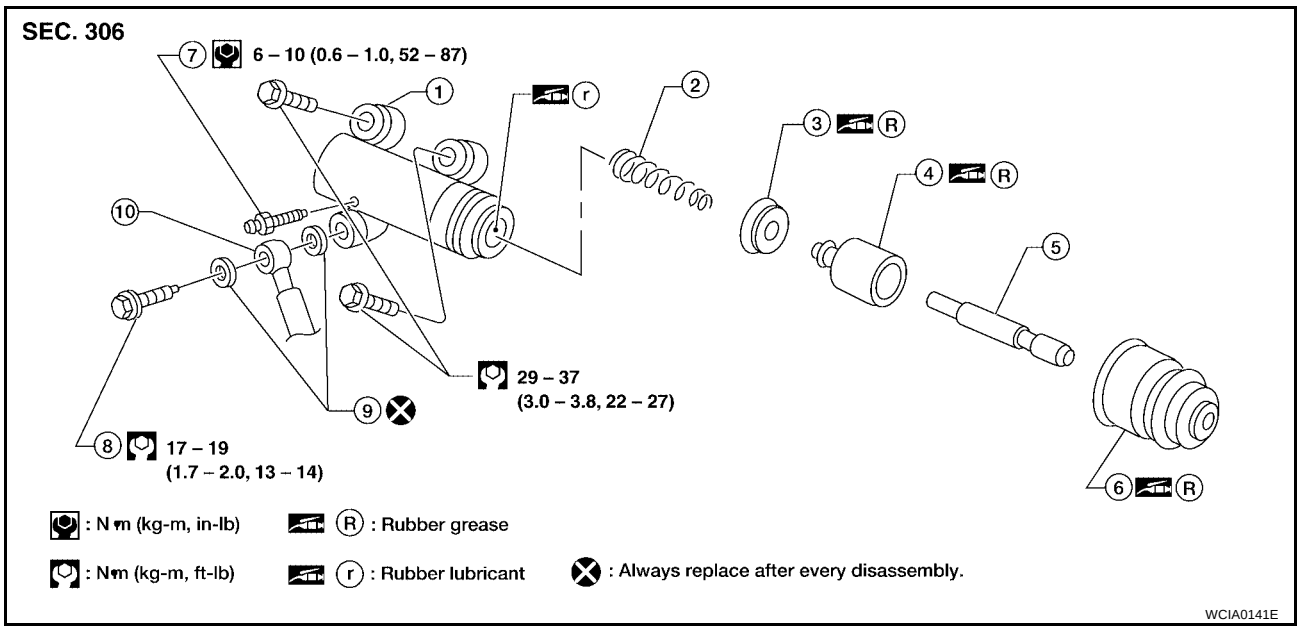
   Clutch tube flare nut : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
6. After installing the clevis pin, install the snap pin to connect the clutch pedal to the push rod.
7. After finishing the installation, bleed the air out of the clutch hydraulic system. Refer to CL-24, "BLEEDING PROCEDURE" .

OPERATING CYLINDER

PFP:30620

Components

ECS005SS



1. Cylinder body
2. Piston spring
3. Piston cup
4. Piston
5. Push rod
6. Dust cover
7. Air bleeder
8. Union bolt
9. Copper washer
10. Clutch hose

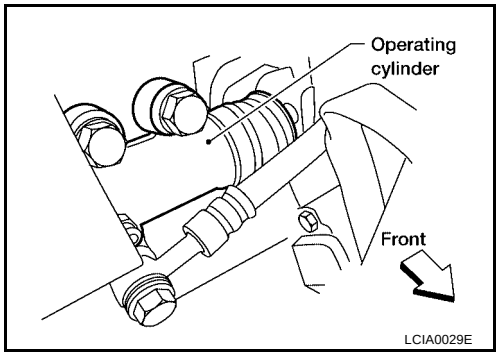
Removal

ECS005ST

1. Drain the brake fluid from clutch hydraulic system.

   CAUTION:
   Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

2. Remove the union bolt, the two copper washers, and the clutch hose from the operating cylinder. Discard the copper washers.
3. Remove the operating cylinder bolts, and remove the operating cylinder.



Disassembly

ECS005SU

1. Remove the dust cover from the operating cylinder body.
2. Remove the push rod.
3. Remove the piston.
4. Remove the piston cup.
5. Remove the piston spring.
6. Remove the air bleeder.

Inspection

ECS005SV

Inspect for the following, and replace parts if necessary.

- Damage, foreign material, wear, rust, and pinholes on the cylinder inner surface, piston, and sliding part of piston cup

- Weak piston spring
- Crack or deformation of dust cover

Assembly

ECS005SW

CAUTION:
To assemble the operating cylinder use the specified rubber grease and rubber lubricant. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

1. Apply rubber lubricant to the overall inside surface of the operating cylinder body.
2. Install the air bleeder and tighten to specification.

Air bleeder : 6 - 10 N·m (0.6 - 1.0 kg-m, 52 - 87 in-lb)

3. Install the piston spring.
4. Apply rubber grease and install the piston cup.
5. Apply rubber grease and install the piston.
6. Install the push rod.
7. Apply rubber grease and install the dust cover.

Installation

ECS005SX

Installation is in the reverse order of removal.

CAUTION:
- **Install the clutch hose without twisting it.**
- **The two copper washers for the union bolt cannot be reused. Use two new copper washers for installation.**
- **After finishing the installation, bleed the air from the clutch hydraulic system. Refer to CL-24, "BLEEDING PROCEDURE" .**

PIPING

PFP:00000

Removal

ECS005SY

1. Remove the engine air cleaner and air duct.
2. Drain the brake fluid from the clutch hydraulic system.

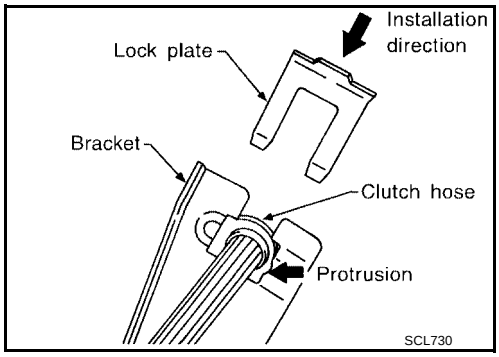
   CAUTION:
   Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
3. Remove the flare nut from the operating cylinder body using a flare nut wrench.
4. Remove the union bolt and two copper washers attaching the clutch hose from the operating cylinder. Discard the two copper washers.
5. Remove the clutch hose from the bracket by removing the lock plate.

Installation

ECS005SZ

1. When installing the clutch hose into the bracket, position the lock plate in the specified direction as shown to secure the clutch hose.

   CAUTION:
   Install the clutch hose without twisting or bending it.



2. Tighten the flare nut to specification, using a flare nut wrench.

   Flare nut : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

   CAUTION:
   Be careful not to damage the flare nut and clutch tube.
3. Position the clutch hose and install the union bolt and two new copper washers on to the operating cylinder, and tighten the union bolt to specification.

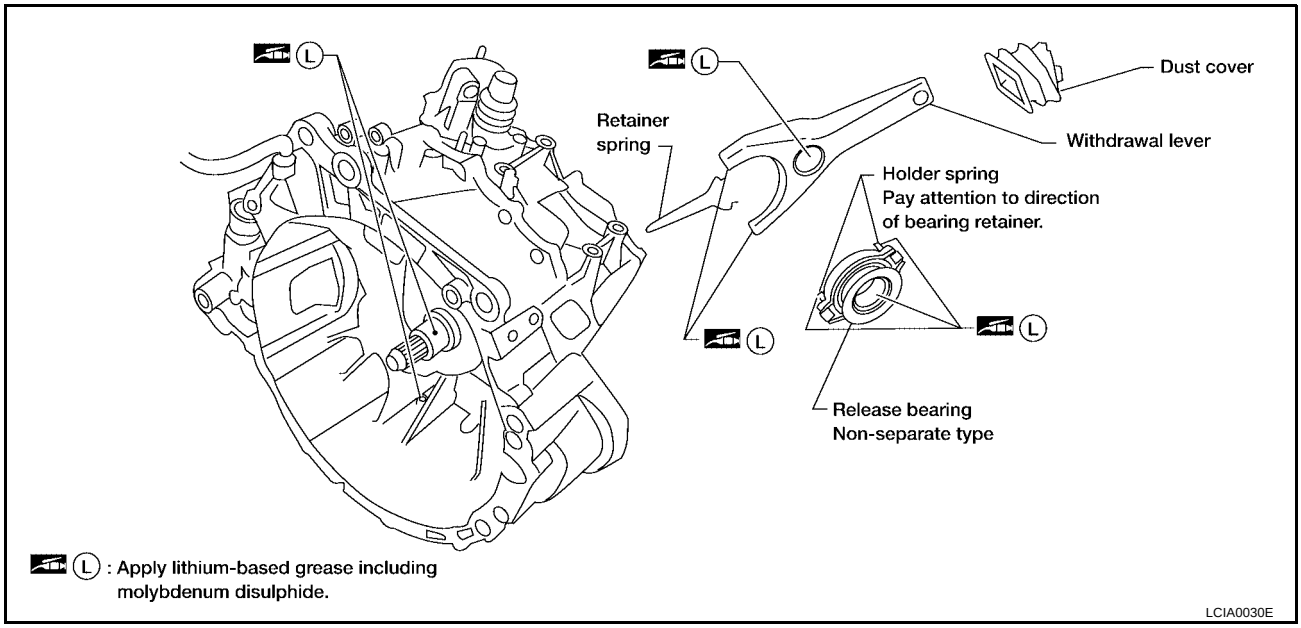
   Union bolt : 17 - 19 N·m (1.7 - 2.0 kg-m, 13 - 14 ft-lb)
4. Bleed the air from the clutch hydraulic system. Refer to CL-24, "BLEEDING PROCEDURE" .
5. Install the engine air cleaner and air duct.

CLUTCH RELEASE MECHANISM

PFP:30502

Components

ECS005T0



Removal

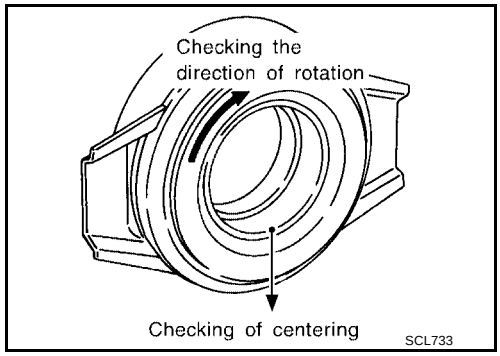
ECS005T1

1. Remove the manual transaxle. Refer to MT-16, "Removal and Installation" .
2. Move the withdrawal lever enough to remove the release bearing, and remove the release bearing from the clutch lever.
3. Remove the withdrawal lever retainer spring.
4. Pull out the withdrawal lever and remove the dust cover.

Inspection After Removal

ECS005T2

- Replace the release bearing if it is seized, damaged, faulty in rotation direction, or has poor alignment.
- Replace the withdrawal lever if the contact surface is worn excessively.
- Replace the dust seal if its deformed or cracked.



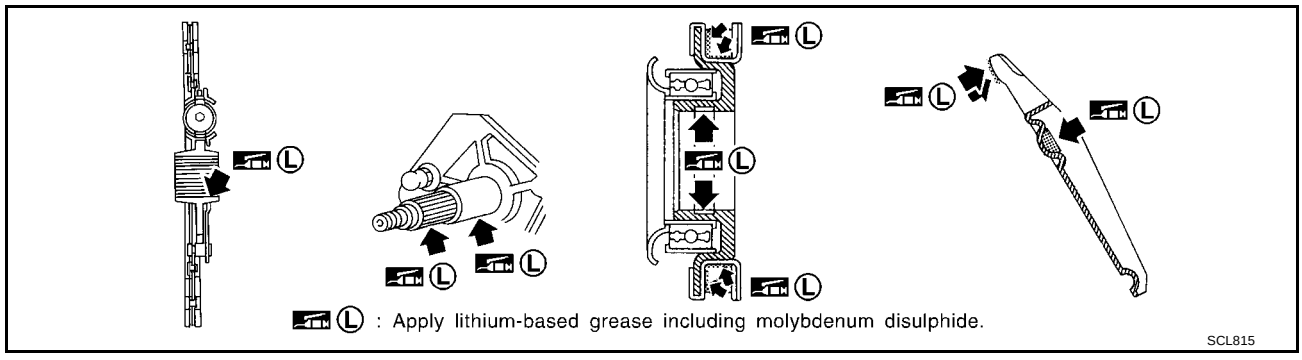
Installation

ECS005T3

1. Installation is in the reverse order of removal.

NOTE:

- Clean any old grease and abrasive materials off of the grease application areas as shown.



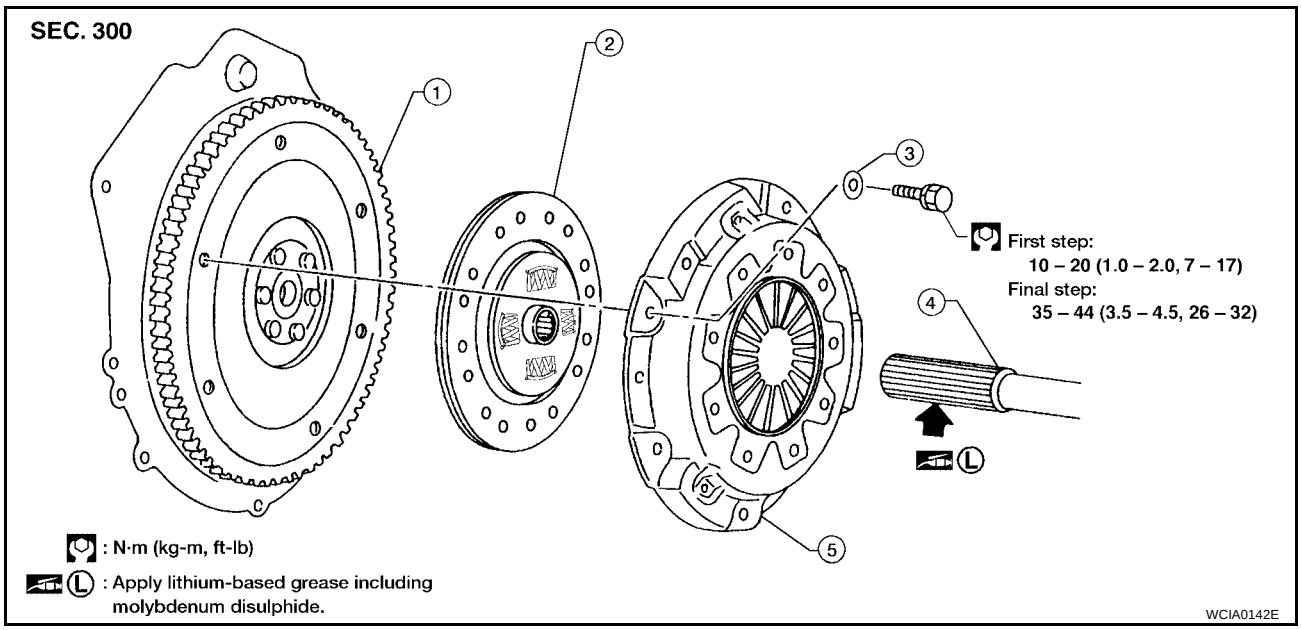
- Apply approximately a 1 mm (0.04 in) thick coating of clutch sleeve grease to the withdrawal lever and holder spring friction surfaces.
- Apply a coat of clutch sleeve grease to the grooves on contact surfaces of the withdrawal lever ball pin and inner surface of the release bearing; make sure the grease is flush with the grooves.
- Apply a thin coat of clutch sleeve grease to the release bearing friction surface. After the grease application, install the release bearing. Wipe off any excess grease forced out from the bearing installation.

CLUTCH DISC, CLUTCH COVER AND FLYWHEEL

PFP:30100

Components

ECS005T4



1. Flywheel
2. Clutch disc
3. Washer
4. Main drive shaft
5. Clutch cover

CAUTION:

- **Do not clean the clutch disc with solvent.**
- **When installing the clutch disc, do not allow grease from the main drive shaft to contact the clutch disc friction surface.**

Inspection and Adjustment

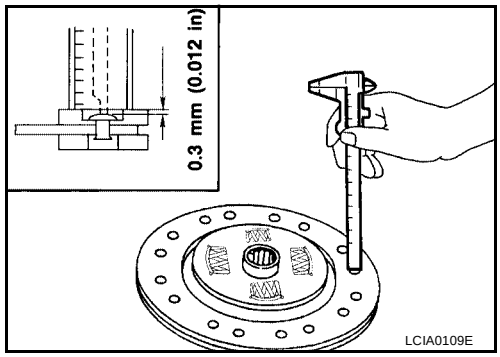
ECS005T5

NOTE:
The following procedures are done with the manual transaxle removed.

CLUTCH DISC

- Check clutch disc for wear of the facing surface at the rivets as shown.

  Wear limit of facing surface to rivet head : 0.3 mm (0.012 in)

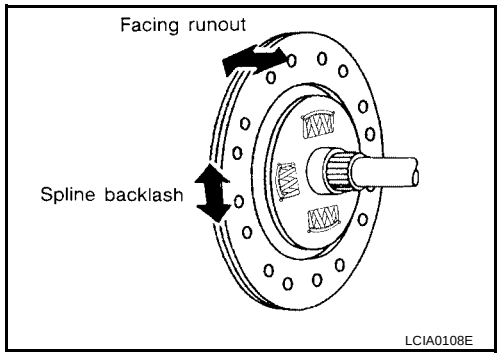


- Check the clutch disc for backlash of the spline and runout of the facing as shown.

  Maximum backlash of spline (at outer edge of disc) : 0.9 mm (0.035 in)

  Runout limit : 1.0 mm (0.039 in)

  Distance of runout check point (from hub center) : 115.0 mm (4.53 in)



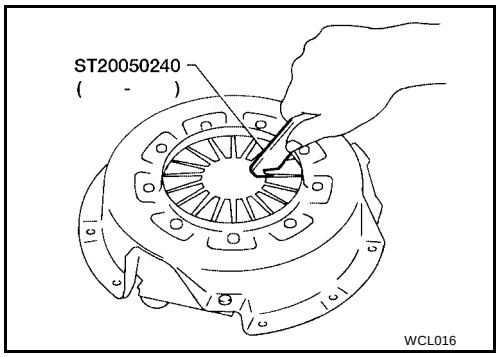
- Check the clutch disc for burns, discoloration, or oil and grease leakage. Replace the components as necessary.

CLUTCH COVER AND FLYWHEEL

Check the spring toe height unevenness of the clutch cover with it installed on the vehicle.

Uneven limit : 0.7 mm (0.028 in)

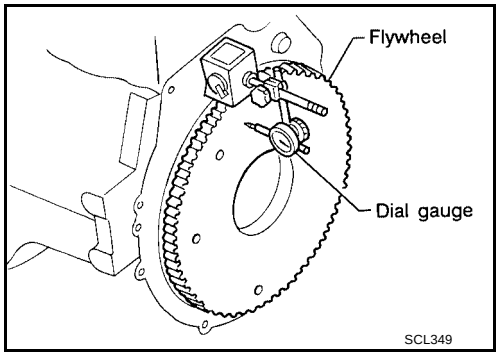
If the measured uneven height is greater than the specified limit, adjust the spring toe height with Tool as shown.



FLYWHEEL INSPECTION

- Check the contact surface of the flywheel for slight burns or discoloration. Clean the flywheel contact surface with emery paper.
- Check the flywheel runout using a dial gauge as shown.

Maximum allowable runout : Refer to EM-184, "MOVEMENT AMOUNT OF FLYWHEEL (M/T MODEL)" .



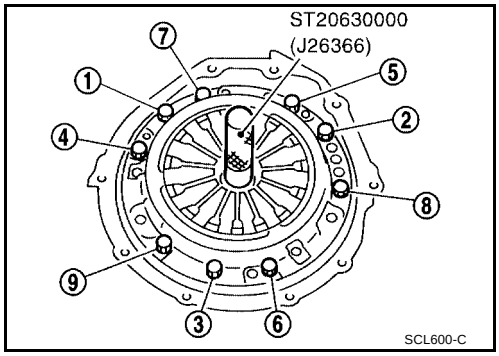
Installation

ECS005T6

1. Insert Tool into the clutch disc hub for correct alignment when installing the clutch cover and disc as shown.

   CAUTION:
   Do not allow the grease to contaminate the clutch facing.
2. Tighten the bolts in numerical order in two steps.

   First step : 10 - 20 N·m (1.0 - 2.0 kg-m, 7 - 14 ft-lb)
   Final step : 35 - 44 N·m (3.5 - 4.5 kg-m, 26 - 32 ft-lb)



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Clutch Control System

ECS005T7

Type of clutch control	Hydraulic

Clutch Master Cylinder

ECS005T8

Unit: mm (in)

Inner diameter	15.87 (5/8)

Clutch Operating Cylinder

ECS005T9

Unit: mm (in)

Inner diameter	19.05 (3/4)

Clutch Disc

ECS005TA

Unit: mm (in)

Engine model	QR25DE
Model	240
Facing size (Outer dia. × inner dia. × thickness)	240 × 160 × 3.5 (9.45 × 6.30 × 0.138)
Thickness of disc assembly with load	7.8 - 8.4 (0.307 - 0.331) with 5,884 N (600 kg, 1,322 lb)
Wear limit of facing surface to rivet head	0.3 (0.012)
Runout limit of facing	1.0 (0.039)
Distance of runout check point (from the hub center)	115.0 (4.53)
Maximum backlash of spline (at outer edge disc)	0.9 (0.035)

Clutch Cover

ECS005TB

Unit: mm (in)

Engine model	QR25DE
Model	240
Full-load	5,884 N (600 kg, 1,322 lb)
Uneven limit of diaphragm spring toe height	0.7 (0.028)

Clutch Pedal

ECS005TC

Unit: mm (in)

Clearance “C” between pedal stopper rubber and clutch interlock switch threaded end while clutch pedal is fully depressed.	0.1 - 1.0 (0.004 - 0.039)

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DRIVER INFORMATION SYSTEM

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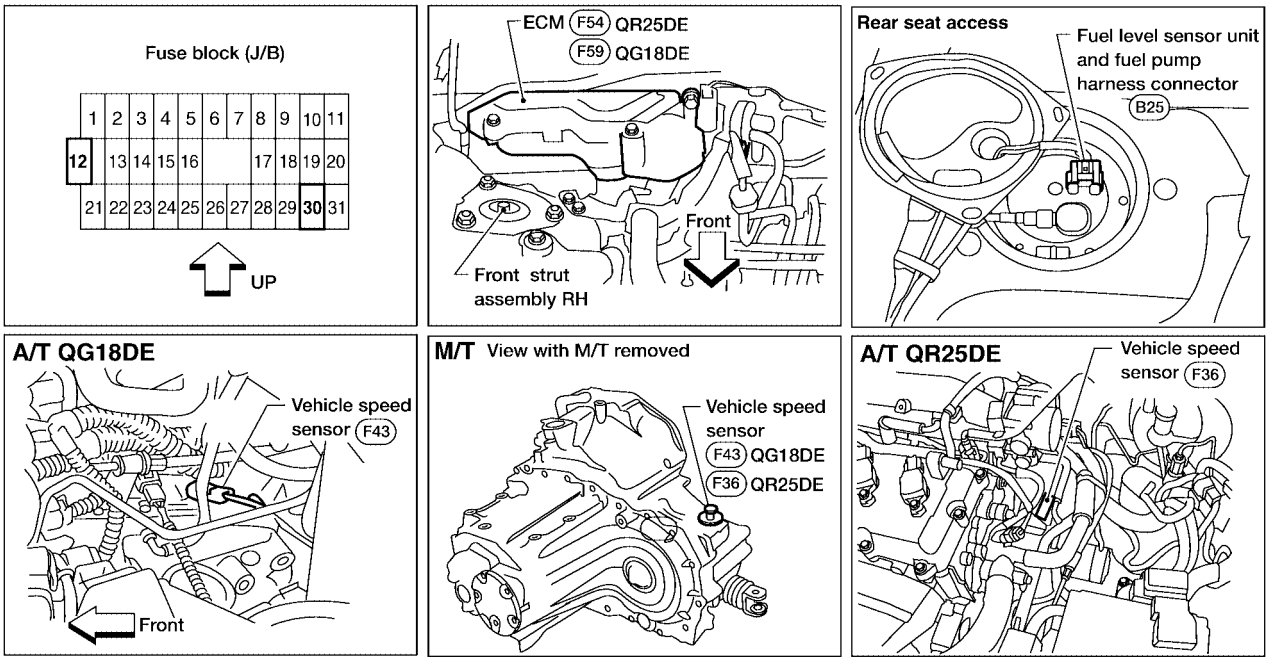
METERS AND GAUGES

PFP:24814

Component Parts and Harness Connector Location

EKS00399



WKIA1045E

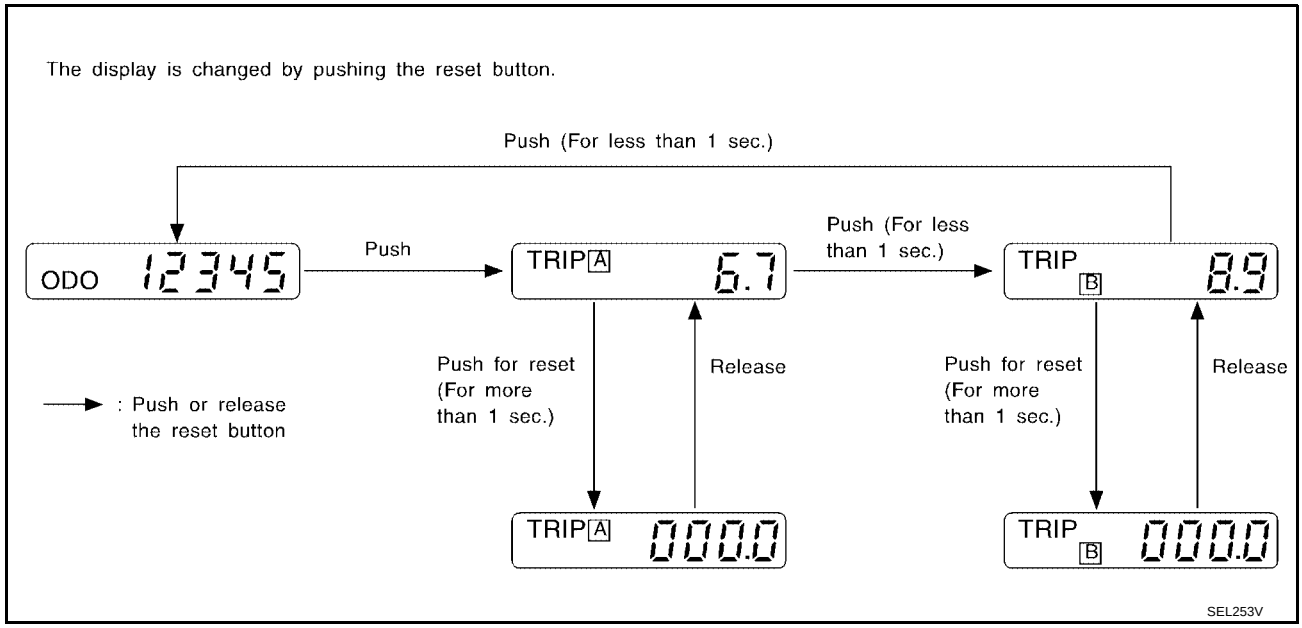
System Description

EKS0039A

UNIFIED CONTROL METER

- Speedometer, odo/trip meter, tachometer (if equipped), fuel gauge and water temperature gauge are controlled totally by control unit built-in combination meter.
- Digital meter is adopted for odo/trip meter.*
  *The record of the odometer is kept even if the battery cable is disconnected. The record of the trip meter is erased when the battery cable is disconnected.
- Odo/trip meter segment can be checked in diagnosis mode.
- Meter/gauge can be checked in diagnosis mode.

HOW TO CHANGE THE DISPLAY FOR ODO/TRIP METER



NOTE:
Turn ignition switch to the ON position to operate odo/trip meter.

POWER SUPPLY AND GROUND CIRCUIT

Power is supplied at all times:

- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to combination meter terminal 25 (without tachometer) or 42 (with tachometer).

With the ignition switch in the ON or START position, power is supplied:

- through 10A fuse [No. 30, located in the fuse block (J/B)]
- to combination meter terminal 26 (without tachometer), or
- to combination meter terminals 41 and 6 (with tachometer).

Ground is supplied:

- to combination meter terminal 27 (without tachometer) or 48 (with tachometer)
- through body grounds M28 and M54.

WATER TEMPERATURE GAUGE

QG18DE

The water temperature gauge indicates the engine coolant temperature.
ECM provides a water temperature signal to combination meter for water temperature gauge with CAN communication line.

QR25DE

The water temperature gauge indicates the engine coolant temperature. The reading on the gauge is based on the signal from the ECM.
The water temperature gauge is regulated by a signal:

- from terminal 32 of the ECM

- to combination meter terminal 43 for the water temperature gauge.

TACHOMETER

QG18DE Models

The tachometer indicates engine speed in revolutions per minute (rpm).
ECM provides an engine speed signal to combination meter for tachometer with CAN communication line.

QR25DE Models

The tachometer indicates engine speed in revolutions per minute (rpm).
The tachometer is regulated by a signal:

- from terminal 36 of the ECM
- to combination meter terminal 45 for the tachometer.

FUEL GAUGE

The fuel gauge indicates the approximate fuel level in the fuel tank.
The fuel gauge is regulated by a variable ground signal supplied:

- to combination meter terminal 30 (without tachometer) or 44 (with tachometer) for the fuel gauge
- from terminal 2 of the fuel level sensor unit and fuel pump
- through terminal 5 of the fuel level sensor unit and fuel pump, and
- through body grounds B13 and B19.

SPEEDOMETER

The combination meter receives a voltage signal from the vehicle speed sensor for the speedometer.
The voltage is supplied:

- to combination meter terminal 29 (without tachometer) or 47 (with tachometer) for the speedometer
- from terminal 1 (with QG18DE), or terminal + (with QR25DE) of the vehicle speed sensor.

The speedometer converts the voltage into the vehicle speed displayed.

CAN Communication

EKS003LD

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

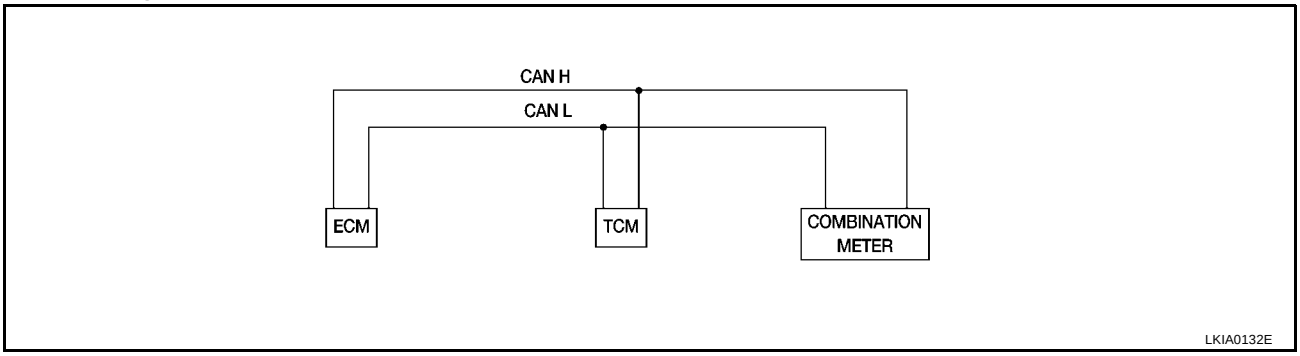
CAN COMMUNICATION UNIT

Body type	Sedan		
Axle	2WD		
Engine	QG18DE		QR25DE
Transmission	A/T	M/T	A/T
CAN communication unit			
ECM	×	×	×
TCM	×		×
Combination meter	×	×	
CAN communication type	DI-6, "TYPE 1"	DI-6, "TYPE 2"	DI-7, "TYPE 3"

×: Applicable

TYPE 1

System Diagram



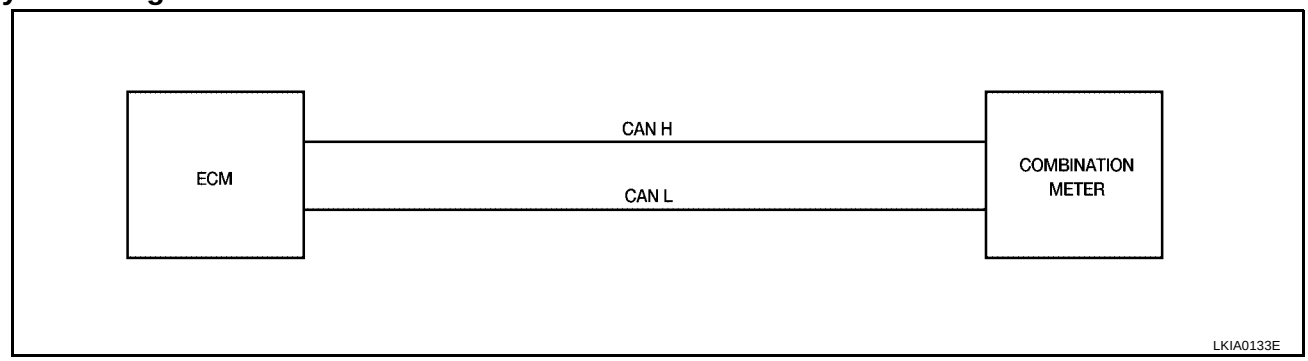
Input/Output Signal Chart

T: Transmit R: Receive

Signals	ECM	TCM	Combination Meter
Accelerator pedal position signal	T	R	
Output shaft revolution signal	R	T	
A/T self-diagnosis signal	R	T	
Closed throttle position signal	T	R	
Wide open throttle position signal	T	R	
Stop lamp switch signal		R	T
Overdrive control switch signal		R	T
O/D OFF indicator signal		T	R
Engine speed signal	T		R
Engine coolant temperature signal	T		R
Vehicle speed signal	R		T
Fuel level sensor signal	R		T
Malfunction indicator lamp signal	T		R
ASCD SET lamp signal	T		R
ASCD CRUISE lamp signal	T		R

TYPE 2

System Diagram



Input/Output Signal Chart

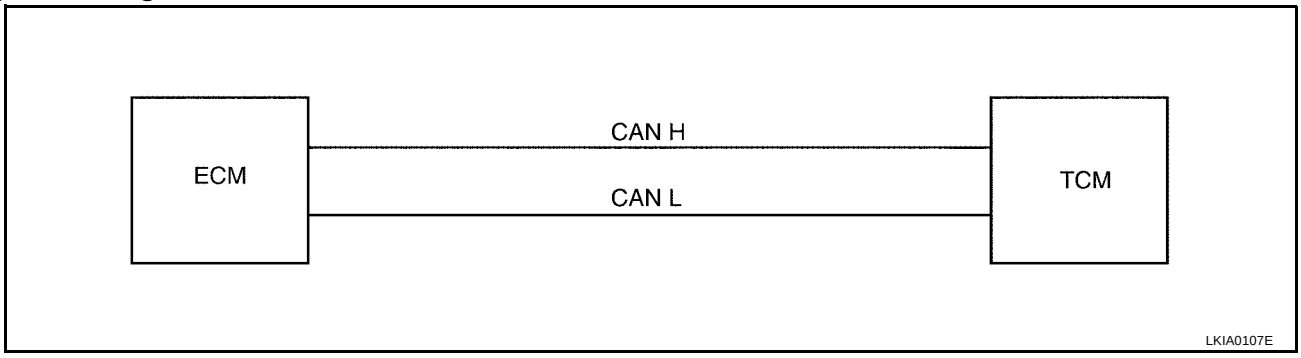
T: Transmit R: Receive

Signals	ECM	Combination Meter
Engine speed signal	T	R
Engine coolant temperature signal	T	R
Vehicle speed signal	R	T

Signals	ECM	Combination Meter
Fuel level sensor signal	R	T
Malfunction indicator lamp signal	T	R
ASCD SET lamp signal	T	R
ASCD CRUISE lamp signal	T	R

TYPE 3

System Diagram



Input/Output Signal Chart

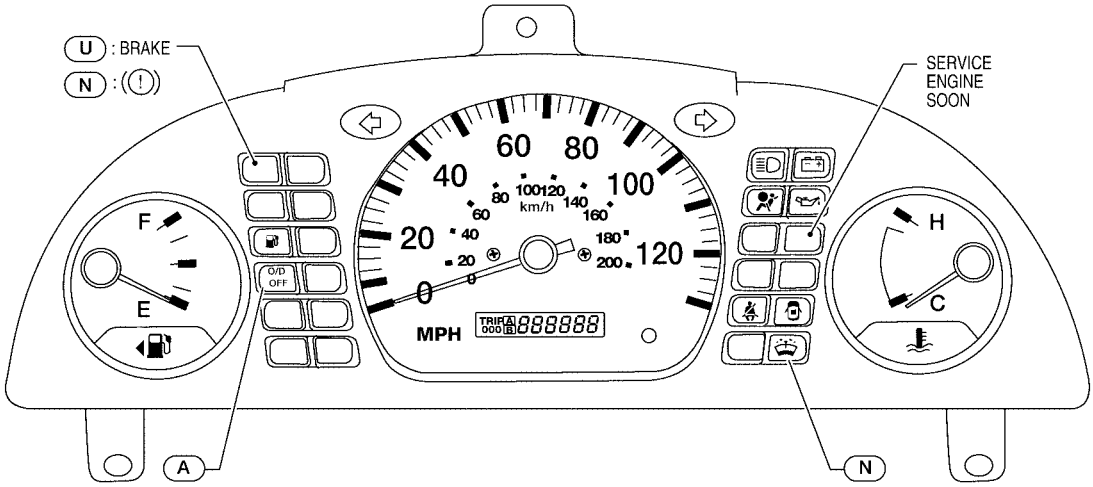
T: Transmit R: Receive

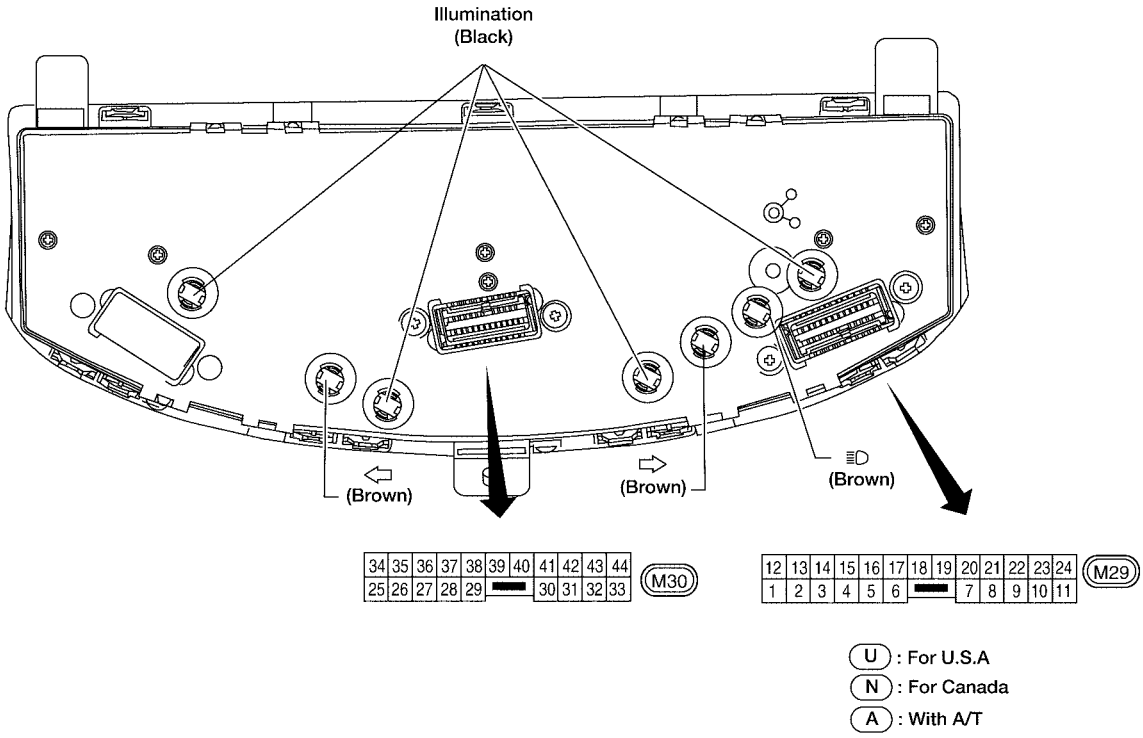
Signals	ECM	TCM
Accelerator pedal position signal	T	R
Output shaft revolution signal	R	T
A/T self-diagnosis signal	R	T
Wide open throttle position signal	T	R
Overdrive cancel signal	T	R

Combination Meter

EKS0039B

WITHOUT TACHOMETER



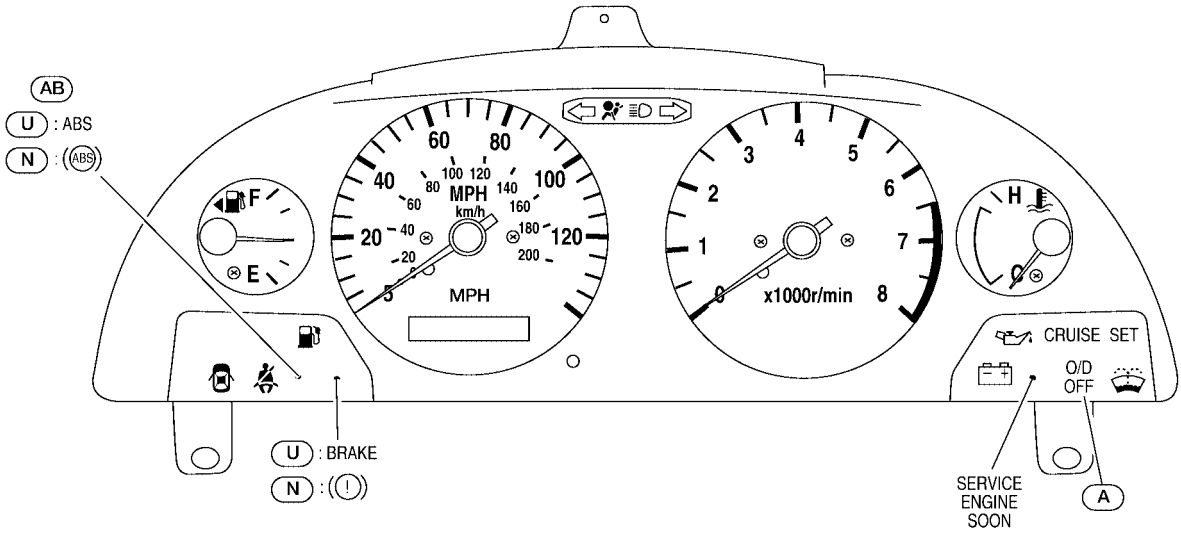


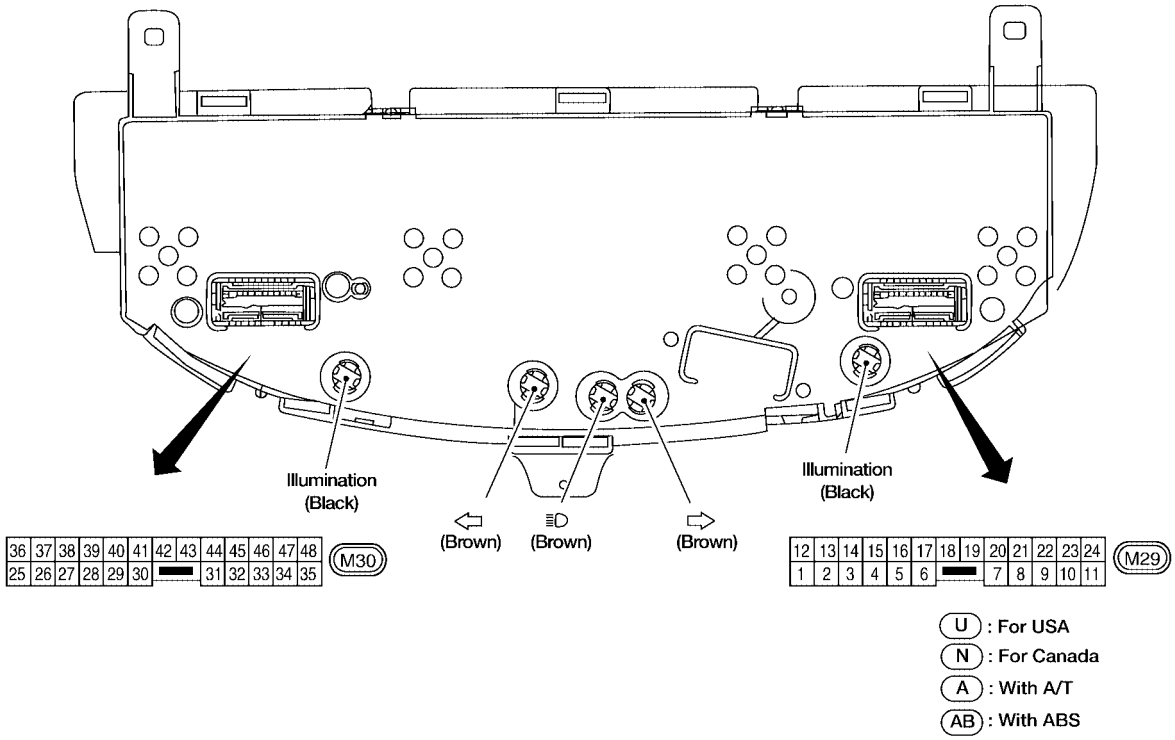
Bulb socket color	Bulb wattage
Brown	1.4W
Black	3.0W

( ): Bulb socket color

WKIA0289E

WITH TACHOMETER (QG18DE MODELS)





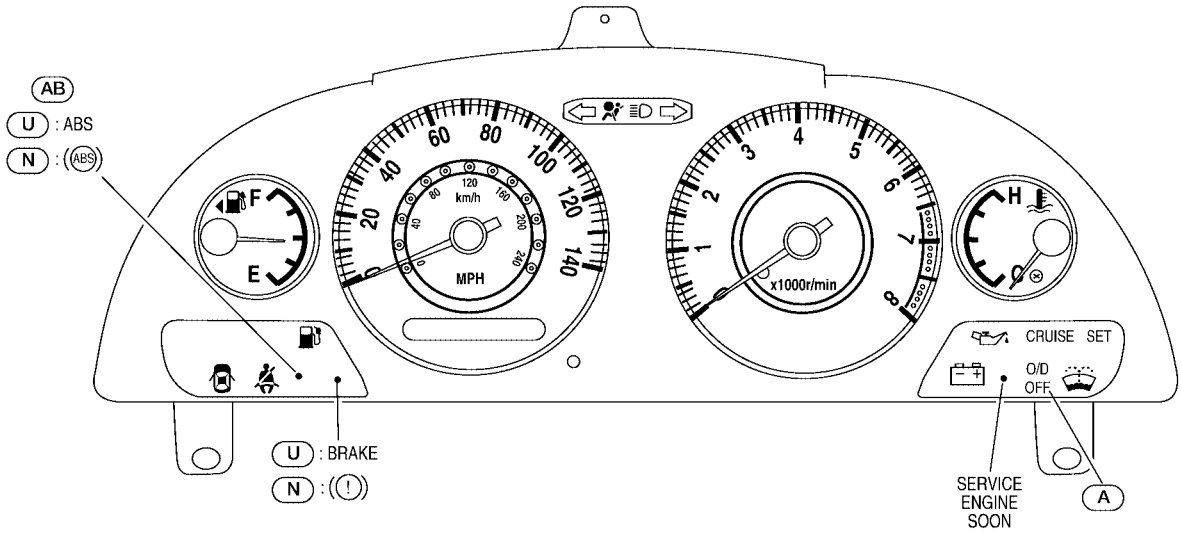
U : For USA
N : For Canada
A : With A/T
AB : With ABS

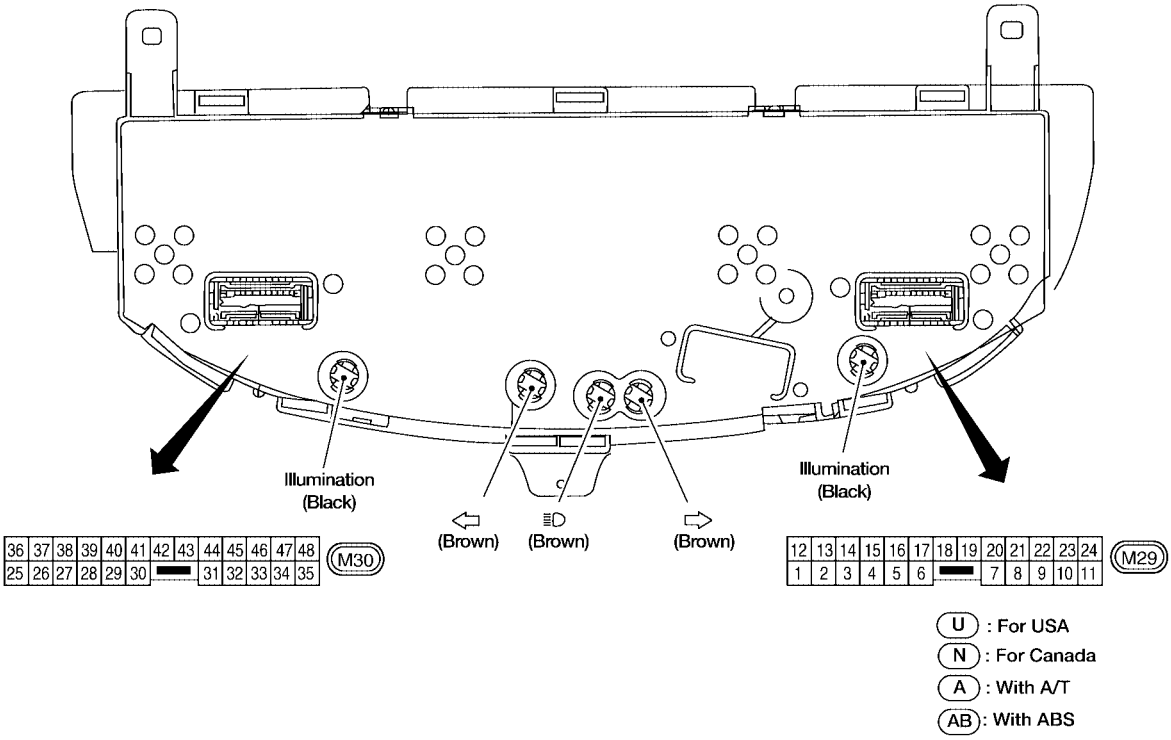
Bulb socket color	Bulb wattage
Brown	1.4W
Black	3.0W

( ): Bulb socket color

WKIA0006E

WITH TACHOMETER (QR25DE MODELS)





Bulb socket color	Bulb wattage
Brown	1.4W
Black	3.0W

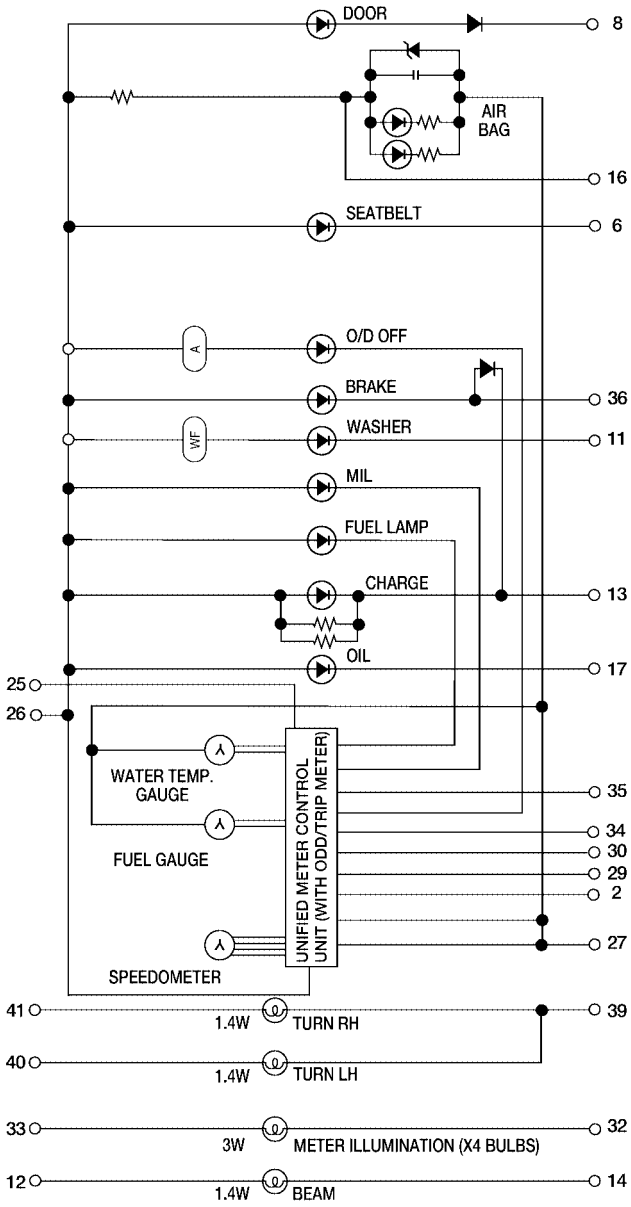
( ): Bulb socket color

WKIA0007E

Schematic

EKS0039C

WITHOUT TACHOMETER

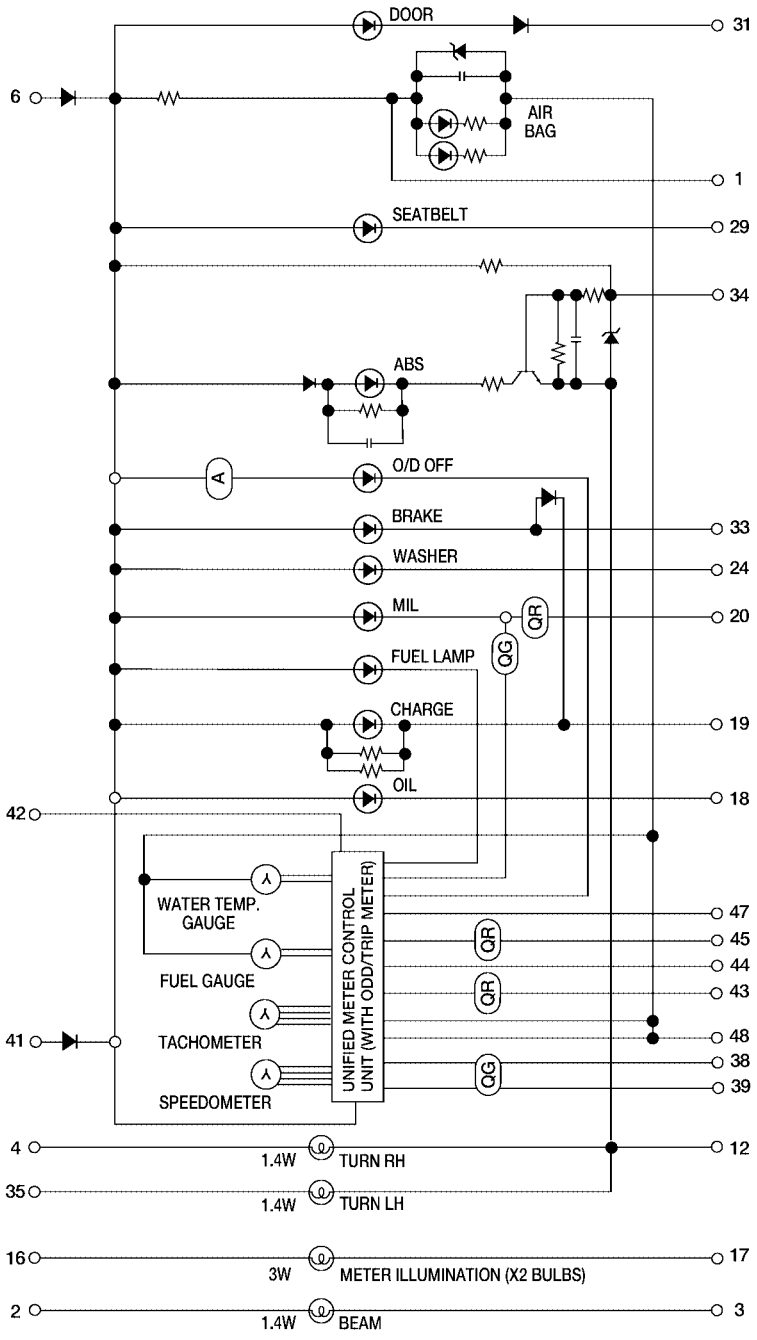


(A) : With A/T

(WF) : With washer fluid lever switch

WKWA0513E

WITH TACHOMETER



(A) : With A/T

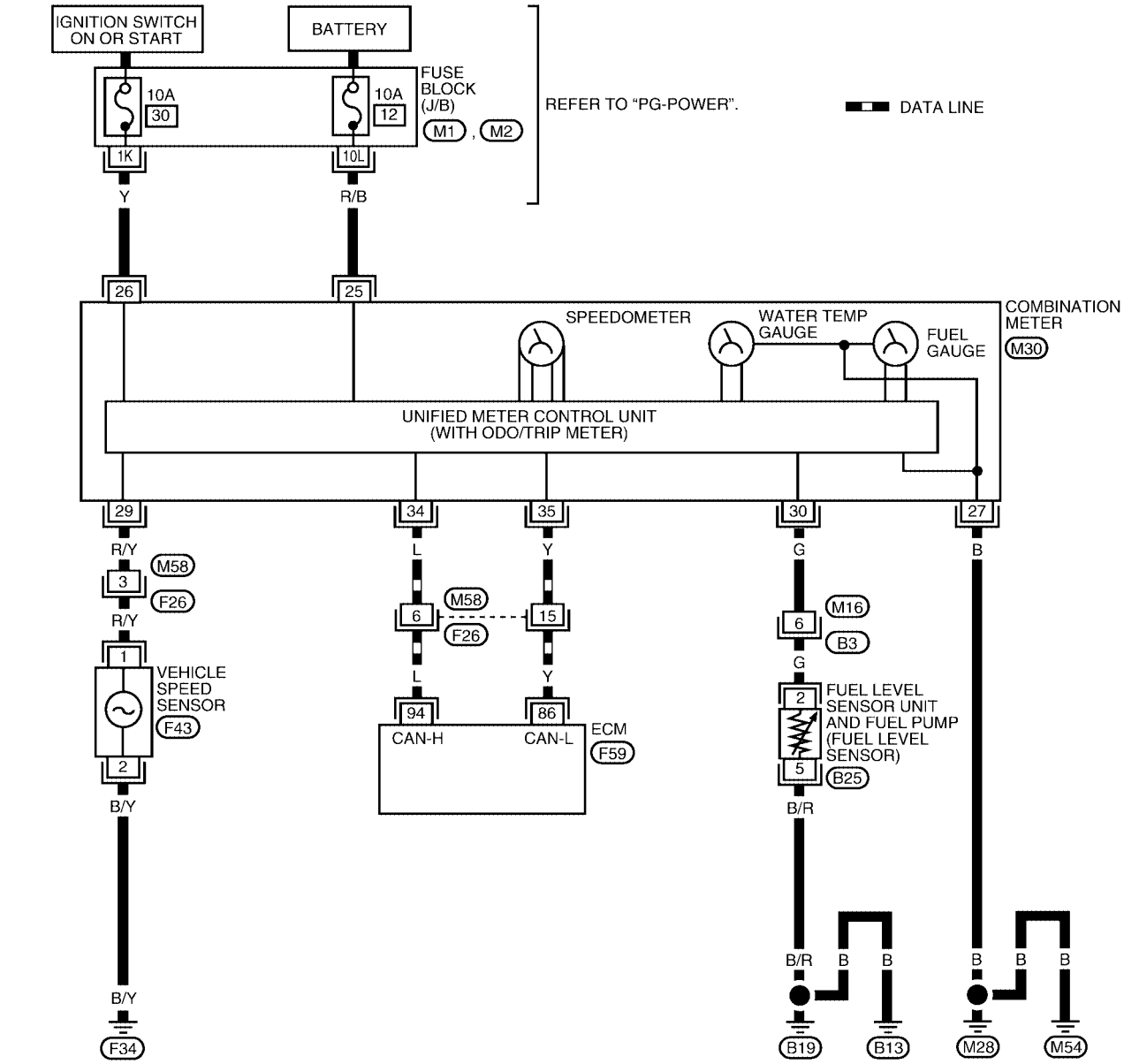
(QG) : With QG18DE
(QR) : With QR25DE

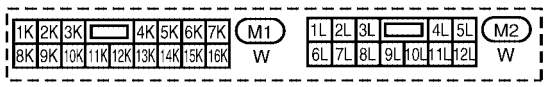
WKWA0506E

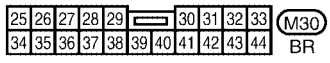
Wiring Diagram — METER —
WITHOUT TACHOMETER

EKS0039D

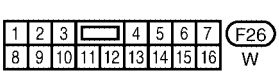
DI-METER-01

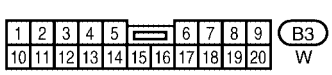


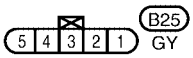




REFER TO THE FOLLOWING.
F59 - ELECTRICAL UNITS

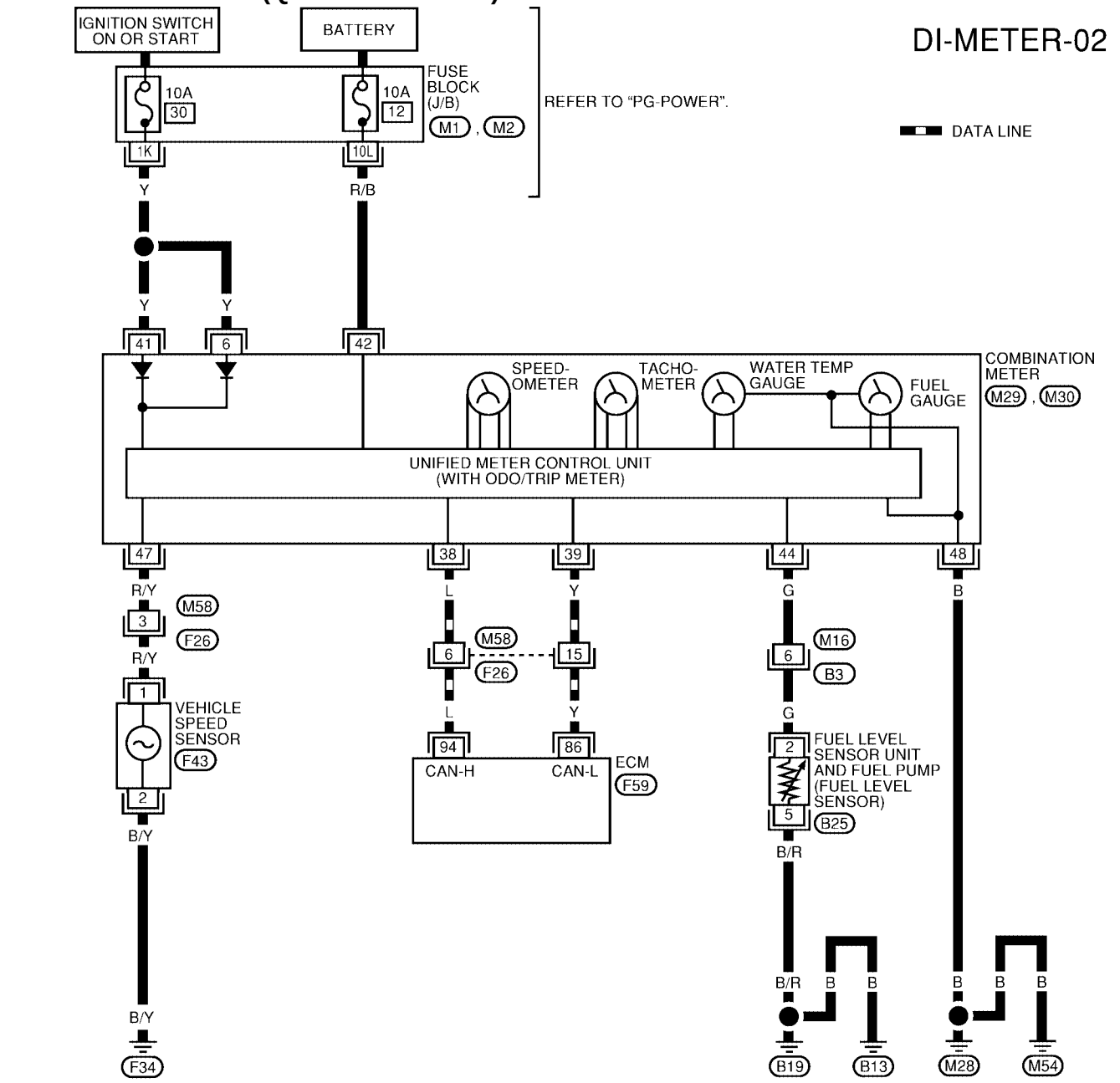


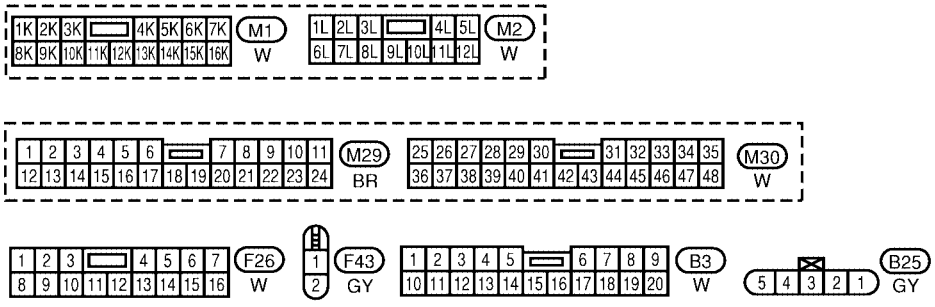




WKWA0507E

WITH TACHOMETER (QG18DE MODELS)



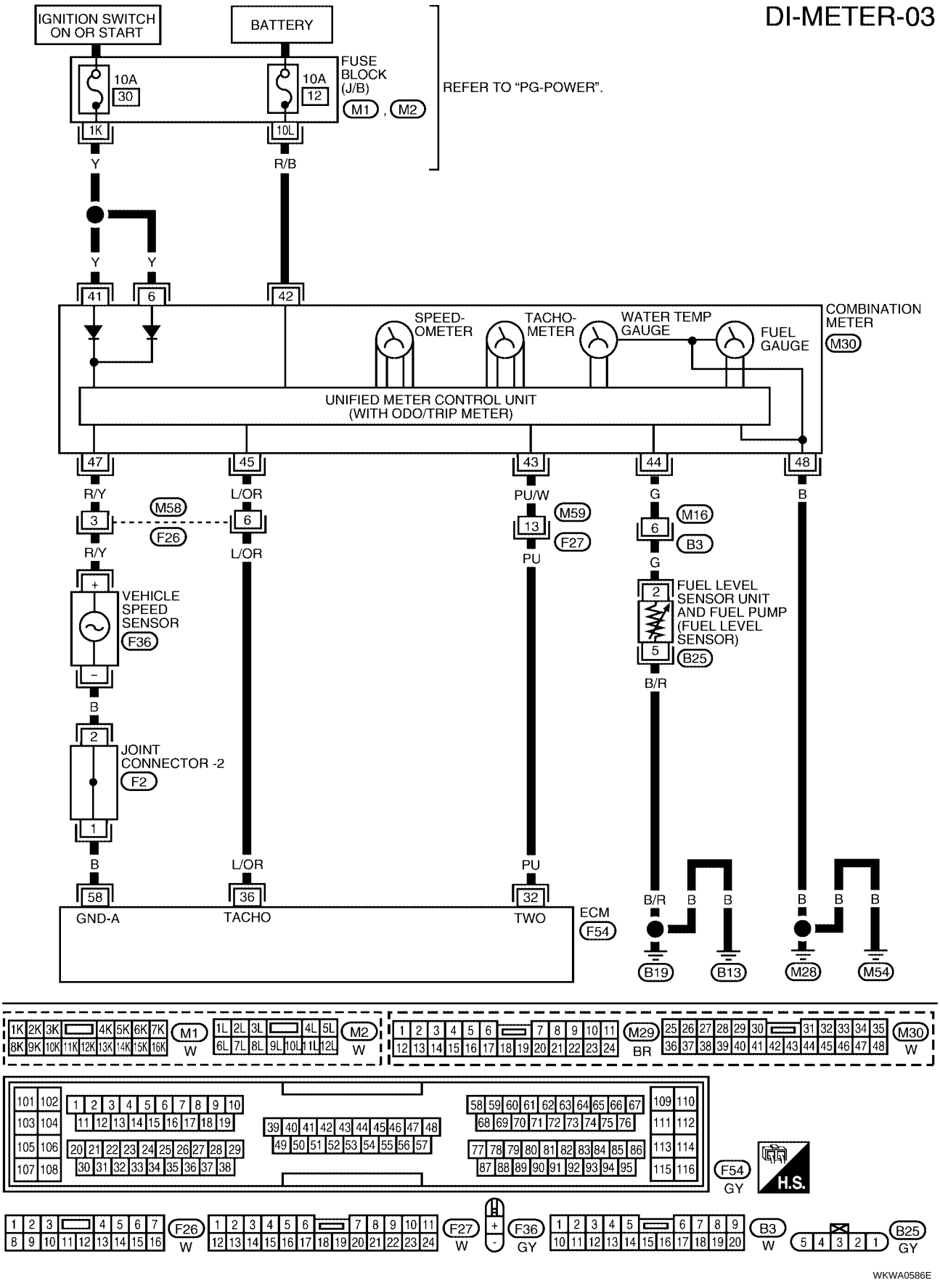


REFER TO THE FOLLOWING.
F59 - ELECTRICAL UNITS

WKWA0508E

WITH TACHOMETER (QR25DE MODELS)

DI-METER-03



WKWA0586E

Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode

EKS0039E

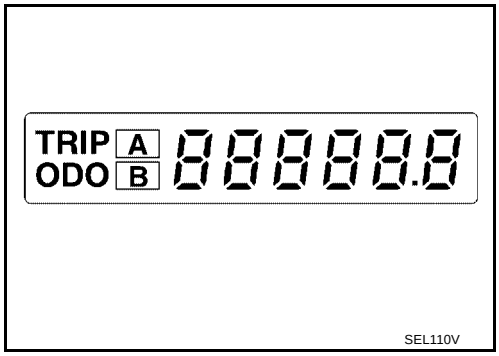
DIAGNOSIS FUNCTION

- Odo/trip meter segment can be checked in diagnosis mode.
- Meters/gauges can be checked in diagnosis mode.

HOW TO ALTERNATE DIAGNOSIS MODE

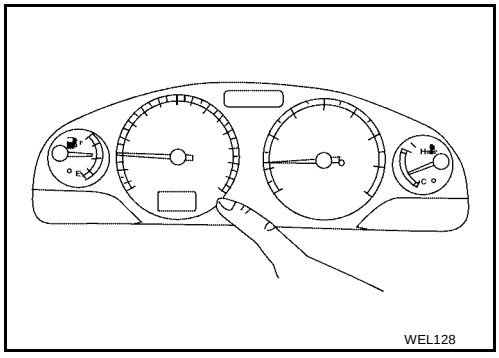
1. Turn ignition switch to ON and change odo/trip meter to “TRIP A” or “TRIP B”.
2. Turn ignition switch to OFF.
3. Turn ignition switch to ON when pushing odo/trip meter switch.
4. Release odo/trip meter switch 1 second after ignition switch is turned ON.
5. Push odo/trip meter switch three times within 7 seconds.
6. All odo/trip meter segments should be turned on.

   NOTE:
   If some segments are not turned on, combination meter should be replaced.
   At this point, the unified control meter is turned to diagnosis mode.



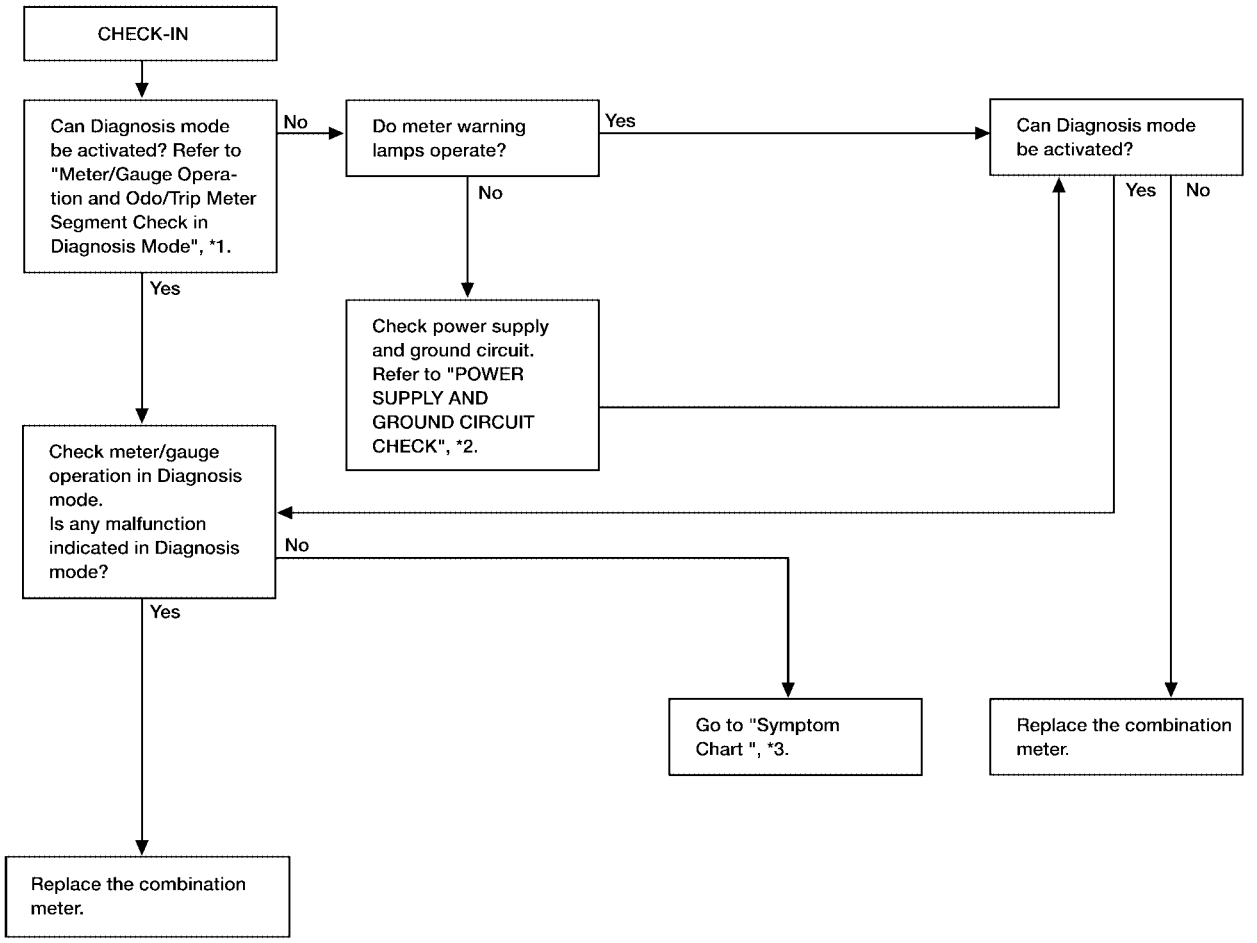
7. Push odo/trip meter switch. Indication of each meter/gauge should be as shown in figure during pushing odo/trip meter switch.

   NOTE:
   It takes a few seconds for indication of fuel gauge and water temperature gauge to become stable.
8. Turn ignition switch to OFF or start engine to cancel diagnosis mode.



Trouble Diagnoses
PRELIMINARY CHECK

EKS0039F



WKIA0159E

*1: DI-16 *2: DI-19 *3: DI-18

SYMPTOM CHART

Symptom	Possible causes	Repair order
One meter/gauge (speedometer/tachometer/fuel gauge/water temp. gauge) is malfunctioning. Multiple meters/gauges (except odo/trip meter) are malfunctioning.	1. Sensor signal - Vehicle speed signal - Engine revolution signal - Fuel gauge - Water temp. gauge 2. Unified meter control unit	1. Check the sensor for malfunctioning meter/gauge. DI-21, "INSPECTION/VEHICLE SPEED SENSOR" DI-22, "INSPECTION/ENGINE REVOLUTION SIGNAL (QR25DE)" DI-23, "INSPECTION/FUEL LEVEL SENSOR UNIT AND FUEL PUMP" DI-24, "INSPECTION/WATER TEMPERATURE GAUGE (QG18DE MODELS)" DI-25, "INSPECTION/WATER TEMPERATURE GAUGE (QR25DE MODELS)" 2. Replace combination meter assembly.

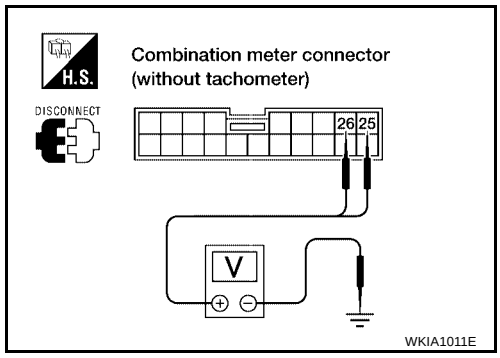
Before starting trouble diagnoses below, perform “PRELIMINARY CHECK”, DI-17, "PRELIMINARY CHECK" .

POWER SUPPLY AND GROUND CIRCUIT CHECK

Power Supply Circuit Check

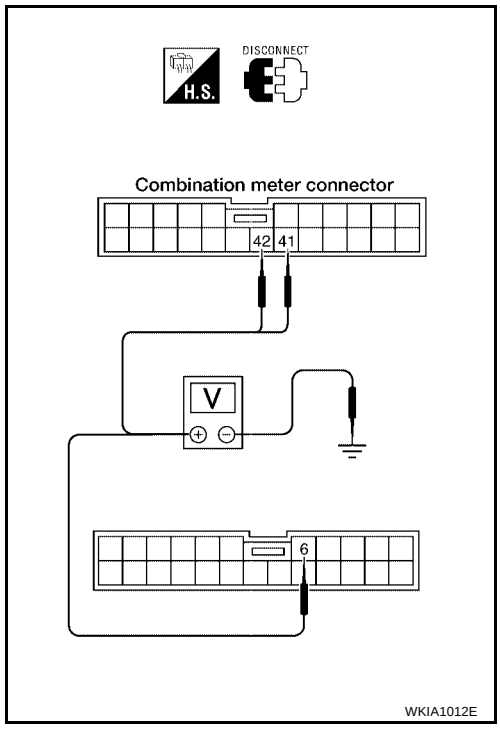
WITHOUT TACHOMETER

Terminals			Ignition switch position		
(+)		(-)			
Connector	Terminal (Wire color)		OFF	ACC	ON
M30	25 (R/B)	Ground	Battery voltage	Battery voltage	Battery voltage
M30	26 (Y)	Ground	0V	0V	Battery voltage



WITH TACHOMETER

Terminals			Ignition switch position		
(+)		(-)			
Connector	Terminal (Wire color)		OFF	ACC	ON
M29	6 (Y)	Ground	0V	0V	Battery voltage
M30	41 (Y)	Ground	0V	0V	Battery voltage
M30	42 (R/B)	Ground	Battery voltage	Battery voltage	Battery voltage



If NG, check the following.

- 10A fuse [No. 12, located in fuse block (J/B)]
- 10A fuse [No. 30, located in fuse block (J/B)]
- Harness for open or short between fuse and combination meter

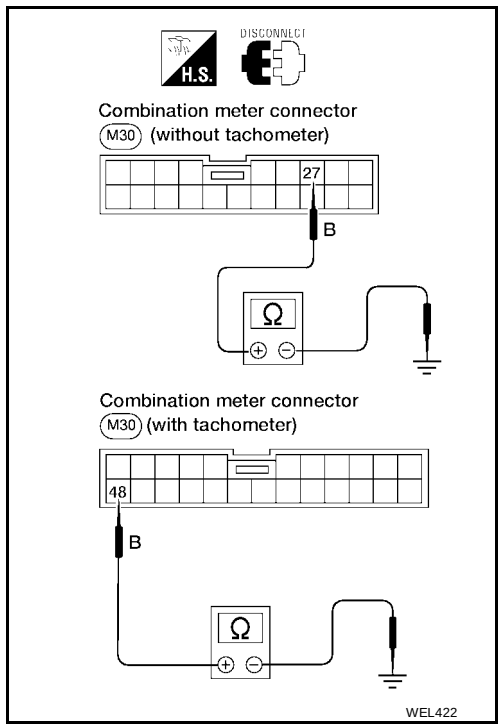
Ground Circuit Check

WITHOUT TACHOMETER

Terminals			Continuity
(+)		(-)	
Connector	Terminal (Wire color)		
M30	27 (B)	Ground	Yes

WITH TACHOMETER

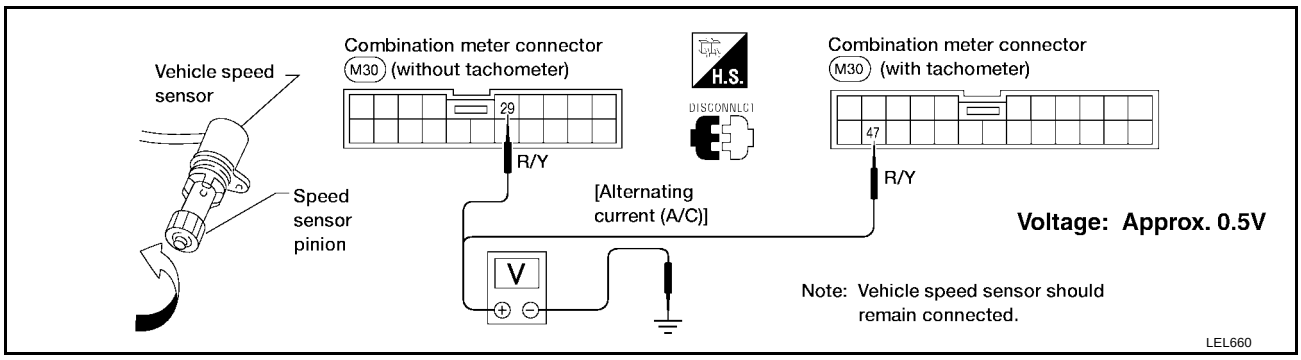
Terminals			Continuity
(+)		(-)	
Connector	Terminal (Wire color)		
M30	48 (B)	Ground	Yes



INSPECTION/VEHICLE SPEED SENSOR

1. CHECK VEHICLE SPEED SENSOR OUTPUT

1. Remove vehicle speed sensor from transmission.
2. Check voltage between combination meter terminal 29 (without tachometer) or 47 (with tachometer) and ground while quickly turning speed sensor pinion.



OK or NG

OK >> Vehicle speed sensor is OK.
NG >> GO TO 2.

2. CHECK VEHICLE SPEED SENSOR

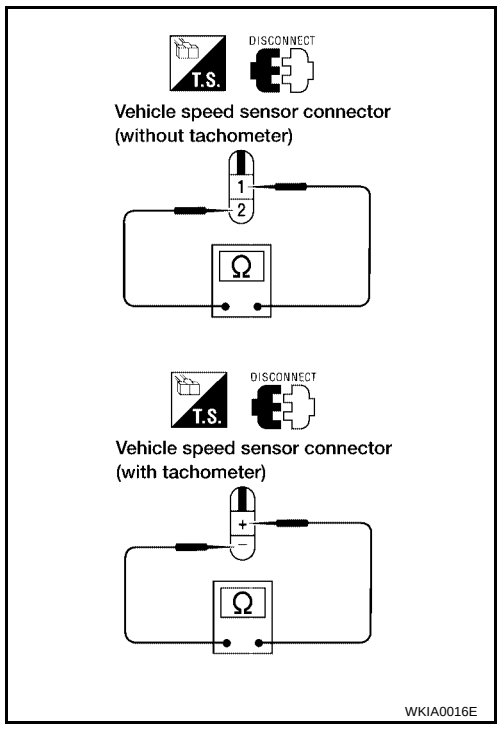
Check resistance between vehicle speed sensor connector F43 terminals 1 and 2 (with QG18DE), or connector F36 terminals + and - (with QR25DE).

Resistance Approx. 250Ω

OK or NG

OK >> Check the following.
- Harness between combination meter and vehicle speed sensor.
- Vehicle speed sensor ground circuit.

NG >> Replace vehicle speed sensor.



INSPECTION/ENGINE REVOLUTION SIGNAL (QG18DE)

1. CHECK ECM SELF-DIAGNOSIS

Perform ECM self diagnosis. Refer to EC-113 (ULEV Models), EC-694 (SULEV Models).

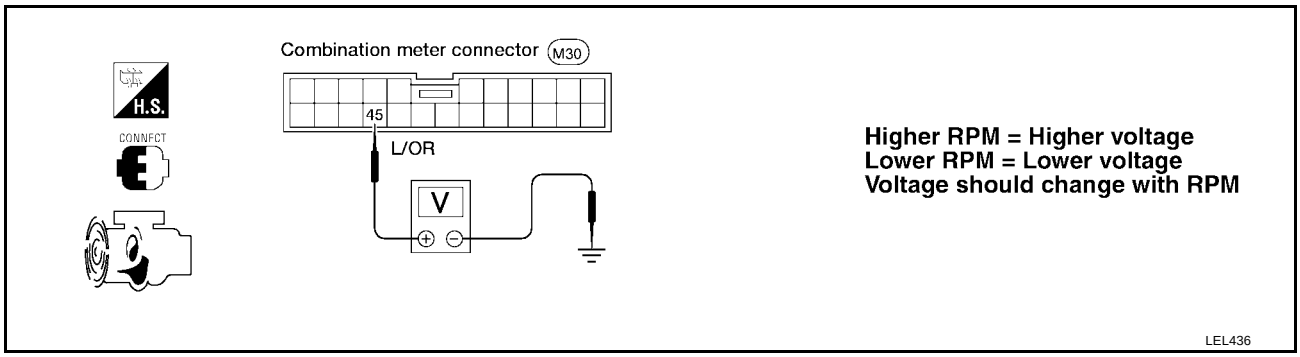
OK or NG

OK >> Replace combination meter.
NG >> Go to ECM trouble diagnosis. Refer to EC-113 (ULEV Models), EC-694 (SULEV Models).

INSPECTION/ENGINE REVOLUTION SIGNAL (QR25DE)

1. CHECK ECM OUTPUT

1. Start engine.
2. Check voltage between combination meter terminal 45 and ground at idle and 2,000 rpm.



OK or NG

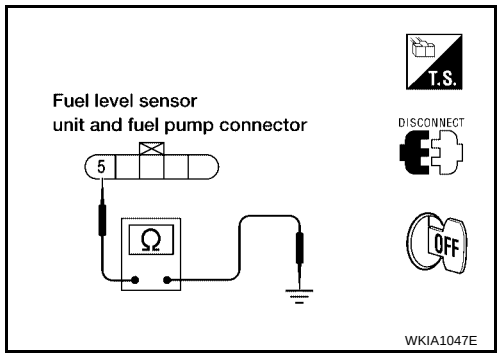
OK >> Engine revolution signal is OK.
NG >> Harness for open or short between ECM and combination meter.

INSPECTION/FUEL LEVEL SENSOR UNIT AND FUEL PUMP

1. CHECK GROUND CIRCUIT FOR FUEL LEVEL SENSOR UNIT

Check harness continuity between fuel level sensor unit and fuel pump connector terminal 5 and ground.

Terminals			Continuity
(+)		(-)	
Connector	Terminal (Wire color)		
MB25	5 (B/R)	Ground	Yes



OK or NG

OK >> GO TO 2.
NG >> Repair harness or connector.

2. CHECK FUEL LEVEL SENSOR UNIT

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

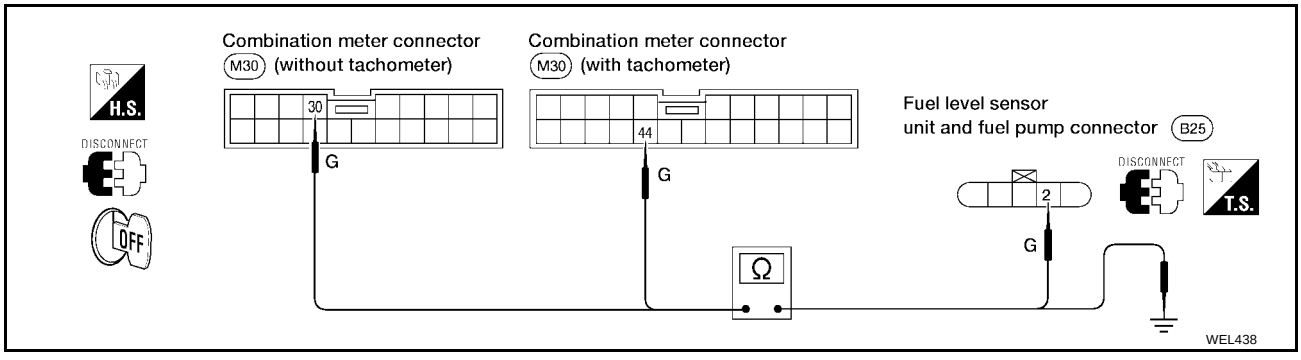
OK >> GO TO 3.
NG >> Replace fuel level sensor unit.

3. CHECK HARNESS FOR OPEN OR SHORT

1. Disconnect combination meter connector and fuel level sensor unit and fuel pump connector.
2. Check continuity between combination meter terminal 30 (without tachometer) or terminal 44 (with tachometer) and fuel level sensor unit and fuel pump connector terminal 2.

Continuity should exist.

3. Check continuity between combination meter terminal 30 (without tachometer) or terminal 44 (with tachometer) and ground.



Continuity should not exist.

OK or NG

OK >> Fuel level sensor unit is OK.
NG >> Repair harness or connector.

INSPECTION/WATER TEMPERATURE GAUGE (QG18DE MODELS)

1. CHECK ECM SELF-DIAGNOSIS

Perform ECM self diagnosis. Refer to EC-113 (ULEV Models), EC-694 (SULEV Models).

OK or NG

OK >> Replace combination meter.
NG >> Go to ECM trouble diagnosis. Refer to EC-113 (ULEV Models), EC-694 (SULEV Models).

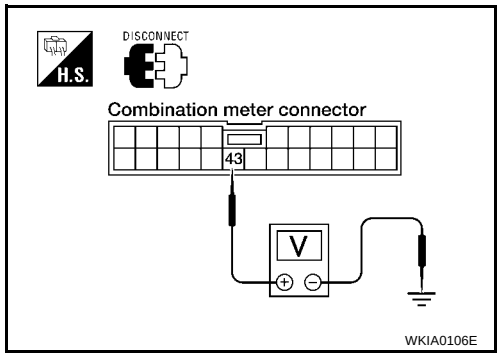
INSPECTION/WATER TEMPERATURE GAUGE (QR25DE MODELS)

1. CHECK ECM OUTPUT

1. Disconnect combination meter.
2. Check voltage between combination meter harness connector M30 terminal 43 (PU/W) and ground.
   Battery voltage should exist.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

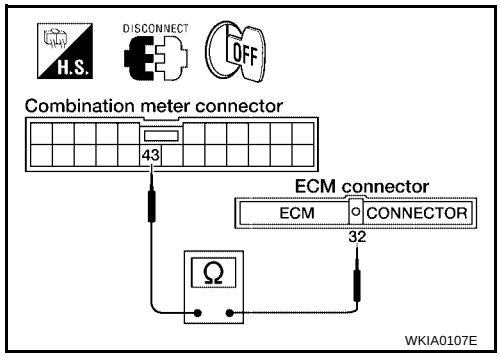


2. CHECK HARNESS FOR OPEN OR SHORT

1. Disconnect ECM connector.
2. Check continuity between combination meter harness connector M30 terminal 43 (PU/W) and ECM harness connector F54 terminal 32 (PU).
   Continuity should exist.
3. Check continuity between combination meter harness connector M30 terminal 43 (PU/W) and ground.
   Continuity should not exist.

OK or NG

OK >> GO TO 3.
NG >> Repair harness or connector.

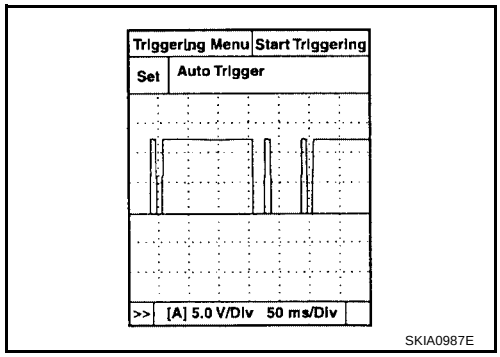


3. CHECK WATER TEMPERATURE OUTPUT SIGNAL

1. Connect combination meter connector and ECM connector.
2. Start engine.
3. Check output signal between combination meter harness connector M30 terminal 43 (PU/W) and ground. (Use "SIMPLE OSCILLOSCOPE" in "SUB MODE" with CONSULT-II.)
   Reading should be as shown.

OK or NG

OK >> Replace combination meter.
NG >> Check ECM.



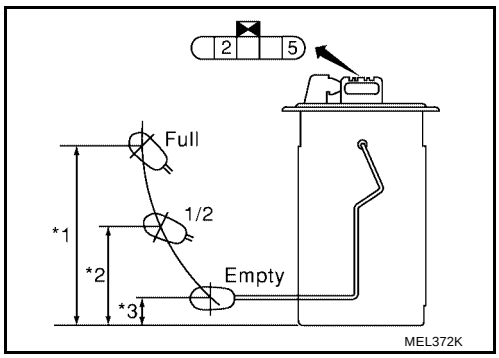
Electrical Components Inspection

EKS0039G

FUEL LEVEL SENSOR UNIT CHECK

- For removal, refer to FL-3, "Removal and Installation" .

Check the resistance between terminals 2 and 5.

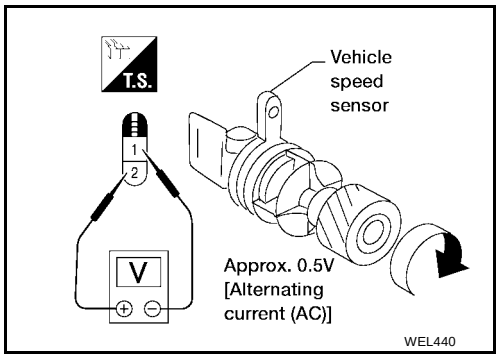


Ohmmeter		Float position mm (in)			Resistance (Approximate)
(+)	(–)				
2	5	*1	Full	136.1 (5.358)	4.5 - 5.5 Ω
		*2	1/2	89.8 (3.535)	31.5 - 33.5 Ω
		*3	Empty	31.3 (1.232)	80 - 83 Ω

*1 and *3: When float rod is in contact with stopper.

VEHICLE SPEED SENSOR SIGNAL CHECK

1. Remove vehicle speed sensor from transmission.
2. Turn vehicle speed sensor pinion quickly and measure voltage across terminals 1 and 2 (with QG18DE), or terminals + and - (with QR25DE).



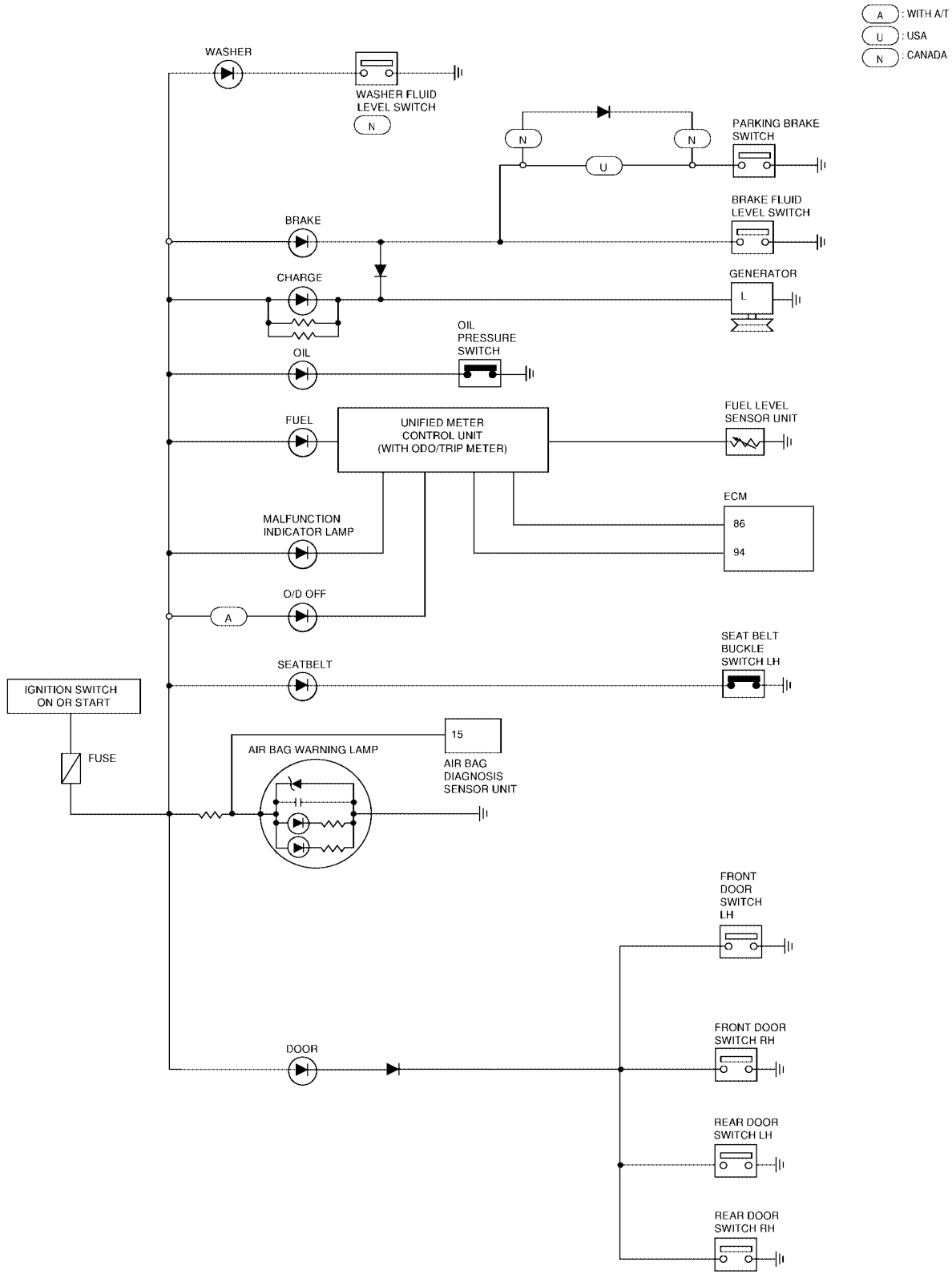
WARNING LAMPS

PFP:24814

Schematic

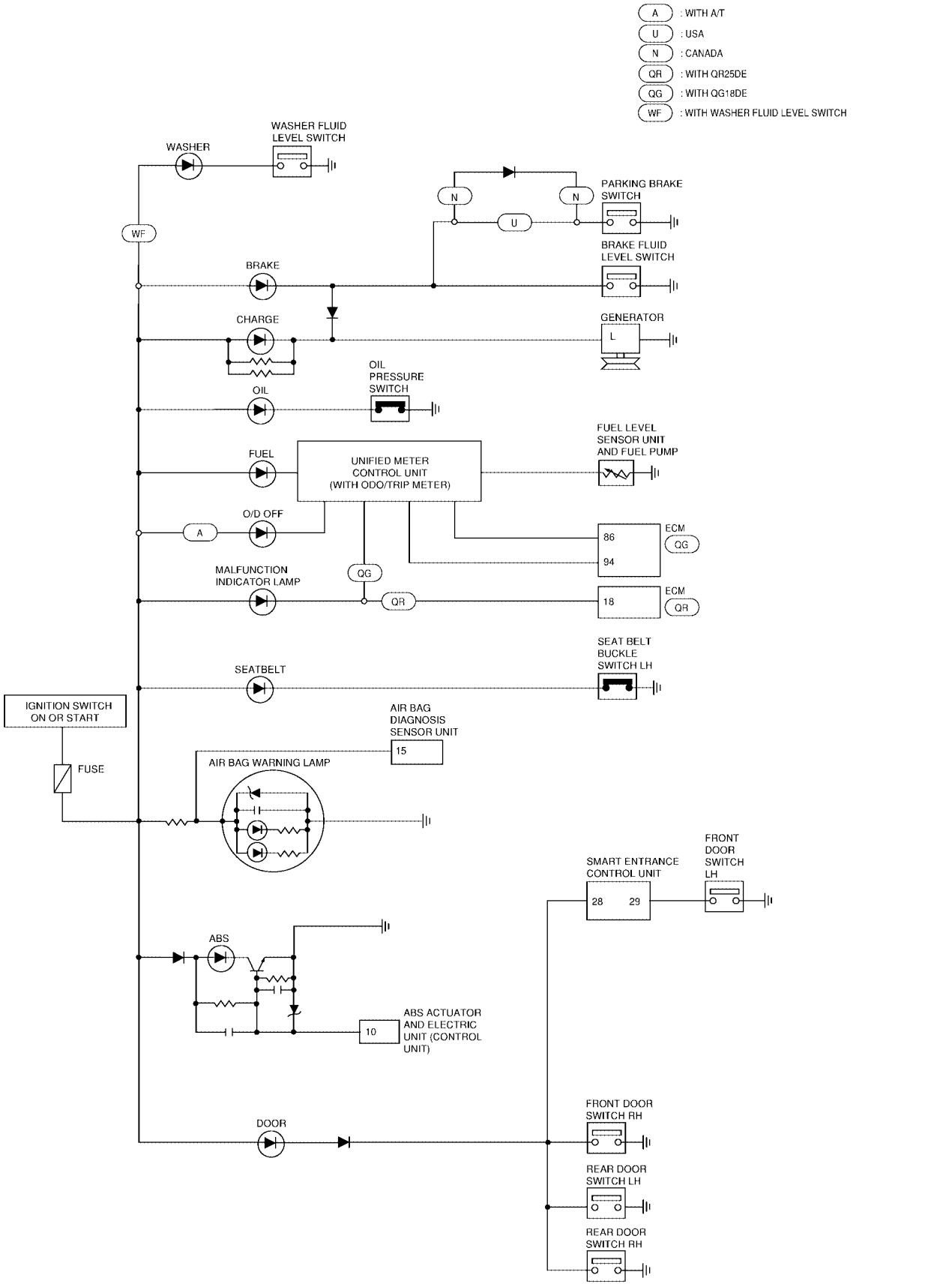
EKS0039H

WITHOUT TACHOMETER



WKWA0509E

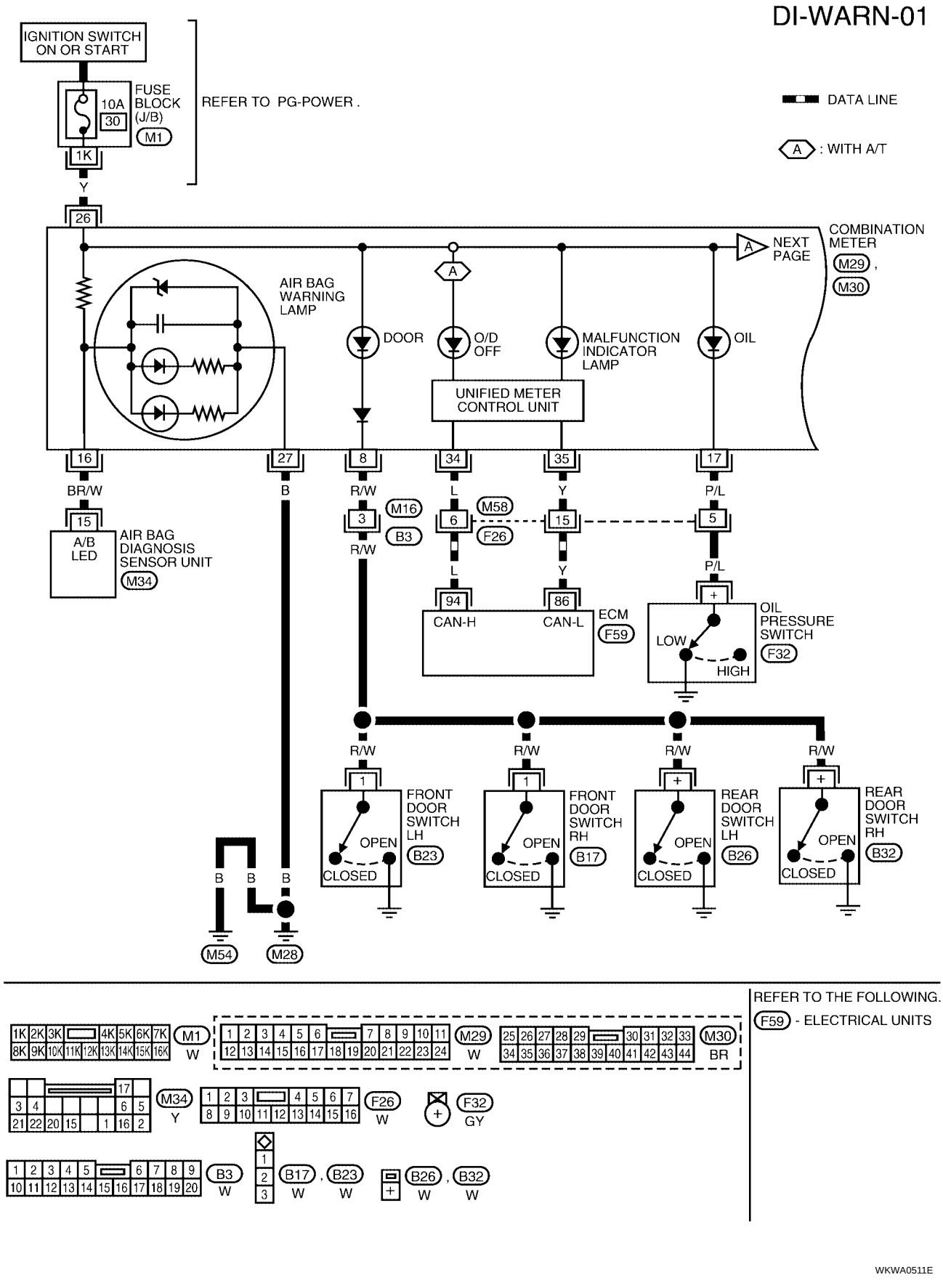
WITH TACHOMETER



WKWA0510E

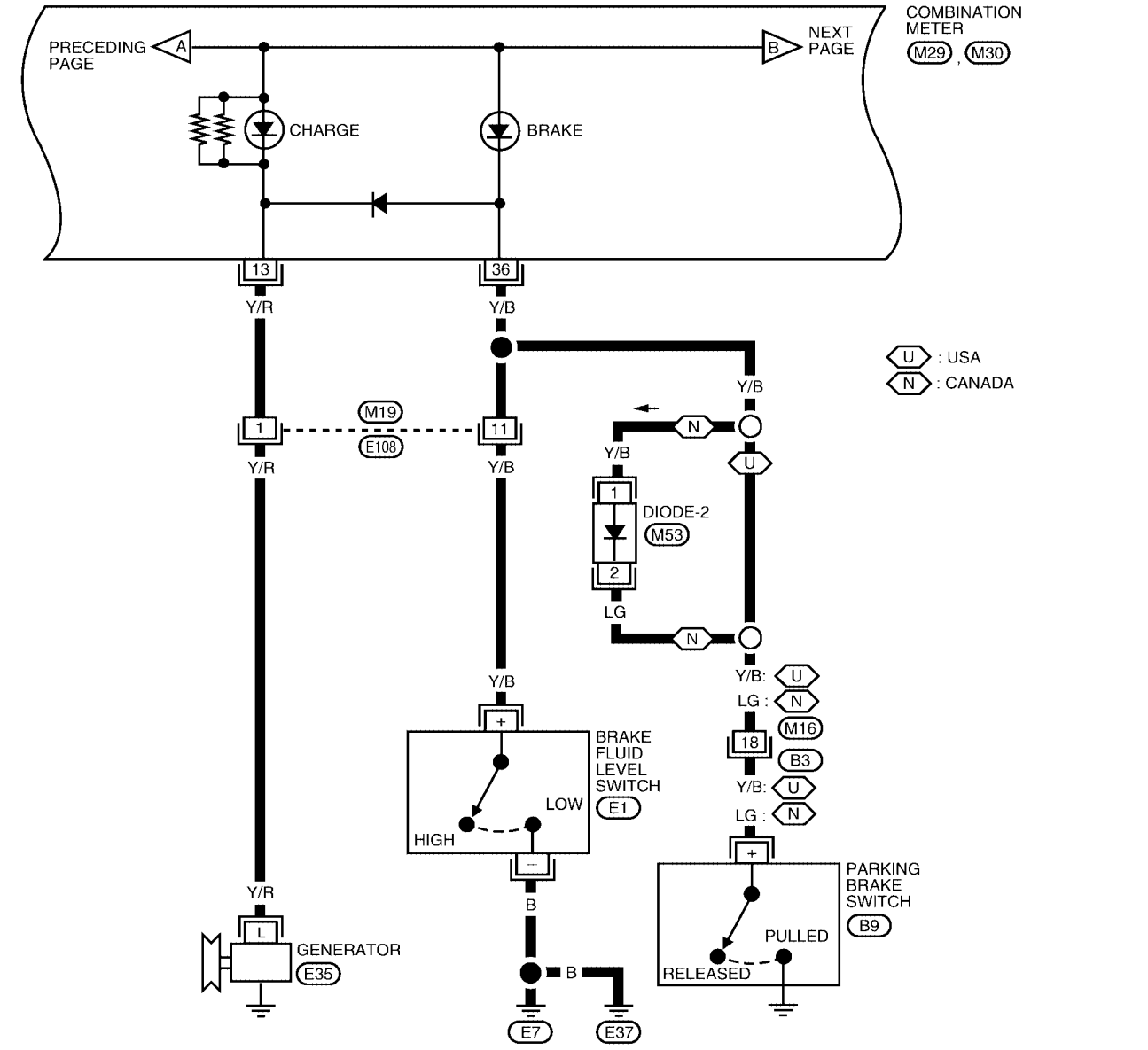
Wiring Diagram — WARN —
WITHOUT TACHOMETER

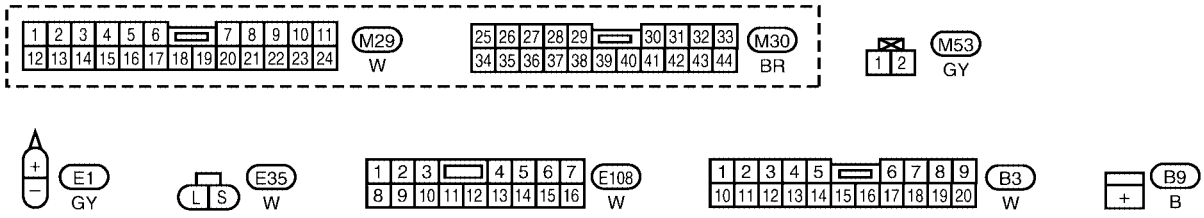
EKS0039I



WKWA0511E

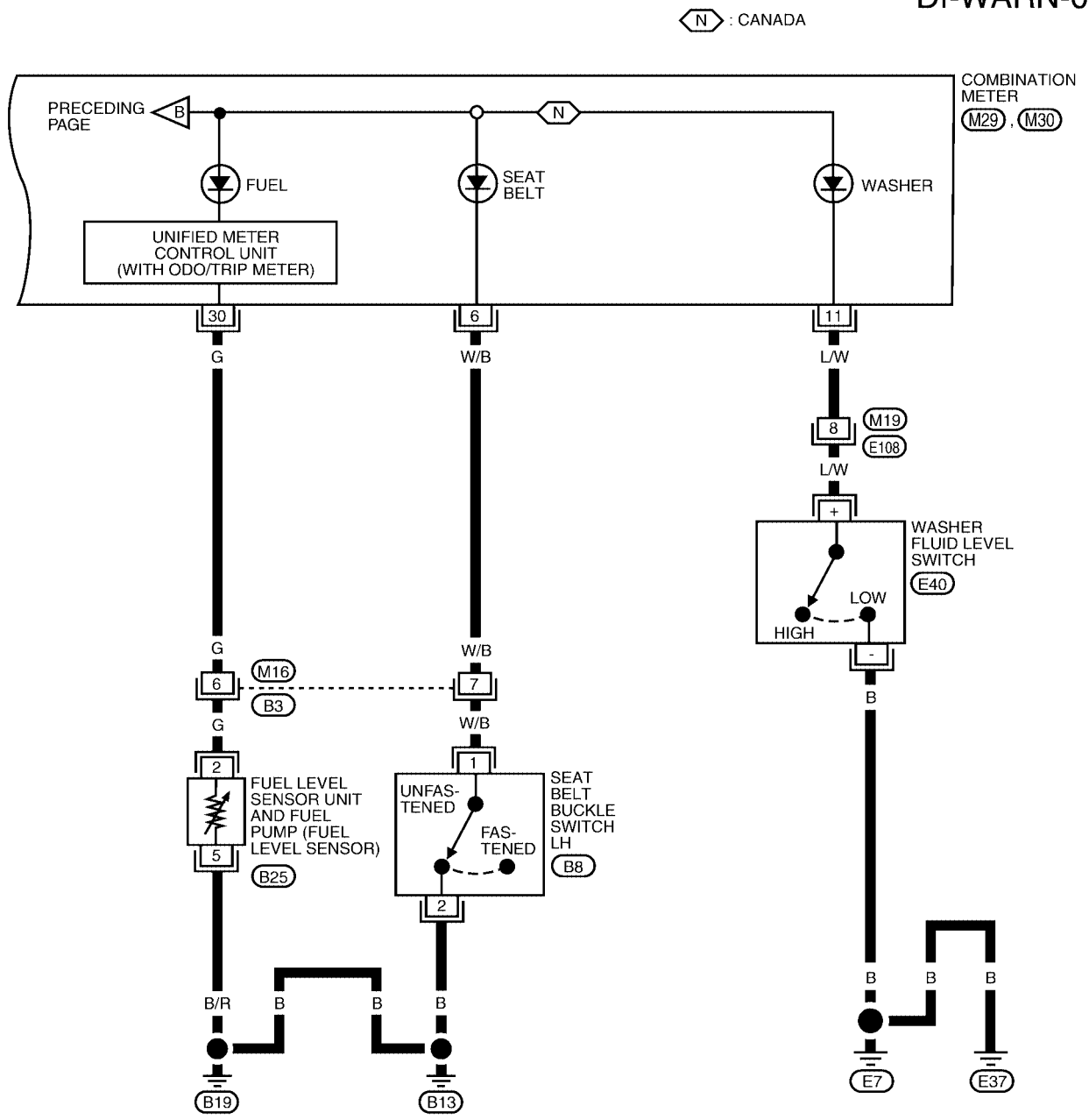
DI-WARN-02

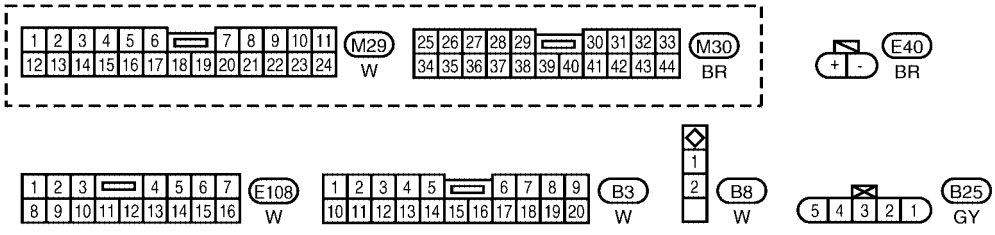




WKWA0238E

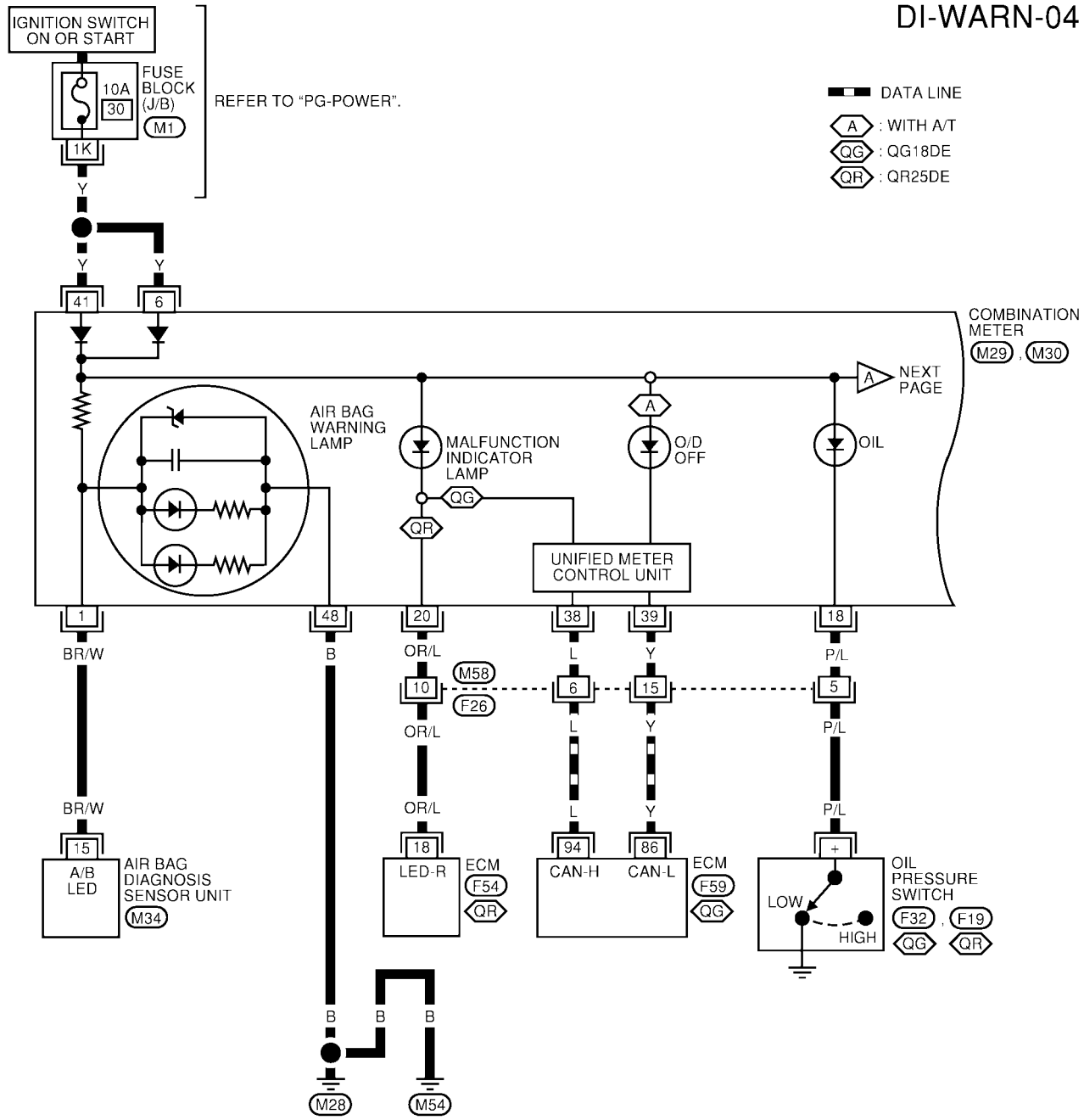
DI-WARN-03

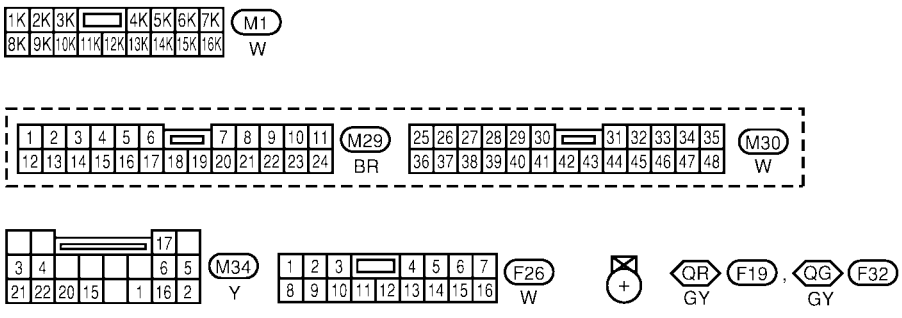




WKWA0239E

WITH TACHOMETER

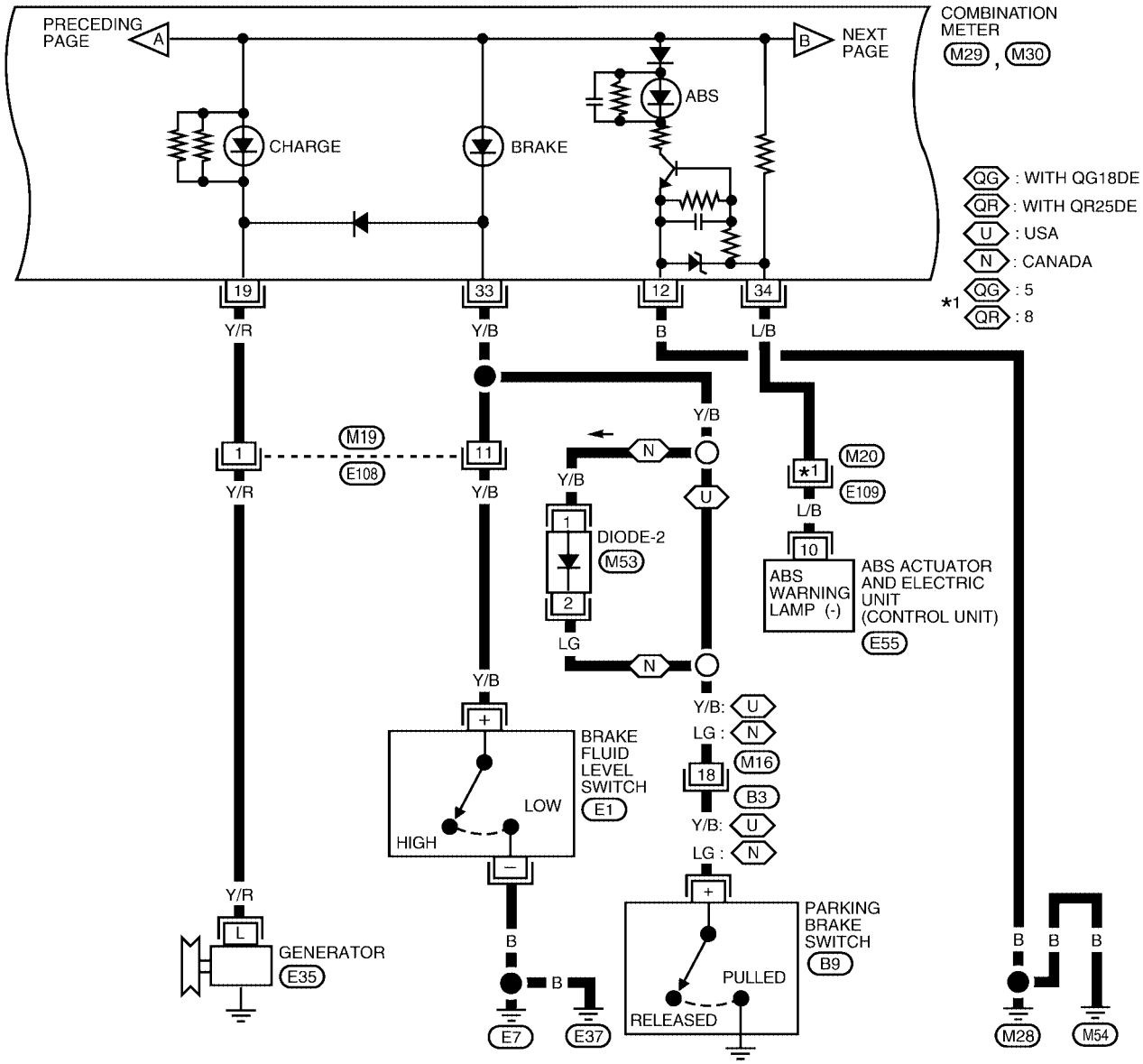


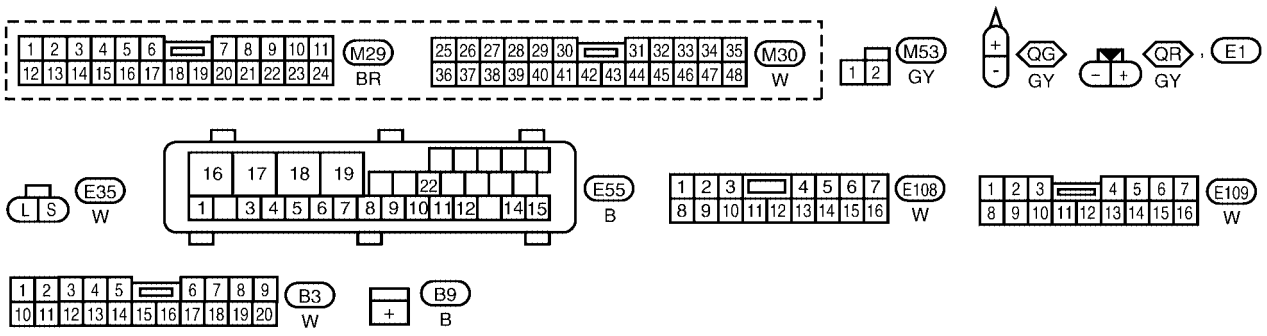


REFER TO THE FOLLOWING.
F54 - ELECTRICAL UNITS
F59 - ELECTRICAL UNITS

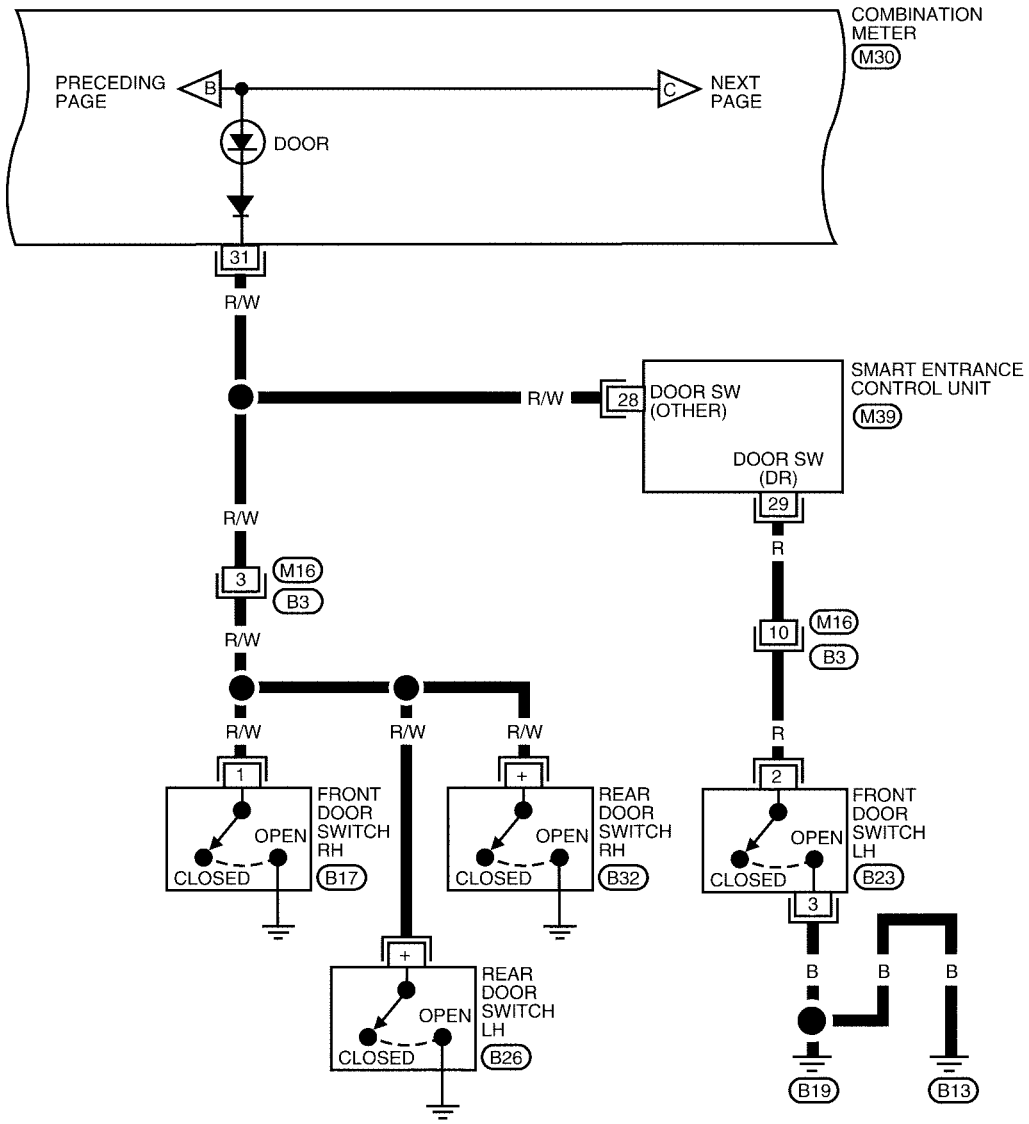
WKWA0512E

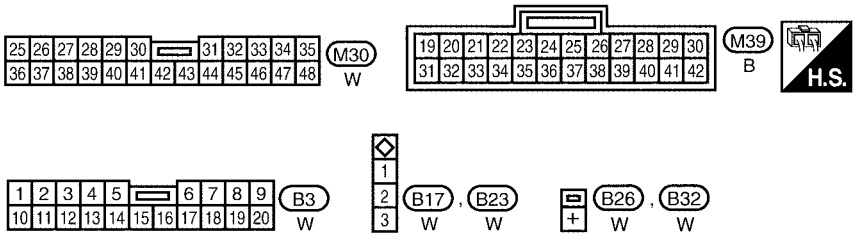
DI-WARN-05





WKWA0241E

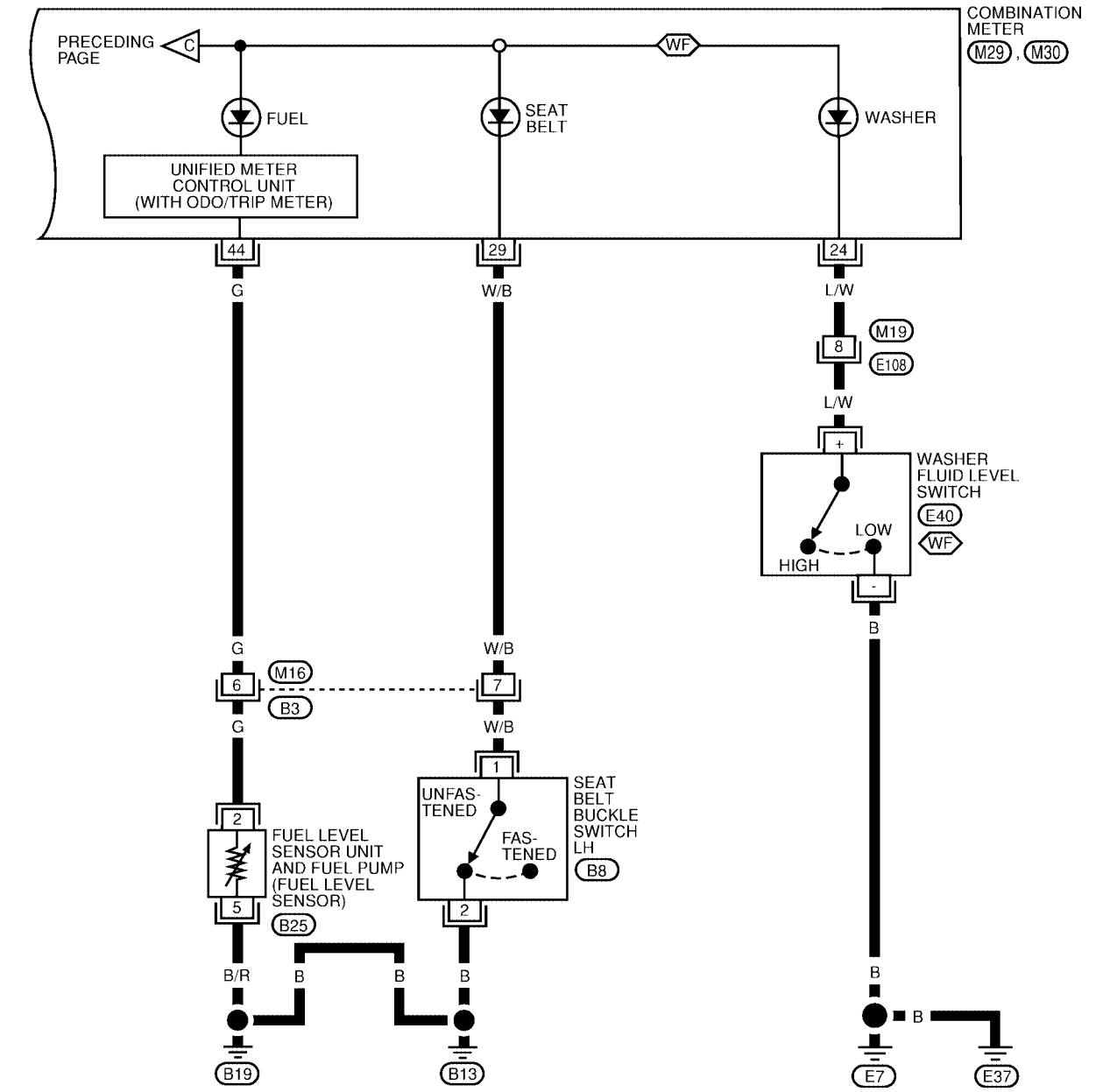

COMBINATION METER
M30
PRECEDING PAGE
B
C
NEXT PAGE
DOOR
31
R/W
R/W
28
DOOR SW (OTHER)
SMART ENTRANCE CONTROL UNIT
M39
DOOR SW (DR)
29
R
R/W
3
M16
B3
10
M16
B3
R/W
R/W
R/W
R
1
2
FRONT DOOR SWITCH RH
OPEN
CLOSED
B17
+
REAR DOOR SWITCH RH
OPEN
CLOSED
B32
FRONT DOOR SWITCH LH
OPEN
CLOSED
B23
3
+
REAR DOOR SWITCH LH
OPEN
CLOSED
B26
B
B
B
B19
B13

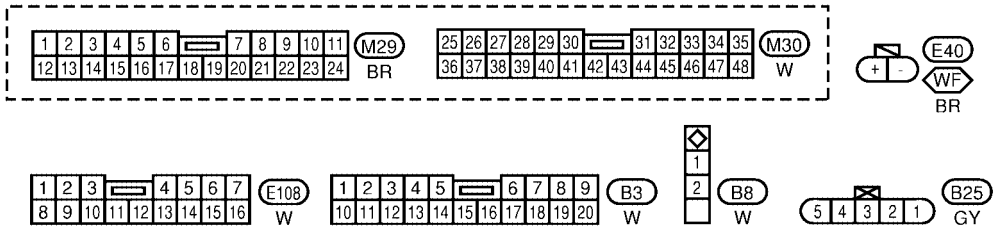

25 26 27 28 29 30 31 32 33 34 35
36 37 38 39 40 41 42 43 44 45 46 47 48
M30
W
19 20 21 22 23 24 25 26 27 28 29 30
31 32 33 34 35 36 37 38 39 40 41 42
M39
B
H.S.
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20
B3
W
1
2
3
B17
W
B23
W
+
B26
W
B32
W

WKWA0242E

DI-WARN-07

WF : With washer fluid level switch





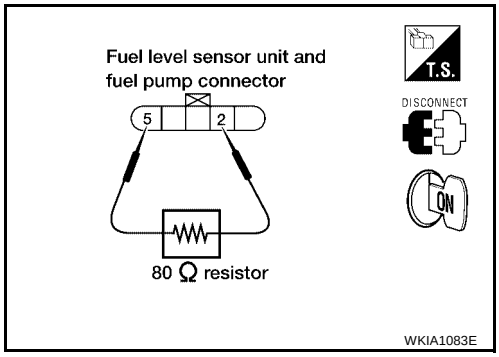
WKWA0585E

Electrical Components Inspection

EKS0039J

FUEL WARNING LAMP OPERATION CHECK

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector B25.
3. Connect a resistor (80Ω) between fuel level sensor unit and fuel pump harness connector terminal 2 (G) and 5 (B/R).
4. Turn ignition switch ON.



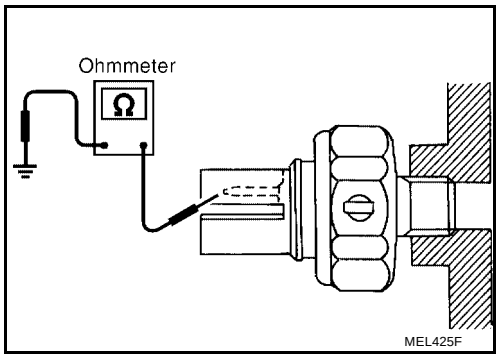
The fuel warning lamp should come on.

NOTE:
ECM might store the 1st trip DTC P0180 and the 1st trip DTC P0464 during this inspection.
If the DTC is stored in ECM memory, erase the DTC after reconnecting fuel level sensor unit and fuel pump harness connector.
Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" [QG18DE (ULEV Model)], EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" [QG18DE (SULEV Model)], or EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" (QR25DE).

OIL PRESSURE SWITCH CHECK

	Oil pressure kPa (kg/cm^2 , psi)	Continuity
Engine running	More than 10 - 20 (0.1 - 0.2, 1 - 3)	No
Engine not running	Less than 10 - 20 (0.1 - 0.2, 1 - 3)	Yes

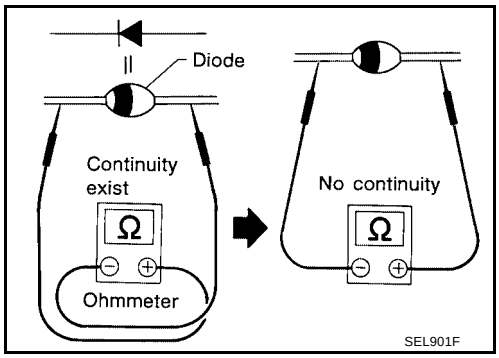
Check the continuity between the terminals of oil pressure switch and body ground.



DIODE CHECK

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure.
- Check diodes at the combination meter harness connector instead of on the combination meter assembly. Refer to DI-29, "Wiring Diagram — WARN —" .

  NOTE:
  Specification may vary depending on the type of tester. Before performing this inspection, be sure to refer to the instruction manual for the tester to be used.

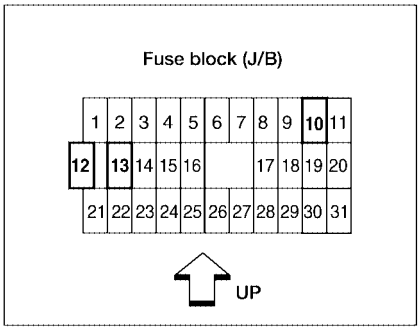


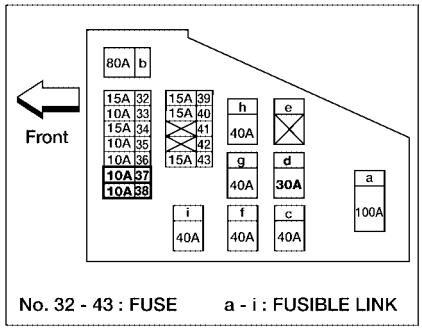
WARNING CHIME

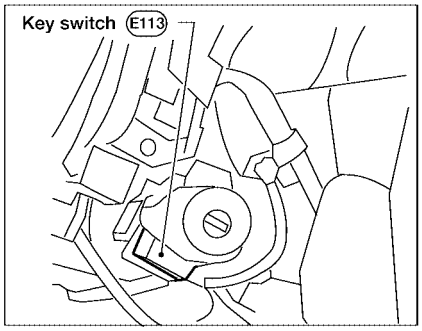
PFP:24814

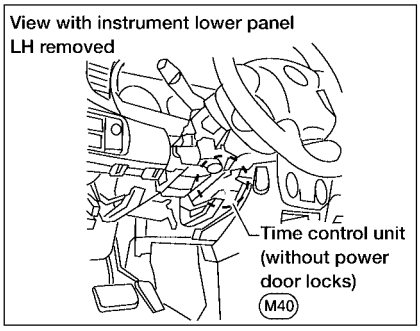
Component Parts and Harness Connector Location

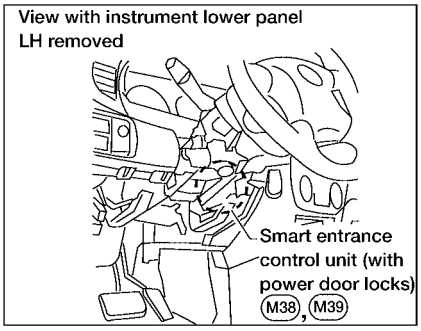
EKS0039K

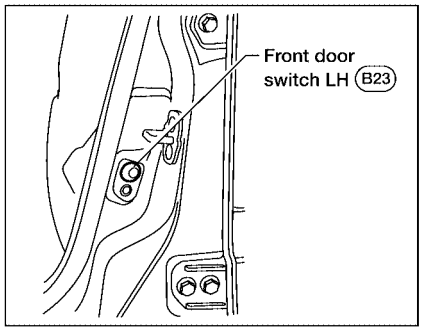


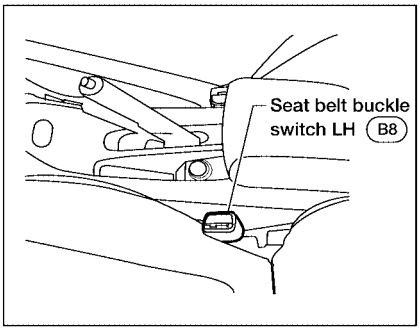












WKIA0160E

System Description

EKS0039L

WITHOUT POWER DOOR LOCKS

The warning chime is controlled by the time control unit.
The warning chime is located in the time control unit.
Power is supplied at all times:

- through 10A fuse [No. 13, located in fuse block (J/B)]
- to time control unit terminal 7
- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to key switch terminal 2, and
- through 10A fuse (No. 38, located in the fuse and fusible link box)
- to lighting switch terminal 11.

With the ignition switch in the ON or START position, power is supplied:

- through 10A fuse [No. 10, located in the fuse block (J/B)]
- to time control unit terminal 9.

Ground is supplied to time control unit terminal 8 through body grounds M28 and M54.
When a signal, or combination of signals, is received by the time control unit, the warning chime will sound.

Ignition Key Warning Chime

With the key in the ignition switch, the ignition switch in the OFF position, and the driver door open, the warning chime will sound.
Power is supplied:

- from key switch terminal 1
- to time control unit terminal 4.

Ground is supplied:

- from front door switch LH terminal 2
- to time control unit terminal 2.

Front door switch LH terminal 3 is grounded through body grounds B13 and B19.

Light Warning Chime

With ignition switch OFF, driver door open, and lighting switch in parking lamp (1ST) or ON (2ND) position, warning chime will sound.
Power is supplied:

- from lighting switch terminal 12
- to time control unit terminal 5.

Ground is supplied:

- from front door switch LH terminal 2
- to time control unit terminal 2.

Front door switch LH terminal 3 is grounded through body grounds B13 and B19.

Seat Belt Warning Chime

With ignition switch turned ON and seat belt unfastened (seat belt buckle switch LH ON), warning chime will sound for approximately 6 seconds.
Ground is supplied:

- from seat belt buckle switch LH terminal 1
- to time control unit terminal 1.

Seat belt buckle switch LH terminal 2 is grounded through body grounds B13 and B19.

WITH POWER DOOR LOCKS

The warning chime is controlled by the smart entrance control unit.
The warning chime is located in the smart entrance control unit.
Power is supplied at all times:

- through 10A fuse (No. 37, located in fuse and fusible link box)
- to smart entrance control unit terminal 10,
- through 10A fuse [No. 12, located in the fuse block (J/B)]

- to key switch terminal 2, and
- through 10A fuse (No. 38, located in the fuse and fusible link box)
- to lighting switch terminal 11.

With the ignition switch in the ON or START position, power is supplied:

- through 10A fuse [No. 10, located in the fuse block (J/B)]
- to smart entrance control unit terminal 33.

Ground is supplied to smart entrance control unit terminal 16 through body grounds M28 and M54.
When a signal, or combination of signals, is received by the smart entrance control unit, the warning chime will sound.

Ignition Key Warning Chime

With the key in the ignition switch, the ignition switch in the OFF position, and the driver door open, the warning chime will sound.
Power is supplied:

- from key switch terminal 1
- to smart entrance control unit terminal 32.

Ground is supplied:

- from front door switch LH terminal 2
- to smart entrance control unit terminal 29.

Front door switch LH terminal 3 is grounded through body grounds B13 and B19.

Light Warning Chime

With ignition switch OFF, driver door open, and lighting switch in parking lamp (1ST) or ON (2ND) position, warning chime will sound.
Power is supplied:

- from lighting switch terminal 12
- to smart entrance control unit terminal 34.

Ground is supplied:

- from front door switch LH terminal 2
- to smart entrance control unit terminal 29.

Front door switch LH terminal 3 is grounded through body grounds B13 and B19.

Seat Belt Warning Chime

With ignition switch turned ON and seat belt unfastened (seat belt switch ON), warning chime will sound for approximately 6 seconds.
Ground is supplied:

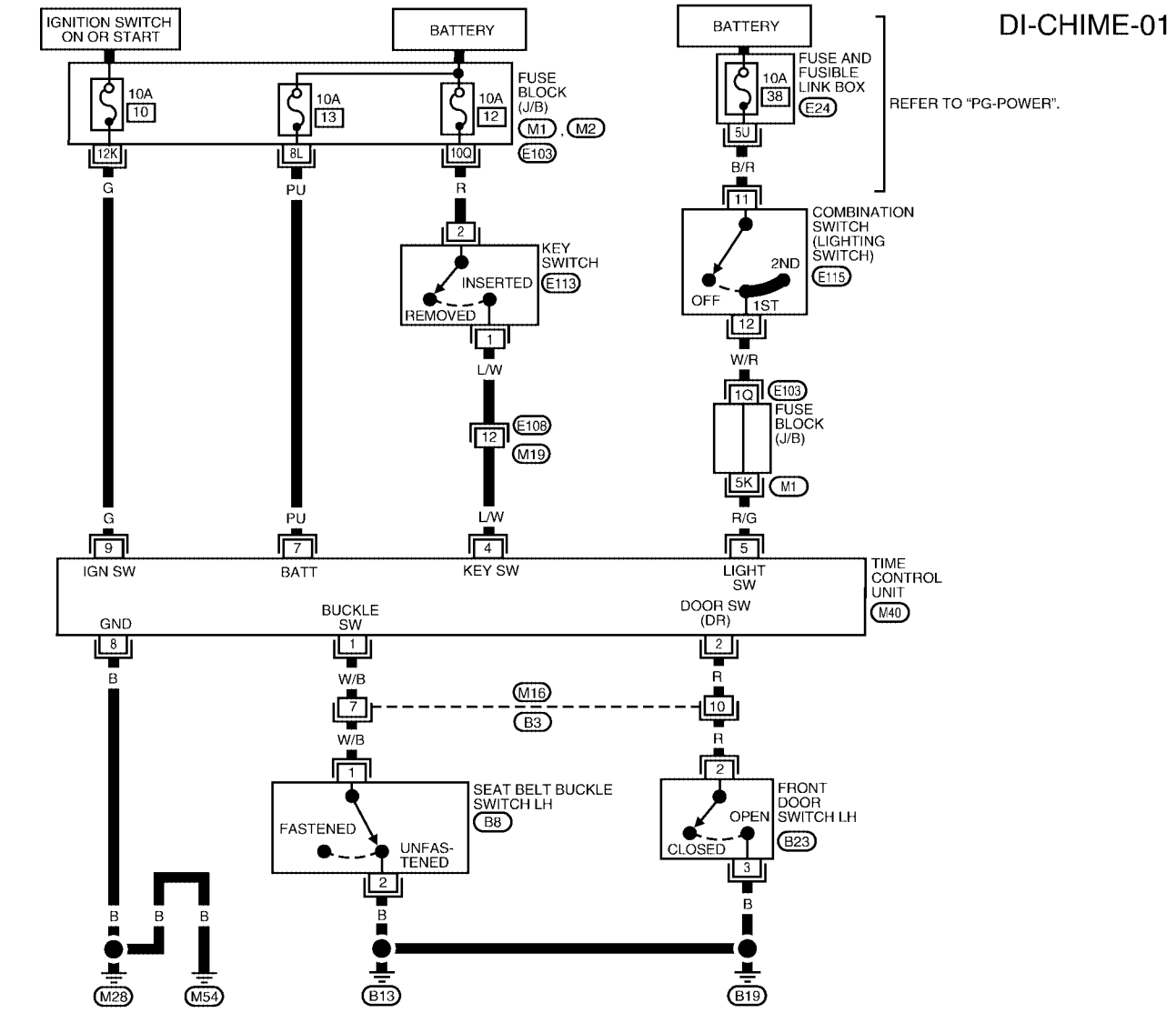
- from seat belt buckle switch LH terminal 1
- to smart entrance control unit terminal 22.

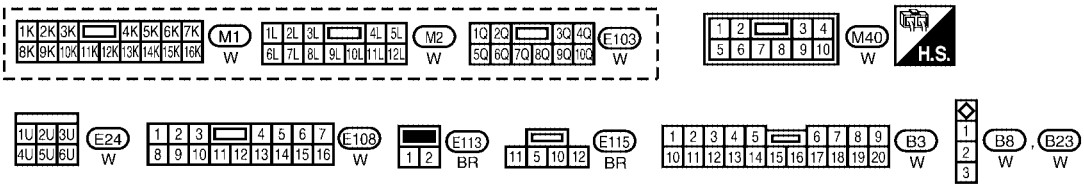
Seat belt buckle switch LH terminal 2 is grounded through body grounds B13 and B19.

Wiring Diagram — CHIME —

EKS0039M

WITHOUT POWER DOOR LOCKS





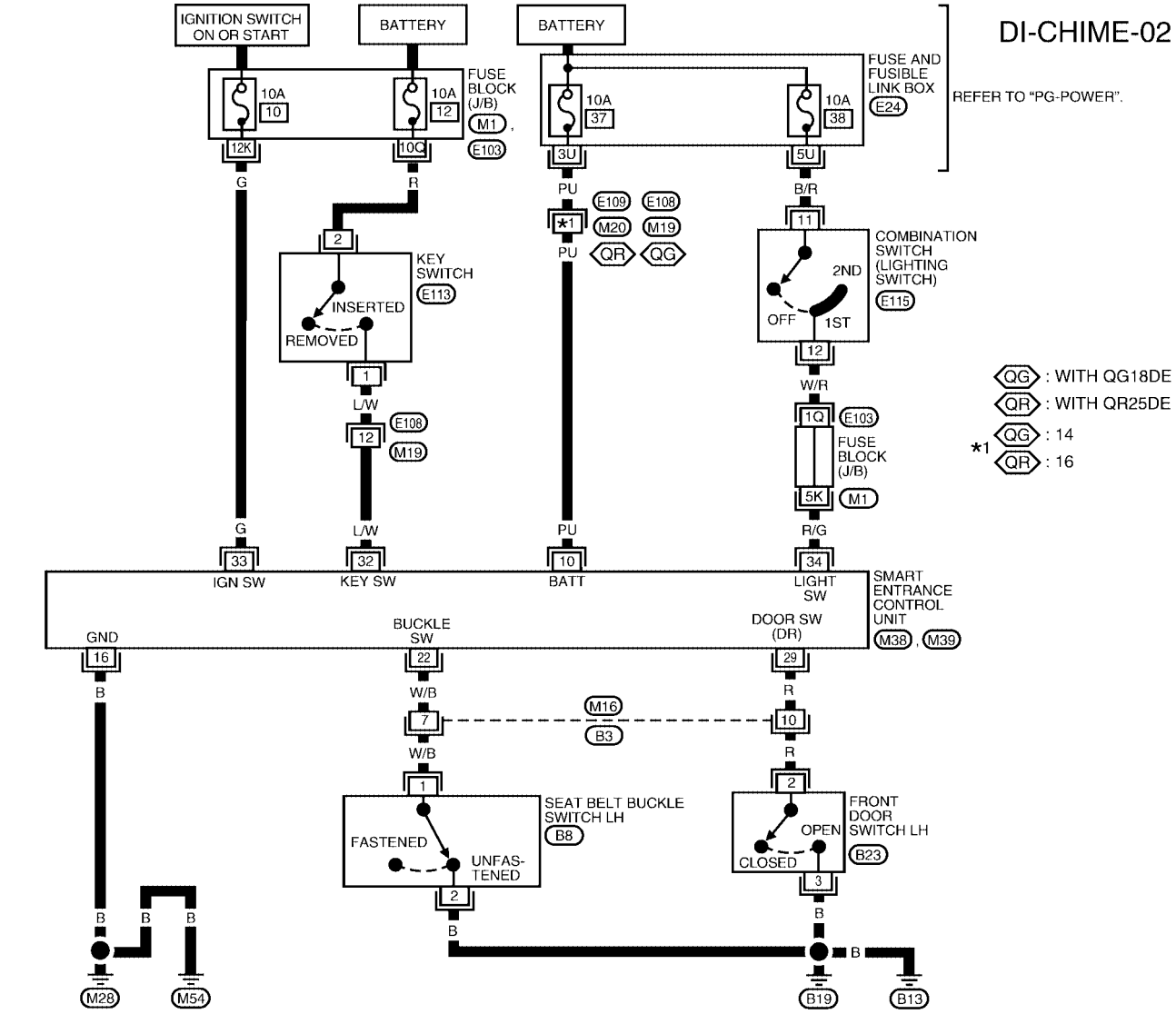
WKWA0244E

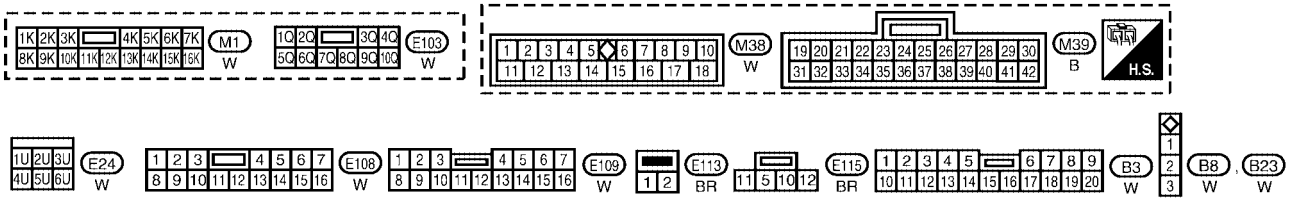
TIME CONT. UNIT (WITHOUT POWER DOOR LOCKS) TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	W/B	SEAT BELT BUCKLE SWITCH LH	UNFASTEN (IGNITION KEY IN ON POSITION)	0V
			FASTEN (IGNITION SWITCH IN ON POSITION)	5V
2	R	FRONT DOOR SWITCH LH	OFF (CLOSED)	5V
			ON (OPEN)	0V
4	L/W	IGNITION KEY SWITCH (INSERT)	IGNITION KEY IS INSERTED	12V
			IGNITION KEY IS REMOVED	0V
5	R/G	COMBINATION SWITCH (LIGHTING SWITCH)	1ST, 2ND POSITIONS: ON	12V
			OFF	0V
7	PU	POWER SOURCE (FUSE)	—	12V
8	B	GROUND	—	—
9	G	IGNITION SWITCH (ON)	IGNITION KEY IS IN ON POSITION	12V
		IGNITION SWITCH (START)	IGNITION KEY IS IN START POSITION	12V

LEL597

WITH POWER DOOR LOCKS





WKWA0245E

SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
10	PU	POWER SOURCE (FUSE)	—	12V
16	B	GROUND	—	—
22	W/B	SEAT BELT BUCKLE SWITCH LH	UNFASTEN (IGNITION KEY IN ON POSITION)	0V
			FASTEN (IGNITION KEY IN ON POSITION)	5V
29	R	FRONT DOOR SWITCH LH	OFF (CLOSED)	5V
			ON (OPEN)	0V
32	L/W	IGNITION KEY SWITCH (INSERT)	IGNITION KEY IS INSERTED	12V
			IGNITION KEY IS REMOVED	0V
33	G	IGNITION SWITCH (START)	IGNITION KEY IS IN ON POSITION	12V
			IGNITION KEY IS IN START POSITION	12V
34	R/G	COMBINATION SWITCH (LIGHTING SWITCH)	1ST, 2ND POSITIONS: ON	12V
			OFF	0V

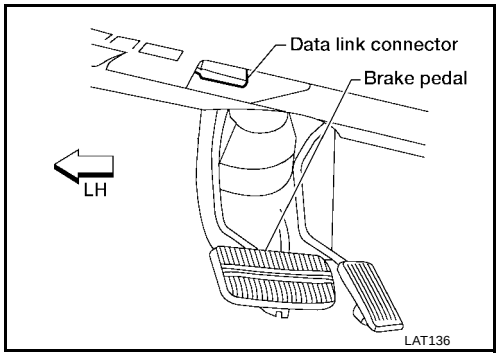
LEL599

CONSULT-II Inspection Procedure (With Power Door Locks)

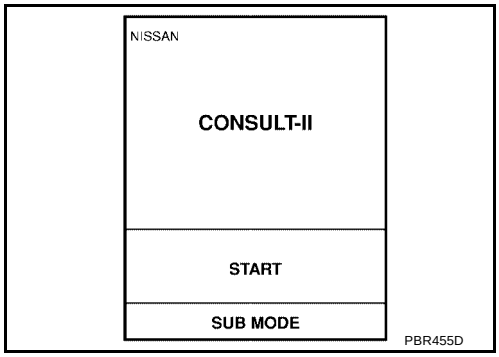
EKS0039N

“KEY WARN ALM”/“LIGHT WARN ALM”/“SEAT BELT ALM”

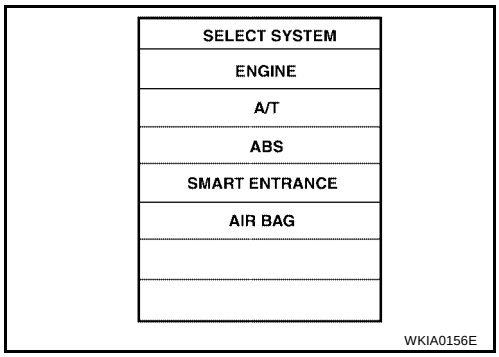
1. Turn ignition switch OFF.
2. Connect “CONSULT-II” to the data link connector.



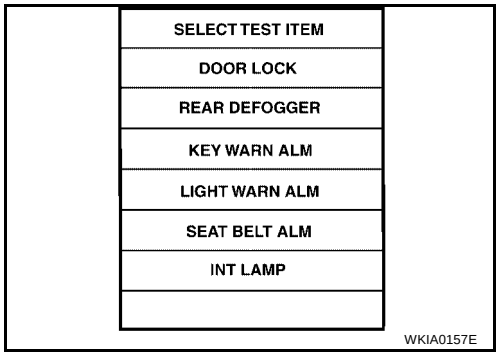
3. Turn ignition switch ON.
4. Touch “START”.



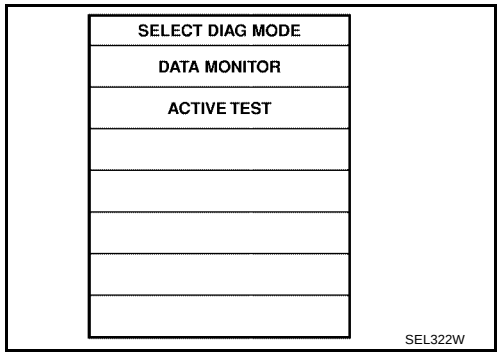
5. Touch “SMART ENTRANCE”.



6. Touch “KEY WARN ALM”, “LIGHT WARN ALM” or “SEAT BELT ALM”.



7. Select diagnosis mode.
“DATA MONITOR” and “ACTIVE TEST” are available for the warning chime.



CONSULT-II Application Items (With Power Door Locks)

EKS0039O

“KEY WARN ALARM”

Data Monitor

Monitored Item	Description
IGN ON SW	Indicates [ON/OFF] condition of ignition switch.
KEY ON SW	Indicates [ON/OFF] condition of key switch.
DOOR SW-DR	Indicates [ON/OFF] condition of front door switch LH.

Active Test

Test Item	Description
CHIME	This test is able to check key warning chime operation. Key warning chime sounds after touching “ON” on CONSULT-II screen.

“LIGHT WARN ALM”

Data Monitor

Monitored Item	Description
IGN ON SW	Indicates [ON/OFF] condition of ignition switch.
HD/LMP 1ST SW	Indicates [ON/OFF] condition of lighting switch.
DOOR SW-DR	Indicates [ON/OFF] condition of front door switch LH.

Active Test

Test Item	Description
CHIME	This test is able to check light warning chime operation. Light warning chime sounds after touching “ON” on CONSULT-II screen.

“SEAT BELT ALM”

Data Monitor

Monitored Item	Description
IGN ON SW	Indicates [ON/OFF] condition of ignition switch.
SEAT BELT SW	Indicates [ON/OFF] condition of seat belt buckle switch LH.

Active Test

Test Item	Description
CHIME	This test is able to check seat belt warning chime operation. Seat belt warning chime sounds after touching “ON” on CONSULT-II screen.

Trouble Diagnoses (Without Power Door Locks)

EKS0039P

SYMPTOM CHART

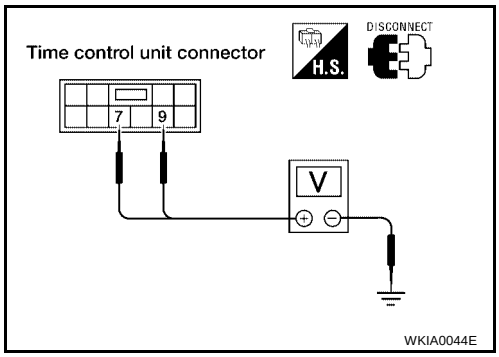
REFERENCE PAGE	DI-44	DI-45	DI-45	DI-46	DI-47
SYMPTOM	POWER SUPPLY AND GROUND CIRCUIT CHECK	DIAGNOSTIC PROCEDURE 1 (LIGHTING SWITCH INPUT SIGNAL CHECK)	DIAGNOSTIC PROCEDURE 2 (KEY SWITCH INSERTSIGNAL CHECK)	DIAGNOSTIC PROCEDURE 3 (SEAT BELT BUCKLE SWITCH LH CHECK)	DIAGNOSTIC PROCEDURE 4
Light warning chime does not activate.	X	X			X
Ignition key warning chime does not activate.	X		X		X
Seat belt warning chime does not activate.	X			X	X
All warning chimes do not activate.	X				X

X: Applicable

POWER SUPPLY AND GROUND CIRCUIT CHECK

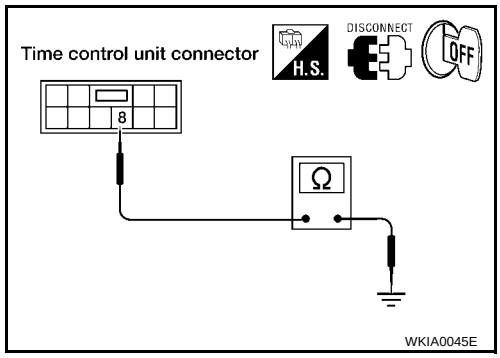
Power Supply Circuit Check

Terminals			Ignition switch position		
(+)		(-)			
Connector	Terminal (Wire color)		OFF	ACC	ON
M40	7 (PU)	Ground	Battery voltage	Battery voltage	Battery voltage
M40	9 (G)	Ground	0V	0V	Battery voltage



Ground Circuit Check

Terminals			Continuity
(+)		(-)	
Connector	Terminal (Wire color)		
M40	8 (B)	Ground	Yes

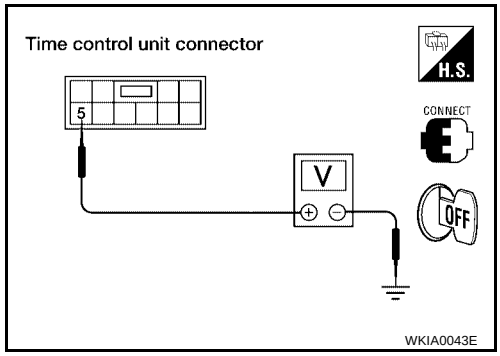


DIAGNOSTIC PROCEDURE 1 (LIGHTING SWITCH INPUT SIGNAL CHECK)

1. CHECK LIGHTING SWITCH INPUT SIGNAL

Check voltage between time control unit terminal 5 and ground.

Terminals			Condition of lighting switch		
(+)		(-)	1st position	2nd position	OFF
Connector	Terminal (Wire color)				
M40	5 (R/G)	Ground	Battery voltage	Battery voltage	0V



OK or NG

OK >> Lighting switch is OK.
NG >> Check the following.

- 10A fuse (No. 38, located in the fuse and fusible link box)
- Harness for open or short between control unit and lighting switch

DIAGNOSTIC PROCEDURE 2 (KEY SWITCH INSERT SIGNAL CHECK)

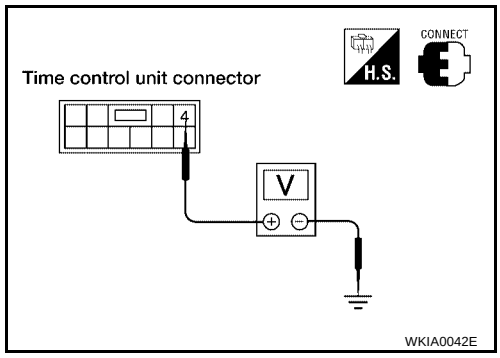
1. CHECK KEY SWITCH INPUT SIGNAL

Check voltage between time control unit terminal 4 and ground.

Terminals			Condition of key switch	
(+)		(-)	Key inserted	Key removed
Connector	Terminal (Wire color)			
M40	4 (L/W)	Ground	Battery voltage	0V

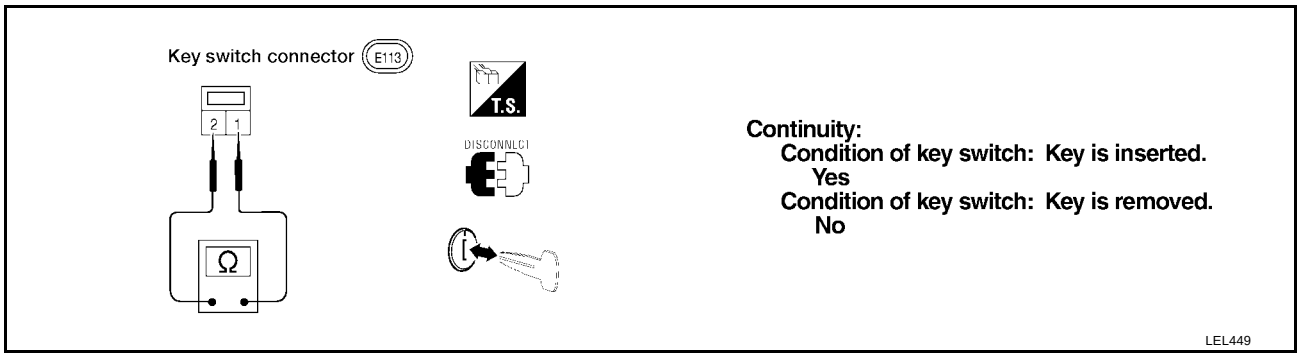
OK or NG

OK >> Key switch is OK.
NG >> GO TO 2.



2. CHECK KEY SWITCH

Check continuity between terminals 1 and 2.



OK or NG

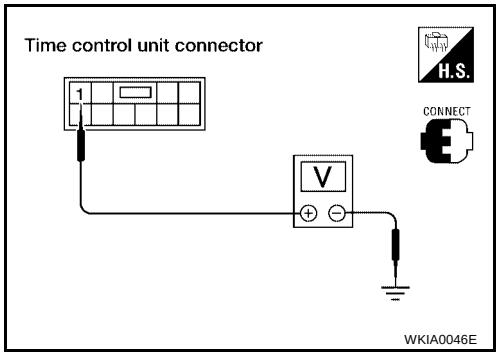
OK >> Check the following.
- 10A fuse [No. 12, located in fuse block (J/B)]
- Harness for open or short between key switch and fuse
- Harness for open or short between time control unit and key switch

NG >> Replace key switch.

DIAGNOSTIC PROCEDURE 3 (SEAT BELT BUCKLE SWITCH LH CHECK)

1. CHECK SEAT BELT BUCKLE SWITCH LH INPUT SIGNAL

1. Turn ignition switch ON.
2. Check voltage between time control unit terminal 1 and ground.



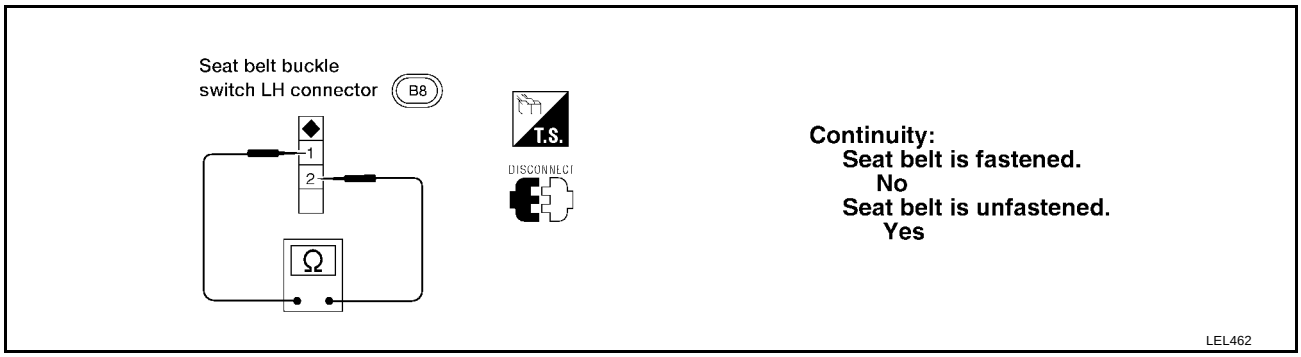
Terminals			Condition of seat belt buckle switch LH	
(+)		(-)	Fastened	Unfastened
Connector	Terminal (Wire color)			
M40	1 (W/B)	Ground	Approx. 5V	0V

OK or NG

OK >> Seat belt buckle switch LH is OK.
NG >> GO TO 2.

2. CHECK SEAT BELT BUCKLE SWITCH LH

Check continuity between terminals 1 and 2 when seat belt is fastened and unfastened.



OK or NG

OK >> Check the following.
- Seat belt buckle switch LH ground circuit
- Harness for open or short between time control unit and seat belt buckle switch LH

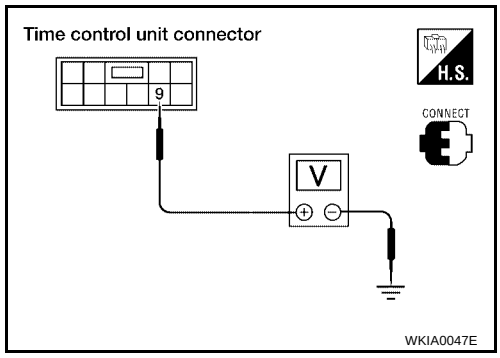
NG >> Replace seat belt buckle switch LH.

DIAGNOSTIC PROCEDURE 4

1. CHECK IGNITION ON SIGNAL

Check voltage between time control unit terminal 9 and ground.

Terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
9 (G)	Ground	0V	0V	Battery voltage



OK or NG

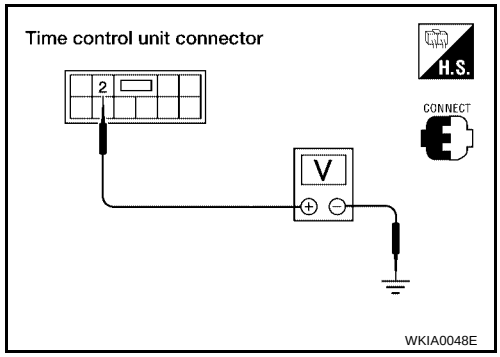
OK >> GO TO 2.

NG >> Check the following.
- 10A fuse [No. 10, located in fuse block (J/B)]
- Harness for open or short between time control unit and fuse

2. CHECK FRONT DOOR SWITCH LH INPUT SIGNAL

With ignition switch OFF, check voltage between time control unit terminal 2 and ground.

Terminals			Condition of driver's door	
(+)		(-)	Closed	Open
Connector	Terminal (Wire color)			
M40	2 (R)	Ground	Approx. 5V	0V



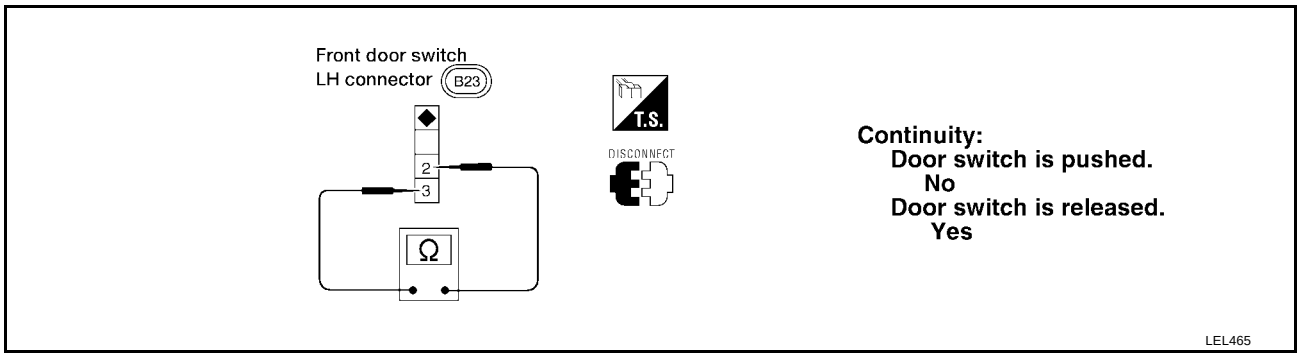
OK or NG

OK >> System is OK.

NG >> GO TO 3.

3. CHECK FRONT DOOR SWITCH LH

Check continuity between terminals 2 and 3.



OK or NG

OK >> Check the following.

- Front door switch LH ground circuit and condition
- Harness for open or short between time control unit and front door switch LH

NG >> Replace front door switch LH.

Trouble Diagnoses (With Power Door Locks)

EKS0039Q

SYMPTOM CHART

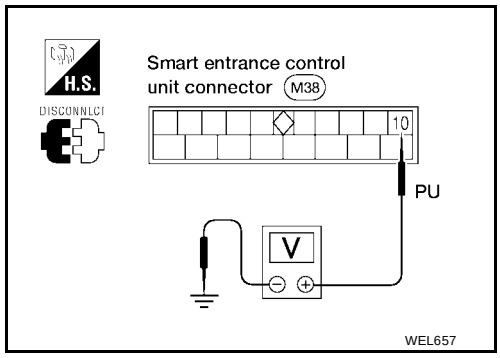
REFERENCE PAGE	DI-49	DI-50	DI-51	DI-52	DI-53
SYMPTOM	POWER SUPPLY AND GROUND CIRCUIT CHECK	DIAGNOSTIC PROCEDURE 1 (LIGHTING SWITCH INPUT SIGNAL CHECK)	DIAGNOSTIC PROCEDURE 2 (KEY SWITCH INSERTSIGNAL CHECK)	DIAGNOSTIC PROCEDURE 3 (SEAT BELT BUCKLE SWITCH LH CHECK)	DIAGNOSTIC PROCEDURE 4
Light warning chime does not activate.	X	X			X
Ignition key warning chime does not activate.	X		X		X
Seat belt warning chime does not activate.	X			X	X
All warning chimes do not activate.	X				X

X: Applicable

POWER SUPPLY AND GROUND CIRCUIT CHECK

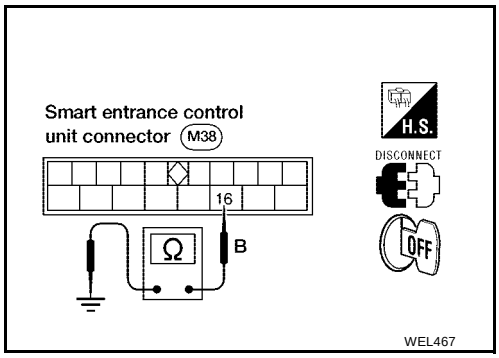
Power Supply Circuit Check

Terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
10	Ground	Battery voltage	Battery voltage	Battery voltage



Ground Circuit Check

Terminals			Continuity
(+)		(-)	
Connector	Terminal (Wire color)		
M38	16 (B)	Ground	Yes

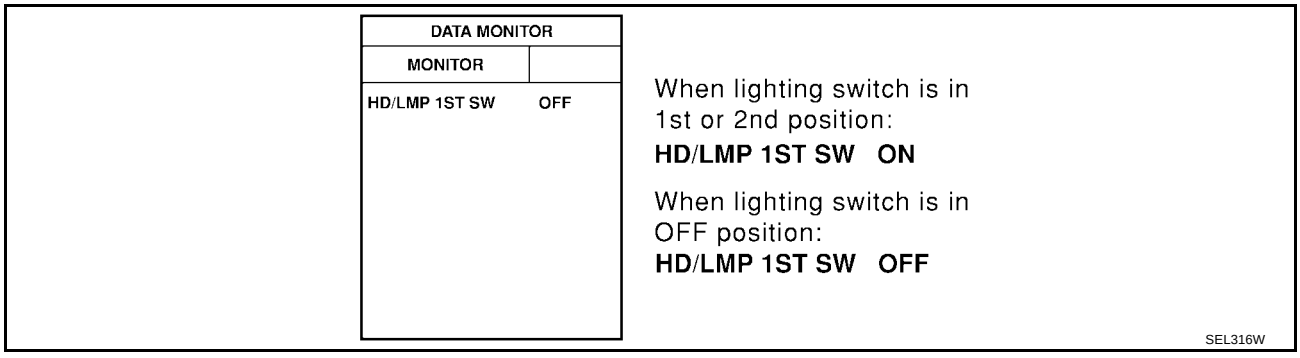


DIAGNOSTIC PROCEDURE 1 (LIGHTING SWITCH INPUT SIGNAL CHECK)

1. CHECK LIGHTING SWITCH INPUT SIGNAL

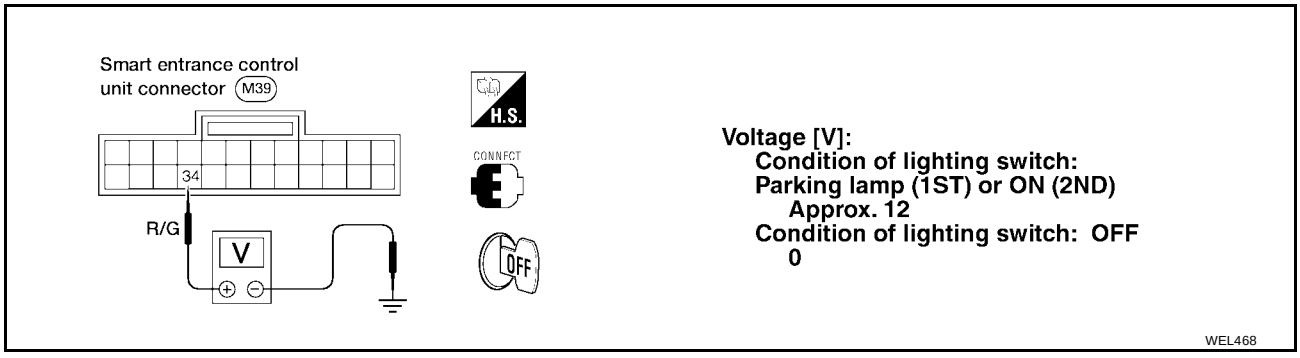
With CONSULT-II

Check lighting switch ("HD/LMP 1ST SW") in "DATA MONITOR" mode with CONSULT-II.



Without CONSULT-II

Check voltage between smart entrance control unit terminal 34 and ground.



OK or NG

OK >> Lighting switch is OK.

NG >> Check the following.

- 10A fuse (No. 38, located in the fuse and fusible link box)
- Harness for open or short between smart entrance control unit and lighting switch

DIAGNOSTIC PROCEDURE 2 (KEY SWITCH INSERT SIGNAL CHECK)

1. CHECK KEY SWITCH INPUT SIGNAL

With CONSULT-II

Check key switch ("KEY ON SW") in "DATA MONITOR" mode with CONSULT-II.

DATA MONITOR	
MONITOR	
KEY ON SW	ON

When key is inserted to ignition key cylinder:

KEY ON SW ON

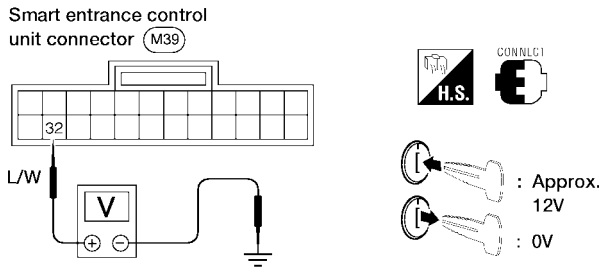
When key is removed from ignition key cylinder:

KEY ON SW OFF

SEL315W

Without CONSULT-II

Check voltage between smart entrance control unit terminal 32 and ground.



Voltage [V]:
Condition of key switch: Key is inserted.
Approx. 12
Condition of key switch: Key is removed.
0

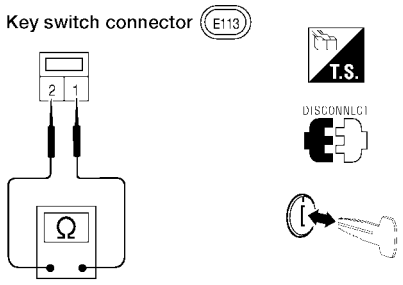
WEL469

OK or NG

OK >> Key switch is OK.
NG >> GO TO 2.

2. CHECK KEY SWITCH

Check continuity between terminals 1 and 2.



Continuity:
Condition of key switch: Key is inserted.
Yes
Condition of key switch: Key is removed.
No

LEL449

OK or NG

OK >> Check the following.
- 10A fuse [No. 12, located in fuse block (J/B)]
- Harness for open or short between key switch and fuse
- Harness for open or short between smart entrance control unit and key switch

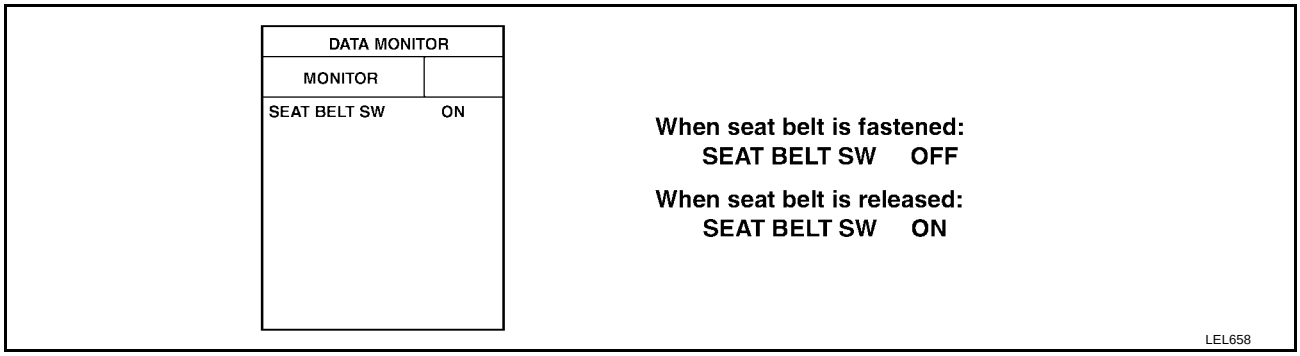
NG >> Replace key switch.

DIAGNOSTIC PROCEDURE 3 (SEAT BELT BUCKLE SWITCH LH CHECK)

1. CHECK SEAT BELT BUCKLE SWITCH LH INPUT SIGNAL

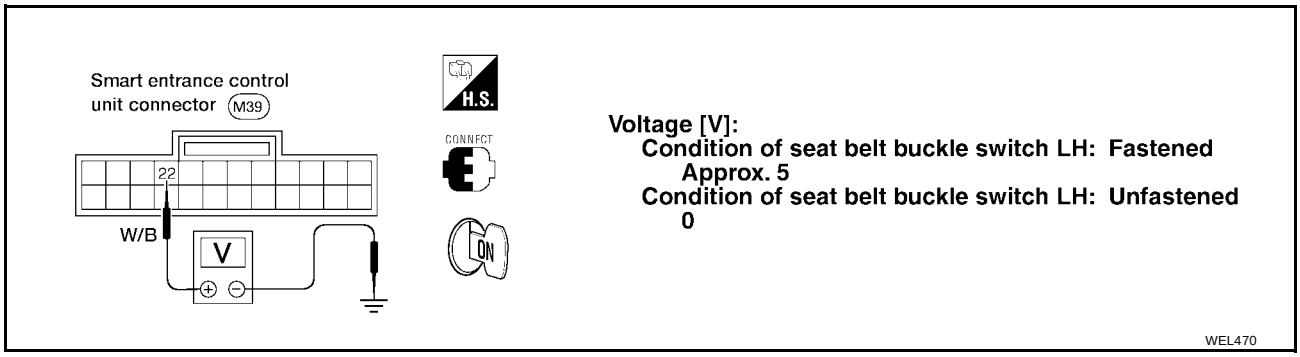
With CONSULT-II

Check seat belt buckle switch LH (“SEAT BELT SW”) in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

1. Turn ignition switch ON.
2. Check voltage between smart entrance control unit terminal 22 and ground.

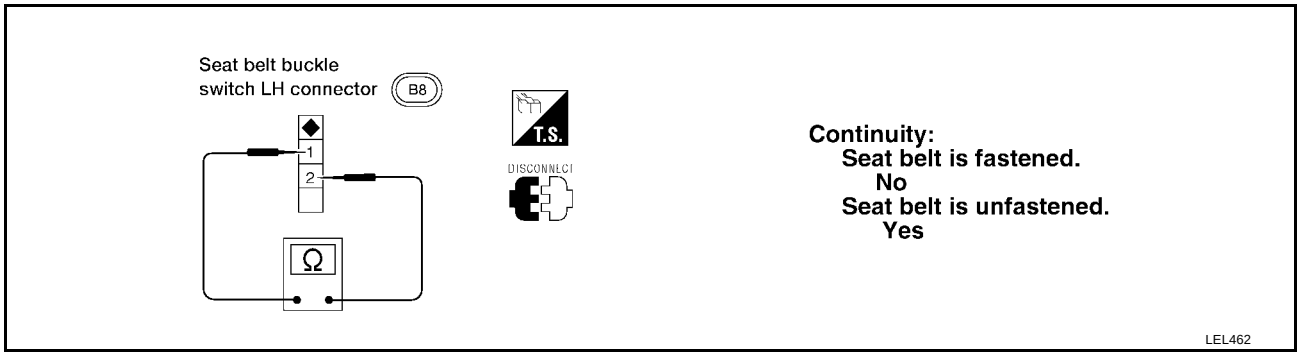


OK or NG

OK >> Seat belt buckle switch LH is OK.
NG >> GO TO 2.

2. CHECK SEAT BELT BUCKLE SWITCH LH

Check continuity between terminals 1 and 2 when seat belt is fastened and unfastened.



OK or NG

OK >> Check the following.
- Seat belt buckle switch LH ground circuit
- Harness for open or short between smart entrance control unit and seat belt buckle switch LH

NG >> Replace seat belt buckle switch LH.

DIAGNOSTIC PROCEDURE 4

1. CHECK IGNITION ON SIGNAL

With CONSULT-II

Check ignition switch ON signal (“IGN ON SW”) in “DATA MONITOR” mode with CONSULT-II.

DATA MONITOR	
MONITOR	
IGN ON SW	ON

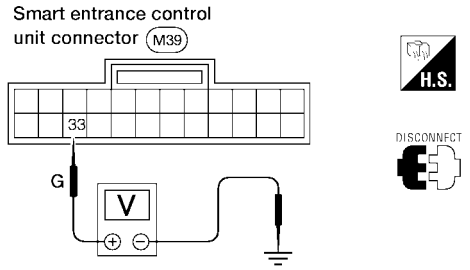
When ignition switch is ON:
IGN ON SW ON

When ignition switch is OFF:
IGN ON SW OFF

SEL318W

Without CONSULT-II

Check voltage between smart entrance control unit terminal 33 and ground.



Terminals		Ignition switch position		
(+)	(–)	OFF	ACC	ON
33	Ground	0V	0V	Battery voltage

WEL471

OK or NG

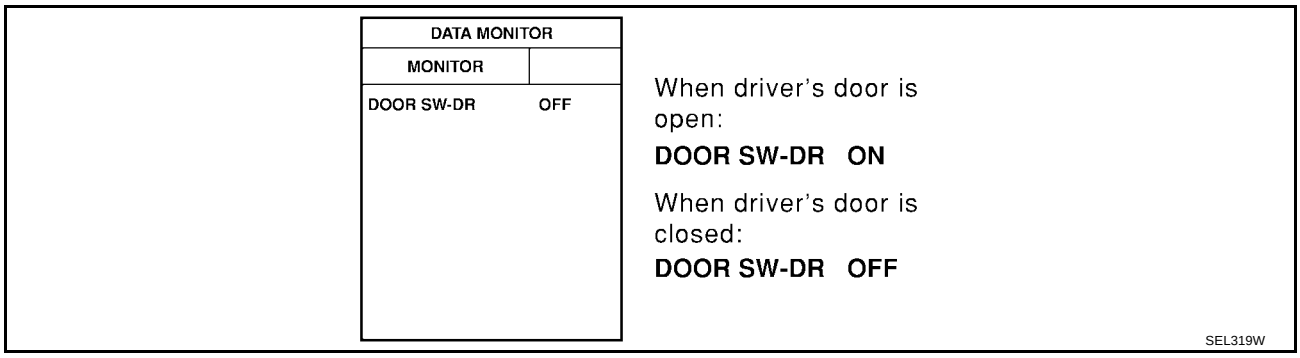
OK >> GO TO 2.
NG >> Check the following.

- 10A fuse [No. 10, located in fuse block (J/B)]
- Harness for open or short between smart entrance control unit and fuse

2. CHECK FRONT DOOR SWITCH LH INPUT SIGNAL

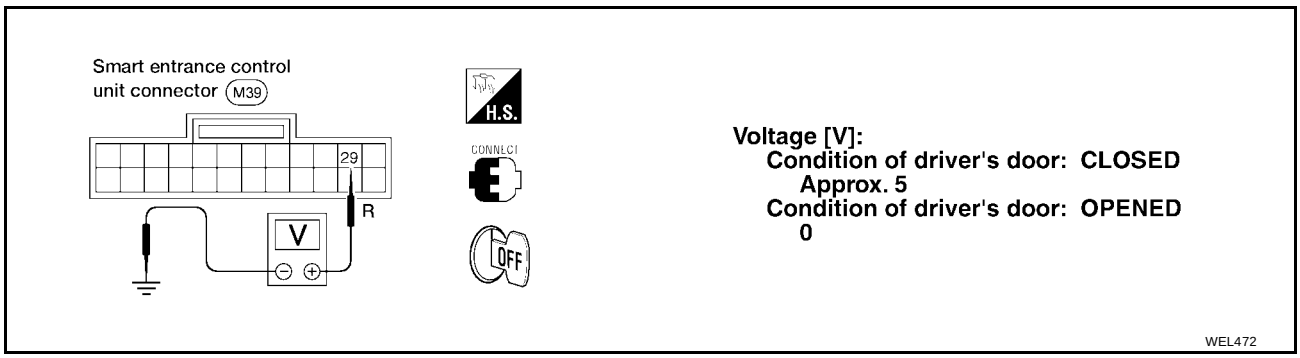
With CONSULT-II

Check front door switch LH signal (“DOOR SW-DR”) in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

Check voltage between smart entrance control unit terminal 29 and ground.

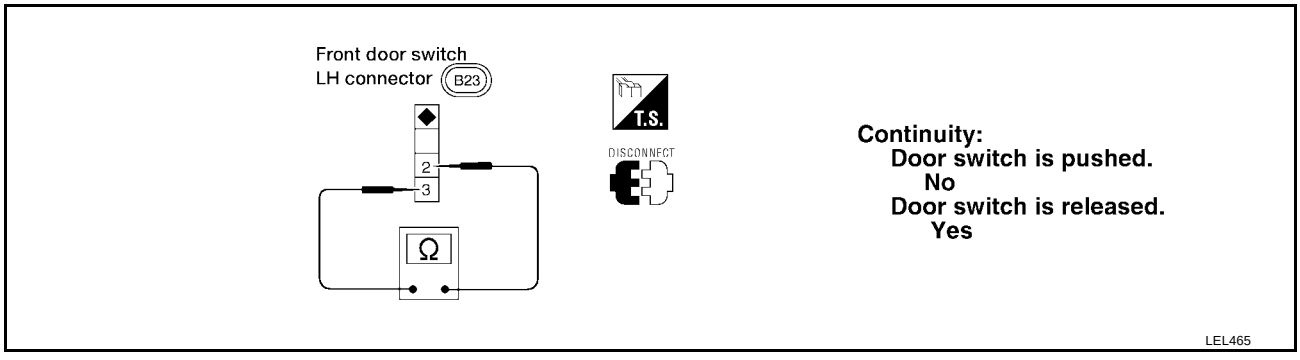


OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. CHECK FRONT DOOR SWITCH LH

Check continuity between terminals 2 and 3.



OK or NG

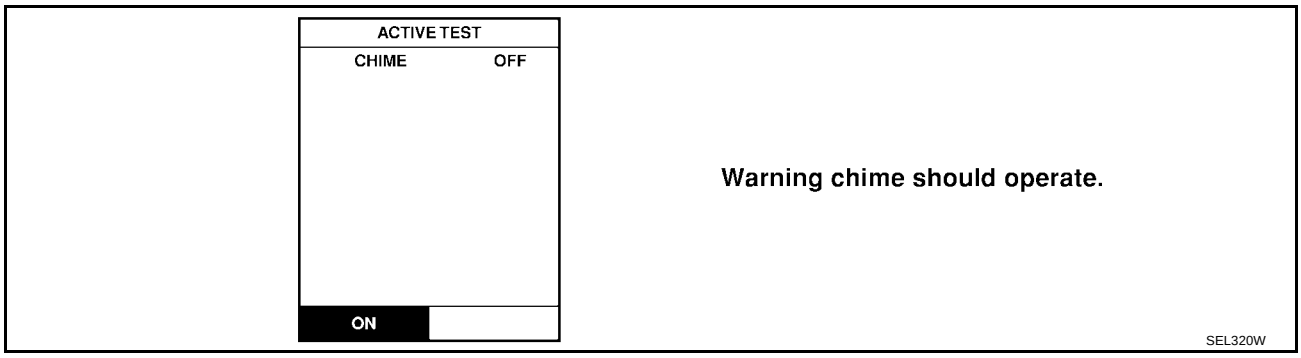
OK >> Check the following.
- Front door switch LH ground circuit and condition
- Harness for open or short between smart entrance control unit and front door switch LH

NG >> Replace front door switch LH.

4. CHECK WARNING CHIME

With CONSULT-II

Perform “CHIME” in “ACTIVE TEST” mode with CONSULT-II.



OK or NG

OK >> System is OK.
NG >> Replace smart entrance control unit.

SECTION EC
ENGINE CONTROL SYSTEM

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NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE".

×: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
A/T 1ST GR FNCTN	P0731	0731	2	×	AT-136
A/T 2ND GR FNCTN	P0732	0732	2	×	AT-141
A/T 3RD GR FNCTN	P0733	0733	2	×	AT-146
A/T 4TH GR FNCTN	P0734	0734	2	×	AT-151
A/T TCC S/V FNCTN	P0744	0744	2	×	AT-164
APP SEN 1/CIRC	P2122	2122	1	×	EC-503
APP SEN 1/CIRC	P2123	2123	1	×	EC-503
APP SEN 2/CIRC	P2127	2127	1	×	EC-511
APP SEN 2/CIRC	P2128	2128	1	×	EC-511
APP SENSOR	P2138	2138	1	×	EC-525
ASCD BRAKE SW	P1572	1572	1	—	EC-481
ASCD SW	P1564	1564	1	—	EC-474
ASCD VHL SPD SEN	P1574	1574	1	—	EC-491
ATF TEMP SEN/CIRC	P0710	0710	2	×	AT-121
BRAKE SW/CIRCUIT	P1805	1805	2	—	EC-497
CAN COMM CIRCUIT	U1000	1000	1	×	EC-145
CAN COMM CIRCUIT	U1001	1001	2	—	EC-145
CKP SEN/CIRCUIT	P0335	0335	2	×	EC-277
CLOSED LOOP-B1	P1148	1148	1	×	EC-436
CMP SEN/CIRCUIT	P0340	0340	2	×	EC-283
CTP LEARNING	P1225	1225	2	—	EC-451
CTP LEARNING	P1226	1226	2	—	EC-453
CYL1 MISFIRE	P0301	0301	2	×	EC-267
CYL2 MISFIRE	P0302	0302	2	×	EC-267
CYL3 MISFIRE	P0303	0303	2	×	EC-267
CYL4 MISFIRE	P0304	0304	2	×	EC-267
ECM	P0605	0605	1 or 2	× or —	EC-372
ECM BACK UP/CIRC	P1065	1065	2	×	EC-375
ECT SEN/CIRCUIT	P0117	0117	1	×	EC-181
ECT SEN/CIRCUIT	P0118	0118	1	×	EC-181
ECT SENSOR	P0125	0125	1	×	EC-193
ENG OVER TEMP	P1217	1217	1	×	EC-438
ENGINE SPEED SIG	P0725	0725	2	×	AT-132
ETC ACTR	P1121	1121	1 or 2	×	EC-390
ETC FUNCTION/CIRC	P1122	1122	1	×	EC-392
ETC MOT	P1128	1128	1	×	EC-404
ETC MOT PWR	P1124	1124	1	×	EC-399

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
ETC MOT PWR	P1126	1126	1	×	EC-399
EVAP GROSS LEAK	P0455	0455	2	×	EC-338
EVAP PURG FLOW/MON	P0441	0441	2	×	EC-294
EVAP SMALL LEAK	P0442	0442	2	×	EC-301
EVAP SYS PRES SEN	P0452	0452	2	×	EC-324
EVAP SYS PRES SEN	P0453	0453	2	×	EC-330
EVAP VERY SML LEAK	P0456	0456	2	×	EC-346
FTT SEN/CIRCUIT	P0182	0182	2	×	EC-256
FTT SEN/CIRCUIT	P0183	0183	2	×	EC-256
FTT SENSOR	P0181	0181	2	×	EC-251
FUEL LEV SEN SLOSH	P0460	0460	2	×	EC-354
FUEL LEVEL SENSOR	P0461	0461	2	×	EC-356
FUEL LEVL SEN/CIRC	P0462	0462	2	×	EC-359
FUEL LEVL SEN/CIRC	P0463	0463	2	×	EC-359
FUEL SYS-LEAN-B1	P0171	0171	2	×	EC-238
FUEL SYS-RICH-B1	P0172	0172	2	×	EC-245
HO2S1 (B1)	P0132	0132	2	×	EC-201
HO2S1 (B1)	P0133	0133	2	×	EC-207
HO2S1 (B1)	P0134	0134	2	×	EC-216
HO2S1 (B1)	P1143	1143	2	×	EC-409
HO2S1 (B1)	P1144	1144	2	×	EC-415
HO2S1 HTR (B1)	P0031	0031	2	×	EC-151
HO2S1 HTR (B1)	P0032	0032	2	×	EC-151
HO2S2 (B1)	P0138	0138	2	×	EC-223
HO2S2 (B1)	P0139	0139	2	×	EC-230
HO2S2 (B1)	P1146	1146	2	×	EC-421
HO2S2 (B1)	P1147	1147	2	×	EC-428
HO2S2 HTR (B1)	P0037	0037	2	×	EC-157
HO2S2 HTR (B1)	P0038	0038	2	×	EC-157
IAT SEN/CIRCUIT	P0112	0112	2	×	EC-177
IAT SEN/CIRCUIT	P0113	0113	2	×	EC-177
IAT SENSOR	P0127	0127	2	×	EC-196
INT/V TIM CONT-B1	P0011	0011	2	×	EC-148
INT/V TIM V/CIR-B1	P1111	1111	2	×	EC-385
ISC SYSTEM	P0506	0506	2	×	EC-363
ISC SYSTEM	P0507	0507	2	×	EC-365
KNOCK SEN/CIRC-B1	P0327	0327	2	—	EC-273
KNOCK SEN/CIRC-B1	P0328	0328	2	—	EC-273
L/PRESS SOL/CIRC	P0745	0745	2	×	AT-174
MAF SEN/CIRCUIT	P0101	0101	1	×	EC-163
MAF SEN/CIRCUIT	P0102	0102	1	×	EC-171
MAF SEN/CIRCUIT	P0103	0103	1	×	EC-171

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
MAF SENSOR	P1102	1102	1	×	EC-379
MULTI CYL MISFIRE	P0300	0300	2	×	EC-267
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*6	—	Flashing*6	EC-73
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	0000	—	—	—
O/R CLTCH SOL/CIRC	P1760	1760	2	×	AT-194
P-N POS SW/CIRCUIT	P1706	1706	2	×	EC-493
PNP SW/CIRC	P0705	0705	2	×	AT-116
PURG VOLUME CONT/V	P0444	0444	2	×	EC-311
PURG VOLUME CONT/V	P0445	0445	2	×	EC-311
PURG VOLUME CONT/V	P1444	1444	2	×	EC-460
PW ST P SEN/CIRC	P0550	0550	2	—	EC-367
SENSOR POWER/CIRC	P1229	1229	1	×	EC-455
SFT SOL A/CIRC	P0750	0750	1	×	AT-180
SFT SOL B/CIRC	P0755	0755	1	×	AT-184
TCC SOLENOID/CIRC	P0740	0740	2	×	AT-160
THERMSTAT FNCTN	P0128	0128	2	×	EC-199
TP SEN/CIRC A/T	P1705	1705	1	×	AT-188
TP SEN 1/CIRC	P0222	0222	1	×	EC-260
TP SEN 1/CIRC	P0223	0223	1	×	EC-260
TP SEN 2/CIRC	P0122	0122	1	×	EC-186
TP SEN 2/CIRC	P0123	0123	1	×	EC-186
PT SENSOR	P2135	2135	1	×	EC-518
TW CATALYST SYS-B1	P0420	0420	2	×	EC-289
VEH SPD SEN/CIR AT	P0720*5	0720	2	×	AT-127
VEH SPEED SEN/CIRC	P0500*5	0500	2	×	EC-361
VENT CONTROL VALVE	P0447	0447	2	×	EC-317
VENT CONTROL VALVE	P1446	1446	2	×	EC-468

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: Is Diagnostic Test Mode-II (self-diagnostic results), there numbers are controlled by NISSAN.
*4: These DTCs are displayed with CONSULT-II only.
*5: The MIL illuminates when both the “Revolution sensor signal” and the “Vehicle speed sensor signal” meet the fail-safe condition at the same time.
*6: When engine is running.

DTC No. Index

UBS001C2

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE".

×: Applicable —: Not applicable

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
No DTC	Flashing*6	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	Flashing*6	EC-73
U1000	1000	CAN COMM CIRCUIT	1	×	EC-145
U1001	1001	CAN COMM CIRCUIT	2	—	EC-145
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	**—**
P0011	0011	INT/V TIM CONT-B1	2	×	EC-148
P0031	0031	HO2S1 HTR (B1)	2	×	EC-151
P0032	0032	HO2S1 HTR (B1)	2	×	EC-151
P0037	0037	HO2S2 HTR (B1)	2	×	EC-157
P0038	0038	HO2S2 HTR (B1)	2	×	EC-157
P0101	0101	MAF SEN/CIRCUIT	1	×	EC-163
P0102	0102	MAF SEN/CIRCUIT	1	×	EC-171
P0103	0103	MAF SEN/CIRCUIT	1	×	EC-171
P0112	0112	IAT SEN/CIRCUIT	2	×	EC-177
P0113	0113	IAT SEN/CIRCUIT	2	×	EC-177
P0117	0117	ECT SEN/CIRCUIT	1	×	EC-181
P0118	0118	ECT SEN/CIRCUIT	1	×	EC-181
P0122	0122	TP SEN 2/CIRC	1	×	EC-186
P0123	0123	TP SEN 2/CIRC	1	×	EC-186
P0125	0125	ECT SENSOR	1	×	EC-193
P0127	0127	IAT SENSOR	2	×	EC-196
P0128	0128	THERMSTAT FNCTN	2	×	EC-199
P0132	0132	HO2S1 (B1)	2	×	EC-201
P0133	0133	HO2S1 (B1)	2	×	EC-207
P0134	0134	HO2S1 (B1)	2	×	EC-216
P0138	0138	HO2S2 (B1)	2	×	EC-223
P0139	0139	HO2S2 (B1)	2	×	EC-230
P0171	0171	FUEL SYS-LEAN-B1	2	×	EC-238
P0172	0172	FUEL SYS-RICH-B1	2	×	EC-245
P0181	0181	FTT SENSOR	2	×	EC-251
P0182	0182	FTT SEN/CIRCUIT	2	×	EC-256
P0183	0183	FTT SEN/CIRCUIT	2	×	EC-256
P0222	0222	TP SEN 1/CIRC	1	×	EC-260
P0223	0223	TP SEN 1/CIRC	1	×	EC-260
P0300	0300	MULTI CYL MISFIRE	2	×	EC-267
P0301	0301	CYL1 MISFIRE	2	×	EC-267
P0302	0302	CYL2 MISFIRE	2	×	EC-267
P0303	0303	CYL3 MISFIRE	2	×	EC-267
P0304	0304	CYL4 MISFIRE	2	×	EC-267
P0327	0327	KNOCK SEN/CIRC-B1	2	—	EC-273
P0328	0328	KNOCK SEN/CIRC-B1	2	—	EC-273

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P0335	0335	CKP SEN/CIRCUIT	2	×	EC-277
P0340	0340	CMP SEN/CIRCUIT	2	×	EC-283
P0420	0420	TW CATALYST SYS-B1	2	×	EC-289
P0441	0441	EVAP PURG FLOW/MON	2	×	EC-294
P0442	0442	EVAP SMALL LEAK	2	×	EC-301
P0444	0444	PURG VOLUME CONT/V	2	×	EC-311
P0445	0445	PURG VOLUME CONT/V	2	×	EC-311
P0447	0447	VENT CONTROL VALVE	2	×	EC-317
P0452	0452	EVAP SYS PRES SEN	2	×	EC-324
P0453	0453	EVAP SYS PRES SEN	2	×	EC-330
P0455	0455	EVAP GROSS LEAK	2	×	EC-338
P0456	0456	EVAP VERY SML LEAK	2	×	EC-346
P0460	0460	FUEL LEV SEN SLOSH	2	×	EC-354
P0461	0461	FUEL LEVEL SENSOR	2	×	EC-356
P0462	0462	FUEL LEVL SEN/CIRC	2	×	EC-359
P0463	0463	FUEL LEVL SEN/CIRC	2	×	EC-359
P0500*5	0500	VEH SPEED SEN/CIRC	2	×	EC-361
P0506	0506	ISC SYSTEM	2	×	EC-363
P0507	0507	ISC SYSTEM	2	×	EC-365
P0550	0550	PW ST P SEN/CIRC	2	—	EC-367
P0605	0605	ECM	1 or 2	× or —	EC-372
P0705	0705	PNP SW/CIRC	2	×	AT-116
P0710	0710	ATF TEMP SEN/CIRC	2	×	AT-121
P0720*5	0720	VEH SPD SEN/CIR AT	2	×	AT-127
P0725	0725	ENGINE SPEED SIG	2	×	AT-132
P0731	0731	A/T 1ST GR FNCTN	2	×	AT-136
P0732	0732	A/T 2ND GR FNCTN	2	×	AT-141
P0733	0733	A/T 3RD GR FNCTN	2	×	AT-146
P0734	0734	A/T 4TH GR FNCTN	2	×	AT-151
P0740	0740	TCC SOLENOID/CIRC	2	×	AT-160
P0744	0744	A/T TCC S/V FNCTN	2	×	AT-164
P0745	0745	L/PRESS SOL/CIRC	2	×	AT-174
P0750	0750	SFT SOL A/CIRC	1	×	AT-180
P0755	0755	SFT SOL B/CIRC	1	×	AT-184
P1065	1065	ECM BACK UP/CIRC	2	×	EC-375
P1102	1102	MAF SENSOR	1	×	EC-379
P1111	1111	INT/V TIM V/CIR-B1	2	×	EC-385
P1121	1121	ETC ACTR	1 or 2	×	EC-390
P1122	1122	ETC FUNCTION/CIRC	1	×	EC-392
P1124	1124	ETC MOT PWR	1	×	EC-399
P1126	1126	ETC MOT PWR	1	×	EC-399
P1128	1128	ETC MOT	1	×	EC-404

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P1143	1143	HO2S1 (B1)	2	×	EC-409
P1144	1144	HO2S1 (B1)	2	×	EC-415
P1146	1146	HO2S2 (B1)	2	×	EC-421
P1147	1147	HO2S2 (B1)	2	×	EC-428
P1148	1148	CLOSED LOOP-B1	1	×	EC-436
P1217	1217	ENG OVER TEMP	1	×	EC-438
P1225	1225	CTP LEARNING	2	—	EC-451
P1226	1226	CTP LEARNING	2	—	EC-453
P1229	1229	SENSOR POWER/CIRC	1	×	EC-455
P1444	1444	PURG VOLUME CONT/V	2	×	EC-460
P1446	1446	VENT CONTROL VALVE	2	×	EC-468
P1564	1564	ASCD SW	1	—	EC-474
P1572	1572	ASCD BRAKE SW	1	—	EC-481
P1574	1574	ASCD VHL SPD SEN	1	—	EC-491
P1705	1705	TP SEN/CIRC A/T	1	×	AT-188
P1706	1706	P-N POS SW/CIRCUIT	2	×	EC-493
P1760	1760	O/R CLTCH SOL/CIRC	2	×	AT-194
P1805	1805	BRAKE SW/CIRCUIT	2	—	EC-497
P2122	2122	APP SEN 1/CIRC	1	×	EC-503
P2123	2123	APP SEN 1/CIRC	1	×	EC-503
P2127	2127	APP SEN 2/CIRC	1	×	EC-511
P2128	2128	APP SEN 2/CIRC	1	×	EC-511
P2135	2135	TP SENSOR	1	×	EC-518
P2138	2138	APP SENSOR	1	×	EC-525

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: Is Diagnostic Test Mode-II (self-diagnostic results), there numbers are controlled by NISSAN.
*4: These DTCs are displayed with CONSULT-II only.
*5: The MIL illuminates when both the “Revolution sensor signal” and the “Vehicle speed sensor signal” meet the fail-safe condition at the same time.
*6: When engine is running.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

UBS001C3

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

On Board Diagnostic (OBD) System of Engine and A/T

UBS001C4

The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

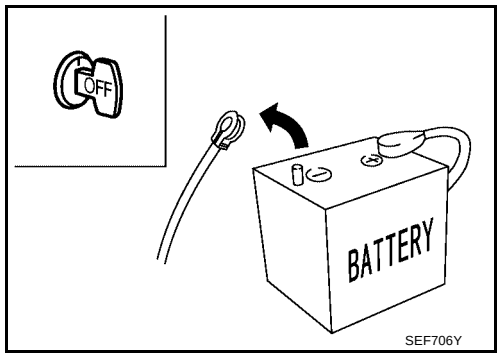
CAUTION:

- **Be sure to turn the ignition switch “OFF” and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector.**
  For description and how to disconnect, refer to PG-46, "HARNESS CONNECTOR" .
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the EVAP system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

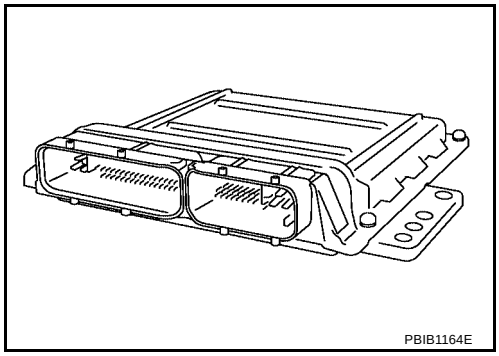
Precautions

UBS001C5

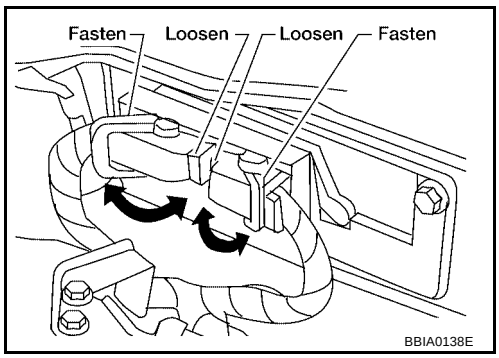
- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn off ignition switch and then disconnect battery ground cable.**



- **Do not disassemble ECM.**
- **If a battery terminal is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

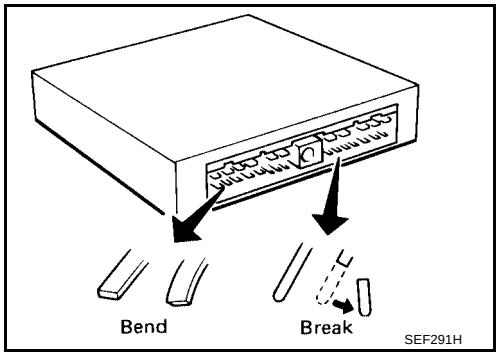

PBIB1164E

- **When connecting ECM harness connector, fasten it securely with a lever as far as it will go, as shown at left.**

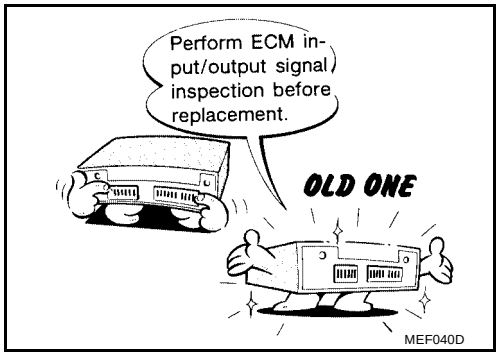


BBIA0138E

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminals when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A Poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent a engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**
- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-105, "ECM Terminals and Reference Value" .**

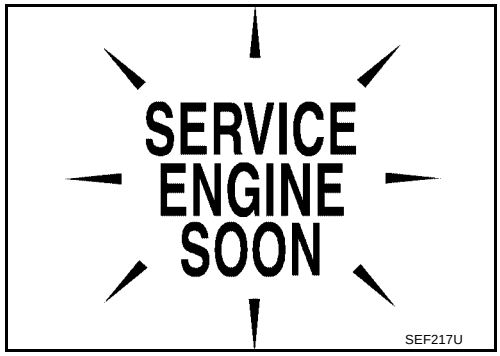


SEF291H

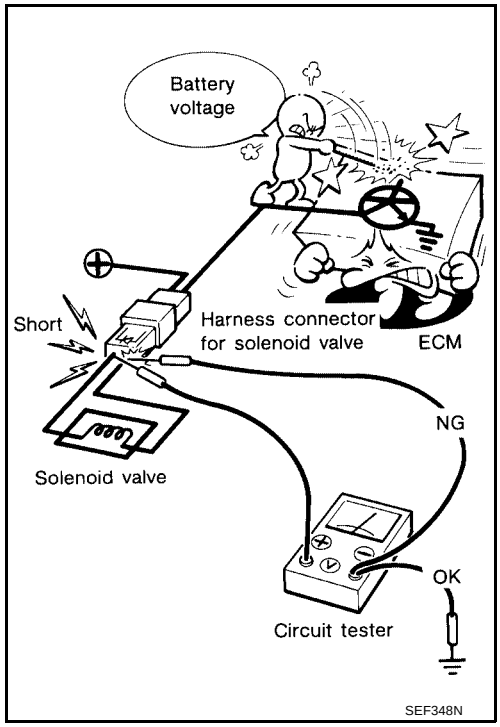


MEF040D

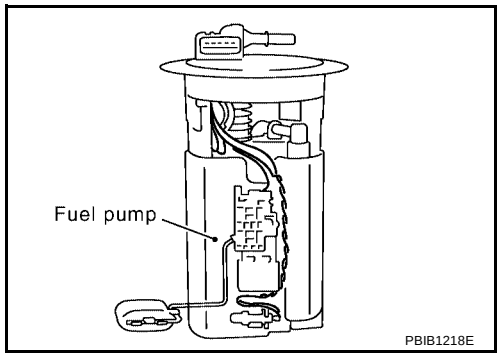
- **After performing each TROUBLE DIAGNOSIS, perform "Overall Function Check" or "DTC Confirmation Procedure".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



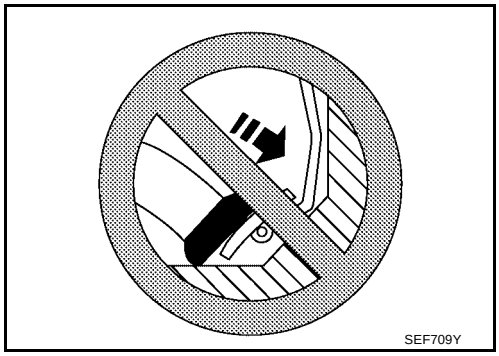
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Even a slight leak in the air intake system can cause serious problems.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**



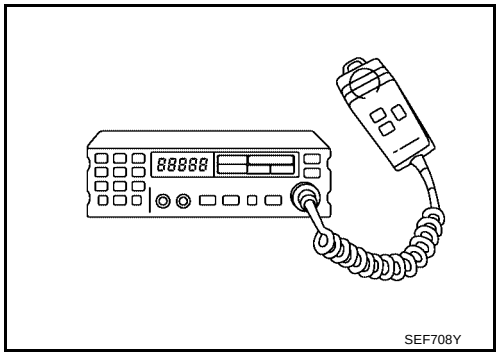
- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B., ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**


SEF708Y

Wiring Diagrams and Trouble Diagnosis

UBS001C6

When you read Wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams"
- PG-2, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"

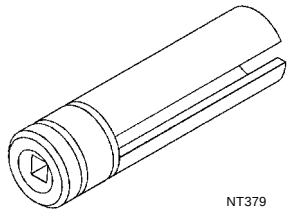
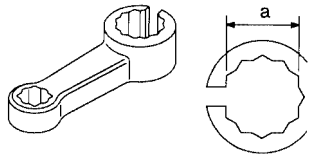
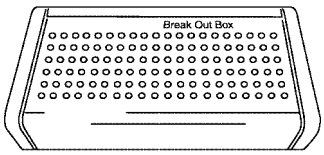
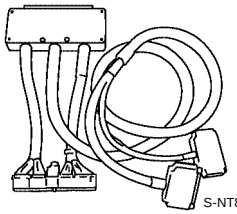
PREPARATION

PFP:00002

Special Service Tools

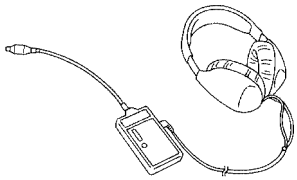
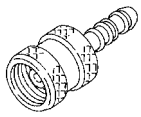
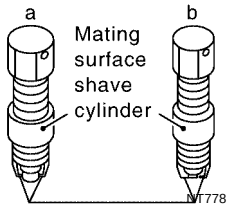
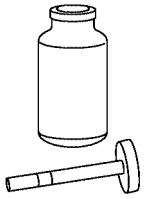
UBS001C7

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description	
KV10117100 (J36471-A) Heated oxygen sensor wrench	 NT379	Loosening or tightening heated oxygen sensor 1 with 22 mm (0.87 in) hexagon nut
KV10114400 (J-38365) Heated oxygen sensor wrench	 NT636	Loosening or tightening heated oxygen sensor 2 **a: 22 mm (0.87 in)**
Fuel filler cap adapter (J-45356)	 NT815	Checking fuel tank vacuum relief valve opening pressure
KV109E0010 (J-46209) Break-out box	 S-NT825	Measuring the ECM signals with a circuit tester
KV109E0080 (J-45819) Y-cable adapter	 S-NT826	Measuring the ECM signals with a circuit tester

Commercial Service Tools

UBS001C8

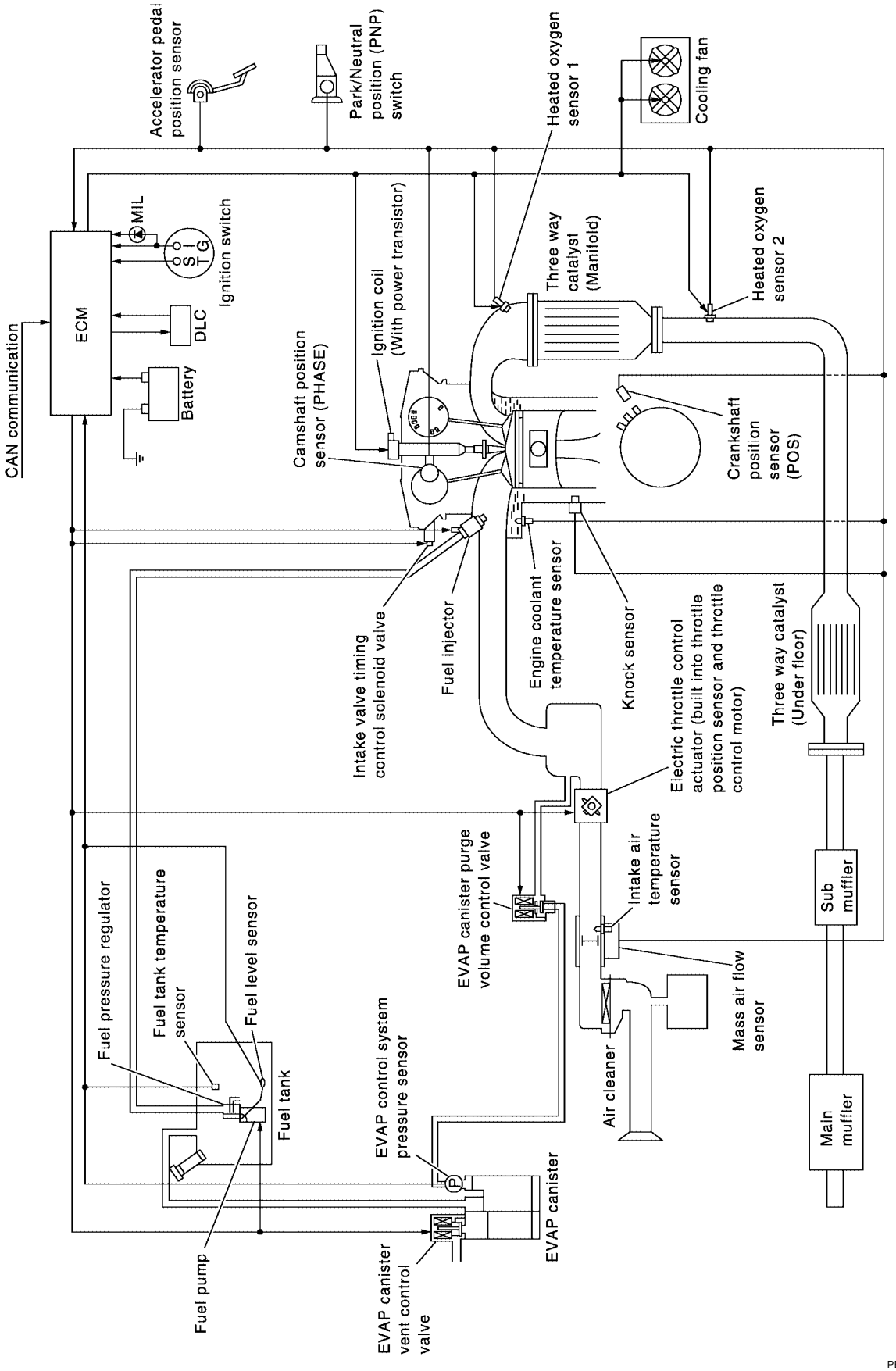
Tool name	Description	
Leak detector i.e.: (J41416)	 NT703	Locating the EVAP leak
EVAP service port adapter i.e.: (J41413-OBD)	 NT704	Applying positive pressure through EVAP service port
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	 NT778	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: J-43897-18 18 mm with 1.5 mm pitch dia., for Zirconia Oxygen Sensor** **b: J-43897-12 12 mm with 1.25 mm pitch dia., for Titania Oxygen Sensor**
Anti-seize lubricant i.e.: (Permatex^{TM} 133AR or equivalent meeting MIL specification MIL-A-907)	 NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

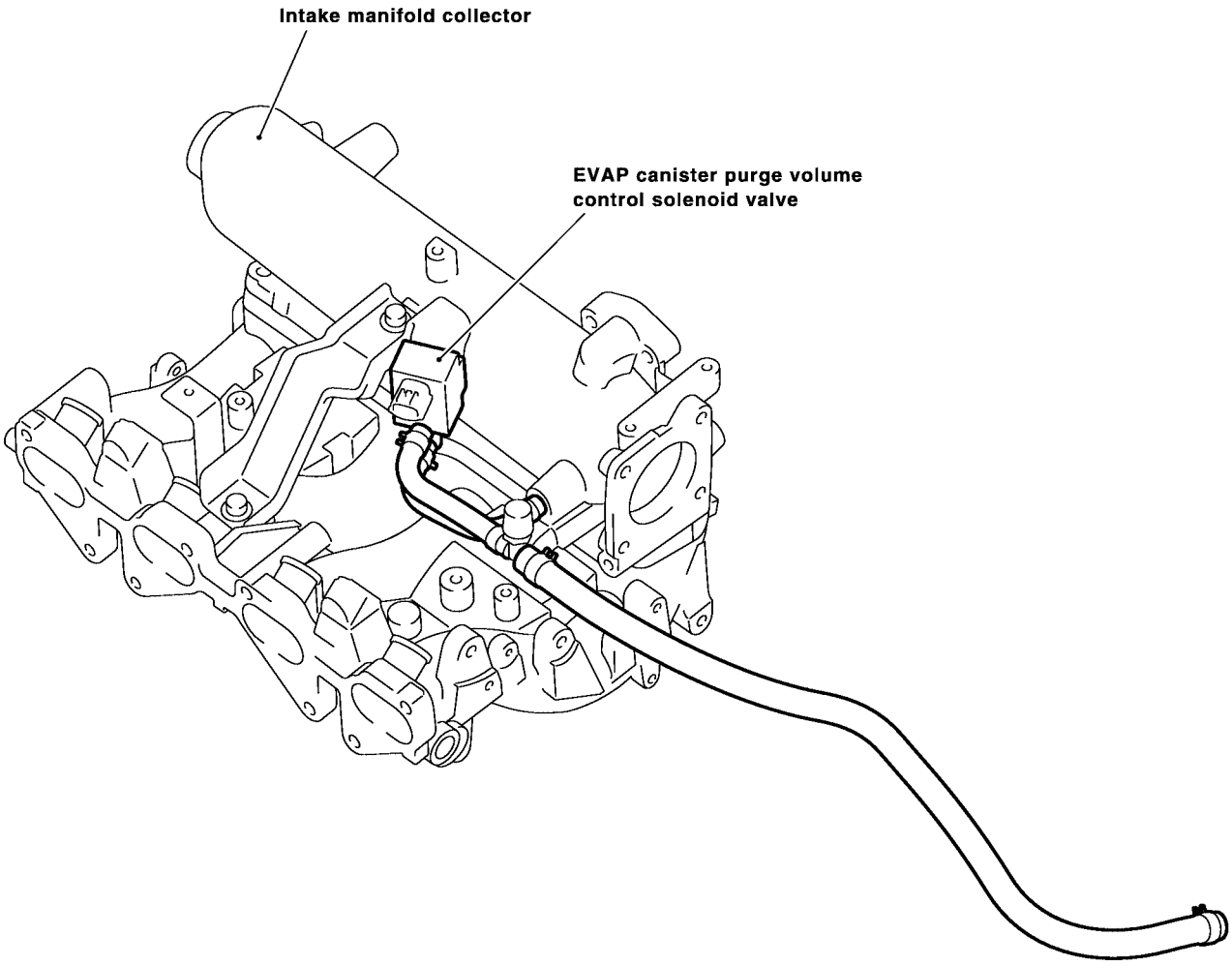
UBS001C9



PBIB1055E

Vacuum Hose Drawing

UBS001CA



NOTE : Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

PBIB1056E

Refer to EC-33, "System Diagram" for Vacuum Control System.

System Chart

UBS001CB

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Ignition switch ● Throttle position sensor ● PNP switch ● Air conditioner switch ● Knock sensor ● EVAP control system pressure sensor ● Fuel tank temperature sensor*1 ● Battery voltage ● Power steering pressure sensor ● Vehicle speed signal*2 ● Intake air temperature sensor ● Heated oxygen sensor 2*3 ● TCM (Transmission control module)*2 ● Electrical load ● Fuel level sensor*1 *2 ● Refrigerant pressure sensor ● ASCD steering switch ● ASCD brake switch ● ASCD clutch switch ● Accelerator pedal position sensor ● Stop lamp switch	Fuel injection & mixture ratio control	Injectors
	Distributor ignition system	Power transistor
	Intake valve timing control	Intake valve timing control solenoid valve
	Fuel pump control	Fuel pump relay*4
	On board diagnostic system	Malfunction indicator lamp (On the instrument panel)
	Heated oxygen sensor 1 and 2 heater control	Heated oxygen sensor heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Cooling fan control	Cooling fan relays
	Air conditioning cut control	Air conditioner relay
	ASCD vehicle speed control	Electric throttle control actuator
	ON BOARD DIAGNOSIS for EVAP system	● EVAP canister vent control valve

*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.
*2: These input signals are sent to the ECM through CAN communication line.
*3: This sensor is not used to control the engine system under normal conditions.
*4: These output signals are sent form the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

UBS001CC

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed*3 and piston position	Fuel injection & mixture ratio control	Injector
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Acceletor pedal position sensor	Acceletor pedal position		
PNP switch	Gear position		
Vehicle speed signal*2	Vehicle speed		
Air conditioner switch	Air conditioner operation		
Knock sensor	Engine knocking condition		
Electrical load	Electrical load signal		
Battery	Battery voltage*3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		

*1: Under normal conditions, this sensor is not for engine control operation.

*2: This signal is sent to the ECM through CAN communication line.

*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the camshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

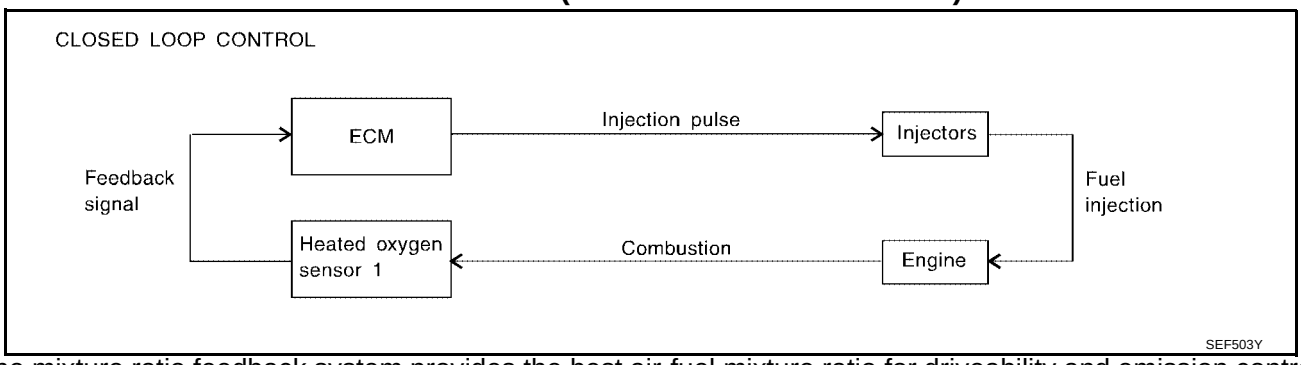
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (A/T models only)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation
- During high vehicle speed operation
- Extremely high engine coolant temperature

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the heated oxygen sensor 1, refer to EC-201 . This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst. Even if the switching characteristics of the heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from the heated oxygen sensor 2.

Open Loop Control

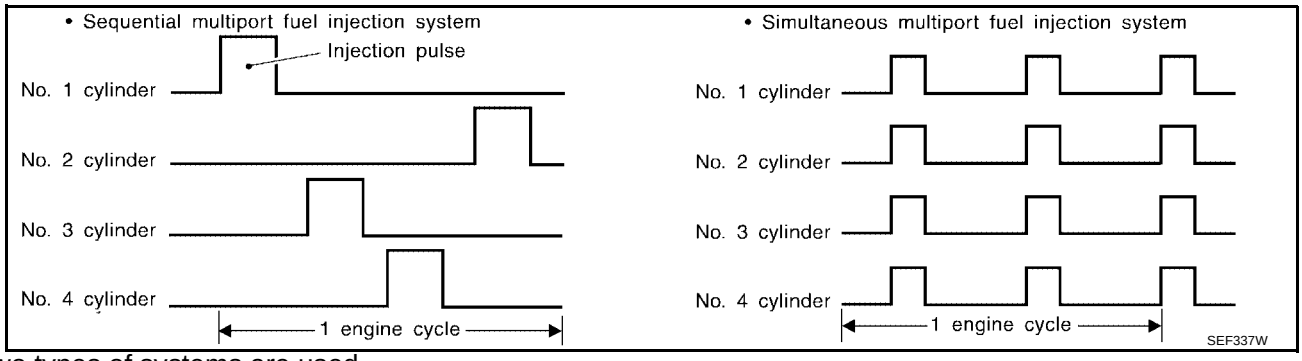
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from the heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

UBS001CD

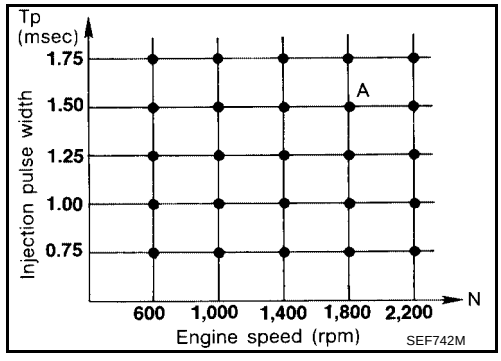
INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed*2 and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Vehicle speed signal*1	Vehicle speed		
Knock sensor	Engine knocking		
PNP switch	Gear position		
Battery	Battery voltage*2		

*1: This signal is sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown above.



The ECM receives information such as the injection pulse width and camshaft position sensor (PHASE) signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A°BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions.
If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

UBS001CE

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Power steering pressure sensor	Power steering operation	Air conditioner cut control	Air conditioner relay
Vehicle speed signal*2	Vehicle speed		
Air conditioner switch	Air conditioner “ON” signal		
PNP switch	Neutral position		
Throttle position sensor	Throttle position		
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed*1		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Refrigerant pressure sensor	Refrigerant pressure		

*1: ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: Signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When the refrigerant pressure is excessively high or low.

Fuel Cut Control (at No Load and High Engine Speed)

UBS001CF

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed signal*1	Vehicle speed	Fuel cut control	Injectors
PNP switch	Neutral position		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		

*1: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 2,500 rpm with no load, (for example, in Neutral and engine speed over 2,500 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 2,000 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under EC-36, "Multiport Fuel Injection (MFI) System" .

CAN communication

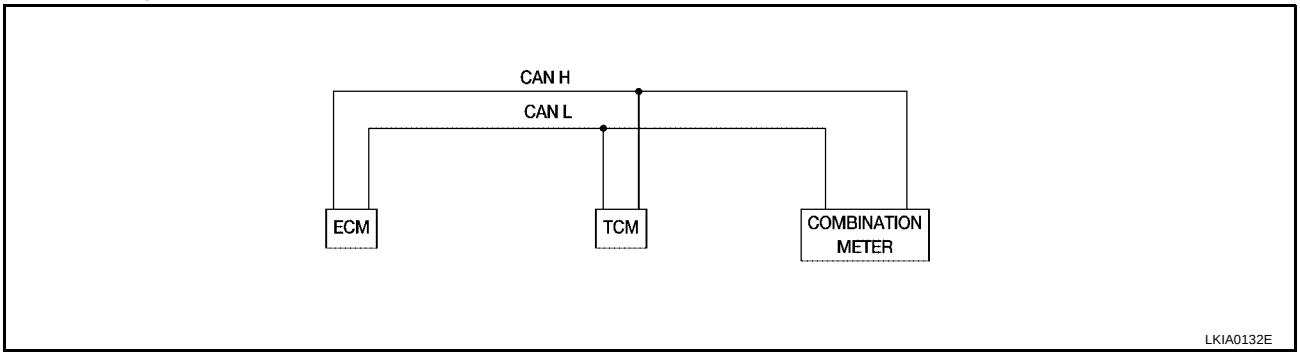
UBS003PF

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

A/T MODELS

System Diagram



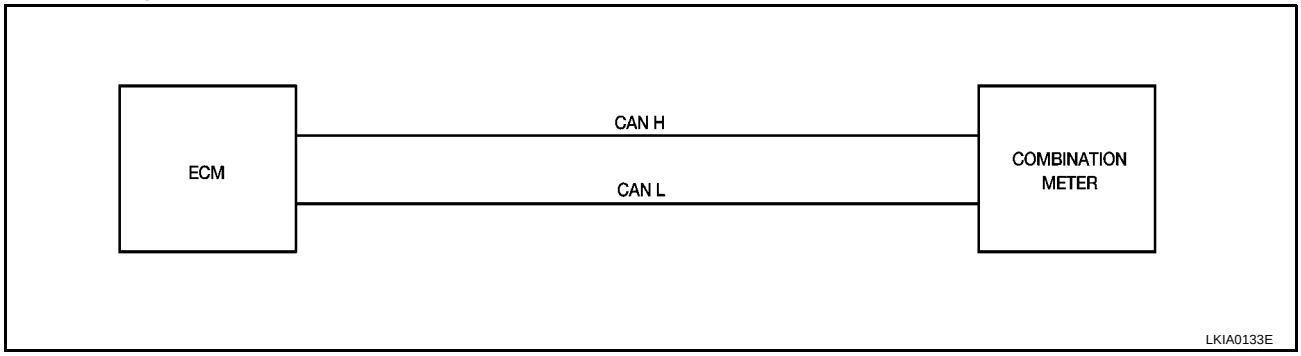
Input/Output Signal Chart

T: Transmit R: Receive

Signals	ECM	TCM	Combination meter
Accelerator pedal position signal	T	R	
Output shaft revolution signal	R	T	
A/T self-diagnosis signal	R	T	
Closed throttle position signal	T	R	
Wide open throttle position signal	T	R	
Stop lamp switch signal		R	T
Overdrive control switch signal		R	T
O/D OFF indicator signal		T	R
Engine speed signal	T		R
Engine coolant temperature signal	T		R
Vehicle speed signal	R		T
Fuel level sensor signal	R		T
Malfunction indicator lamp signal	T		R
ADCD SET lamp signal	T		R
ASCD CRUISE lamp signal	T		R

M/T MODELS

System Diagram



Input/Output Signal Chart

T: Transmit R: Receive

Signals	ECM	Combination meter
Engine speed signal	T	R
Engine coolant temperature signal	T	R
Vehicle speed signal	R	T
Fuel level sensor signal	R	T
Malfunction indicator lamp signal	T	R
ASCD SET lamp signal	T	R
ASCD CRUISE lamp signal	T	R

BASIC SERVICE PROCEDURE

PFP:00018

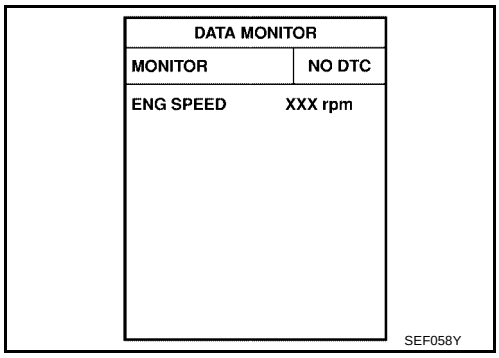
Idle Speed and Ignition Timing Check

UBS001CG

IDLE SPEED

Using CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.

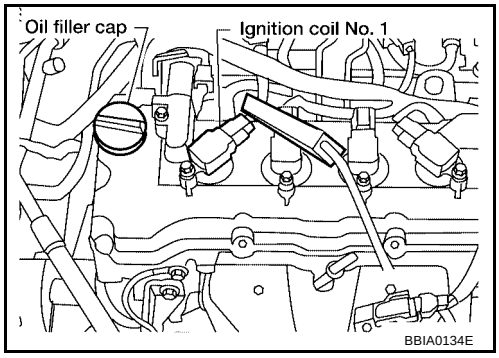


IGNITION TIMING

Any of following two methods may be used.

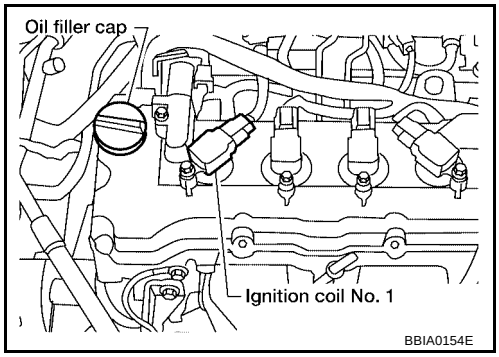
Method A

1. Slide the harness protector off ignition coil No.1 to clear the wires.
2. Attach timing light to the wires as shown in the figure.
3. Check ignition timing.

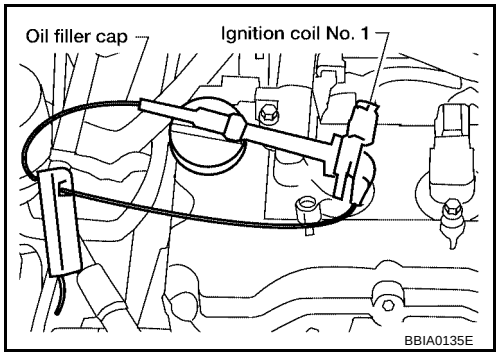


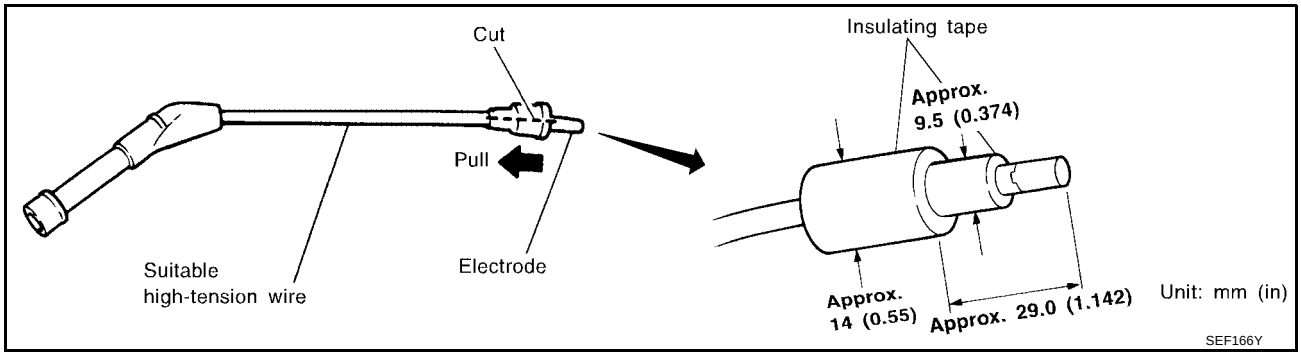
Method B

1. Remove No. 1 ignition coil.

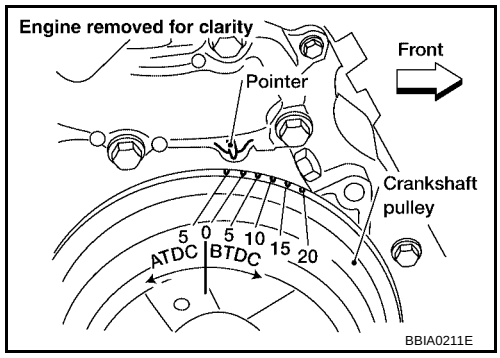


2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.



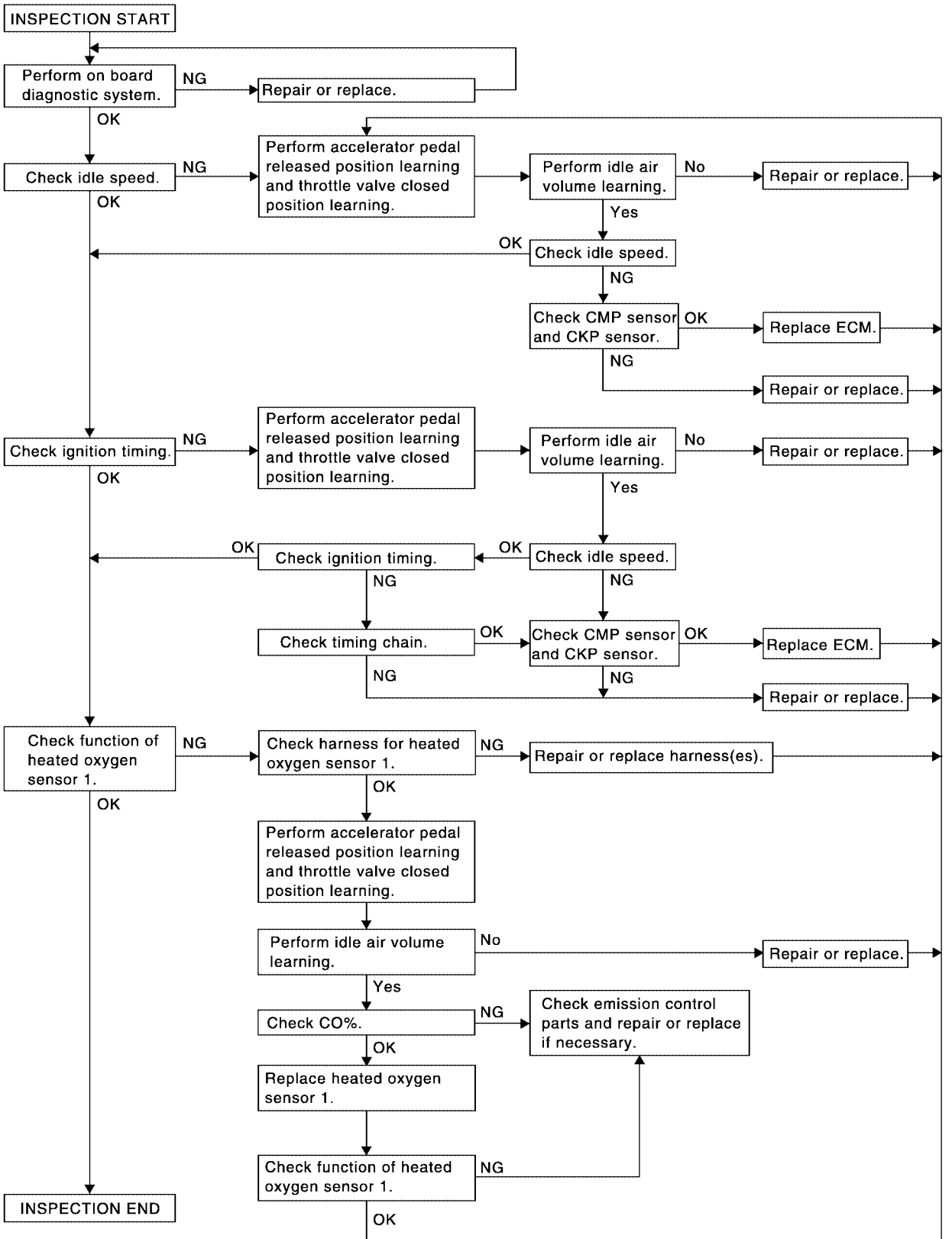
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

UBS006DO

PREPARATION

1. Make sure that the following parts are in good order.
   - Battery
   - Ignition system
   - Engine oil and coolant levels
   - Fuses
   - ECM harness connector
   - Vacuum hoses
   - Air intake system
     (Oil filler cap, oil level gauge, etc.)
   - Fuel pressure
   - Engine compression
   - Throttle valve
   - Evaporative emission system
2. On air conditioner equipped models, checks should be carried out while the air conditioner is “OFF”.
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in “N” position.
4. When measuring “CO” percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamp, heater blower, rear window defogger.
6. Keep front wheels pointed straight ahead.

OVERALL INSPECTION SEQUENCE



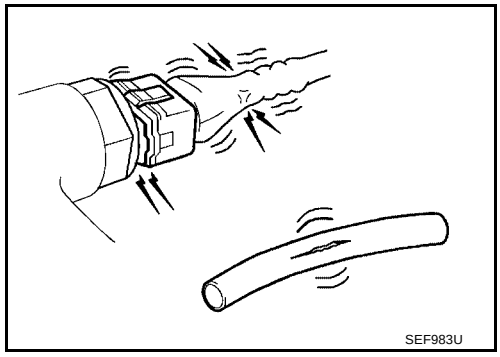
NOTE:
If a vehicle contains a part which is operating outside of design specifications with no MIL illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system cannot reasonably be expected to detect the resulting malfunction.

PBIB1054E

INSPECTION PROCEDURE

1. INSPECTION START

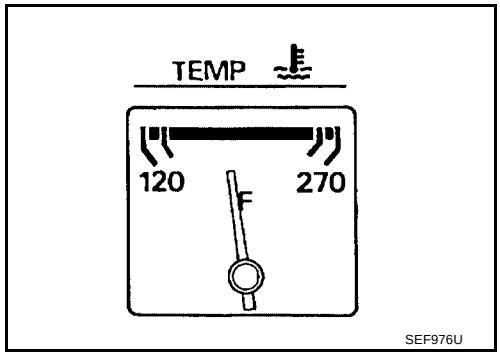
1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:


SEF983U

- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.

4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.

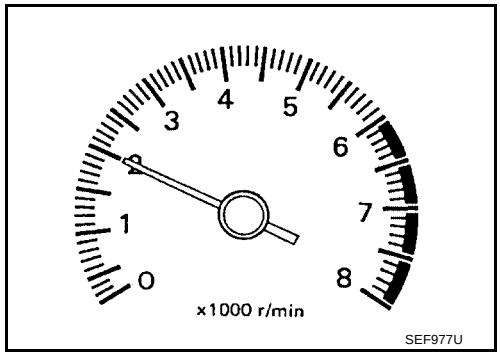


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

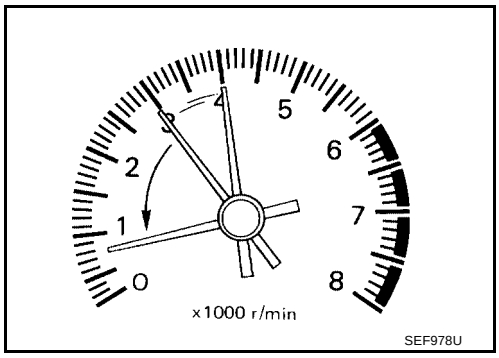
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

With CONSULT-II

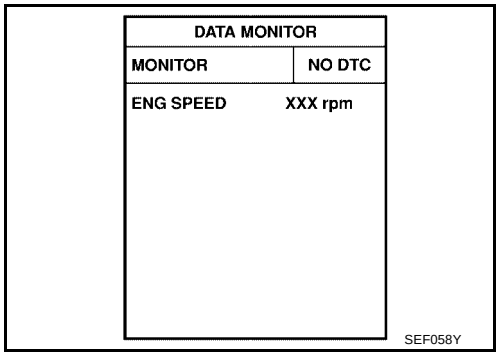
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm

A/T: 800 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 650 ± 50 rpm

A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-53, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-53, "Idle Air Volume Learning" .
Is “Idle Air Volume Learning” carried out successfully?

Yes or No

Yes >> GO TO 7.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-283 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-277 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 7 ± 5° BTDC
A/T: 18 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK (With CONSULT-II)>>GO TO 19.
OK (Without CONSULT-II)>>GO TO 20.
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-53, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-53, "Idle Air Volume Learning" .
Is “Idle Air Volume Learning” carried out successfully?

Yes or No

Yes >> GO TO 14.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 7 ± 5° BTDC
A/T: 18 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK (With CONSULT-II)>>GO TO 19.
OK (Without CONSULT-II)>>GO TO 20.
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-39, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-283 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-277 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

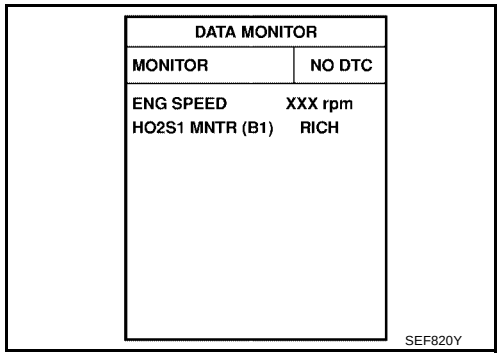
19. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.

1 time: RICH → LEAN → RICH

2 times: RICH → LEAN → RICH → LEAN → RICH



OK or NG

OK >> INSPECTION END
NG (Monitor does not fluctuate.)>>GO TO 21.
NG (Monitor fluctuates less than 5 times.)>>GO TO 28.

20. CHECK HEATED OXYGEN SENSOR 1 (BANK 1) SIGNAL

Without CONSULT-II

1. Stop engine and set ECM to Self-diagnostic mode II (Heated oxygen sensor 1 monitor). Refer to EC-73, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
2. Start engine and run it at about 2,000 rpm for about 2 minutes under no-load.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the MIL comes on more than 5 times during 10 seconds.

OK or NG

OK >> INSPECTION END
NG (MIL does not come on)>>GO TO 21.
NG (MIL comes on less than 5 times)>>GO TO 28.

21. CHECK HEATED OXYGEN SENSOR 1 HARNESS

1. Turn ignition switch “OFF” and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect heated oxygen sensor 1 harness connector.
4. Check harness continuity between ECM terminal 35 and heated oxygen sensor 1 terminal 1. Refer to Wiring Diagram, EC-201 .

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 22.
NG >> 1. Repair or replace harness between ECM and heated oxygen sensor 1.
2. GO TO 4.

22. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Reconnect ECM harness connector.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .

>> GO TO 23.

23. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-53, "Throttle Valve Closed Position Learning" .

>> GO TO 24.

24. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-53, "Idle Air Volume Learning" .
Is “Idle Air Volume Learning” carried out successfully?

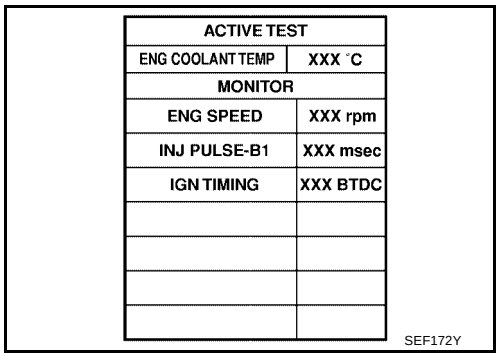
Yes or No

Yes (With CONSULT-II)>>GO TO 25.
Yes (Without CONSULT-II)>>GO TO 26.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

25. CHECK “CO”%

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Select “ENG COOLANT TEMP” in “ACTIVE TEST” mode.
4. Set “ENG COOLANT TEMP” to 5°C (41°F) by touching “DWN” and “Qd”.
5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
6. Check “CO”%.



Idle CO: 3 – 11% and engine runs smoothly.

OK or NG

OK >> GO TO 28.
NG >> GO TO 27.

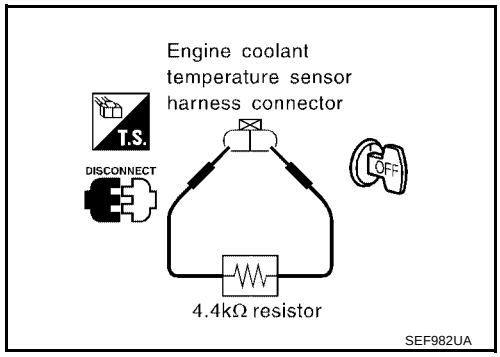
26. CHECK “CO”%

Without CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
2. Turn ignition switch “OFF”.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.
5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
6. Check “CO”%.

   Idle CO: 3 – 11% and engine runs smoothly.

7. After checking “CO”%, turn ignition switch “OFF”, disconnect the resistor from the terminals of engine coolant temperature sensor harness connector, and then connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.



OK or NG

OK >> GO TO 28.
NG >> GO TO 27.

27. RECONNECT HEATED OXYGEN SENSOR 1 HARNESS CONNECTOR

1. Turn ignition switch “OFF”.
2. Reconnect heated oxygen sensor 1 harness connector.

>> GO TO 31.

28. REPLACE HEATED OXYGEN SENSOR 1

1. Stop engine.
2. Replace heated oxygen sensor 1 on the malfunctioning bank.

With CONSULT-II>>GO TO 29.
Without CONSULT-II>>GO TO 30.

29. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
2. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.

   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

OK or NG

OK >> GO TO 4.
NG >> GO TO 31.

30. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

Without CONSULT-II

1. Set ECM to Self-diagnostic mode II (Heated oxygen sensor 1 monitor). Refer to EC-73, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
2. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the MIL comes on more than 5 times during 10 seconds.

OK or NG

OK >> GO TO 4.
NG >> GO TO 31.

31. DETECT MALFUNCTIONING PART

Check the following.

- Check fuel pressure regulator and repair or replace if necessary. Refer to EC-56, "Fuel Pressure Check" .
- Check mass air flow sensor and its circuit, and repair or replace if necessary. Refer to EC-163 , EC-171 and EC-379 .
- Check injector and its circuit, and repair or replace if necessary. Refer to EC-547 .
- Check engine coolant temperature sensor and its circuit, and repair or replace if necessary. Refer to EC-181 and EC-193 .

OK or NG

OK >> GO TO 33.
NG >> 1. Repair or replace.
2. GO TO 32.

32. ERASE UNNECESSARY DTC

After this inspection, unnecessary DTC might be displayed.
Erase the stored memory in ECM and TCM. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and AT-40, "HOW TO ERASE DTC" .

>> GO TO 4.

33. CHECK ECM FUNCTION

Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)

>> GO TO 4.

Accelerator Pedal Released Position Learning

UBS006E7

DESCRIPTION

“Accelerator Pedal Released Position Learning” is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch “ON” and wait at least 2 seconds.
3. Turn ignition switch “OFF” wait at least 10 seconds.
4. Turn ignition switch “ON” and wait at least 2 seconds.
5. Turn ignition switch “OFF” wait at least 10 seconds.

Throttle Valve Closed Position Learning

UBS006E8

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

UBS006E9

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

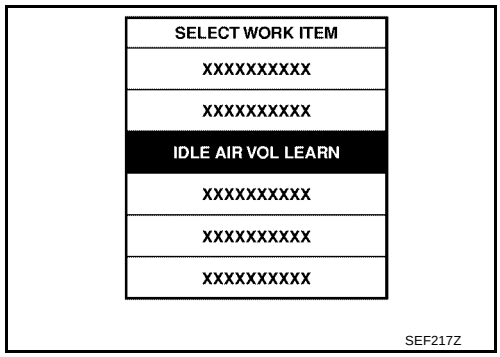
Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 100°C (158 - 212°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On models with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
  For models without CONSULT-II, drive vehicle for 10 minutes.

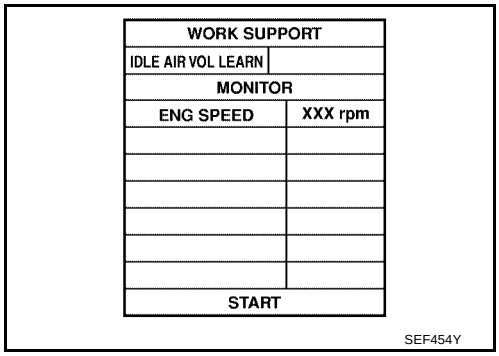
OPERATION PROCEDURE

With CONSULT-II

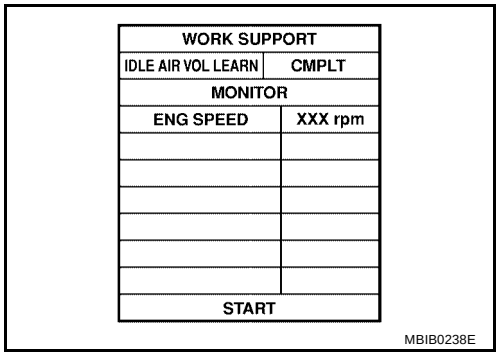
1. Perform EC-52, "Accelerator Pedal Released Position Learning" .
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic "PREPARATION" (previously mentioned) are in good order.
5. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.



6. Touch “START” and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “CMPLT” is not displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	MT: 650±50 rpm AT: 800±50 rpm (in “P” or “N” position)
Ignition timing	MT: 7±5° BTDC AT: 18±5° BTDC (in “P” or “N” position)

Without CONSULT-II

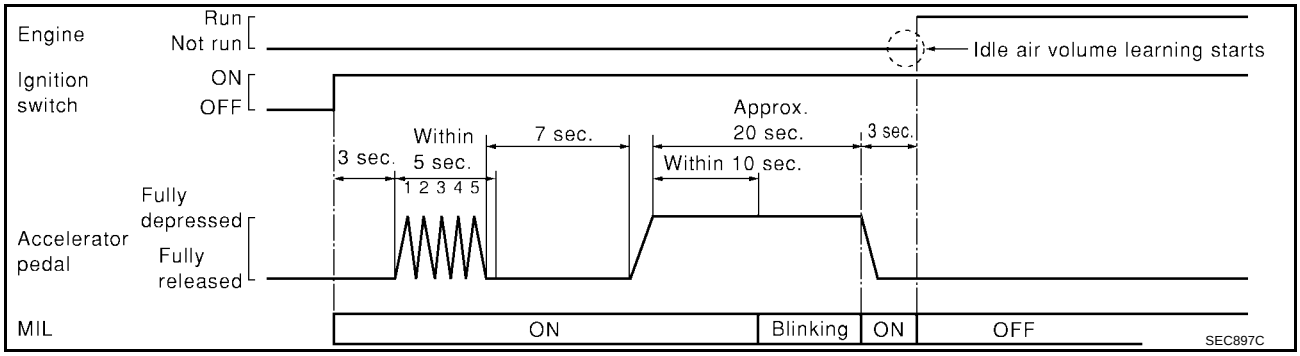
NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-52, "Accelerator Pedal Released Position Learning" .
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MIL goes off.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	MT: 650±50 rpm AT: 800±50 rpm (in “P” or “N” position)
Ignition timing	MT: 7±5° BTDC AT: 18±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, the result will be incomplete. In this case, find the cause of the incident by referring to the “DIAGNOSTIC PROCEDURE” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.**
   It is useful to perform EC-133, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform “Idle air volume learning” all over again:**
   - **Engine stalls.**
   - **Erroneous idle.**

Fuel Pressure Check

UBS001CJ

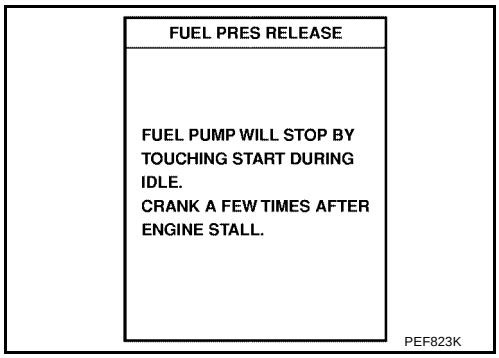
FUEL PRESSURE RELEASE

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because B15 models do not have fuel return system.

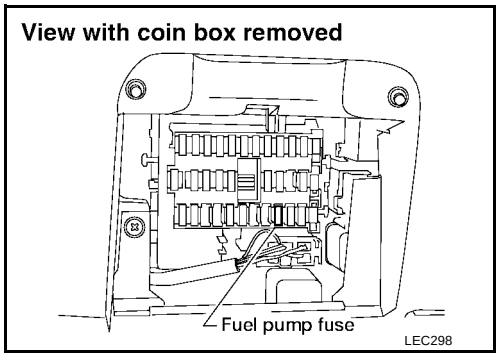
With CONSULT-II

1. Turn ignition switch ″ON″.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.



Without CONSULT-II

1. Remove fuel pump fuse.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.



FUEL PRESSURE CHECK

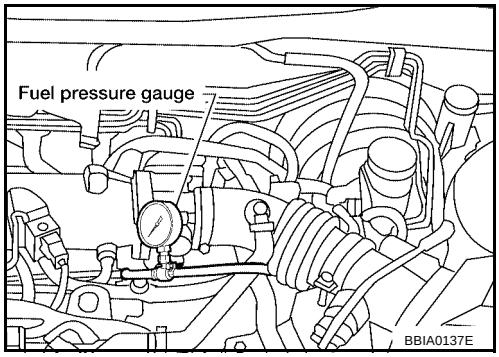
NOTE:

- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**
- **Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C switch, etc.). Fuel pressure gauge may indicate false readings due to varying engine loads and changes in manifold vacuum.**

1. Release fuel pressure to zero. Refer to EC-56 .
2. Install the fuel pressure gauge into the fuel line as shown in the figure.
3. Turn ignition switch “ON”, and check for fuel leakage.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

   At idling: Approximately 350 kPa (3.57 kg/cm^2 , 51 psi)

6. If result is unsatisfactory, go to next step.
7. Check the following.
   - Fuel hoses and fuel tubes for clogging
   - Fuel filter for clogging



- Fuel pump
- Fuel pressure regulator for clogging

If OK, replace fuel pressure regulator.
If NG, repair or replace.

ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

UBS001CK

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information	SAE Mode
Diagnostic Trouble Code (DTC)	Mode 3 of SAE J1979
Freeze Frame data	Mode 2 of SAE J1979
System Readiness Test (SRT) code	Mode 1 of SAE J1979
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of SAE J1979
1st Trip Freeze Frame data	
Test values and Test limits	Mode 6 of SAE J1979
Calibration ID	Mode 9 of SAE J1979

The above information can be checked using procedures listed in the table below.

X: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	X	X	X	X	X	—
GST	X	X*1	X	—	X	X
ECM	X	X*2	—	—	—	—

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.

*2: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-87 .)

Two Trip Detection Logic

UBS001CL

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not light up at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

X: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip display-ing	2nd trip display-ing	1st trip display-ing	2nd trip display-ing
	Blinking	Lighting up	Blinking	Lighting up				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	X	—	—	—	X	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 has been detected	—	—	X	—	—	X	—	—
One trip detection diagnoses (Refer to EC-21 .)	—	X	—	—	X	—	—	—
Except above	—	—	—	X	—	X	X	—

When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting MIL up when there is NG on engine control system.

Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5-trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating fail-safe function.

The fail-safe function also operates when above diagnoses except MIL circuit and demands the driver to repair the trouble.

Engine operating in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut.

Emission-related Diagnostic Information

UBS001CM

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
CAN COMM CIRCUIT	U1000	1000*4	—	—	—	EC-145
CAN COMM CIRCUIT	U1001	1001*4	—	—	X	EC-145
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	0000	—	—	—	—
INT/V TIM CONT-B1	P0011	0011	—	—	X	EC-148
HO2S1 HTR (B1)	P0031	0031	X	X	X*2	EC-151
HO2S1 HTR (B1)	P0032	0032	X	X	X*2	EC-151
HO2S2 HTR (B1)	P0037	0037	X	X	X*2	EC-157
HO2S2 HTR (B1)	P0038	0038	X	X	X*2	EC-157
MAF SEN/CIRCUIT	P0101	0101	—	—	—	EC-163
MAF SEN/CIRCUIT	P0102	0102	—	—	—	EC-171
MAF SEN/CIRCUIT	P0103	0103	—	—	—	EC-171
IAT SEN/CIRCUIT	P0112	0112	—	—	X	EC-177
IAT SEN/CIRCUIT	P0113	0113	—	—	X	EC-177
ECT SEN/CIRCUIT	P0117	0117	—	—	—	EC-181
ECT SEN/CIRCUIT	P0118	0118	—	—	—	EC-181
TP SEN 2/CIRC	P0122	0122	—	—	—	EC-186
TP SEN 2/CIRC	P0123	0123	—	—	—	EC-186
ECT SENSOR	P0125	0125	—	—	—	EC-193
IAT SENSOR	P0127	0127	—	—	X	EC-196
THERMSTAT FNCTN	P0128	0128	—	—	X	EC-199
HO2S1 (B1)	P0132	0132	X	X	X*3	EC-201
HO2S1 (B1)	P0133	0133	X	X	X*3	EC-207
HO2S1 (B1)	P0134	0134	X	X	X*3	EC-216
HO2S2 (B1)	P0138	0138	X	X	X*3	EC-223
HO2S2 (B1)	P0139	0139	X	X	X*3	EC-230
FUEL SYS-LEAN-B1	P0171	0171	—	—	X	EC-238
FUEL SYS-RICH-B1	P0172	0172	—	—	X	EC-245
FTT SENSOR	P0181	0181	—	—	X	EC-251
FTT SEN/CIRCUIT	P0182	0182	—	—	X	EC-256
FTT SEN/CIRCUIT	P0183	0183	—	—	X	EC-256
TP SEN 1/CIRC	P0222	0222	—	—	—	EC-260
TP SEN 1/CIRC	P0223	0223	—	—	—	EC-260
MULTI CYL MISFIRE	P0300	0300	—	—	X	EC-267
CYL1 MISFIRE	P0301	0301	—	—	X	EC-267
CYL2 MISFIRE	P0302	0302	—	—	X	EC-267

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
CYL3 MISFIRE	P0303	0303	—	—	X	EC-267
CYL4 MISFIRE	P0304	0304	—	—	X	EC-267
KNOCK SEN/CIRC-B1	P0327	0327	—	—	X	EC-273
KNOCK SEN/CIRC-B1	P0328	0328	—	—	X	EC-273
CKP SEN/CIRCUIT	P0335	0335	—	—	X	EC-277
CMP SEN/CIRCUIT	P0340	0340	—	—	X	EC-283
TW CATALYST SYS-B1	P0420	0420	X	X	X*3	EC-289
EVAP PURG FLOW/MON	P0441	0441	X	X	X*3	EC-294
EVAP SMALL LEAK	P0442	0442	X	X	X*3	EC-301
PURG VOLUME CONT/V	P0444	0444	—	—	X	EC-311
PURG VOLUME CONT/V	P0445	0445	—	—	X	EC-311
VENT CONTROL VALVE	P0447	0447	—	—	X	EC-317
EVAP SYS PRES SEN	P0452	0452	—	—	X	EC-324
EVAP SYS PRES SEN	P0453	0453	—	—	X	EC-330
EVAP GROSS LEAK	P0455	0455	—	X	X*3	EC-338
EVAP VERY SML LEAK	P0456	0456	X*4	X	X*3	EC-346
FUEL LEV SEN SLOSH	P0460	0460	—	—	X	EC-354
FUEL LEVEL SENSOR	P0461	0461	—	—	X	EC-356
FUEL LEVL SEN/CIRC	P0462	0462	—	—	X	EC-359
FUEL LEVL SEN/CIRC	P0463	0463	—	—	X	EC-359
VEH SPEED SEN/CIRC	P0500	0500	—	—	X	EC-361
ISC SYSTEM	P0506	0506	—	—	X	EC-363
ISC SYSTEM	P0507	0507	—	—	X	EC-365
PW ST P SEN/CIRC	P0550	0550	—	—	X	EC-367
ECM	P0605	0605	—	—	X	EC-372
PNP SW/CIRC	P0705	0705	—	—	X	AT-116
ATF TEMP SEN/CIRC	P0710	0710	—	—	X	AT-121
VEH SPD SEN/CIR AT	P0720	0720	—	—	X	AT-127
ENGINE SPEED SIG	P0725	0725	—	—	X	AT-132
A/T 1ST GR FNCTN	P0731	0731	—	—	X	AT-136
A/T 2ND GR FNCTN	P0732	0732	—	—	X	AT-141
A/T 3RD GR FNCTN	P0733	0733	—	—	X	AT-146
A/T 4TH GR FNCTN	P0734	0734	—	—	X	AT-151
TCC SOLENOID/CIRC	P0740	0740	—	—	X	AT-160
A/T TCC S/V FNCTN	P0744	0744	—	—	X	AT-164
L/PRESS SOL/CIRC	P0745	0745	—	—	X	AT-174
SFT SOL A/CIRC	P0750	0750	—	—	—	AT-180
SFT SOL B/CIRC	P0755	0755	—	—	—	AT-184
ECM BACK UP/CIRC	P1065	1065	—	—	X	EC-375
MAF SENSOR	P1102	1102	—	—	—	EC-379
INT/V TIM V/CIR-B1	P1111	1111	—	—	X	EC-385
ETC ACTR	P1121	1121	—	—	X	EC-390

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
ETC FUNCTION/CIRC	P1122	1122	—	—	—	EC-392
ETC MOT PWR	P1124	1124	—	—	—	EC-399
ETC MOT PWR	P1126	1126	—	—	—	EC-399
ETC MOT	P1128	1128	—	—	—	EC-404
HO2S1 (B1)	P1143	1143	X	X	X*3	EC-409
HO2S1 (B1)	P1144	1144	X	X	X*3	EC-415
HO2S2 (B1)	P1146	1146	X	X	X*3	EC-421
HO2S2 (B1)	P1147	1147	X	X	X*3	EC-428
CLOSED LOOP-B1	P1148	1148	—	—	—	EC-436
ENG OVER TEMP	P1217	1217	—	—	—	EC-438
CTP LEARNING	P1225	1225	—	—	X	EC-451
CTP LEARNING	P1226	1226	—	—	X	EC-453
PURG VOLUME CONT/V	P1444	1444	—	—	X	EC-460
VENT CONTROL VALVE	P1446	1446	—	—	X	EC-468
ASCD SW	P1564	1564	—	—	—	EC-474
ASCD BRAKE SW	P1572	1572	—	—	—	EC-481
ASCD VHL SPD SEN	P1574	1574	—	—	—	EC-491
TP SEN/CIRC A/T	P1705	1705	—	—	—	AT-188
P-N POS SW/CIRCUIT	P1706	1706	—	—	X	EC-493
O/R CLTCH SOL/CIRC	P1760	1760	—	—	X	AT-194
BRAKE SW/CIRCUIT	P1805	1805	—	—	X	EC-497
APP SEN 1/CIRC	P2122	2122	—	—	—	EC-503
APP SEN 1/CIRC	P2123	2123	—	—	—	EC-503
APP SEN 2/CIRC	P2127	2127	—	—	—	EC-511
APP SEN 2/CIRC	P2128	2128	—	—	—	EC-511
TP SENSOR	P2135	2135	—	—	—	EC-518
APP SENSOR	P2138	2138	—	—	—	EC-525

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012
*3: These are not displayed with GST.
*4: SRT code will not be set if the self-diagnostic result is NG.

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

For malfunctions in which 1st trip DTCs are displayed, refer to EC-59 . These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-II.
1st trip DTC is specified in Mode 7 of SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-82 . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

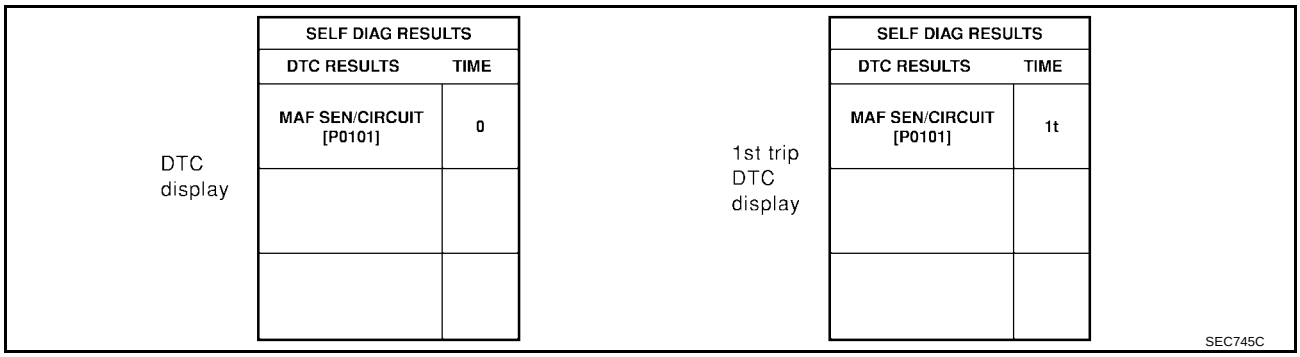
With CONSULT-II

With GST

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P1148, P1706, etc.
These DTCs are prescribed by SAE J2012.
(CONSULT-II also displays the malfunctioning component or system.)

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST does not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.



FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, throttle valve operating angle, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-117 .
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:

The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If MIL is “ON” during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”) and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item (CONSULT-II indication)	Performance Priority*	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
EVAPORATIVE SYSTEM	1	EVAP control system	P0442
	2	EVAP control system	P0456
		EVAP control system purge flow monitoring	P0441
HO2S	2	Heated oxygen sensor 1	P0132
		Heated oxygen sensor 1	P0133
		Heated oxygen sensor 1	P0134
		Heated oxygen sensor 1	P1143
		Heated oxygen sensor 1	P1144
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139
		Heated oxygen sensor 2	P1146
		Heated oxygen sensor 2	P1147
HO2S HTR	2	Heated oxygen sensor 1 heater	P0031, P0032
		Heated oxygen sensor 2 heater	P0037, P0038

*: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT-II.

SRT Set Timing

SRT is set as “CMPLT” after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON →	OFF ← ON →	OFF ← ON →	OFF ← ON →
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MIL “ON”)
		SRT of EGR	“INCMP”	“INCMP”	“INCMP”	“CMPLT”

OK: Self-diagnosis is carried out and the result is OK.
NG: Self-diagnosis is carried out and the result is NG.
—: Self-diagnosis is not carried out.

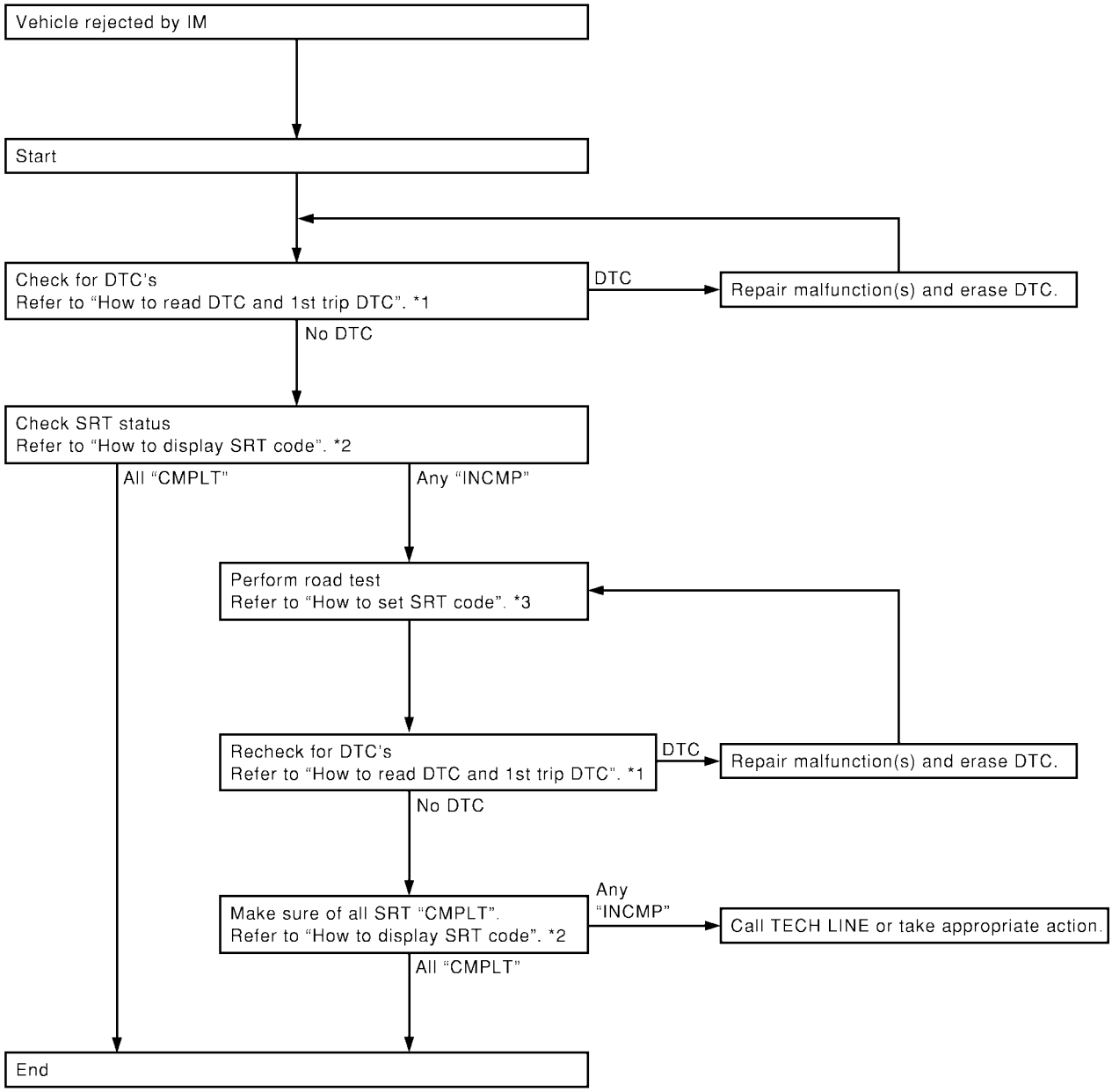
When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above
When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above
If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above
The table above shows that the minimum number of cycles for setting SRT as “INCMP” is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary of each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to “CMPLT” of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:
SRT can be set as “CMPLT” together with the DTC (s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

SRT Service Procedure

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating “INCMP”, review the flowchart diagnostic sequence on the next page.



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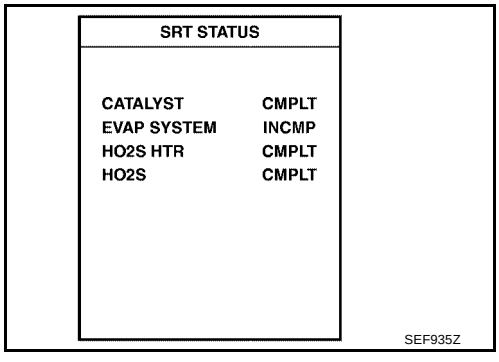
*1 EC-62 *2 EC-66 *3 EC-67

How to Display SRT Code

With CONSULT-II

Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.
For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.



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With GST

Selecting Mode 1 with GST (Generic Scan Tool)

A sample of CONSULT-II display for SRT code is shown below.

“INCMP” means the self-diagnosis is incomplete and SRT is not set. “CMPLT” means the self-diagnosis is complete and SRT is set.

How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

With CONSULT-II

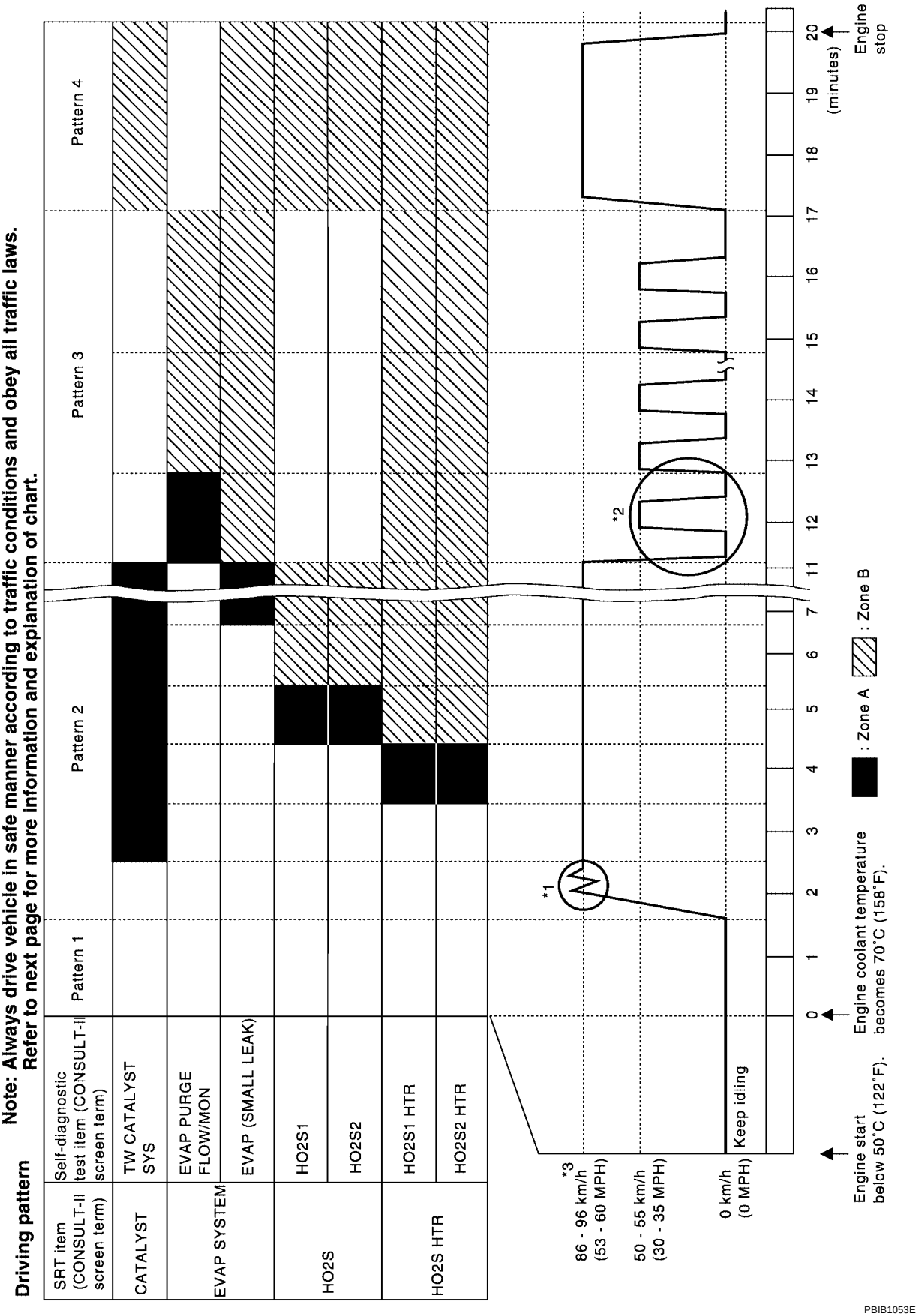
Perform corresponding DTC Confirmation Procedure one by one based on “Performance Priority” in the table on EC-64 .

Without CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern

Driving pattern **Note: Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws.**
Refer to next page for more information and explanation of chart.



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- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time required, for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals 73 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals 73 and ground is lower than 1.4V).**
- **The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 107 and ground is less than 4.1V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

Pattern 3:

- The driving pattern outlined in *2 must be repeated at least 3 times.

Pattern 4:

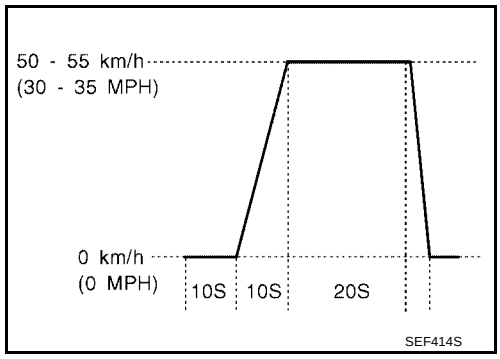
- Tests are performed after the engine has been operated for at least 17 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Operate the vehicle in the following driving pattern.

1. Decelerate vehicle to 0 km/h (0 MPH) and let engine idle.
2. Repeat driving pattern shown below at least 10 times.

– **During acceleration, hold the accelerator pedal as steady as possible.**



*3: Checking the vehicle speed with GST is advised.

Suggested Transmission Gear Position for A/T Models

Set the selector lever in the “D” position with the overdrive switch turned ON.

Suggested upshift speeds for M/T models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:	For quick acceleration in low altitude areas and high altitude areas [over 1,219 m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	km/h (MPH)
1st to 2nd	24 (15)	25 (15)
2nd to 3rd	40 (25)	40 (25)
3rd to 4th	65 (40)	65 (40)
4th to 5th	75 (45)	75 (45)

Suggested Maximum Speed in Each Gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.
Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted speed limits and drive according to the road conditions to ensure safe operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

Gear	km/h (MPH)
1st	48 (30)
2nd	84 (52)
3rd	128 (80)
4th	—
5th	—

TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-II)

The following is the information specified in Mode 6 of SAE J1979.
The test value is a parameter used to determine whether a system/circuit diagnostic test is “OK” or “NG” while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items (13 test items).
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

X: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function	02H	81H	Min.	X
EVAP SYSTEM	EVAP control system (Small leak)	05H	03H	Max.	X
	EVAP control system purge flow monitoring	06H	83H	Min.	X
HO2S	Heated oxygen sensor 1	09H	04H	Max.	X
		0AH	84H	Min.	X
		0BH	04H	Max.	X
		0CH	04H	Max.	X
		0DH	04H	Max.	X
	Heated oxygen sensor 2	19H	86H	Min.	X
		1AH	86H	Min.	X
		1BH	06H	Max.	X
		1CH	06H	Max.	X
HO2S HTR	Heated oxygen sensor 1 heater	29H	08H	Max.	X
		2AH	88H	Min.	X
	Heated oxygen sensor 2 heater	2DH	0AH	Max.	X
		2EH	8AH	Min.	X

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC (With CONSULT-II)

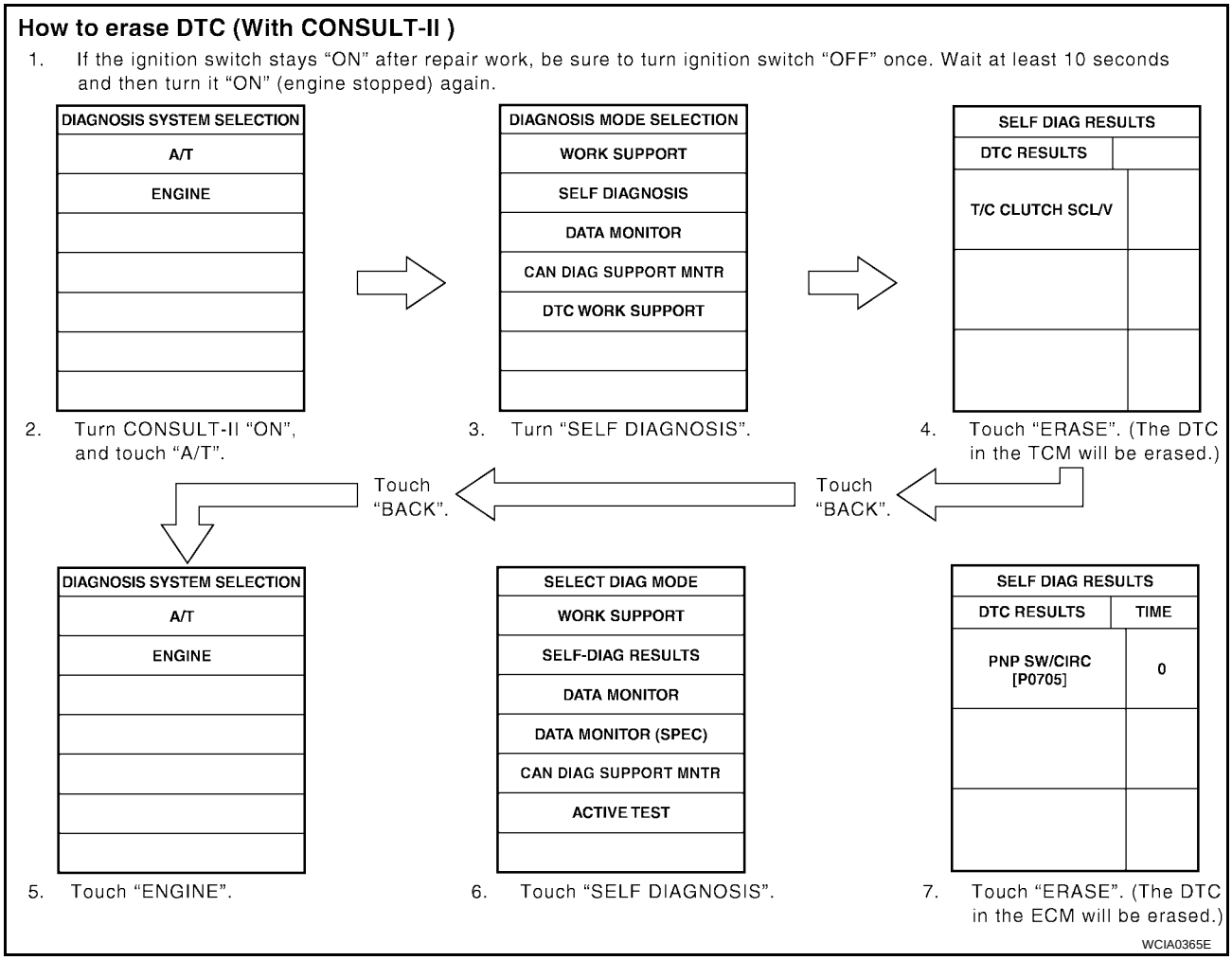
NOTE:
If the DTC is not for A/T related items (see EC-21), skip steps 2 through 4.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “A/T”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. [The DTC in the TCM (Transmission control module) will be erased.] Then touch “BACK” twice.
5. Touch “ENGINE”.
6. Touch “SELF-DIAG RESULTS”.
7. Touch “ERASE”. (The DTC in the ECM will be erased.)

- If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.



How to Erase DTC (With GST)

NOTE:
If the DTC is not for A/T related items (see EC-21), skip step 2.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Perform “SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)” in AT section titled “TROUBLE DIAGNOSIS”, “Self-diagnosis”. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)

3. Select Mode 4 with GST (Generic Scan Tool).

How to Erase DTC (No Tools)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once.
2. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-73, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

– Diagnostic trouble codes
– 1st trip diagnostic trouble codes
– Freeze frame data
– 1st trip freeze frame data
– System readiness test (SRT) codes
– Test values
– Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

Malfunction Indicator Lamp (MIL)

UBS006C3

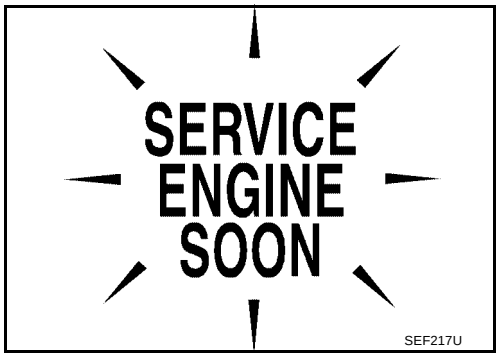
DESCRIPTION

The MIL is located on the instrument panel.

1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.

- If the MIL does not light up, refer to DI-27, "WARNING LAMPS" .

2. When the engine is started, the MIL should go off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.



ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position Engine stopped	BULB CHECK	This function checks the MIL bulb for damage (blown, open circuit, etc.). If the MIL does not come on, check MIL circuit.
	Engine running	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip. ● “Misfire (Possible three way catalyst damage)” ● ″One trip detection diagnoses″

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode II	Ignition switch in “ON” position Engine stopped	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting MIL up when there is NG on engine control system.
Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating fail-safe function.
The fail-safe function also operates when above diagnoses except MIL circuit and demands the driver to repair the trouble.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

MIL Flashing without DTC

If the ECM is in Diagnostic Test Mode II, MIL may flash when engine is running. In this case, check ECM diagnostic test mode, EC-73, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later, EC-73, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned “OFF”.**

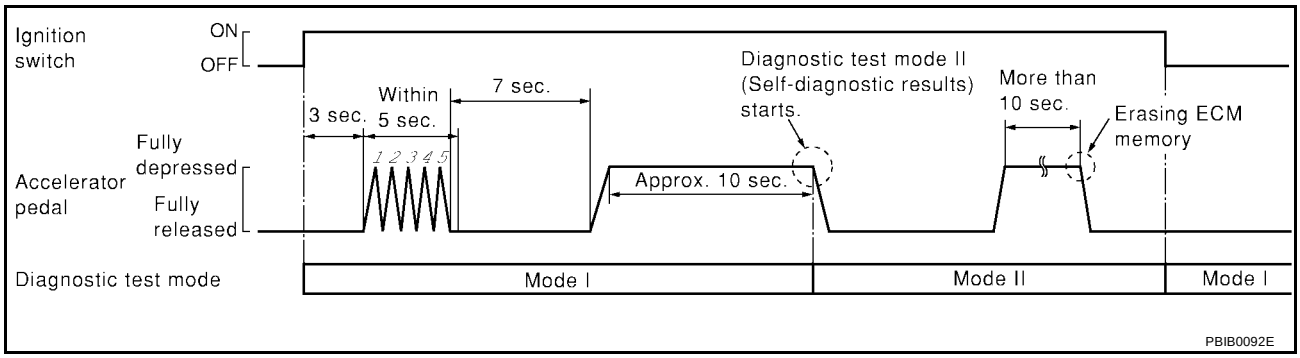
How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MIL starts blinking.
4. Fully release the accelerator pedal.

ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-73, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-73, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-27, "WARNING LAMPS" .

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

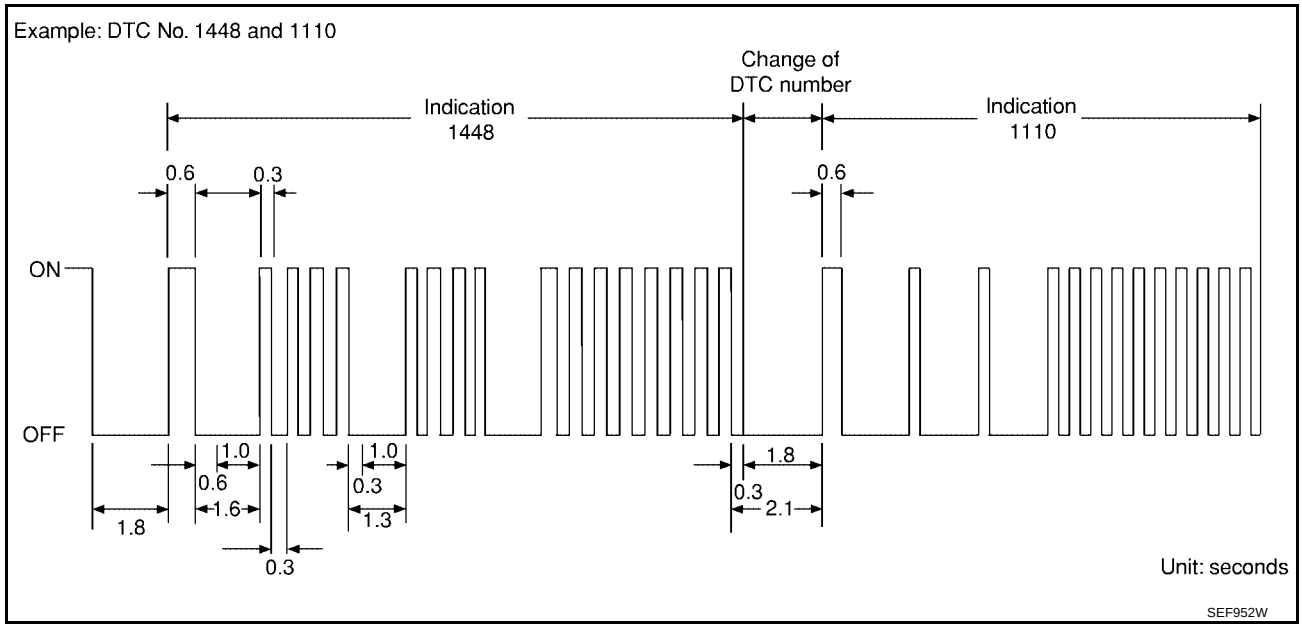
MIL	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

- These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below. The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These uniden-

tified codes can be identified by using the CONSULT-II or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-21, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-73, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MIL displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MIL	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MIL comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

OBD System Operation Chart

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RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to EC-58, "Two Trip Detection Logic" .
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in “OK” for the 2nd trip.

SUMMARY CHART

Items	Fuel Injection System	Misfire	Other
MIL (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

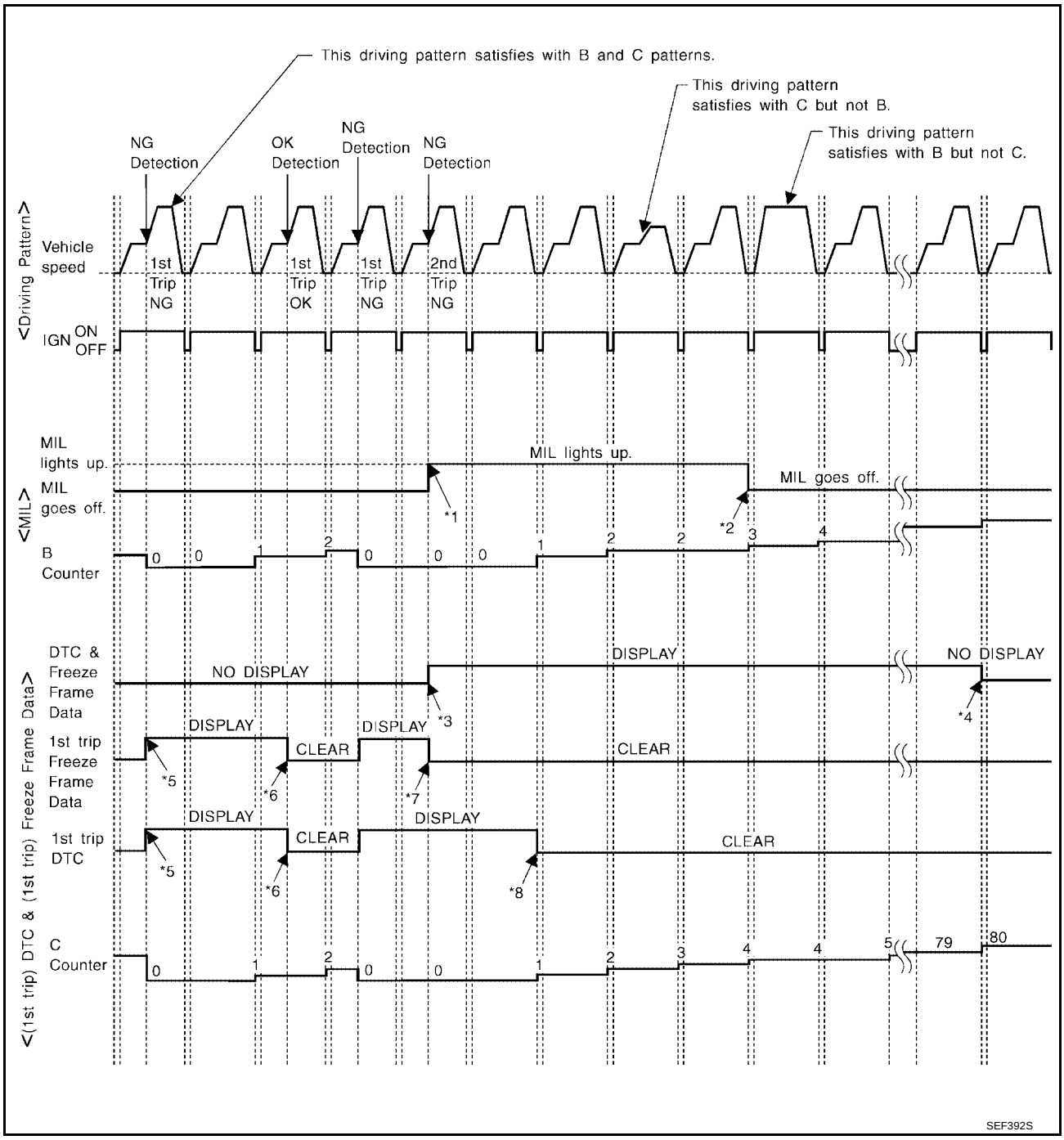
For details about patterns “B” and “C” under “Fuel Injection System” and “Misfire”, see EC-78 .

For details about patterns “A” and “B” under “Other”, see EC-80 .

*1: Clear timing is at the moment OK is detected.

*2: Clear timing is when the same malfunction is detected in the 2nd trip.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>, "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will go off when the B counter reaches 3. (*2 in "OBD SYSTEM OPERATION CHART")

<Driving Pattern C>

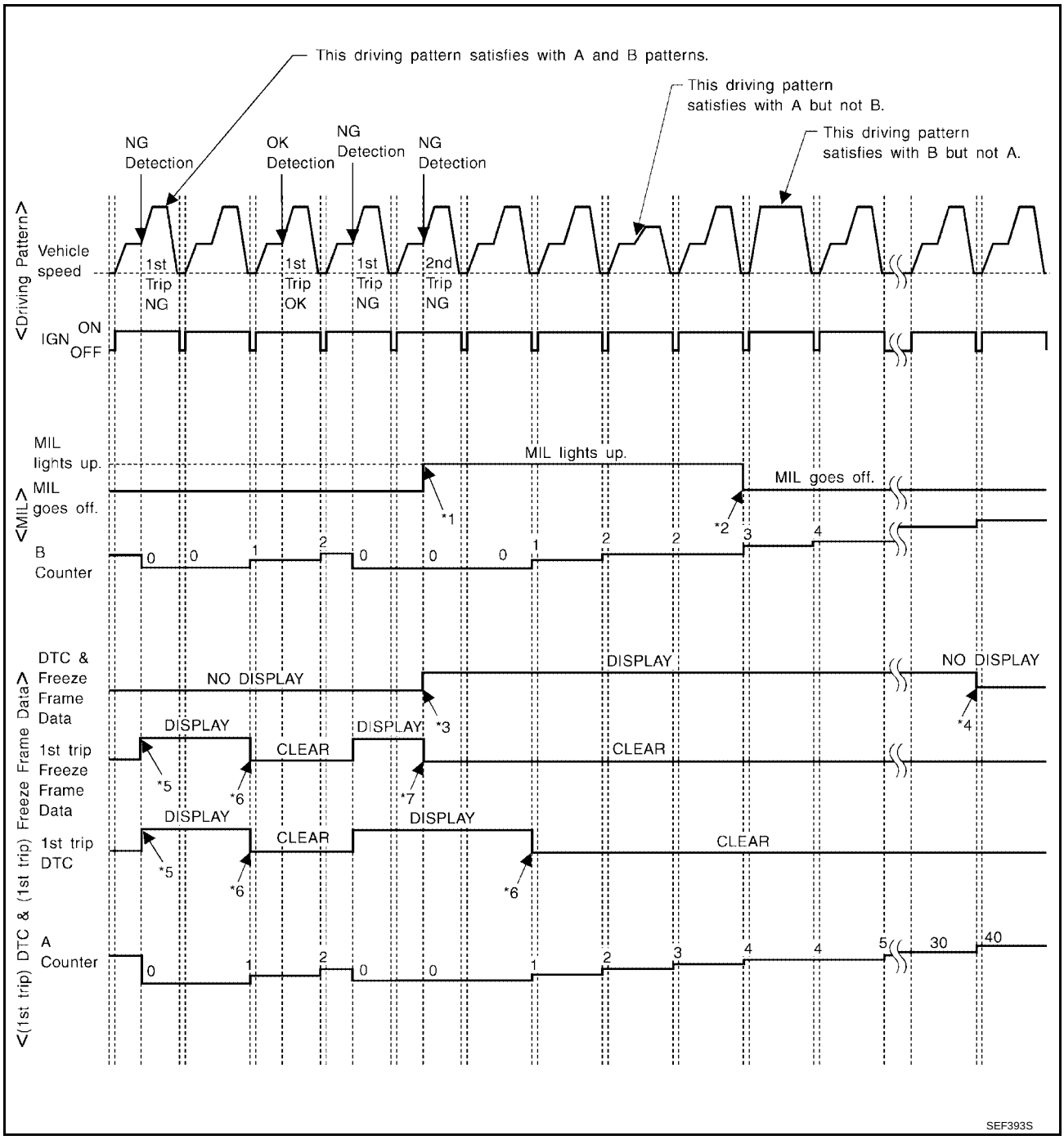
Driving pattern C means the vehicle operation as follows:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) × (1±0.1) [%]
Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of vehicle conditions above.
- The C counter will be counted up when vehicle conditions above is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

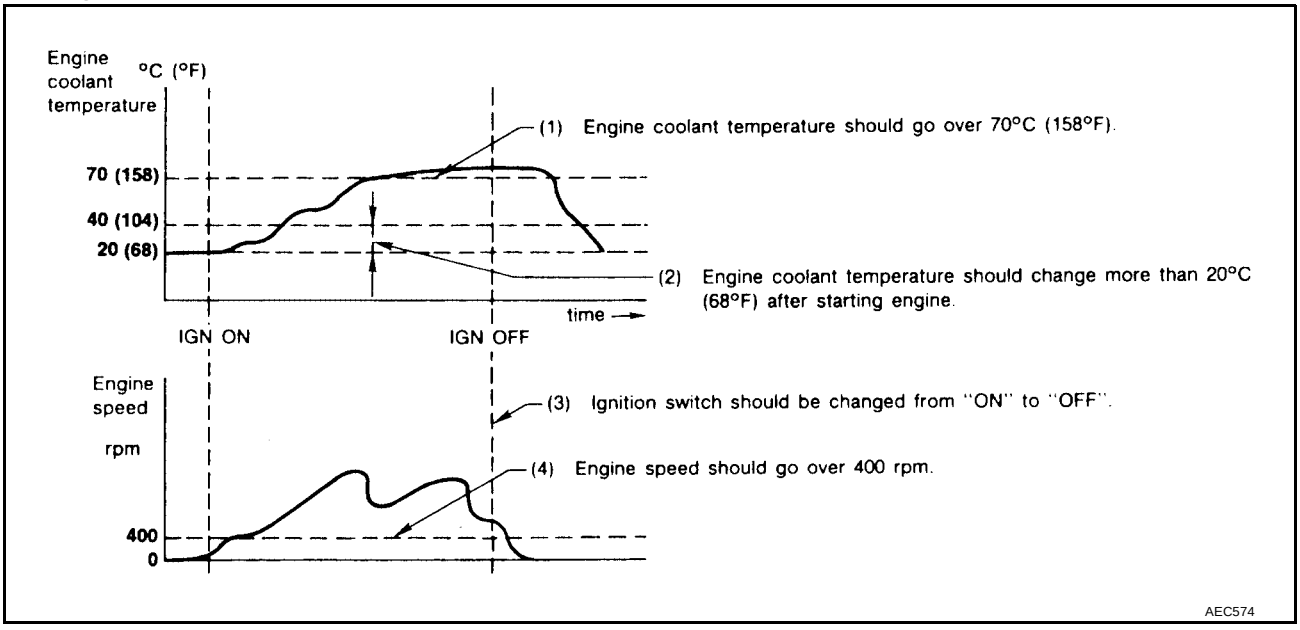
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").

TROUBLE DIAGNOSIS

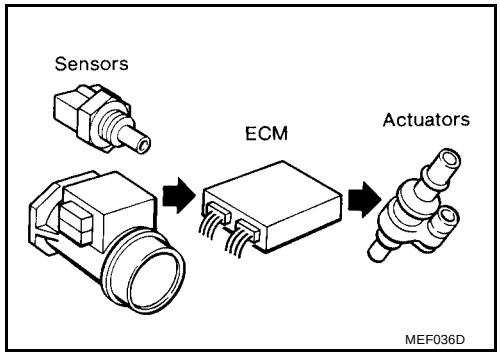
PFP:00004

Trouble Diagnosis Introduction

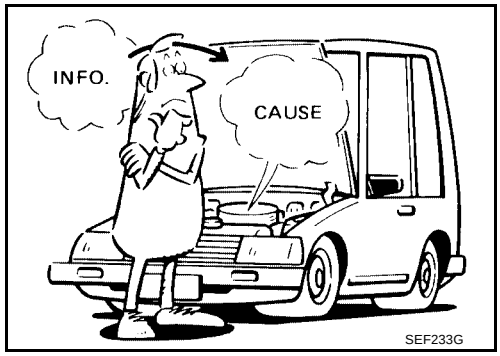
UBS001CP

INTRODUCTION

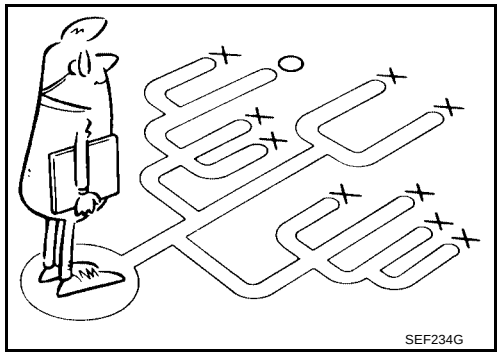
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.



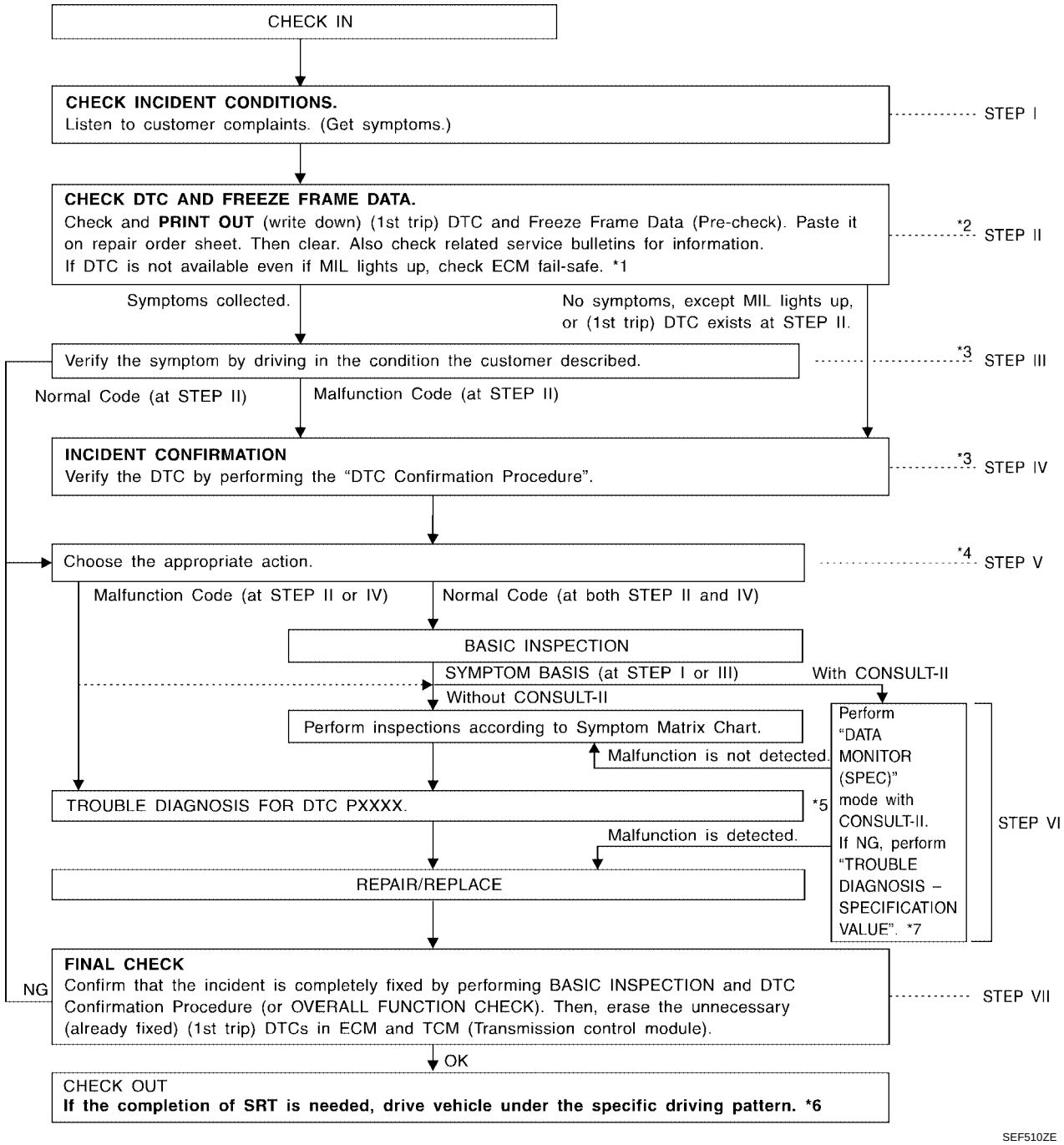
It is much more difficult to diagnose a incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



A visual check only may not find the cause of the incidents. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-82 .
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on next page should be used.
Start your diagnosis by looking for “conventional” malfunctions first. This will help troubleshoot driveability malfunctions on an electronically controlled engine vehicle.



WORK FLOW
Flow Chart



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*1: EC-87

*2: If time data of "SELF-DIAG RESULTS" is other than "0" or "1t", refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3: If the incident cannot be duplicated, refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*4: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-138, "POWER SUPPLY CIRCUIT FOR ECM" .

*5: If the malfunctioning part cannot be found, refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*6: EC-68

*7: EC-133

Description for Work Flow

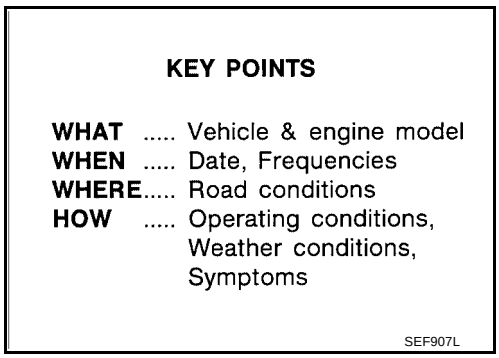
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the EC-84, "DIAGNOSTIC WORKSHEET" .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or Generic Scan Tool) the (1st trip) Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-71 .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot verified, perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-93 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot verified, perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) Diagnostic Trouble Code by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot verified, perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall function check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to trouble diagnosis for DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-88 .) If CONSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TROUBLE DIAGNOSIS — SPECIFICATION VALUE”. (If malfunction is detected, proceed to “REPAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-93 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-105 , EC-126 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" . Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer toEC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and AT-40, "HOW TO ERASE DTC" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.
Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.



Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

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DTC Inspection Priority Chart

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NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE".
If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority	Detected items (DTC)
1	● U1000, U1001 CAN communication ● P0101, P0102, P0103, P1102 Mass air flow sensor ● P0112, P0113, P0127 Intake air temperature sensor ● P0117, P0118, P0125 Engine coolant temperature sensor ● P0122, P0123, P0222, P0223, P1225, P1226, P2135 Throttle position sensor ● P0128 Thermostat function ● P0181, P0182, P0183 Fuel tank temperature sensor ● P0327, P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0460, P0461, P0462, P0463 Fuel level sensor ● P0500 Vehicle speed sensor ● P0605 ECM ● P0705 Park/Neutral position (PNP) switch ● P1229 Sensor power supply ● P1706 Park/Neutral position (PNP) switch ● P2122, P2123, P2127, P2128, P2138 Accelerator pedal position sensor
2	● P0031, P0032 Heated oxygen sensor 1 heater ● P0037, P0038 Heated oxygen sensor 2 heater ● P0132, P0133, P0134, P1143, P1144 Heated oxygen sensor 1 ● P0138, P0139, P1146, P1147 Heated oxygen sensor 2 ● P0441 EVAP control system purge flow monitoring ● P0444, P0445, P1444 EVAP canister purge volume control solenoid valve ● P0447, P1446, P1448 EVAP canister vent control valve ● P0452, P0453 EVAP system pressure sensor ● P0550 Power steering pressure sensor ● P0710-P0725, P0740-P0755, P1705, P1760 A/T related sensors and solenoid valves ● P1065 ECM power supply ● P112 Electric throttle control function ● P1124, P1126, P1128 Electric throttle control actuator ● P1805 Brake switch
3	● P0011 Intake valve timing control ● P0171, P0172 Fuel injection system function ● P0300-P0304 Misfire ● P0420 Three way catalyst function ● P0442, P0455, P0456 EVAP control system ● P0506, P0507 Idle speed control system ● P0731-P0734 A/T function ● P1111 Intake valve timing control solenoid valve ● P1121 Electric throttle control ● P1148 Closed loop control ● P1217 Engine over temperature ● P1564 ASCD steering switch ● P1572 ASCD brake switch ● P1574 ASCD vehicle speed sensor

Fail-safe Chart

UBS006C4

- When the DTC listed below is detected, the ECM enters fail-safe mode and the MIL lights up.

DTC No.	Detected items	Engine operating condition in fail-safe mode
P0102 P0103 P1102	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.
P0117 P0118	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.
		Condition: Just as ignition switch is turned ON or Start — Engine coolant temperature decided (CONSULT-II display): 40°C (104°F)
		Condition: More than approx. 4 minutes after ignition ON or Start — Engine coolant temperature decided (CONSULT-II display): 80°C (176°F)
		Condition: Except as shown above — Engine coolant temperature decided (CONSULT-II display): 40 - 80°C (104 - 176°F) (Depends on the time)
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.
P1121	Electric throttle control actuator (ECM detect the throttle valve is stuck open.)	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.
P1122	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1124 P1126	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1128	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring
P1229	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

- When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting MIL up when there is NG on engine control system.
  Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating fail-safe function.
  The fail-safe function also operates when above diagnoses except MIL circuit and demands the driver to repair the trouble.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

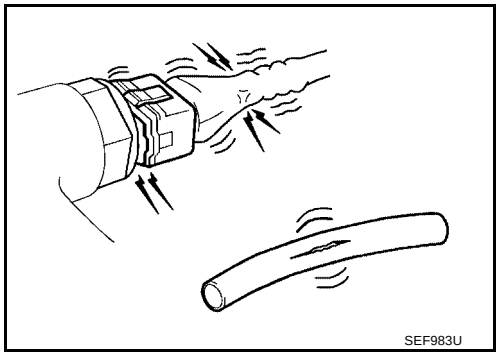
Basic Inspection

UBS006DP

1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:

- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket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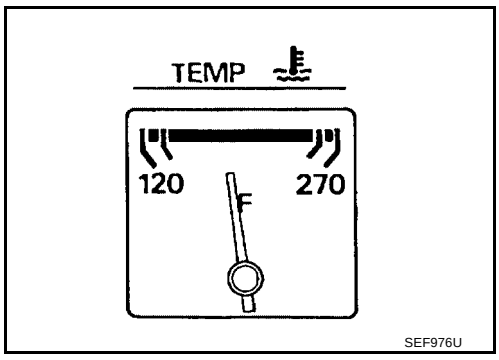
3. Confirm that electrical or mechanical loads are not applied.

- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.

4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
   Ensure engine stays below 1,000 rpm.



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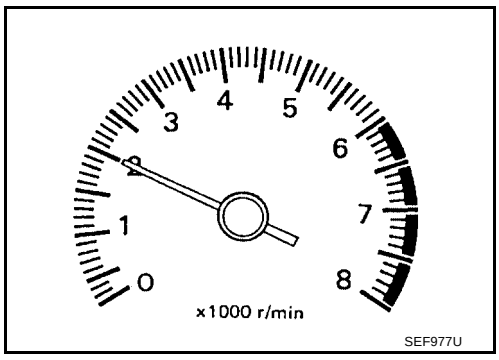
5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



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2. REPAIR OR REPLACE

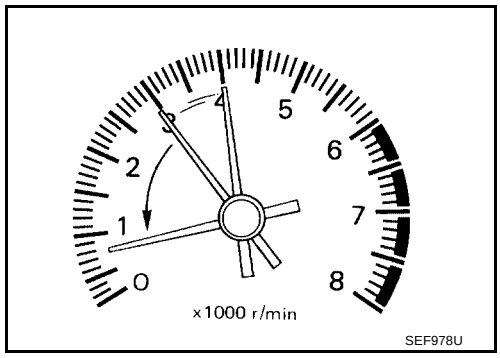
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

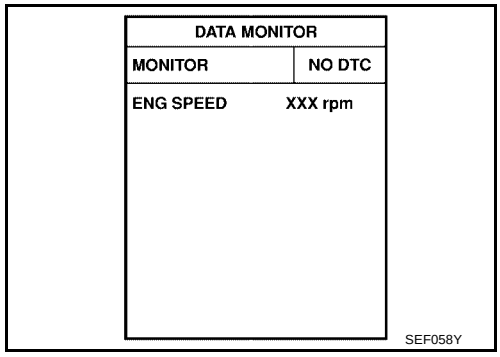
With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-53, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-53, "Idle Air Volume Learning" .

Is ″Idle Air Volume Learning″ carried out successfully?

Yes or No

Yes >> GO TO 7.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-283 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-277 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 7 ± 5° BTDC
A/T: 18 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-53, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-53, "Idle Air Volume Learning" .

Is ″Idle Air Volume Learning″ carried out successfully?

Yes or No

Yes >> GO TO 14.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 7 ± 5° BTDC
A/T: 18 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-39, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-283 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-277 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

Symptom Matrix Chart
SYSTEM — ENGINE CONTROL SYSTEM

UBS001CT

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-553
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-56
	Injector circuit	1	1	2	3	2		2	2			2			EC-547
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-583
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-596
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-88
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-390, EC-392
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-88
	Ignition circuit	1	1	2	2	2		2	2			2			EC-535
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3		2	EC-138
Air conditioner circuit		2	2	3	3	3	3	3	3	3		3		2	MTC-19

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Crankshaft position sensor (POS) circuit	2	2	3	3	3		3	3			3			EC-277
Camshaft position sensor (PHASE) circuit	2	2	3	3	3		3	3			3			EC-283
Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-163,EC-171 ,EC-379
Heated oxygen sensor 1 circuit		1	2	3	2		2	2			2			EC-201,EC-207 ,EC-216 ,EC-409 ,EC-415
Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-181, EC-193
Throttle position sensor circuit		1	2		2	2	2	2	2		2			EC-186,EC-260 ,EC-451 ,EC-453 ,,EC-518
Accelerator pedal position sensor circuit			3	2	1	2			2					EC-455,EC-503 EC-511 , EC-525
Intake valve timing control system		3	3		3		3				3			EC-385
Vehicle speed signal circuit		2	3		3						3			EC-361
Knock sensor circuit			2								3			EC-273
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-372
PNP switch circuit			3		3		3	3			3			EC-493
Power steering pressure sensor circuit		2				3	3	3	3					EC-367
Electrical load signal circuit							3	3						EC-564

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-7,EM-19
	Fuel piping			5	5	5		5	5			5			
	Vapor lock														
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														
Air	Air duct	5	5	5	5	5	5	5	5	5		5			
	Air cleaner														
	Air leakage from air duct (Mass air flow sensor — throttle body)														
	Electric throttle control actuator														EC-390,EC-392
	Air leakage from intake manifold/ Collector/Gasket														—
Cranking	Battery	1	1	1		1		1	1			1		1	SC-4
	Generator circuit														SC-22
	Starter circuit	3													SC-9
	Flywheel/Drive plate/Signal plate	6													EM-67
	PNP switch	4													MT-13 or AT-116

1 - 6: The numbers refer to the order of inspection.

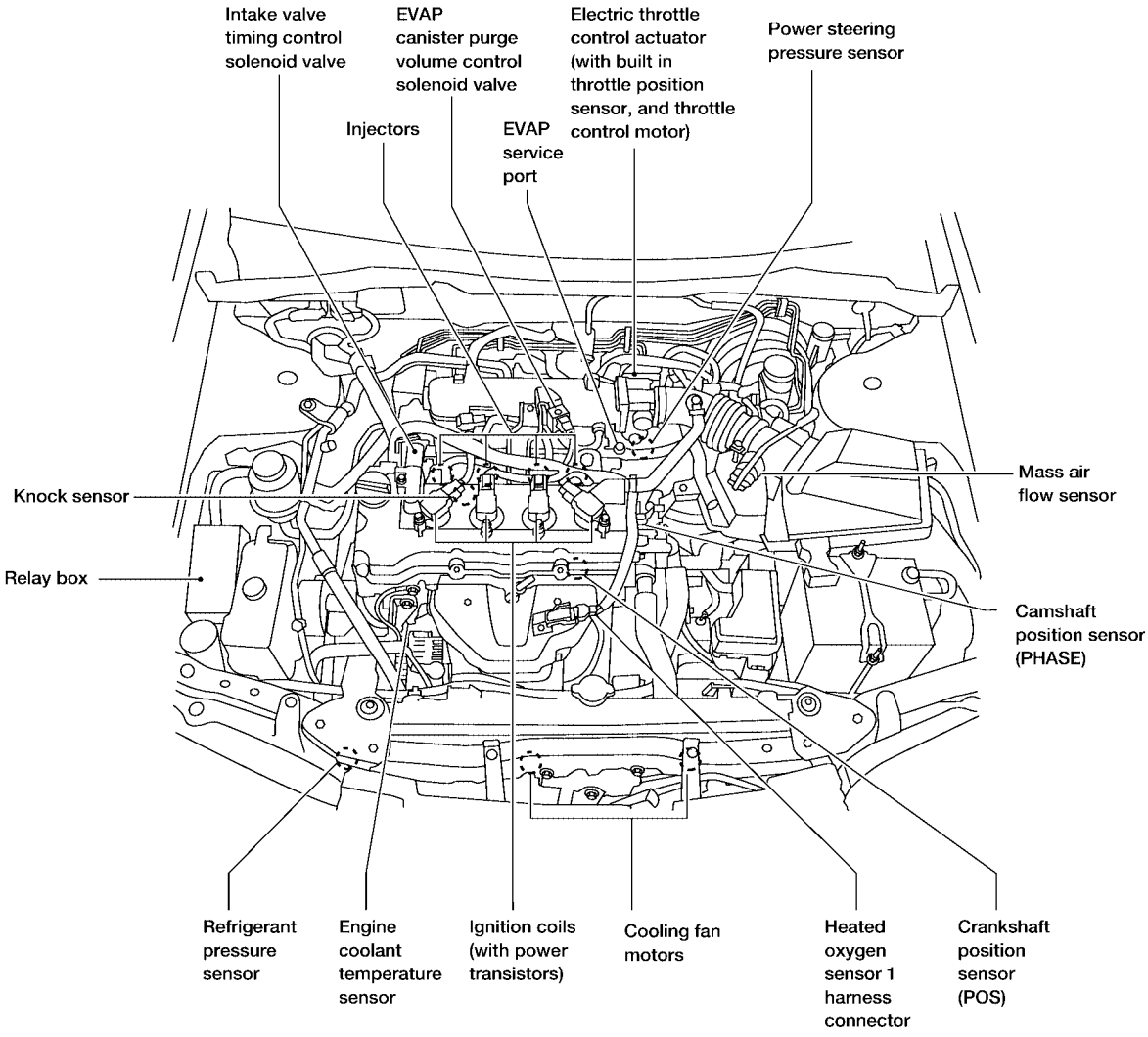
(continued on next page)

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-52
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-67
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			EM-39
	Camshaft														EM-26
	Intake valve												3		EM-52
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-12,EX-3
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			EM-16,LU-8 ,LU-7 ,LU-4
	Oil level (Low)/Filthy oil														LU-5
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-13
	Thermostat									5					CO-11
	Water pump														CO-9
	Water gallery														CO-6
	Cooling fan									5					EC-438
	Coolant level (low)/Contaminated coolant														CO-7

1 - 6: The numbers refer to the order of inspection.

Engine Control Component Parts Location

UBS001CU



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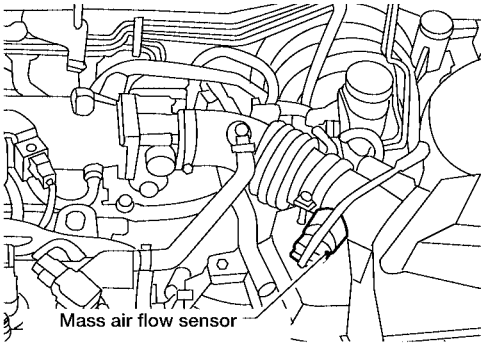
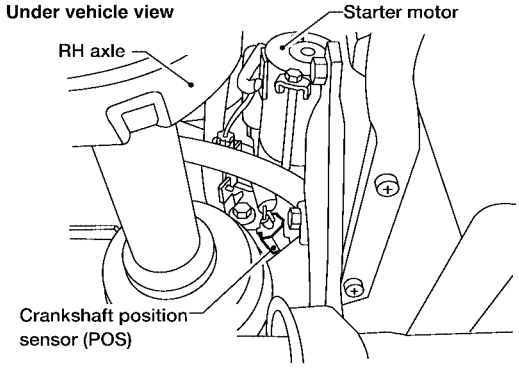
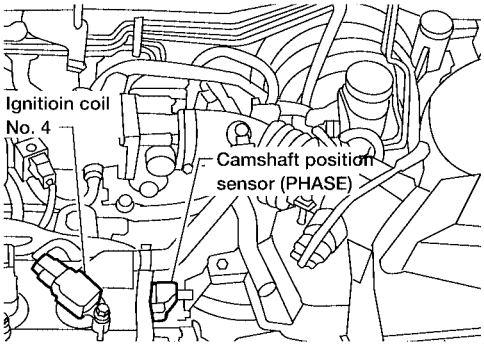
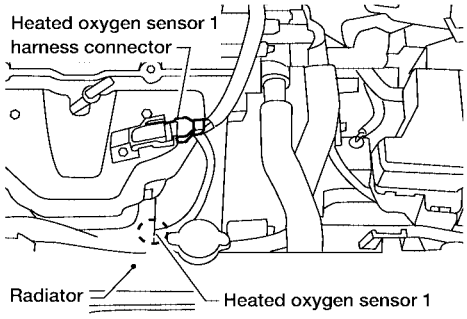
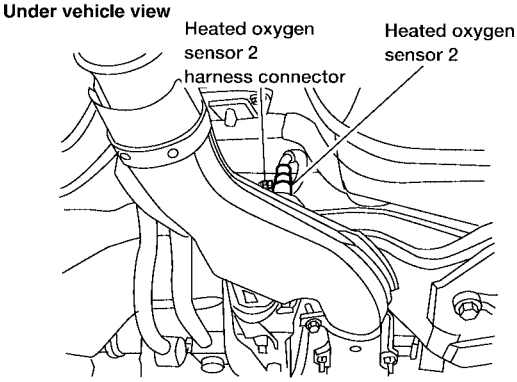
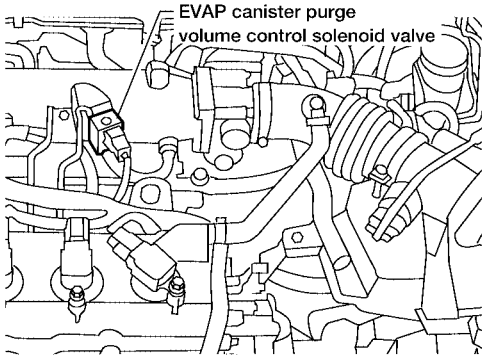

Mass air flow sensor


Under vehicle view
Starter motor
RH axle
Crankshaft position sensor (POS)

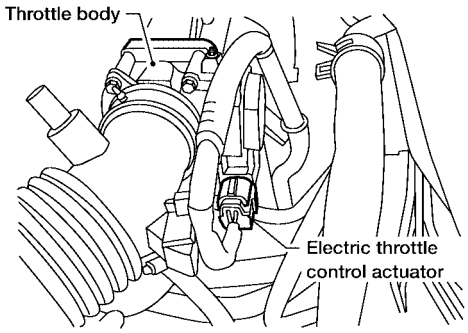

Ignitioin coil No. 4
Camshaft position sensor (PHASE)

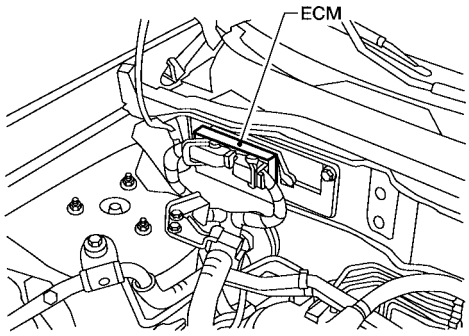

Heated oxygen sensor 1 harness connector
Radiator
Heated oxygen sensor 1


Under vehicle view
Heated oxygen sensor 2 harness connector
Heated oxygen sensor 2

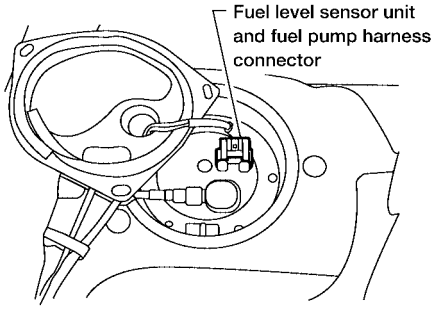

EVAP canister purge volume control solenoid valve

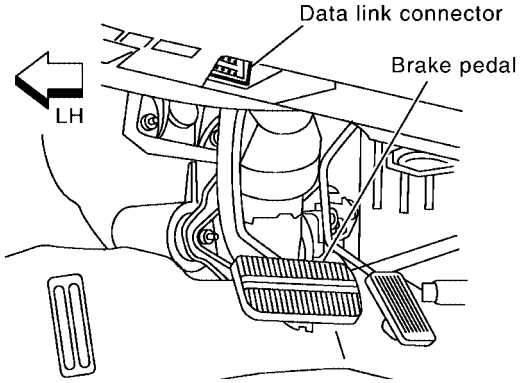
BBIA0142E

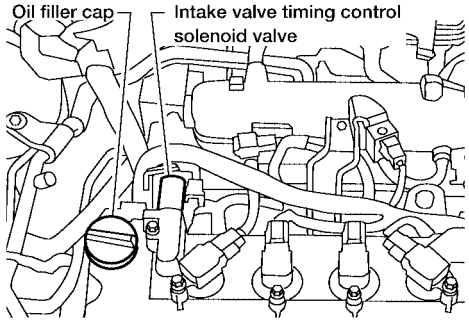




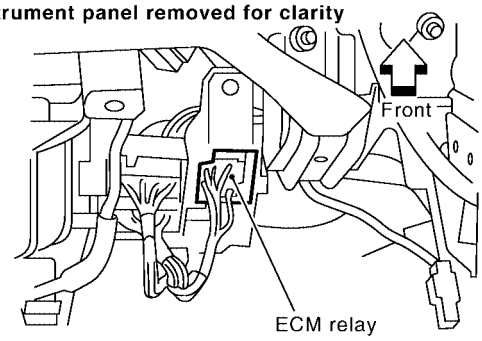
Rear seat access







Instrument panel removed for clarity



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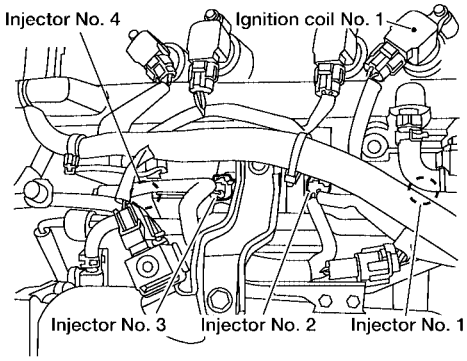
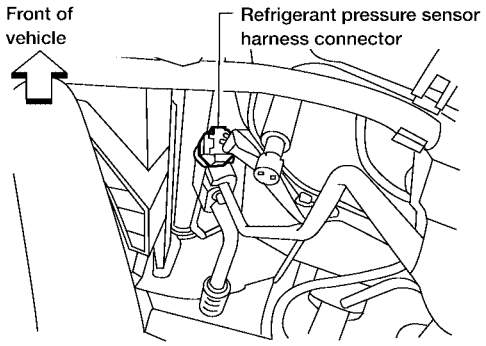
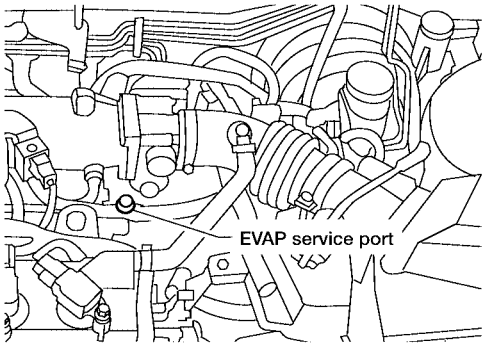
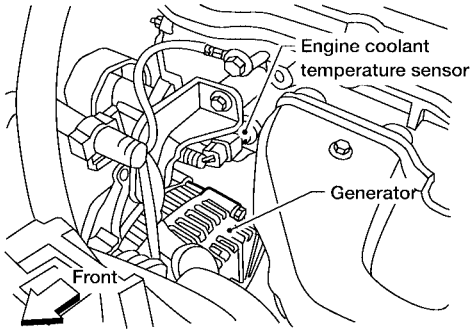
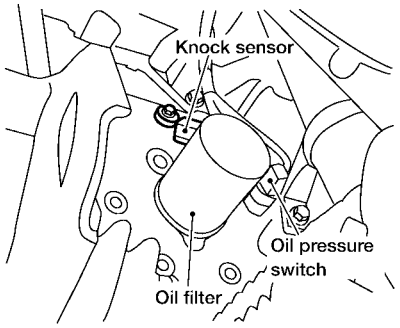
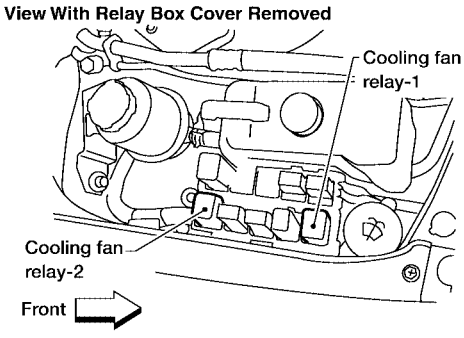

Injector No. 4
Ignition coil No. 1
Injector No. 3
Injector No. 2
Injector No. 1


Front of vehicle
Refrigerant pressure sensor harness connector

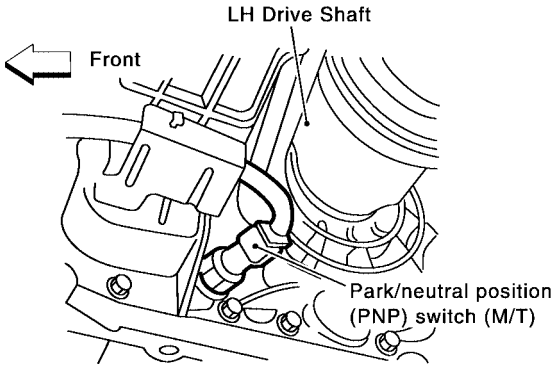

EVAP service port

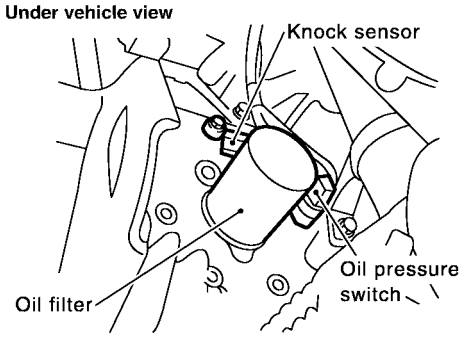

Engine coolant temperature sensor
Generator
Front

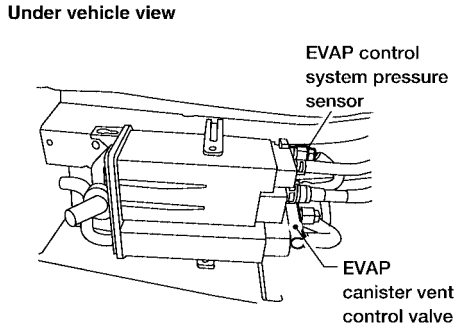

Knock sensor
Oil pressure switch
Oil filter

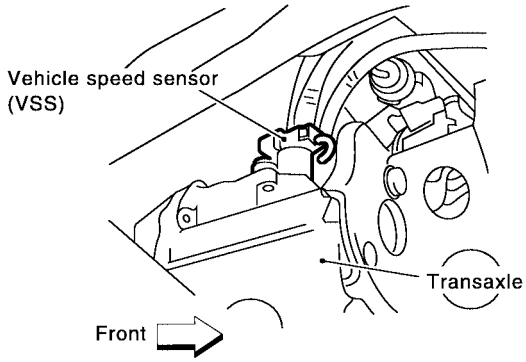

View With Relay Box Cover Removed
Cooling fan relay-1
Cooling fan relay-2
Front

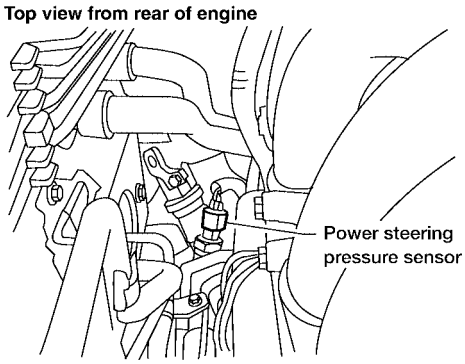
BBIA0144E


LH Drive Shaft
Front
Park/neutral position
(PNP) switch (M/T)

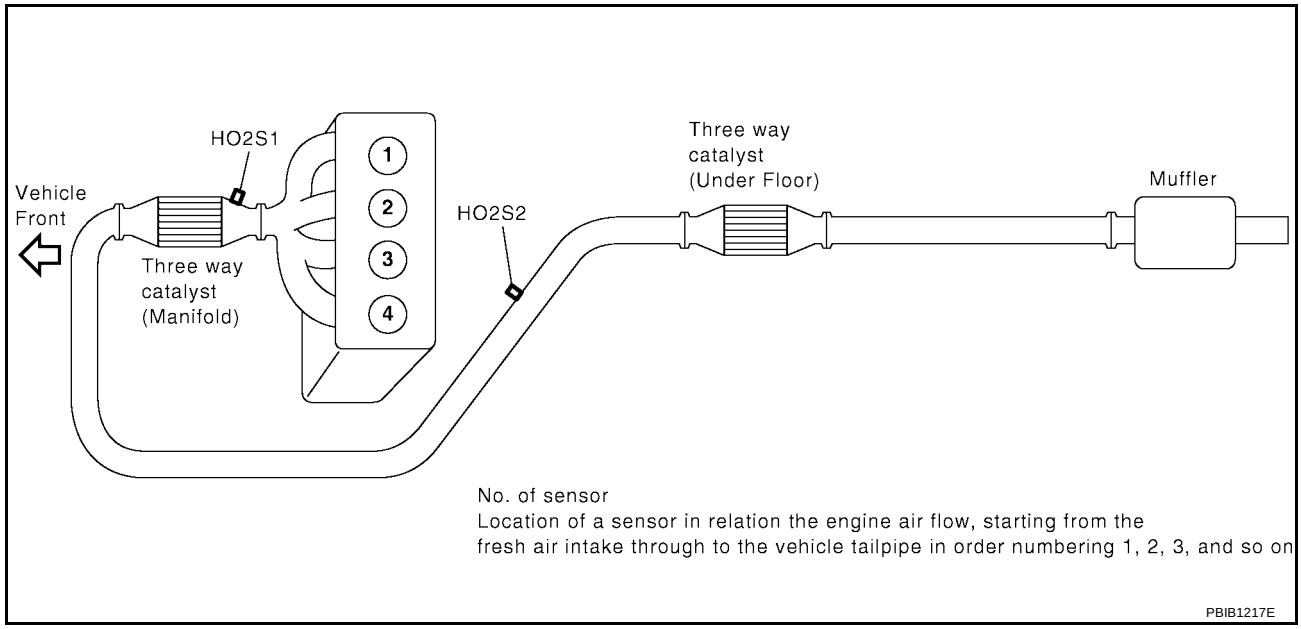

Under vehicle view
Knock sensor
Oil pressure
switch
Oil filter

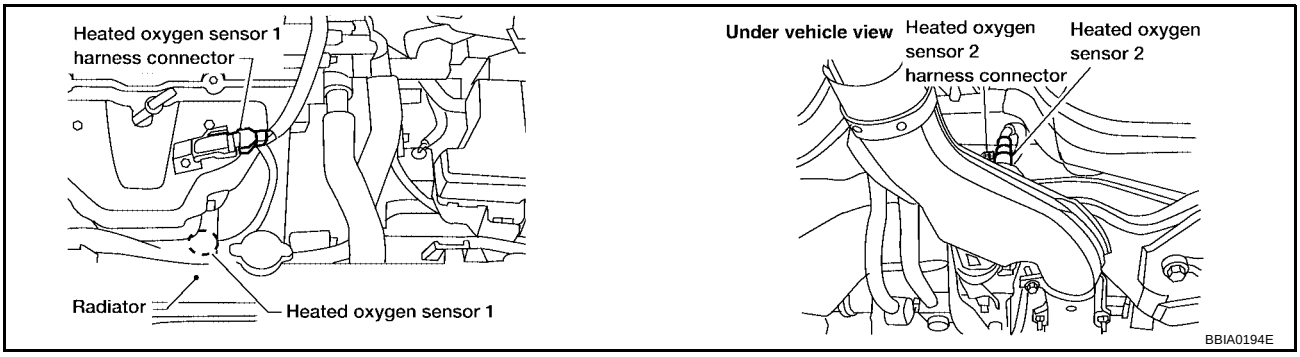

Under vehicle view
EVAP control
system pressure
sensor
EVAP
canister vent
control valve


Vehicle speed sensor
(VSS)
Transaxle
Front


Top view from rear of engine
Power steering
pressure sensor

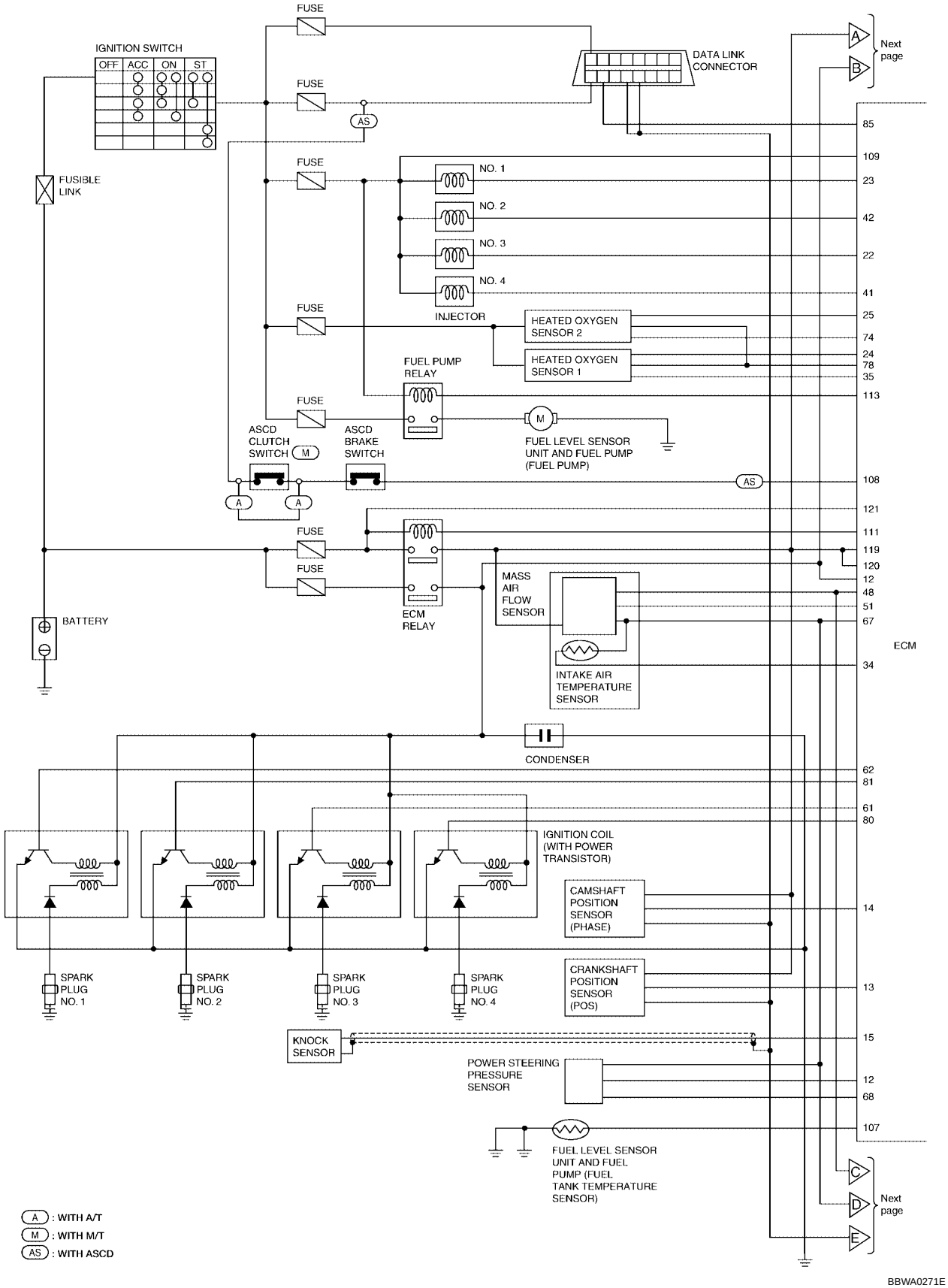
BBIA0145E


HO2S1
Vehicle
Front
Three way
catalyst
(Manifold)
1
2
3
4
HO2S2
Three way
catalyst
(Under Floor)
Muffler
No. of sensor
Location of a sensor in relation the engine air flow, starting from the
fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on
PBIB1217E

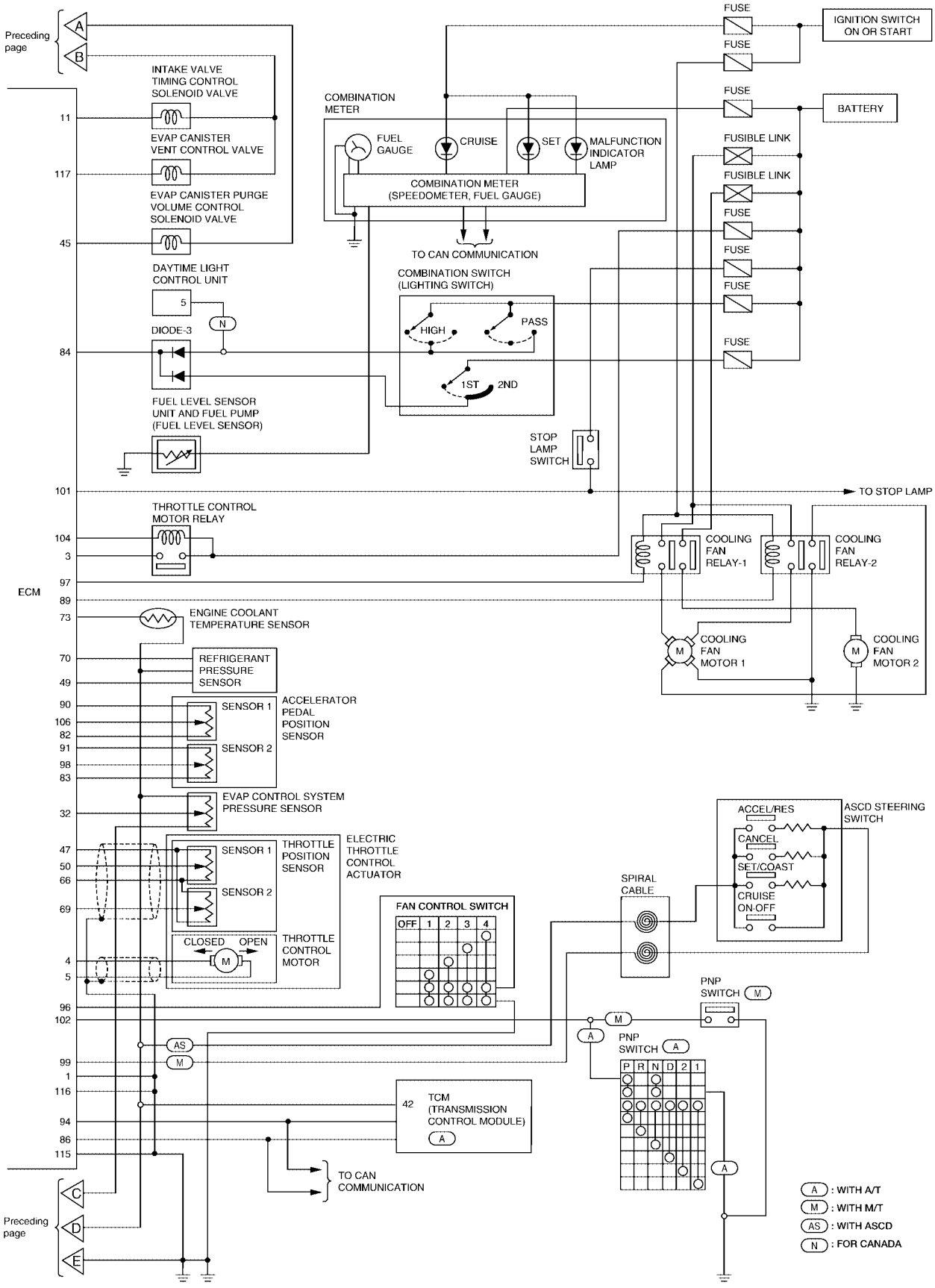

Heated oxygen sensor 1
harness connector
Radiator
Heated oxygen sensor 1
Under vehicle view
Heated oxygen
sensor 2
harness connector
Heated oxygen
sensor 2
BBIA0194E

Circuit Diagram

UBS001CV

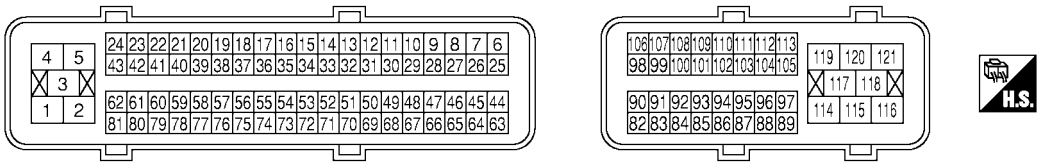


BBWA0271E


Preceding page
A
B
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
11
EVAP CANISTER VENT CONTROL VALVE
117
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
45
DAYTIME LIGHT CONTROL UNIT
5
N
DIODE-3
84
FUEL LEVEL SENSOR UNIT AND FUEL PUMP (FUEL LEVEL SENSOR)
COMBINATION METER
FUEL GAUGE
CRUISE
SET
MALFUNCTION INDICATOR LAMP
COMBINATION METER (SPEEDOMETER, FUEL GAUGE)
TO CAN COMMUNICATION
COMBINATION SWITCH (LIGHTING SWITCH)
HIGH
PASS
1ST
2ND
STOP LAMP SWITCH
FUSE
IGNITION SWITCH ON OR START
BATTERY
FUSIBLE LINK
101
TO STOP LAMP
THROTTLE CONTROL MOTOR RELAY
104
3
97
89
ECM
COOLING FAN RELAY-1
COOLING FAN RELAY-2
COOLING FAN MOTOR 1
COOLING FAN MOTOR 2
73
ENGINE COOLANT TEMPERATURE SENSOR
70
49
REFRIGERANT PRESSURE SENSOR
90
106
82
91
98
83
ACCELERATOR PEDAL POSITION SENSOR
SENSOR 1
SENSOR 2
32
EVAP CONTROL SYSTEM PRESSURE SENSOR
47
50
66
69
4
5
ELECTRIC THROTTLE CONTROL ACTUATOR
THROTTLE POSITION SENSOR
THROTTLE CONTROL MOTOR
CLOSED
OPEN
FAN CONTROL SWITCH
OFF 1 2 3 4
SPIRAL CABLE
ACCEL/RES
CANCEL
SET/COAST
CRUISE ON·OFF
ASCD STEERING SWITCH
PNP SWITCH
M
A
AS
96
102
99
1
116
94
86
115
42
TCM (TRANSMISSION CONTROL MODULE)
TO CAN COMMUNICATION
P R N D 2 1
C
D
E
Preceding page
A : WITH A/T
M : WITH M/T
AS : WITH ASCD
N : FOR CANADA
BBWA0272E

ECM Harness Connector Terminal Layout

UBS001CW



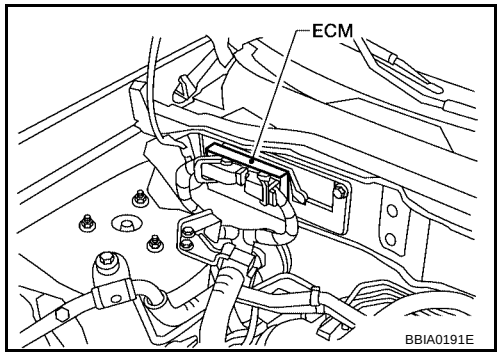
MBIB0045E

ECM Terminals and Reference Value

UBS001CX

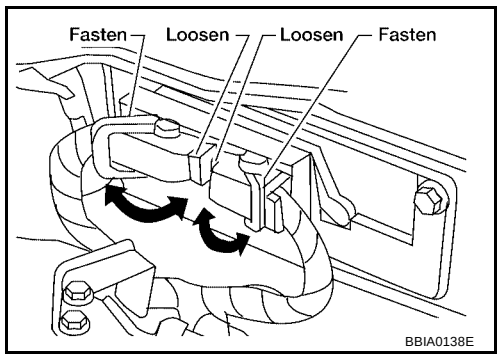
PREPARATION

1. ECM is located in the right side of the cowl top (behind the strut tower).
2. Remove ECM harness connector.



BBIA0191E

3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as shown at right.
4. Connect a bread-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



BBIA0138E

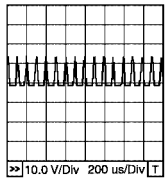
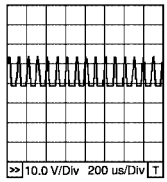
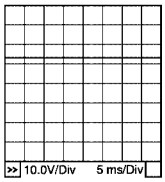
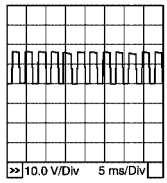
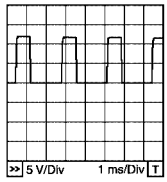
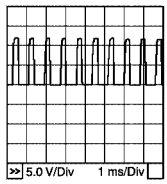
ECM INSPECTION TABLE

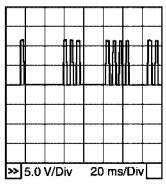
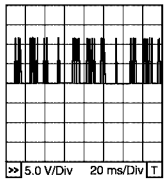
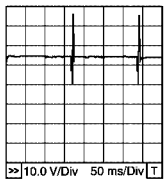
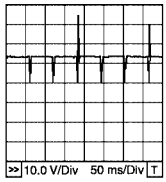
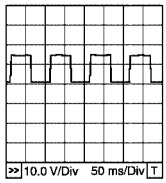
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

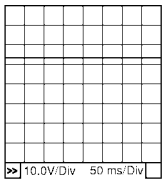
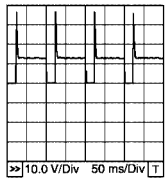
CAUTION:

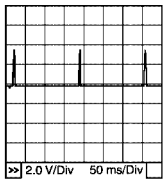
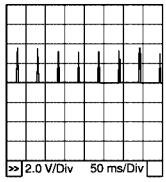
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
3	R/W	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
11	G/Y	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● Engine speed 2,500 rpm	7 - 10V★  PBIB0532E
12	P	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned	0.4 - 0.8V
13	Y	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	W/R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	G/W	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	W/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed: Below 3,600 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
32	L	EVAP control system pressure sensor	**[Ignition switch "ON"]**	Approximately 1.8 - 4.8V
34	Y/G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
45	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
48	R/W	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
49	R/Y	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
51	L/R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.5 - 2.1V
61 62 80 81	L/W BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 0.2V★  PBIB0522E
66	R	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
67	B/W	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	G/R	Sensor power supply (Power steering pressure sensor)	**[Ignition switch “ON”]**	Approximately 5V
69	G	Throttle position sensor 2	**[Ignition switch “ON”]** ● Engine stopped ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch “ON”] ● Engine stopped ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
70	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are “ON” (Compressor operates.)	1.0 - 4.0V
73	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
78	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82	B/Y	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	G	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
84	PU	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V
85	LG	DATA link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	Y	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.3V
89	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is high speed operating	0 - 1.0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
94	L	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.8V
96	Y/G	Electrical load signal (Heater fan signal)	**[Engine is running]** ● Heater fan switch "ON"	Approximately 0V
			[Engine is running] ● Heater fan switch "OFF"	Approximately 5V
97	LG/R	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating.	0 - 1.0V
98	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.28 - 0.48V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 2.0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
99	W/R	ASCD steering switch	**[Ignition switch "ON"]** ● ASCD steering switch is "OFF".	Approximately 4.0V
			[Ignition switch "ON"] ● CRUISE switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1V
			[Ignition switch "ON"] ● COAST/SET switch is "ON".	Approximately 2V
			[Ignition switch "ON"] ● ACCEL/RESUME switch is "ON".	Approximately 3V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
102	G/OR	PNP switch	**[Ignition switch "ON"]** ● Gear position is "P" or "N"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V
104	P	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.65 - 0.87V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 4.3V
107	OR	Fuel tank temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature.
108	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released	BATTERY VOLTAGE (11 - 14V)
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
117	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

CONSULT-II Function

UBS001CY

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output specification of the Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
CAN diagnostic support monitor	The results of transmit/receive diagnosis of CAN communication can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
Function test	This mode is used to inform customers of their vehicle condition of periodic maintenance.
ECM part number	ECM part number can be read.

*1 The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

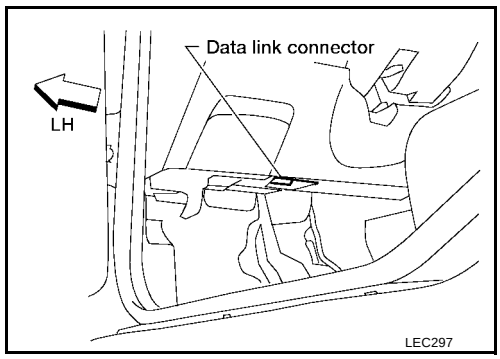
		Item	DIAGNOSTIC TEST MODE							
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Camshaft position sensor (PHASE)		X	X					
		Crankshaft position sensor (POS)		X			X			
		Mass air flow sensor		X		X	X			
		Engine coolant temperature sensor		X	X	X	X	X		
		Heated oxygen sensor 1		X		X	X		X	X
		Heated oxygen sensor 2		X		X	X		X	X
		Vehicle speed sensor		X	X	X	X			
		Throttle position sensor		X		X	X			
		Fuel tank temperature sensor		X		X	X	X		
		EVAP control system pressure sensor		X		X	X			
		Intake air temperature sensor		X	X	X	X			
		Knock sensor		X						
		Air conditioner switch				X	X			
		Park/neutral position (PNP) switch		X		X	X			
		Power steering pressure sensor		X		X	X			
		Battery voltage				X	X			
		Load signal				X	X			
		Fuel level sensor		X		X	X			
		Stop lamp switch		X		X	X			
		ASCD steering switch		X		X	X			
		ASCD brake switch		X		X	X			
		Accelerator pedal position sensor		X		X	X			
		Refrigerant pressure sensor								
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				X	X	X		
		Power transistor (Ignition timing)	X			X	X	X		
		Throttle control motor relay		X		X	X			
		Throttle control motor		X						
		EVAP canister purge volume control solenoid valve		X		X	X	X		X
		Air conditioner relay				X	X			
		Fuel pump relay	X			X	X	X		
		Cooling fan relay		X		X	X	X		
		Heated oxygen sensor 1 heater		X		X	X		X	
		Heated oxygen sensor 2 heater		X		X	X		X	
		EVAP canister vent control valve		X		X	X	X		
		Intake valve timing control solenoid valve		X		X	X	X		
		Calculated load value			X	X	X			

X: Applicable

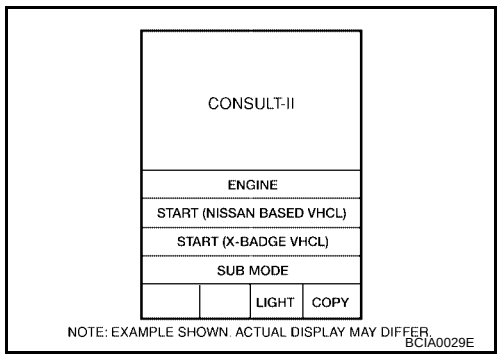
*1: This item includes 1st trip DTCs.
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-62, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .

CONSULT-II INSPECTION PROCEDURE

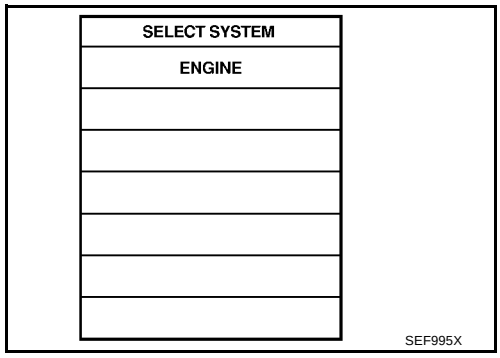
1. Turn ignition switch OFF.
2. Connect “CONSULT-II” to data link connector, which is located under LH dash panel near the fuse box cover.
3. Turn ignition switch ON.



4. Touch “START (NISSAN BASED VHCL)”.

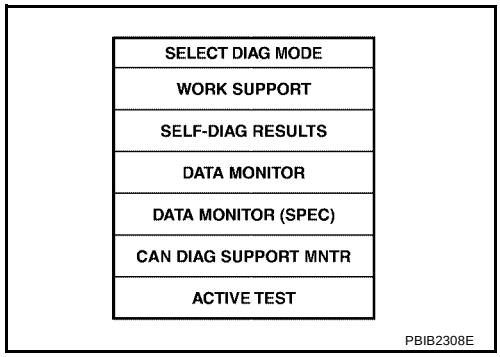


5. Touch “ENGINE”.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
EVAP SYSTEM CLOSE	CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. ● IGN SW “ON” ● ENGINE NOT RUNNING ● AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). ● NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM ● TANK FUEL TEMP. IS MORE THAN 0°C (32°F). ● WITHIN 10 MINUTES AFTER STARTING “EVAP SYSTEM CLOSE” ● WHEN TRYING TO EXECUTE “EVAP SYSTEM CLOSE” UNDER THE CONDITION EXCEPT ABOVE, CONSULT-II WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. **NOTE:** **WHEN STARTING ENGINE, CONSULT-II MAY DISPLAY “BATTERY VOLTAGE IS LOW. CHARGE BATTERY”, EVEN IN USING CHARGED BATTERY.**	When detecting EVAP vapor leak point of EVAP system
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGNITION TIMING ADJ*	● IDLE CONDITION	● When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light. ● If once the “TARGET IDLE RPM ADJ” has been done, the Idle Air Volume Learning procedure will not be completed.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to “TROUBLE DIAGNOSIS — INDEX” (See EC-21 .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to “TROUBLE DIAGNOSIS — INDEX”, EC-21 .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VEHICLE SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*1: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE

Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×	● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	×	×	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×	● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1) [V]	×		● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	×	×	● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	×		● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	×	×	● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×	● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	×	×	● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×			
THRTL SEN 1 [V]	×	×	● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×			
FUEL T/TEMP SE [°C] or [°F]	×		● The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
INT/A TEMP SE [°C] or [°F]	×	×	● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
EVAP SYS PRES [V]	×		● The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE [V]	×		● The signal voltage of the fuel level sensor is displayed.	
START SIGNAL [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	Description	Remarks
CLSD THL POS [ON/OFF]	×	×	● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×	● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×		● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×		● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×		● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		×	● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]			● “Calculated load value” indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V [%]			● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]			● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]			● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
AIR COND RLY [ON/OFF]		×	● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×	● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
VENT CONT/V [ON/OFF]			● The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON ... Closed OFF ... Open	
THRTL RELAY [ON/OFF]		×	● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]			● Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI ... High speed operation LOW ... Low speed operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
IDL A/V LEARN [YET/CMPLT/ INCMP]			● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully. INCMP ... Idle air volume learning has not been performed successfully.	
TRVL AFTER MIL [km] or [mile]			● Distance traveled while MIL is activated.	
O2SEN HTR DTY [%]			● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals.	
AC PRESS SEN [V]			● The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE [km/h] or [mph]			● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
SET VHCL SPD [km/h] or [mph]			● The preset vehicle speed is displayed.	
MAIN SW [ON/OFF]			● Indicates [ON/OFF] condition from CRUISE switch signal.	
CANCEL SW [ON/OFF]			● Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW [ON/OFF]			● Indicates [ON/OFF] condition from ACCEL/RES switch signal.	
SET SW [ON/OFF]			● Indicates [ON/OFF] condition from COAST/SET switch signal.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
BRAKE SW1 SW [ON/OFF]			● Indicates [ON/OFF] condition from ASCD brake switch signal, and ASCD clutch switch signal (M/T models).	
BRAKE SW2 SW [ON/OFF]			● Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT [NON/CUT]			● Indicates the vehicle cruise condition. NON ... Vehicle speed is maintained at the ASCD set speed. CUT ...Vehicle speed increased to excessively high compared with the ASCD set speed, and ASCD operation is cut off.	
LO SPEED CUT [NON/CUT]			● Indicates the vehicle cruise condition. NON ... Vehicle speed is maintained at the ASCD set speed. CUT ...Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off.	
AT OD MONITOR [ON/OFF]			● Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM.	
AT OD CANCEL [ON/OFF]			● Indicates [ON/OFF] condition of A/T O/D cancel signal sent from the TCM.	
CRUISE LAMP [ON/OFF]			● Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	
SET LAMP [ON/OFF]			● Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.	
Voltage [V]			● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only “#” is displayed if item is unable to be measured. ● Figures with “#”s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]				
DUTY-HI				
DUTY-LOW				
PLS WIDTH-HI				
PLS WIDTH-LOW				

NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE
Monitored Item

X: Applicable

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signal of the camshaft position sensor (PHASE).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running, specification range is indicated.
B/FUEL SCHDL [msec]			● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running, specification range is indicated.
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running, specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

ACTIVE TEST MODE
Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Adjust initial ignition timing
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever: N (A/T models) Neutral (M/T models) ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN*	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” using CONSULT-II.	Cooling fan moves and stops.	● Harness and connector ● Cooling fan motor ● Cooling fan relay
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connector ● Fuel pump relay

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connector ● Solenoid valve
FUEL/T TEMP SEN	● Change the fuel tank temperature using CONSULT-II.		
VENT CONTROL/V	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve “ON” and “OFF” with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

*: Leaving cooling fan “OFF” with CONSULT-II while engine is running may cause the engine to overheat.

DTC & SRT CONFIRMATION MODE

SRT Status Mode

For details, refer to EC-63, "SYSTEM READINESS TEST (SRT) CODE" .

SRT Work Support Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

DTC Work Support Mode

Test mode	Test item	Condition	Reference page
EVAPORATIVE SYSTEM	PURG FLOW P0441	Refer to corresponding trouble diagnosis for DTC.	EC-294
	EVAP SML LEAK P0442		EC-301
	EVAP V/S LEAK P0456		EC-346
	PURG VOL CN/V P1444		EC-460
HO2S1	HO2S1 (B1) P0133		EC-207
	HO2S1 (B1) P0134		EC-216
	HO2S1 (B1) P1143		EC-409
	HO2S1 (B1) P1144		EC-415
HO2S2	HO2S2 (B1) P0139		EC-230
	HO2S2 (B1) P1146		EC-421
	HO2S2 (B1) P1147		EC-428

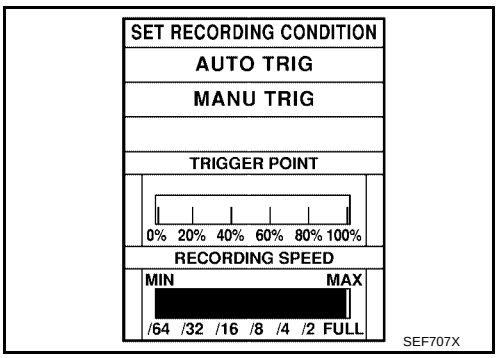
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

1. “AUTO TRIG” (Automatic trigger):

– The malfunction will be identified on the CONSULT-II screen in real time.
In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at left, and the data after the malfunction detection is recorded. Then when the percentage reached 100%,



"REAL-TIME DIAG" screen is displayed. If "STOP" is touched on the screen during " Recording Data ... xx%", "REAL-TIME DIAG" screen is also displayed.
The recording time after the malfunction detection and the recording speed can be changed by "TRIGGER POINT" and "Recording Speed". Refer to CONSULT-II OPERATION MANUAL.

2. "MANU TRIG" (Manual trigger):

- DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
  DATA MONITOR can be performed continuously even though a malfunction is detected.

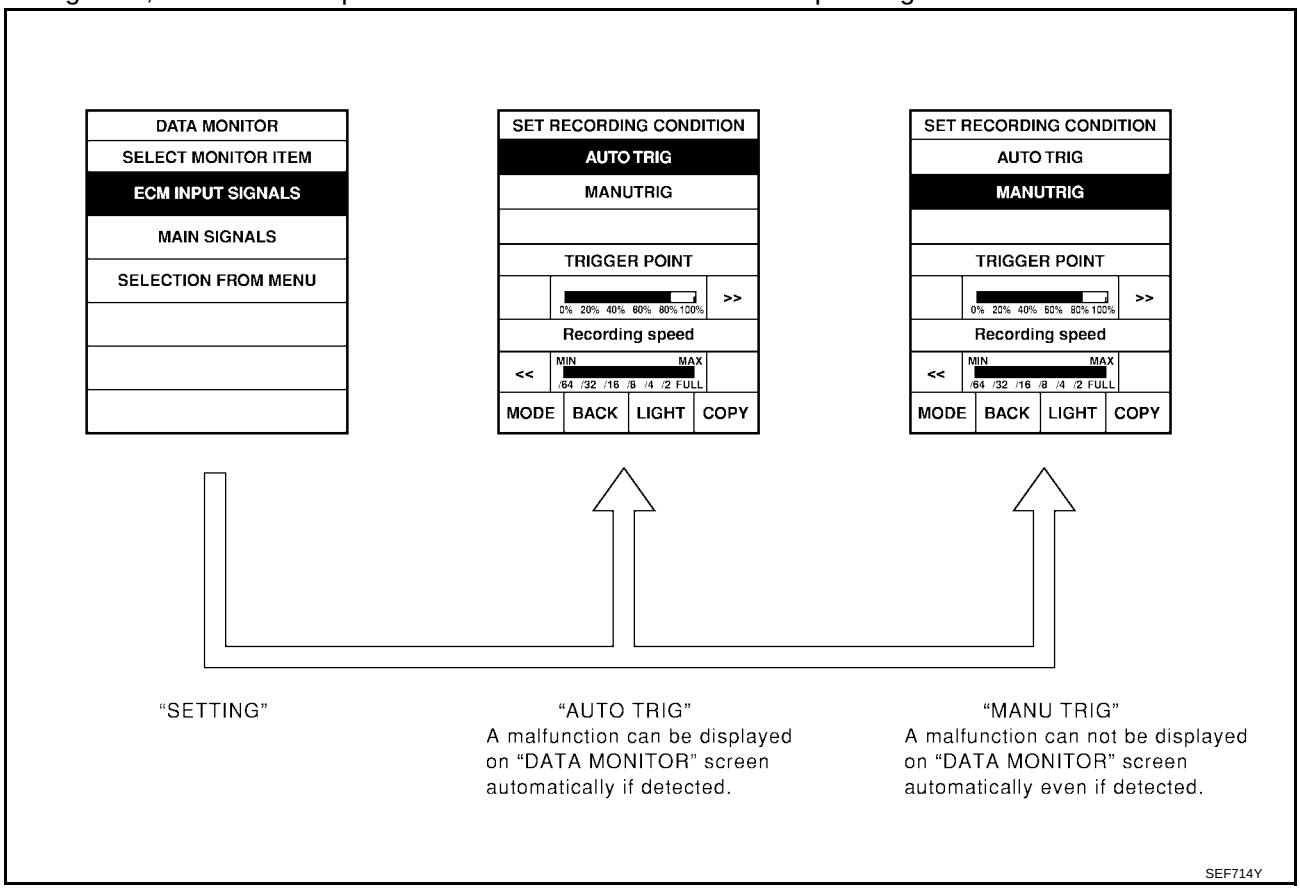
Operation

1. "AUTO TRIG"

- While trying to detect the DTC/1st trip DTC by performing the "DTC Confirmation Procedure", be sure to select "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.
  When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC Confirmation Procedure", the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , "Incident Simulation Tests".)

2. "MANU TRIG"

- If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT-II to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

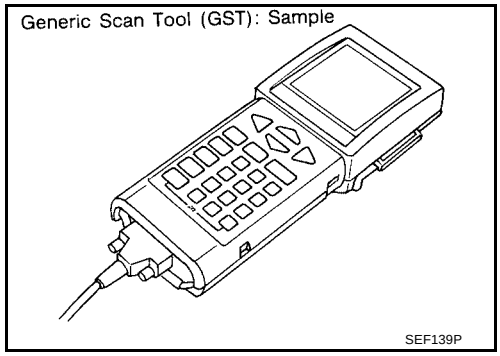


Generic Scan Tool (GST) Function

UBS001CZ

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained on the next page.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



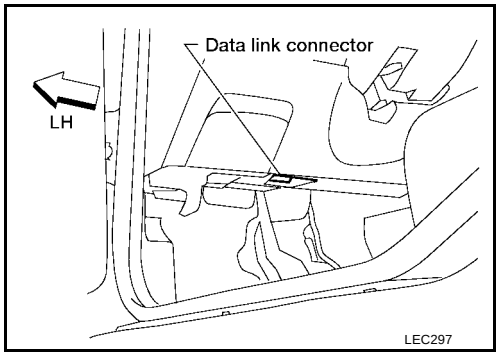
FUNCTION

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-62, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode can close EVAP system in ignition switch “ON” position (Engine stopped). When this mode is performed, following parts can be opened or closed. ● EVAP canister vent control valve open In the following conditions, this mode cannot function. ● Low ambient temperature ● Low battery voltage ● Engine running ● Ignition switch “OFF” ● Low fuel temperature ● Too much pressure is applied to EVAP system
MODE 9	(CALIBRATION ID)	This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

GST INSPECTION PROCEDURE

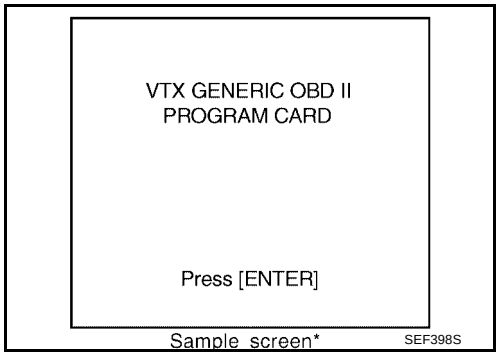
1. Turn ignition switch OFF.

2. Connect “GST” to data link connector. (Data link connector is located under LH dash panel near the fuse box cover.)



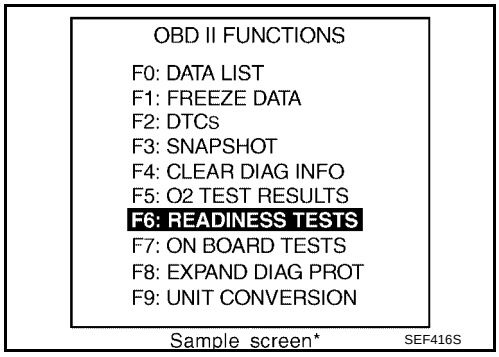
3. Turn ignition switch ON.
4. Enter the program according to instruction on the screen or in the operation manual.

(*: Regarding GST screens in this section, sample screens are shown.)



5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.



CONSULT-II Reference Value in Data Monitor Mode

UBS001D0

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  (i.e., Adjust ignition timing with a timing light before monitoring IGN TIMING. Specification data might be displayed even when ignition timing is not adjusted to specification. This IGN TIMING monitors the data calculated by the ECM according to the input signals from the camshaft position sensor and other ignition timing related sensors.)
- If the real-time diagnosis results are NG, and the on board diagnostic system results are OK, when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.4V

MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.0 - 1.6 msec
		2,000 rpm	0.7 - 1.3 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	53 - 155%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87V
		Accelerator pedal: Fully depressed	More than 4.3V
ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96V
		Accelerator pedal: Fully depressed	More than 4.0V
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T), 1st (M/T)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
EVAP SYS PRES	● Ignition switch: ON		Approx. 1.8 - 4.8V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch “OFF”	OFF
		A/C switch “ON” (Compressor operates)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever “P” or “N”	ON
		Except above	OFF

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF		ON → OFF
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 3.2 msec
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	M/T: 7°±5° BTDC A/T: 18°±5°BTDC
		2,000 rpm	More than 25° BTDC
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	12.0 - 27.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.4 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	0%
		2,000 rpm	—
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (stops in 1.0 seconds)		ON
	● Except as shown above		OFF
THRTL RELAY	● Ignition switch: ON		ON

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 50%
VENT CONT/V	● Ignition switch: ON		OFF
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH
HO2S1 HTR (B1) HO2S1 HTR (B2)	● Engine: After warming up ● Engine speed: Below 3,600 rpm		ON
	● Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1) HO2S2 HTR (B2)	● Engine speed is below 3,600 rpm after the following conditions are met. – Engine: After warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load		ON
	● Engine speed: Above 3,600 rpm		OFF
VEHICLE SPEED	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MIL has turned ON.	0 - 65,535 km (0 - 40,723 mile)
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80°C (176°F) ● Engine speed: Below 3,600 rpm		Approx. 40%
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
SET VHCL SPD	● Engine: Running	ASCD: Operating.	The preset vehicle speed is displayed.
MAIN SW	● Ignition switch: ON	CRUISE switch: Depressed	ON
		CRUISE switch: Released	OFF
CANCEL SW	● Ignition switch: ON	CANCEL switch: Depressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	ACCEL/RES switch: Depressed	ON
		ACCEL/RES switch: Released	OFF

MONITOR ITEM	CONDITION		SPECIFICATION
SET SW	● Ignition switch: ON	COAST/SET switch: Depressed	ON
		COAST/SET switch: Released	OFF
BRAKE SW1	● Ignition switch: ON	Brake pedal and clutch pedal (M/T): Fully released	ON
		Brake pedal and/or clutch pedal (M/T): Slightly depressed	OFF
BRAKE SW2	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
CRUISE LAMP	● Ignition switch: ON	CRUISE lamp: Illuminated	ON
		CRUISE lamp: Not illuminated	OFF
SET LAMP	● Ignition switch: ON	SET lamp: Illuminated	ON
		SET lamp: Not illuminated	OFF

*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

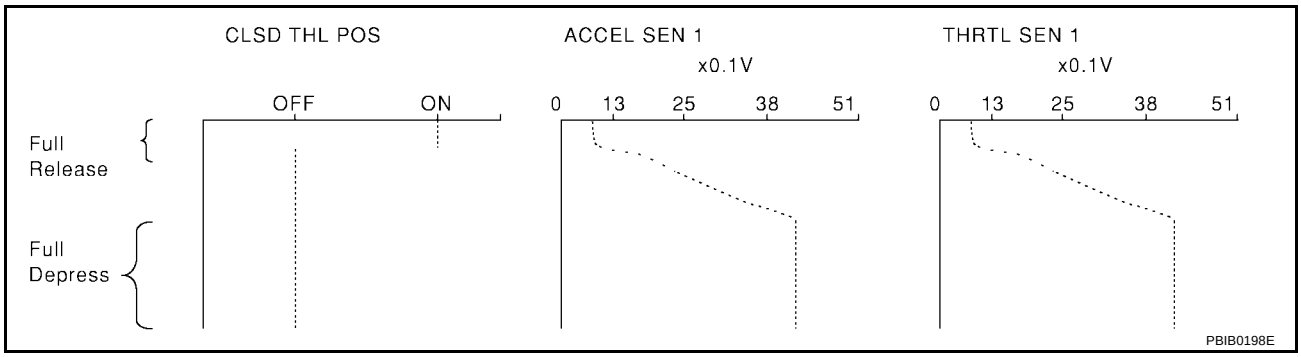
Major Sensor Reference Graph in Data Monitor Mode

UBS001D1

The following are the major sensor reference graphs in “DATA MONITOR” mode.

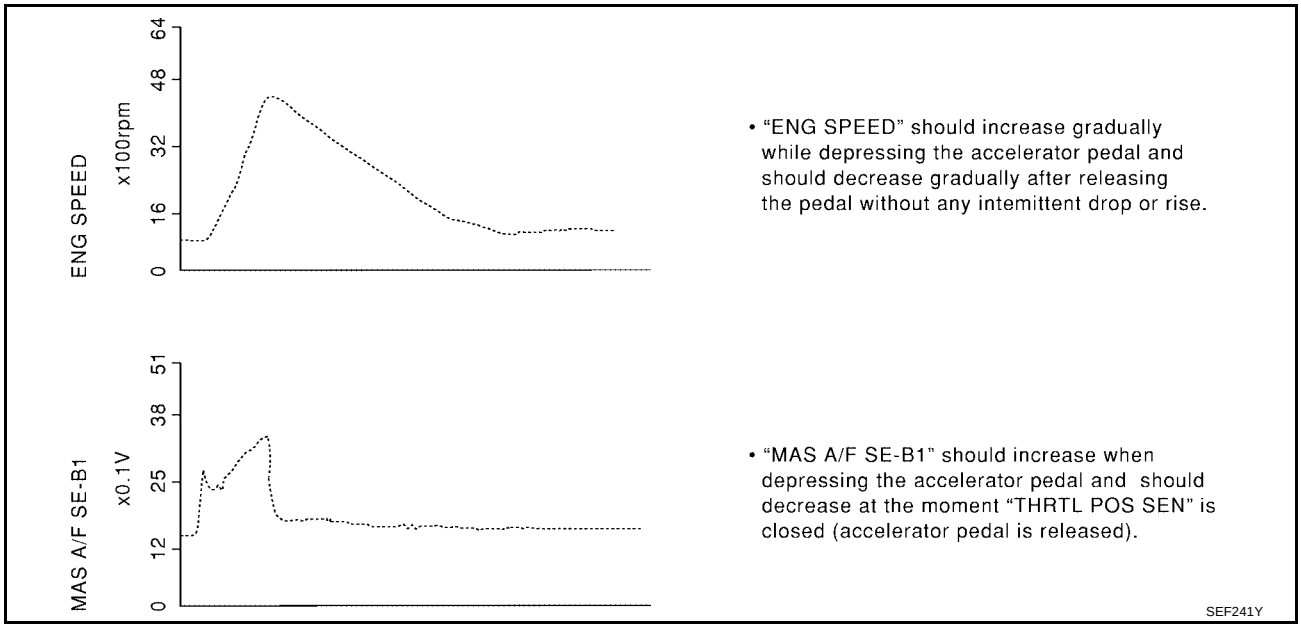
CLSD THL POS, ACCEL SEN1, THRTL SEN1·

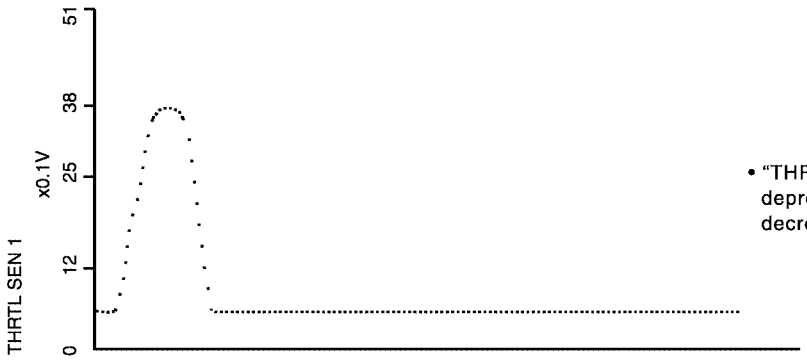
Below is the data for “CLSD THL POS”, “ACCEL SEN1”, and “THRTL SEN1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position (A/T models) or with shift lever in “1st” position (M/T models).
The signal of “ACCEL SEN1” and “THRTL SEN1” should rise gradually without any intermittent drop or rise after “CLSD THL/P SW” is changed from “ON” to “OFF”.



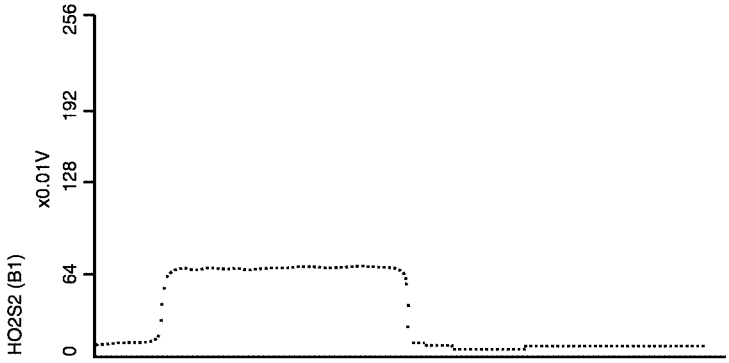
ENG SPEED, MAS A/F SE-B1, THRTL POS SEN, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine to normal operating temperature.
Each value is for reference, the exact value may vary.

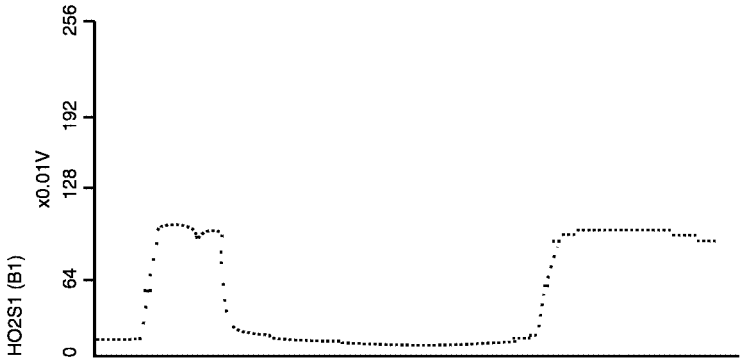




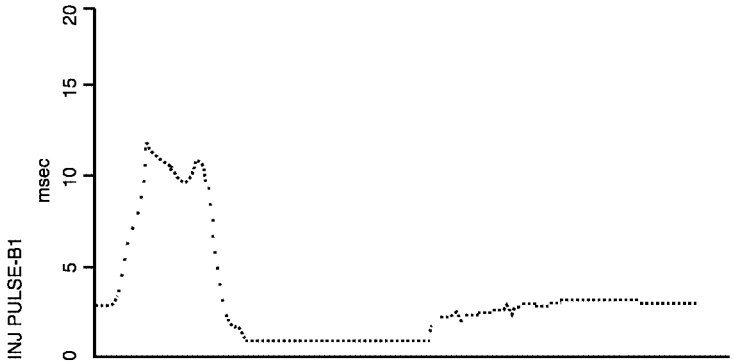
• "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

UBS001D2

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of engine control system. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the engine control system is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the engine control system may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the engine control system, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction.)
- A/F ALPHA-B1 (The mean value of air/fuel ratio feedback correction factor per cycle.)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor.)

Testing Condition

UBS001D3

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmosphere temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up *1
- Electrical load: Not applied *2
- Engine speed: Idle

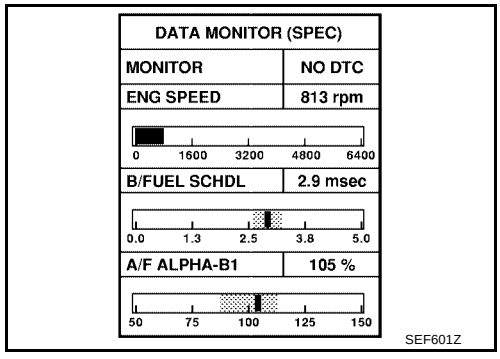
*1: For A/T models, after the engine is warmed-up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates less than 0.9V. For M/T models, drive vehicle for 5 minutes after the engine is warmed-up to normal operating temperature.
*2: Rear window defogger switch, air conditioner switch, and lighting switch are “OFF”. Cooling fans are not operating. Steering wheel straight ahead.

Inspection Procedure

UBS001D4

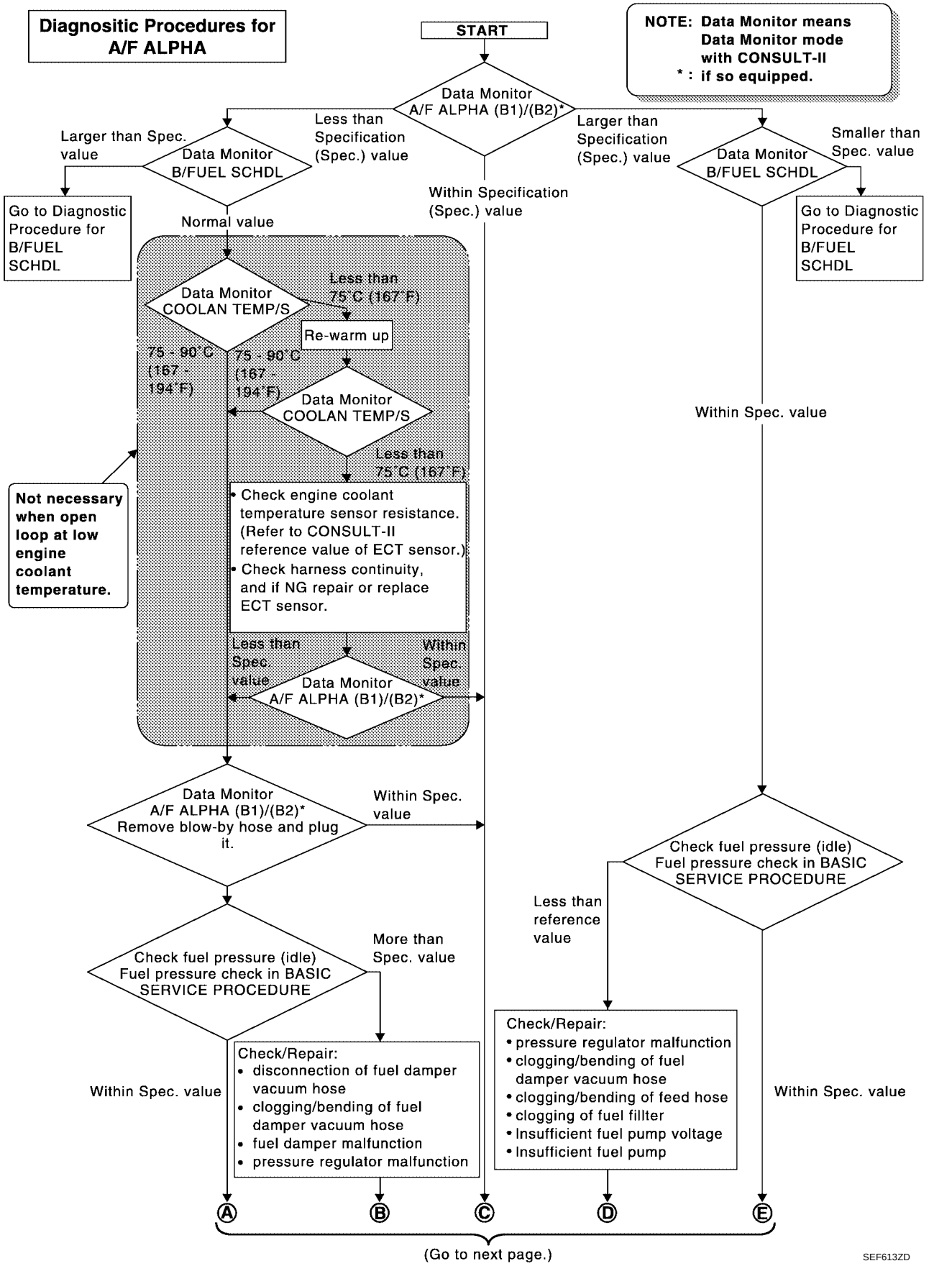
NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

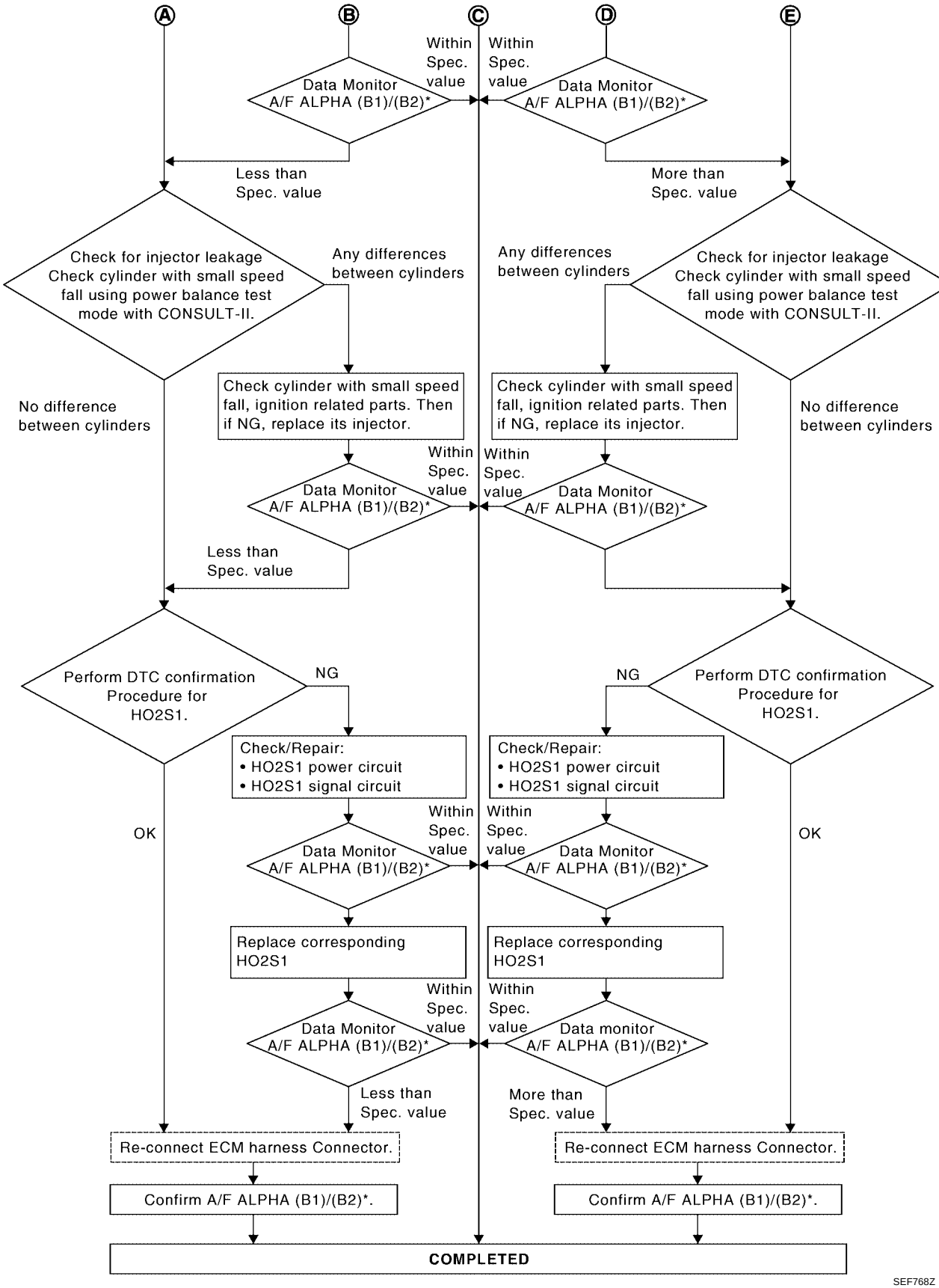
1. Perform “Basic Inspection”. Refer to EC-88 .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1”, and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-134, "Diagnostic Procedure" .

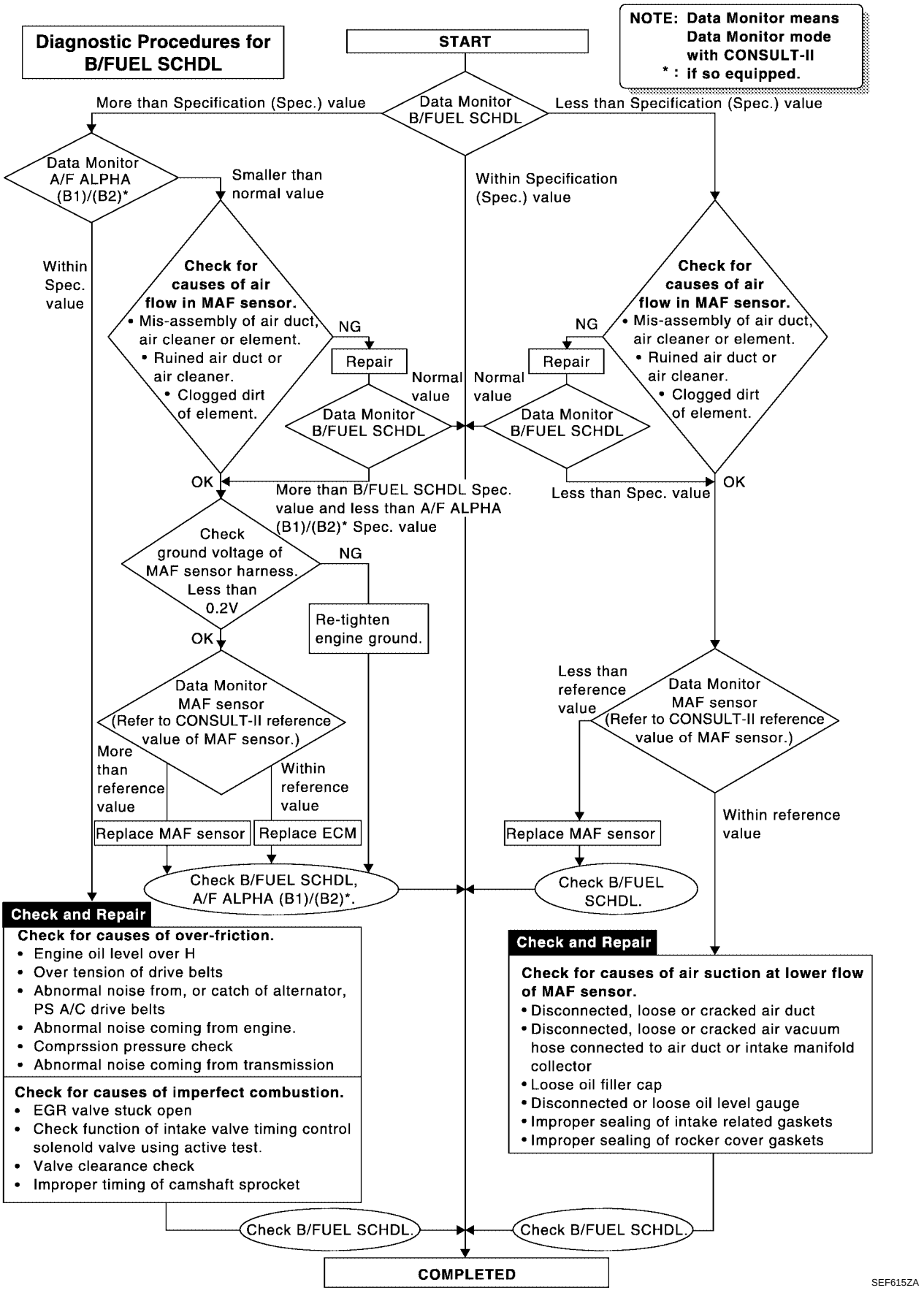


Diagnostic Procedure

UBS001D5




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair: • HO2S1 power circuit • HO2S1 signal circuit
Check/Repair: • HO2S1 power circuit • HO2S1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED
SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
Re-tighten engine ground.
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Less than reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check B/FUEL SCHDL.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

UBS001D6

Intermittent incidents (I/I) may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on DTC (1st trip) visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

COMMON I/I REPORT SITUATIONS

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “1t”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC data does not appear during the DTC CONFIRMATION PROCEDURE.
VI	The TROUBLE DIAGNOSIS for PXXXX does not indicate the malfunctioning area.

Diagnostic Procedure

UBS001D7

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection. Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “CIRCUIT INSPECTION”, “Ground Inspection”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “INCIDENT SIMULATION TEST”.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK CONNECTOR TERMINALS

Refer to GI-23, "How to Check Terminal" , “HOW TO PROBE CONNECTORS”, “How to Check Enlarged Contact Spring of Terminal”.

OK or NG

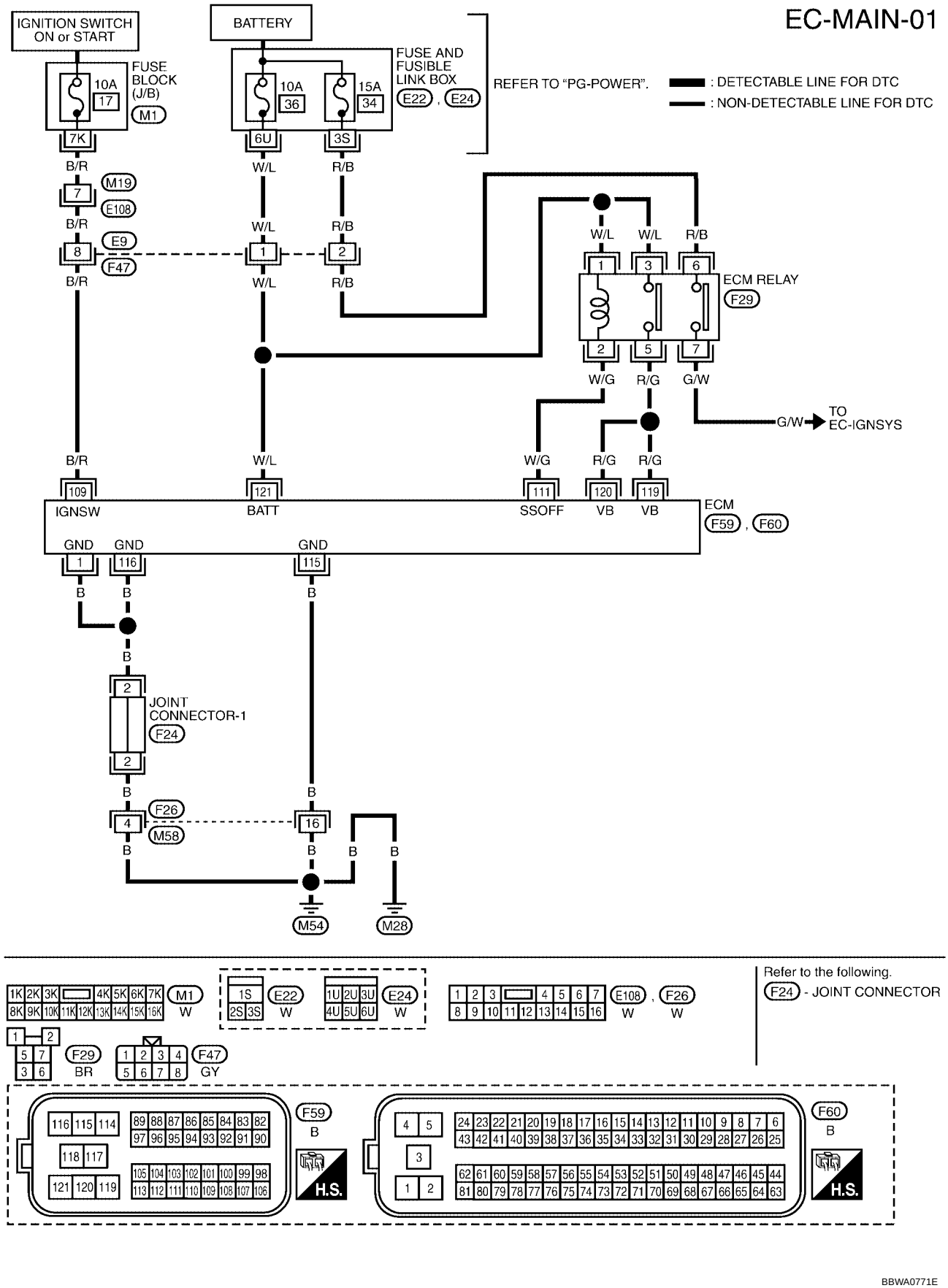
OK >> **INSPECTION END**
NG >> Repair or replace connector.

POWER SUPPLY CIRCUIT FOR ECM

PFP:24110

Wiring Diagram

UBS001D8



BBWA0771E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Back-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS006GB

1. INSPECTION START

Start engine.

Is engine running?

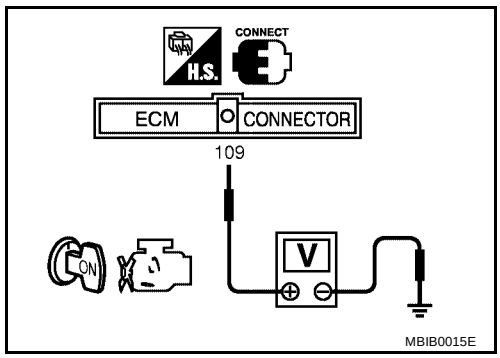
Yes or No

Yes >> GO TO 9.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E9, F47
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

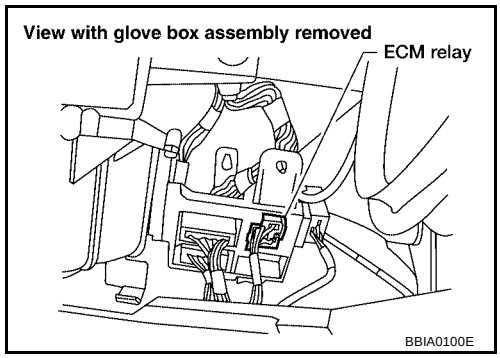
Check the following.

- Harness connectors F26, M58
- Joint connector-1
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

6. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.

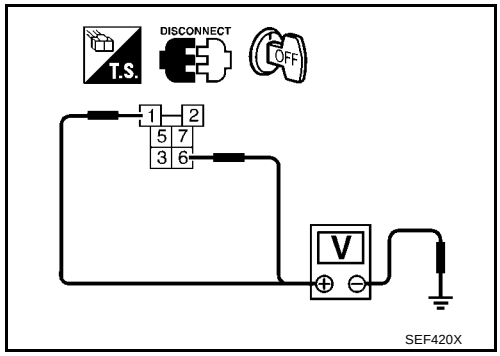


2. Check voltage between ECM relay terminals 1 and 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.



7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 10A fuse
- 15A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

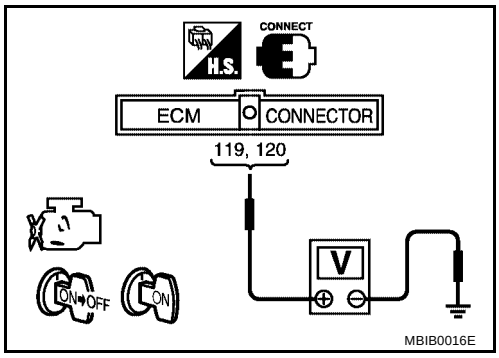
OK or NG

OK >> Go to EC-535, "IGNITION SIGNAL" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Stop engine and wait at least 10 seconds.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

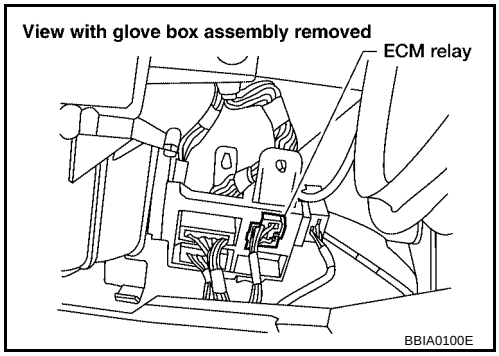


OK or NG

OK >> GO TO 14.
NG (Battery voltage does not exist.)>>GO TO 10.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 12.

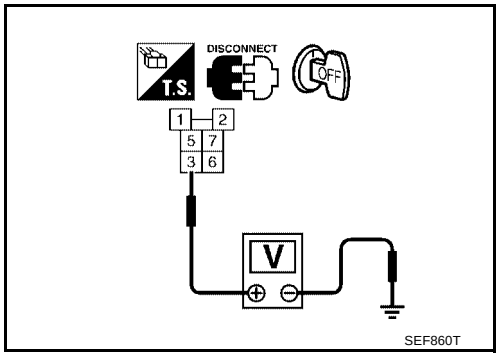
10. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Harness for open or short between ECM relay and

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 119, 120 and ECM relay terminal 5. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 13.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

13. CHECK ECM RELAY

Refer to EC-144, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> Replace ECM relay.

14. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F26, M58
- Joint connector-1
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> **INSPECTION END**

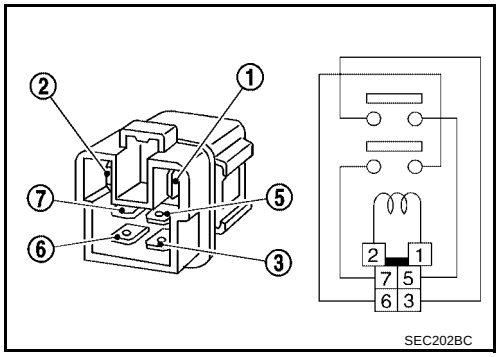
Component Inspection

UBS001DA

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No



DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

UBS003PG

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

UBS003PH

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000*1 1000*1	CAN communication line	● ECM can not communicate to other control units. ● ECM can not communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted).
U1001*2 1001*2			

***1: This self-diagnosis has the one trip detection logic.**

***2: The MIL will not light up for this diagnosis.**

DTC Confirmation Procedure

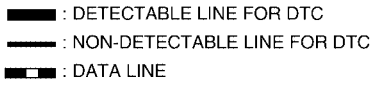
UBS003PI

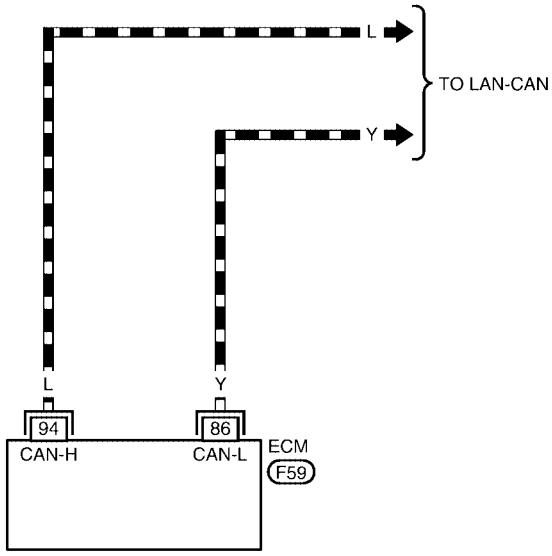
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-147, "Diagnostic Procedure" .

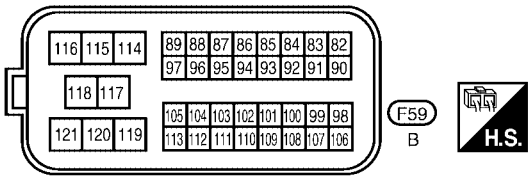
Wiring Diagram

UBS003PJ

EC-CAN-01







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Diagnostic Procedure

UBS003PK

Go to LAN-3, "CAN COMMUNICATION" .

DTC P0011 IVT CONTROL

PFP:23796

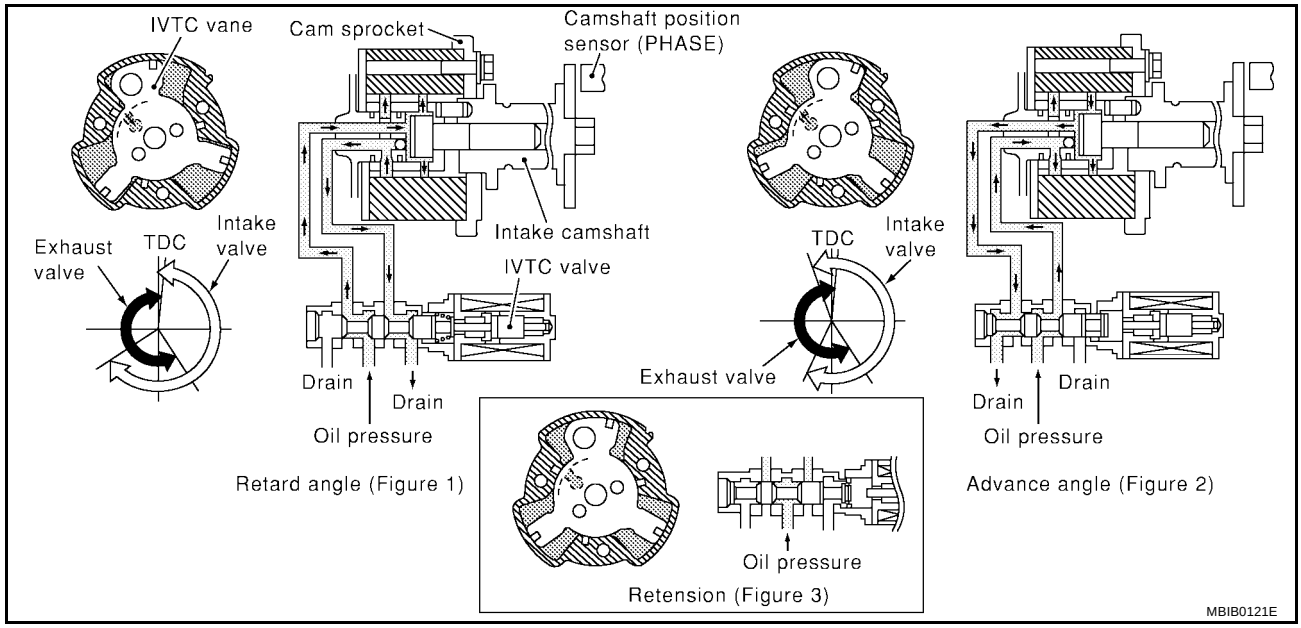
Description

UBS0057H

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

CONSULT-II Reference Value in Data Monitor Mode

UBS0057I

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T models) Neutral (M/T models) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 50%

On Board Diagnosis Logic

UBS0057J

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle.	● Crankshaft position sensor (POS) ● Camshaft position sensor (PHASE) ● Accumulation of debris to the signal pick-up portion of the camshaft

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

UBS0057K

CAUTION:
Always drive at a safe speed.

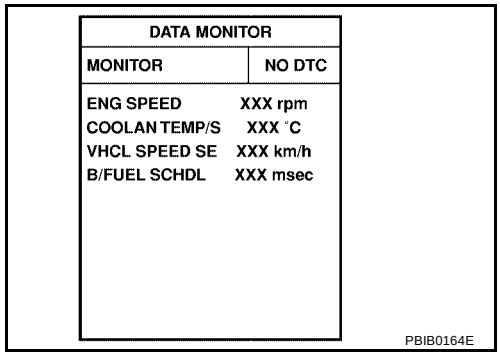
NOTE:

- **If DTC P0011 is displayed with DTC P1111, first perform trouble diagnosis for “DTC P1111”. See EC-385, "DTC P1111 IVT CONTROL SOLENOID VALVE" .**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select ″DATA MONITOR″ mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Maintain the following conditions for at least 6 consecutive seconds.
   Hold the accelerator pedal as steady as possible.



VHCL SPEED SE	100 - 120 km/h (63 - 75 MPH)
ENG SPEED	2,000 - 4,000 rpm
COOLAN TEMP/S	60 - 120°C (140 - 248°F)
B/FUEL SCHDL	More than 3.38 msec
Selector lever	A/T models: D position M/T models: 5th position

4. Stop vehicle with engine running and let engine idle for 10 seconds.
5. If 1st trip DTC is detected, go to EC-150, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
6. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	70 - 105°C (176 - 194°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

7. If 1st trip DTC is detected, go to EC-150, "Diagnostic Procedure" .

WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS0057L

1. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-282, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace crankshaft position sensor (POS).

2. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-287, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace camshaft position sensor (PHASE).

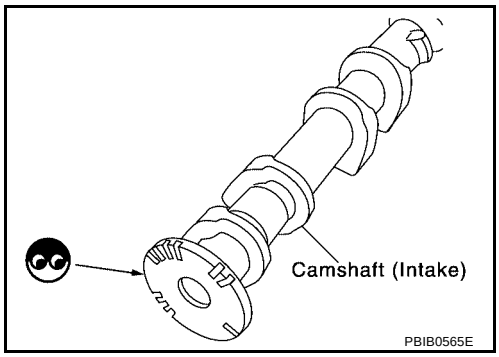
3. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 4.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



4. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For wiring diagram refer to EC-279, "Wiring Diagram" for CKP sensor (POS) and EC-284, "Wiring Diagram" for CMP sensor (PHASE).

>> **INSPECTION END**

DTC P0031, P0032 HO2S1 HEATER

PFP:22690

Description

UBS003TA

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

UBS003TB

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80°C (176°F) ● Engine speed: Below 3,600 rpm	Approx. 40%

On Board Diagnosis Logic

UBS003TC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heater oxygen sensor 1 heater
P0032 0032	Heated oxygen sensor 1 heater control circuit high	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heater oxygen sensor 1 heater

DTC Confirmation Procedure

UBS003TD

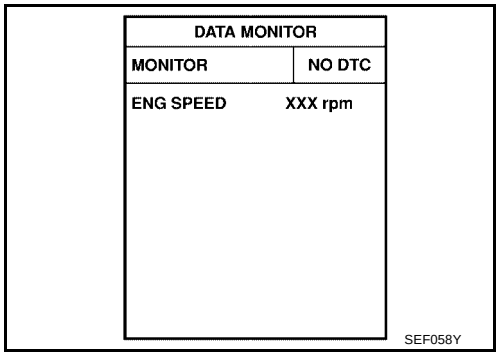
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and run it for at least 6 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-154, "Diagnostic Procedure" .



WITH GST

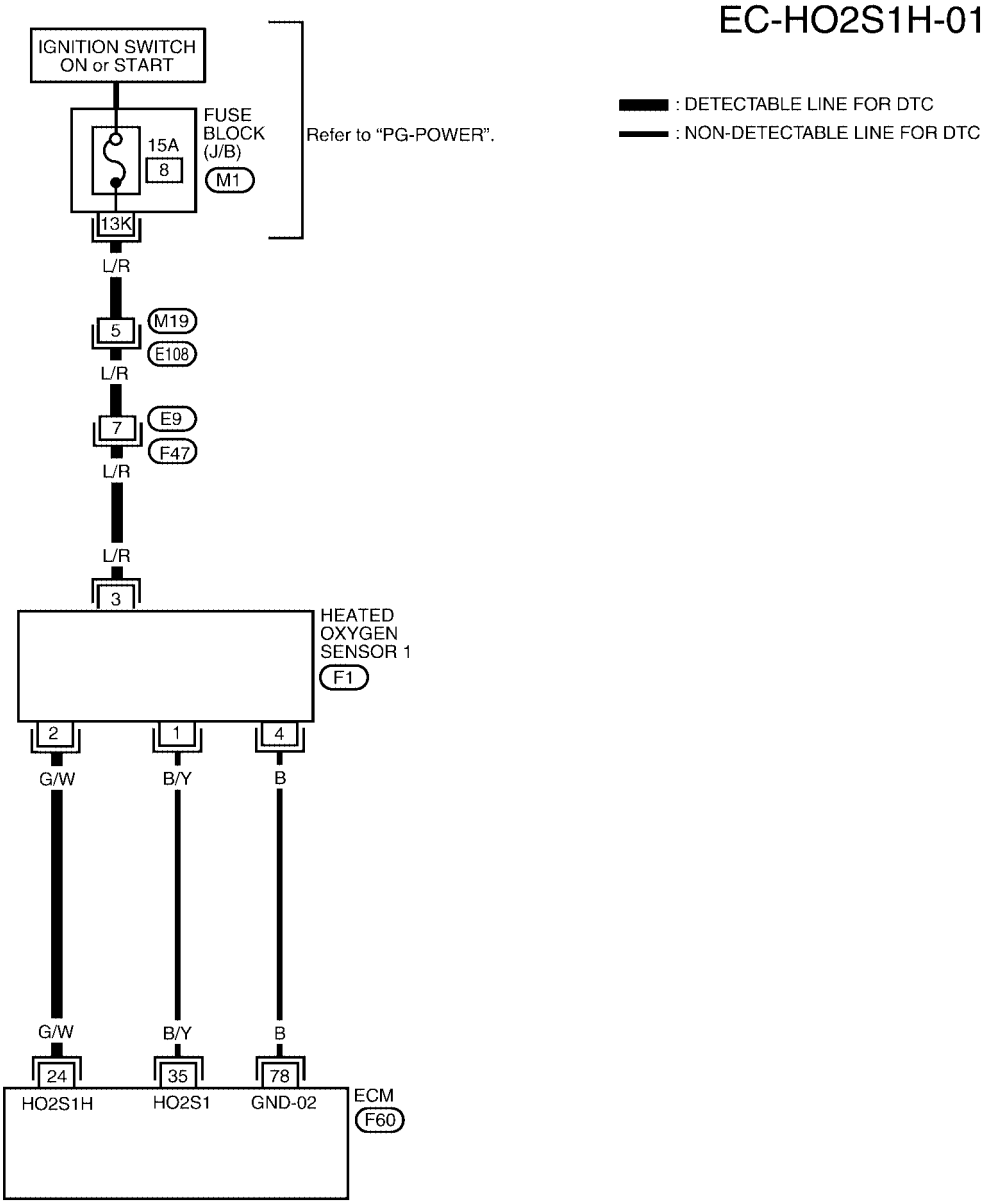
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and run it for at least 6 seconds at idle speed.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine and run it for at least 6 seconds at idle speed.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-154, "Diagnostic Procedure" .

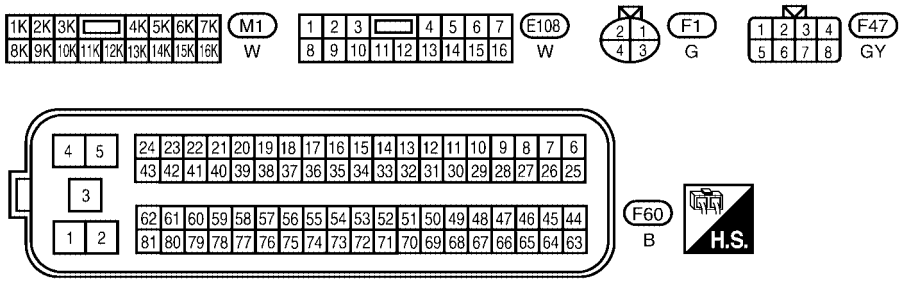
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS003TE

EC-HO2S1H-01





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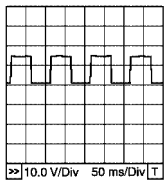
Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	G/W	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

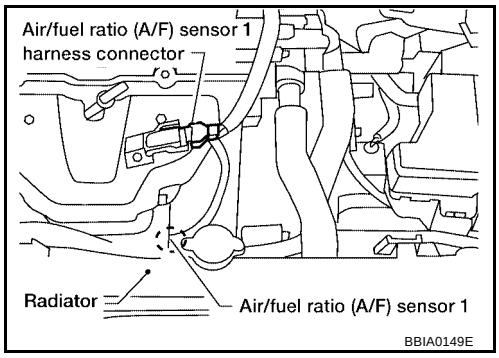
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS003TF

1. CHECK HO2S1 POWER SUPPLY CIRCUIT

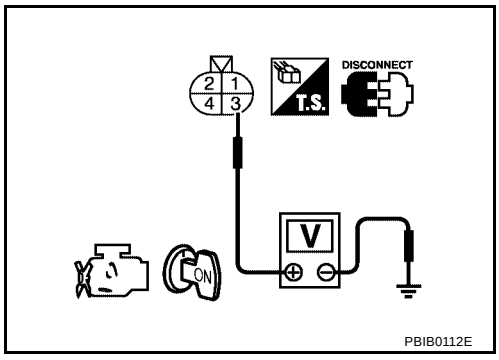
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch “ON”.



BBIA0149E

4. Check voltage between HO2S1 terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



PBIB0112E

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E9, F47
- Fuse block (J/B) connector M1
- 15A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair harness or connectors.

3. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 24 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-156, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

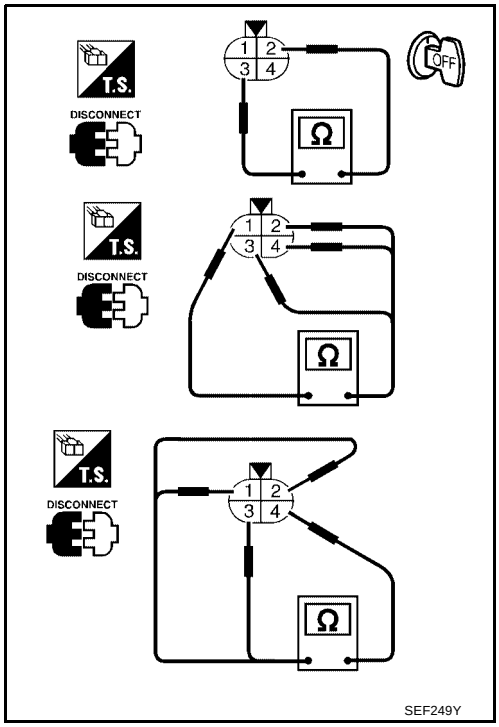
Component Inspection

UBS003TG

HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	



2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS003TH

HEATED OXYGEN SENSOR 1

Refer to EM-12, "Removal and Installation" .

DTC P0037, P0038 HO2S2 HEATER

PFP:226A0

Description

UBS006C5

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
● Below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	ON

CONSULT-II Reference Value in Data Monitor Mode

UBS006C6

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	ON
	● Engine speed: Above 3,600 rpm	OFF

On Board Diagnosis Logic

UBS006C7

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037 (Bank 1)	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) ● Heater oxygen sensor 2 heater
P0038 0038 (Bank 1)	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) ● Heater oxygen sensor 2 heater

DTC Confirmation Procedure

UBS006C8

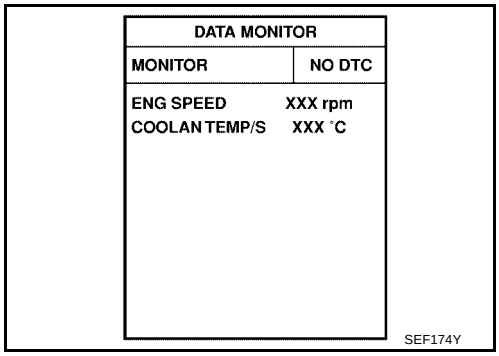
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch ″OFF″ and wait at least 10 seconds.

4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minute.
6. If 1st trip DTC is detected, go to EC-160, "Diagnostic Procedure" .



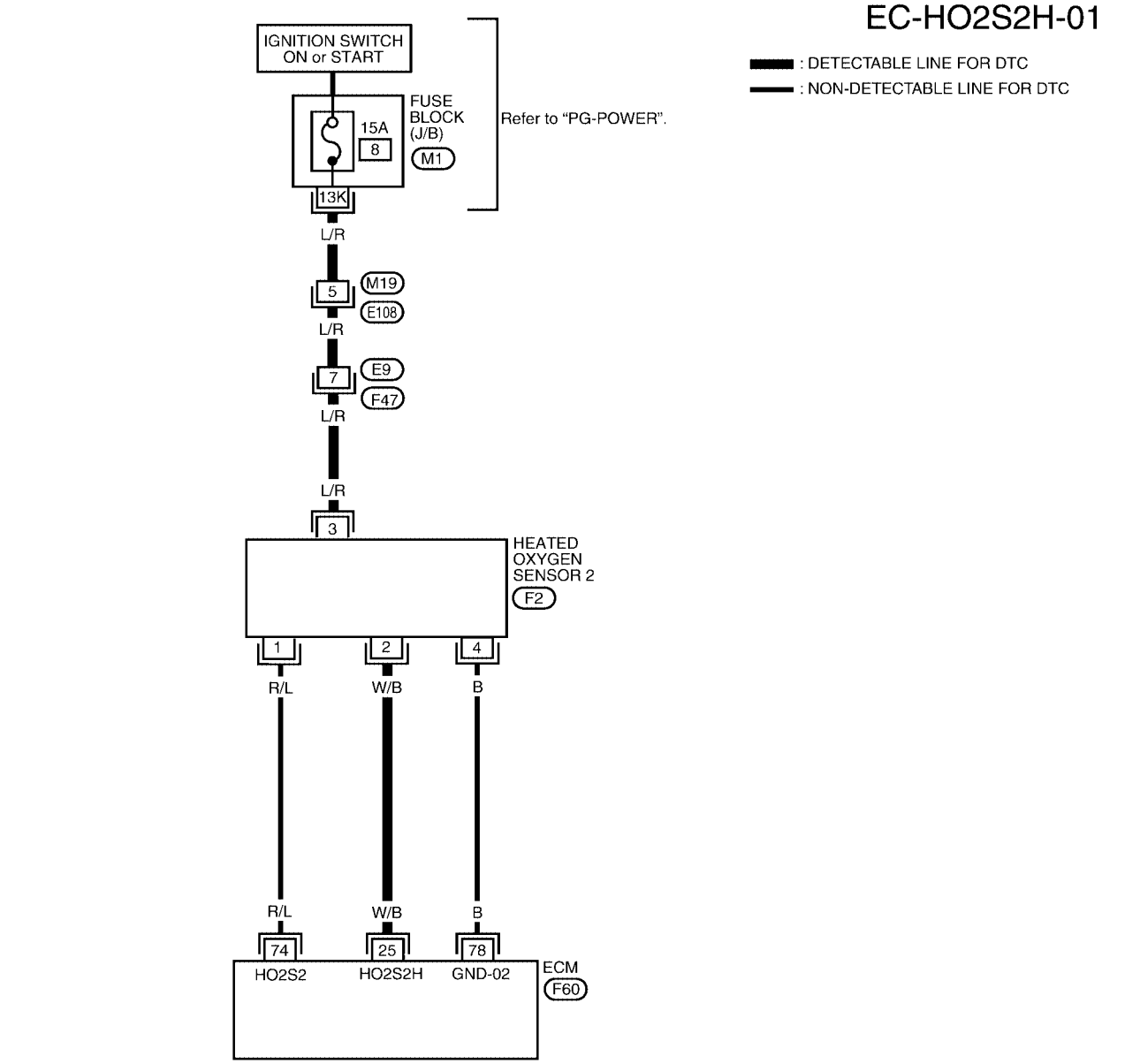
WITH GST

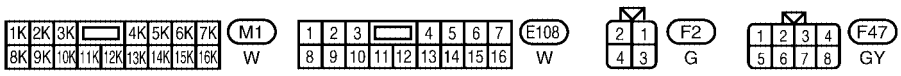
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Turn ignition switch ″OFF″and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for one minute.
8. Select “MODE 3” with GST.
9. If DTC is detected, go to EC-160, "Diagnostic Procedure" .

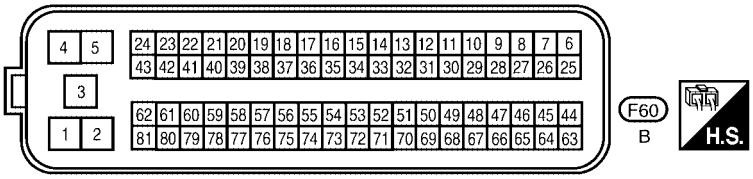
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS006C9







BBWA0773E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

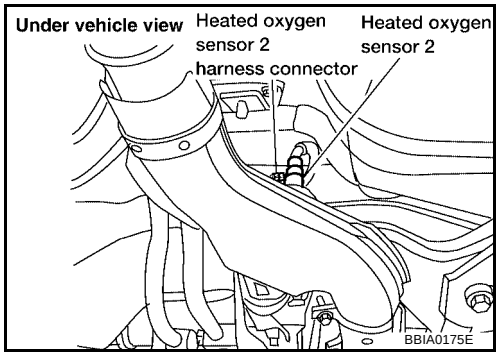
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	W/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed: Below 3,600 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS006CA

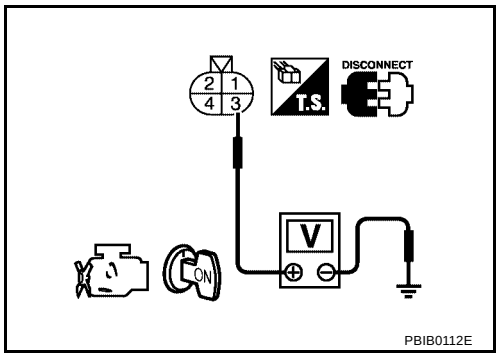
1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch "ON".



4. Check voltage between HO2S2 terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E9, F47
- Fuse block (J/B) connector M1
- 15A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 25 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-162, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

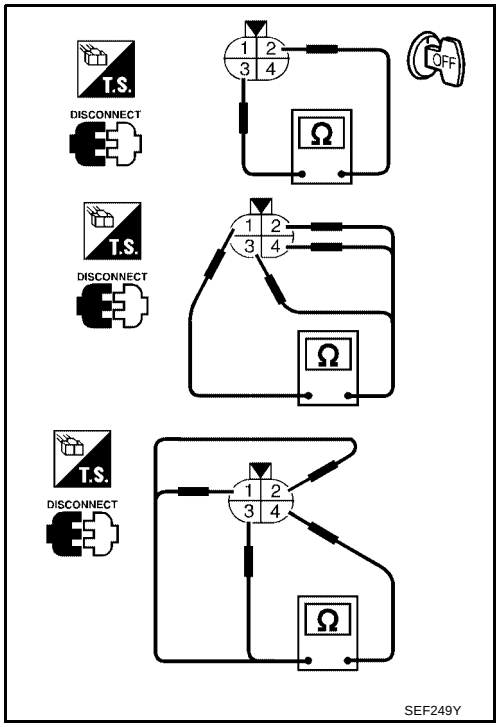
UBS006CB

HEATED OXYGEN SENSOR 2 HEATER

1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

2. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS006CC

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

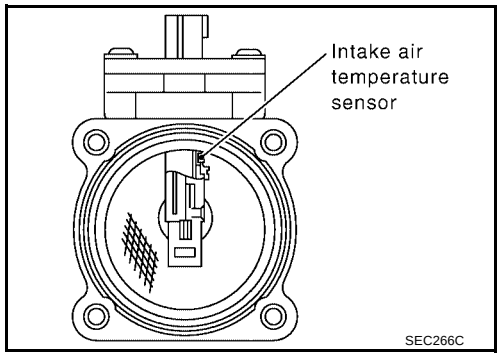
DTC P0101 MAF SENSOR

PFP:22680

Component Description

UBS003PL

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS003PM

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.4V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	12.0 - 27.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.4 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS003PN

This self-diagnosis has the one trip detection logic.

NOTE:
If DTC P0101 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-455, "DTC P1229 SENSOR POWER SUPPLY".

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0101 0101	Mass air flow sensor circuit range/performance problem	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor
		B)	A low voltage from the sensor is sent to ECM under heavy load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor

DTC Confirmation Procedure

UBS003PO

Perform “PROCEDURE FOR MALFUNCTION A” first.

If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”.

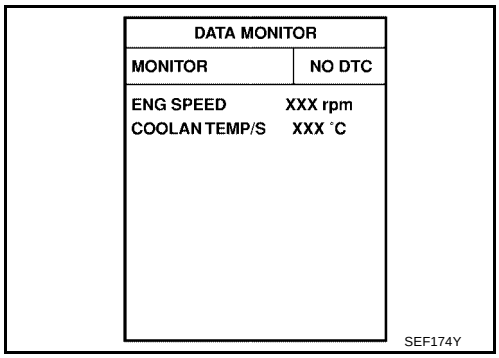
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

NOTE:
If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch “ON”) instead of running engine at idle speed.

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and warm it up to normal operating temperature.
4. Run engine for at least 10 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-167, "Diagnostic Procedure" .



With GST

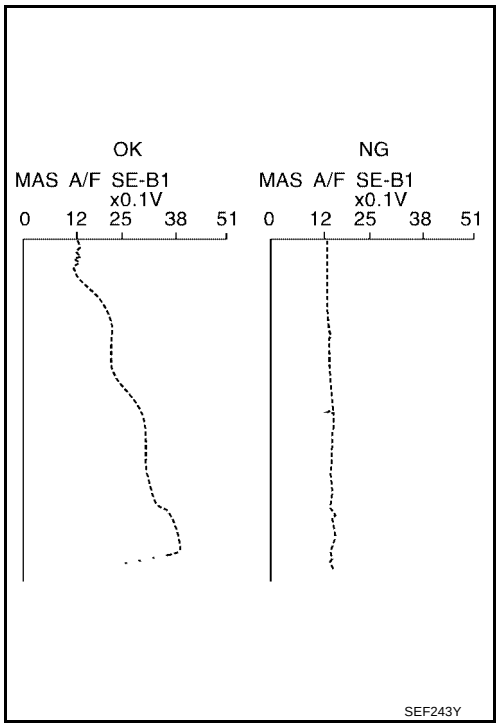
Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

CAUTION:
Always drive vehicle at a safe speed.

With CONSULT-II

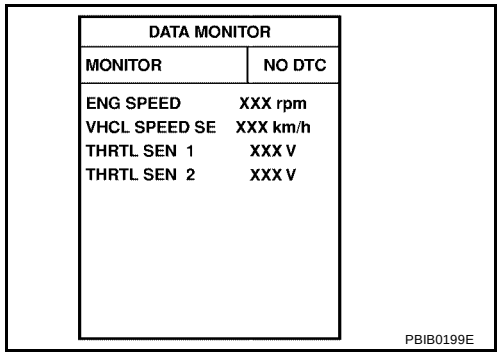
1. Turn ignition switch “ON”.
2. Start engine and warm it up to normal operating temperature.
   If engine cannot be started, go to EC-167, "Diagnostic Procedure" .
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Check the voltage of “MAS A/F SE-B1” with “DATA MONITOR”.
5. Increases engine speed to about 4,000 rpm.
6. Monitor the linear voltage rise in response to engine speed increases.
   If NG, go to EC-167, "Diagnostic Procedure" .
   If OK, go to following step.



7. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
THRTL SEN 1	More than 3V
THRTL SEN 2	More than 3V
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

8. If 1st trip DTC is detected, go to EC-167, "Diagnostic Procedure" .



Overall Function Check

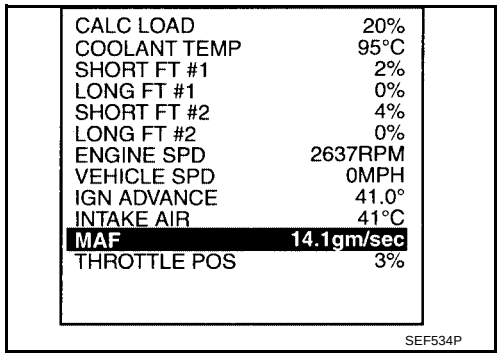
UBS003PP

PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a 1st trip DTC might not be confirmed.

With GST

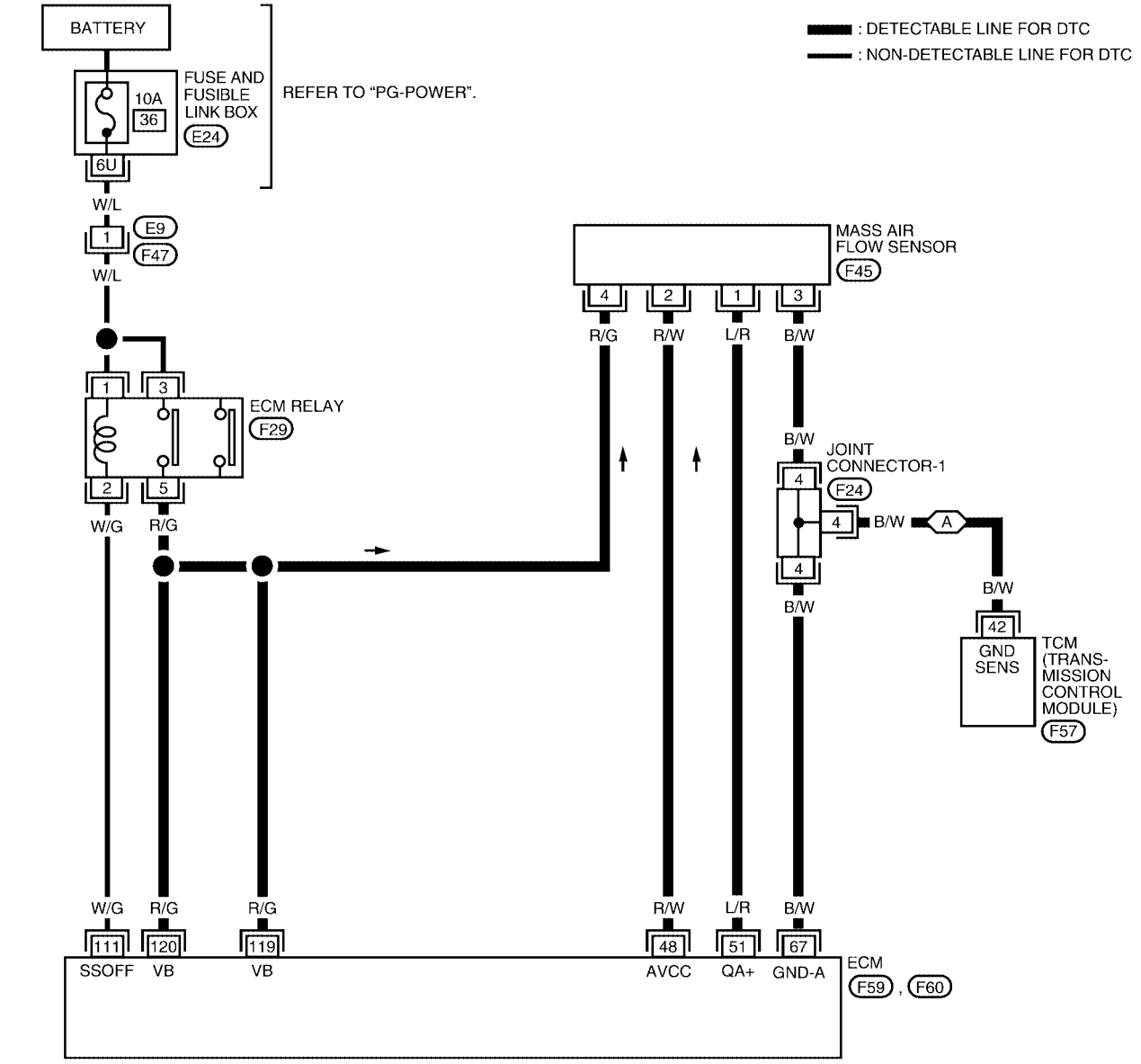
1. Start engine and warm it up to normal operating temperature.
2. Select “MODE 1” with GST.
3. Check the mass air flow sensor signal with “MODE 1”.
4. Check for linear mass air flow sensor signal value rise in response to increases to about 4,000 rpm in engine speed.
5. If NG, go to EC-167, "Diagnostic Procedure" .

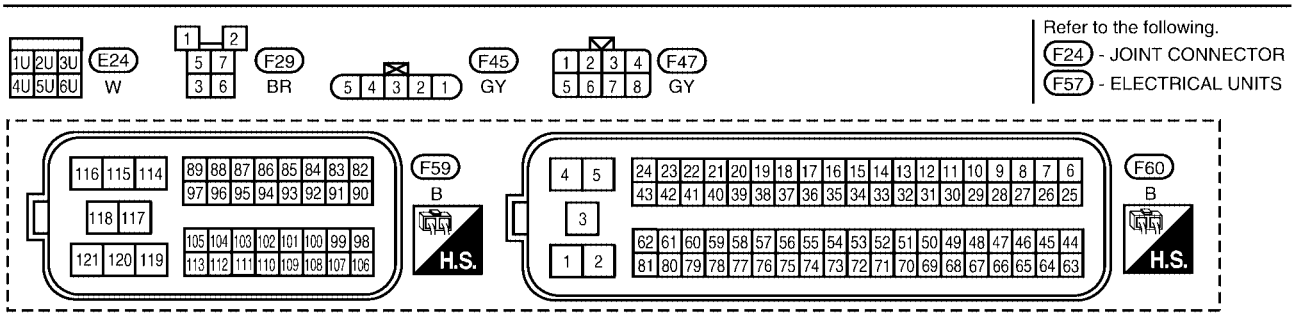


Wiring Diagram

UBS003PQ

EC-MAFS-01





BBWA0774E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	R/W	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
51	L/R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.5 - 2.1V
67	B/W	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS003PR

1. INSPECTION START

Which malfunction (A or B) is duplicated?

A or B

A >> GO TO 3.
B >> GO TO 2.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

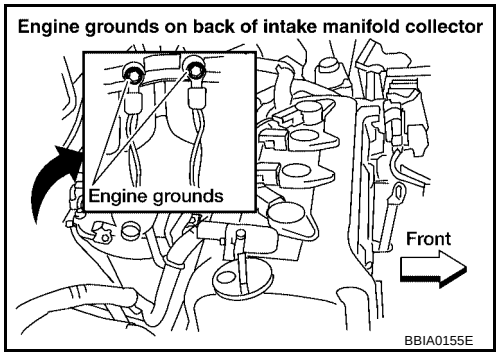
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

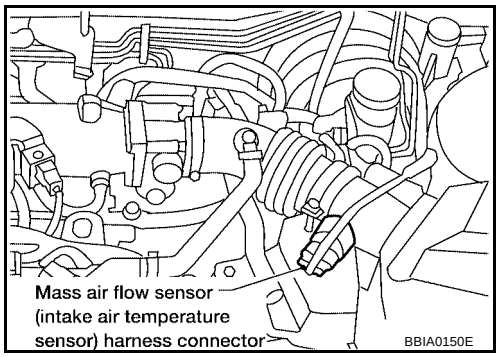
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 4.



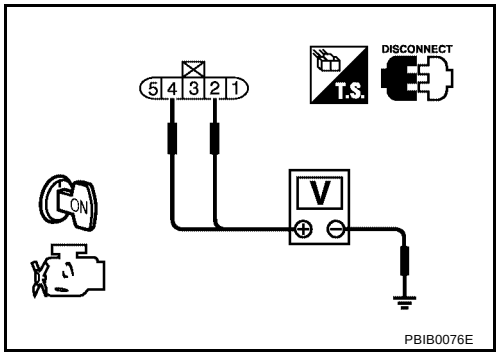
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 51.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-170, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

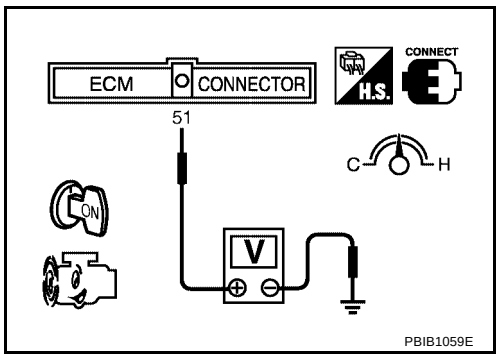
>> **INSPECTION END**

Component Inspection

UBS003PS

MASS AIR FLOW SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

4. If the voltage is out of specification, proceed the following.
   - Turn ignition switch “OFF”.
   - Disconnect mass air flow sensor harness connector and reconnect it again.
   - Perform steps 2 and 3 again.
5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

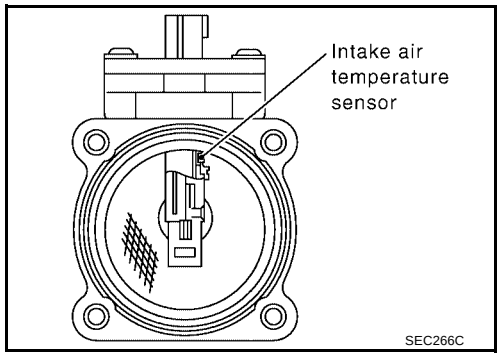
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

UBS003PU

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS003PV

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.4V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	12.0 - 27.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.4 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS003PW

These self-diagnoses have the one trip detection logic.

NOTE:
If DTC P0101 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to **EC-455, "DTC P1229 SENSOR POWER SUPPLY"**.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

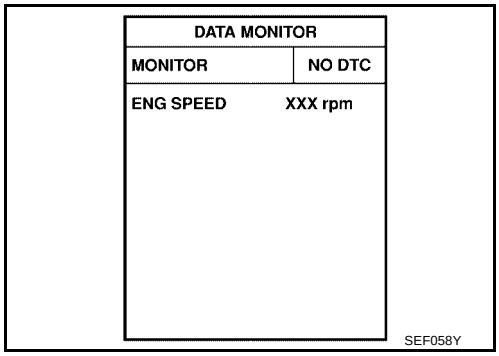
UBS003PX

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-174, "Diagnostic Procedure" .



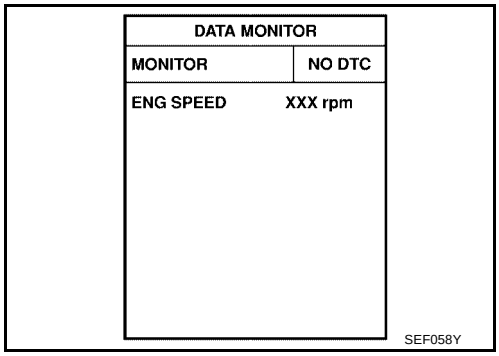
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-174, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-174, "Diagnostic Procedure" .



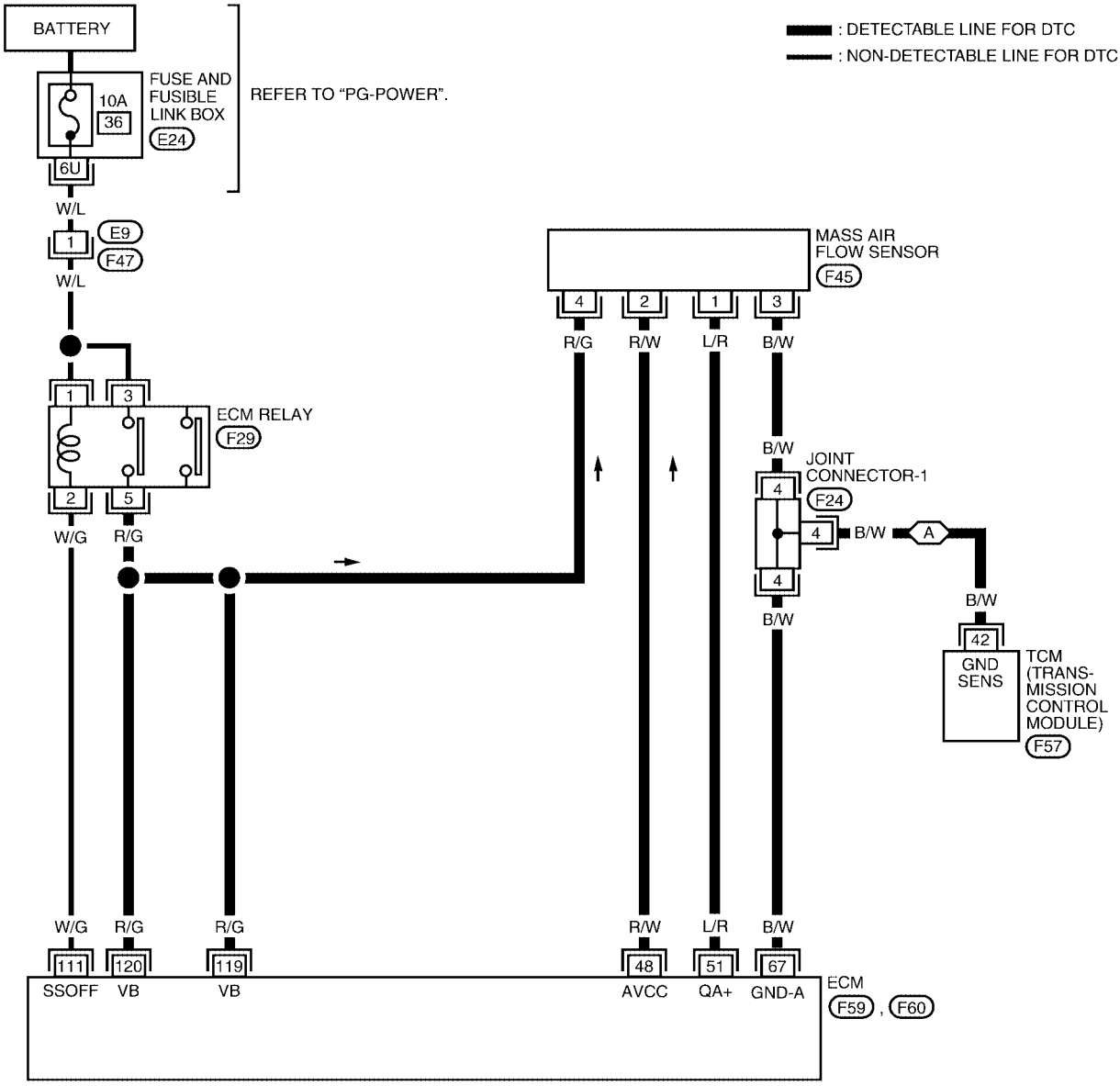
With GST

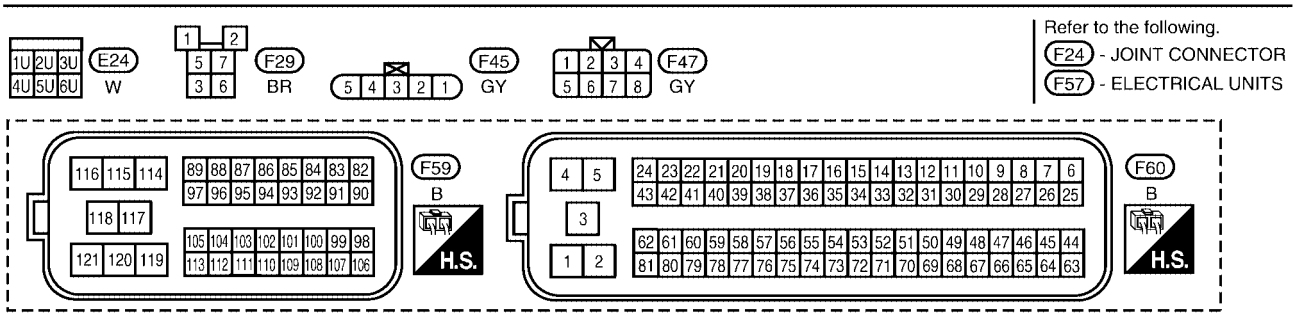
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS003PY

EC-MAFS-01





BBWA0774E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	R/W	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
51	L/R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B/W	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

UBS003PZ

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

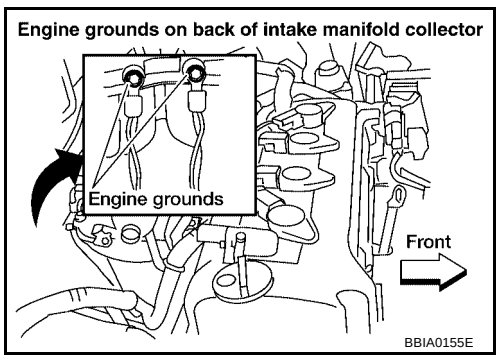
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

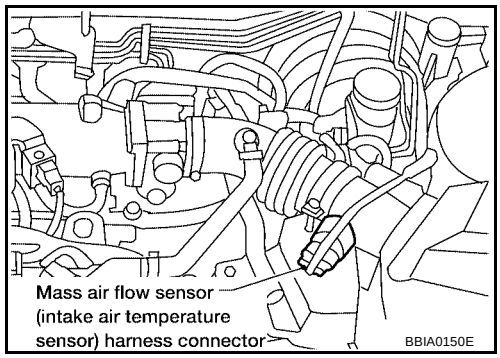
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



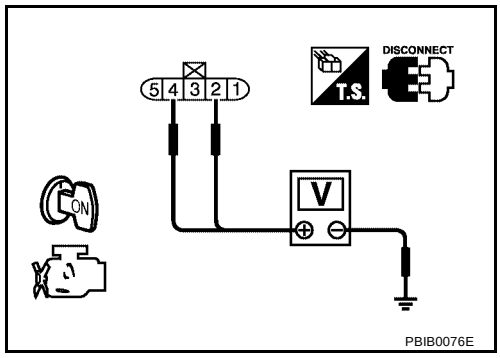
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 51. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-176, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

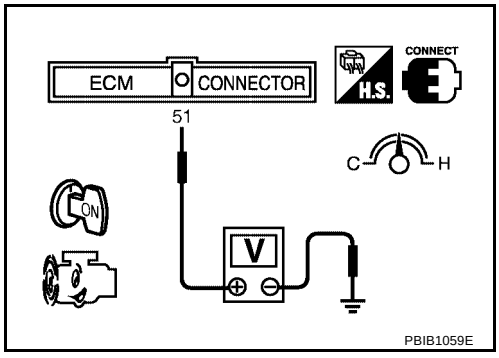
UBS003Q0

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

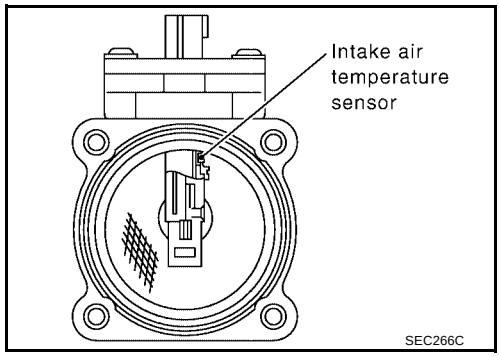
DTC P0112, P0113 IAT SENSOR

PFP:22630

Component Description

UBS003Q2

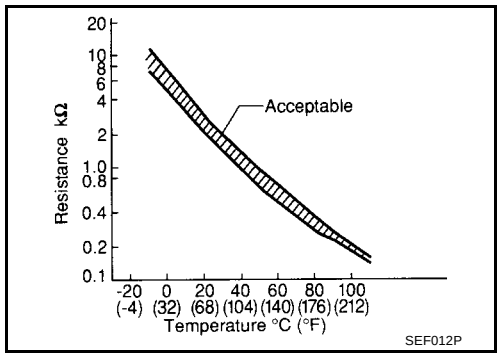
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS003Q3

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

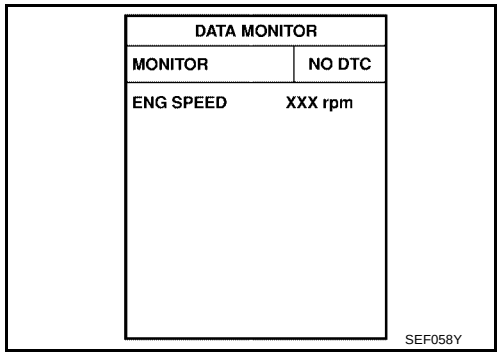
DTC Confirmation Procedure

UBS003Q4

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-179, "Diagnostic Procedure" .



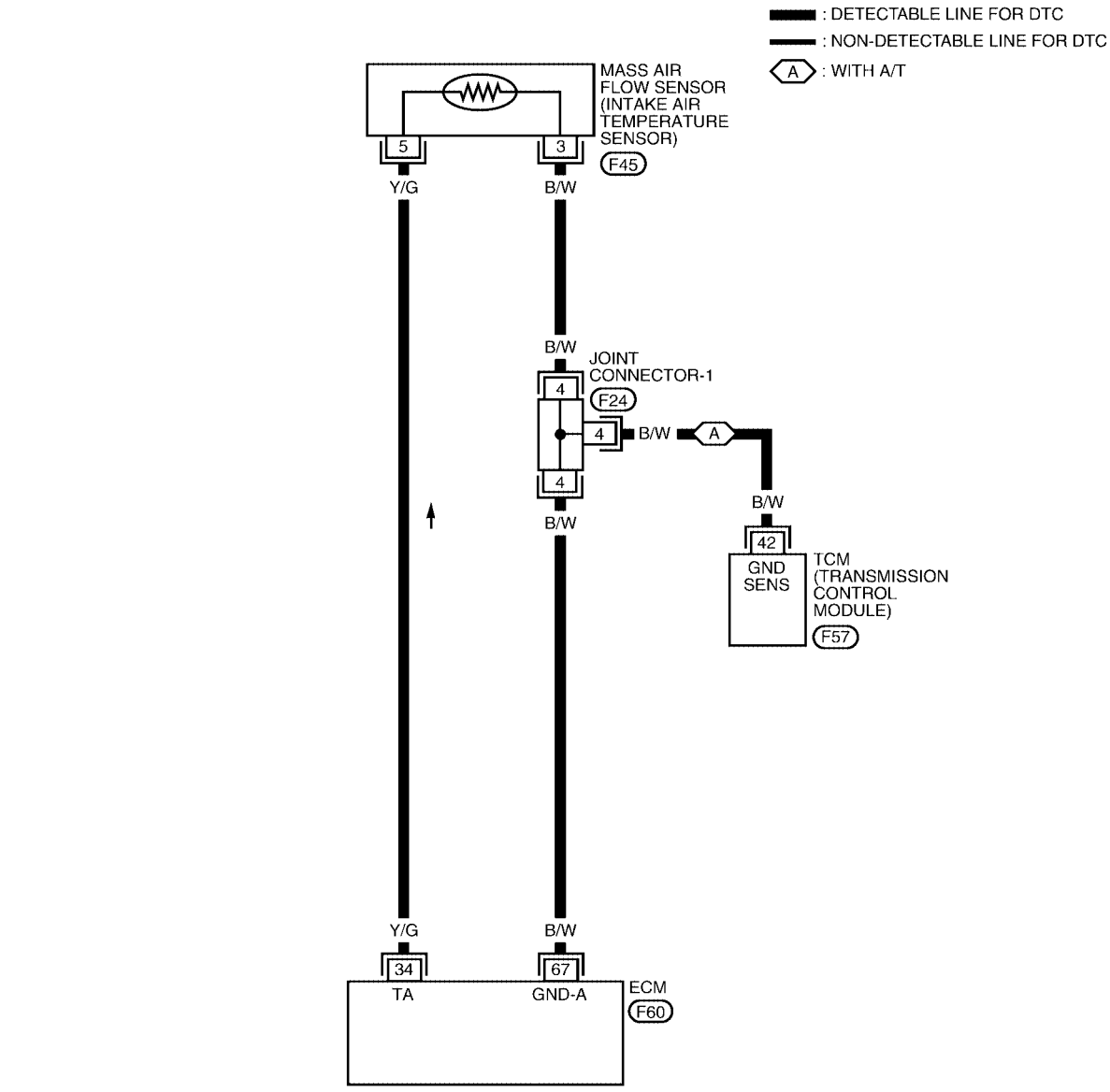
WITH GST

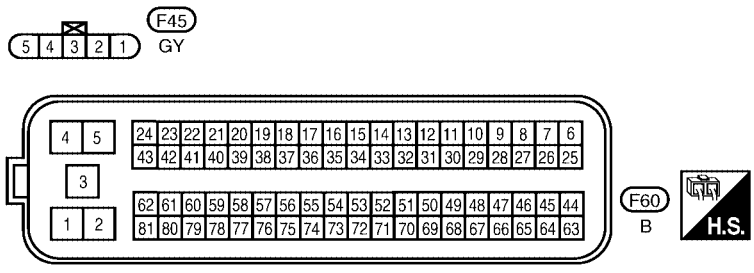
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003Q5

EC-IATS-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

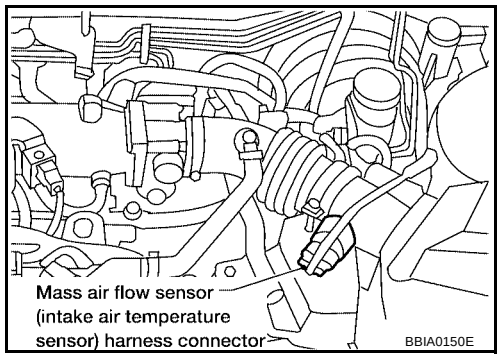
BBWA0775E

Diagnostic Procedure

UBS003Q6

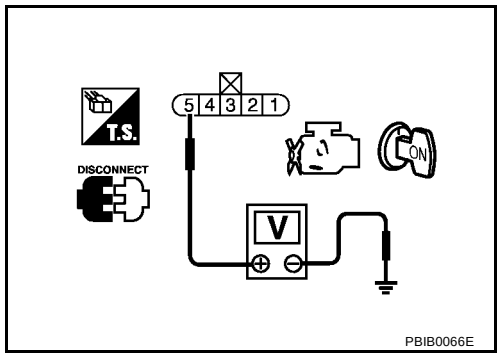
1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between TCM and intake air temperature sensor
- Harness for open or short between ECM and intake air temperature sensor

>> Repair open circuit or short to power in harness or connectors.

4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-180, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

5. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

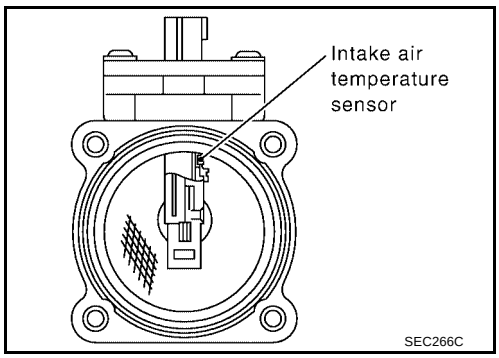
UBS003Q7

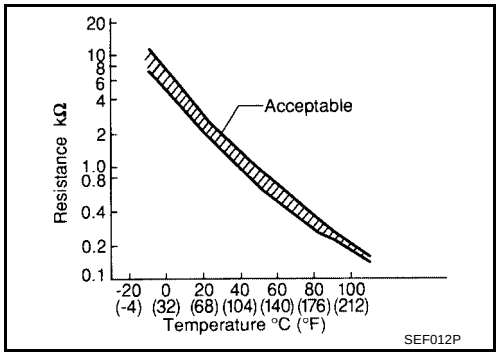
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





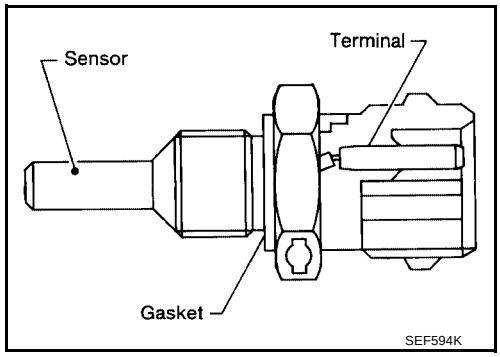
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

UBS001EF

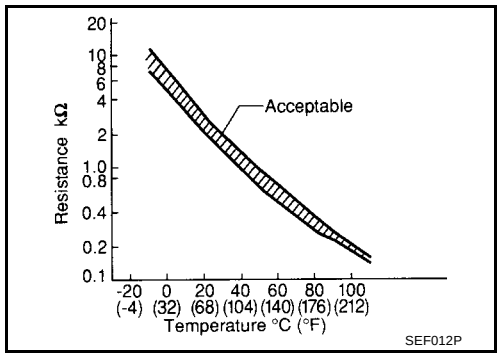
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may lead to ECM's transistor damage. Use ground other than ECM, such as engine ground.

On Board Diagnosis Logic

UBS006GC

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

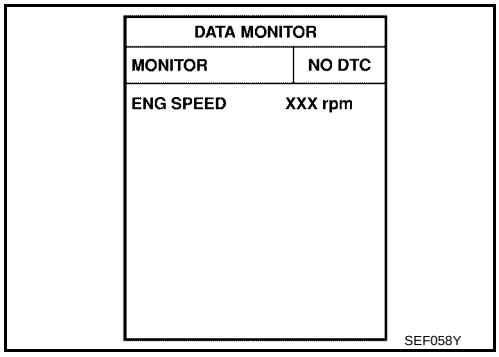
DTC Confirmation Procedure

UBS001EI

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-184, "Diagnostic Procedure" .



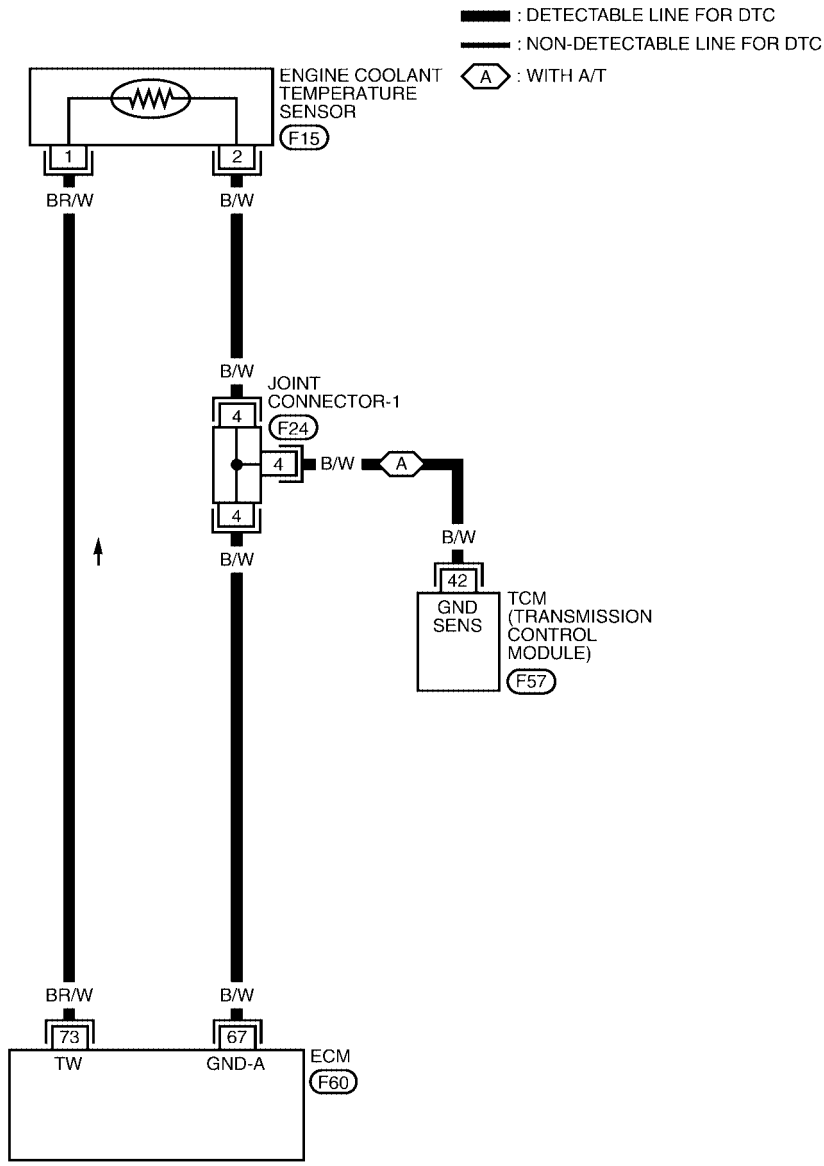
WITH GST

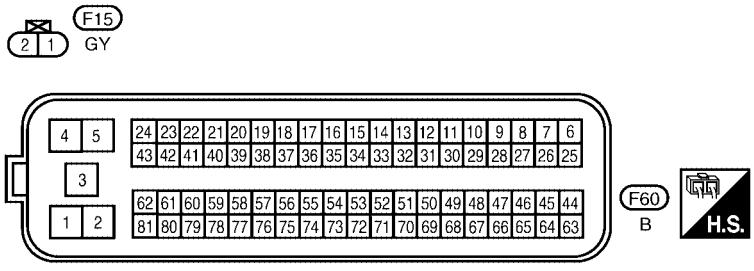
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS001EJ

EC-ECTS-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

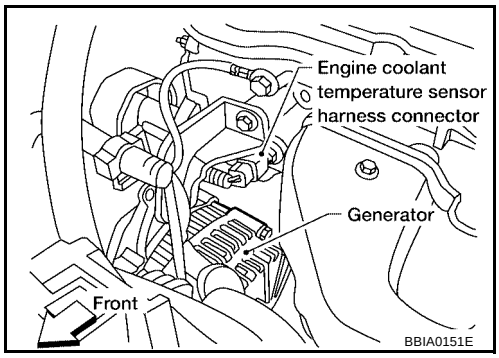
BBWA0776E

Diagnostic Procedure

UBS001EK

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature sensor (ECTS) harness connector.
3. Turn ignition switch “ON”.

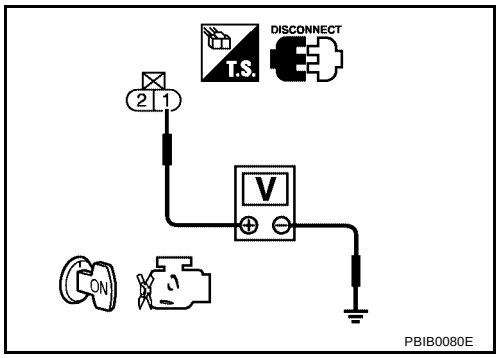


4. Check voltage between ECTS terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 2.
NG >> Repair harness or connectors.



2. CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECTS terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and engine coolant temperature sensor
- Harness for open or short between TCM (Transmission control module) and engine coolant temperature sensor.
- Joint connector-1

>> Repair open circuit or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-185, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

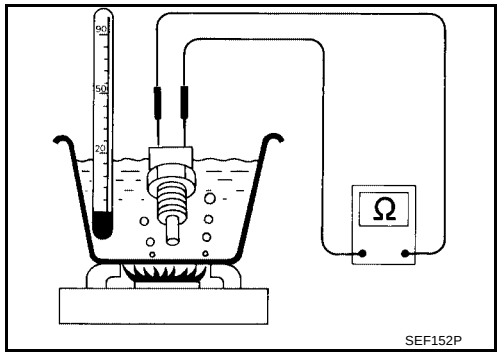
>> **INSPECTION END**

Component Inspection

UBS001EL

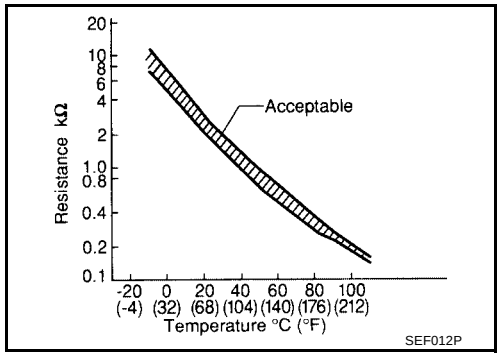
ENGINE COOLANT TEMPERATURE SENSOR

Check resistance as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS001EM

ENGINE COOLANT TEMPERATURE SENSOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

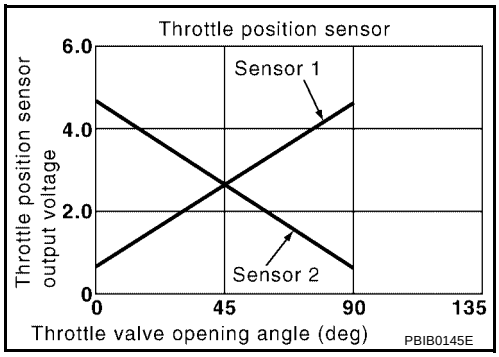
DTC P0122, P0123 TP SENSOR

PFP:16119

Component Description

UBS003ZS

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS003ZT

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	More than 0.36V
	● Shift lever: D (A/T), 1st (M/T)	Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS003ZU

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122 0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 2) ● Accelerator pedal position sensor (APP sensor)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

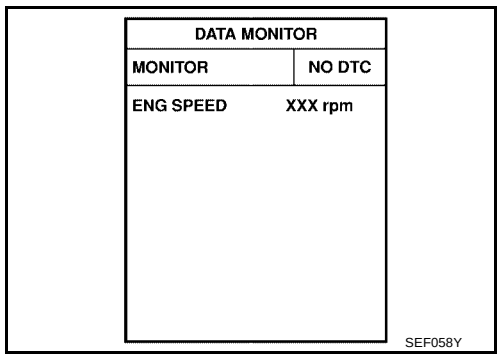
DTC Confirmation Procedure

UBS003ZV

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-189, "Diagnostic Procedure" .



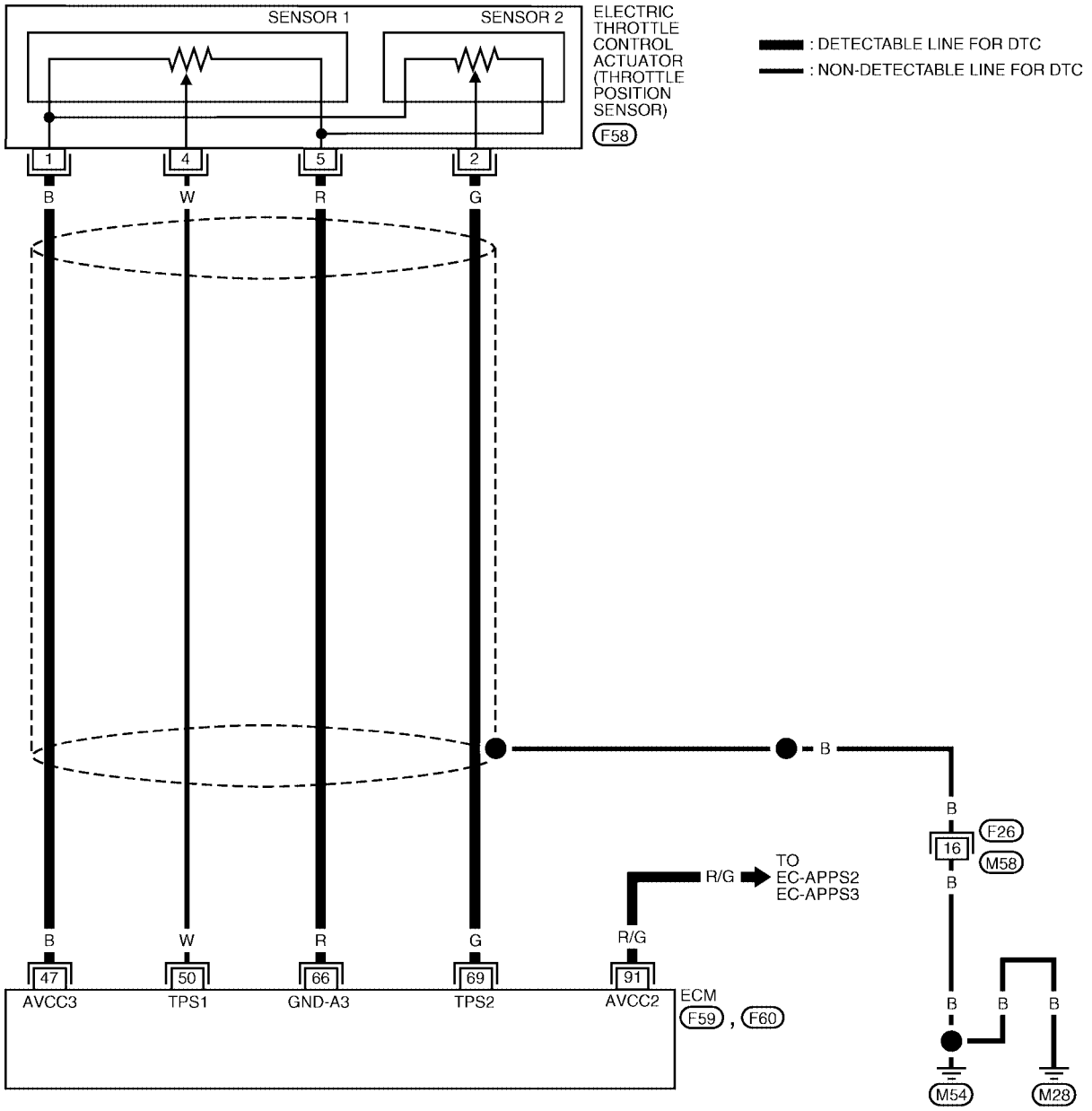
WITH GST

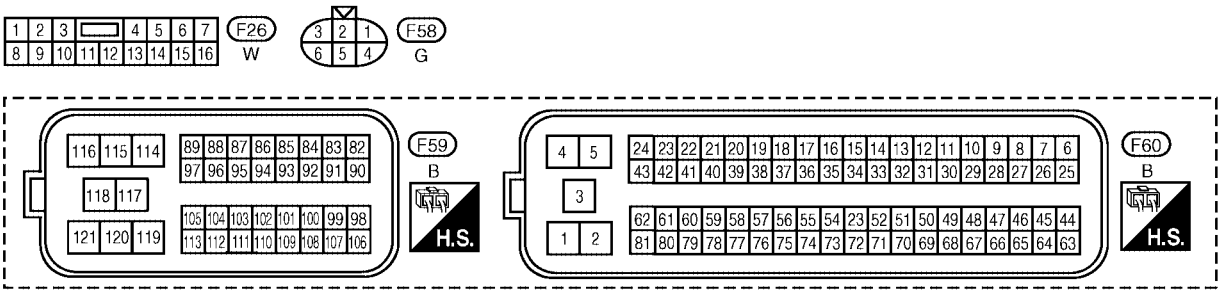
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003ZW

EC-TPS2-01





BBWA1380E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	R	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V

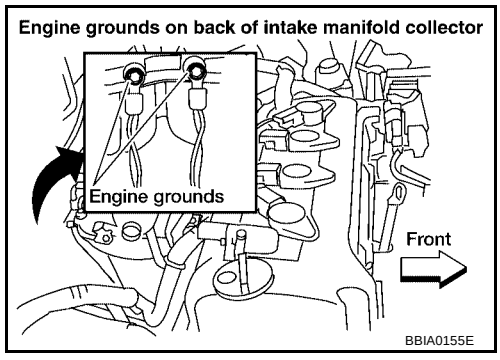
Diagnostic Procedure

UBS003ZX

1. RETIGHTEN GROUND SCREWS

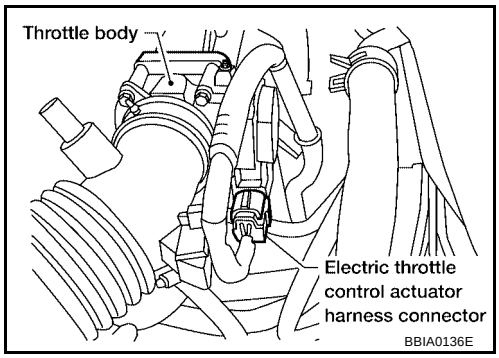
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

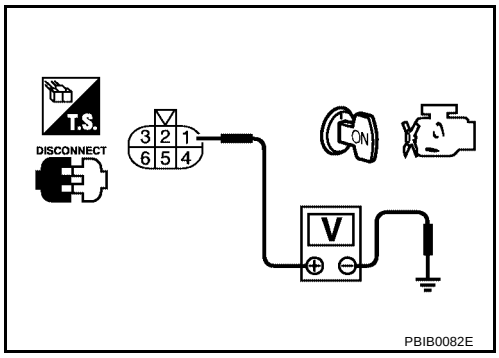


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 7.
NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace open circuit.

4. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-186
91	APP sensor terminal 1	EC-511

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-511, "DTC P2127, P2128 APP SENSOR" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 69 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to EC-192, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

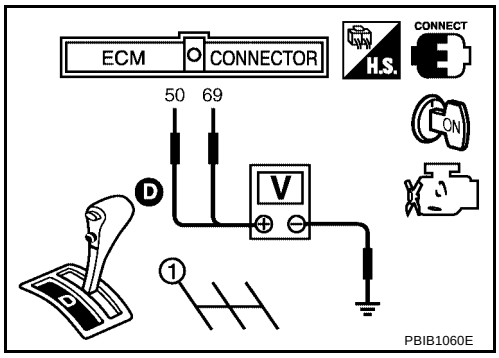
>> **INSPECTION END**

Component Inspection

UBS003ZY

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or ″1st″ position (M/T models).
5. Check voltage between ECM terminals 50 (TP sensor 1signal), 69 (TP sensor 2signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-53, "Throttle Valve Closed Position Learning" .
8. Perform EC-53, "Idle Air Volume Learning" .

Removal and Installation

UBS003ZZ

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

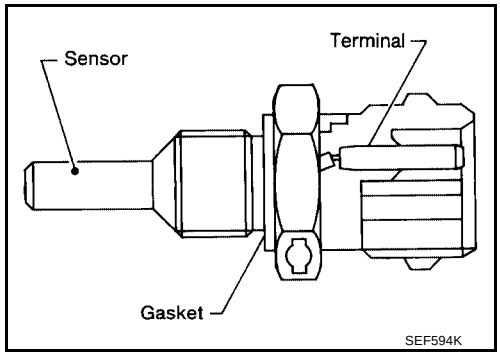
DTC P0125 ECT SENSOR

PFP:22630

Component Description

UBS001EV

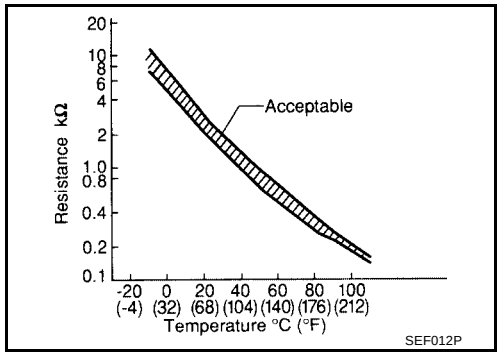
NOTE:
If DTC P0125 is displayed with P0117 or P0118, first perform trouble diagnosis for DTC P0117 or P0118, EC-181 .
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may lead to ECM's transistor damage. Use ground other than ECM, such as engine ground.

On Board Diagnosis Logic

UBS001EX

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	Insufficient engine coolant temperature for closed loop fuel control	● Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. ● Engine coolant temperature is insufficient for closed loop fuel control.	● Harness or connectors (High resistance in the circuit) ● Engine coolant temperature sensor ● Thermostat

DTC Confirmation Procedure

UBS001EY

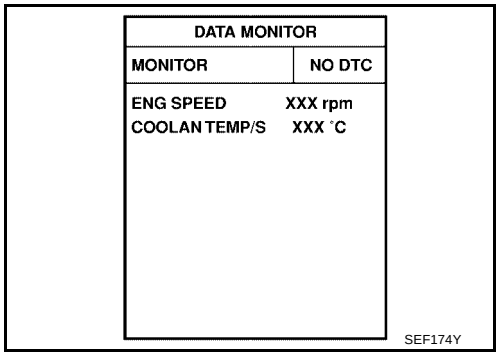
CAUTION:
Be careful not to overheat engine.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Check that “COOLAN TEMP/S” is above 10°C (50°F).
   If it is above 10°C (50°F), the test result will be OK. If it is below 10°C (50°F), go to following step.
4. Start engine and run it for 65 minutes at idle speed.
   If “COOLAN TEMP/S” increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.
5. If 1st trip DTC is detected, go to EC-194, "Diagnostic Procedure" .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS001F0

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-194, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace engine coolant temperature sensor.

2. CHECK THERMOSTAT OPERATION

When the engine is cooled [lower than 82°C (180°F)], grasp lower radiator hose and confirm the engine coolant does not flow.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace thermostat. Refer to CO-11, "THERMOSTAT AND THERMOSTAT HOUSING" .

3. CHECK INTERMITTENT INCIDENT

Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

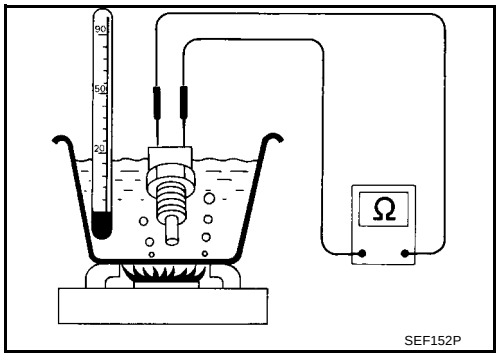
>> **INSPECTION END**

Component Inspection

UBS001F1

ENGINE COOLANT TEMPERATURE SENSOR

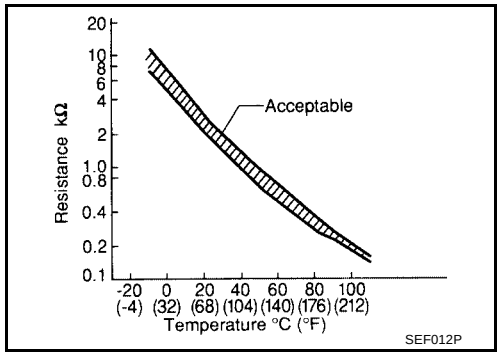
Check resistance as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
90 (194)	0.236 - 0.260

If NG, replace engine coolant temperature sensor.



UBS001F2

Removal and Installation

ENGINE COOLANT TEMPERATURE SENSOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

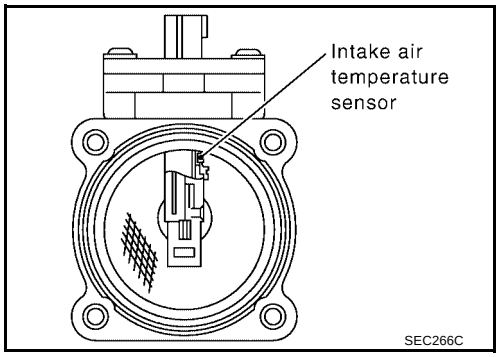
DTC P0127 IAT SENSOR

PFP:22630

Component Description

UBS003QI

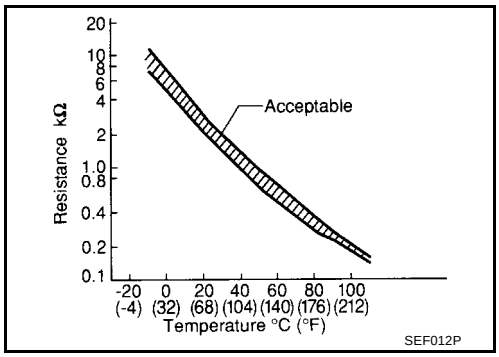
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS003QJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127 0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Intake air temperature sensor

DTC Confirmation Procedure

UBS003QK

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

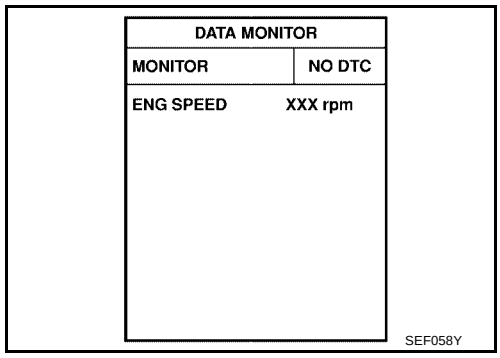
CAUTION:
Always drive vehicle at a safe speed.
TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Wait until engine coolant temperature is less than 90°C (194°F)

a. Turn ignition switch “ON”.
b. Select “DATA MONITOR” mode with CONSULT-II.
c. Check the engine coolant temperature.
d. If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch “OFF” and cool down engine.
   - Perform the following steps before engine coolant temperature is above 90°C (194°F).

2. Turn ignition switch “ON”.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6. If 1st trip DTC is detected, go to EC-197, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS003QM

1. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-197, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

2. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

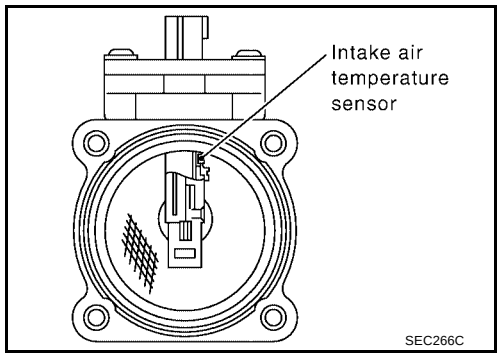
>> **INSPECTION END**

Component Inspection

UBS003QN

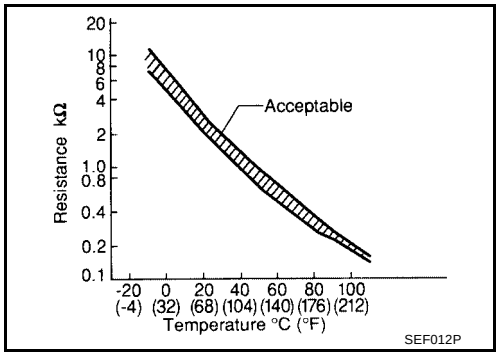
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.



Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).



DTC P0128 THERMOSTAT FUNCTION

PFP:21200

On Board Diagnosis Logic

UBS006GD

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.
This is due to a leak in the seal or the thermostat stuck open.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128 0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	● Thermostat ● Leakage from sealing portion of thermostat ● Engine coolant temperature sensor

DTC Confirmation Procedure

UBS001F5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:

- **For best results, perform at ambient temperature of –10°C (14°F) or higher.**
- **For best results, perform at engine coolant temperature of –10°C (14°F) to 60°C (140°F).**

WITH CONSULT-II

1. Replace thermostat with new one. Refer to CO-11, "THERMOSTAT AND THERMOSTAT HOUSING" . Use only a genuine NISSAN thermostat as a replacement. If an incorrect thermostat is used, the MIL may come on.
2. Turn ignition switch “ON”.
3. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
4. Check that the “COOLAN TEMP/S” is above 60°C (140°F).
   If it is below 60°C (140°F), go to following step.
   If it is above 60°C (140°F), stop engine and cool down the engine to less than 60°C (140°F), then retry from step 1.
5. Drive vehicle for 10 consecutive minutes under the following conditions.

VHCL SPEED SE	80 - 120 km/h (50 - 75 MPH)

If 1st trip DTC is detected, go to EC-199, "Diagnostic Procedure" .

WITH GST

1. Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS001F6

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-200, "Component Inspection" .

OK or NG

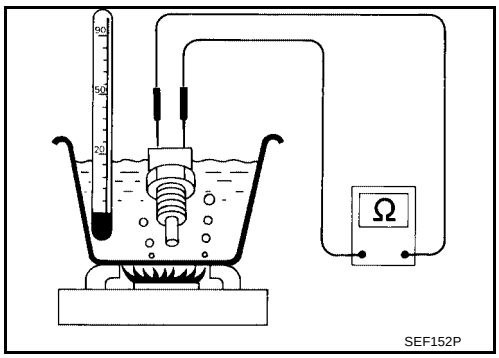
OK >> **INSPECTION END**
NG >> Replace engine coolant temperature sensor.

Component Inspection

UBS001F7

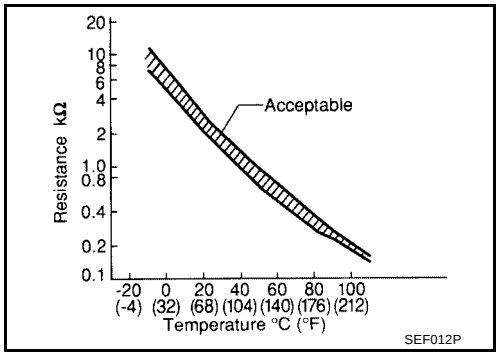
ENGINE COOLANT TEMPERATURE SENSOR

Check resistance as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
90 (194)	0.236 - 0.260



If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS001F8

ENGINE COOLANT TEMPERATURE SENSOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

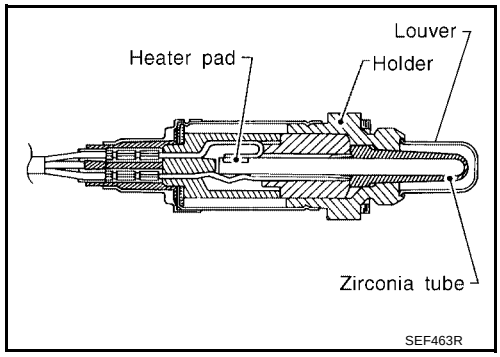
DTC P0132 HO2S1

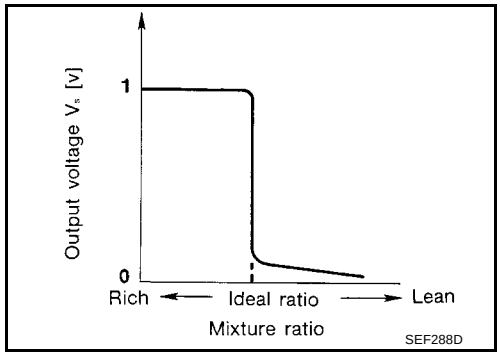
PFP:22690

Component Description

UBS003TQ

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS003TR

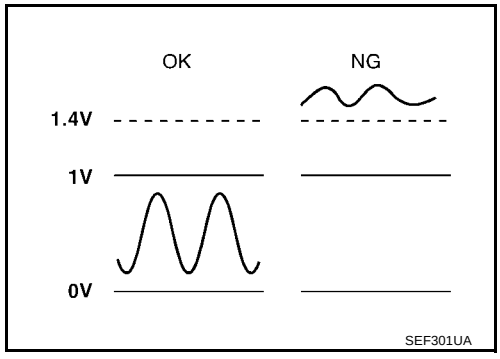
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS003TS

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1

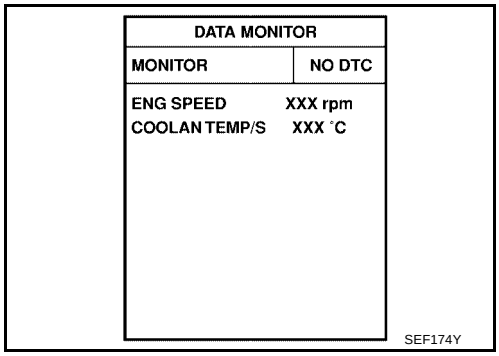
DTC Confirmation Procedure

UBS003TT

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-204, "Diagnostic Procedure" .



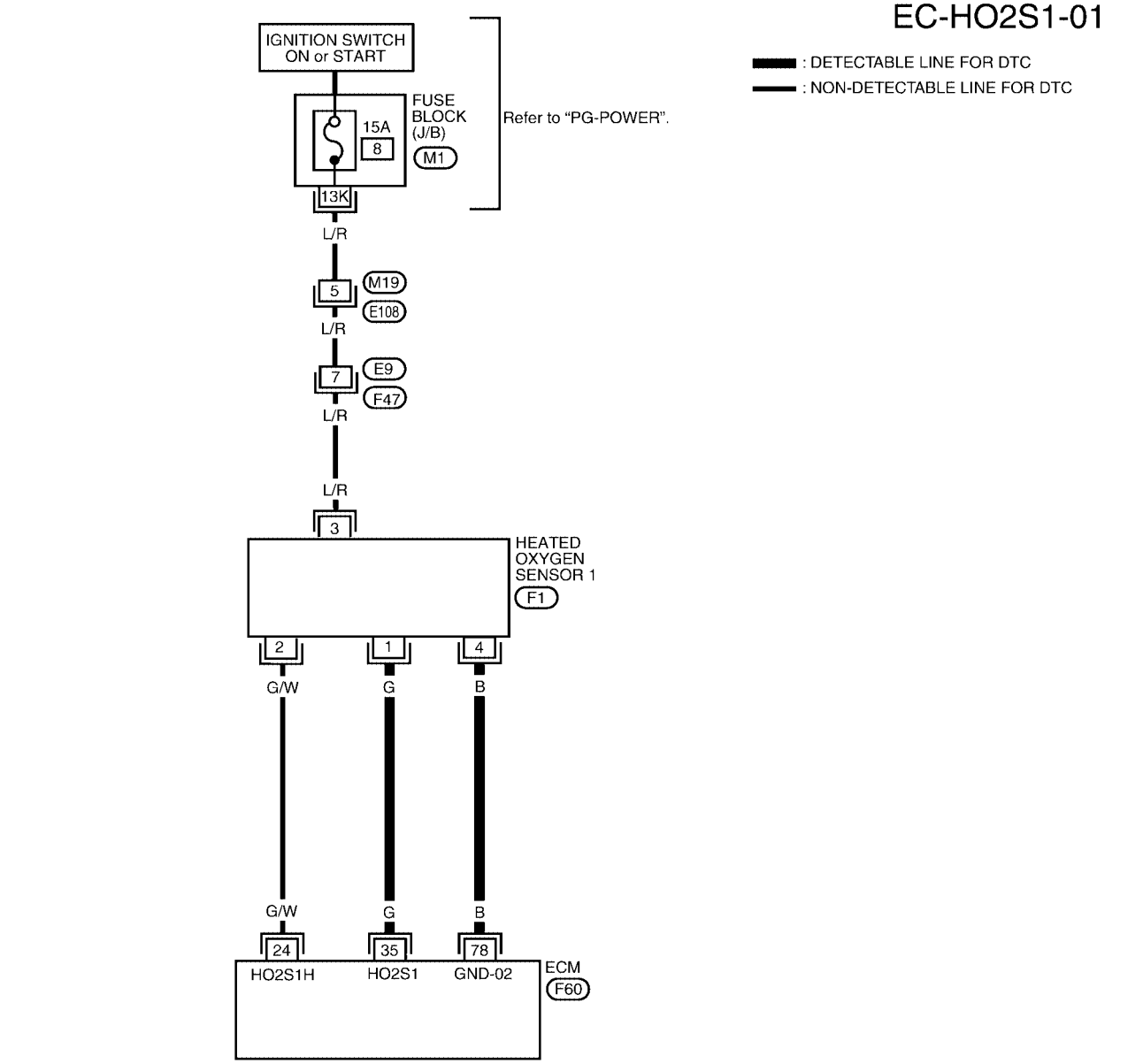
WITH GST

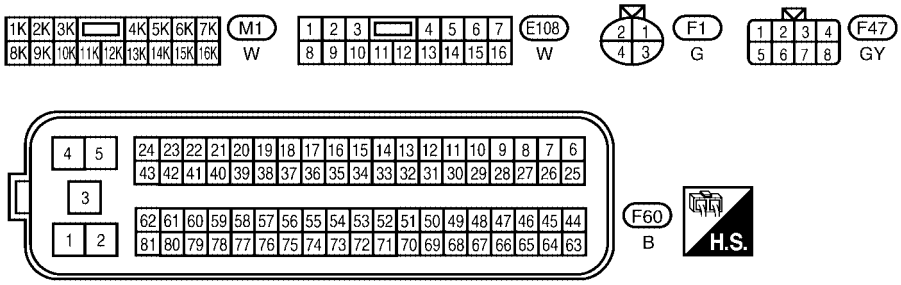
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Restart engine and let it idle for 2 minutes.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-204, "Diagnostic Procedure" .

- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS003TU





BBWA0778E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
78	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

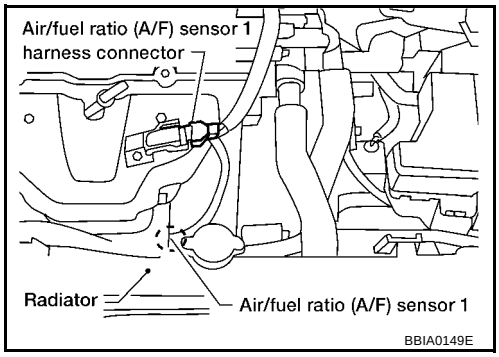
UBS003TV

1. RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

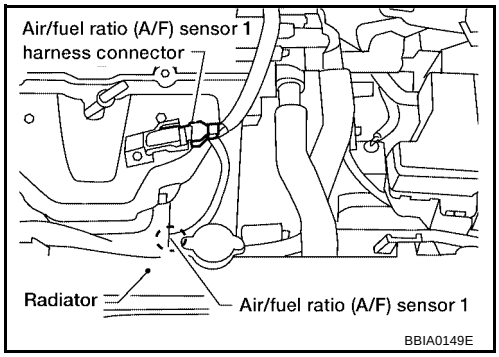
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 78 HO2S1 terminal 4.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-205, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

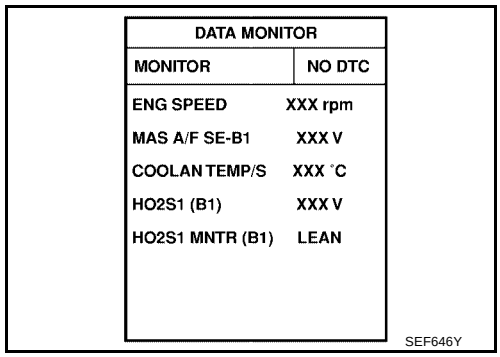
Component Inspection

UBS003TW

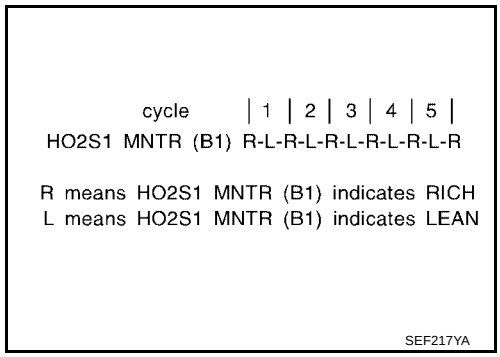
HEATED OXYGEN SENSOR 1

With CONSULT-II

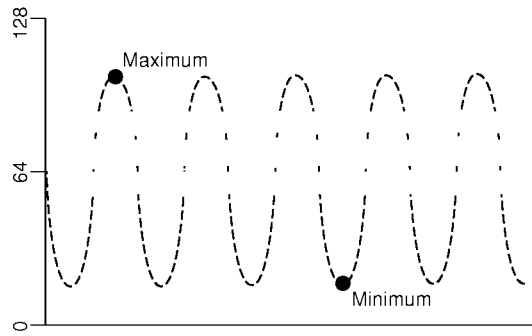
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



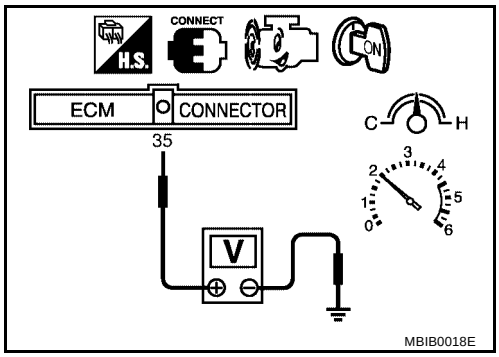
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS003TX

HEATED OXYGEN SENSOR 1

Refer to EM-12, "Removal and Installation" .

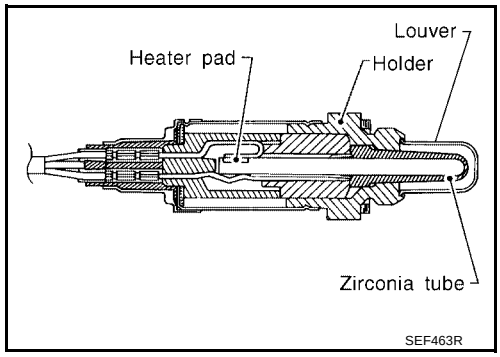
DTC P0133 HO2S1

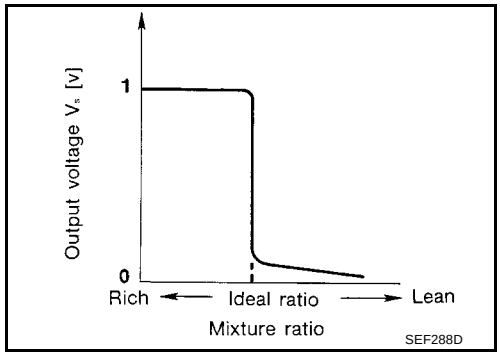
PFP:22690

Component Description

UBS003TY

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS003TZ

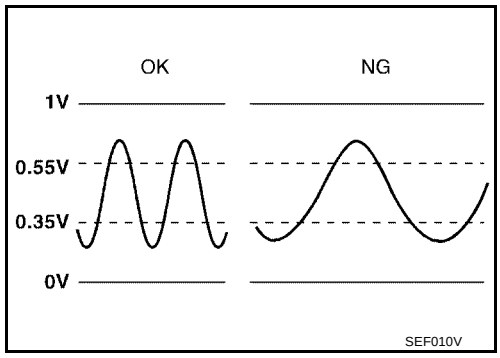
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS003U0

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133	Heated oxygen sensor 1 circuit slow response	The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV valve ● Mass air flow sensor

DTC Confirmation Procedure

UBS003U1

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

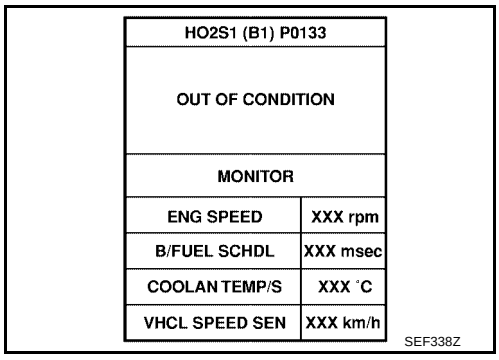
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

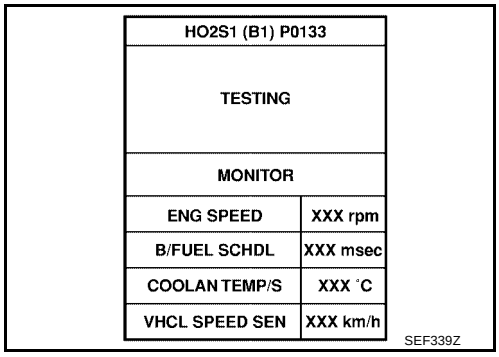
1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:

   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



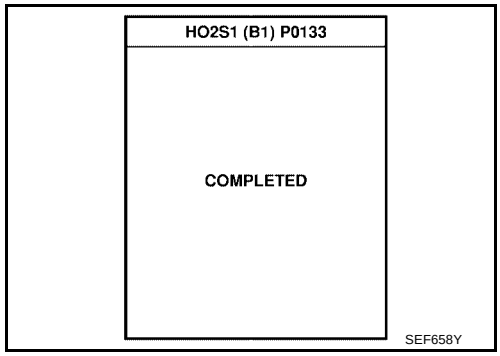
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 20 to 50 seconds.)



ENG SPEED	1,950 - 3,200 rpm (A/T models) 2,300 - 3,750 rpm (M/T models)
Vehicle speed	More than 80 km/h (50 MPH)
B/FUEL SCHDL	3.5 - 12.5 msec (A/T models) 3.0 - 10.0 msec (M/T models)
Selector lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-211, "Diagnostic Procedure" .



Overall Function Check

UBS003U2

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

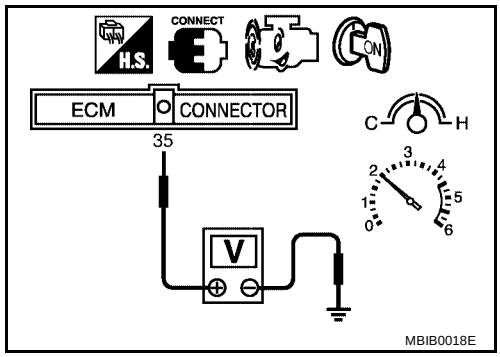
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1(B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.

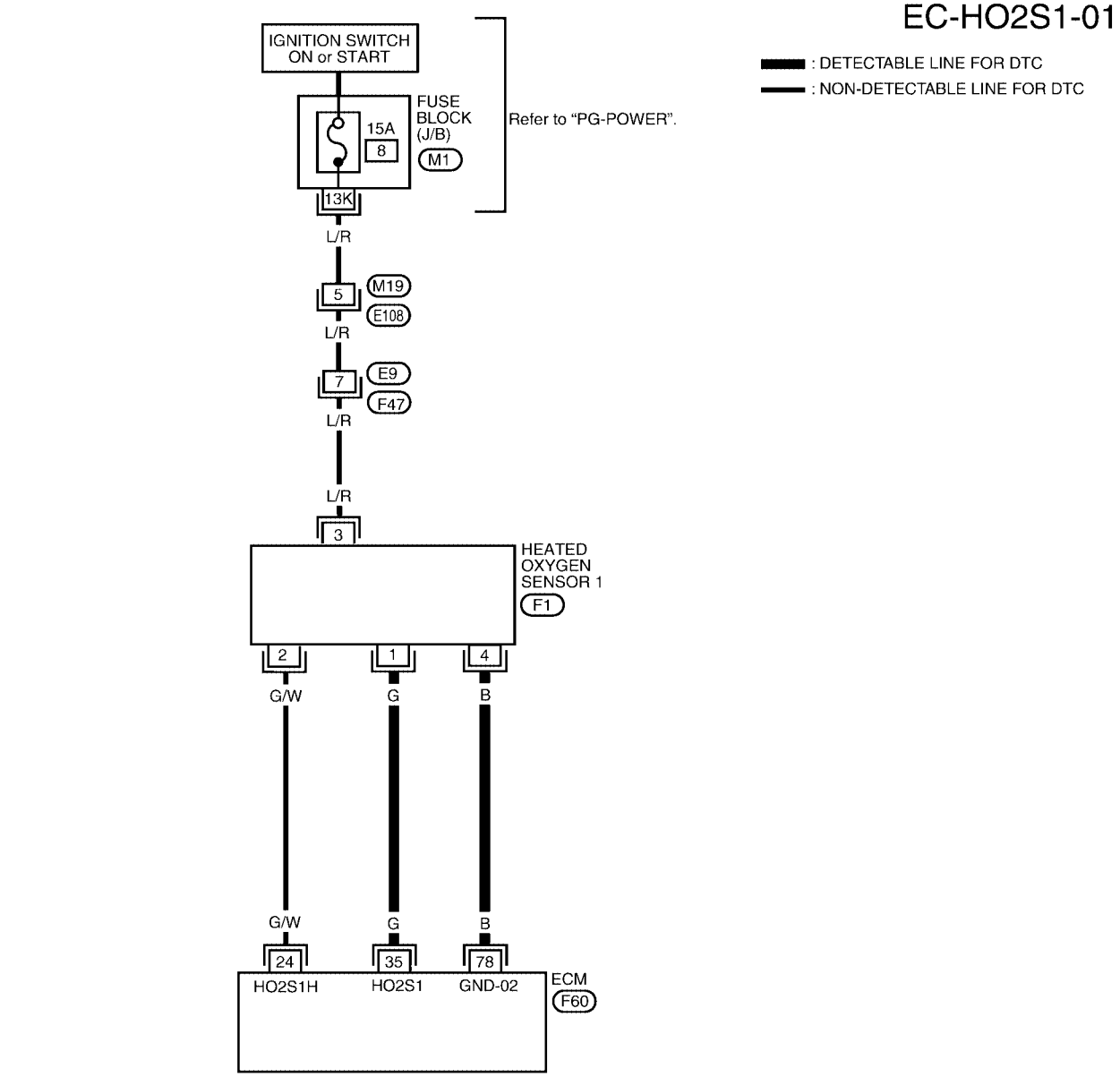
1 time:	**0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**
2 times:	**0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**

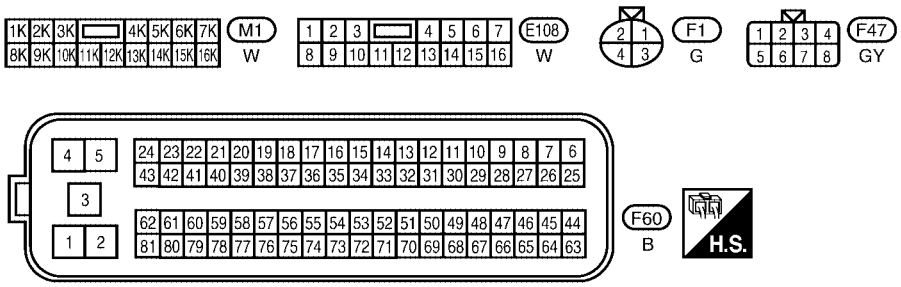
4. If NG, go to EC-211, "Diagnostic Procedure" .



Wiring Diagram

UBS003U3





BBWA0778E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

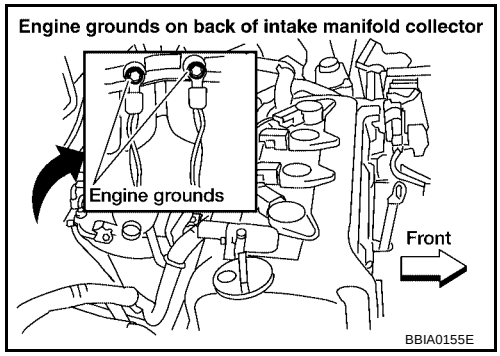
Diagnostic Procedure

UBS003U4

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

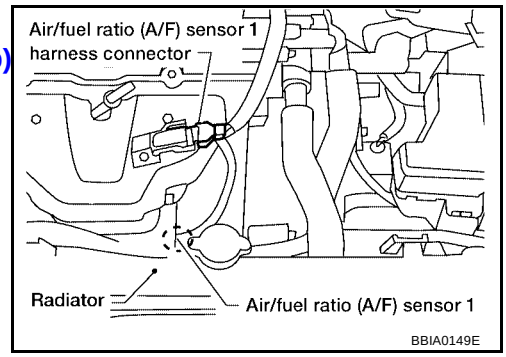


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

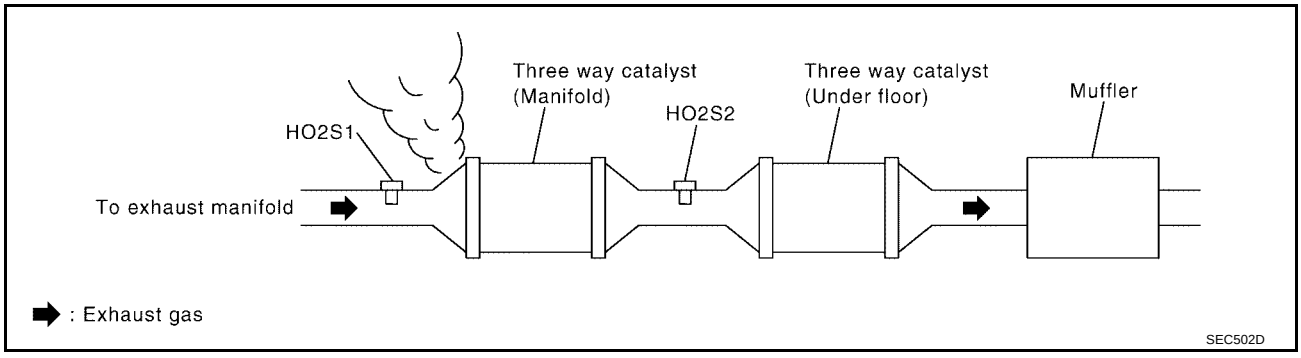
Tightening torque: 40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

>> GO TO 3.



3. CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (Manifold).



OK or NG

OK >> GO TO 4.

NG >> Repair or replace.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

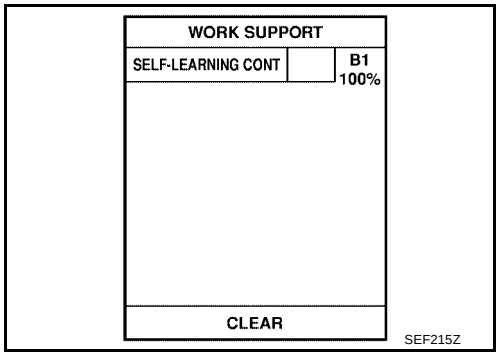
OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

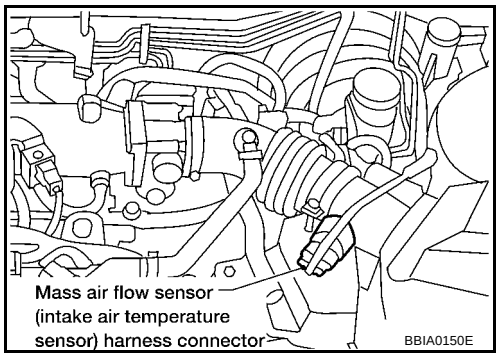
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

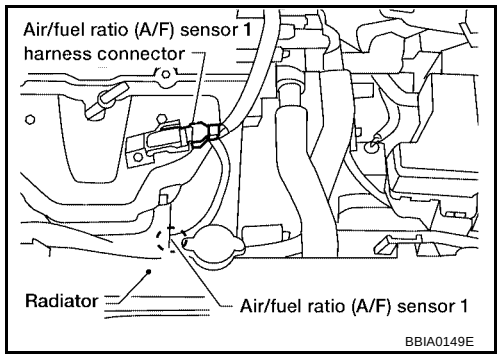
Yes >> Perform trouble diagnosis for DTC P0171 or DTC P0172 (Refer to EC-238 or EC-245).
No >> GO TO 6.

6. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 78 HO2S1 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.



OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to power in harness or connectors.

7. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-156, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace malfunctioning heated oxygen sensor 1.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-170, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK PCV VALVE

Refer to EC-596, "Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace PCV valve.

11. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-214, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace heated oxygen sensor 1.

12. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS003U5

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

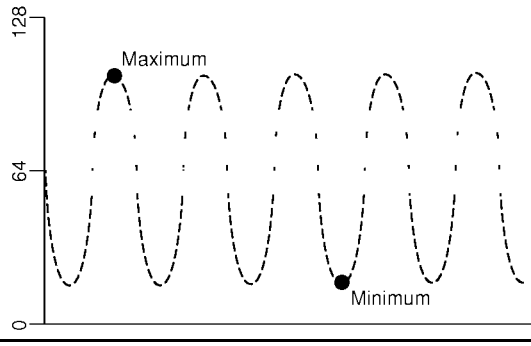
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

CAUTION:

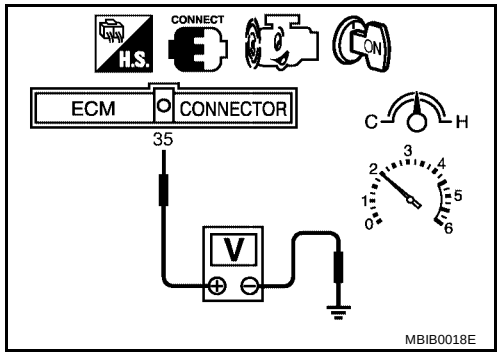
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS003U6

HEATED OXYGEN SENSOR 1

Refer to EM-12, "Removal and Installation" .

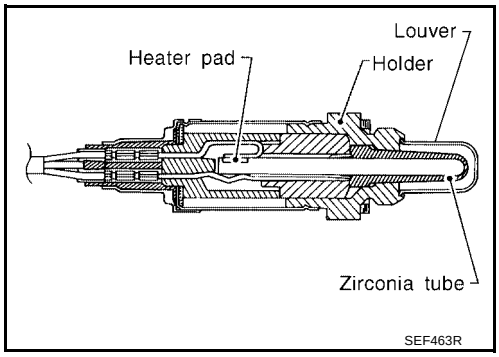
DTC P0134 HO2S1

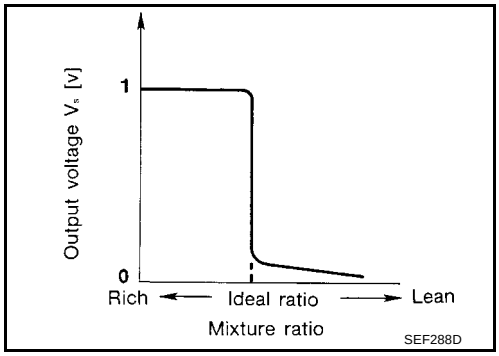
PFP:22690

Component Description

UBS003U7

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS003U8

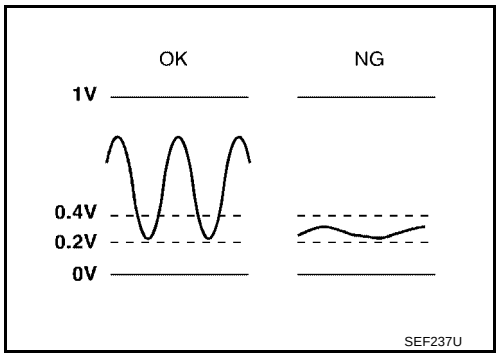
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS003U9

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1

DTC Confirmation Procedure

UBS003UA

CAUTION:
Always drive vehicle at a safe speed.

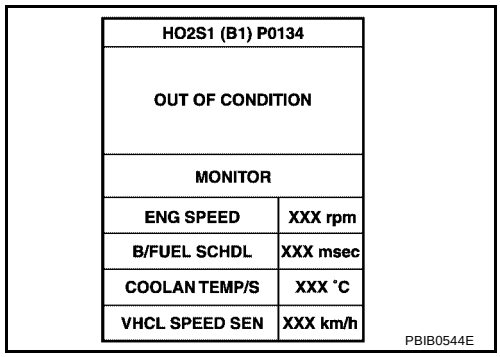
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

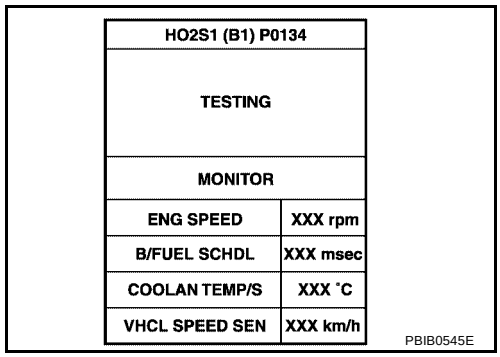
1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 (B1) P0134” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
3. Touch “START”.
4. Let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 4.



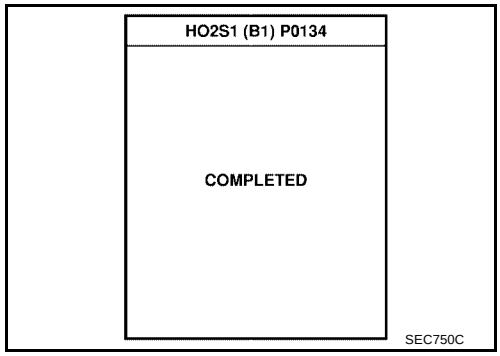
5. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,550 - 3,450 rpm (A/T models) 1,850 - 4,100 rpm (M/T models)
Vehicle speed	More than 64 km/h (40 MPH)
B/FUEL SCHDL	2.4 - 12.5 msec (A/T models) 2 - 10 msec (M/T models)
Selector lever	Suitable position



If “TESTING” is not displayed after 5 minutes, retry from step 2.

6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-220, "Diagnostic Procedure" .



Overall Function Check

UBS003UB

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

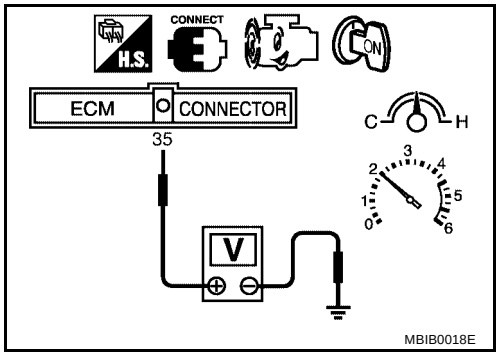
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.

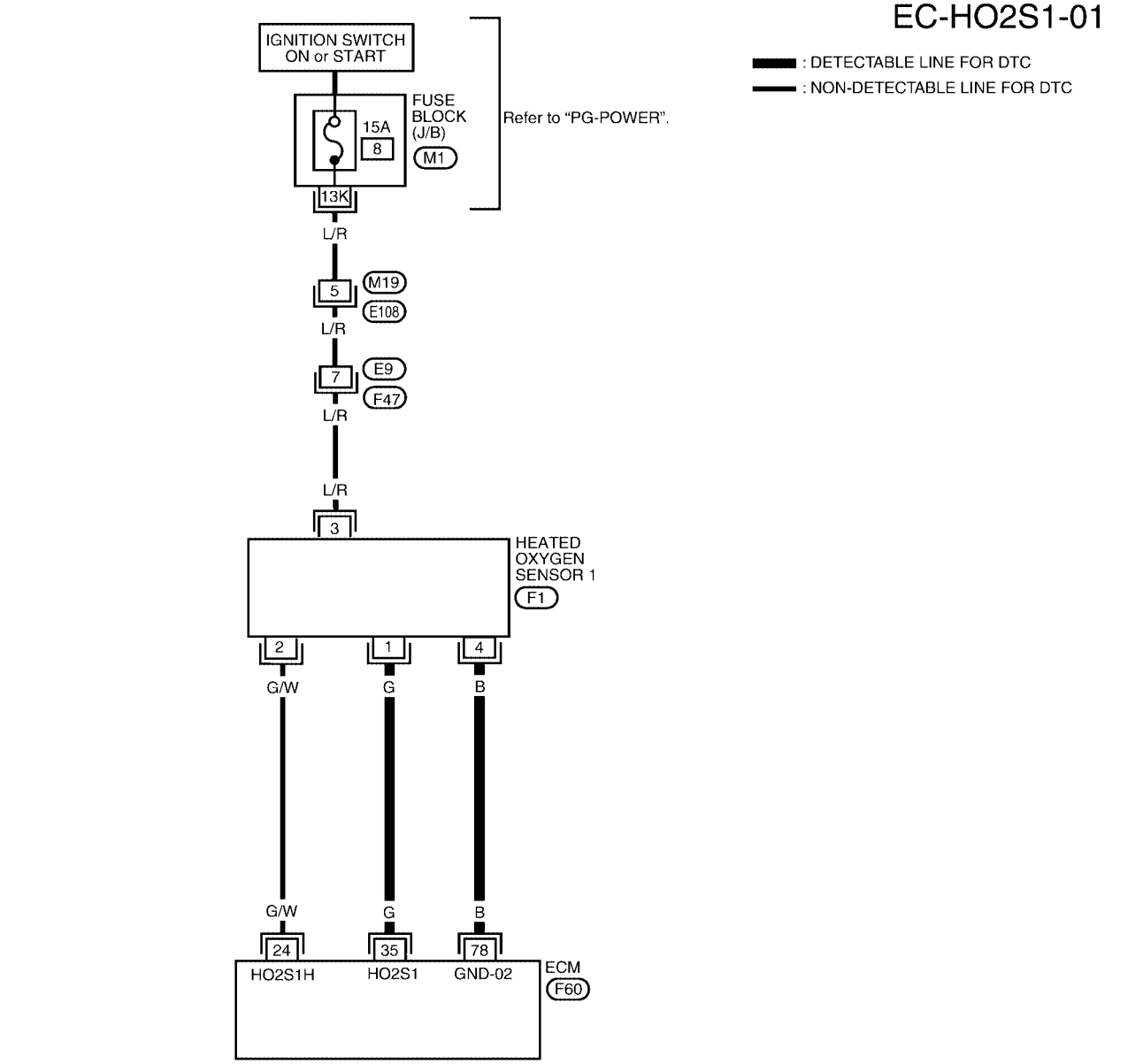
- The voltage does not remain in the range of 0.2 to 0.4V.

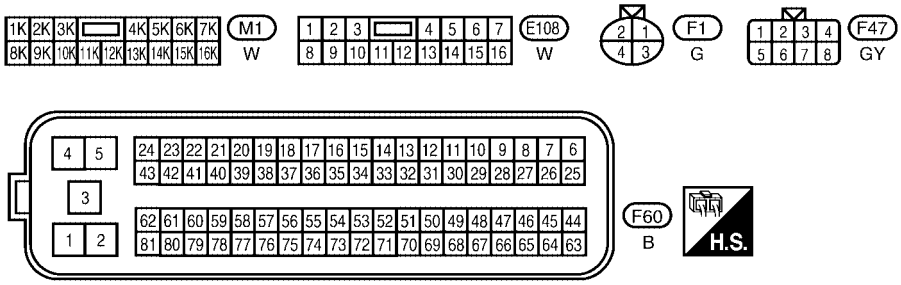
4. If NG, go to EC-220, "Diagnostic Procedure" .



Wiring Diagram

UBS003UC





BBWA0778E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

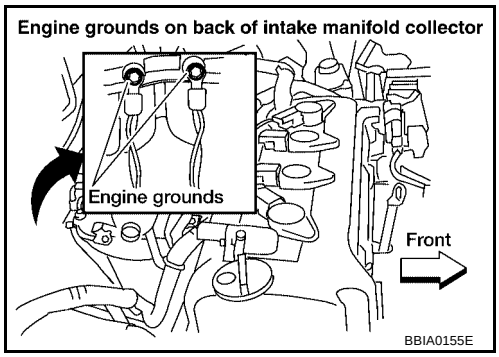
Diagnostic Procedure

UBS003UD

1. INSPECTION START

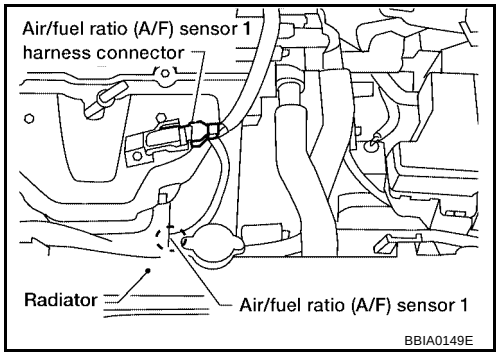
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.



2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 78 HO2S1 terminal 4.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-221, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

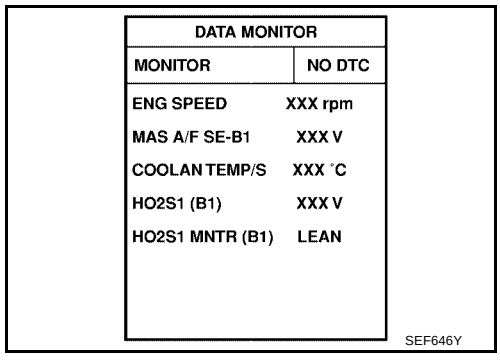
Component Inspection

UBS003UE

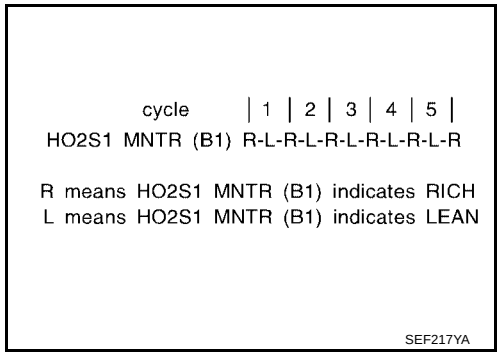
HEATED OXYGEN SENSOR 1

With CONSULT-II

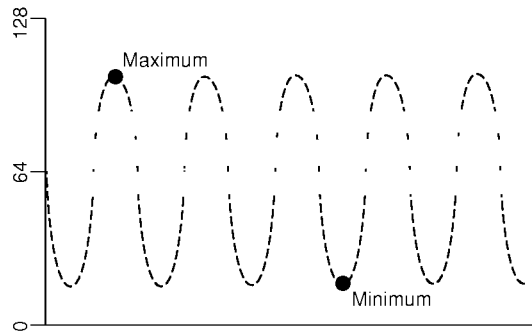
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



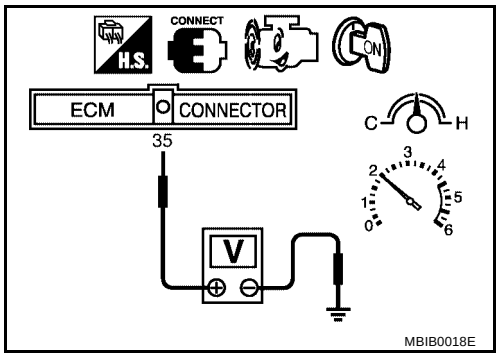
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS003UF

HEATED OXYGEN SENSOR 1

Refer to EM-12, "Removal and Installation" .

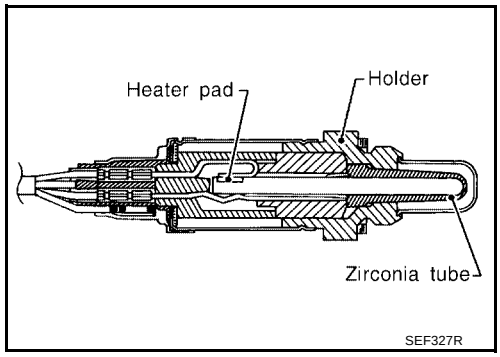
DTC P0138 HO2S2

PFP:226A0

Component Description

UBS006CD

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS006CE

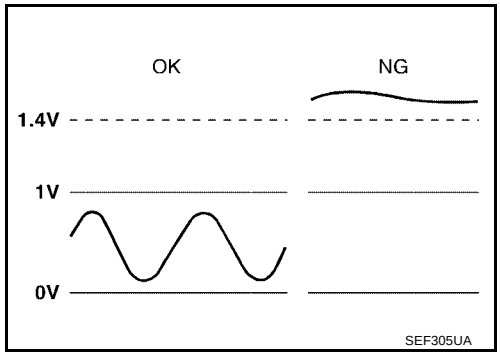
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

UBS006CF

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2

DTC Confirmation Procedure

UBS006CG

CAUTION:

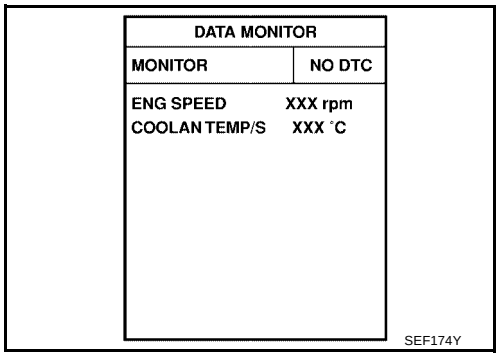
Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for two minutes.
6. If 1st trip DTC is detected, go to EC-226, "Diagnostic Procedure" .



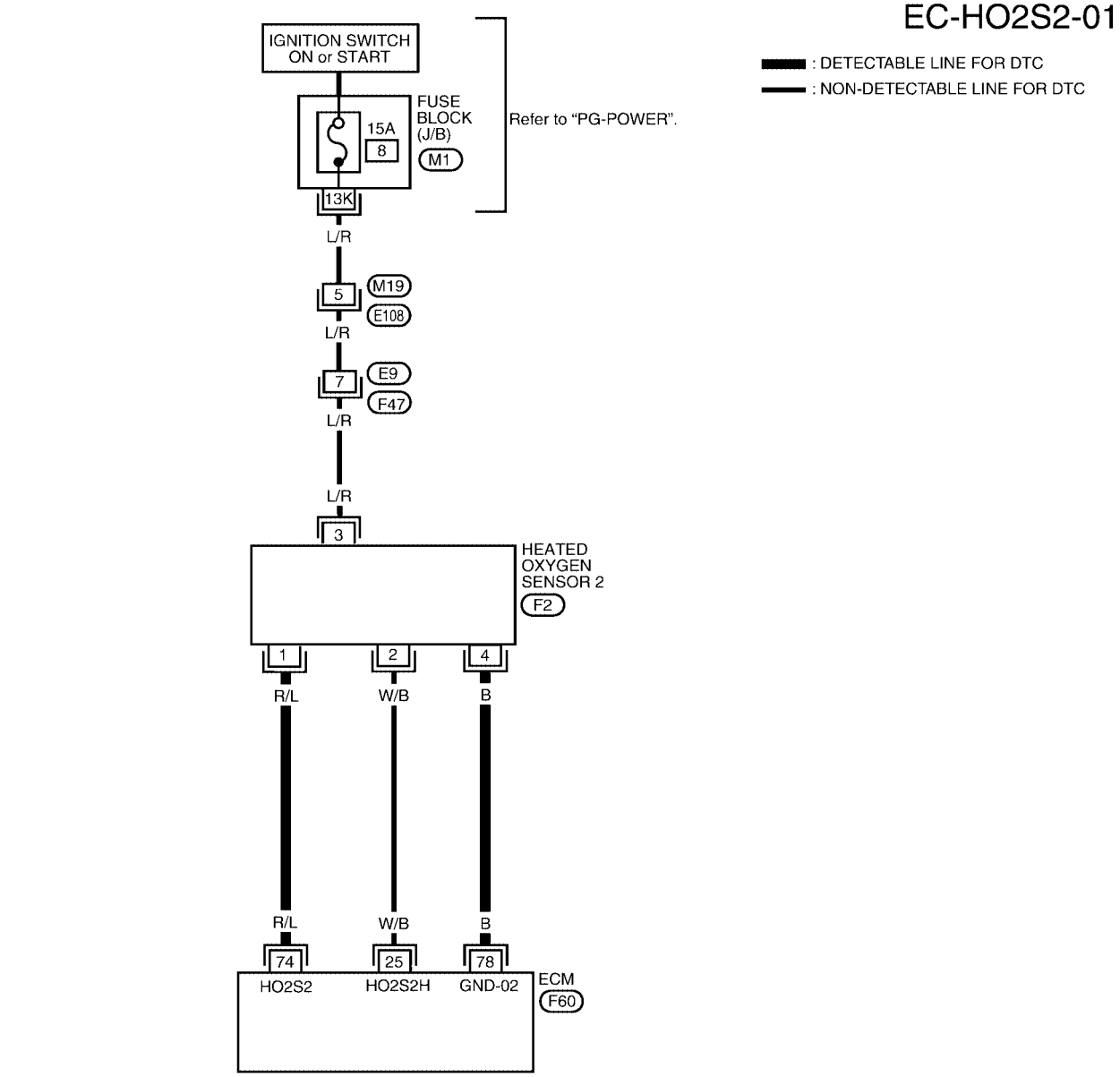
WITH GST

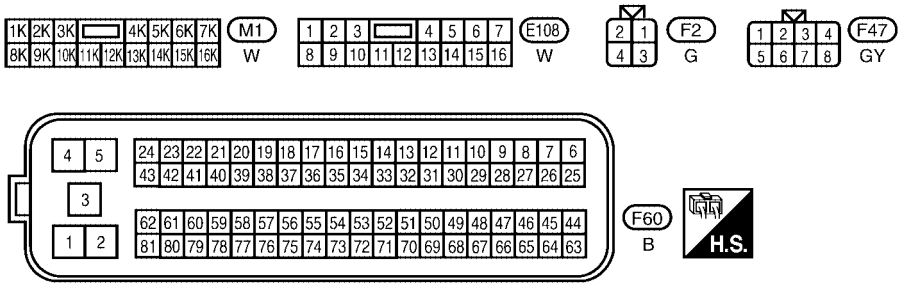
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for two minutes.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for two minutes.
8. Select “Mode 3” with GST.
9. If NG, go to EC-226, "Diagnostic Procedure" .

- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS006CH





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Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
78	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

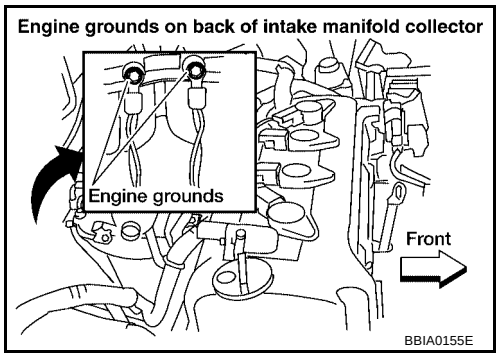
Diagnostic Procedure

UBS006CI

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

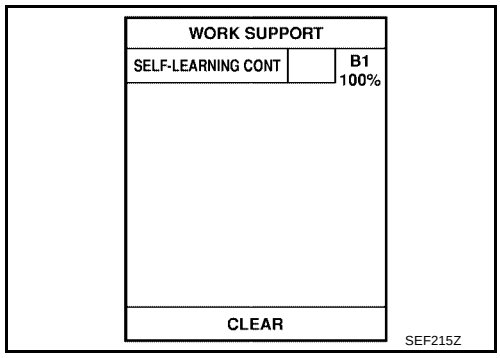
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

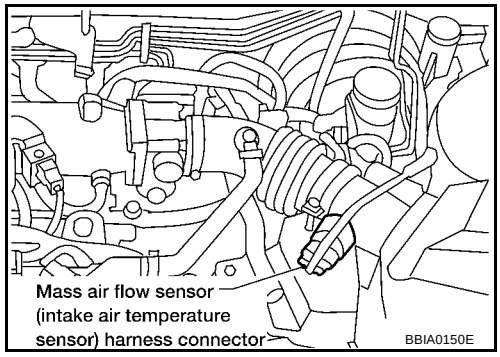
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-245 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

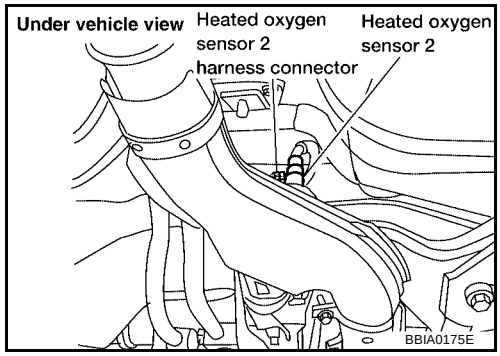
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 74 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 74 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-228, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

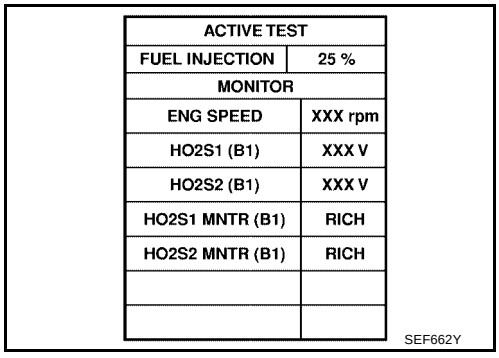
Component Inspection

UBS006CJ

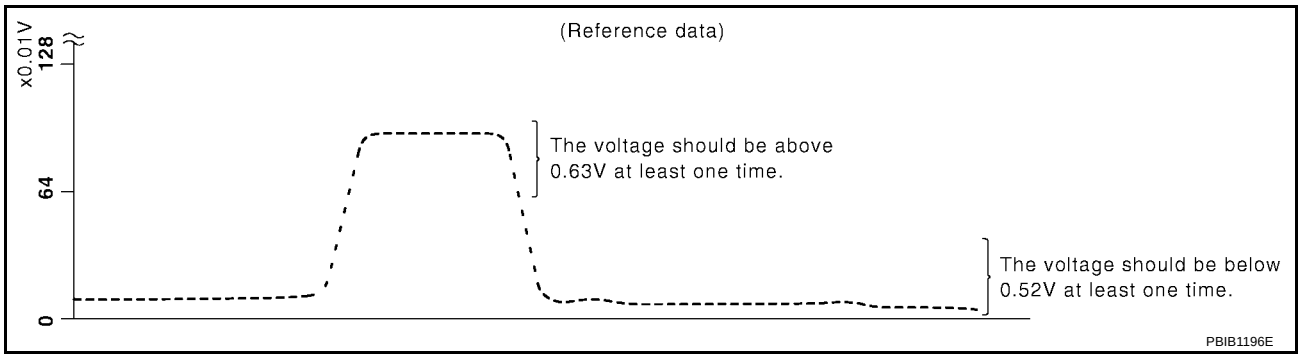
HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



6. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



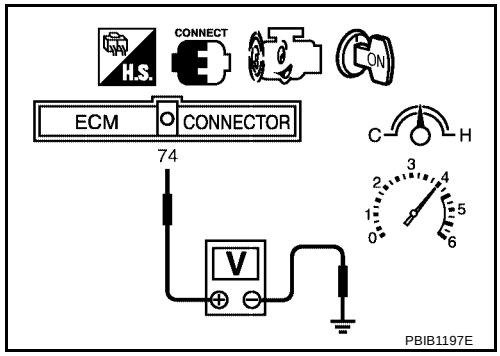
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.52V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.52V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS006CK

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

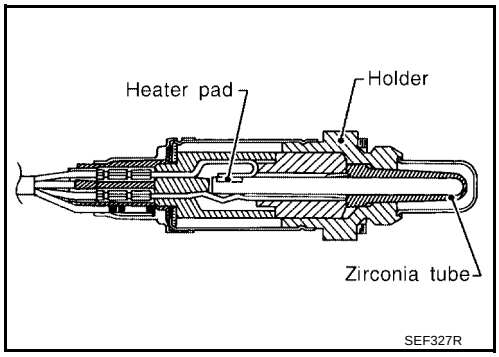
DTC P0139 HO2S2

PFP:226A0

Component Description

UBS006CL

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS006CM

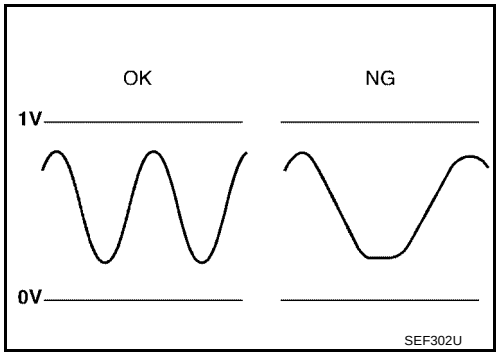
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

UBS006CN

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

UBS006FL

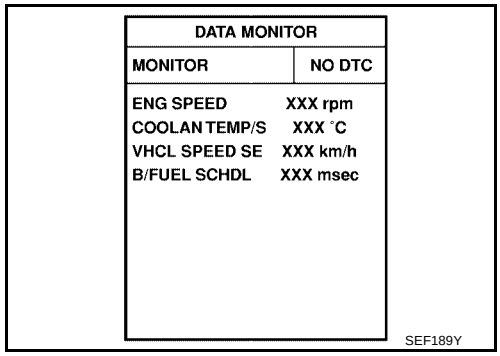
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

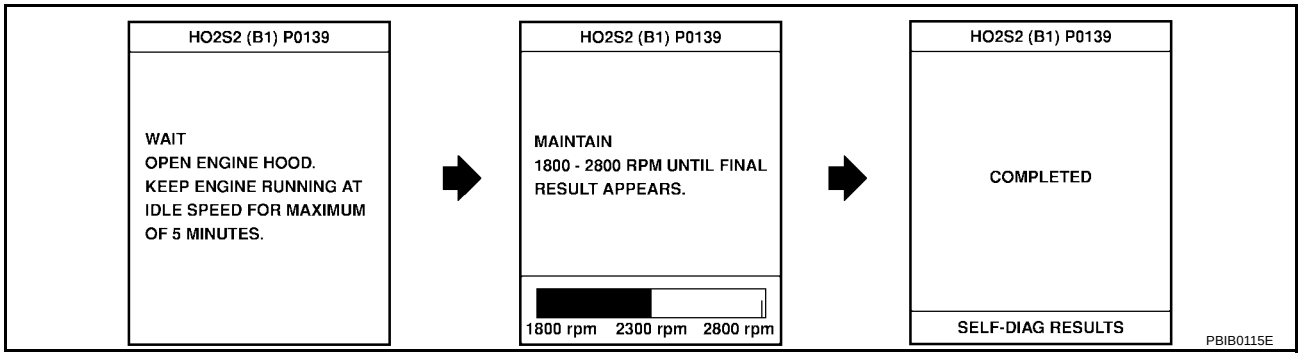
TESTING CONDITION:

For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30 °C (32 to 86 °F).

1. Turn ignition switch “ON” and select ″DATA MONITOR″ mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch ″OFF″ and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minutes.
6. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches to 70°C (158°F).



7. Select “HO2S2 (B1) P0139” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
8. Start engine and following the instruction of CONSULT-II.



9. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-234, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).

b. Return to step 1.

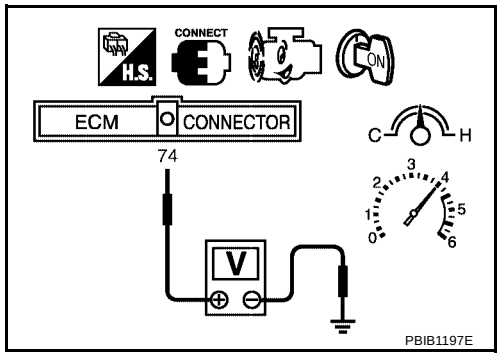
Overall Function Check

UBS006FM

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to the normal operating.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 74 and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   A change of voltage should be more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).

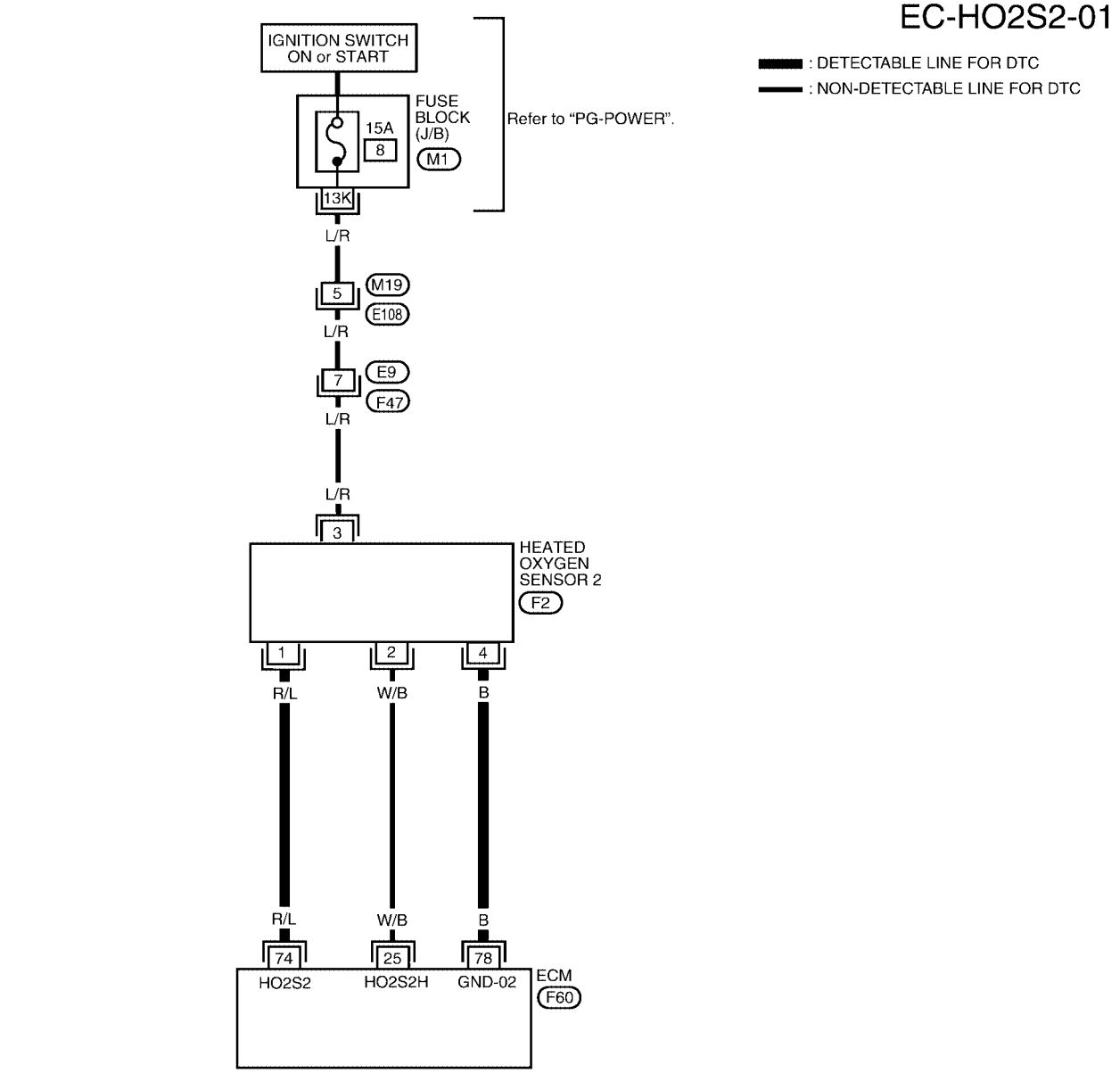


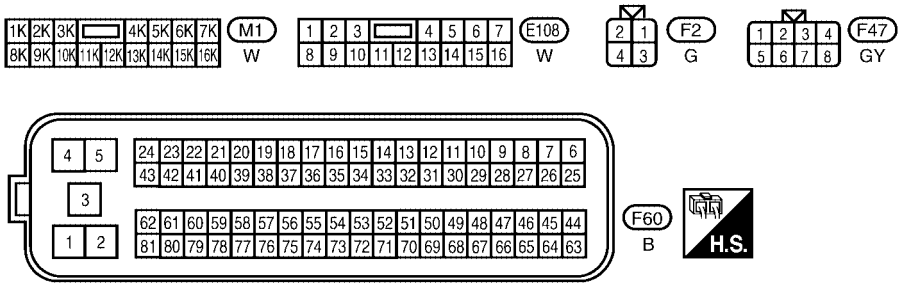
A change of voltage should be more than 0.06V for 1 second during this procedure.

8. If NG, go to EC-234, "Diagnostic Procedure" .

Wiring Diagram

UBS006CQ





BBWA0779E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
78	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

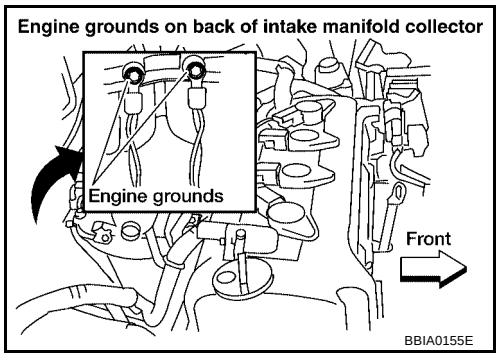
Diagnostic Procedure

UBS006CR

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

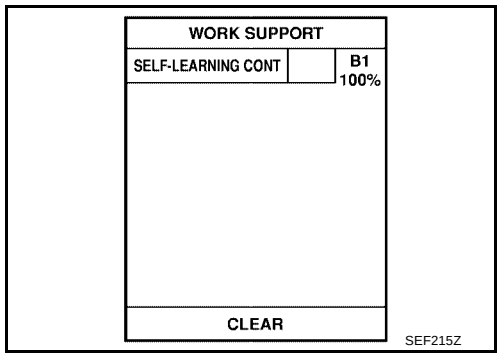
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

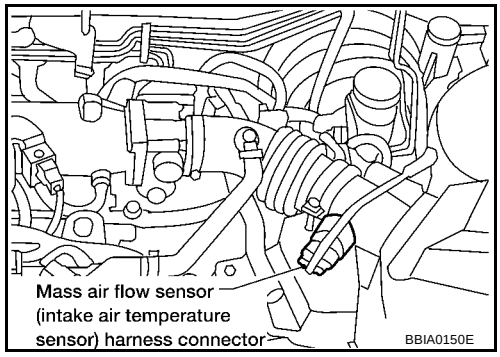
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-238 or EC-245 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

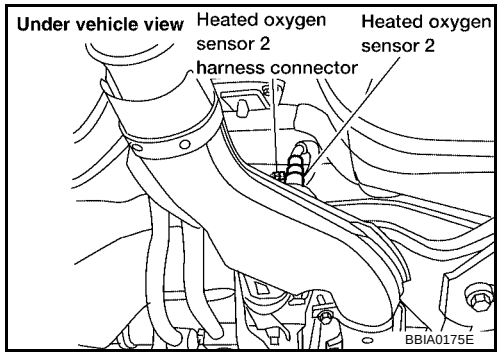
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 74 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 74 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-236, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

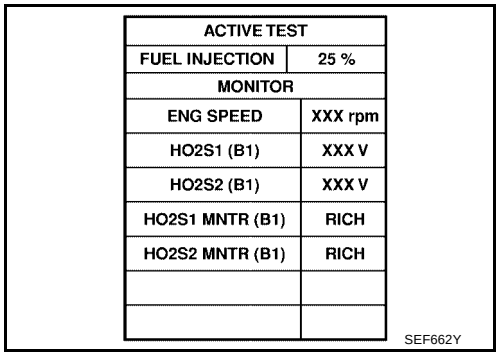
Component Inspection

UBS006CS

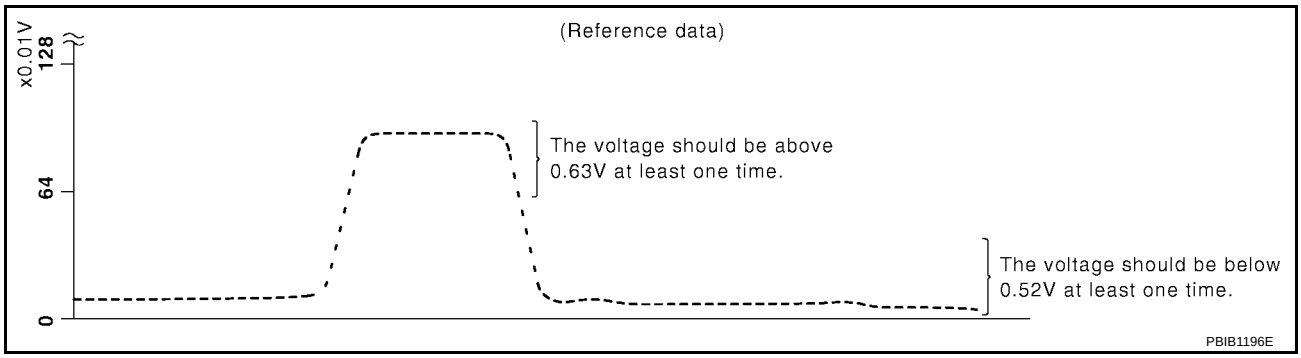
HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



6. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



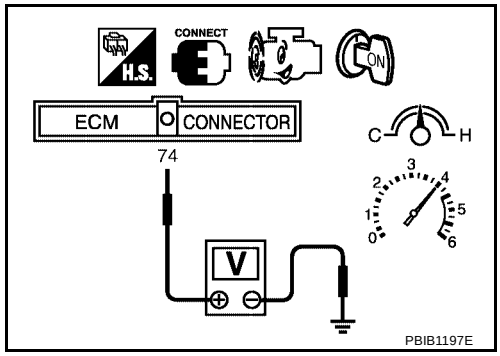
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.52V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.
7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.52V at least once during this procedure.



8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS006CT

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P0171 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

UBS003UY

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and lights up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171	Fuel injection system too lean	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor ● Incorrect PCV hose connection

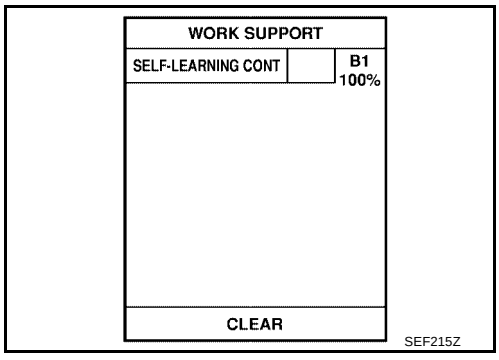
DTC Confirmation Procedure

UBS003UZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

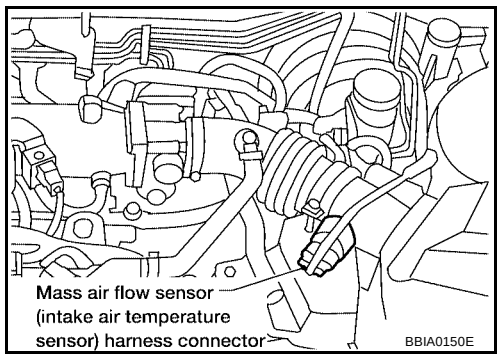
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-241, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-241, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



WITH GST

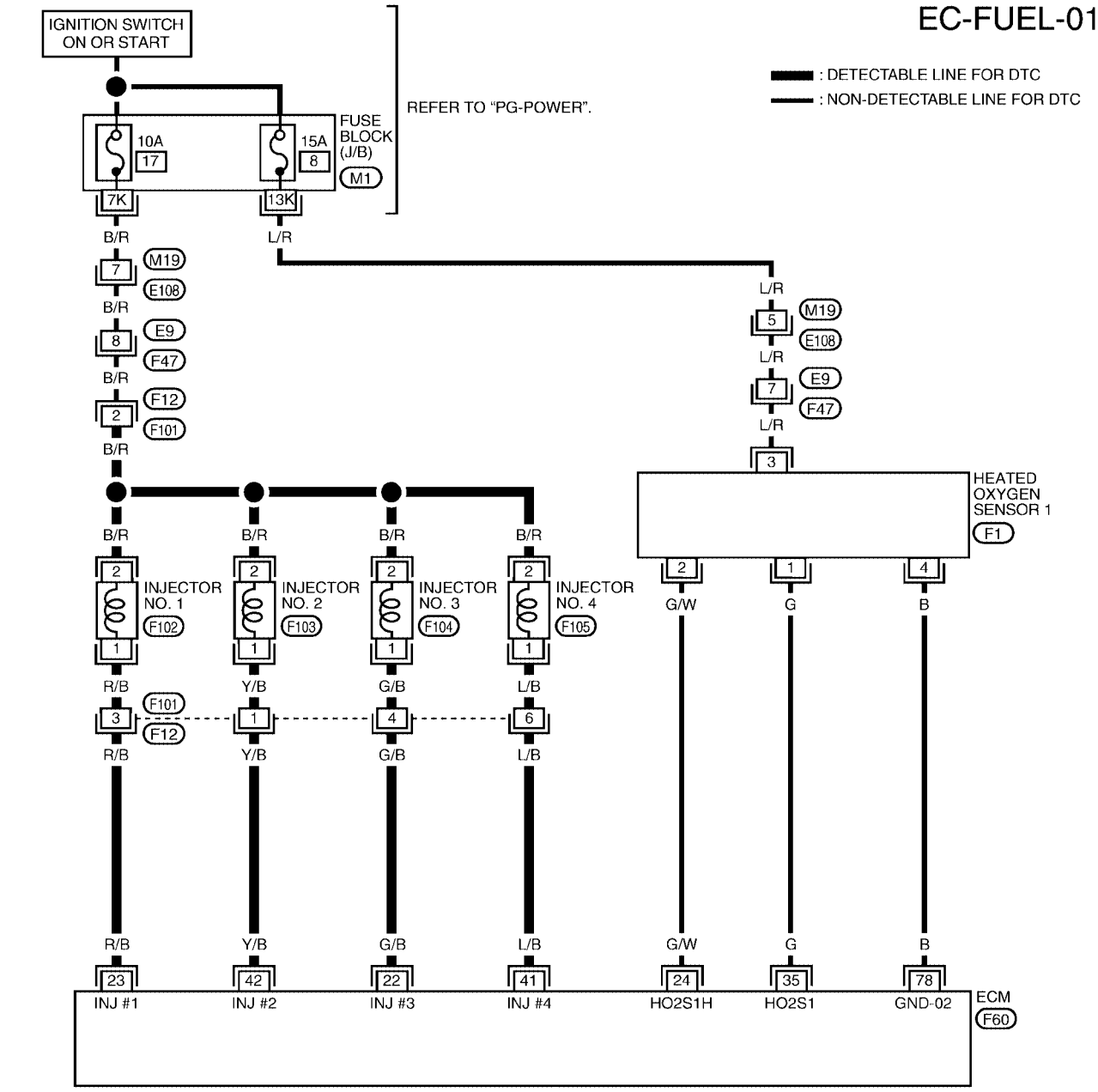
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

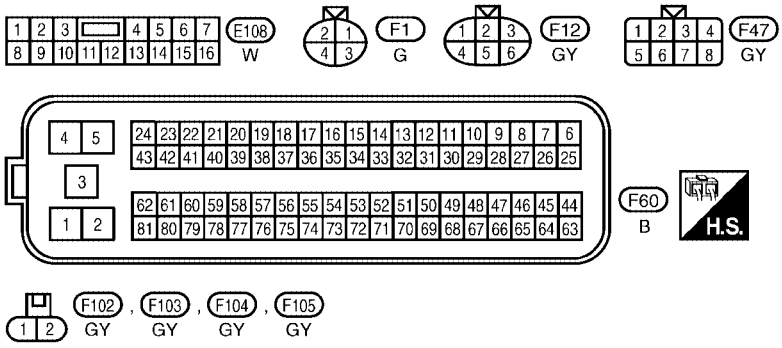
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-241, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-241, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



Wiring Diagram

UBS003V0





Refer to the following.
M1 - FUSE BLOCK - JUNCTION BOX (J/B)

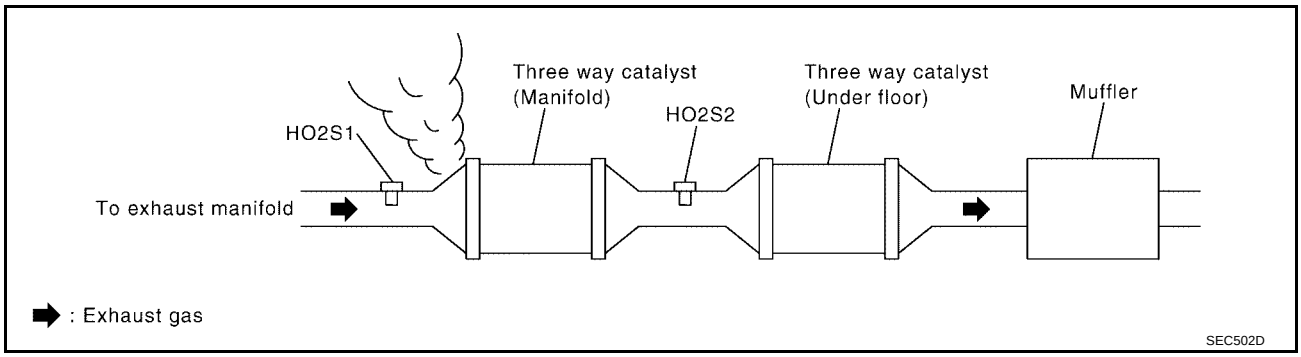
BBWA0780E

Diagnostic Procedure

UBS003V1

1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

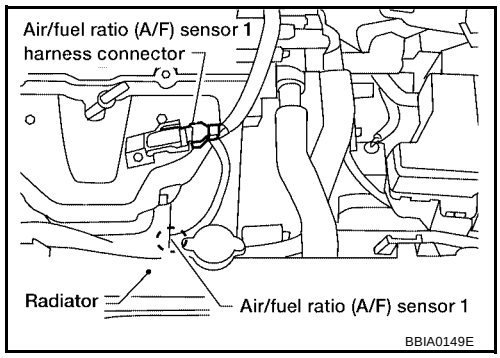
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 35 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminal 35 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-56, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-56, "Fuel Pressure Check" .

At idling: Approximately 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.4 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.4 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

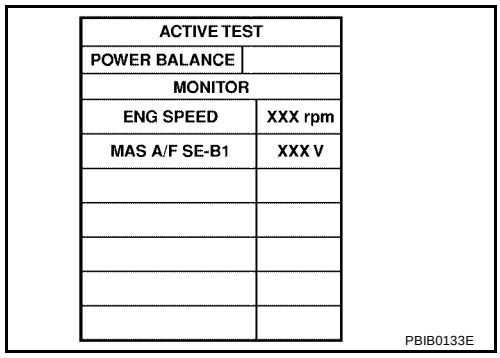
OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-163, "DTC P0101 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

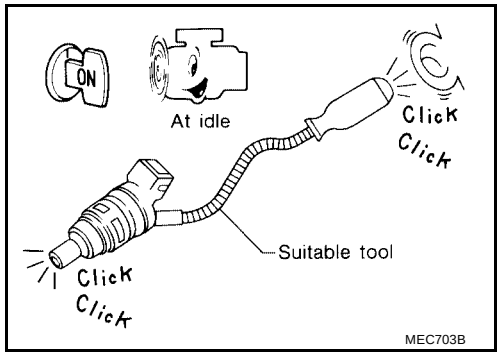
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



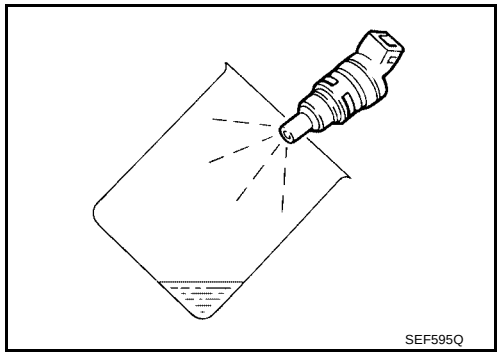
OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-547, "INJECTOR" .

7. CHECK INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Disconnect injector harness connectors.
4. Remove injector gallery assembly. Refer to EM-19, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

Fuel should be sprayed evenly for each injector.



OK or NG

OK >> GO TO 8.
NG >> Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0172 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

UBS003V2

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and lights up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172	Fuel injection system too rich	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

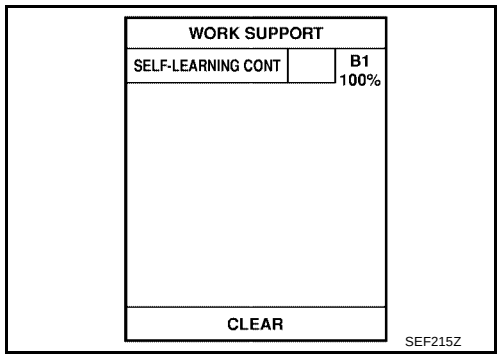
DTC Confirmation Procedure

UBS003V3

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

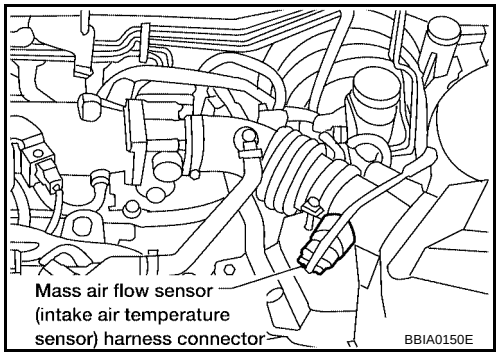
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-248, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal.
   If engine starts, go to EC-248, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.



WITH GST

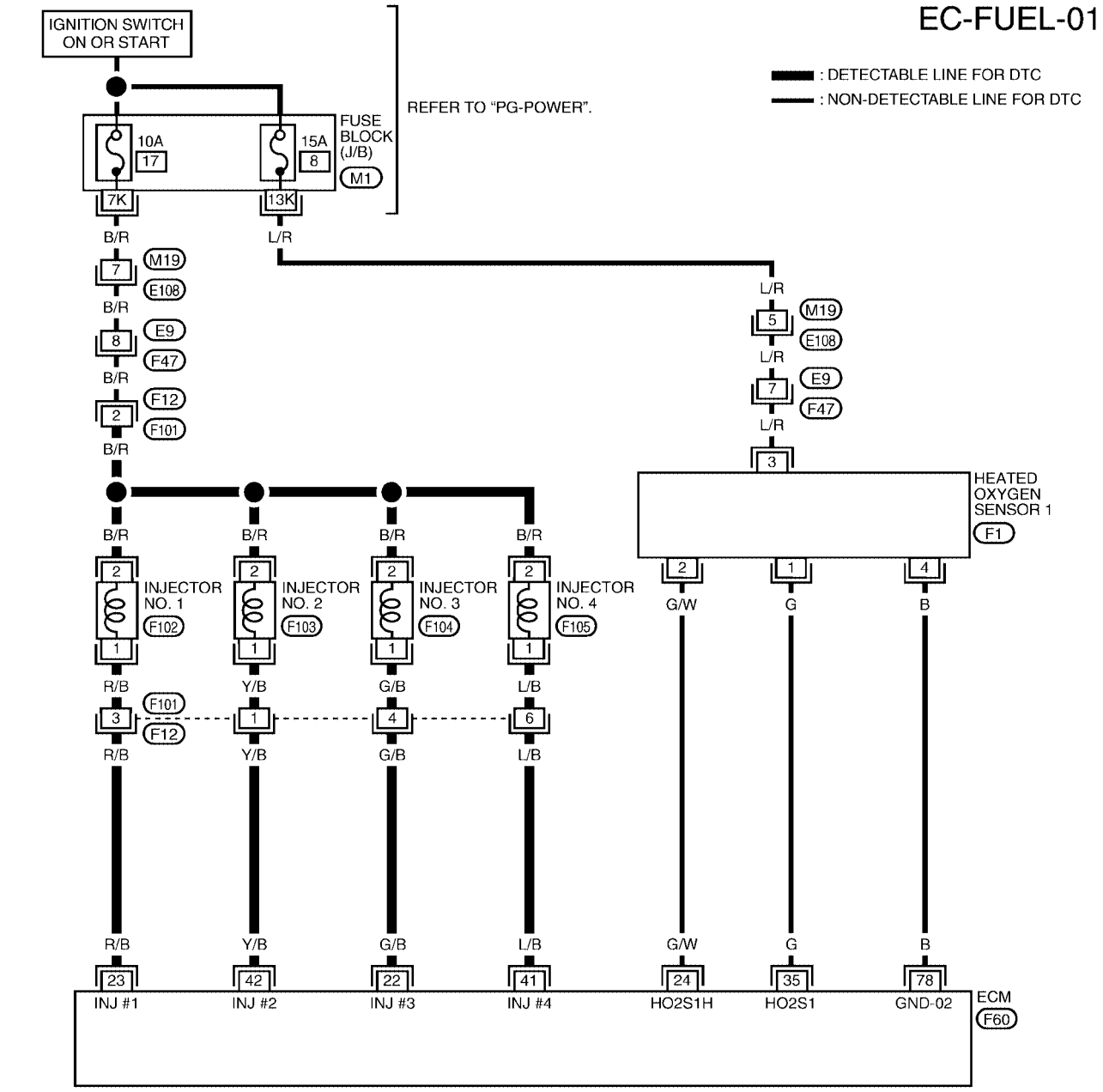
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

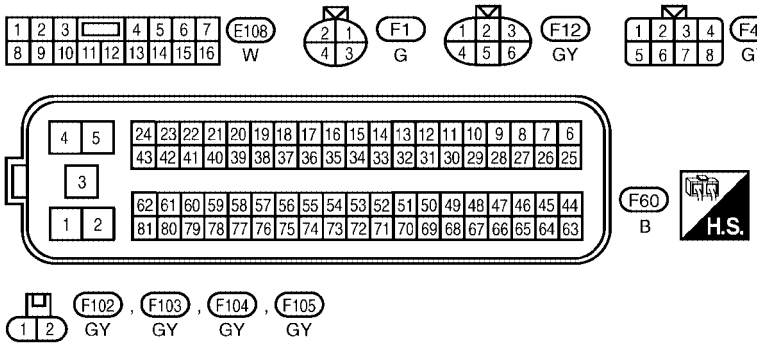
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-248, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-248, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



Wiring Diagram

UBS003V4





Refer to the following.
M1 - FUSE BLOCK - JUNCTION BOX (J/B)

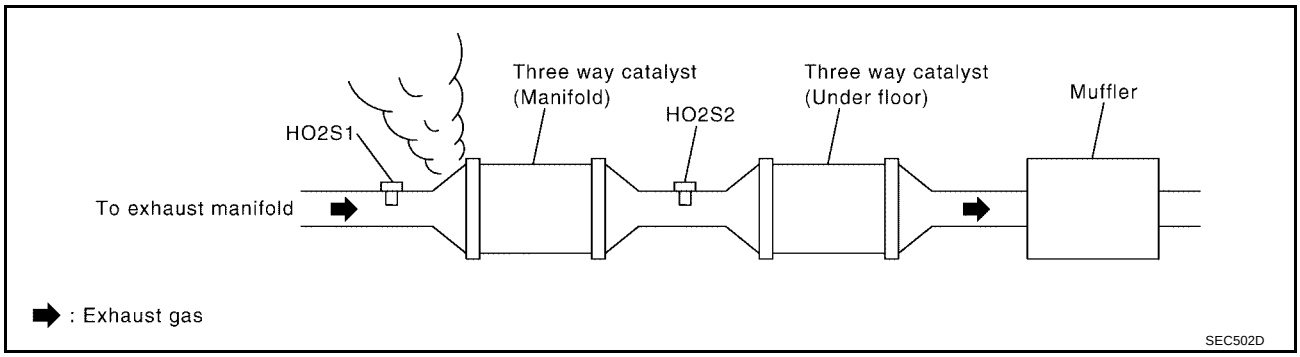
BBWA0780E

Diagnostic Procedure

UBS003V5

1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

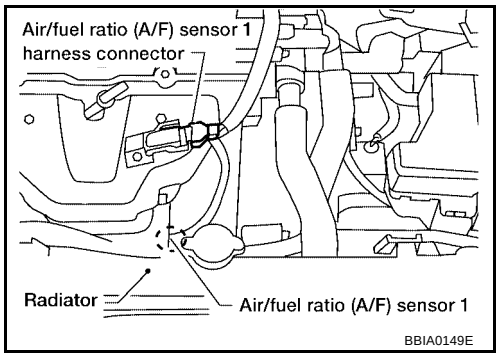
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 35 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminal 35 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-56, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-56, "Fuel Pressure Check" .

   At idling: 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.4 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.4 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-163, "DTC P0101 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

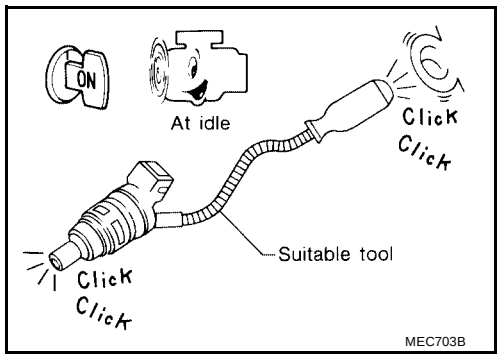
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-547, "INJECTOR" .

7. CHECK INJECTOR

1. Remove injector assembly. Refer to EM-19, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors should remain connected.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all ignition coil harness connectors.
4. Prepare pans or saucers under each injectors.
5. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

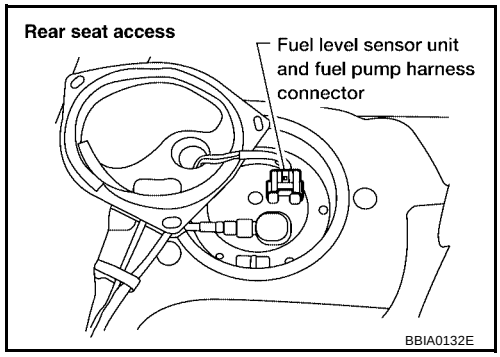
DTC P0181 FTT SENSOR

PFP:22630

Component Description

UBS003QP

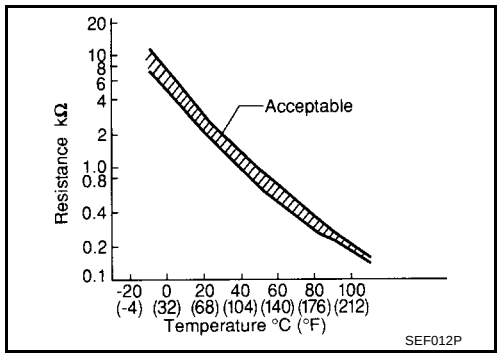
The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 107 (Fuel tank temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS003QQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181 0181	Fuel tank temperature sensor circuit range/ performance	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel tank temperature sensor

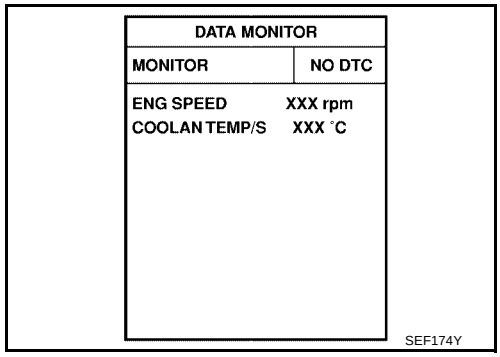
DTC Confirmation Procedure

UBS003QR

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 10 seconds.
   If the result is NG, go to EC-254, "Diagnostic Procedure" .
   If the result is OK, go to following step.
4. Check “COOLAN TEMP/S” value.
   If “COOLAN TEMP/S” is less than 60°C (140°F), the result will be OK.
   If “COOLAN TEMP/S” is above 60°C (140°F), go to the following step.
5. Cool engine down until “COOLAN TEMP/S” is less than 60°C (140°F).
6. Wait at least 10 seconds.
7. If 1st trip DTC is detected, go to EC-254, "Diagnostic Procedure" .



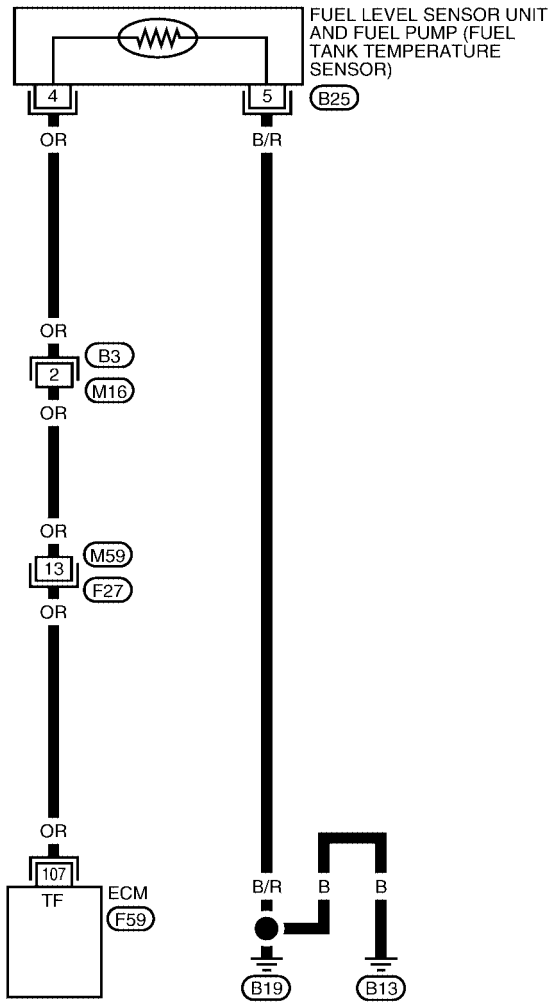
WITH GST

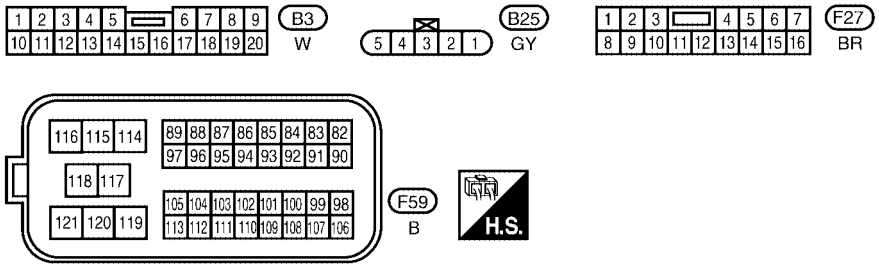
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003QS

EC-FTTS-01





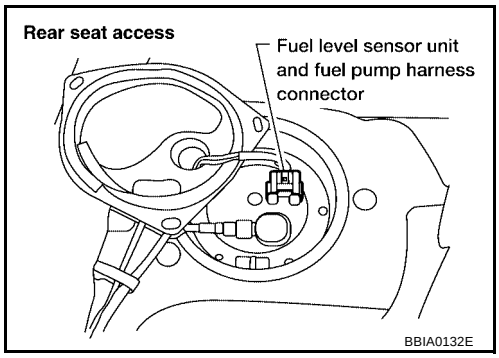
BBWA0285E

Diagnostic Procedure

UBS003QT

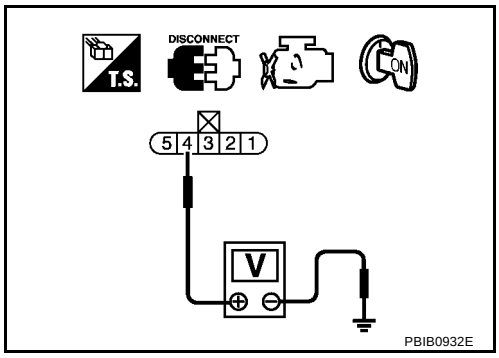
1. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M59, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair harness or connector.

3. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connector.

4. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-255, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel level sensor unit.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

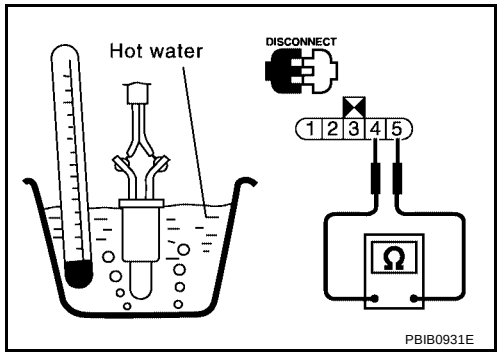
Component Inspection

UBS003QU

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90



Removal and Installation

UBS003QV

FUEL TANK TEMPERATURE SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

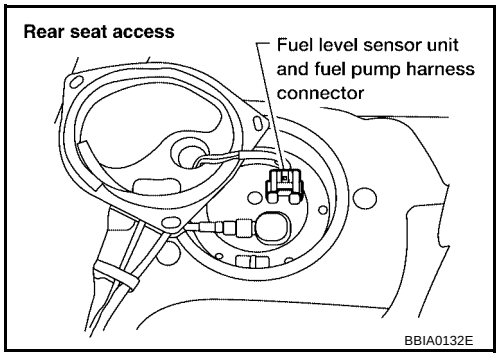
DTC P0182, P0183 FTT SENSOR

PFP:22630

Component Description

UBS003QW

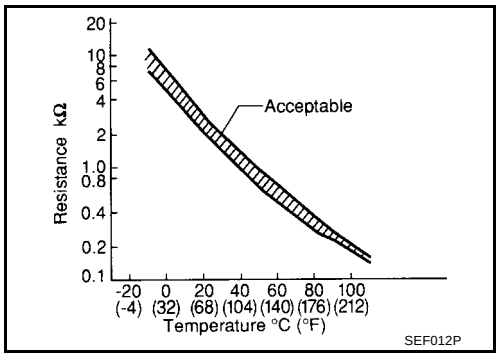
The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 107 (Fuel tank temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS003QX

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182 0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Fuel tank temperature sensor
P0183 0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

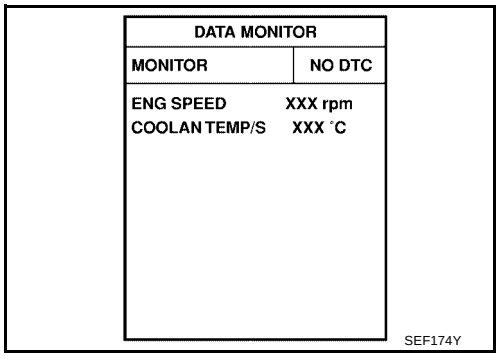
DTC Confirmation Procedure

UBS003QY

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-258, "Diagnostic Procedure" .



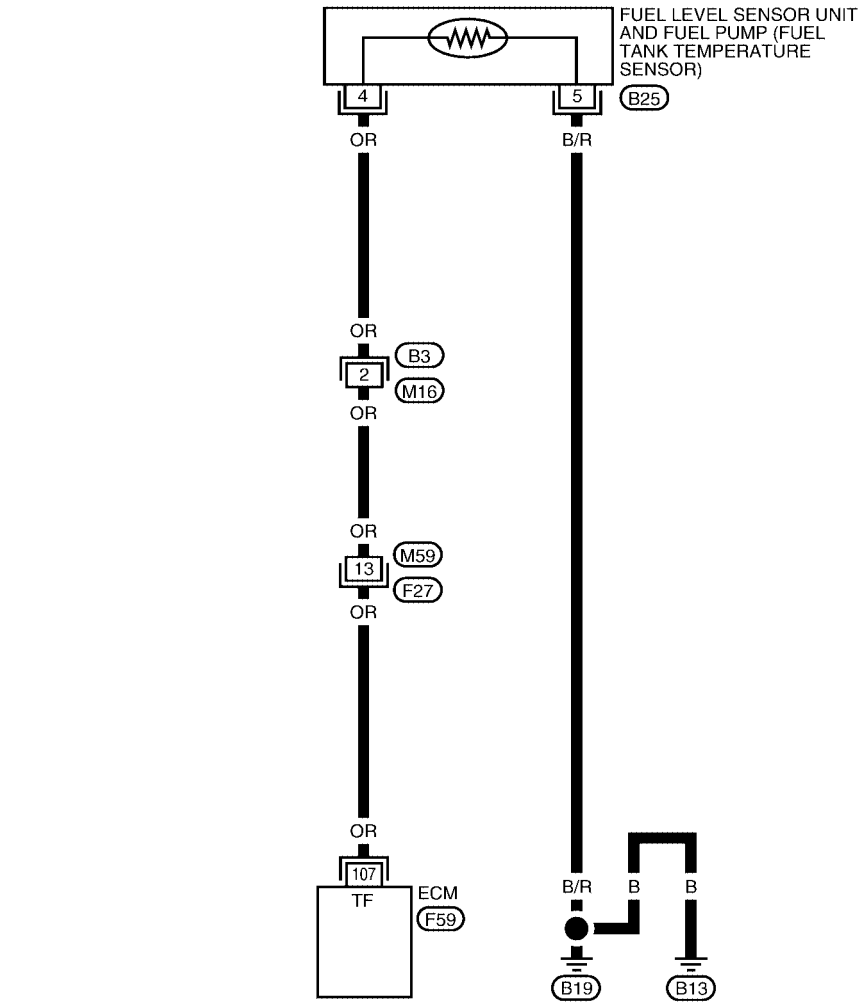
WITH GST

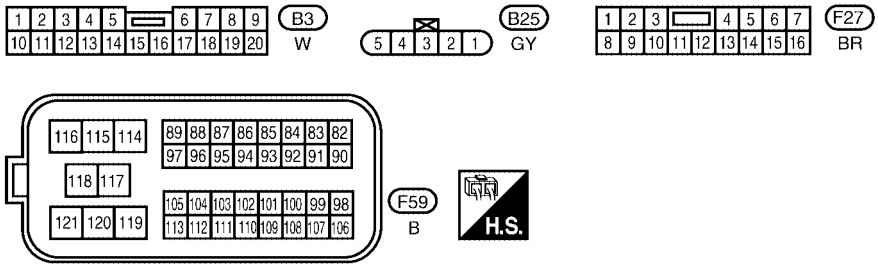
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS003QZ

EC-FTTS-01





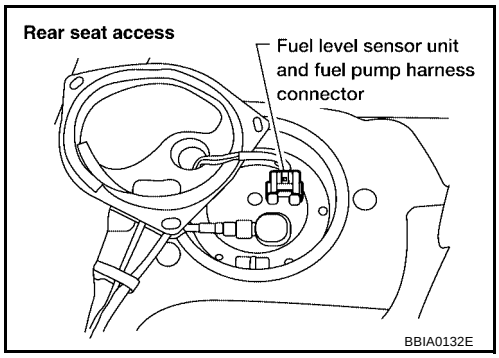
BBWA0285E

Diagnostic Procedure

UBS003R0

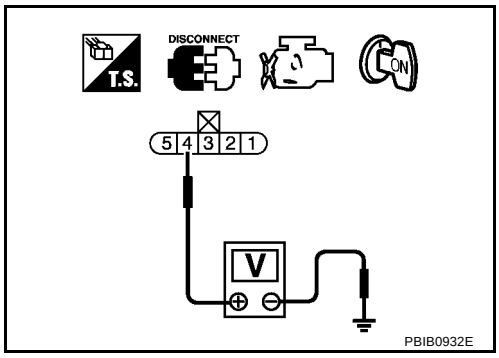
1. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M59, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair harness or connector.

3. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connector.

4. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-259, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel level sensor unit.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

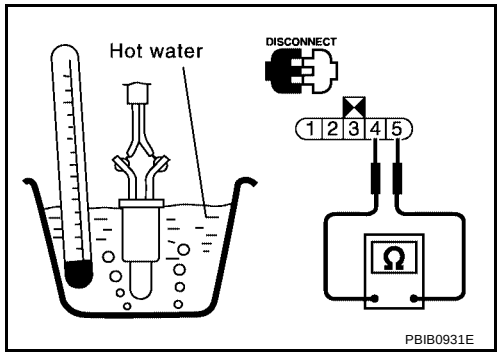
Component Inspection

UBS003R1

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90



Removal and Installation

UBS003R2

FUEL TANK TEMPERATURE SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

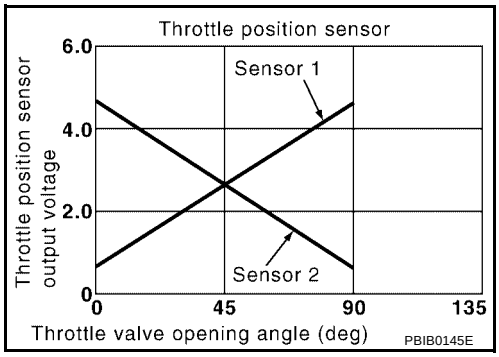
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

UBS003RB

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS003RC

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS003RD

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1) ● Accelerator pedal position sensor (APP sensor 2)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

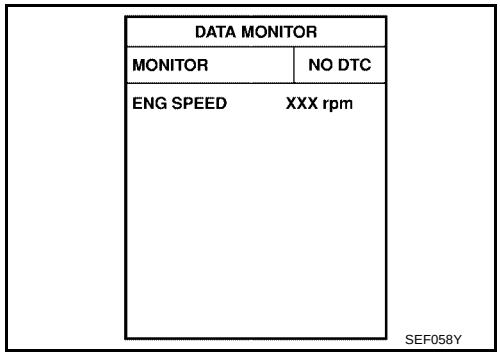
UBS003RE

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-263, "Diagnostic Procedure" .



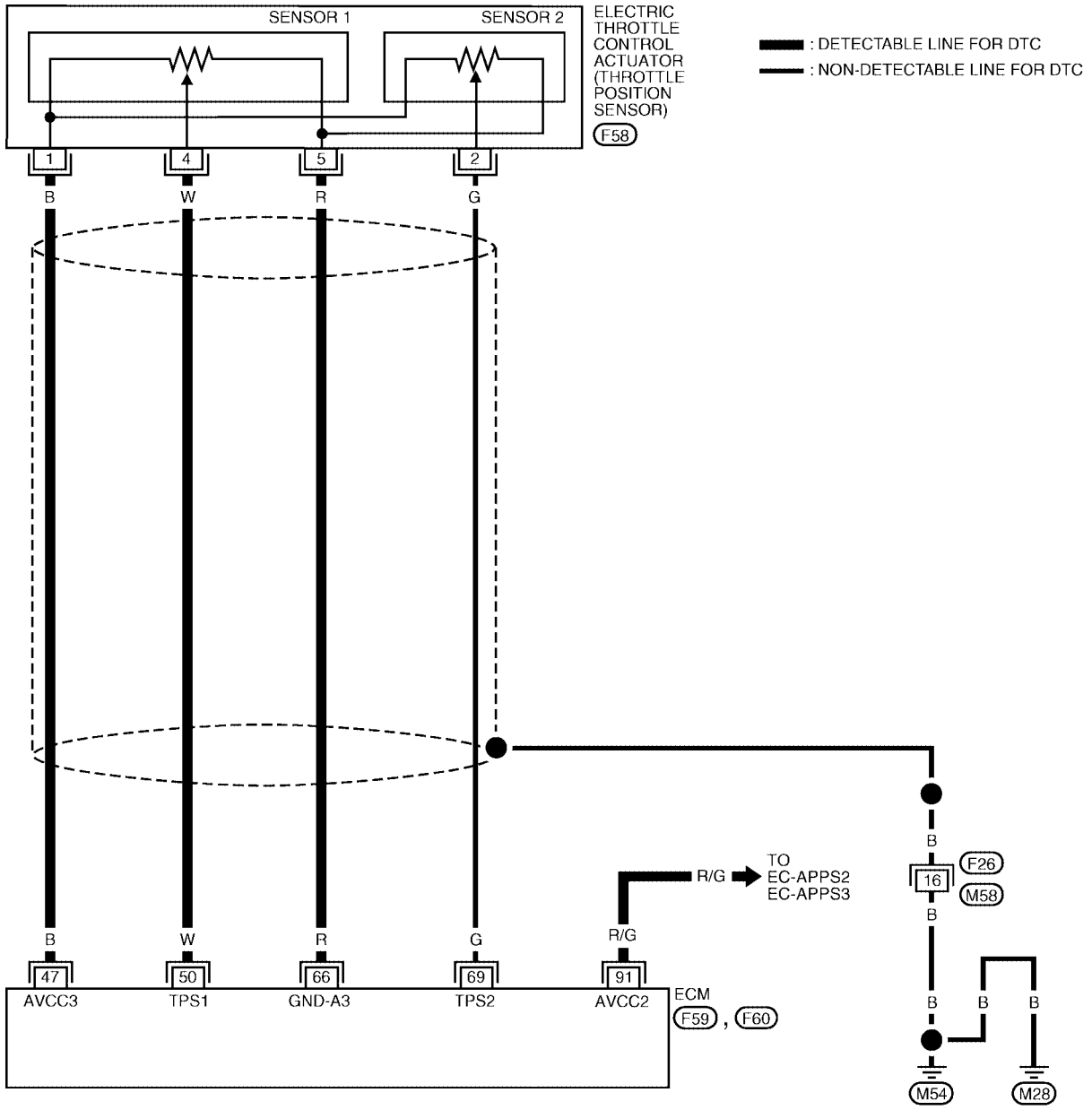
WITH GST

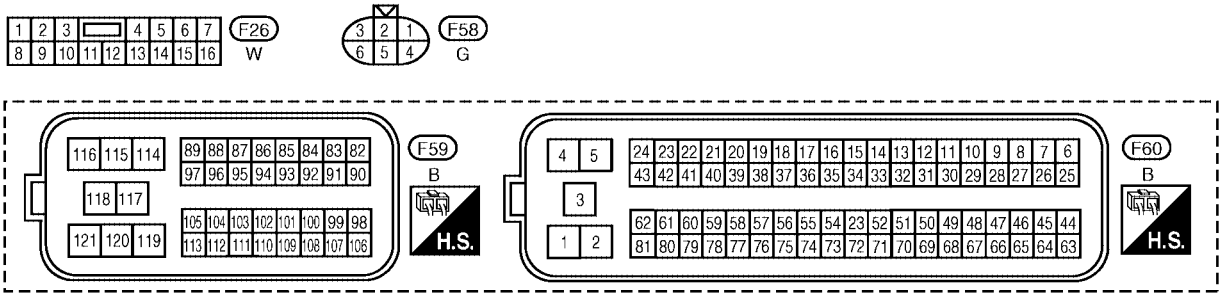
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003RF

EC-TPS1-01





BBWA1381E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	R	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
91	R/G	Sensor power supply (Accelerator pedal position sensor)	**[Ignition switch "ON"]**	Approximately 5V

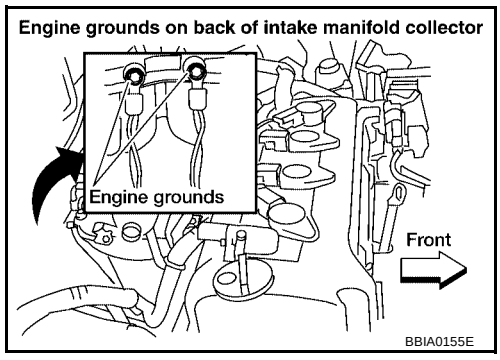
Diagnostic Procedure

UBS003RG

1. RETIGHTEN GROUND SCREWS

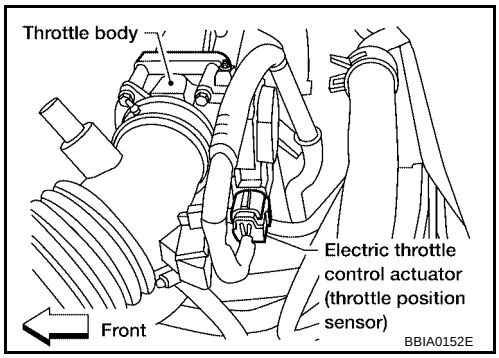
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



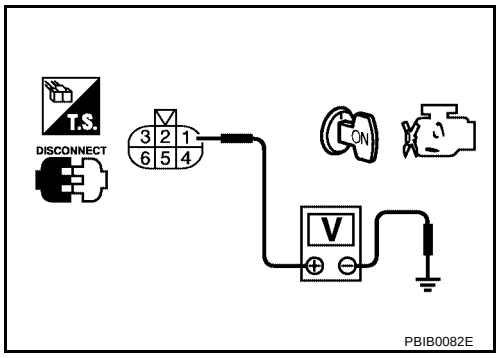
2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace open circuit.

4. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-262
91	APP sensor terminal 1	EC-513

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-517 .

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to EC-266, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

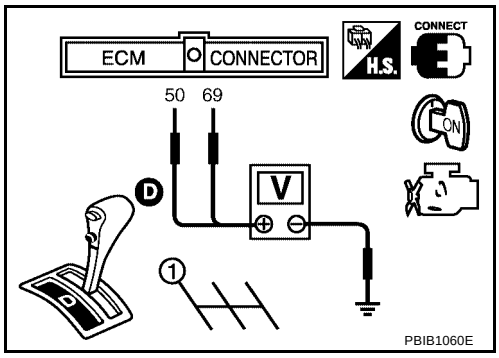
>> **INSPECTION END**

Component Inspection

UBS003RH

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 50 (TP sensor 1 signal), 69 (TP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-53, "Throttle Valve Closed Position Learning" .
8. Perform EC-53, "Idle Air Volume Learning" .

Remove and Installation

UBS003RI

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

PFP:00000

On Board Diagnosis Logic

UBS001H5

When a misfire occurs, engine speed will fluctuate (vary). If the engine speed fluctuates enough to cause the crankshaft position sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the crankshaft position sensor (POS) signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not cause damage to the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the crankshaft position sensor (POS) signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● The injector circuit is open or shorted ● Fuel injectors ● Intake air leak ● The ignition signal circuit is open or shorted ● Lack of fuel ● Drive plate or flywheel ● Heated oxygen sensor 1 ● Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	

On Board Diagnosis Logic

UBS001H6

DTC Confirmation Procedure

UBS001H7

CAUTION:

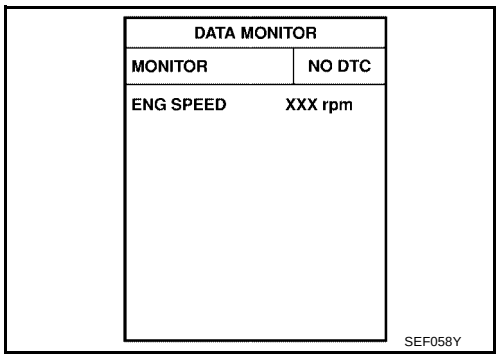
Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”, and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
   NOTE:
   Refer to the freeze frame data for the test driving conditions.
5. If 1st trip DTC is detected, go to EC-268, "Diagnostic Procedure"
   .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS001H8

1. CHECK FOR INTAKE AIR LEAK

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

OK or NG

OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

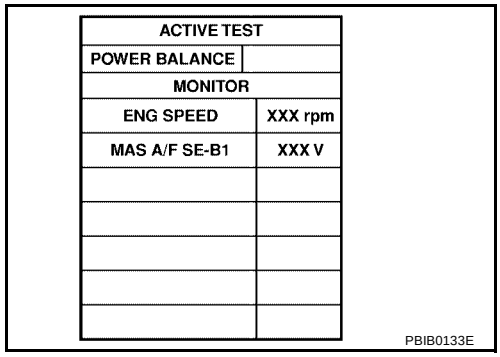
OK or NG

OK >> GO TO 3.
NG >> Repair or replace it.

3. PERFORM POWER BALANCE TEST

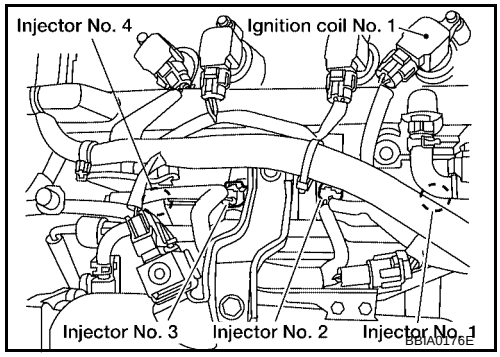
With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?



Without CONSULT-II

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



Yes or No

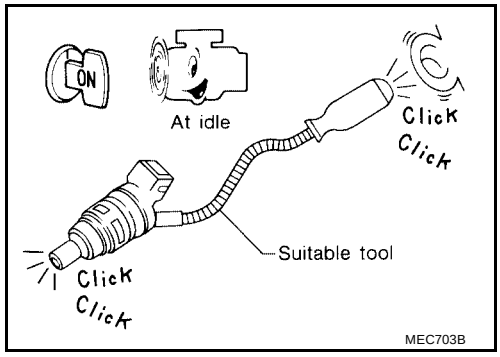
Yes >> GO TO 4.
No >> GO TO 7.

4. CHECK INJECTOR

Does each injector make an operating sound at idle?

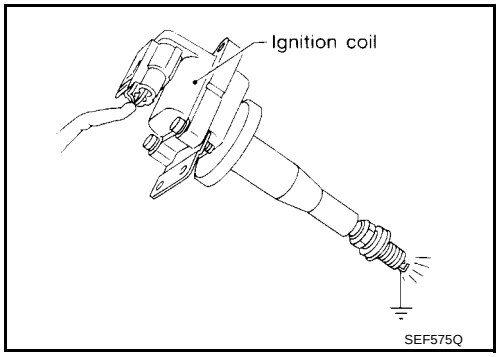
Yes or No

Yes >> GO TO 5.
No >> Check injector(s) and circuit(s). Refer to EC-547 .



5. CHECK IGNITION SPARK

1. Turn Ignition switch “OFF”.
2. Disconnect ignition wire from spark plug.
3. Connect a known-good spark plug to the ignition wire.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.

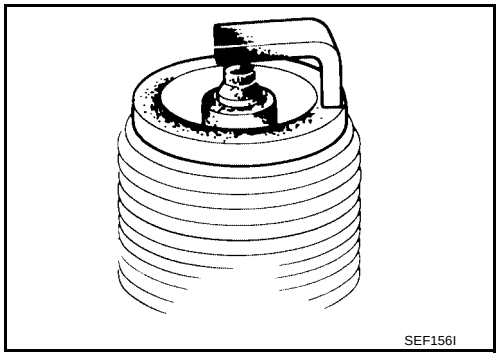


OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.



OK or NG

OK >> GO TO 7.
NG >> Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-16, "ENGINE MAINTENANCE (QG18DE ENGINE)" .

7. CHECK COMPRESSION PRESSURE

Refer to EM-52, "CHECKING COMPRESSION PRESSURE" .
Check compression pressure.

Standard:	**1,324 kPa (13.5 kg/cm^2 , 192 psi)/300 rpm**
Minimum:	**1,157 kPa (11.8 kg/cm^2 , 168 psi)/300 rpm**
Difference between each cylinder:	**98 kPa (1.0 kg/cm^2 , 14 psi)/300 rpm**

OK or NG

OK >> GO TO 8.
NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

8. CHECK FUEL PRESSURE

1. Install any parts removed.
2. Release fuel pressure to zero. Refer to EC-56, "FUEL PRESSURE RELEASE" .
3. Install fuel pressure gauge and check fuel pressure.

At idle:	**Approx. 350 kPa (3.57 kg/cm^2 , 51 psi)**

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit Refer to EC-553, "FUEL PUMP" .
- Fuel pressure regulator Refer to EC-56, "Fuel Pressure Check" .
- Fuel lines.
- Fuel filter for clogging

>> Repair or replace.

10. CHECK IGNITION TIMING

Check the following items. Refer toEC-88, "Basic Inspection" .

Items	Specifications
Target idle speed	M/T: 650 ± 50 rpm
	A/T: 800 ± 50 rpm (in "P" or "N" position)
Ignition timing	M/T: 7 ± 5° BTDC
	A/T: 18 ± 5° BTDC (in "P" or "N" position)

OK or NG

OK >> GO TO 11.
NG >> Adjust ignition timing.

11. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-205, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace heated oxygen sensor 1.

12. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

at idling: 1.4 - 4.0 g·m/sec
at 2,500 rpm: 5.0 - 10.0 g·m/sec

With GST

Check mass air flow sensor signal in MODE 1 with GST.

at idling: 1.4 - 4.0 g·m/sec
at 2,500 rpm: 5.0 - 10.0 g·m/sec

OK or NG

OK >> GO TO 13.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-163, "DTC P0101 MAF SENSOR" .

13. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-93, "Symptom Matrix Chart" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace.

14. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 15.

15. CHECK INTERMITTENT INCIDENT

Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

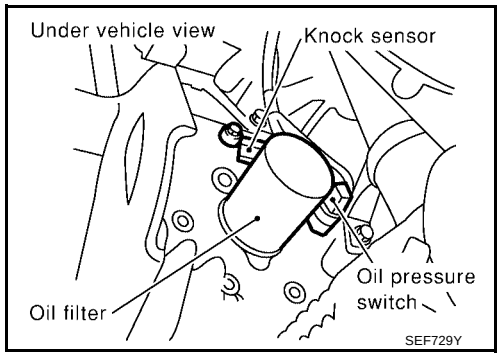
DTC P0327, P0328 KS

PFP:22060

Component Description

UBS001H9

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

UBS006GE

The MIL will not light up for these diagnosis.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

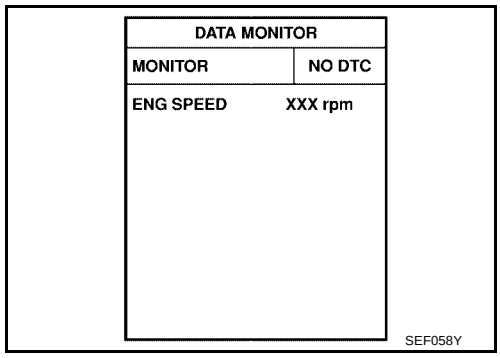
UBS001HB

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If DTC is detected, go to EC-275, "Diagnostic Procedure" .



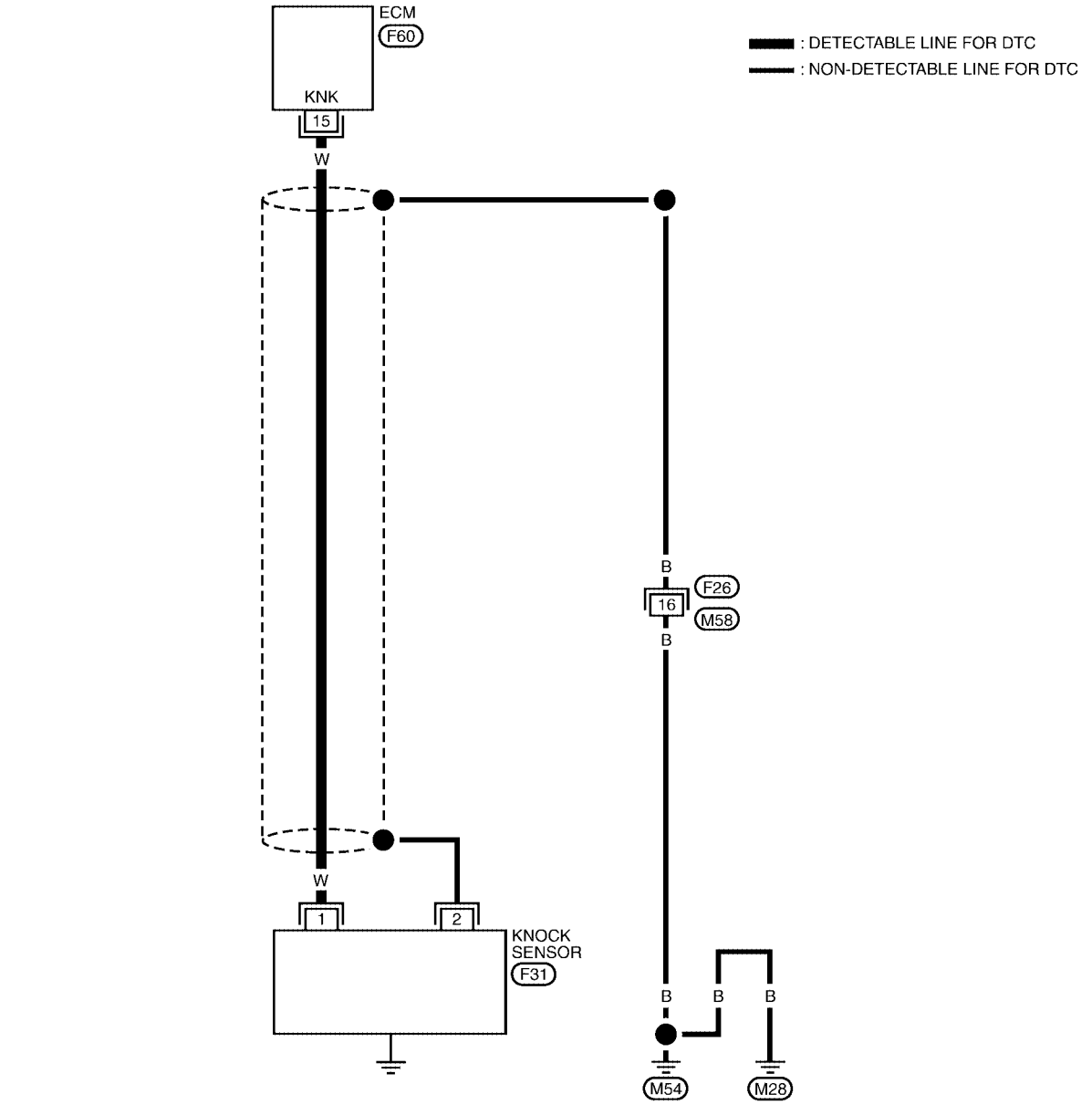
WITH GST

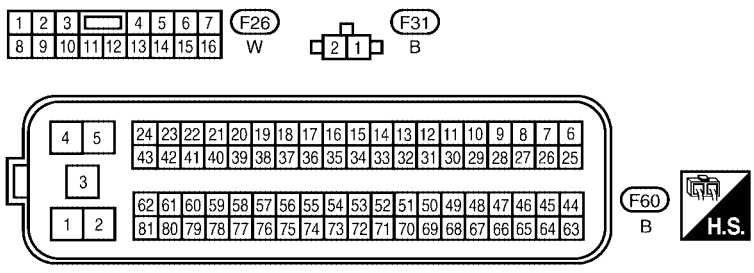
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS001HC

EC-KS-01





BBWA0782E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V

Diagnostic Procedure

UBS001HD

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.

   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

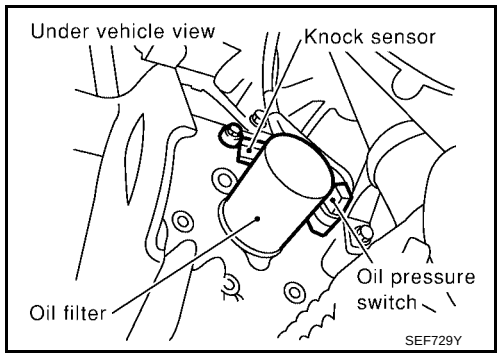
OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

Refer to EC-276, "Component Inspection" .

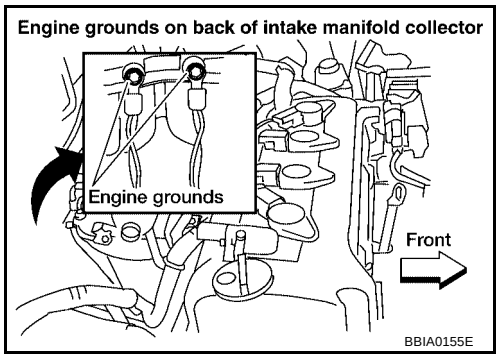
OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 5.



5. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

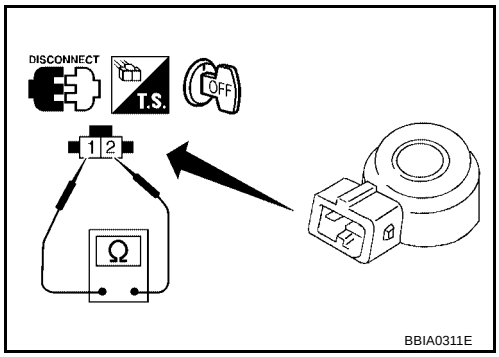
UBS001HE

KNOCK SENSOR

1. Disconnect knock sensor harness connector.
2. Check resistance between terminal 1 and ground.

NOTE:
Use an ohmmeter which can measure more than 10 MΩ.

Resistance: 530 - 590 kΩ [at 20°C (68°F)]



CAUTION:
Discard any knock sensors that have been dropped or physically damaged. Use only new ones.

Removal and Installation

UBS001HF

KNOCK SENSOR

Refer to EM-67, "CYLINDER BLOCK" .

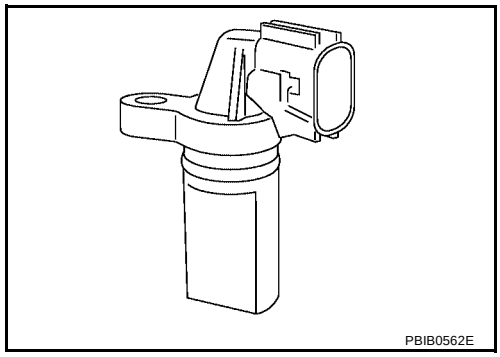
DTC P0335 CKP SENSOR (POS)

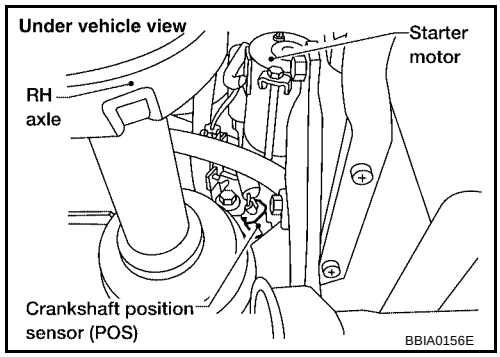
PFP:23731

Component Description

UBS001HG

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E



CONSULT-II Reference Value in Data Monitor Mode

UBS006GF

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED·	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

UBS006GG

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted) ● Crankshaft position sensor (POS) ● Signal plate

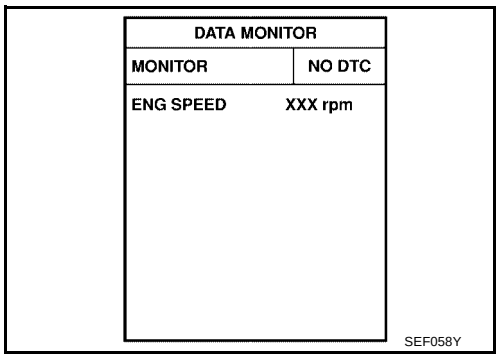
DTC Confirmation Procedure

UBS001HI

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that the battery voltage is more than 10.5V and the ignition switch is “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-280, "Diagnostic Procedure" .



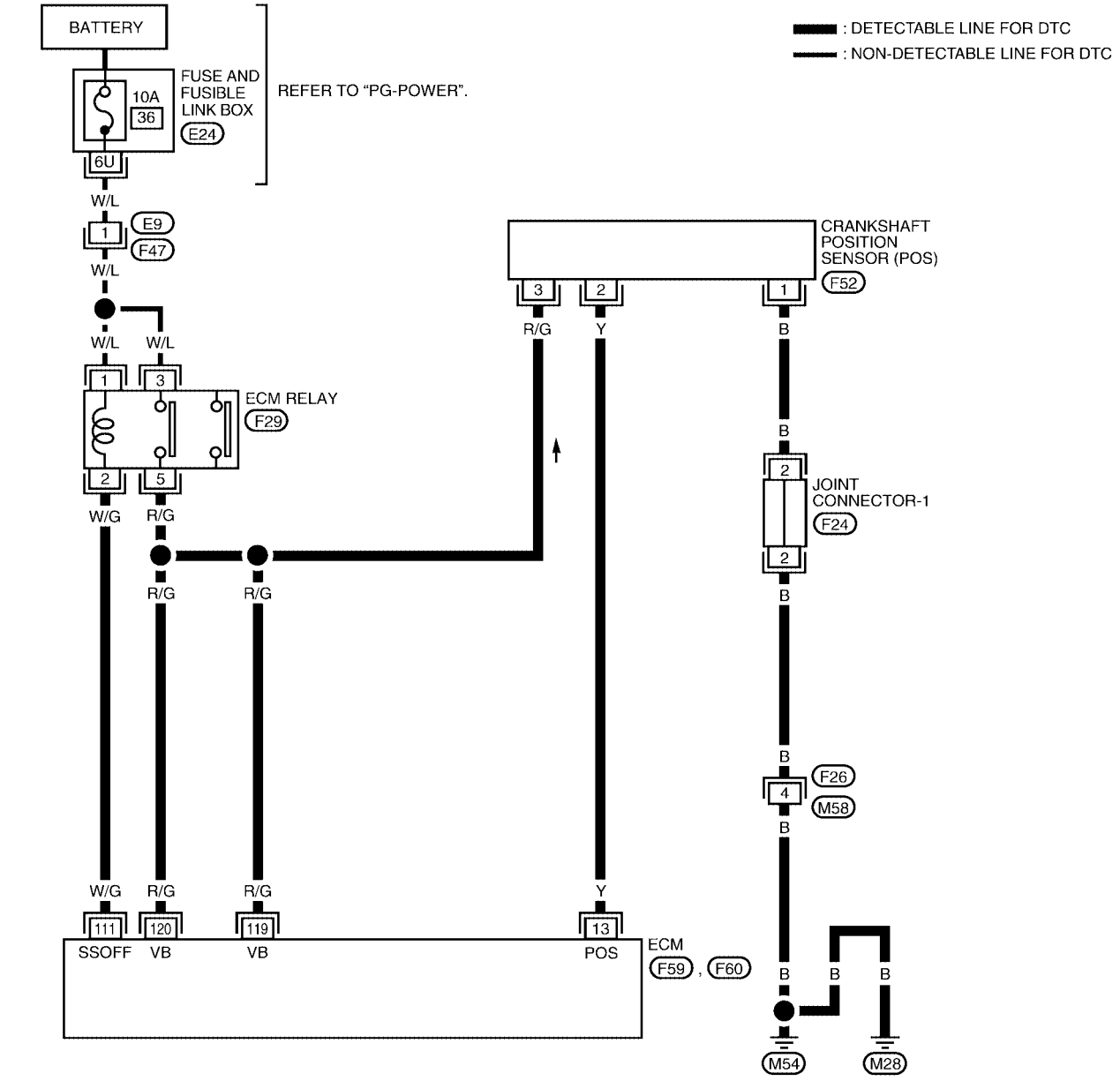
WITH GST

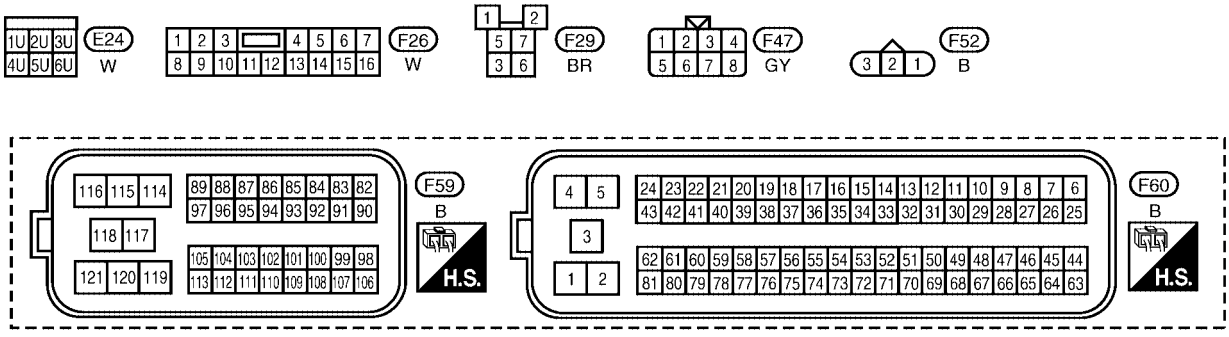
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS001HJ

EC-POS-01



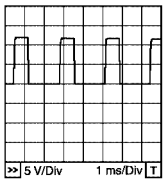
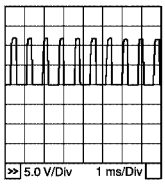


BBWA0783E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	Y	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

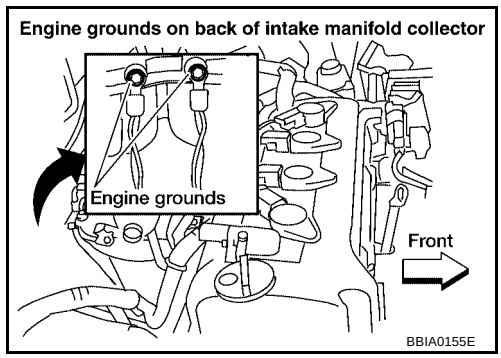
Diagnostic Procedure

UBS006FQ

1. RETIGHTEN GROUND SCREWS

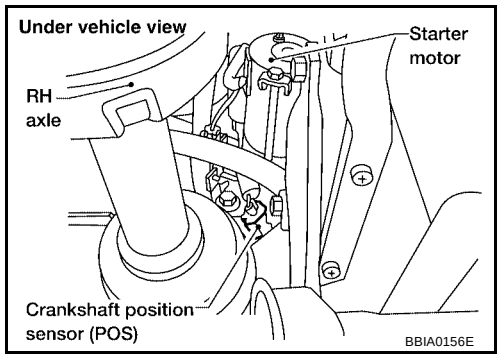
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK POWER SUPPLY

1. Disconnect crankshaft position sensor (POS) harness connector.
2. Turn ignition switch “ON”.



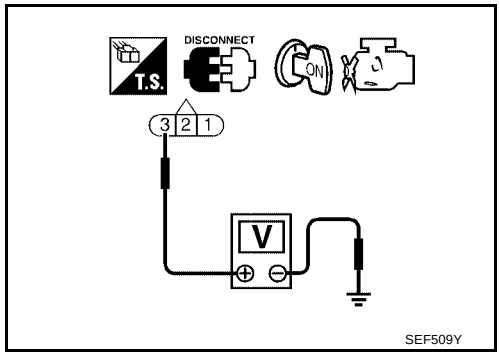
3. Check voltage between crankshaft position sensor (POS) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between crankshaft position sensor (POS) terminal and ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for and short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 13 and crankshaft position sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-282, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 8.
NG >> Replace the signal plate.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

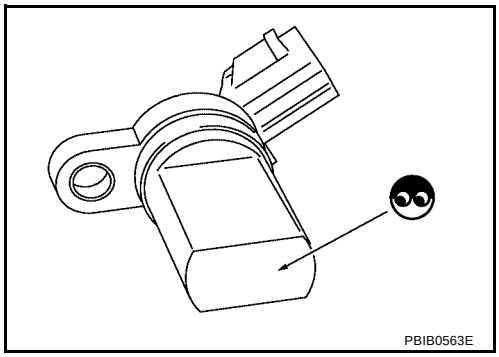
>> **INSPECTION END**

Component Inspection

UBS006FR

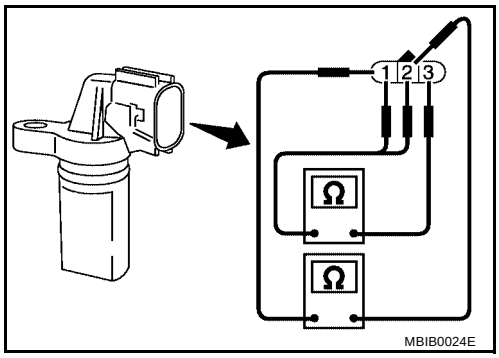
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.


PBIB0563E

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



MBIB0024E

6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

UBS006FS

CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-67, "CYLINDER BLOCK" .

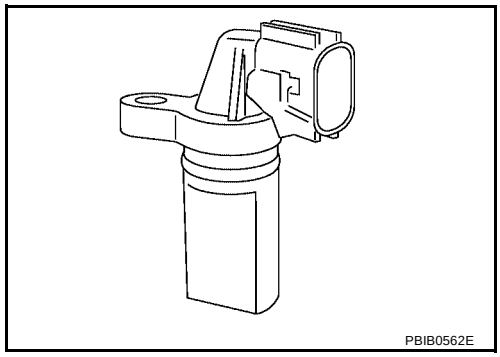
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

UBS001HN

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

UBS006GH

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-9 .) ● Starting system circuit (Refer to SC-9 .) ● Dead (Weak) battery

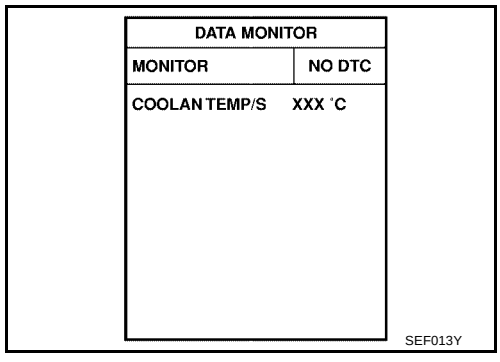
DTC Confirmation Procedure

UBS001HP

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-285, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintain engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-285, "Diagnostic Procedure" .



SEF013Y

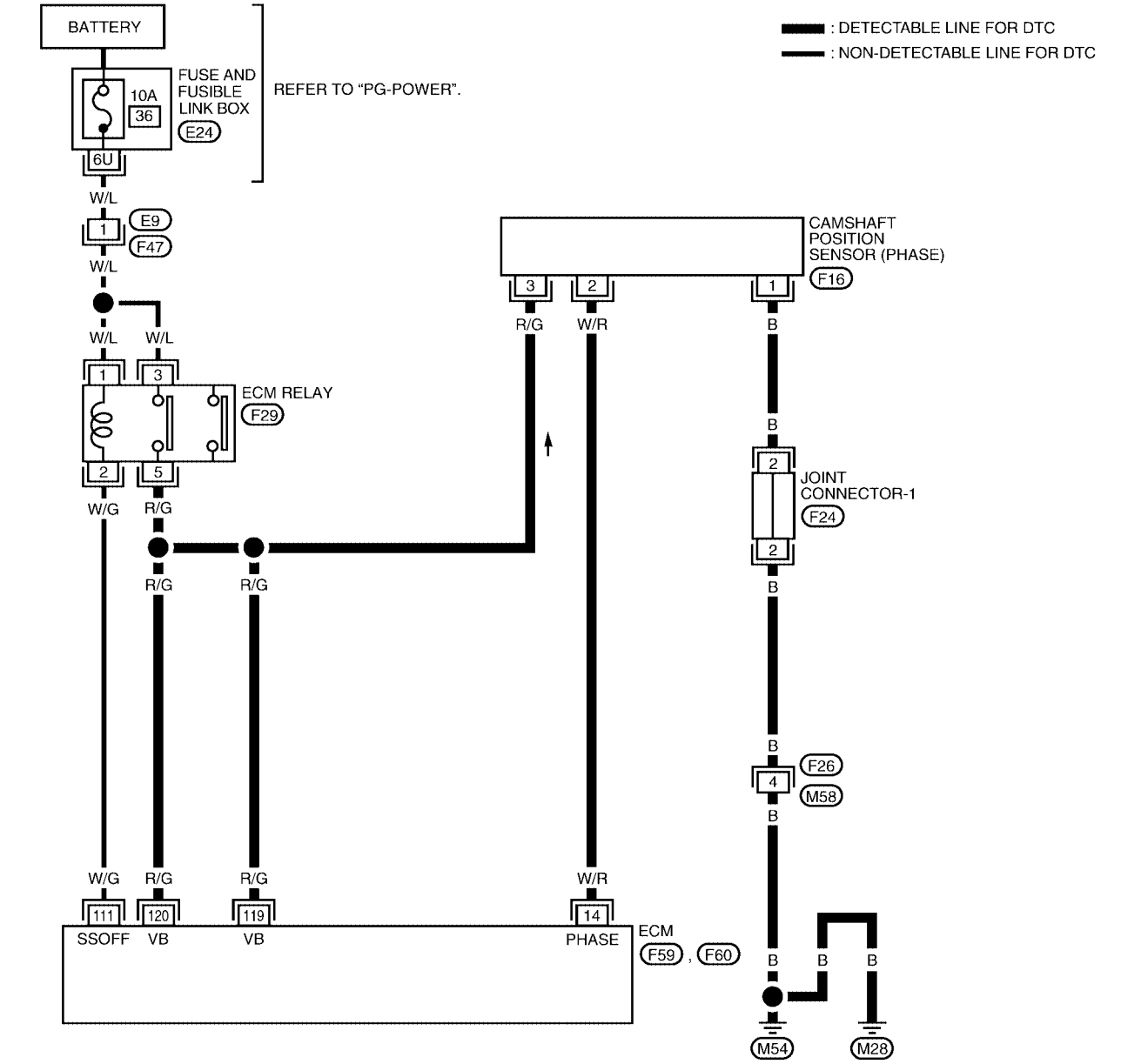
WITH GST

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS001HQ

EC-PHASE-01

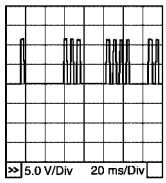
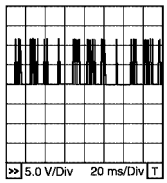


BBWA0784E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	W/R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS001HR

1. CHECK STARTING SYSTEM

Does the engine turn over?
(Does the starter motor operate?)

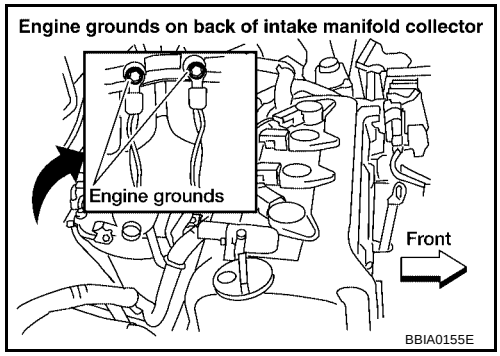
Yes or No

Yes >> GO TO 2.
No >> Check starting system. (Refer to SC-9, "STARTING SYSTEM" .)

2. RETIGHTEN GROUND SCREWS

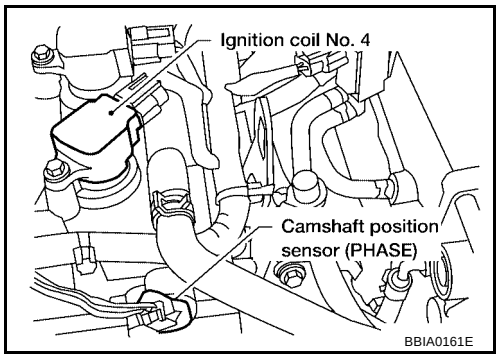
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 3.



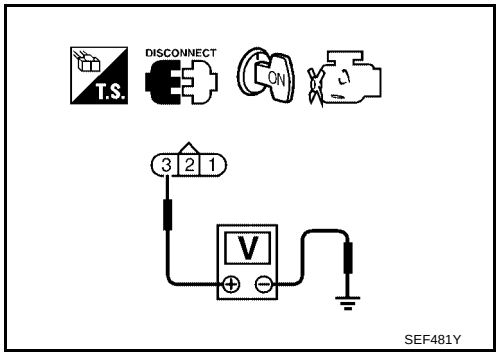
3. CHECK POWER SUPPLY

1. Disconnect camshaft position sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between camshaft position sensor (PHASE) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM relay
- Harness for open or short between camshaft position sensor (PHASE) and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between camshaft position sensor (PHASE) terminal 2 and ECM terminal 14. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Check harness continuity between camshaft position sensor (PHASE) terminal 1 and engine ground. Refer to the Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to power in harness or connectors.

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-287, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

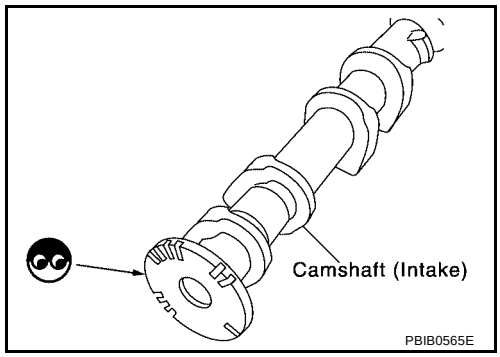
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

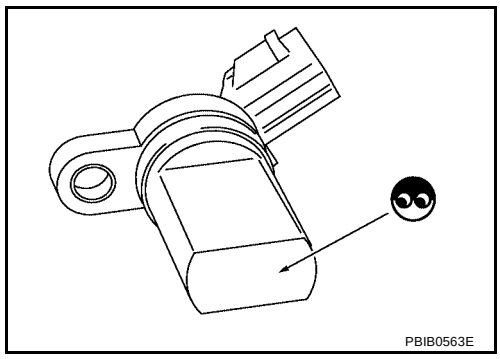
>> **INSPECTION END**

Component Inspection

UBS006FT

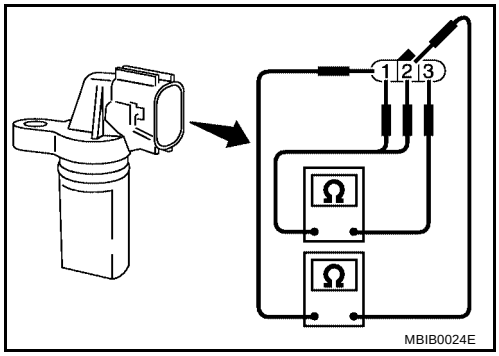
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



Removal and Installation

UBS001HT

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-39, "TIMING CHAIN" .

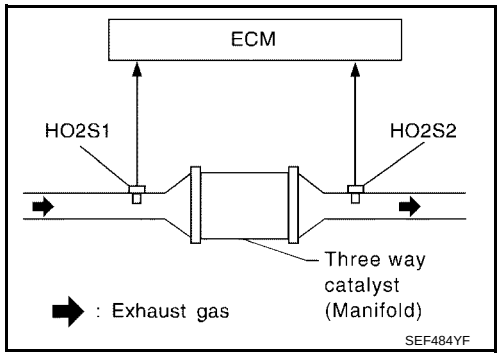
DTC P0420 THREE WAY CATALYST FUNCTION

PFP:20905

On Board Diagnosis Logic

UBS006CU

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 and 2.
A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	● Three way catalyst (manifold) does not operate properly. ● Three way catalyst (manifold) does not have enough oxygen storage capacity.	● Three way catalyst (Manifold) ● Exhaust tube ● Intake air leaks ● Fuel injectors ● Fuel injector leaks ● Spark plug ● Improper ignition timing

DTC Confirmation Procedure

UBS006CV

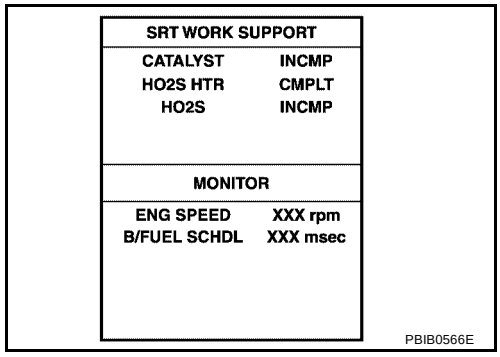
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

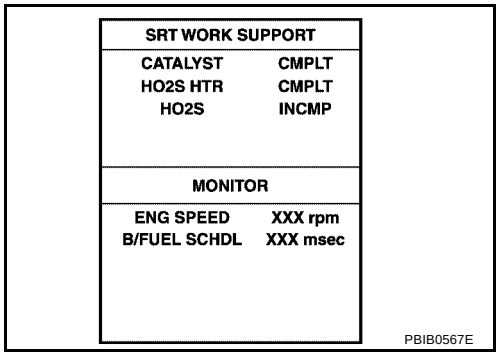
TESTING CONDITION:

- **Open engine hood before conducting the following procedure.**
- **Do not hold engine speed for more than the specified minutes below.**

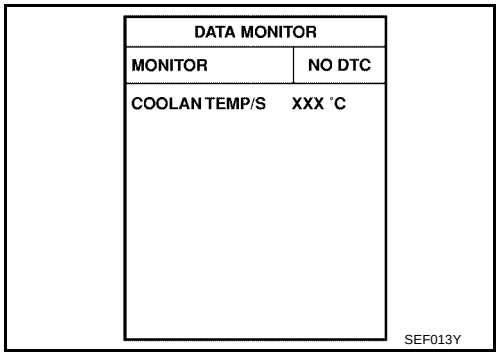
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
6. Start engine.
7. Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
   If “INCMP” of “CATALYST” changed to “COMPLT”, go to step 7
8. Wait 5 seconds at idle.



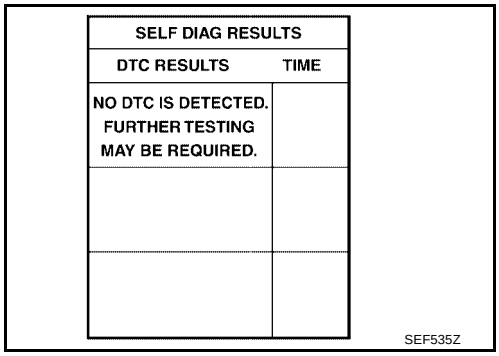
9. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).
   If not “CMPLT”, stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.



a. Turn ignition switch ″OFF″ and leave the vehicle in a cool place (soak the vehicle)
b. Turn ignition switch ″ON″ and select ″COOLAN TEMP/S″ in ″DATA MONITOR″ mode with CONSULT-II.
c. Start engine and warm it up while monitoring ″COOLAN TEMP/S″ indication on CONSULT-II.
d. When ″COOLAN TEMP/S″ indication reaches to 70°C(158°F), go to step 3.



10. Select “SELF-DIAG RESULTS” mode with CONSULT-II.
11. Confirm that the 1st trip DTC is not detected.
    If the 1st trip DTC is detected, go to EC-291, "Diagnostic Procedure" .



Overall Function Check

UBS006CW

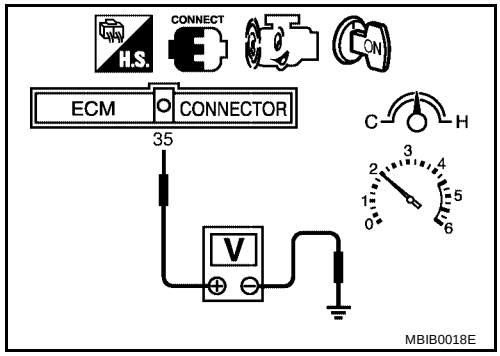
Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a DTC might not be confirmed.

CAUTION:
Always drive vehicle at a safe speed.

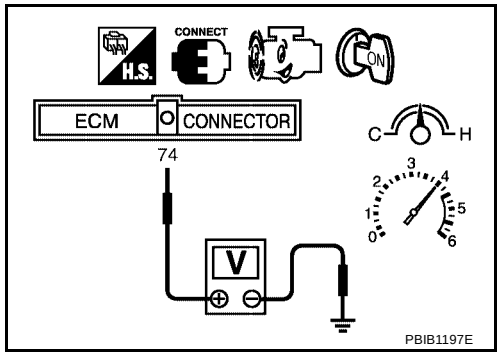
WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.

5. Set voltmeters probes between ECM terminal 35 (HO2S1 signal) and engine ground, and ECM terminal 74 (HO2S2 signal) and engine ground.
6. Keep engine speed at 2,000 rpm constant under no load.



7. Make sure that the voltage switching frequency (high & low) between ECM terminal 74 and engine ground is very less than that of ECM terminal 35 and engine ground.
   Switching frequency ratio = A/B
   A: Heated oxygen sensor 2 voltage switching frequency
   B: Heated oxygen sensor 1 voltage switching frequency
   This ratio should be less than 0.75.
   If the ratio is greater than above, it means three way catalyst does not operate properly. Go to EC-291, "Diagnostic Procedure" .



NOTE:
If the voltage at terminal 35 does not switch periodically more than 5 times within 10 seconds at step 7, perform trouble diagnosis for “DTC P0133” first. (See EC-211 .)

Diagnostic Procedure

UBS006CX

1. CHECK EXHAUST SYSTEM

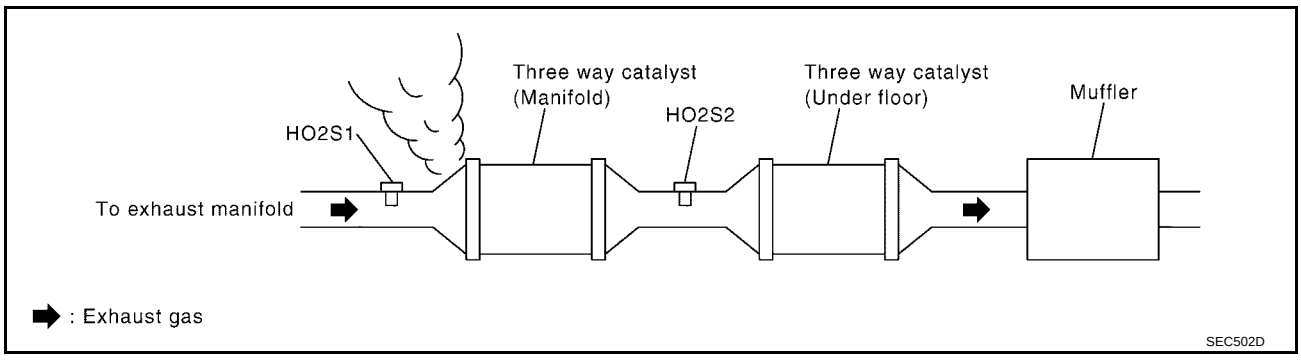
Visually check exhaust tubes and muffler for dent.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst (manifold).



OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check the following items. Refer to EC-88, "Basic Inspection" .

Items	Specifications	
Ignition timing	A/T	18° ± 5° BTDC (in “P” or “N” position)
	M/T	7° ± 5° BTDC
Target idle speed	A/T	800 ± 50 rpm (in “P” or “N” position)
	M/T	650 ± 50 rpm

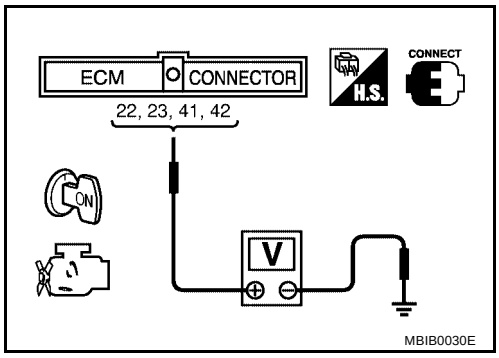
OK or NG

OK >> GO TO 5.
NG >> Follow the “Basic Inspection”.

5. CHECK INJECTORS

1. Refer to Wiring Diagram for Injectors, EC-548 .
2. Stop engine and then turn ignition switch “ON”.
3. Check voltage between ECM terminals 22, 23, 41, 42 and ground with CONSULT-II or tester.

Battery voltage should exist.

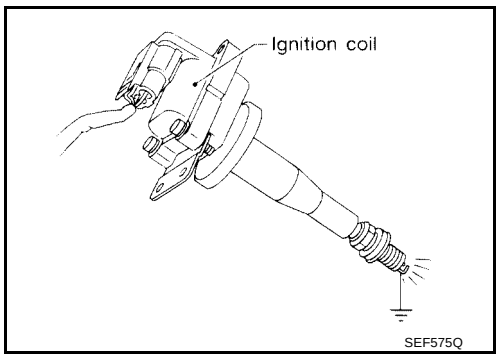


OK or NG

OK >> GO TO 6.
NG >> Perform EC-550, "Diagnostic Procedure" .

6. CHECK IGNITION SPARK

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known-good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



OK or NG

OK >> GO TO 7.
NG >> Check ignition coil with power transistor and their circuit. Refer to EC-535, "IGNITION SIGNAL" .

7. CHECK INJECTOR

1. Turn ignition switch “OFF”.
2. Remove injector assembly.
   Refer to EM-19, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Turn ignition switch “ON”.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injector(s) from which fuel is dripping.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Trouble is fixed.>>**INSPECTION END**
Trouble is not fixed.>>Replace three way catalyst (manifold).

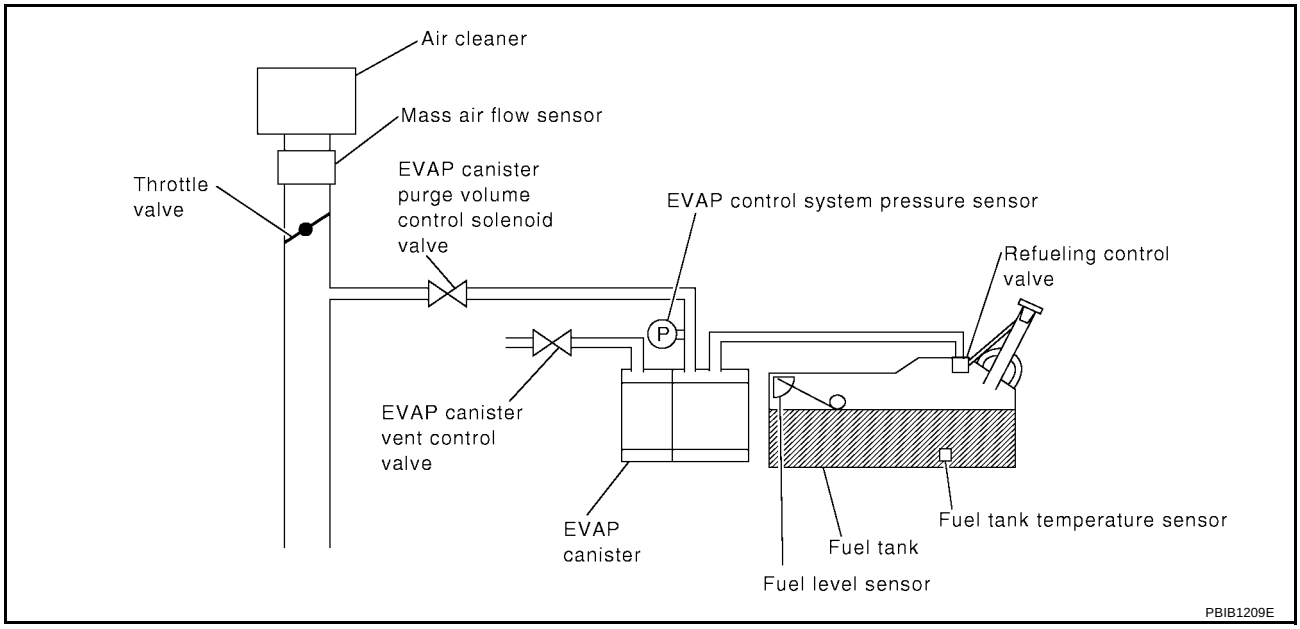
DTC P0441 EVAP CONTROL SYSTEM

PFP:14950

System Description

UBS001IU

NOTE:
If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128, P2138 first perform trouble diagnosis for other DTC.



In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

On Board Diagnosis Logic

UBS006GI

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, malfunction is determined.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441 0441	EVAP control system incorrect purge flow	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	● EVAP canister purge volume control solenoid valve stuck closed ● EVAP control system pressure sensor and the circuit ● Loose, disconnected or improper connection of rubber tube ● Blocked rubber tube ● Cracked EVAP canister ● EVAP canister purge volume control solenoid valve circuit ● Accelerator pedal position sensor ● Blocked purge port ● EVAP canister vent control valve

DTC Confirmation Procedure

UBS001IX

CAUTION:
Always drive vehicle at a safe speed.

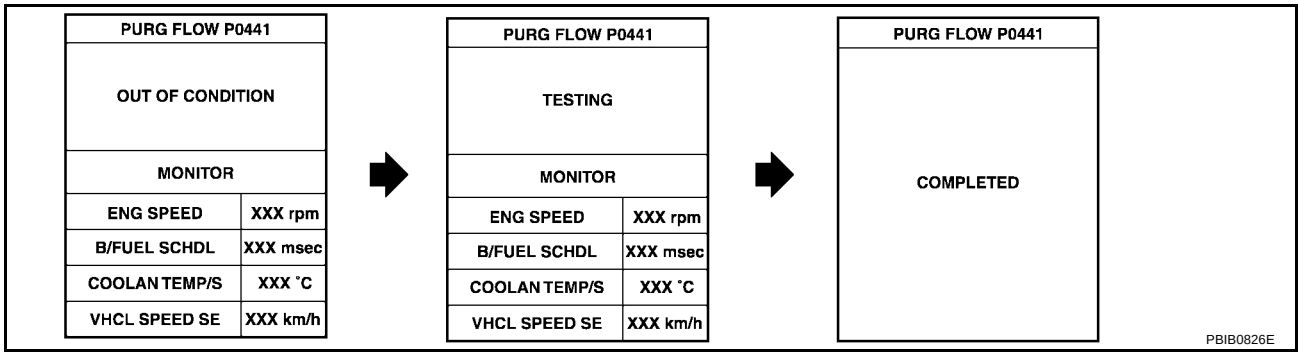
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
For best results, perform test at a temperature of 0°C (32°F) or more.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and let it idle for at least 70 seconds.
4. Select “PURG FLOW P0441” of “EVAPORATIVE SYSTEM” in “DTC CONFIRMATION” mode with CONSULT-II.
5. Touch “START”.
   If “COMPLETED” is displayed, go to step 7.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take at least 35 seconds.)

Selector lever	Suitable position
Vehicle speed	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,800 rpm
B/FUEL SCHDL	1.0 - 8.2 msec
Engine coolant temperature	More than 70°C (158°F)



If “TESTING” is not changed for a long time, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-297, "Diagnostic Procedure" .

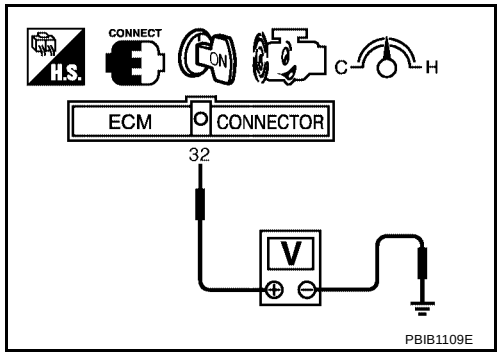
Overall Function Check

UBS001IY

Use this procedure to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Start engine and wait at least 70 seconds.
5. Set voltmeter probes to ECM terminals 32 (EVAP control system pressure sensor signal) and ground.
6. Check EVAP control system pressure sensor value at idle speed and note it.
7. Establish and maintain the following conditions for at least 1 minute.



Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than “P”, “N” or “R”

8. Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed (measured at step 6) for at least 1 second.
9. If NG, go to EC-297, "Diagnostic Procedure" .

Diagnostic Procedure

UBS001IZ

1. CHECK EVAP CANISTER

1. Turn ignition switch “OFF”.
2. Check EVAP canister for cracks.

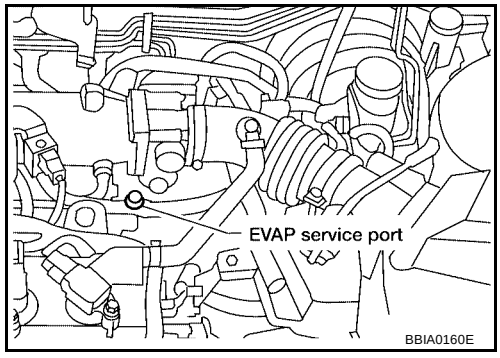
OK or NG

OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> Replace EVAP canister.

2. CHECK PURGE FLOW

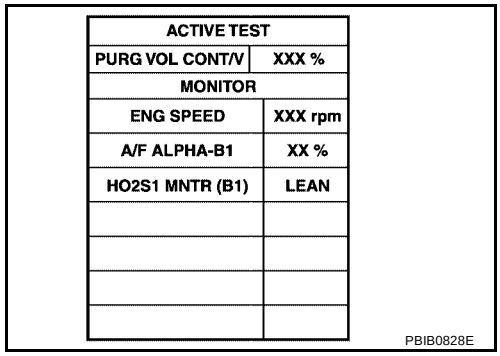
With CONSULT-II

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
2. Start engine and let it idle.



3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II.
4. Rev engine up to 2,000 rpm.
5. Touch “Qd” and “Qu” on CONSULT-II screen to adjust “PURG VOL CONT/V” opening and check vacuum existence.

PURG VOL CONT/V	VACUUM
100.0%	Should exist
0.0%	Should not exist



OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

3. CHECK PURGE FLOW

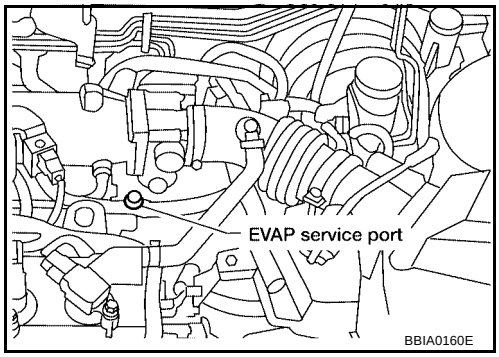
Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum gauge indication when revving engine up to 2,000 rpm.

   Vacuum should exist.

6. Release the accelerator pedal fully and let idle.

   Vacuum should not exist.



OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

4. CHECK EVAP PURGE LINE

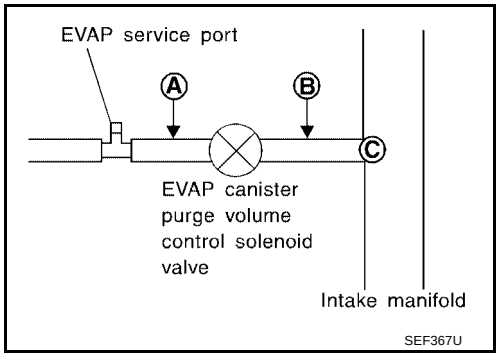
1. Turn ignition switch “OFF”.
2. Check EVAP purge line for improper connection or disconnection. Refer to EC-584, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 5.
NG >> Repair it.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

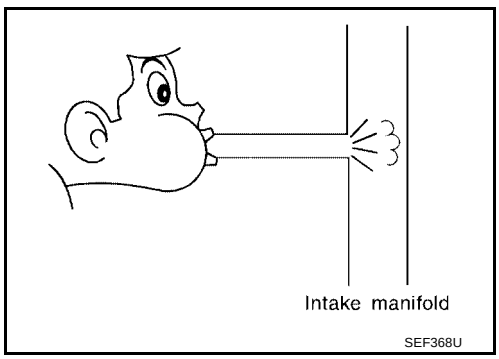
1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B** .
2. Blow air into each hose and EVAP purge port **C** .



3. Check that air flows freely.

OK or NG

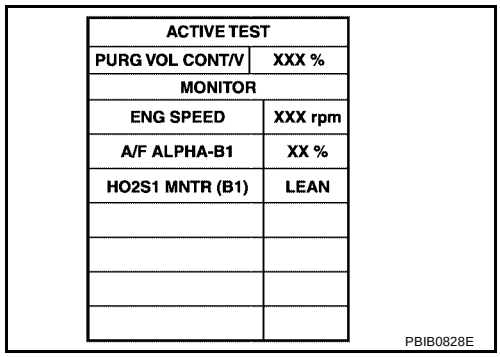
OK (With CONSULT-II)>>GO TO 6.
OK (Without CONSULT-II)>>GO TO 7.
NG >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-316, "Component Inspection" .

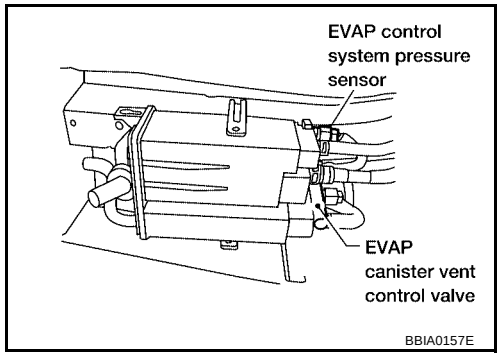
OK or NG

OK >> GO TO 8.
NG >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.



OK or NG

OK >> GO TO 9.
NG >> Replace EVAP control system pressure sensor.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to “DTC Confirmation Procedure” for DTC P0452 EC-324 , P0453 EC-330 .

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 11.
NG >> Clean the rubber tube using an air blower.

11. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-322, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP canister vent control valve.

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.
Refer to EC-584, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 13.
NG >> Replace it.

13. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

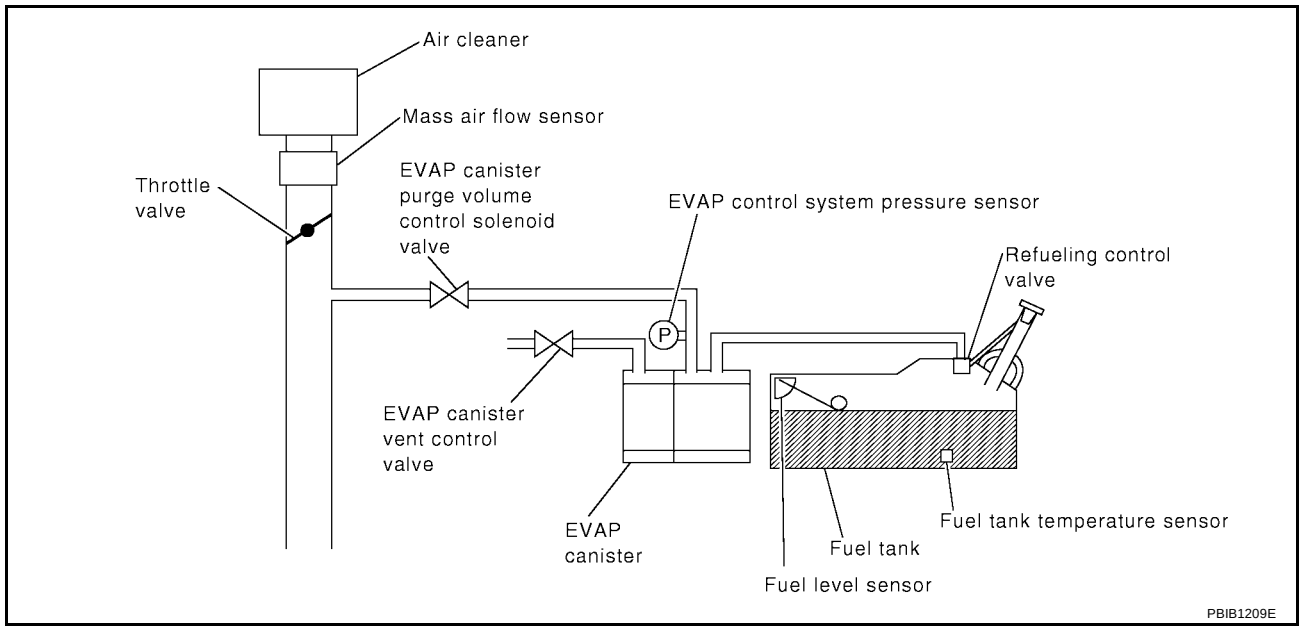
DTC P0442 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS001J0

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.
The EVAP canister vent control valve is closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve will then be opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0442 0442	EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Fuel level sensor and the circuit ● Refueling control valve ● ORVR system leaks

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS001J2

CAUTION:

Never remove fuel filler cap during the DTC confirmation procedure.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

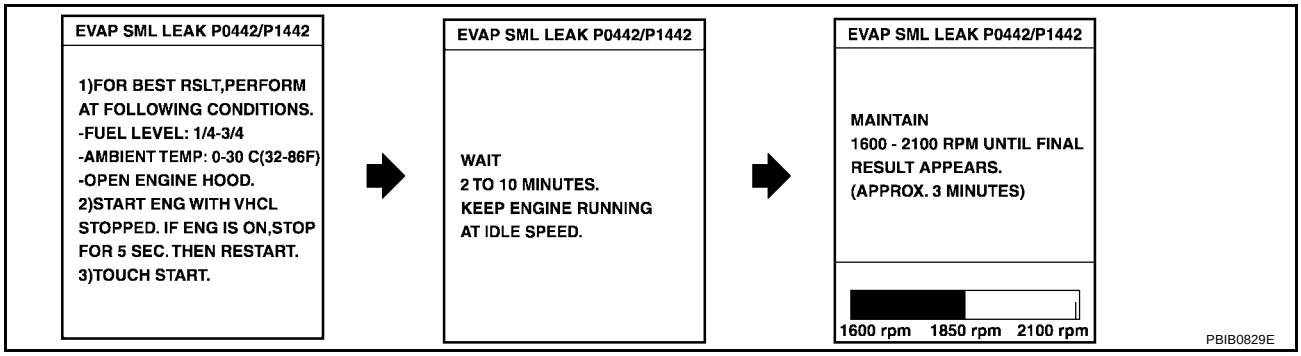
TESTING CONDITION:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting following procedure.**
- **Always perform test at a temperature of 0 to 30°C (32 to 86°F).**

WITH CONSULT-II

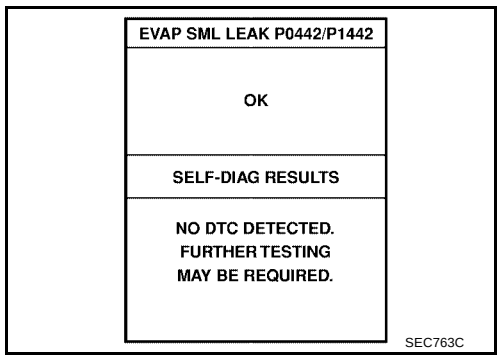
1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Check the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: More than −20°C (−4°F)

5. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
Follow the instruction displayed.



NOTE:
- If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-88, "Basic Inspection" .
- Make sure that EVAP hoses are connected to the EVAP canister purge volume control solenoid valve properly.

6. Make sure that “OK” is displayed.
If “NG” is displayed, refer to EC-304, "Diagnostic Procedure" .



WITH GST

NOTE:
Be sure to read the explanation of “Driving Pattern” on EC-68 before driving vehicle.

1. Start engine.
2. Drive vehicle according to “EC-68, "Driving Pattern" .
3. Stop vehicle.
4. Select “MODE 1” with GST.

– If SRT of EVAP system is not set yet, go to the following step.
– If SRT of EVAP system is set, the result will be OK.

5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine.
It is not necessary to cool engine down before driving.
7. Drive vehicle again according to the EC-68, "Driving Pattern" .
8. Stop vehicle.
9. Select “MODE 3” with GST.

– If P0442 is displayed on the screen, go to EC-304, "Diagnostic Procedure" .
– If P0441 is displayed on the screen, go to “Diagnostic Procedure” for DTC P0441, EC-297 .
– If P0441, P0442 are not displayed on the screen, go to the following step.

10. Select “MODE 1” with GST.

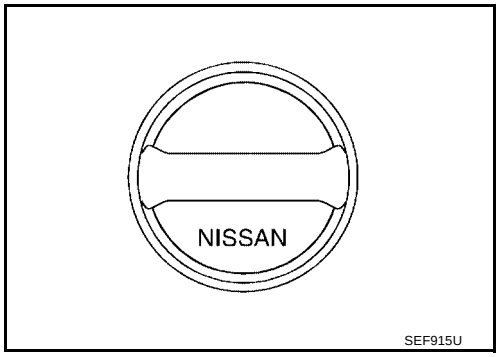
– If SRT of EVAP system is set, the result will be OK.
– If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

UBS001J3

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.



OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.

2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >>
- Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
- Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

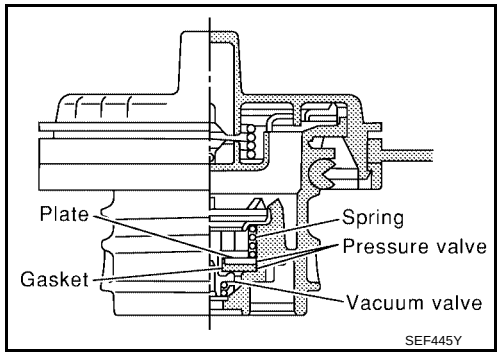
Check for air releasing sound while opening the fuel filler cap.

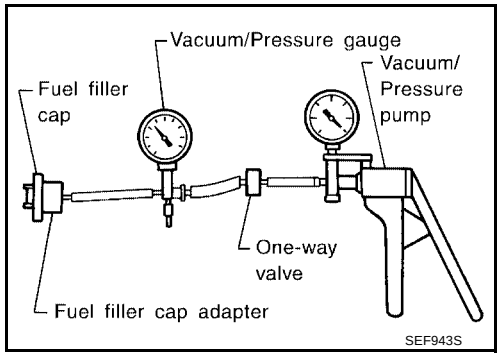
OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

1. Wipe valve housing clean.
2. Check valve opening pressure and vacuum.





Pressure: **15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)**

Vacuum: **–6.0 to –3.4 kPa (–0.061 to –0.035 kg/cm^2 , –0.87 to –0.48 psi)**

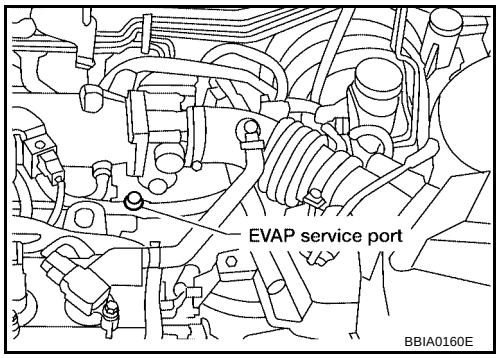
CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

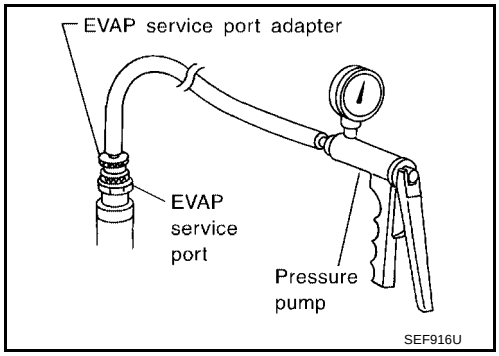
OK or NG

OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.





NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.

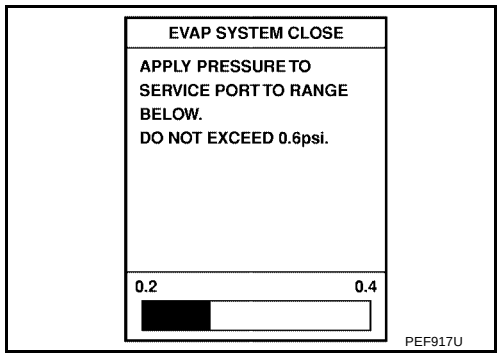
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

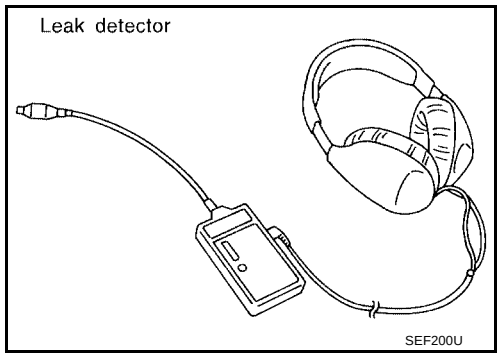
With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-584, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

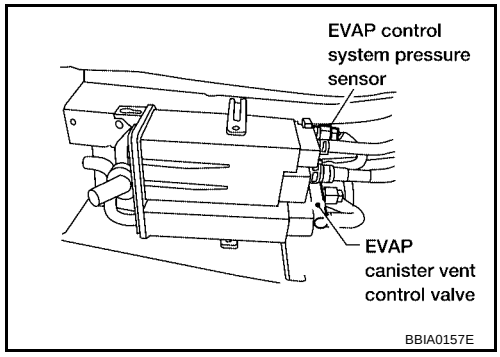
OK >> GO TO 8.
NG >> Repair or replace.

7. CHECK FOR EVAP LEAK

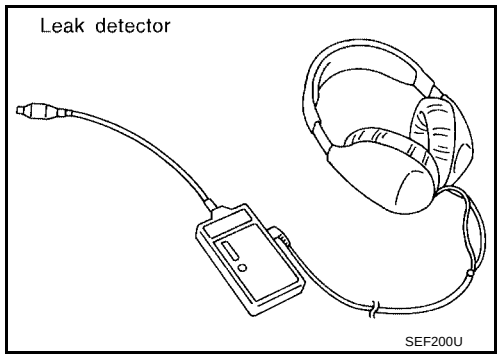
Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-584, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-312, "DTC Confirmation Procedure" .

OK or NG

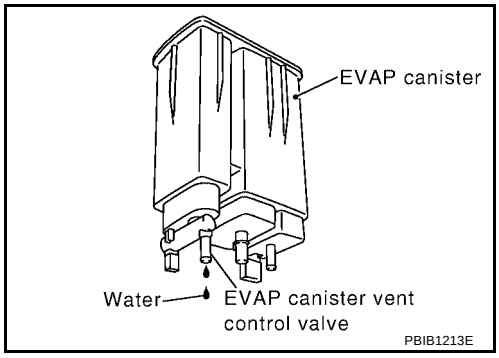
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
HO2S1 MNTR (B1)	LEAN

PBIB0828E

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 17.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-34, "Vacuum Hose Drawing" .

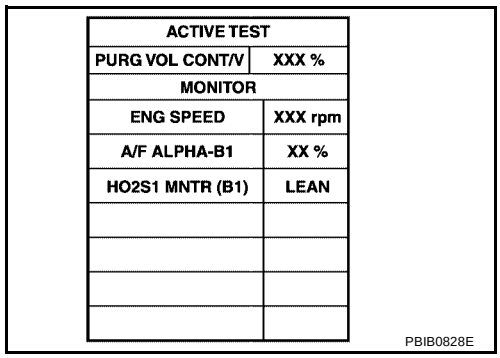
OK or NG

OK (With CONSULT-II)>>GO TO 15.
OK (Without CONSULT-II)>>GO TO 16.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-316, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace EVAP canister purge volume control solenoid valve.

17. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-255, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace fuel level sensor unit.

18. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-329, "Component Inspection" .

OK or NG

OK >> GO TO 19.
NG >> Replace EVAP control system pressure sensor.

19. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-583, "EVAPORATIVE EMISSION SYSTEM" .

OK or NG

OK >> GO TO 20.
NG >> Repair or reconnect the hose.

20. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 21.

21. CHECK EVAP/ORVR VAPOR LINE

Check EVAP/ORVR vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-590, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses and tubes.

22. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 23.
NG >> Repair or replace hoses, tubes or filler neck tube.

23. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-593, "Component Inspection" .

OK or NG

OK >> GO TO 24.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

24. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 25.
NG >> Replace fuel level sensor unit.

25. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

UBS001J5

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*1	Vehicle speed		

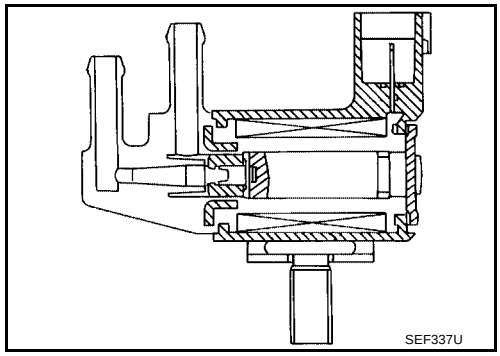
*1: This signal is sent to the ECM through CAN communication line.

*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

UBS001J6

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: N (A/T models), Neutral (M/T models) ● No-load	Idle	0%
		2,000 rpm	—

On Board Diagnosis Logic

UBS006GJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	● Harness or connectors (The sensor circuit is shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

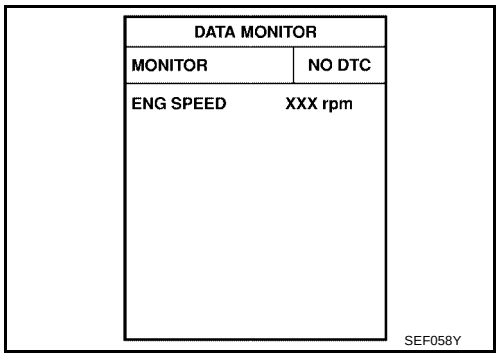
UBS001J9

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 13 seconds.
4. If 1st trip DTC is detected, go to EC-314, "Diagnostic Procedure"



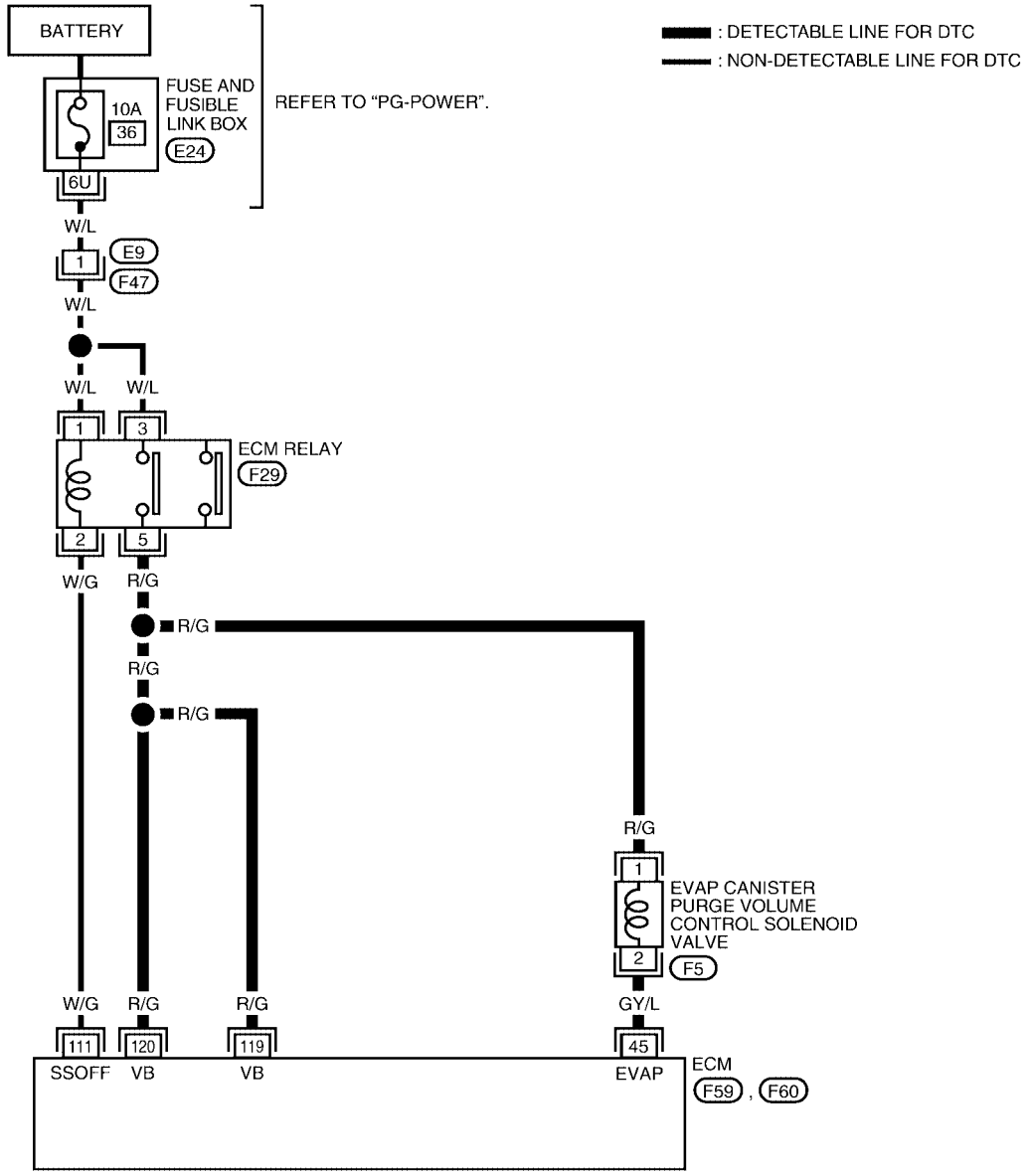
WITH GST

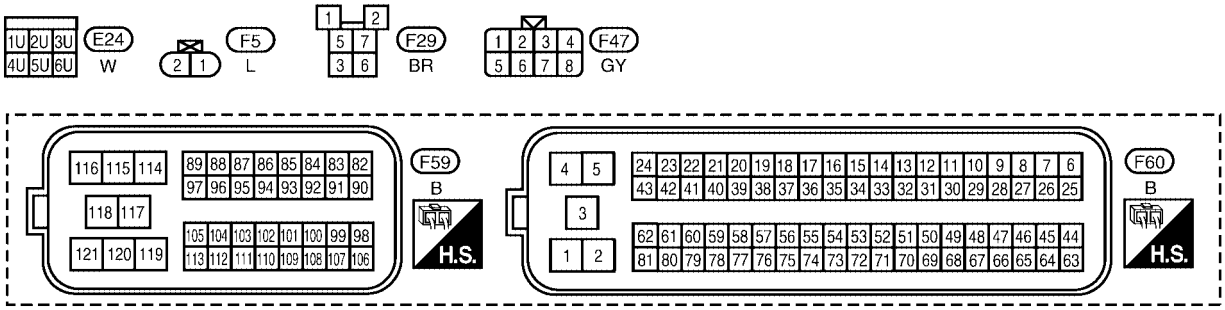
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS001JA

EC-PGC/V-01



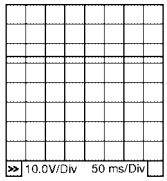
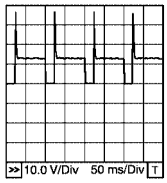


BBWA0785E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

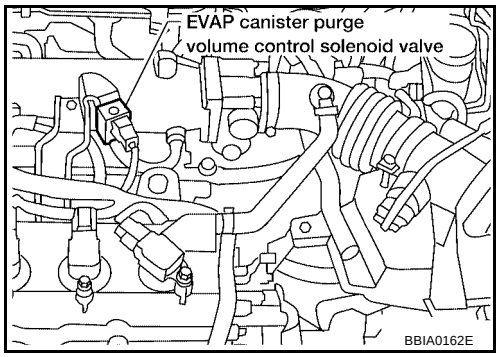
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS001JB

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



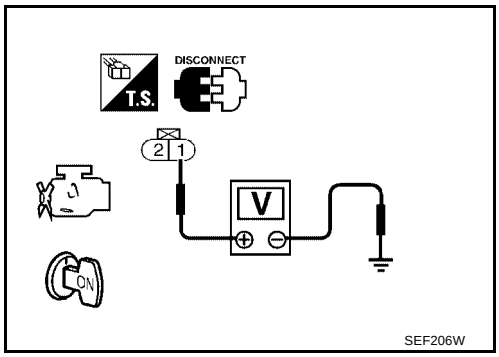
BBIA0162E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF206W

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

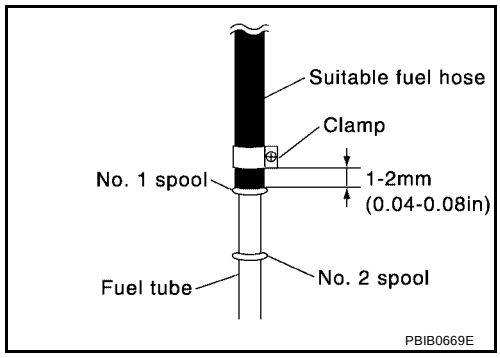
OK or NG

OK (With CONSULT-II)>>GO TO 4.
OK (Without CONSULT-II)>>GO TO 5.
NG >> Repair open circuit or short to ground and short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-316, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

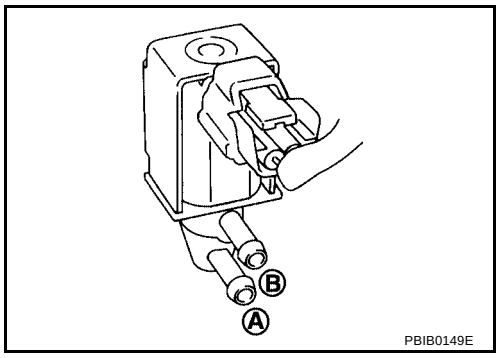
UBS001JC

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

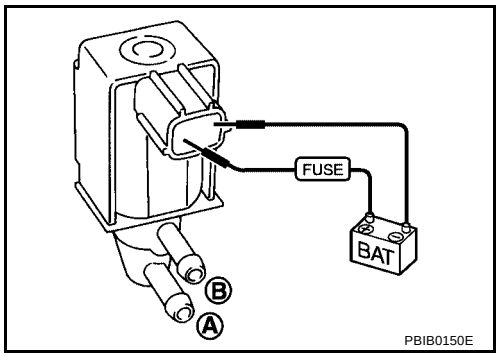
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



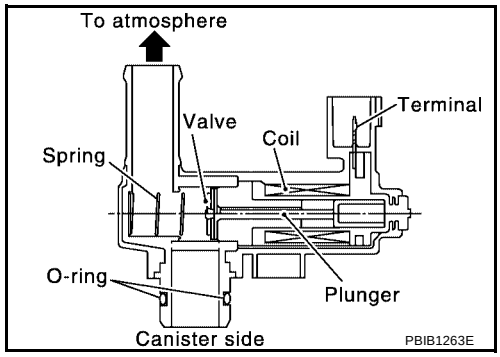
DTC P0447 EVAP CANISTER VENT CONTROL VALVE

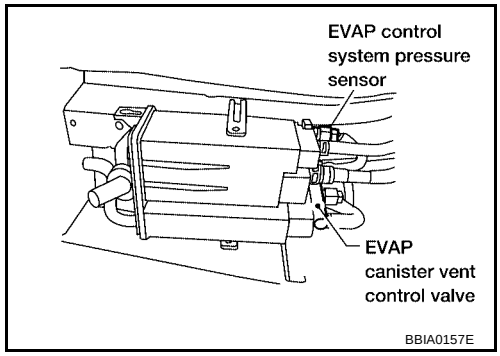
PFP:14935

Component Description

UBS001JD

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnoses.





CONSULT-II Reference Value in Data Monitor Mode

UBS001JE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS006GK

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447 0447	EVAP canister vent control valve circuit open	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister vent control valve

DTC Confirmation Procedure

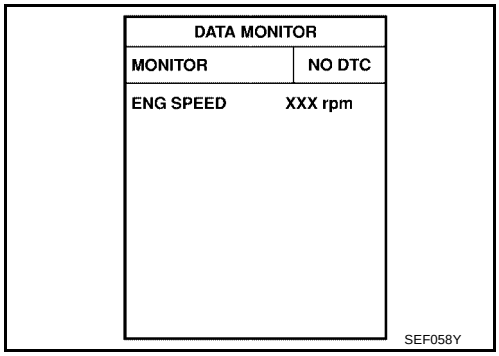
UBS001JH

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch "ON".

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 8 seconds.
4. If 1st trip DTC is detected, go to EC-320, "Diagnostic Procedure"
.



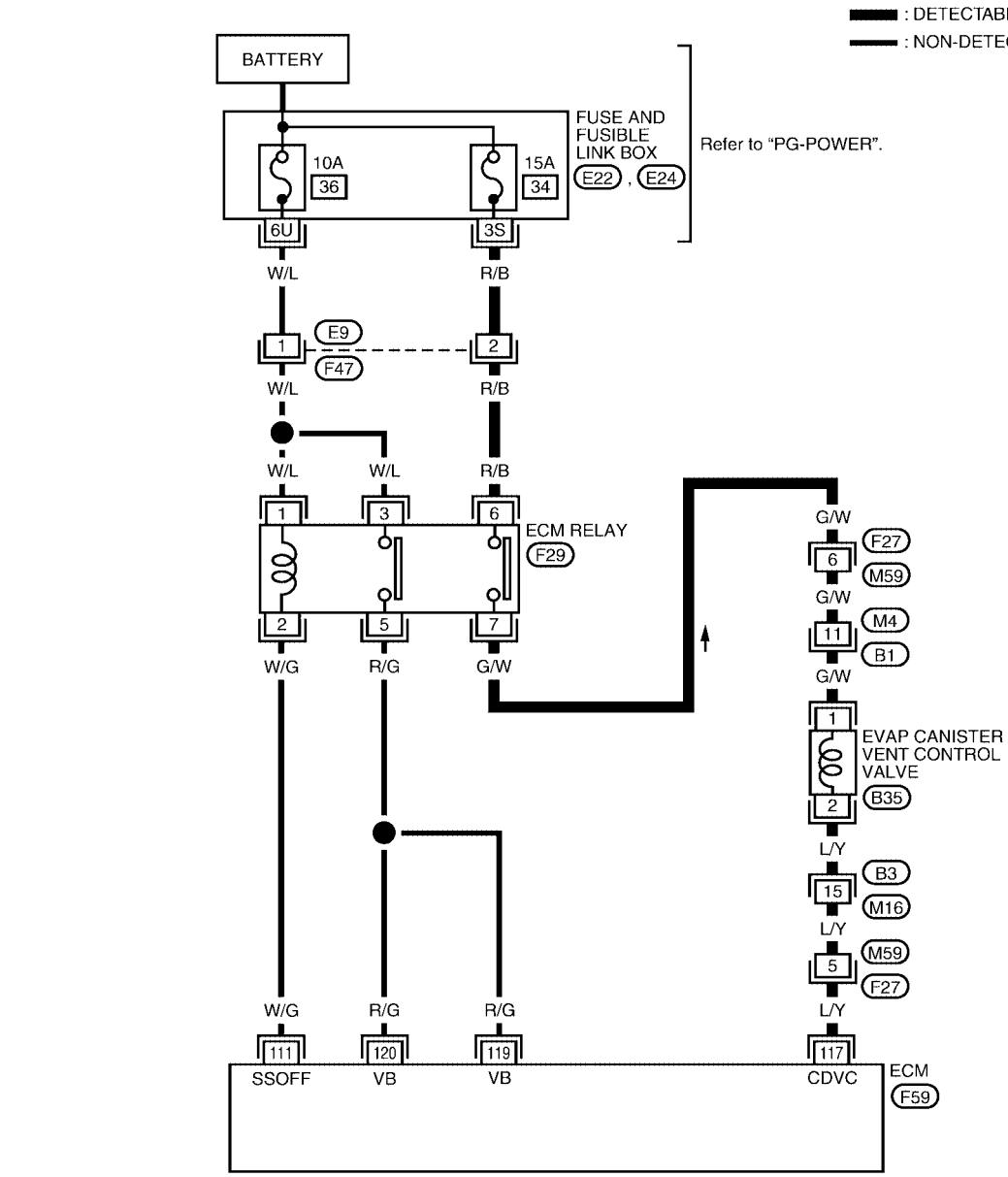
WITH GST

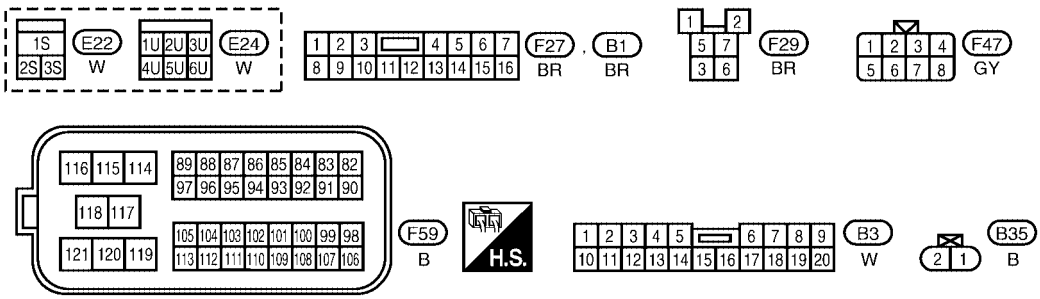
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS001JI

EC-VENT/V-01





BBWA0291E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
117	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS001JJ

1. INSPECTION START

Do you have CONSULT-II?

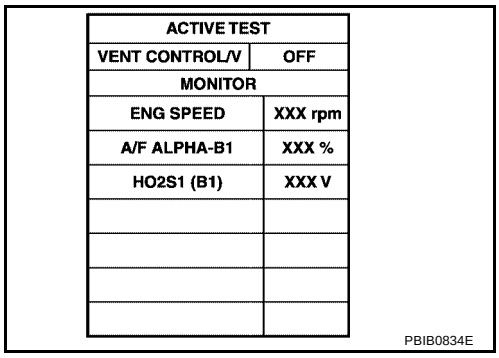
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch "OFF" and then turn "ON".
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON/OFF" on CONSULT-II screen.
4. Check for operating sound of the valve.
   Clicking noise should be heard.

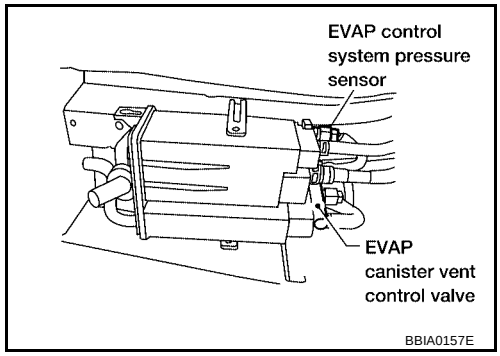


OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

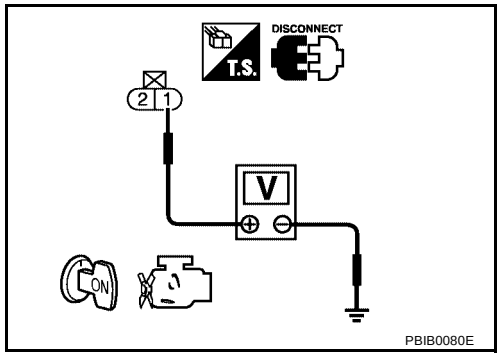
3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister vent control valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between EVAP canister vent control valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Hreness connectors M59, F27
- Harness connectors M14, B1
- Fuse block (J/B) connector E22
- 15A fuse
- Harness for open or short between EVAP canister vent control valve and fuse

>> Repair harness or connectors.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 117 and EVAP canister vent control valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M59, F27
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 8.
NG >> Clean the rubber tube using an air blower.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-322, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister vent control valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

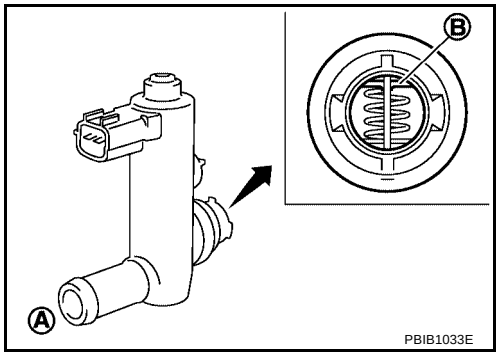
Component Inspection

UBS001JK

EVAP CANISTER VENT CONTROL VALVE

With CONSULT-II

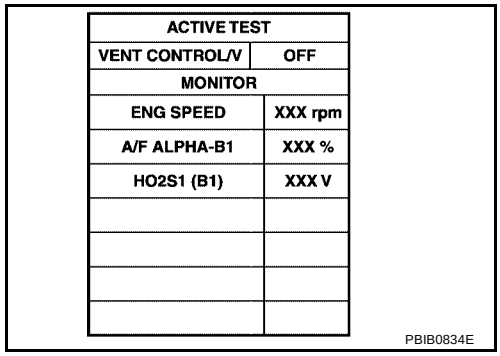
1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.
5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.



6. Check air passage continuity and operation delay time.

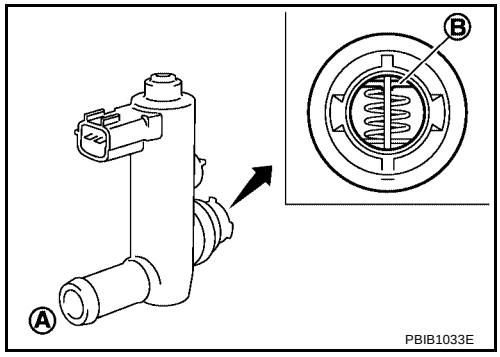
Condition	Air passage continuity between **A** and **B**
ON	No
OFF	Yes

7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform Test No. 5 again.



Without CONSULT-II

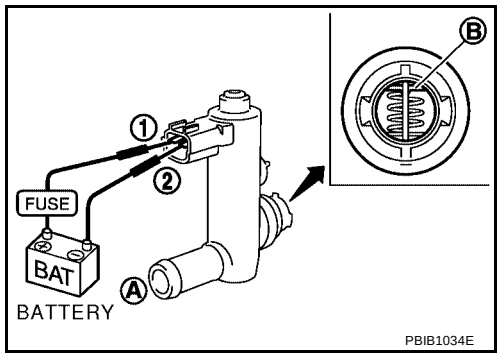
1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	No
OFF	Yes

4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform Test No. 3 again.



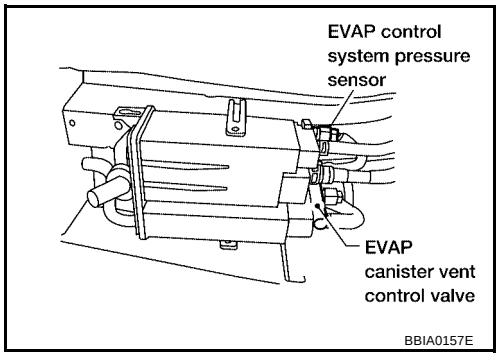
DTC P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

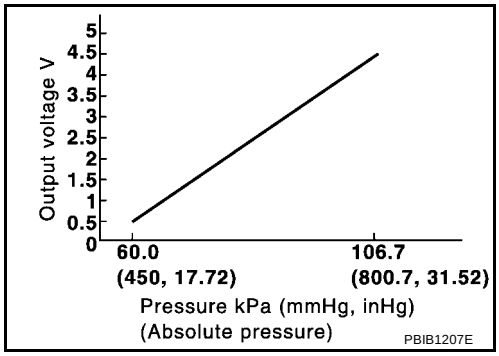
PFP:25085

Component Description

UBS003RJ

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.





CONSULT-II Reference Value in Data Monitor Mode

UBS003RK

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	Approx. 1.8 - 4.8V

On Board Diagnosis Logic

UBS003RL

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452 0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP control system pressure sensor

NOTE:
If DTC P0452 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-455.

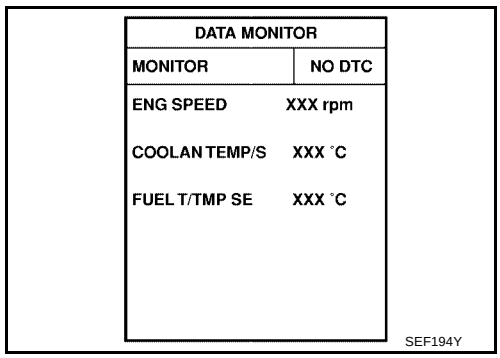
DTC Confirmation Procedure

UBS003RM

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

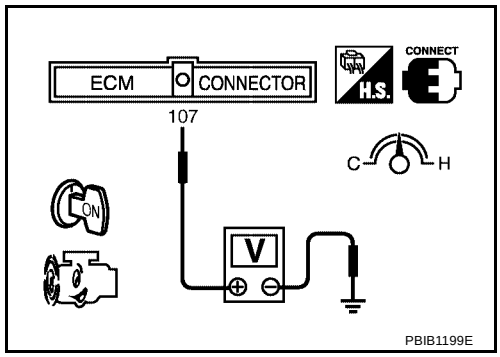
WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
   If 1st trip DTC is detected, go to EC-327, "Diagnostic Procedure"
   .



WITH GST

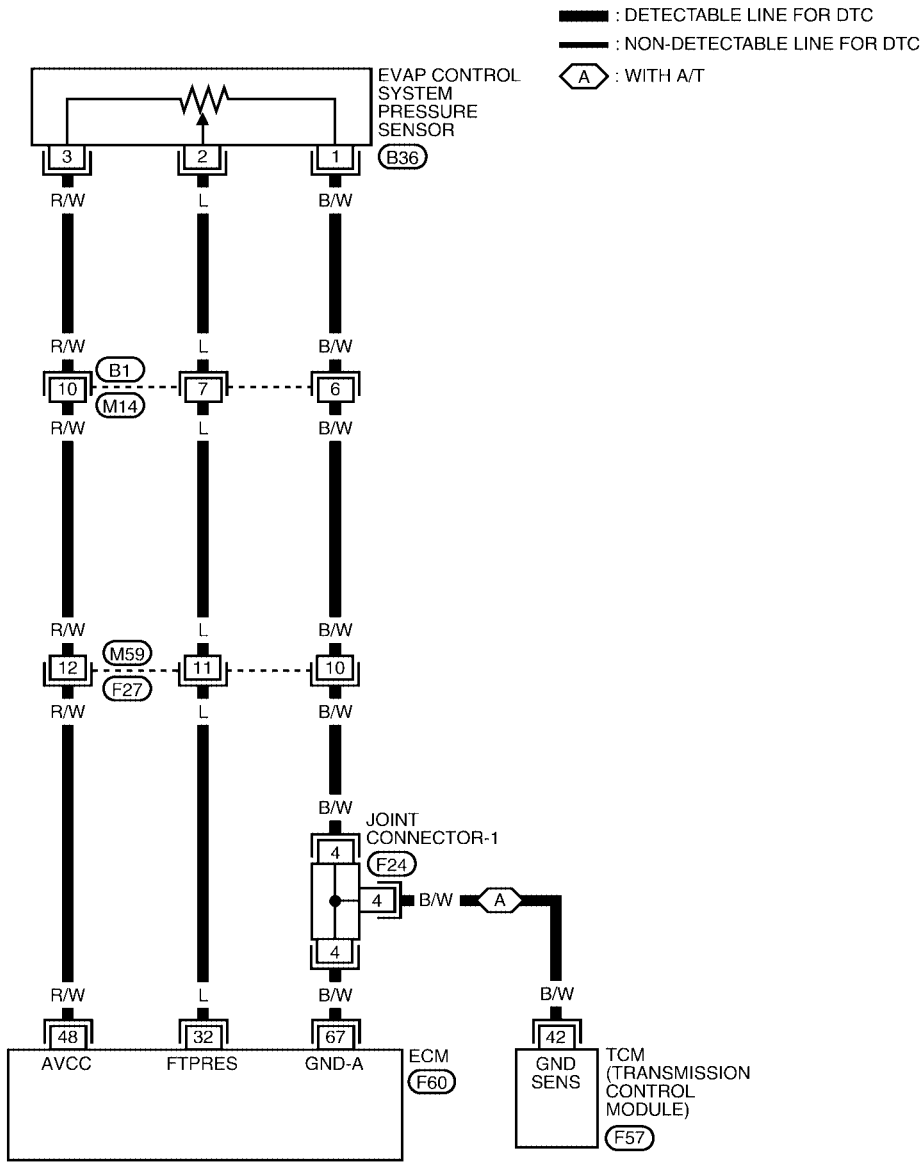
1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and wait at least 20 seconds.
5. Select “MODE 7” with GST.
   If 1st trip DTC is detected, go to EC-327, "Diagnostic Procedure"
   .

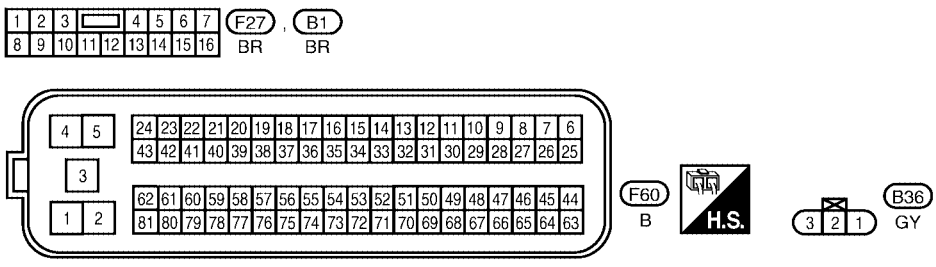


Wiring Diagram

UBS003RN

EC-PRE/SE-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

BBWA0786E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	L	EVAP control system pressure sensor	**[Ignition switch "ON"]**	Approximately 4.4V
48	R/W	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
67	B/W	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

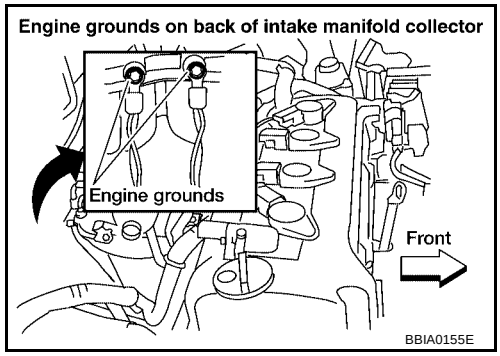
Diagnostic Procedure

UBS003RO

1. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 2.



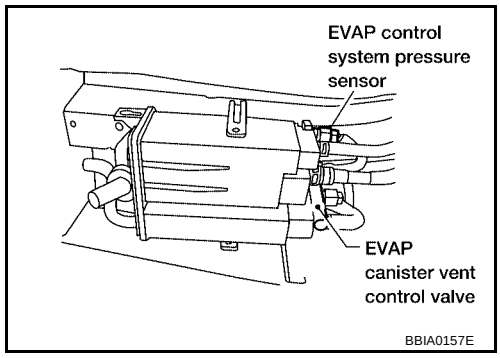
2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.

Water should not exist.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.



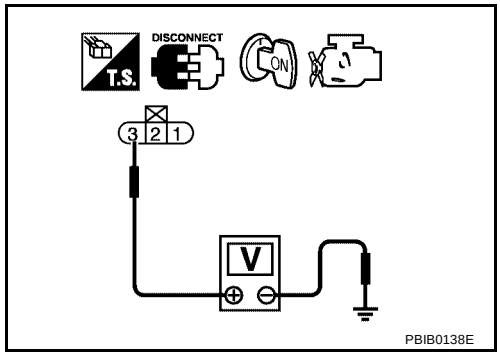
3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "ON".
2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EVAP control system pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between EVAP control system pressure sensor and ECM
- Harness for open or short between EVAP control system pressure sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-329, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

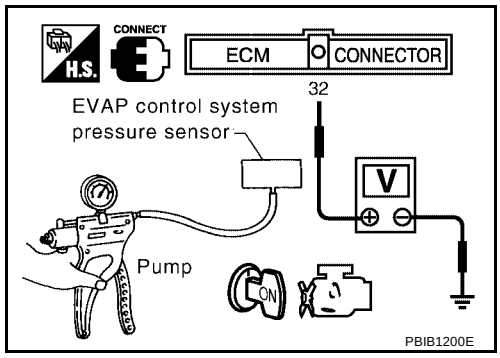
Component Inspection

UBS003RP

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove EVAP control system pressure sensor from EVAP canister.
   Do not reuse the O-ring, replace it with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch “ON” and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value



CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).**

5. If NG, replace EVAP control system pressure sensor.

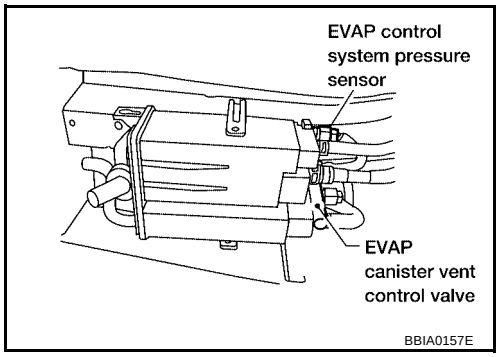
DTC P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

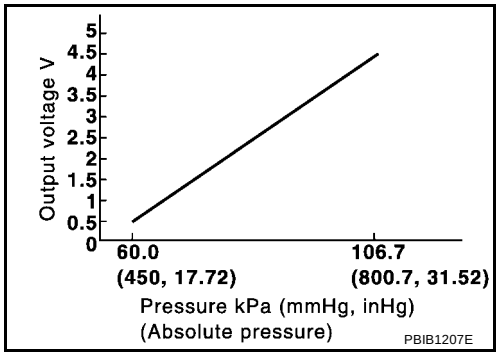
PFP:25085

Component Description

UBS003RQ

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.





CONSULT-II Reference Value in Data Monitor Mode

UBS003RR

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	Approx. 1.8 - 4.8V

On Board Diagnosis Logic

UBS003RS

NOTE:
If DTC P0453 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-455.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453 0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP control system pressure sensor ● EVAP canister vent control valve ● EVAP canister

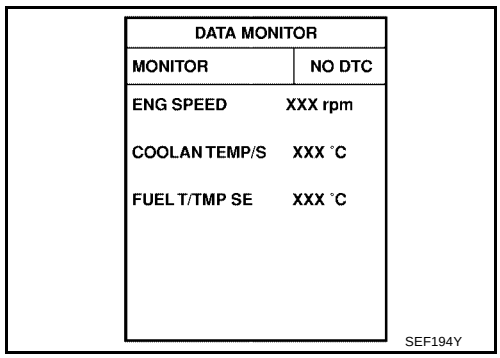
DTC Confirmation Procedure

UBS003RT

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

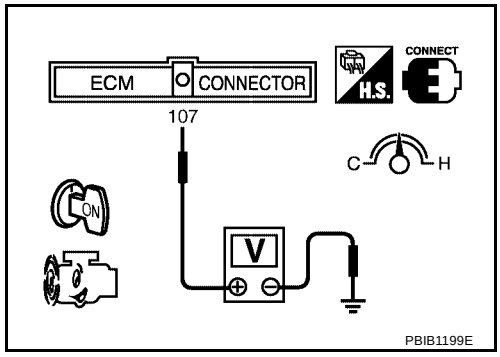
WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
7. If 1st trip DTC is detected, go to EC-333, "Diagnostic Procedure"
.



WITH GST

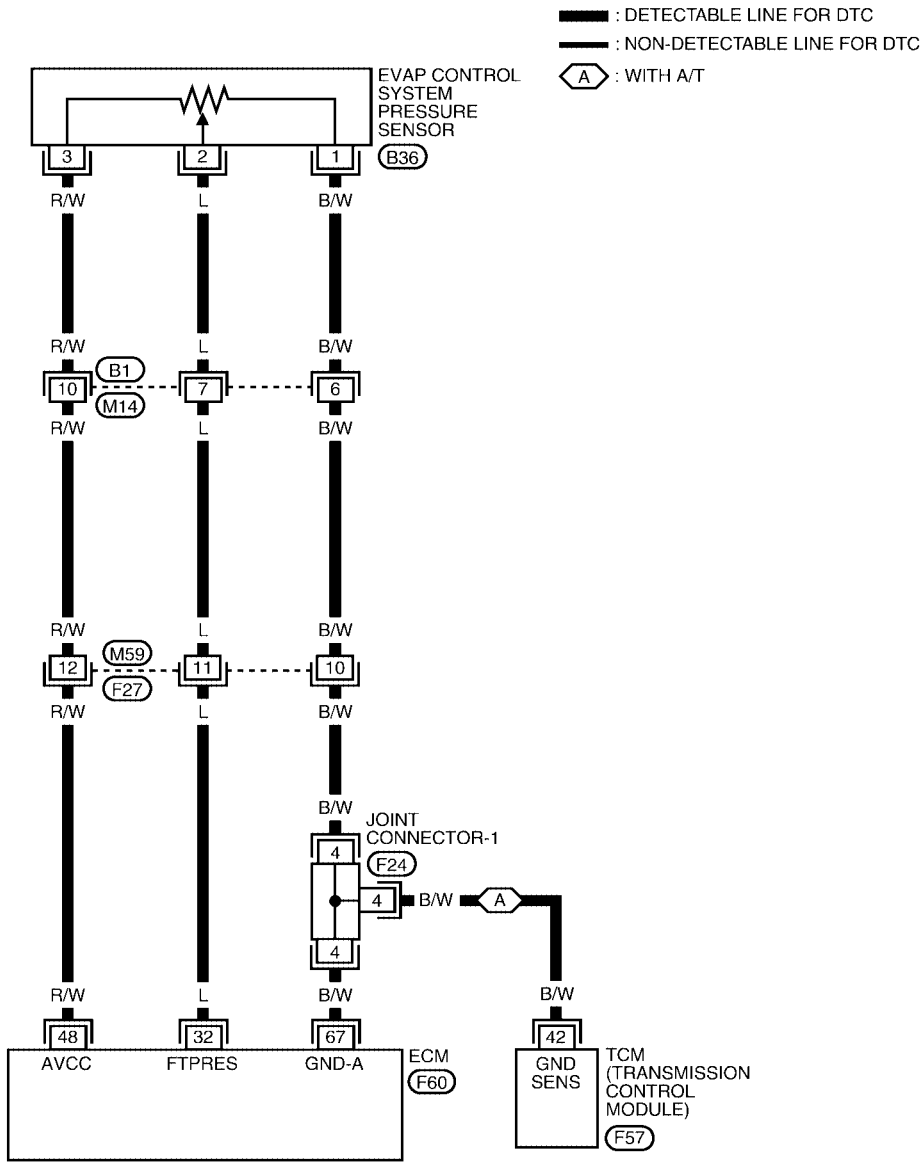
1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and wait at least 20 seconds.
5. Select “MODE 7” with GST.
   If 1st trip DTC is detected, go to EC-333, "Diagnostic Procedure"
.

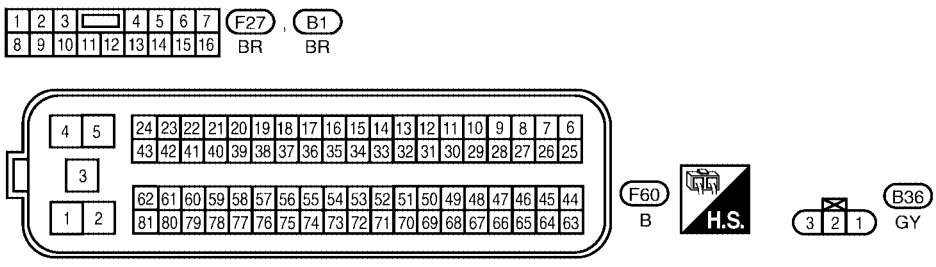


Wiring Diagram

UBS003RU

EC-PRE/SE-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

BBWA0786E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	L	EVAP control system pressure sensor	**[Ignition switch "ON"]**	Approximately 1.8 - 4.8V
48	R/W	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
67	B/W	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

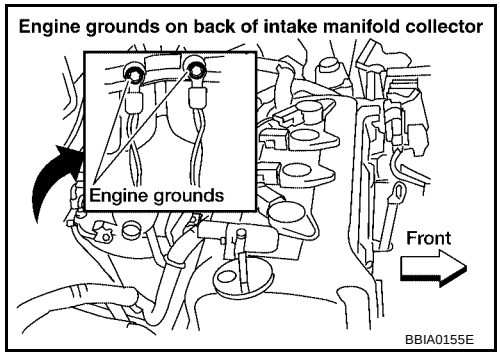
Diagnostic Procedure

UBS003RV

1. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 2.



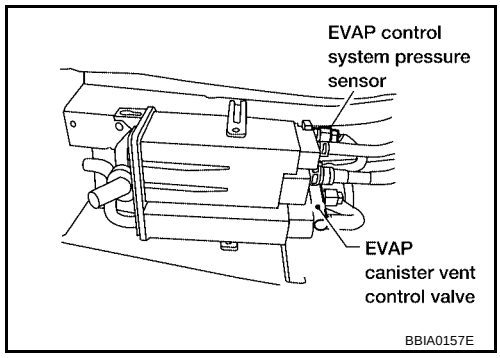
2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.

Water should not exist.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.



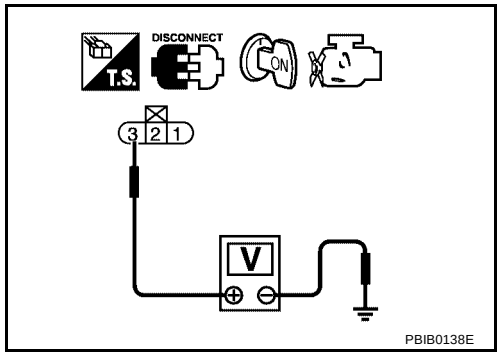
3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "ON".
2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EVAP control system pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between EVAP control system pressure sensor and ECM
- Harness for open or short between EVAP control system pressure sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 10.
NG >> Clean the rubber tube using an air blower.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-322, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP canister vent control valve.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-337, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP control system pressure sensor.

12. CHECK RUBBER TUBE

Check obstructed rubber tube connected to EVAP canister vent control valve.

OK or NG

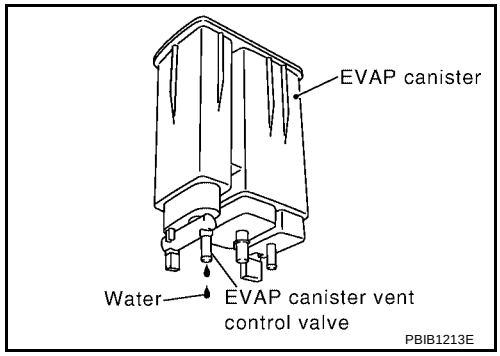
OK >> GO TO 13.
NG >> Clean rubber tube using an air blower, repair or replace rubber tube.

13. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.

OK or NG

OK >> GO TO 14.
NG >> GO TO 16.



14. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage

>> Repair hose or replace EVAP canister.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

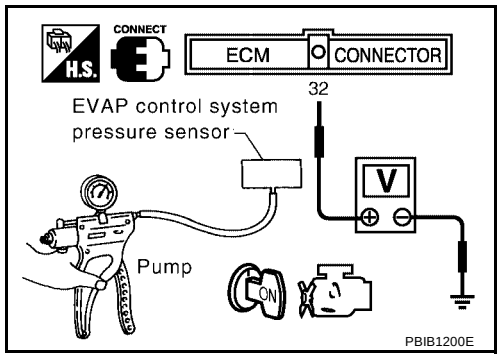
Component Inspection

UBS003RW

EVAP CONTROL PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove EVAP control system pressure sensor from EVAP canister.
   Do not reuse the O-ring, replace it with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch “ON” and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value



CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).**

5. If NG, replace EVAP control system pressure sensor.

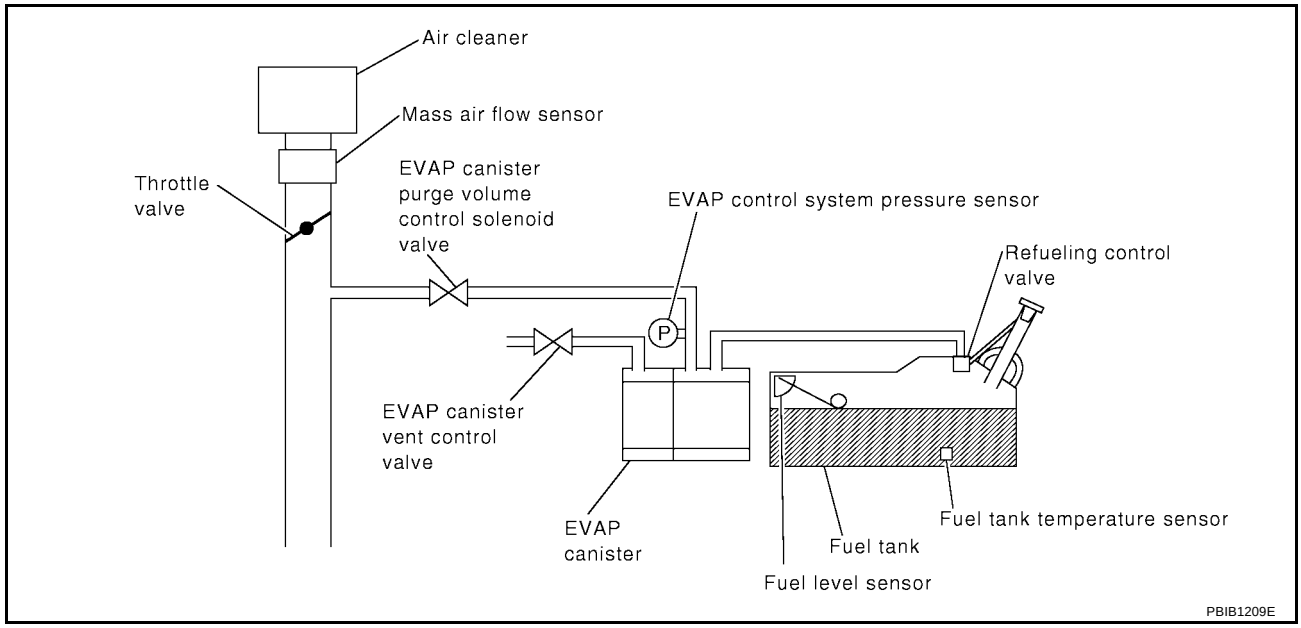
DTC P0455 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS001JT

This diagnosis detects a very large leak (fuel filler cap fell off, etc.) in the EVAP system between the fuel tank and the EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0455 0455	EVAP control system gross leak detected	EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.	● Fuel filler cap remains open or fails to close. ● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent. ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged. ● EVAP control system pressure sensor ● Refueling EVAP vapor cut valve ● ORVR system leaks

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS001JV

CAUTION:
Never remove fuel filler cap during the DTC Confirmation Procedure.

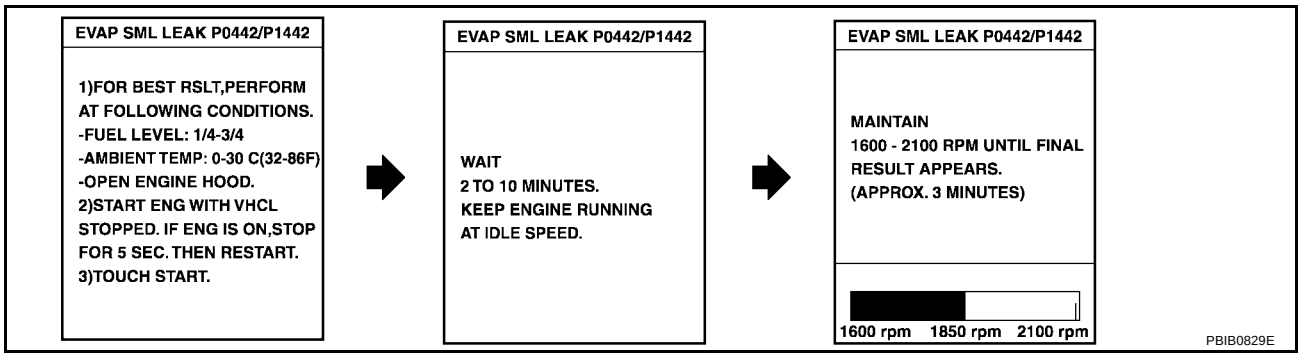
NOTE:
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedure.**

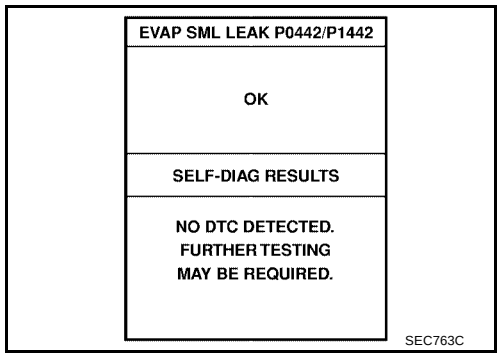
WITH CONSULT-II

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch “ON”.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.

   NOTE:
   If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-88, "Basic Inspection" .



7. Make sure that “OK” is displayed.
   If “NG” is displayed, select “SELF-DIAG RESULTS” mode with CONSULT-II and make sure that “EVAP GROSS LEAK [P0455]” is displayed. If it is displayed, refer to EC-340, "Diagnostic Procedure" .
   If P0442 is displayed, perform “Diagnostic Procedure” for DTC P0442, EC-304 .



WITH GST

NOTE:
Be sure to read the explanation of “Driving Pattern” on EC-68 before driving vehicle.

1. Start engine.

2. Drive vehicle according to EC-68, "Driving Pattern" .
3. Stop vehicle.
4. Select “MODE 1” with GST.
- If SRT of EVAP system is not set yet, go to the following step.
- If SRT of EVAP system is set, the result will be OK.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine.
   It is not necessary to cool engine down before driving.
7. Drive vehicle again according to the EC-68, "Driving Pattern" .
8. Stop vehicle.
9. Select “MODE 3” with GST.
- If P0455 is displayed on the screen, go to EC-340, "Diagnostic Procedure" .
- If P0442 is displayed on the screen, go to “Diagnostic Procedure”, for DTC P0442, EC-304 .
- If P0441 is displayed on the screen, go to “Diagnostic Procedure” for DTC P0441, EC-297 .
- If P0441, P0442 and P0455 are not displayed on the screen, go to the following step.
10. Select “MODE 1” with GST.
- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

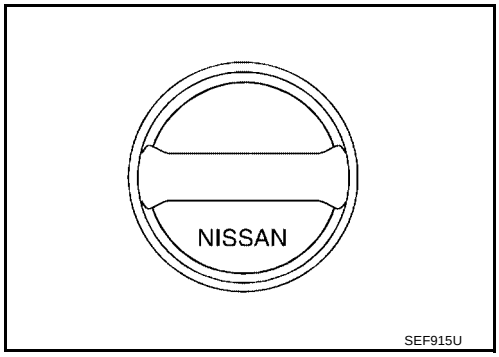
UBS001JW

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >>
- Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
- Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

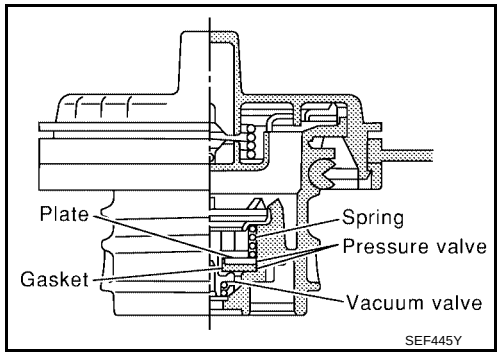
OK or NG

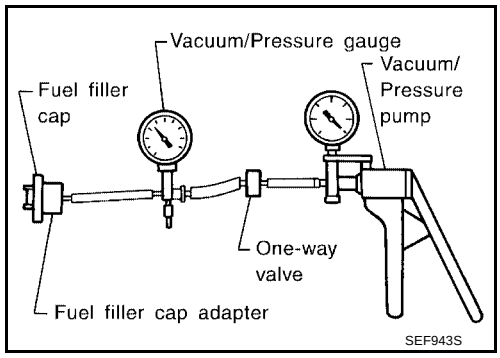
OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.

Pressure:
15.3 - 20.0 kPa
(0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)
Vacuum:
–6.0 to –3.4 kPa
(–0.061 to –0.035 kg/cm^2 , –0.87 to –0.48 psi)





CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

OK or NG

OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.
Refer to EC-583, "EVAPORATIVE EMISSION SYSTEM" .

OK or NG

OK >> GO TO 6.
NG >> Repair or reconnect the hose.

6. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

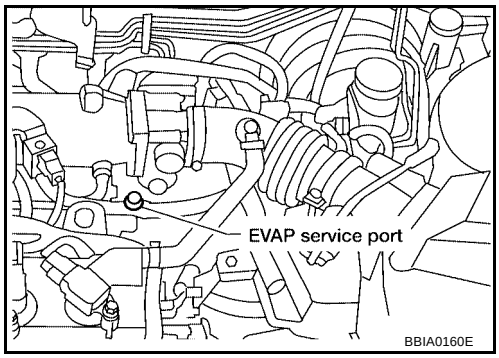
- EVAP canister vent control is installed properly.
  Refer to EC-587, "Removal and Installation" .
- EVAP canister vent control valve.
  Refer to EC-322, "Component Inspection" .

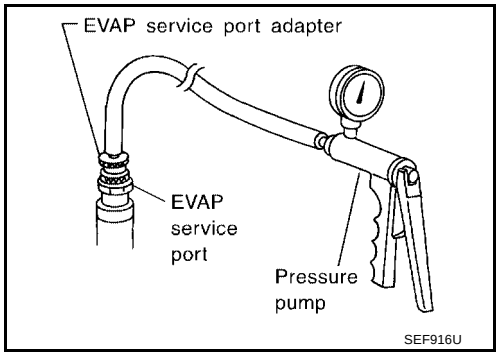
OK or NG

OK >> GO TO 8.
NG >> Repair or replace EVAP canister vent control valve and O-ring.

8. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.





NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.

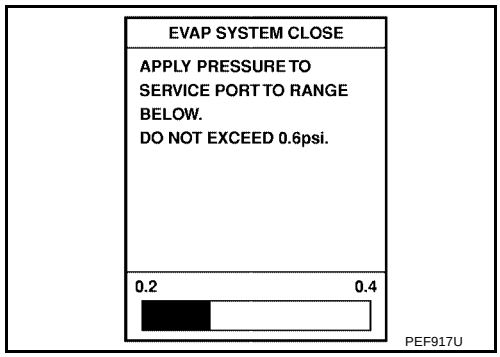
Models with CONSULT-II>>GO TO 9.
Models without CONSULT-II>>GO TO 10.

9. CHECK FOR EVAP LEAK

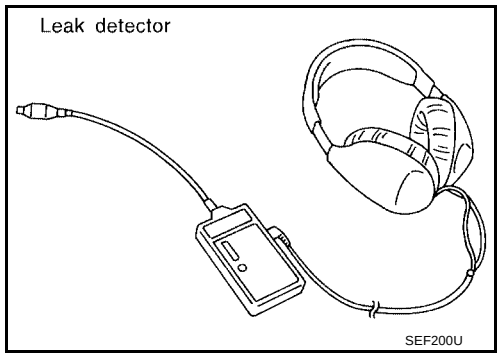
With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-584, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

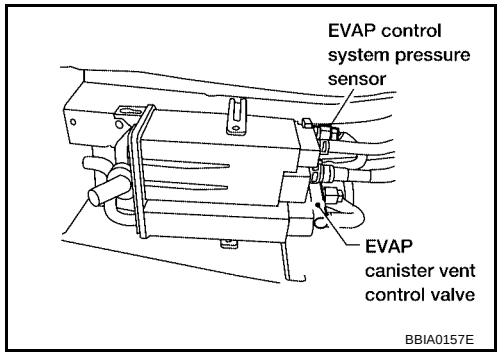
OK >> GO TO 11.
NG >> Repair or replace.

10. CHECK FOR EVAP LEAK

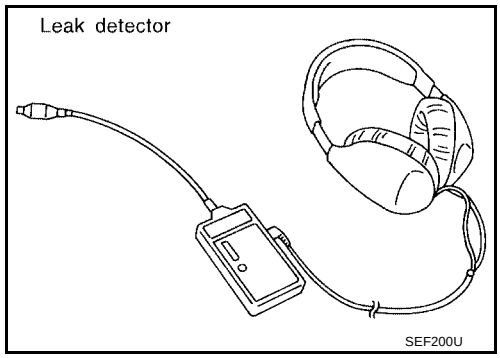
Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-584, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 12.
NG >> Repair or replace.

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
HO2S1 MNTR (B1)	LEAN

PBIB0828E

OK or NG

OK >> GO TO 14.
NG >> GO TO 15.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-34, "Vacuum Hose Drawing" .

OK or NG

OK (With CONSULT-II)>>GO TO 14.
OK (Without CONSULT-II)>>GO TO 15.
NG >> Repair or reconnect the hose.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
HO2S1 MNTR (B1)	LEAN

PBIB0828E

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-316, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-255, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-337, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP/ORVR LINE.

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-590, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 19.
NG >> Repair or replace hoses and tubes.

19. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 20.
NG >> Repair or replace hoses, tubes or filler neck tube.

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-593, "Component Inspection" .

OK or NG

OK >> GO TO 21.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

21. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

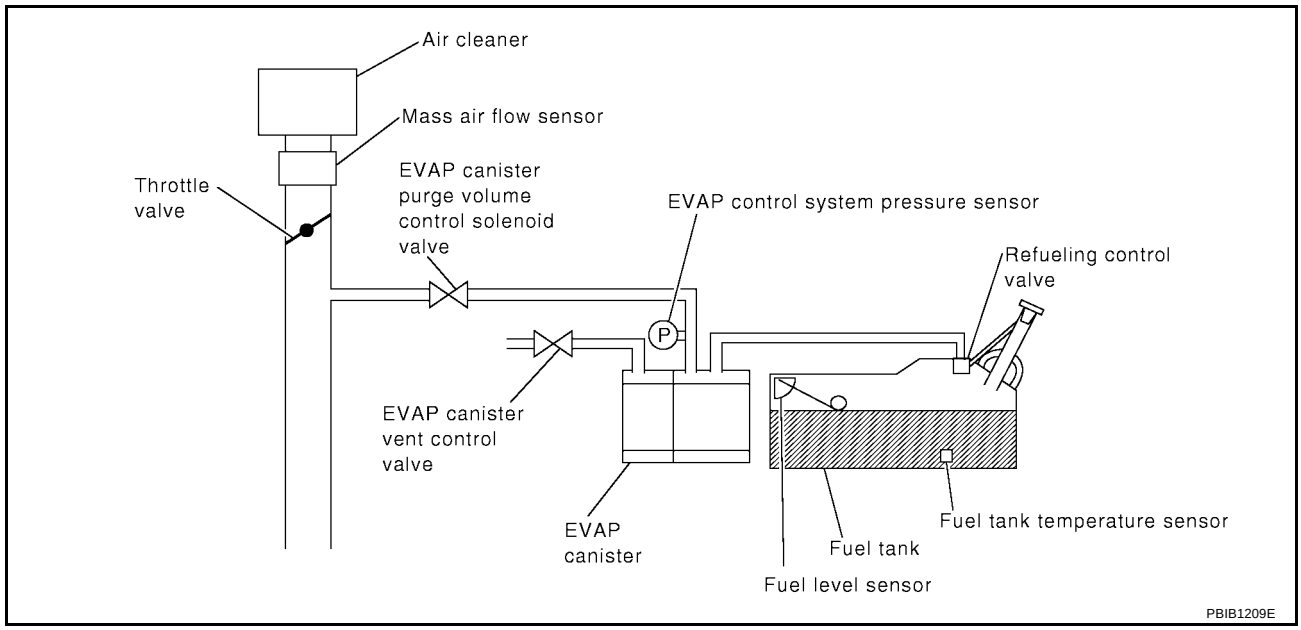
DTC P0456 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS003V6

This diagnosis detects very small leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the intake manifold vacuum in the same way as conventional EVAP small leak diagnosis.
If ECM judges a leak which corresponds to a very small leak, the very small leak P0456 will be detected.
If ECM judges a leak equivalent to a small leak, EVAP small leak P0442 will be detected.
If ECM judges there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456 0456	Evaporative emission control system very small leak (negative pressure check)	● EVAP system has a very small leak. ● EVAP system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Refueling EVAP vapor cut valve ● ORVR system leaks ● Fuel level sensor and the circuit ● Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS003V7

NOTE:

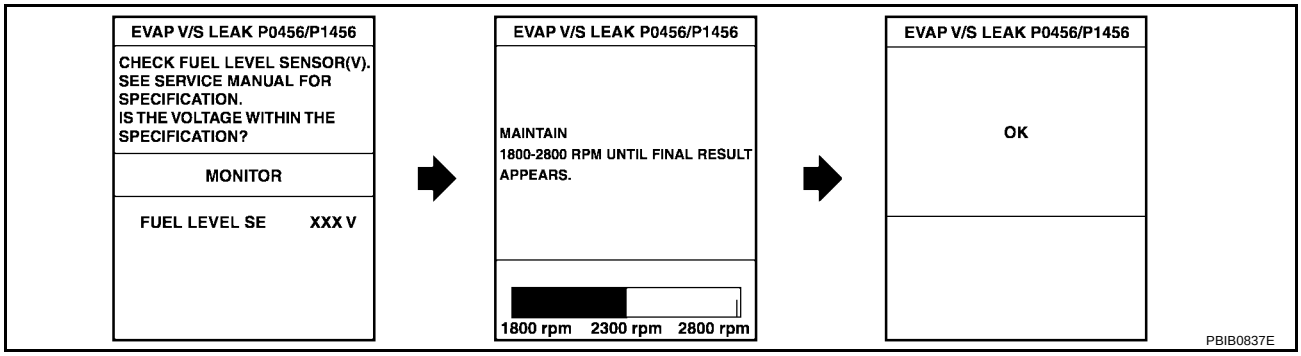
- **If DTC P0456 is displayed with P0442, first perform trouble diagnosis for DTC P0456.**
- **After repair, make sure that the hoses and clips are installed properly.**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Open engine hood before conducting following procedure.**
- **If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**
  - **Fuel filler cap is removed.**
  - **Refilled or drained the fuel.**
  - **EVAP component parts is/are removed.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2. Make sure the following conditions are met.
   FUEL LEVEL SE: 0.25 - 1.15V
   COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
   FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
   INT A/TEMP SE: More than 0°C (32°F)
   If NG, turn ignition switch "OFF" and leave the vehicle in a cool place (soak the vehicle) or refilling/draining fuel until the output voltage condition of the "FUEL LEVEL SE" meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1).
3. Turn ignition switch "OFF" and wait at least 10 seconds.
4. Turn ignition switch "ON".
5. Select "EVAP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
   Follow the instruction displayed.



6. Make sure that "OK" is displayed.
   If "NG" is displayed, refer to EC-348, "Diagnostic Procedure" .

   NOTE:
   - **If the engine speed cannot be maintained within the range displayed on CONSULT-II screen, go to EC-88, "Basic Inspection" .**
   - **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

Overall Function Check

UBS003V8

WITH GST

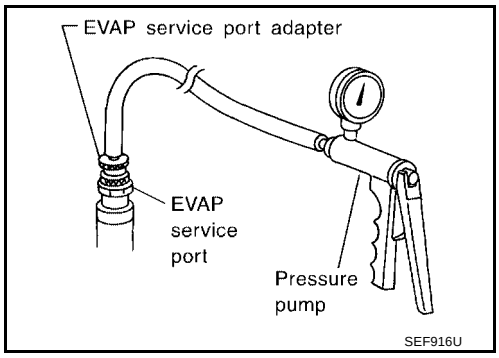
Use this procedure to check the overall function of the EVAP very small leak function. During this check, a DTC might not be confirmed.

CAUTION:

- **Never use compressed air, doing so may damage the EVAP system.**
- **Do not start engine.**
- **Do not exceeded 4.12 kPa (0.042 kg/cm^2 , 0.6 psi).**

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch “ON”.
5. Connect GST and select MODE 8.
6. Using MODE 8 control the EVAP canister vent control valve (close) and vacuum cut valve bypass valve (open).
7. Apply pressure and make sure the following conditions are satisfied.
   Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg)
   Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (3 mmHg, 0.12 inHg).
   If NG, go to EC-348, "Diagnostic Procedure" .
   If OK, go to next step.
8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.
10. Turn ignition switch “OFF” and wait at least 10 seconds.
11. Restart engine and let it idle for 90 seconds.
12. Keep engine speed at 2,000 rpm for 30 seconds.
13. Turn ignition switch “OFF”.

    NOTE:
    For more information, refer to GST instruction manual.



Diagnostic Procedure

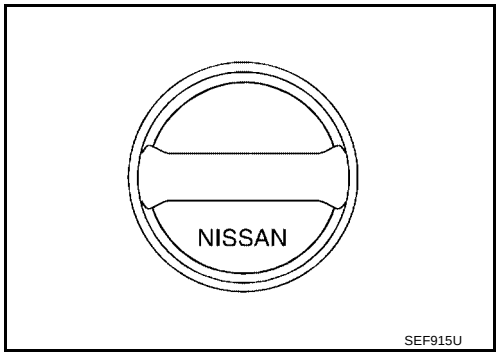
UBS003V9

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "Component Inspection" .

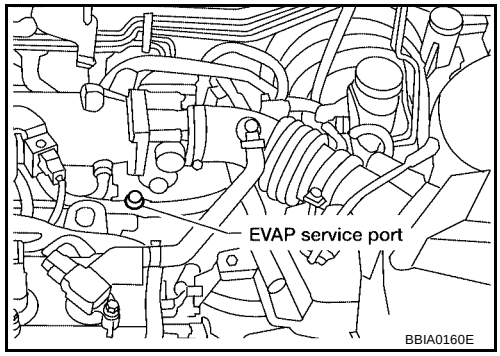
OK or NG

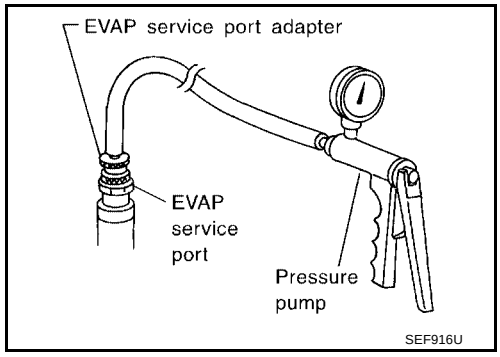
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





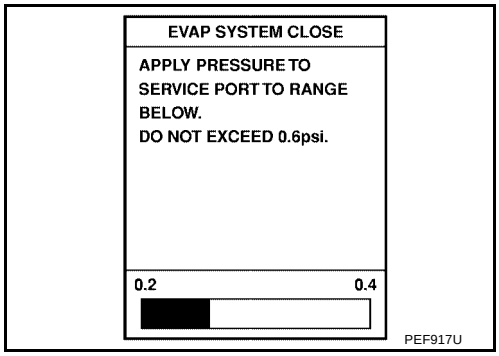
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

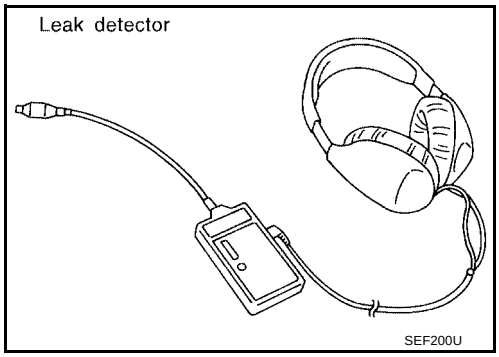
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

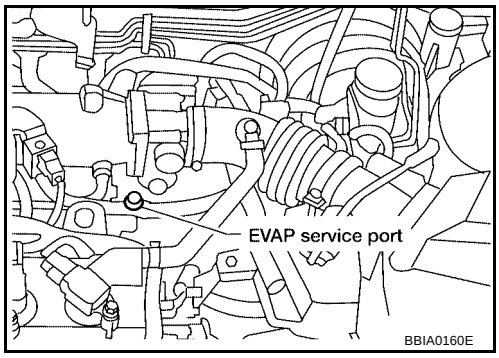


7. CHECK FOR EVAP LEAK

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

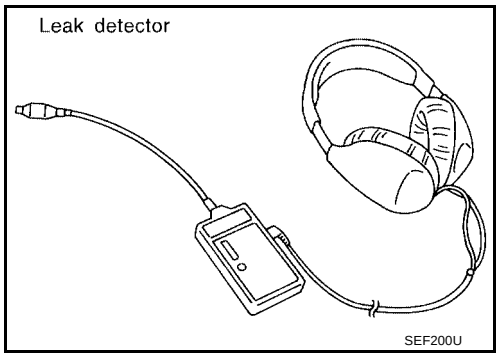
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 8.
NG >> Repair or replace.



8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-1693, "Component Inspection" .

OK or NG

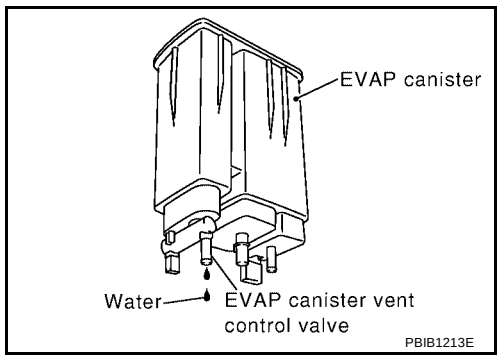
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
HO2S1 MNTR (B1)	LEAN

PBIB0828E

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-316, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-255, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-329, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-583, "EVAPORATIVE EMISSION SYSTEM" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-590, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses, tubes or filler neck tube.

22. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-593, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

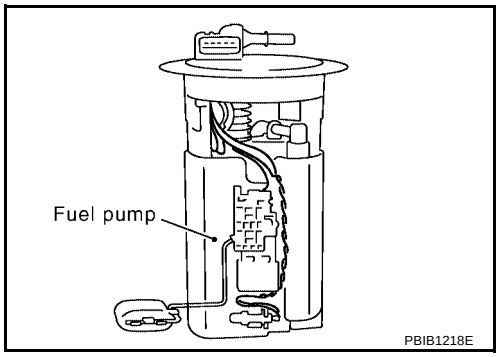
DTC P0460 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS001K1

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal according to the ECM through CAN communication line.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS006GL

NOTE:
If DTC P0460 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE".
When the vehicle is parked, naturally the fuel level in the fuel tank is stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0460 0460	Fuel level sensor circuit noise	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor

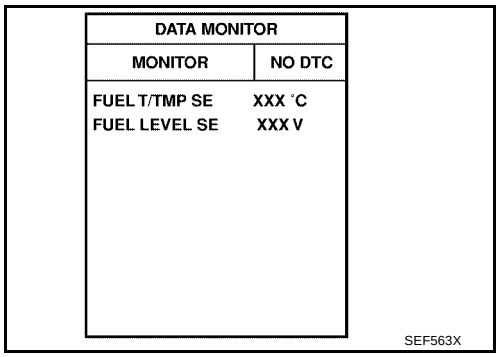
DTC Confirmation Procedure

UBS001K4

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait maximum of 2 consecutive minutes.
4. If 1st trip DTC is detected, go to EC-355, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS001K6

1. CHECK FUEL GAUGE OPERATION

Refer to DI-16, "Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode" .

OK or NG

OK >> GO TO 2.
NG >> Follow the instruction of DI-16, "Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode" .

2. CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning parts.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS006IQ

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

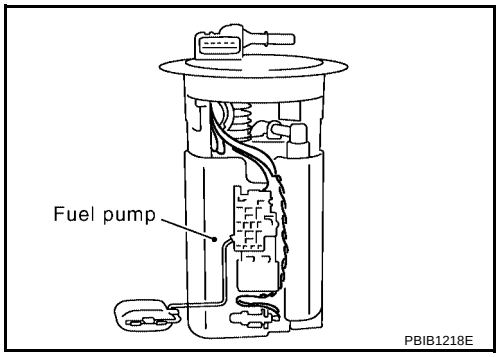
DTC P0461 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS001K7

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal according to the ECM through CAN communication line.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS006GM

NOTE:
If DTC P0461 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to**EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE"**.
Driving long distances naturally affect fuel gauge level.
This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0461 0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor

Overall Function Check

UBS001KA

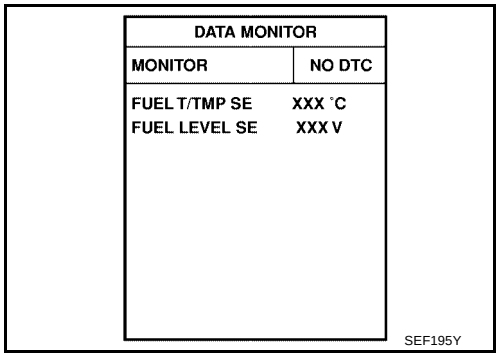
Use this procedure to check the overall function of the fuel level sensor function. During this check, a 1st trip DTC might not be confirmed.

WARNING:
When performing following procedure, be sure to observe the handling of the fuel. Refer to **FL-2, "FUEL SYSTEM"** **.**
TESTING CONDITION:
Before starting overall function check, preparation of draining fuel and refilling fuel is required.

WITH CONSULT-II

NOTE:
Start from step 11, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-56, "FUEL PRESSURE RELEASE" .
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch “OFF” and wait at least 10 seconds then turn “ON”.
6. Select “FUEL LEVEL SE” in “DATA MONITOR” mode with CONSULT-II.
7. Check “FUEL LEVEL SE” output voltage and note it.
8. Select “FUEL PUMP” in “ACTIVE TEST” mode with CONSULT-II.
9. Touch “ON” and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
11. Check “FUEL LEVEL SE” output voltage and note it.



12. Check “FUEL LEVEL SE” output voltage and confirm whether the voltage changes more than 0.03V during step 7 to 11.
    If NG, go to EC-358, "Diagnostic Procedure" .

WITH GST

NOTE:
Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-56, "FUEL PRESSURE RELEASE" .
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch “ON”.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.
10. If NG, go to EC-358, "Diagnostic Procedure" .

Diagnostic Procedure

UBS006IR

1. CHECK FUEL GAUGE OPERATION

Refer to DI-16, "Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode" .

OK or NG

OK >> GO TO 2.
NG >> Follow the instruction of DI-16, "Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode" .

2. CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning parts.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS006IS

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

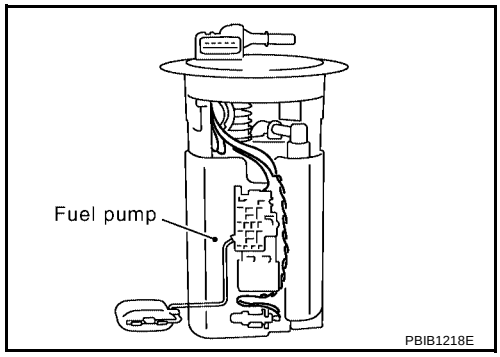
DTC P0462, P0463 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS001KB

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal according to the ECM through CAN communication line.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS006GN

NOTE:
If DTC P0462, P0463 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE".
ECM receives two signals from the fuel level sensor circuit.
One is fuel level sensor power supply circuit, and the other is fuel level sensor ground circuit.
This diagnosis indicates the former, to detect open or short circuit malfunction.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462 0462	Fuel level sensor circuit low input	An excessively low voltage is sent from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor
P0463 0463	Fuel level sensor circuit high input	An excessively high voltage is sent from the sensor is sent to ECM.	

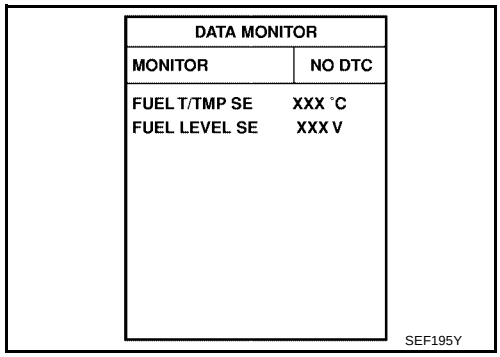
DTC Confirmation Procedure

UBS001KE

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-360, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS001KG

1. CHECK FUEL GAUGE OPERATION

Refer to DI-16, "Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode" .

OK or NG

OK >> GO TO 2.
NG >> Follow the instruction of DI-16, "Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode" .

2. CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning parts.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS006IT

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

DTC P0500 VSS

PFP:32702

Description

UBS001KH

NOTE:
If DTC P0500 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE".
The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the combination meter. The combination meter then sends a signal to the ECM through CAN communication line.

On Board Diagnosis Logic

UBS006GO

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The vehicle speed sensor circuit is open or shorted) ● Harness or connectors (The CAN communication line is open or shorted.) ● Vehicle speed sensor

DTC Confirmation Procedure

UBS001KJ

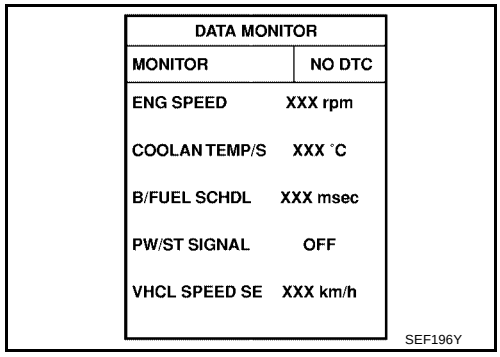
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
This procedure may be conducted in the shop with the drive wheels lifted or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
3. If NG, go to EC-362, "Diagnostic Procedure" .
   If OK, go to following step.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Warm engine up to normal operating temperature.
6. Maintain the following conditions for at least 60 consecutive seconds.



ENG SPEED	1,800 rpm (A/T models) 2,200 rpm (M/T models)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	More than 4.8 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF

7. If 1st trip DTC is detected, go to EC-362, "Diagnostic Procedure" .

Overall Function Check

UBS001KK

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.

2. Start engine.
3. Read vehicle speed sensor signal in “MODE 1” with GST.
   The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-362, "Diagnostic Procedure" .

Diagnostic Procedure

UBS001KM

1. CHECK VEHICLE SPEED SENSOR CIRCUIT

Refer to DI-3, "METERS AND GAUGES" .

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-8, "Combination Meter" .

>> **INSPECTION END**

DTC P0506 ISC SYSTEM

PFP:23781

Description

UBS006CY

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.
The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

UBS006CZ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506 0506	Idle speed control system RPM lower than expected	The idle speed is less than the target idle speed by 100 rpm or more.	● Electric throttle control actuator ● Intake air leak

DTC Confirmation Procedure

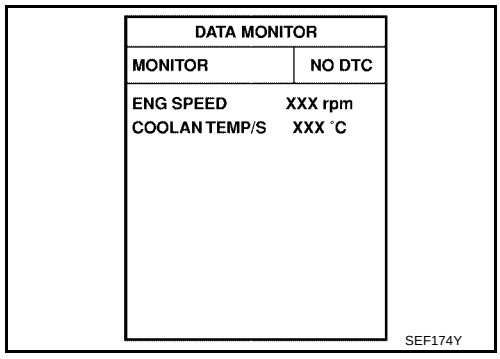
UBS006D0

NOTE:
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform “Idle Air Volume Learning”, EC-53 , before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the “Service Data and Specifications (SDS)”, EC-600 .**

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

WITH CONSULT-II

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” again and select “DATA MONITOR” mode with CONSULT-II.
5. Start engine and run it for at least 1 minute at idle speed.
6. If 1st trip DTC is detected, go to EC-364, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS006D1

1. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform EC-52, "Accelerator Pedal Released Position Learning" .
4. Perform EC-53, "Throttle Valve Closed Position Learning" .
5. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P0507 ISC SYSTEM

PFP:23781

Description

UBS006D2

NOTE:
If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.
The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

UBS006D3

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507 0507	Idle speed control system RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	● Electric throttle control actuator ● Intake air leak ● PCV system

DTC Confirmation Procedure

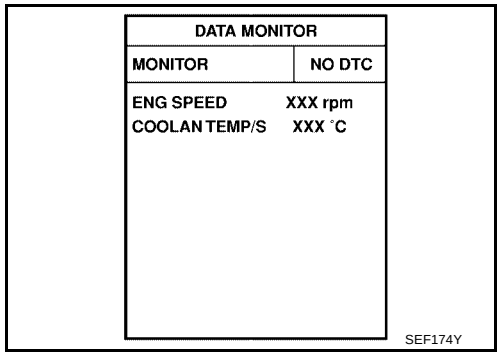
UBS006D4

NOTE:
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform “Idle Air Volume Learning”, EC-53 , before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the “Service Data and Specifications (SDS)”, EC-600 .**

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

WITH CONSULT-II

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” again and select “DATA MONITOR” mode with CONSULT-II.
5. Start engine and run it for at least 1 minute at idle speed.
6. If 1st trip DTC is detected, go to EC-366, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS006D5

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Discover air leak location and repair.

3. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform EC-52, "Accelerator Pedal Released Position Learning" .
4. Perform EC-53, "Throttle Valve Closed Position Learning" .
5. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

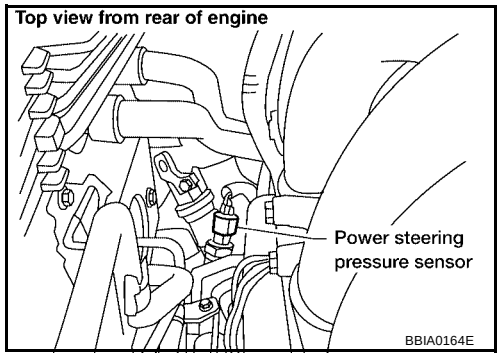
DTC P0550 PSP SENSOR

PFP:49763

Component Description

UBS003RX

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

UBS003RY

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

On Board Diagnosis Logic

UBS003RZ

The MIL will not light up for this diagnosis.

NOTE:
If DTC P0550 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-455.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Power steering pressure sensor

DTC Confirmation Procedure

UBS003S0

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-369, "Diagnostic Procedure" .

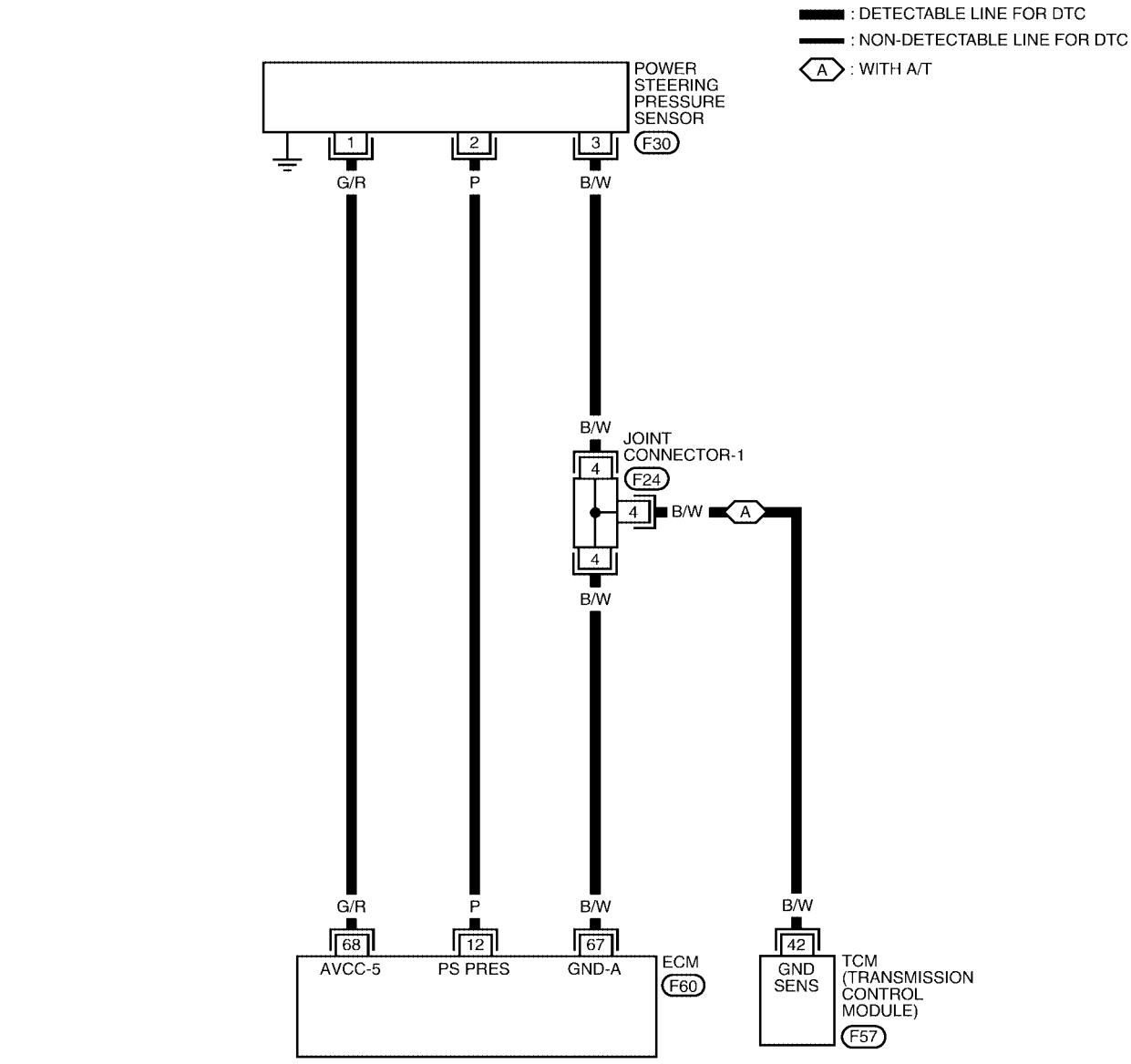
WITH GST

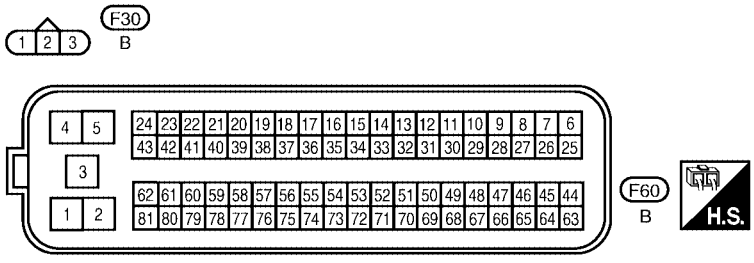
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003S1

EC-PS/SEN-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

BBWA0787E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	P	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8V
67	B/W	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	G/R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V

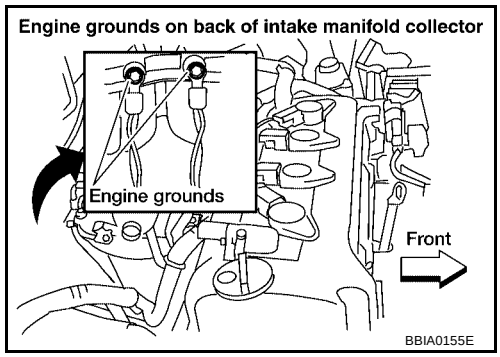
Diagnostic Procedure

UBS003S2

1. RETIGHTEN GROUND SCREWS

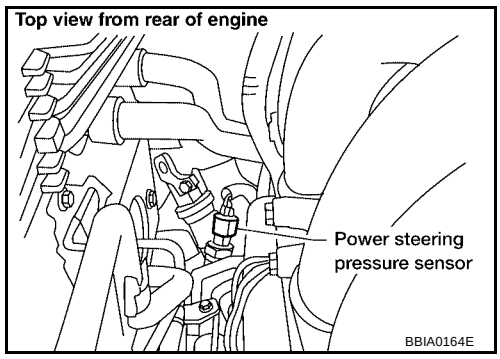
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor harness connector.
2. Turn ignition switch "ON".



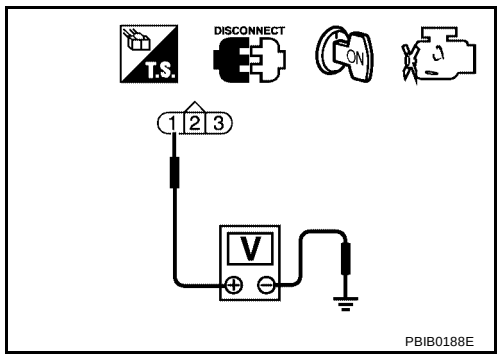
3. Check voltage between PSP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.

NG >> Repair open circuit or short to ground or short to power in harness connectors.



3. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between PSP sensor terminal 3 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between power steering pressure sensor and ECM
- Harness for open or short between power steering pressure sensor and TCM

>> Repair open circuit or short to power in harness or connectors.

5. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK PSP SENSOR

Refer to EC-371, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace PSP sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

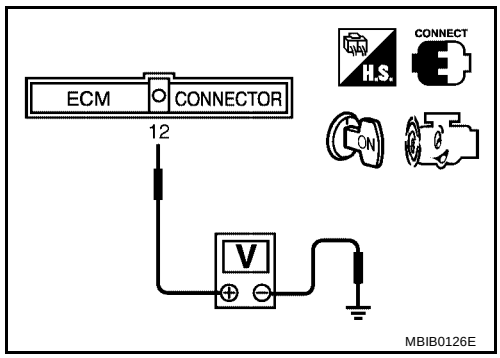
Component Inspection

UBS003S3

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned fully.	0.5 - 4.0V
Steering wheel is not being turned.	0.4 - 0.8V



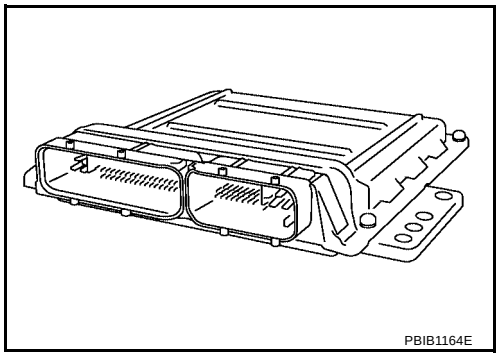
DTC P0605 ECM

PFP:23710

Component Description

UBS001L9

The ECM consists of a microcomputer and connector for signal input and output and for power supply. The ECM controls the engine.


PBIB1164E

On Board Diagnosis Logic

UBS006GP

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

UBS006GQ

Perform “PROCEDURE FOR MALFUNCTION A” first. If the DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no problem on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

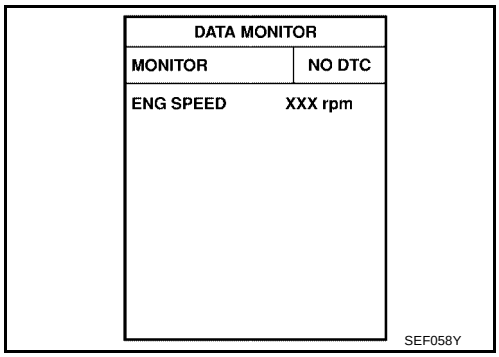
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-373, "Diagnostic Procedure" .



SEF058Y

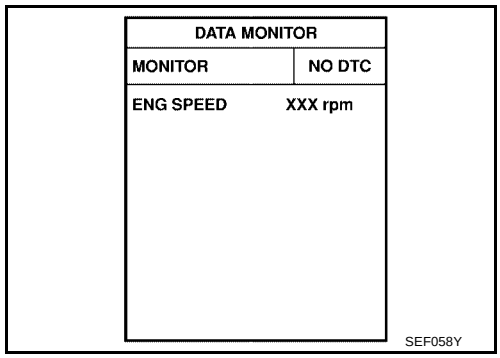
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-373, "Diagnostic Procedure" .



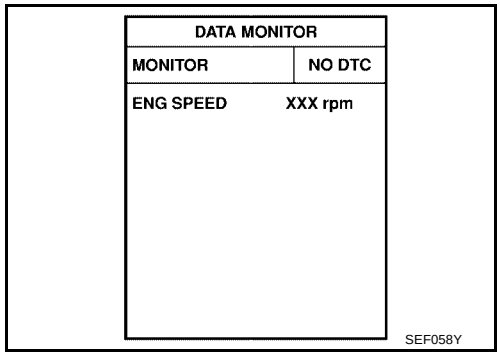
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 for, 32 times.
5. If 1st trip DTC is detected, go to EC-373, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS006GR

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-372 .
5. Is the 1st trip DTC P0605 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-372 .
5. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

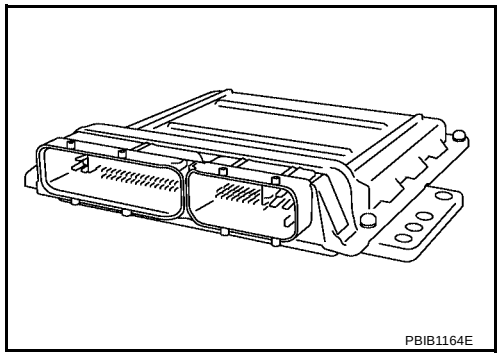
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

UBS003S4

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.


PBIB1164E

On Board Diagnosis Logic

UBS003S5

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back-up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

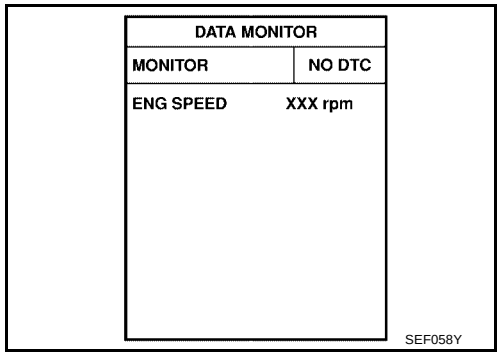
DTC Confirmation Procedure

UBS003S6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-377, "Diagnostic Procedure".



SEF058Y

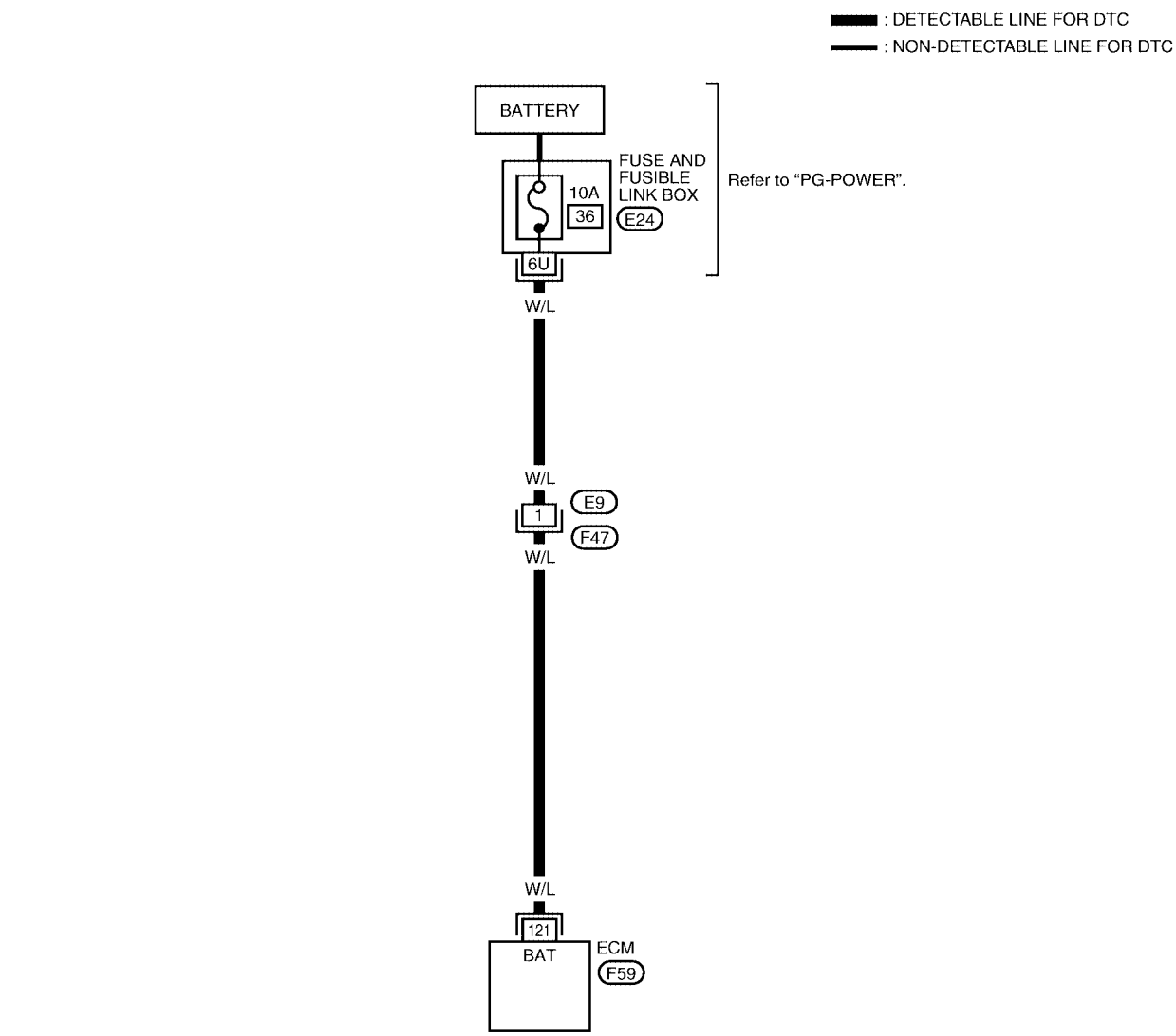
WITH GST

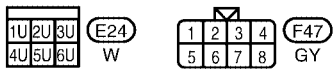
Follow the procedure “WITH CONSULT-II” above.

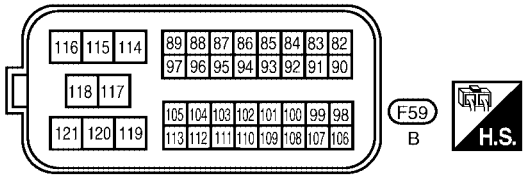
Wiring Diagram

UBS003S7

EC-ECM/PW-01







BBWA0294E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

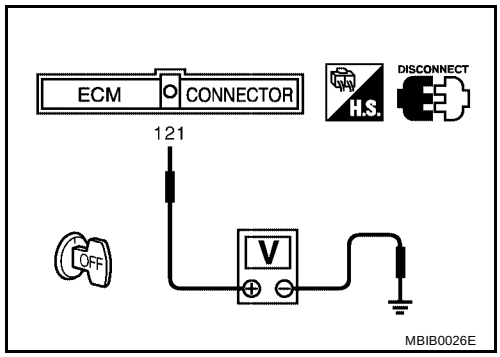
Diagnostic Procedure

UBS003S8

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 10A fuse
- Harness for open or short between ECM and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-375 .
5. Is the 1st trip DTC P1065 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-375 .
5. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

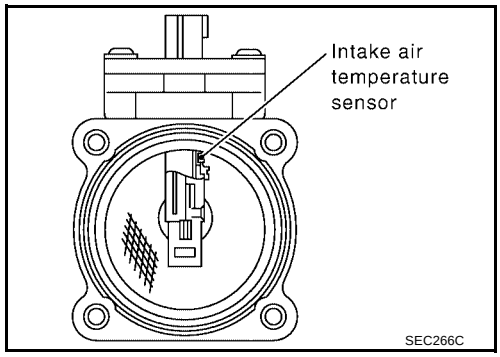
DTC P1102 MAF SENSOR

PFP:22680

Component Description

UBS003S9

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS003SA

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.4V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	12.0 - 27.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T models) Neutral (M/T models) ● No-load	Idle	1.4 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS003SB

This self-diagnosis has the one trip detection logic.

NOTE:
If DTC P1102 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-455.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1102 1102	Mass air flow sensor circuit range/performance problem	A voltage from the sensor is constantly approx.1.0V when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

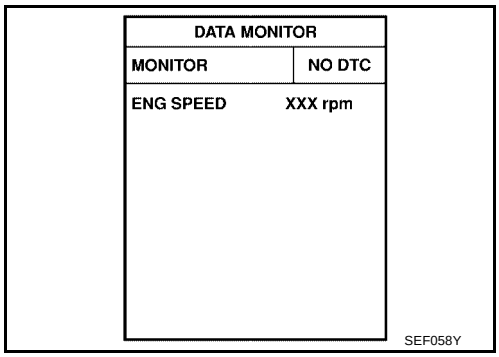
DTC Confirmation Procedure

UBS003SC

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-382, "Diagnostic Procedure" .



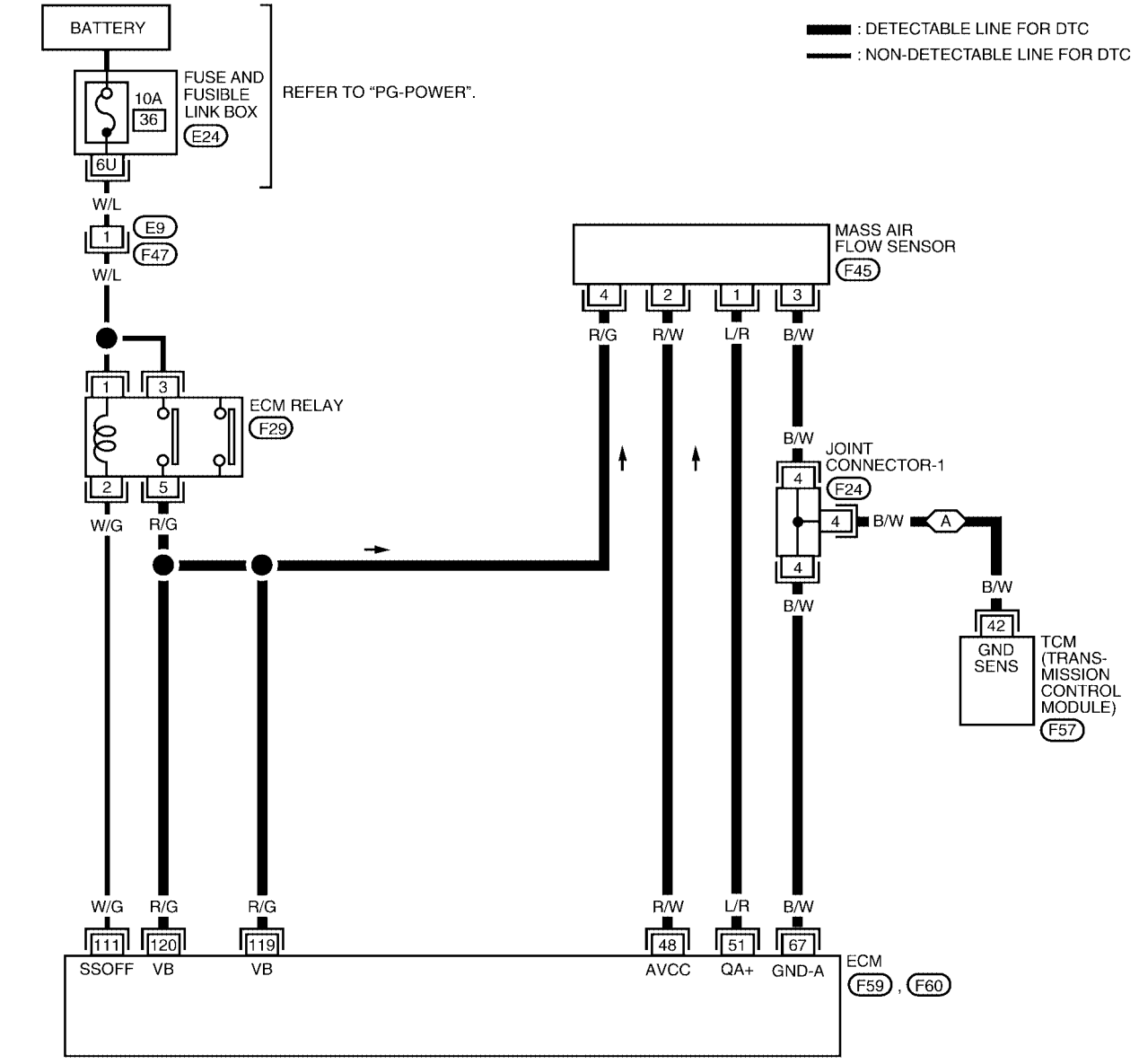
WITH GST

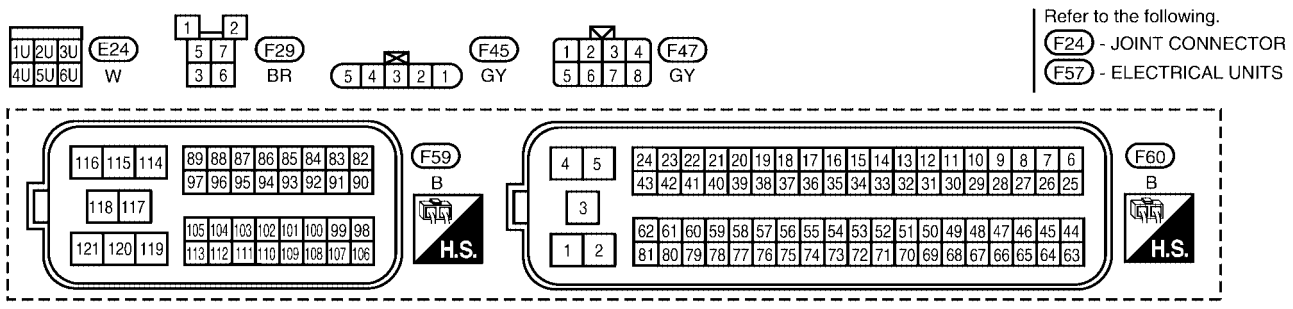
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS003SD

EC-MAFS-01





BBWA0774E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	R/W	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
51	L/R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B/W	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

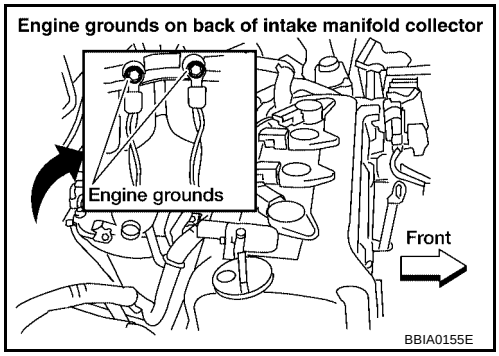
Diagnostic Procedure

UBS003SE

1. RETIGHTEN GROUND SCREWS

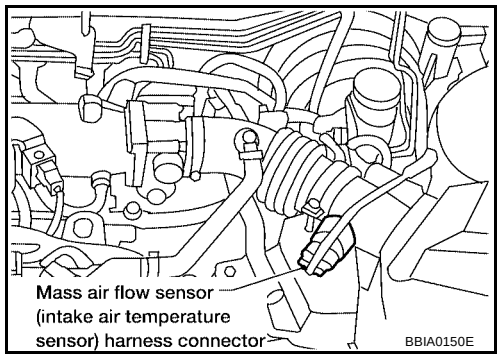
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



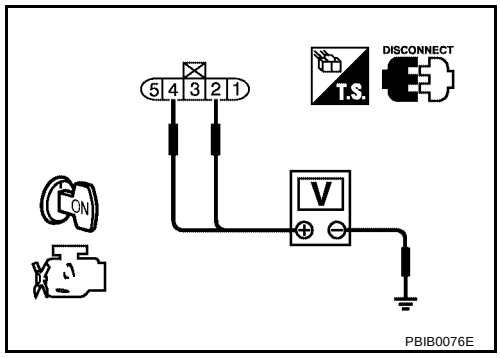
2. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1.
- Harness for open or short between mass air flow sensor and ECM.
- Harness for open or short between mass air flow sensor and TCM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 51 and MAF sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MASS AIR FLOW SENSOR

Refer to EC-384, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace mass air flow sensor.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

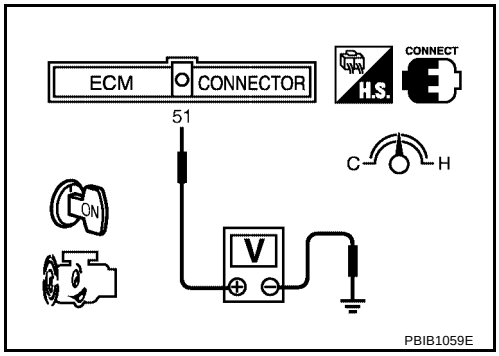
UBS003SF

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

DTC P1111 IVT CONTROL SOLENOID VALVE

PFP:23796

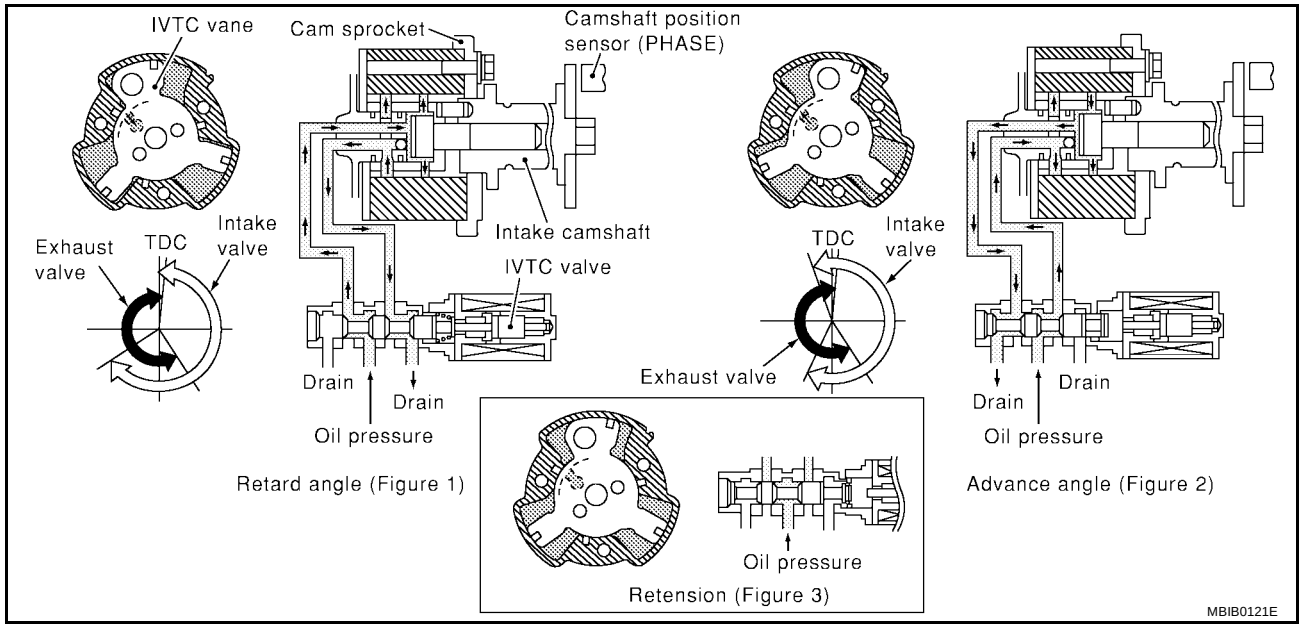
Description

UBS0057M

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

COMPONENT DESCRIPTION

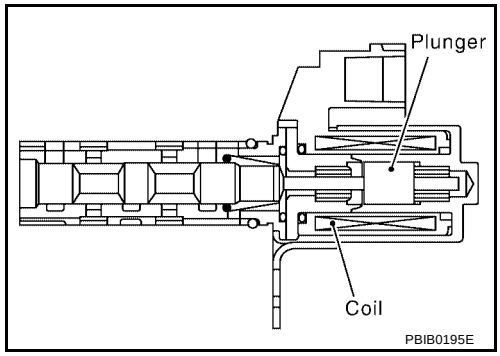
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

UBS0057N

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 0% - 60%

On Board Diagnosis Logic

UBS0057O

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111 1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	● Harness or connectors (Solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

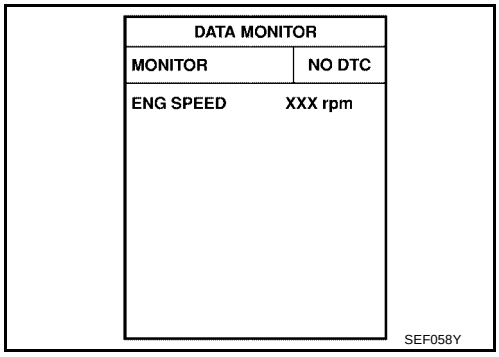
DTC Confirmation Procedure

UBS0057P

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If 1st trip DTC is detected, go to EC-388, "Diagnostic Procedure" .



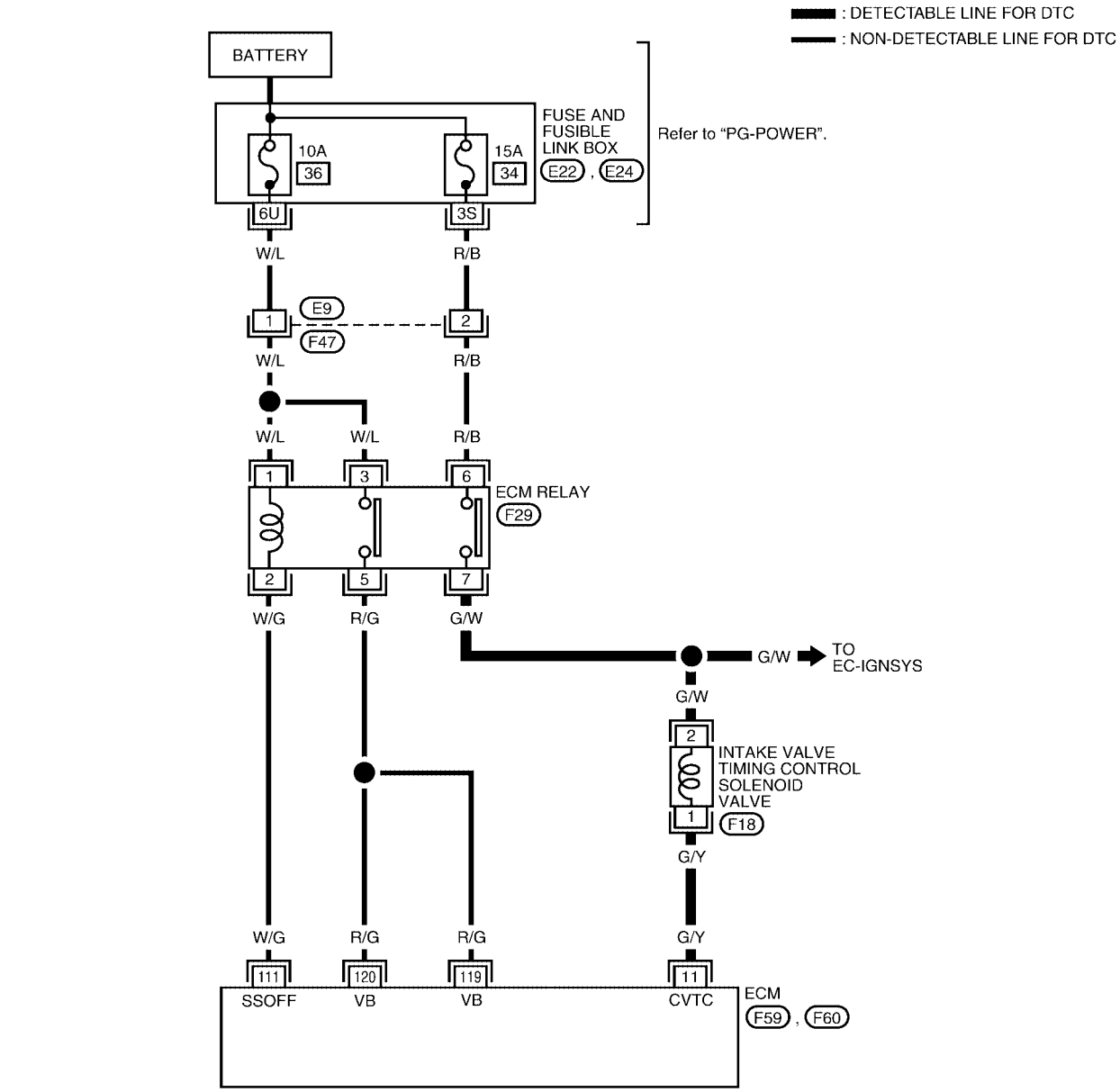
WITH GST

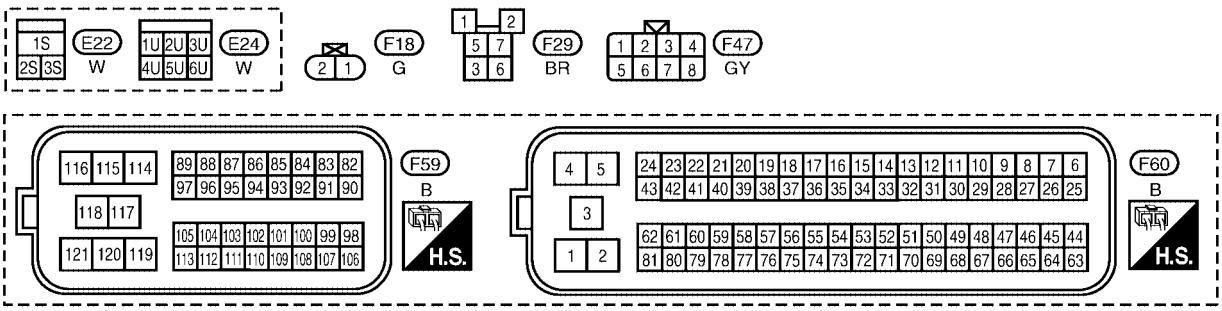
Following the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0057Q

EC-IVC-01



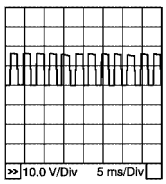


BBWA0788E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	Approximately 7 - 10V★  PBIB0532E

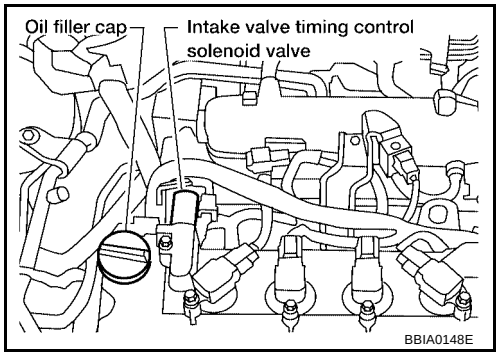
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS0057R

1. CHECK IVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.

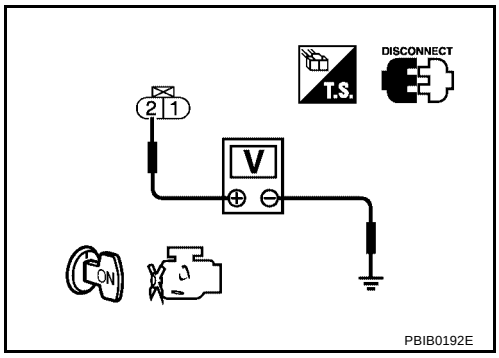


4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTION PART

Check the following.

- Harness for open or short between intake valve timing control solenoid valve and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 11 and intake valve timing control solenoid valve terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-389, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace intake valve timing control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

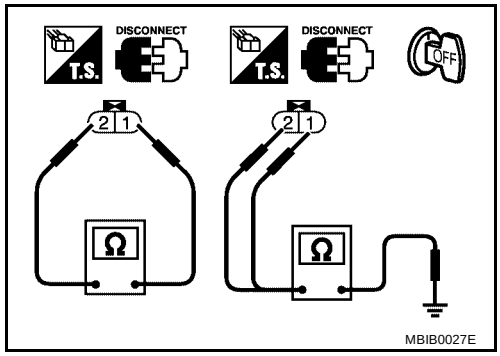
Component Inspection

UBS0057S

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2 under the following conditions.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

UBS0057T

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-39, "TIMING CHAIN" .

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

UBS003SH

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS003SI

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detects the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters fail-safe mode and MIL lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle control actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

UBS003SJ

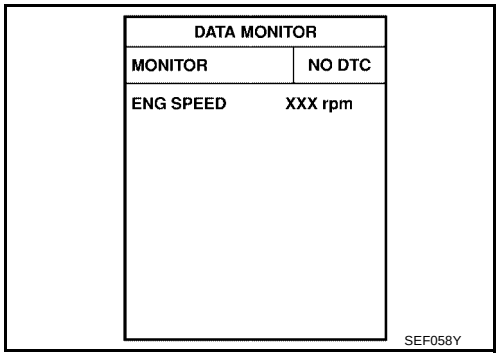
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-391, "Diagnostic Procedure" .



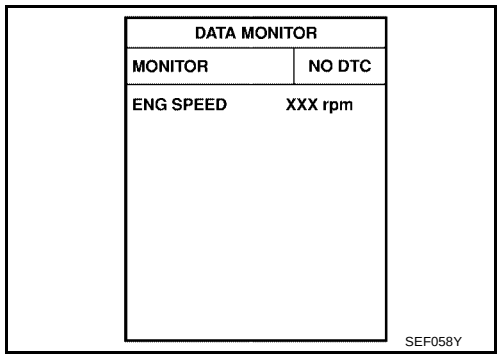
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position (A/T), Neutral position (M/T).
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-391, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

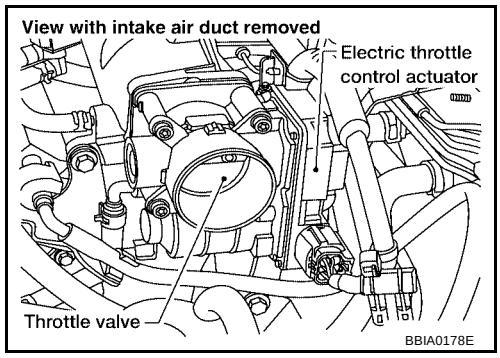
UBS003SK

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

UBS003SM

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-390 or EC-399 .

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS003SN

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted.) ● Harness or connectors (Throttle control motor relay circuit is open or shorted.) ● Electric throttle control actuator ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

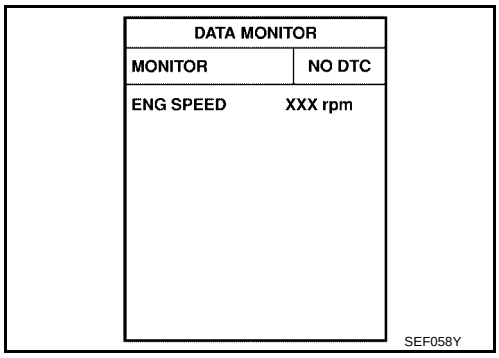
DTC Confirmation Procedure

UBS003SO

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-394, "Diagnostic Procedure" .



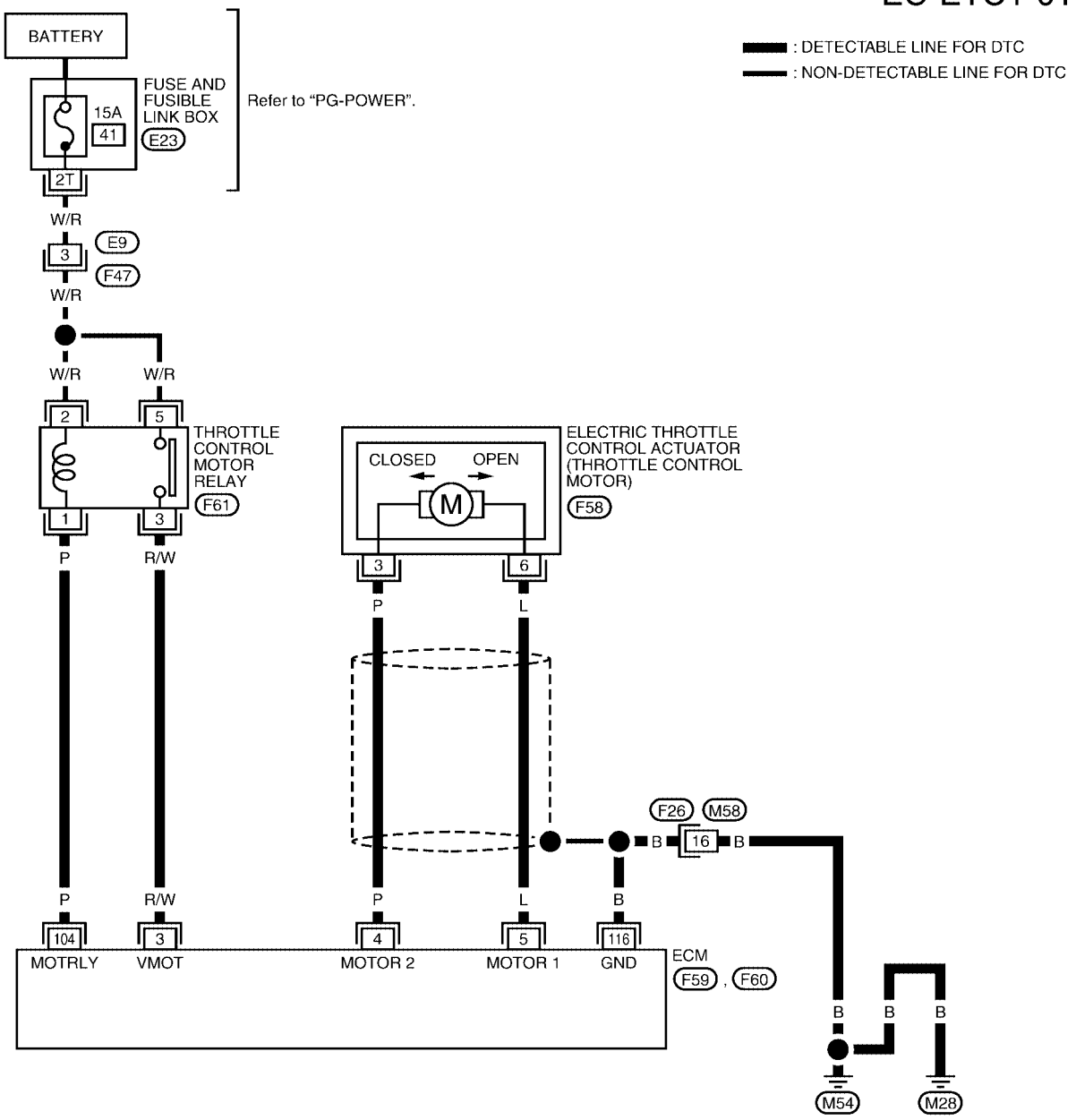
WITH GST

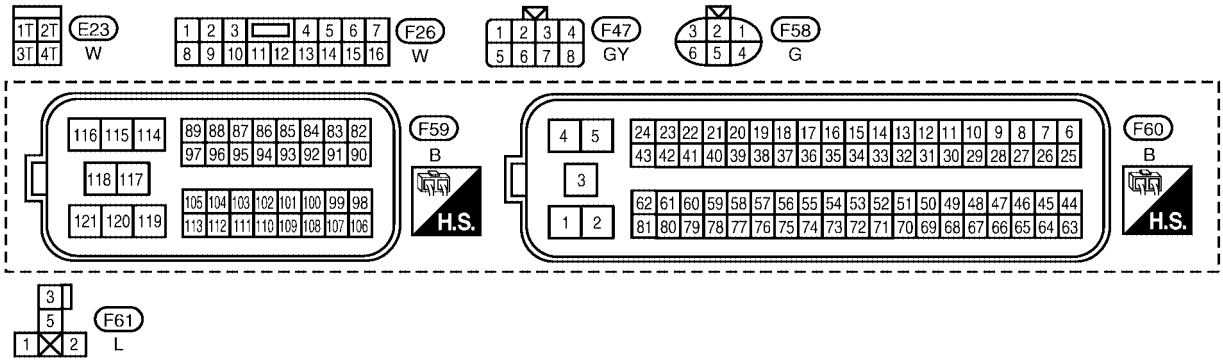
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003SP

EC-ETC1-01



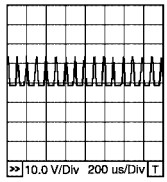
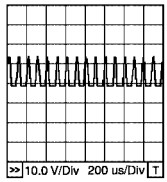


BBWA0789E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R/W	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
104	P	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

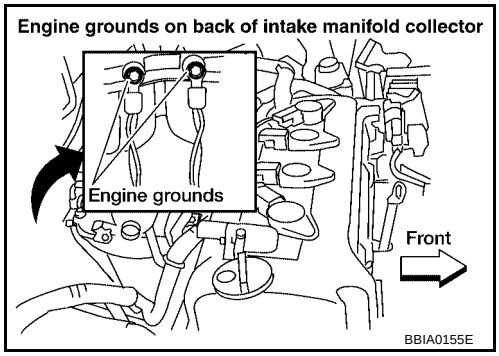
Diagnostic Procedure

UBS003SQ

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.

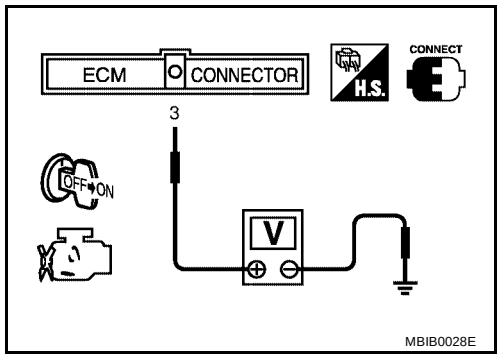


BBIA0155E

2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

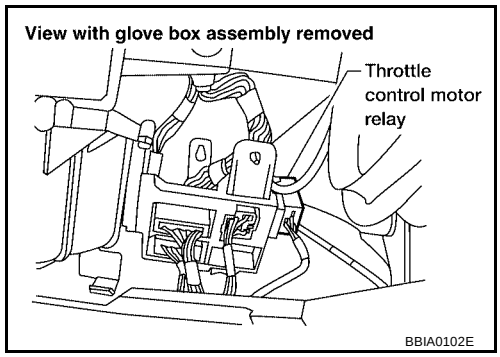


OK or NG

OK >> GO TO 8.
NG >> GO TO 3.

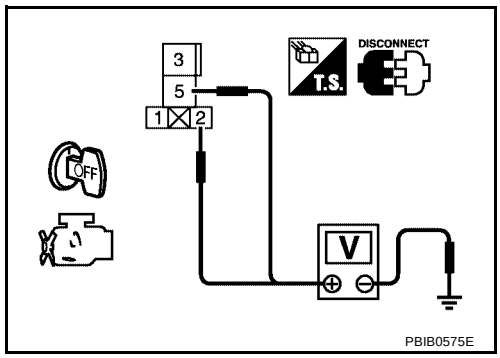
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to power in harness or connectors.

6. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-397, "Component Inspection" .

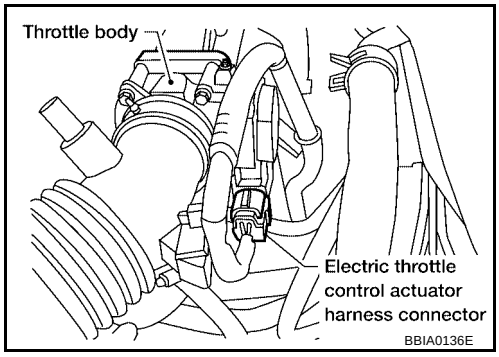
OK or NG

OK >> GO TO 8.
NG >> Replace throttle control motor relay.

8. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist



5. Also check harness for short to ground and short to power.

OK or NG

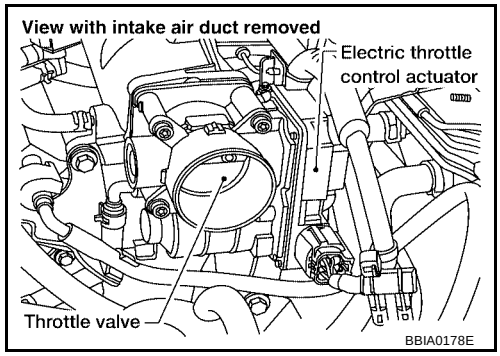
OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 10.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



10. CHECK THROTTLE CONTROL MOTOR

Refer to EC-397, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 12.

11. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 12.
NG >> Repair or replace harness or connectors.

12. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

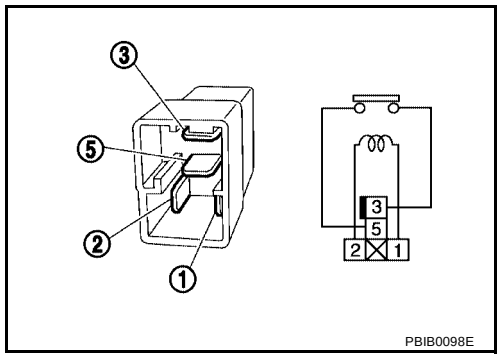
UBS003SR

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.

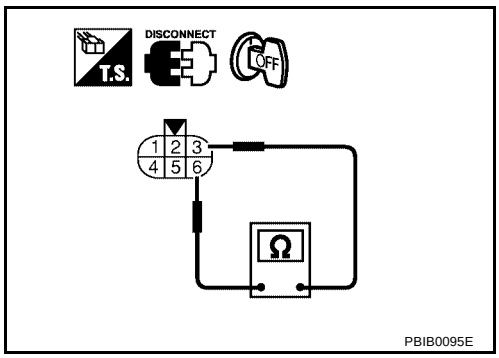


THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-53, "Throttle Valve Closed Position Learning" .
5. Perform EC-53, "Idle Air Volume Learning" .



Removal and Installation

UBS003SS

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

UBS003ST

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

UBS003SU

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

UBS003SV

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detects the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted.) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	● Harness or connectors (Throttle control motor relay circuit is open.) ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

UBS003SW

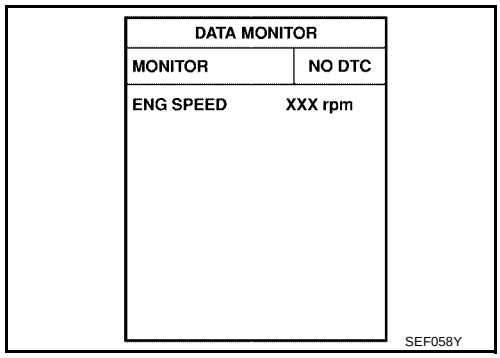
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-402, "Diagnostic Procedure" .



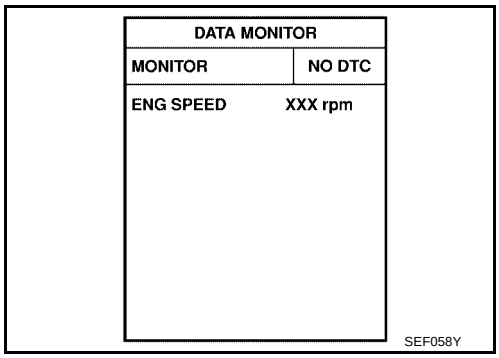
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-402, "Diagnostic Procedure" .

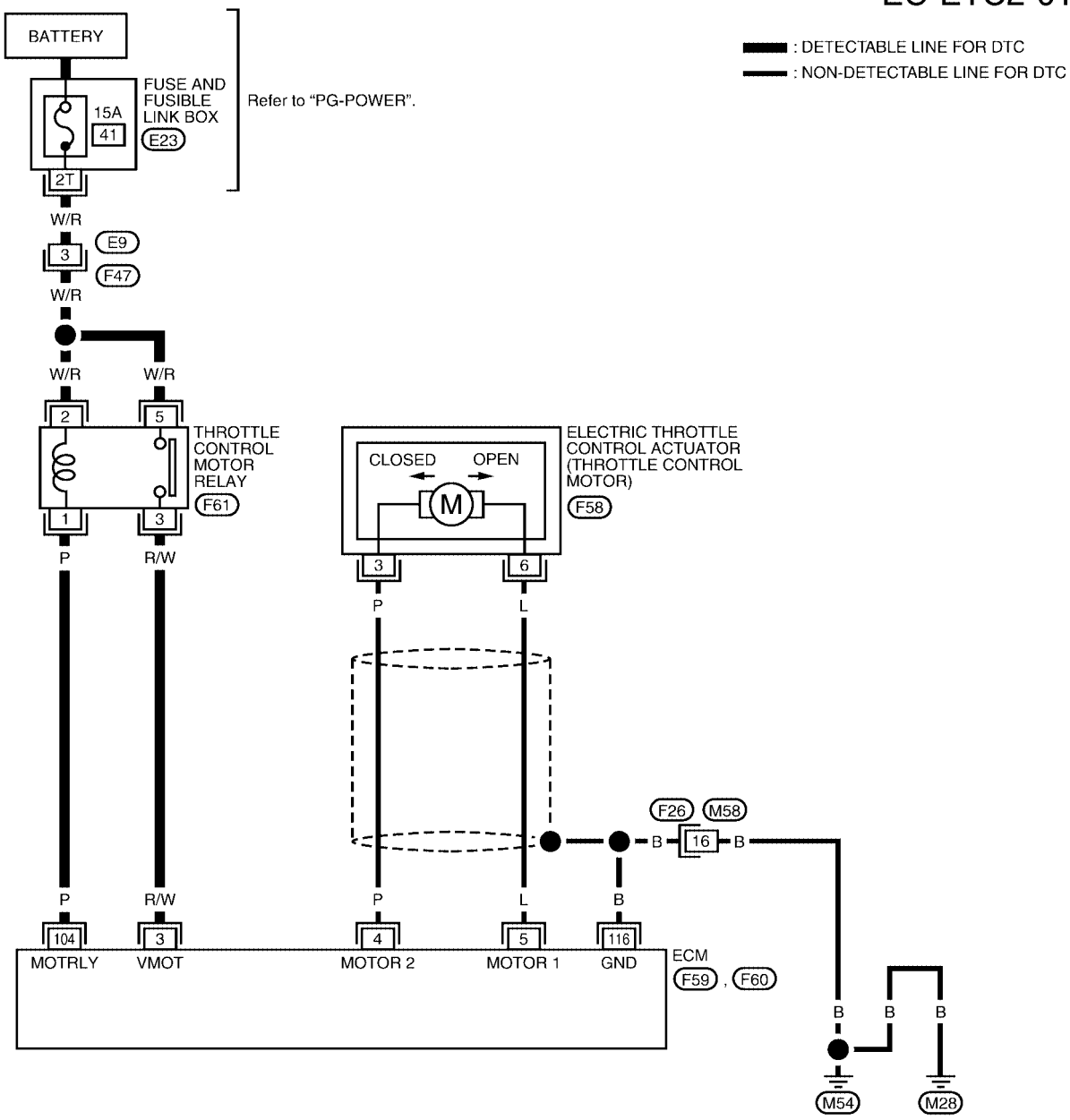


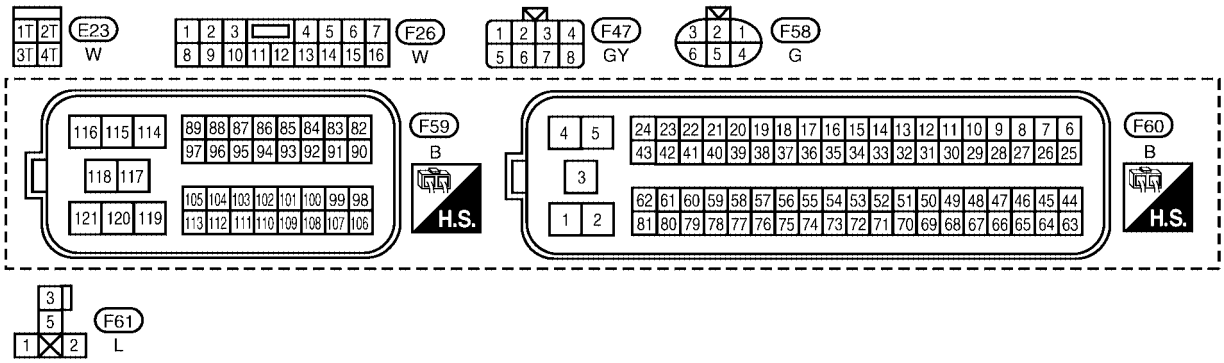
With GST

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS003SX





BBWA0790E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

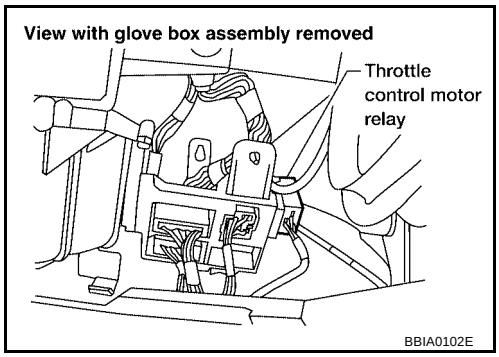
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R/W	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
104	P	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

Diagnostic Procedure

UBS003SY

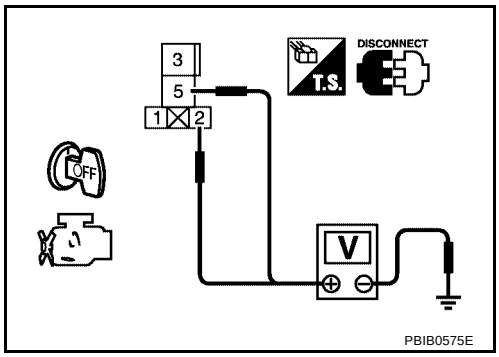
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-403, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace throttle control motor relay.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

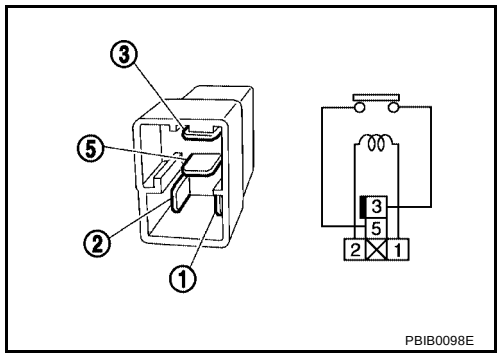
UBS003SZ

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



PBIB0098E

Removal and Installation

UBS006IN

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

UBS003T0

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS003T1

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

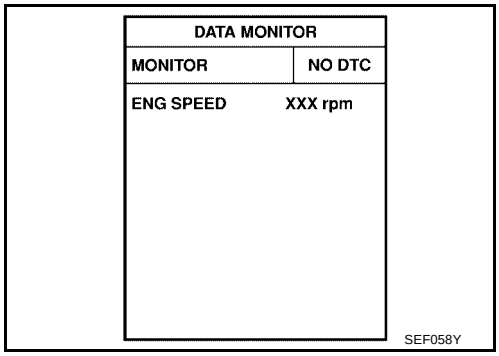
DTC Confirmation Procedure

UBS003T2

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-406, "Diagnostic Procedure" .

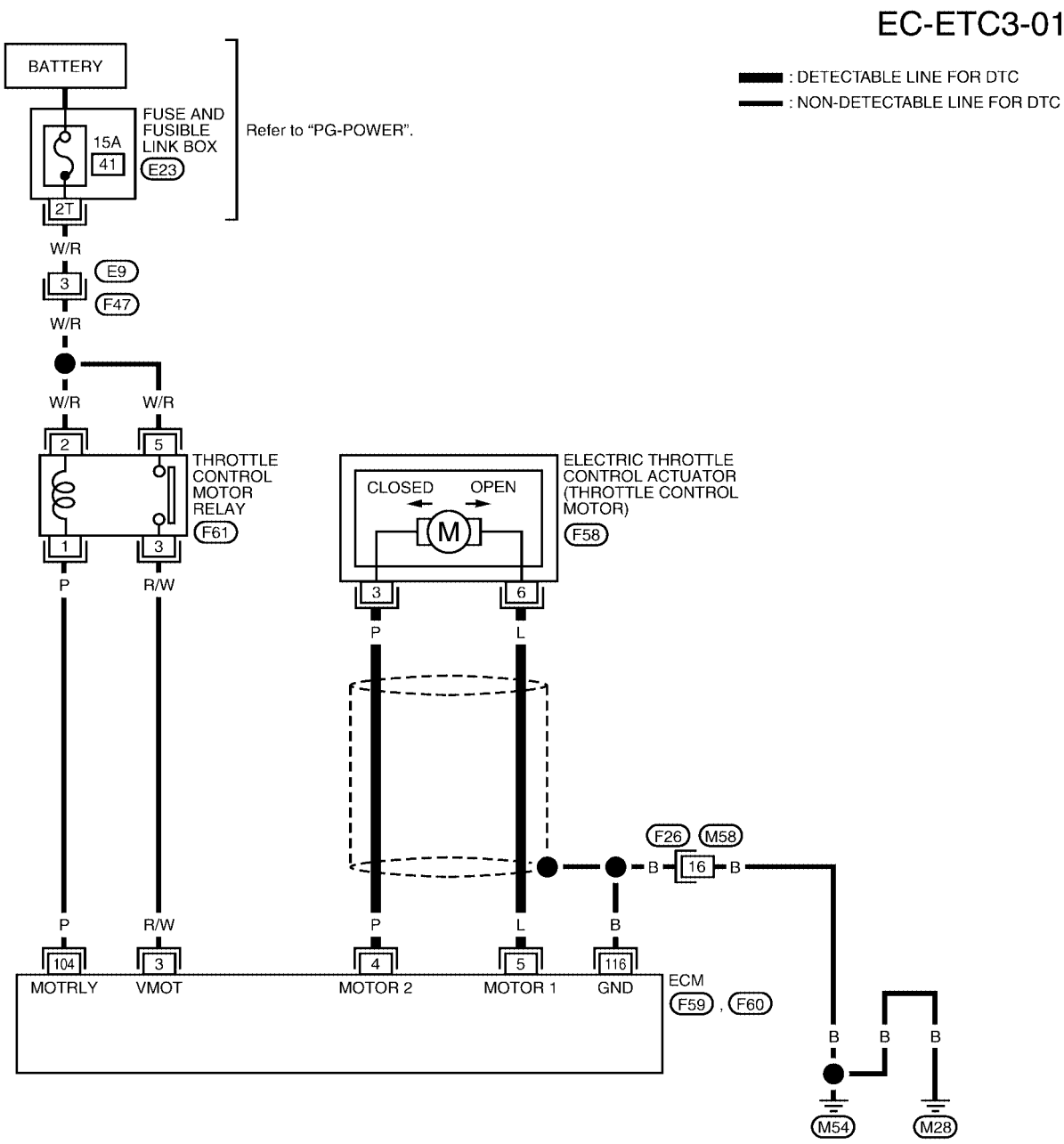


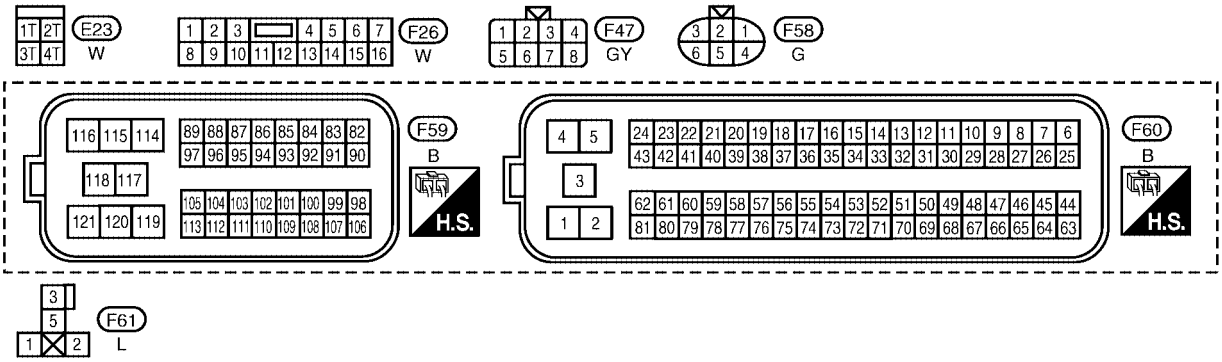
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003T3



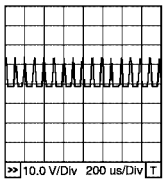
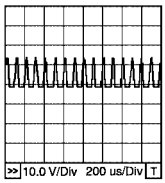


BBWA0791E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

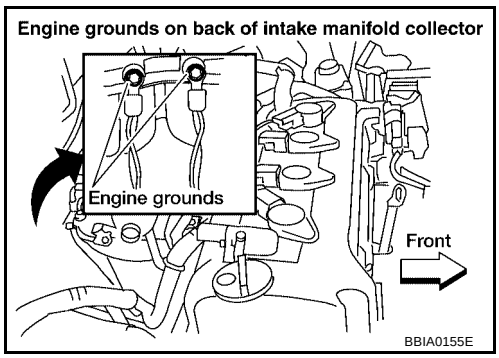
Diagnostic Procedure

UBS003T4

1. RETIGHTEN GROUND SCREWS

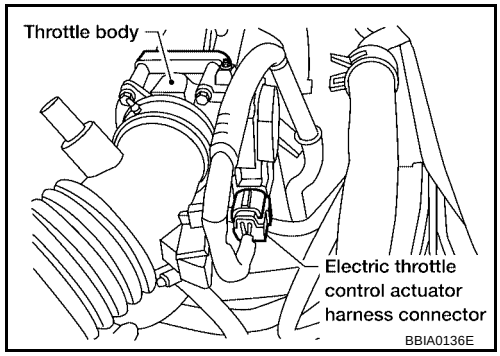
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-407, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

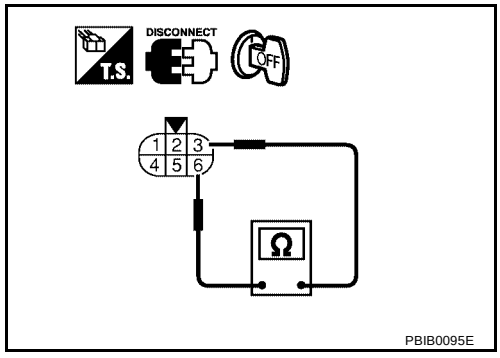
Component Inspection

UBS003T5

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-53, "Throttle Valve Closed Position Learning" .
5. Perform EC-53, "Idle Air Volume Learning" .

Removal and Installation

UBS003T6

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

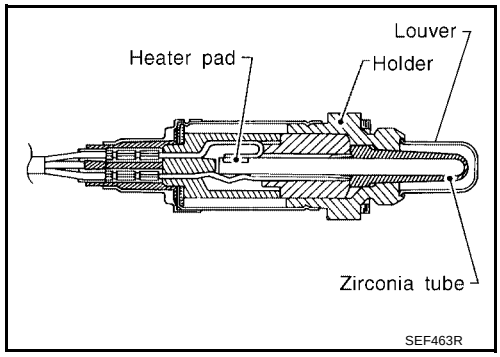
DTC P1143 HO2S1

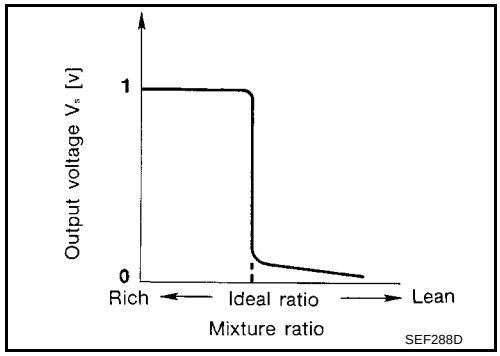
PFP:22690

Component Description

UBS003VB

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS003VC

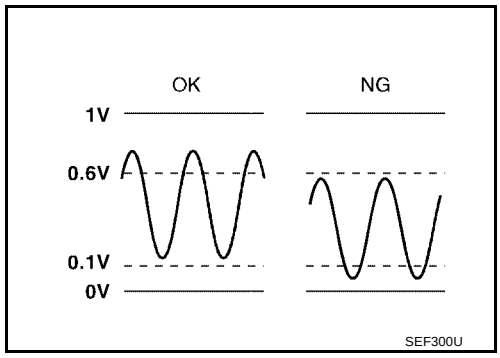
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS003VD

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1143 1143	Heated oxygen sensor 1 lean shift monitoring	The maximum and minimum voltage from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

UBS003VE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

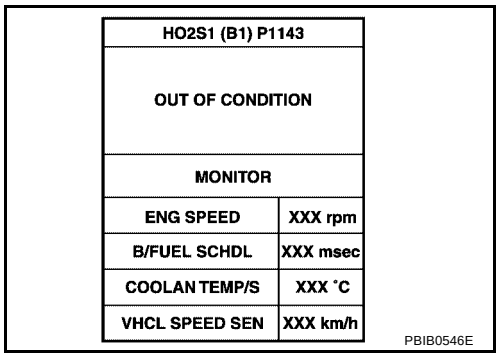
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

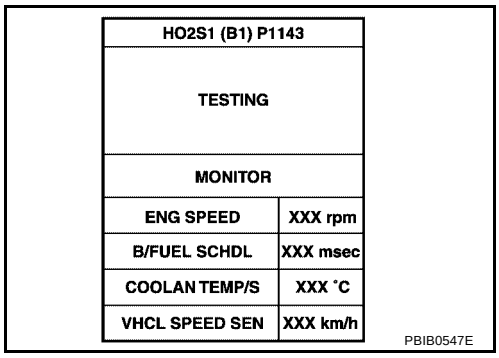
   NOTE:

   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



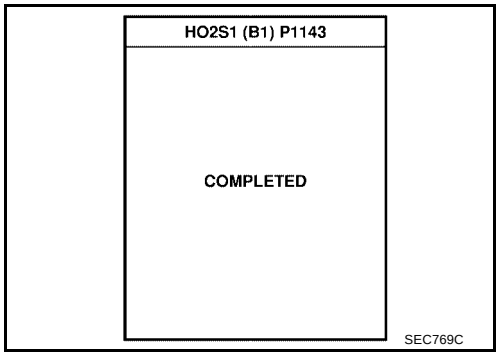
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,350 - 2,700 rpm (A/T models) 1,450 - 3,200 rpm (M/T models)
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	2.4 - 12.5 msec (A/T models) 2.0 - 10.0 msec (M/T models)
Selector lever	Suitable position



If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-411, "Diagnostic Procedure" .



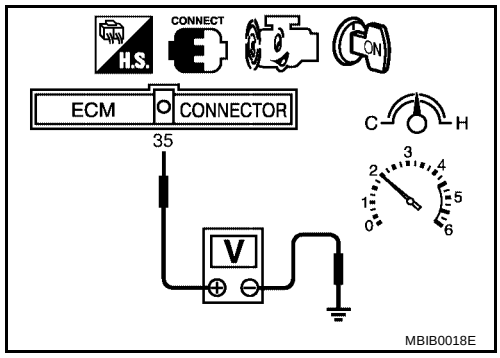
Overall Function Check

UBS003VF

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1(B1) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is over 0.1V at least one time.
4. If NG, go to EC-411, "Diagnostic Procedure" .



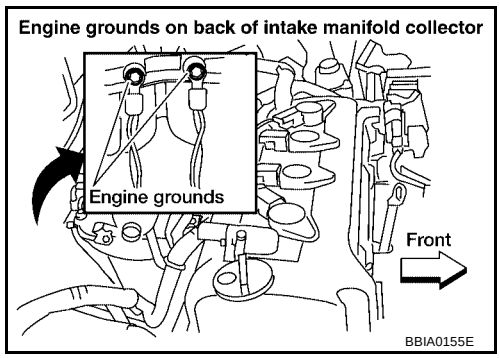
Diagnostic Procedure

UBS003VG

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



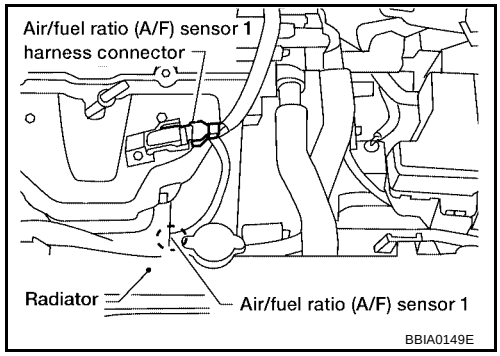
2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque:

40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

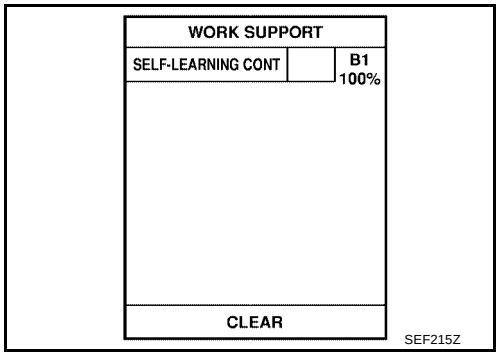
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

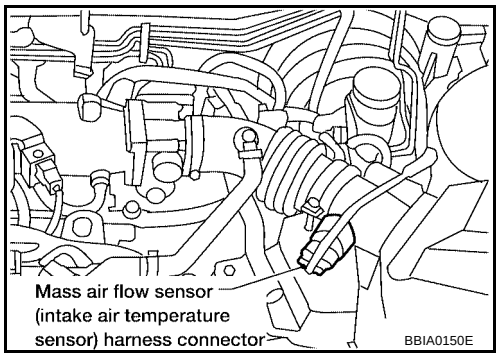
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-238 .
No >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-156, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-413, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-203, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

UBS003VH

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

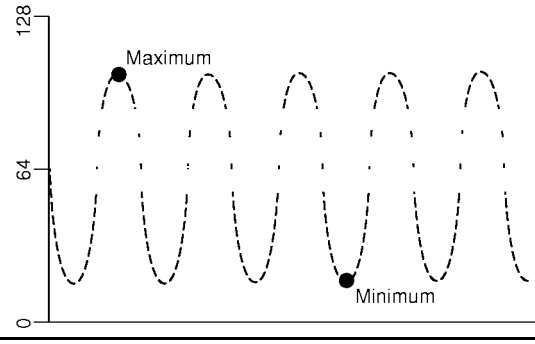
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

CAUTION:

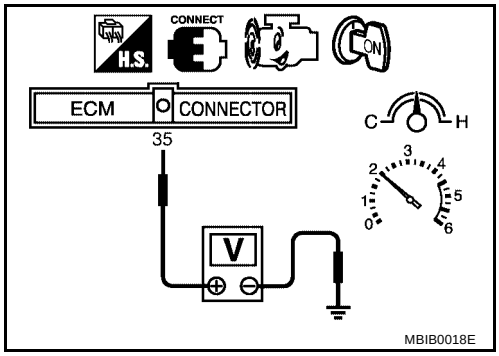
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.

2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS003VI

HEATED OXYGEN SENSOR 1

Refer to EM-12, "Removal and Installation" .

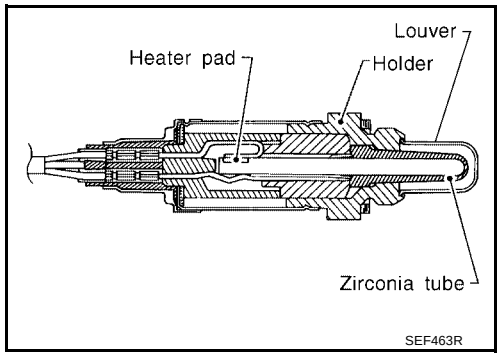
DTC P1144 HO2S1

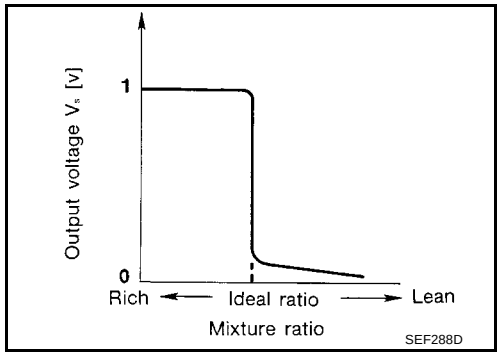
PFP:22690

Component Description

UBS003VJ

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS003VK

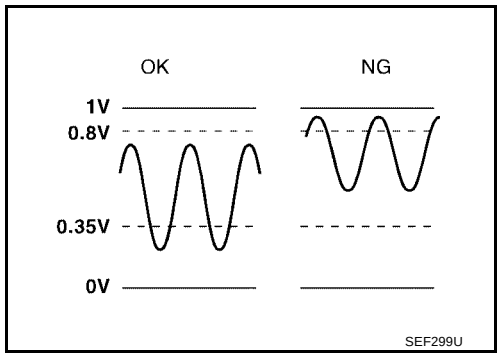
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS003VL

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144 1144	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors

DTC Confirmation Procedure

UBS003VM

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

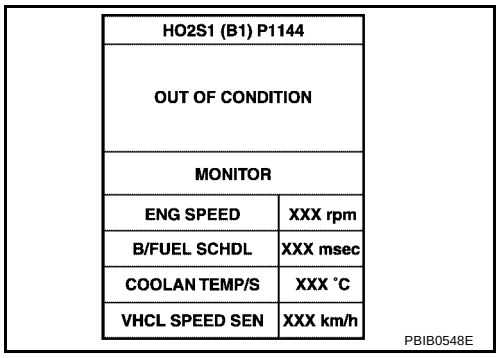
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 5 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1144” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

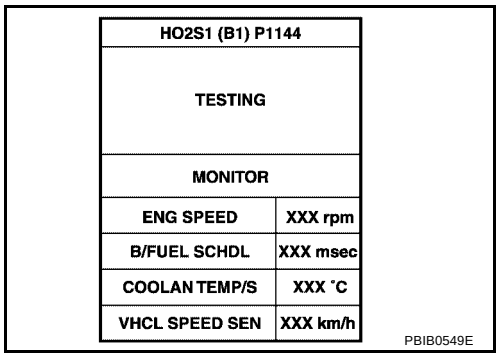
   NOTE:

   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



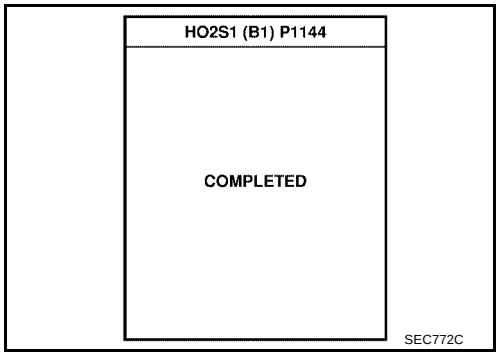
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,350 - 2,700 rpm (A/T models) 1,450 - 3,200 rpm (M/T models)
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	2.4 - 12.5 msec (A/T models) 2.0 - 10.0 msec (M/T models)
Selector lever	Suitable position



If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-417, "Diagnostic Procedure" .



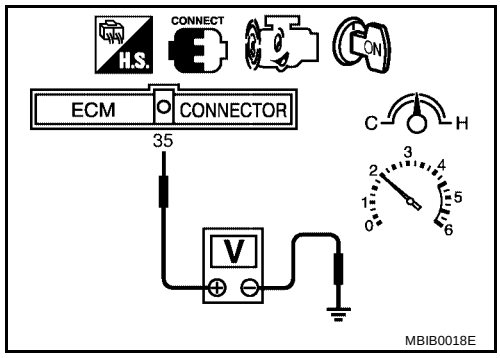
Overall Function Check

UBS003VN

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1(B1) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is below 0.8V at at least one time.
   - The minimum voltage is below 0.35V at least one time.
4. If NG, go to EC-417, "Diagnostic Procedure" .



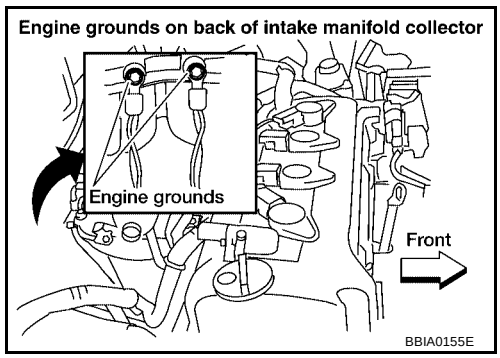
Diagnostic Procedure

UBS003VO

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

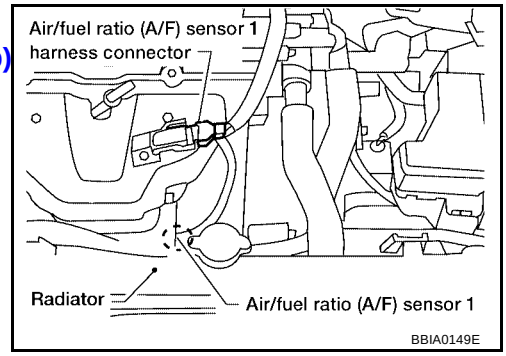


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

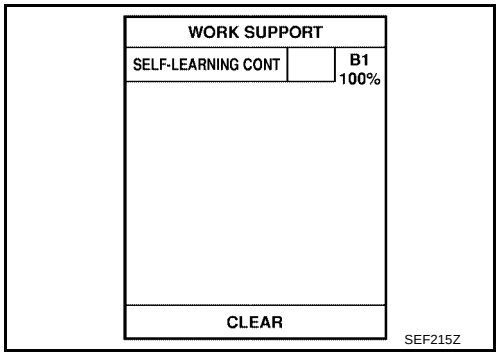
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

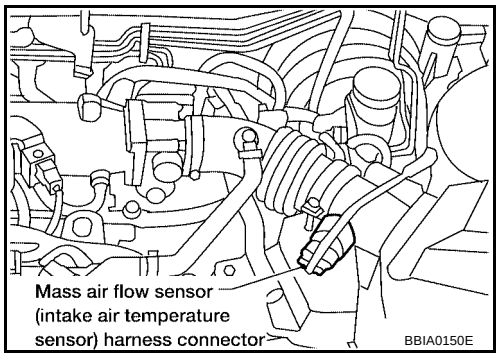
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



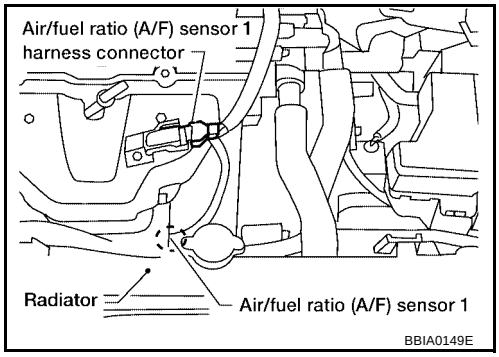
Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-245 .
No >> GO TO 4.

4. CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.

Water should not exist.



OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-156, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-419, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-203, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

UBS003VP

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

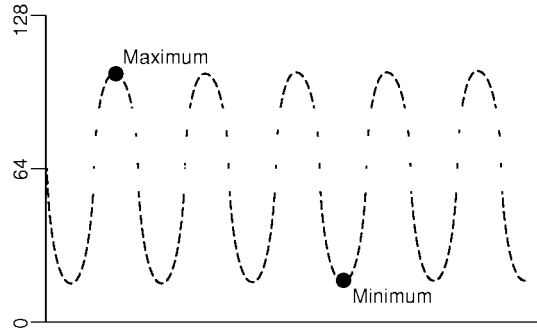
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



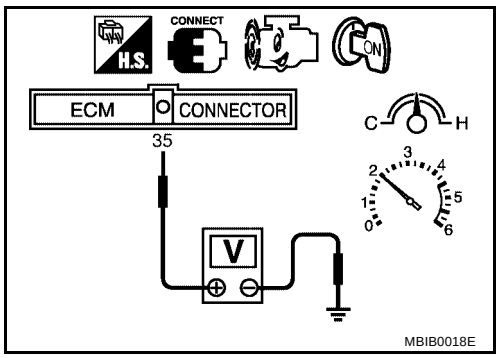
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.



1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS003VQ

HEATED OXYGEN SENSOR 1

Refer to EM-12, "Removal and Installation" .

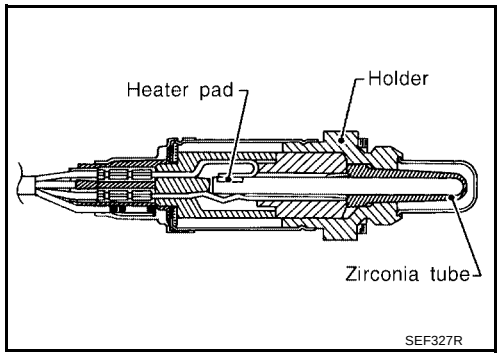
DTC P1146 HO2S2

PFP:226A0

Component Description

UBS006D6

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS006D7

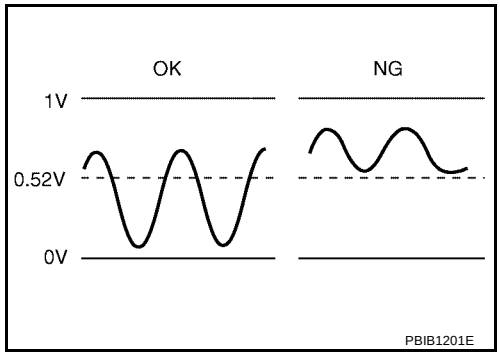
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH

On Board Diagnosis Logic

UBS006D8

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146 1146	Heated oxygen sensor 2 minimum voltage monitoring	The minimum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors

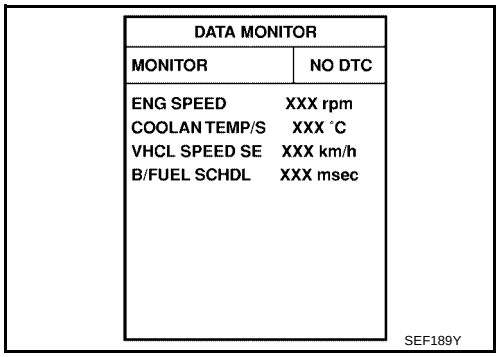
DTC Confirmation Procedure

UBS006D9

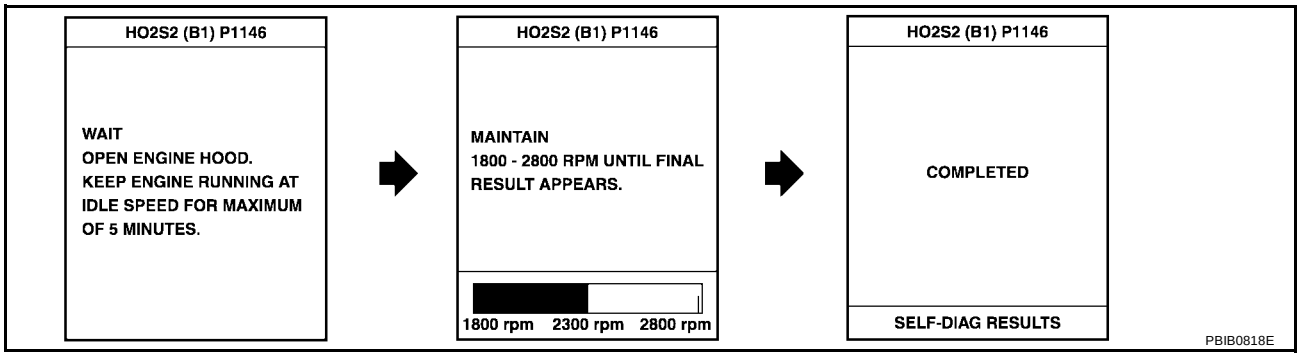
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Open engine hood before conducting following procedure.

WITH CONSULT-II

1. Turn ignition switch ″ON″ and select ″DATA MONITOR″ mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minutes.
6. Make sure that ″COOLAN TEMP/S″ indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when ″COOLAN TEMP/S″ indication reaches to 70°C (158°F).



7. Open engine hood.
8. Select ″HO2S2 (B1) P1146″ of ″HO2S2″ in ″DTC WORK SUPPORT″ mode with CONSULT-II.
9. Start engine and following the instruction of CONSULT-II.



10. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
    If “NG” is displayed, go to EC-424, "Diagnostic Procedure" .
    If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch ″OFF″ and leave the vehicle in a cool place (soak the vehicle).

b. Return to step 1.

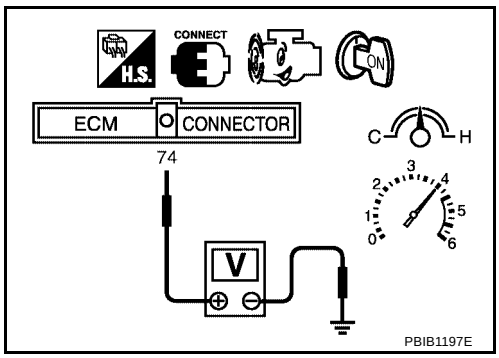
Overall Function Check

UBS006DA

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

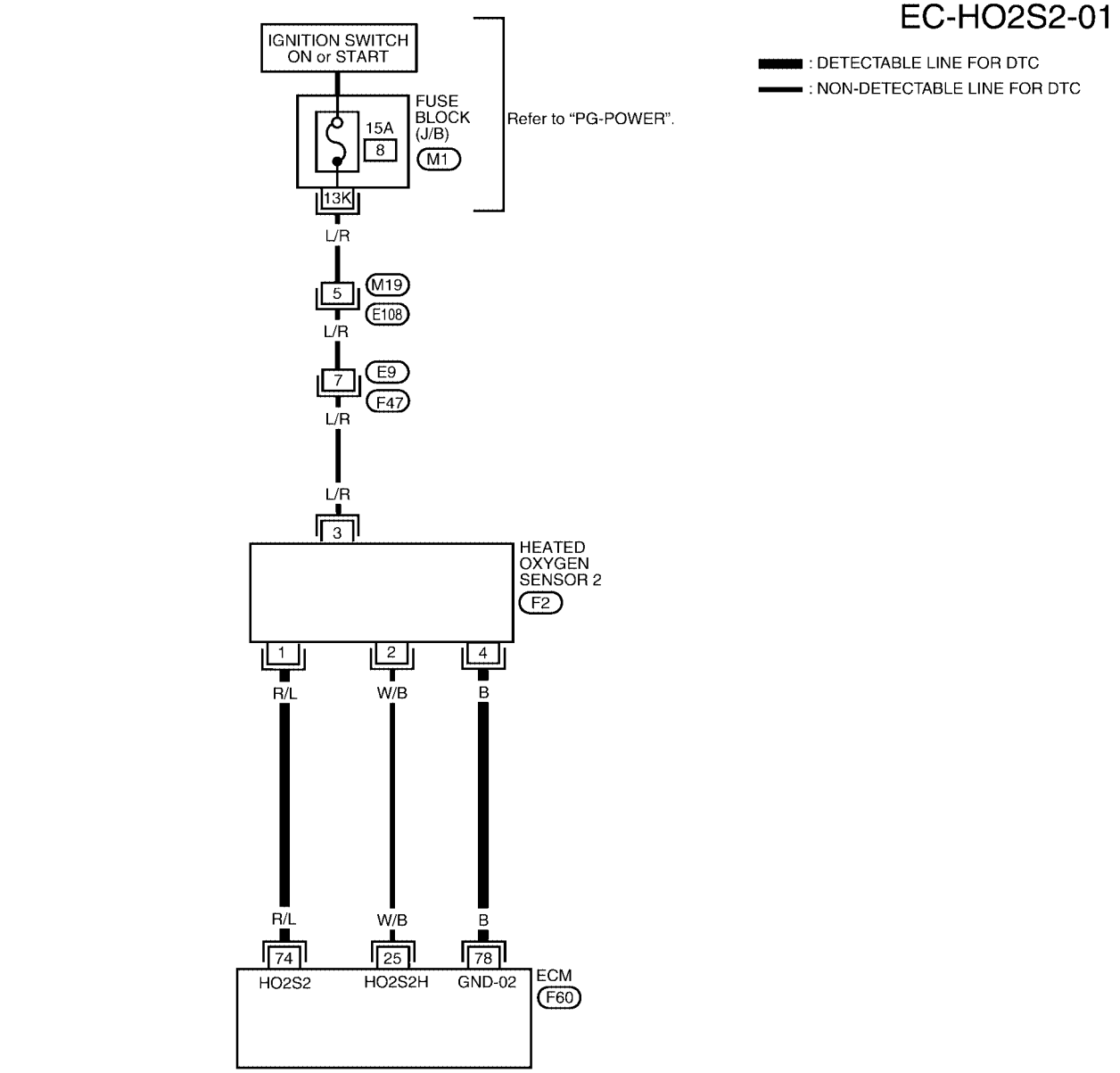
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.52V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.

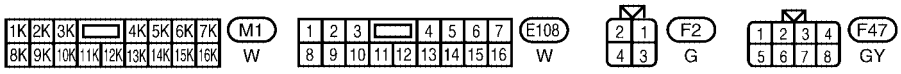


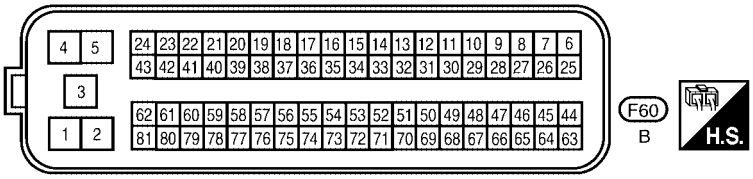
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.52V at least once during this procedure.
8. If NG, go to EC-424, "Diagnostic Procedure" .

Wiring Diagram

UBS006DB







BBWA0779E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	0 - Approximately 1.0V
78	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

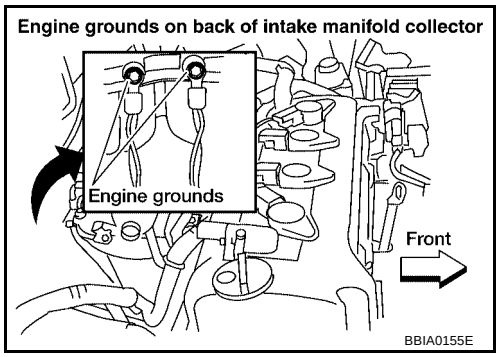
Diagnostic Procedure

UBS006DC

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

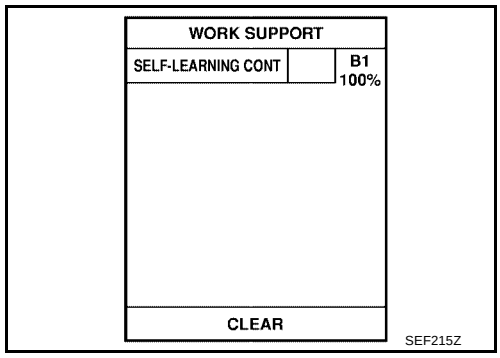
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

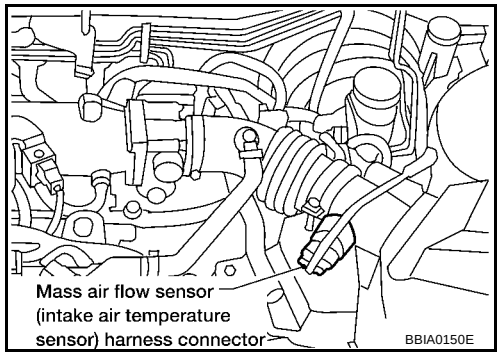
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-245 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

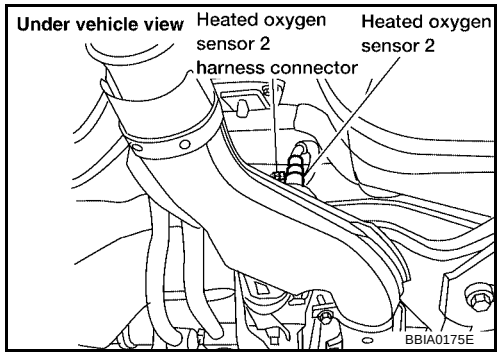
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 74 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 74 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-426, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS006DD

HEATED OXYGEN SENSOR 2

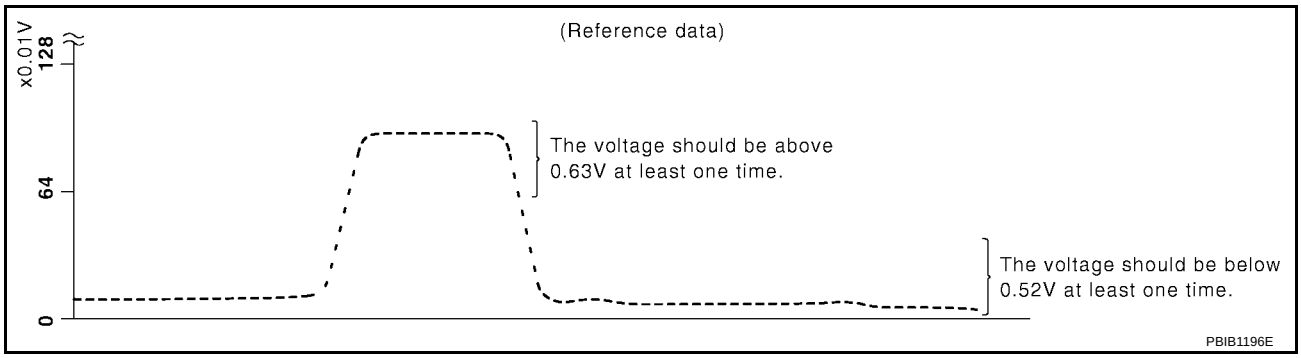
With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle and wait until 2 minutes have passed from starting the engine.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

6. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



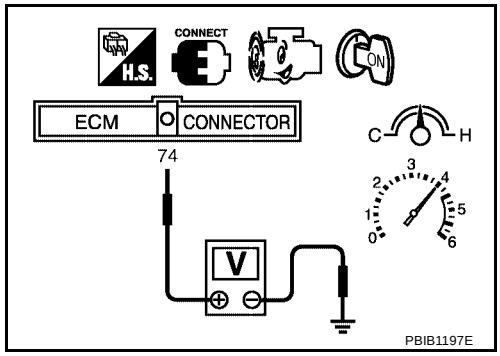
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.52V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.52V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS006DE

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

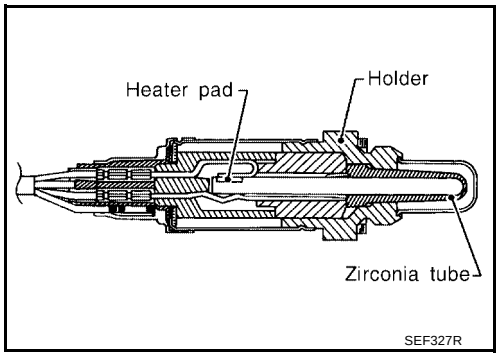
DTC P1147 HO2S2

PFP:226A0

Component Description

UBS006DF

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS006DG

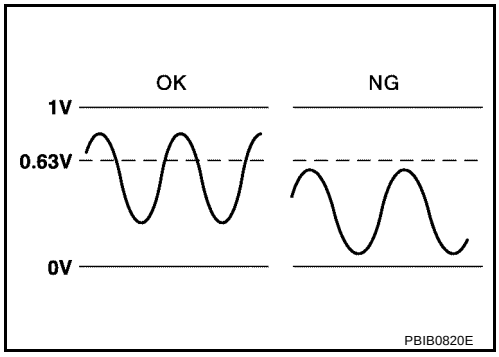
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH

On Board Diagnosis Logic

UBS006DH

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147 1147	Heated oxygen sensor 2 maximum voltage monitoring	The maximum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

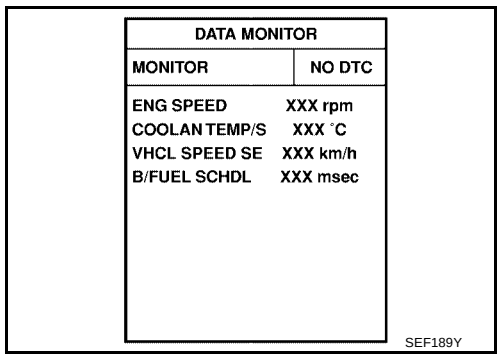
DTC Confirmation Procedure

UBS006DI

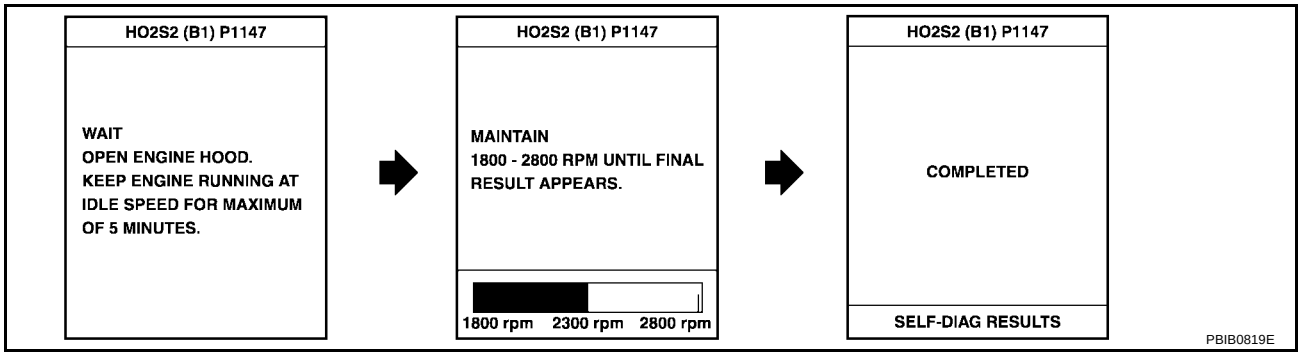
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Open engine hood before conducting following procedure.

WITH CONSULT-II

1. Turn ignition switch ″ON″ and select ″DATA MONITOR″ mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch ″OFF″ and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minute.
6. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when ″COOLANT TEMP/S″ indication reaches to 70°C (158°F)



7. Select “HO2S2 (B1) P1147” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
8. Start engine and following the instruction of CONSULT-II.



9. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, go to EC-432, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch ″OFF″ and leave the vehicle in a cool place (soak the vehicle).
b. Return to step 1.

Overall Function Check

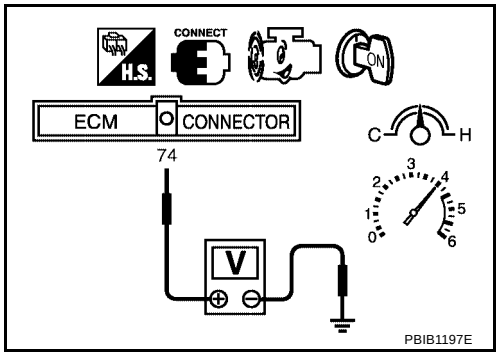
UBS006DJ

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

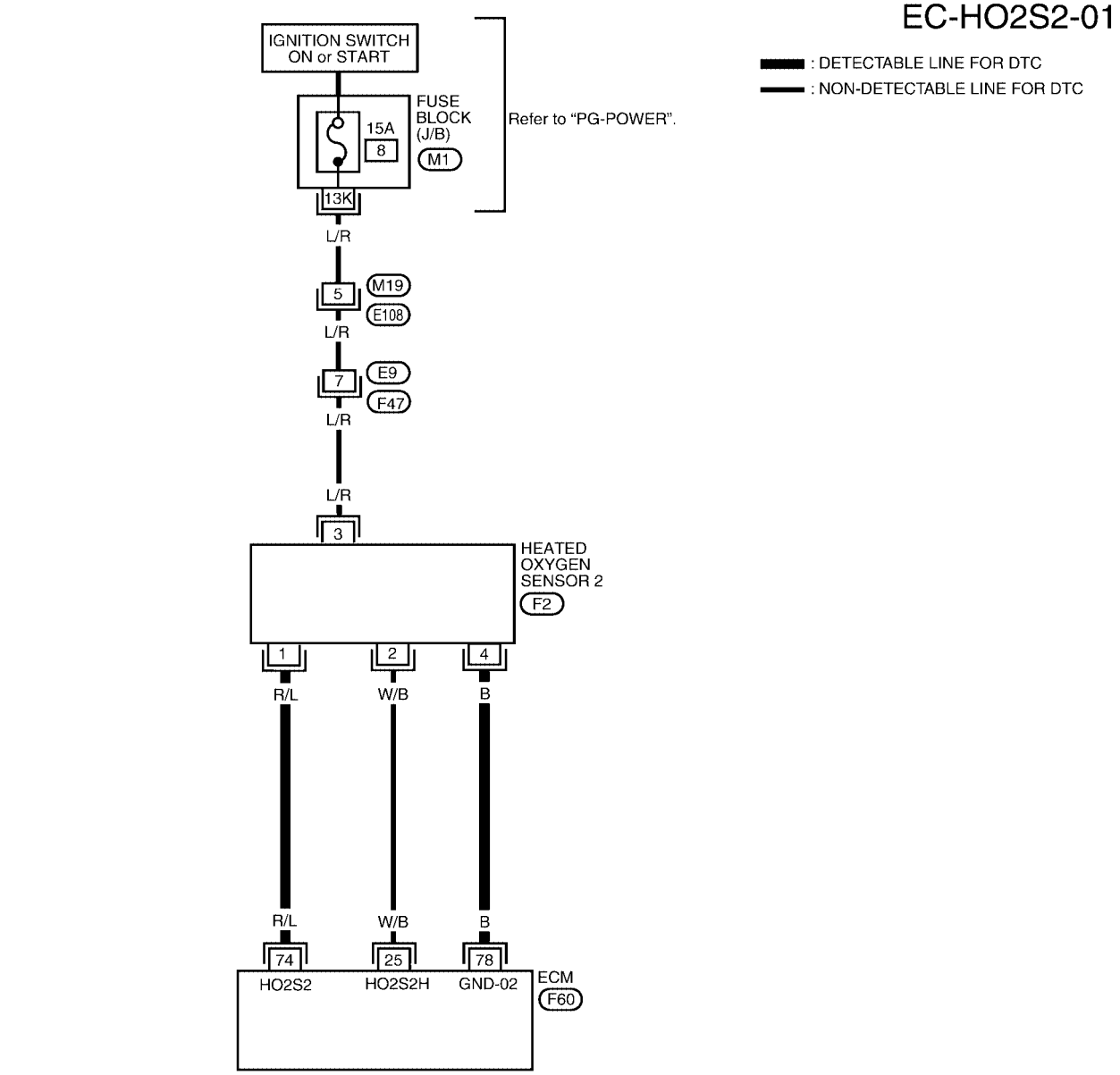
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 [HO2S2 (B1) signal] and engine ground.

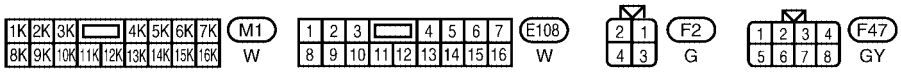
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be above 0.63V at least once during this procedure.
8. If NG, go to EC-432, "Diagnostic Procedure" .

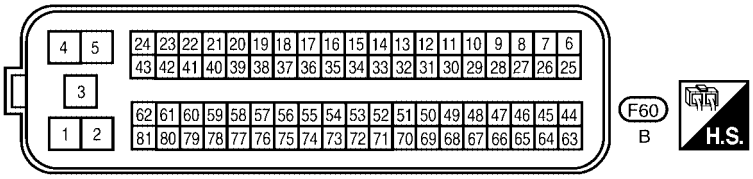


Wiring Diagram

UBS006DK







BBWA0779E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	0 - Approximately 1.0V
78	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

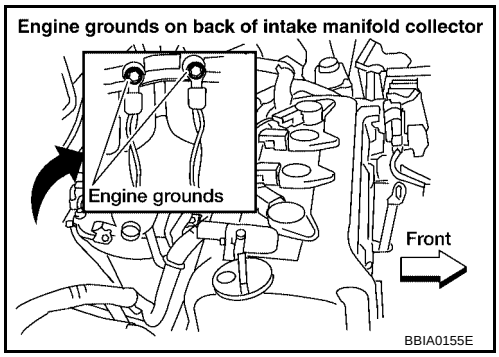
Diagnostic Procedure

UBS006DL

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

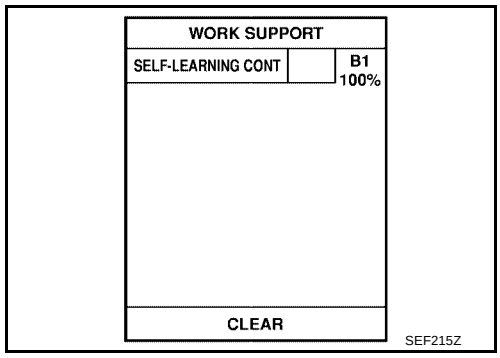
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

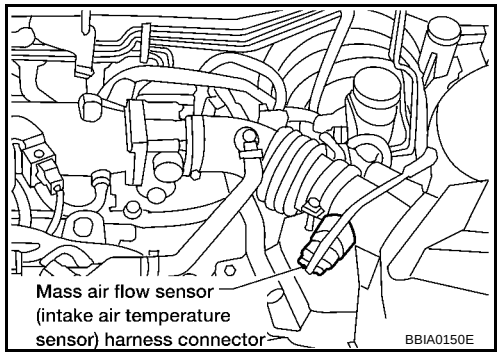
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-238 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

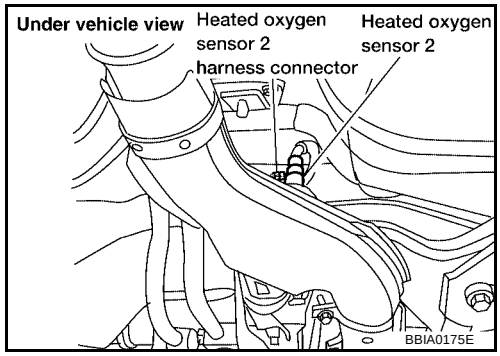
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 74 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 74 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-434, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS006DM

HEATED OXYGEN SENSOR 2

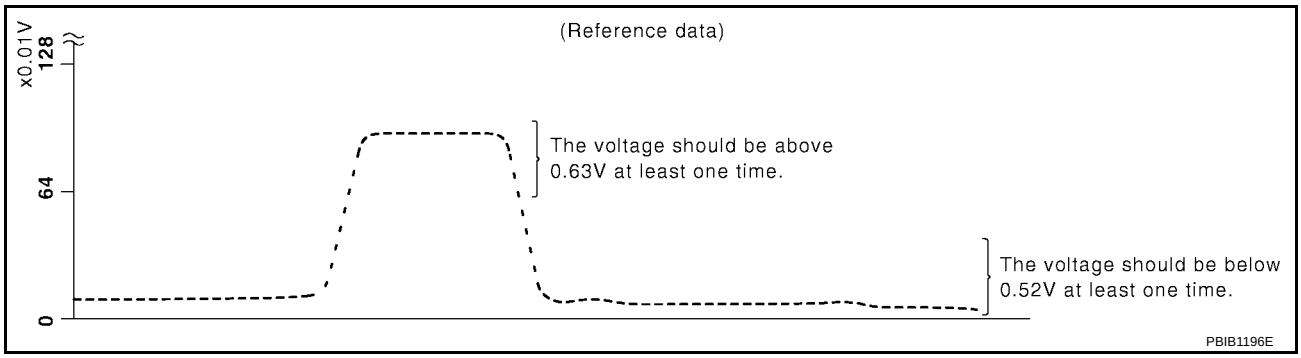
With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

6. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



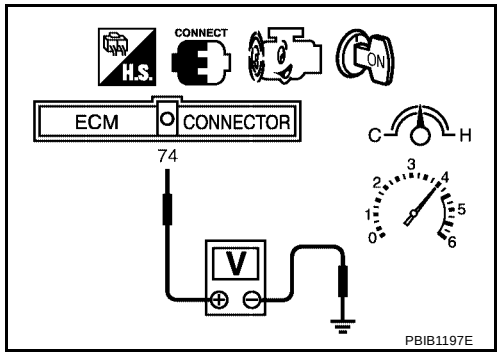
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.52V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.52V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS006DN

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P1148 CLOSED LOOP CONTROL

PFP:22690

On Board Diagnosis Logic

UBS0057U

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148	Closed loop control function	The closed loop control function does not operate even when vehicle is driving in the specified condition.	● The heated oxygen sensor 1 circuit is open or shorted. ● Heated oxygen sensor 1 ● Heated oxygen sensor heater

DTC Confirmation Procedure

UBS0057V

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

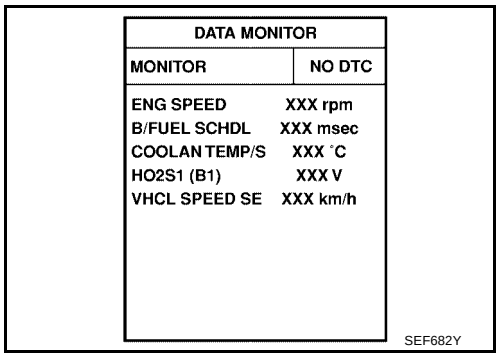
TESTING CONDITION:

- **Never raise engine speed above 3,600 rpm during the “DTC Confirmation Procedure”. If the engine speed limit is exceeded, retry the procedure from step 2.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Hold engine speed at 2,000 rpm and check one of the following.
   - “HO2S1 (B1)” voltage should go above 0.70V at least once.
   - “HO2S1 (B1)” voltage should go below 0.21V at least once.

   If the check result is NG, perform EC-437, "Diagnostic Procedure" .
   If the check result is OK, perform the following step.
4. Let engine idle at least 5 minutes.
5. Maintain the following condition at least 50 consecutive seconds.



B/FUEL SCHDL	2.4 msec or more (A/T models) 2.0 msec or more (M/T models)
ENG SPEED	More than 1,700 rpm (A/T models) More than 2,050 rpm (M/T models)
Selector lever	Suitable position
VHCL SPEED SE	More than 70 km/h (43 MPH)

   During this test, P0134 may be displayed on CONSULT-II screen.
6. If DTC is detected, go to EC-437, "Diagnostic Procedure" .

Overall Function Check

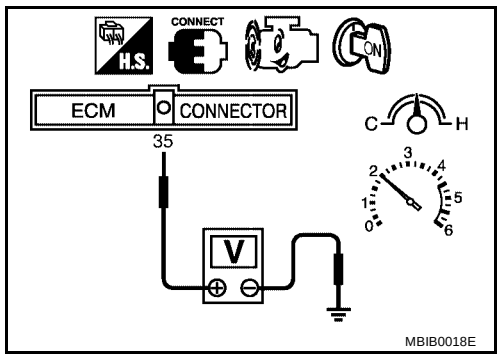
UBS0057W

Use this procedure to check the overall function of the closed loop control. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.

2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no-load.
   - The voltage should go above 0.70V at least once.
   - The voltage should go below 0.21V at least once.
4. If NG, go to EC-437, "Diagnostic Procedure" .



Diagnostic Procedure

UBS0057X

Perform trouble diagnosis for “DTC P0133”, EC-211 .

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

UBS001MV

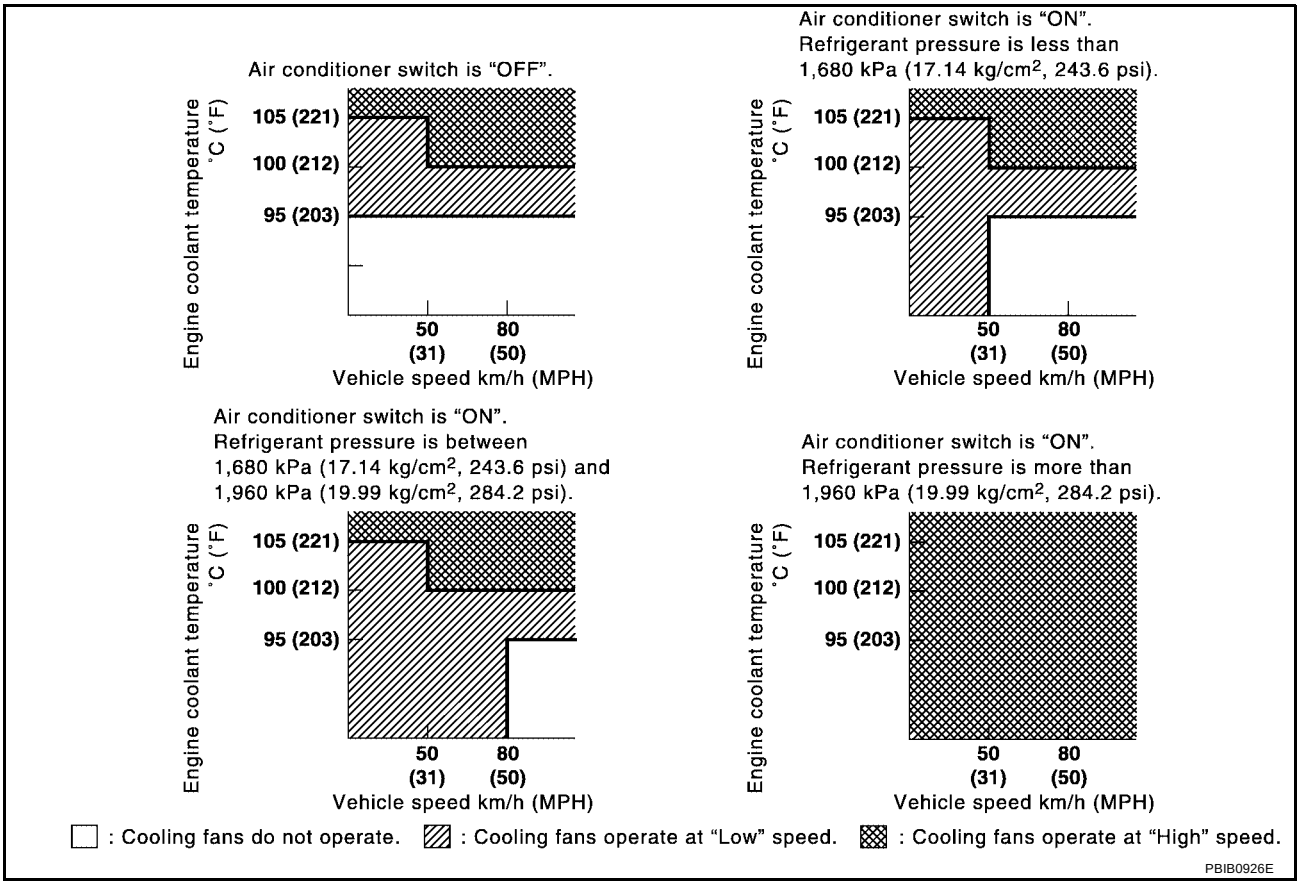
COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1		
Battery	Battery voltage*1		
Vehicle speed signal	Vehicle speed*2	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		
Refrigerant pressure sensor	Refrigerant pressure		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: These signals are sent to the ECM through CAN communication line.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

UBS001MW

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

On Board Diagnosis Logic

UBS006GS

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer toEC-1662, "Main 12 Causes of Overheating" .

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to MA-16, "Changing Engine Coolant" . Also, replace the engine oil. Refer to LU-17, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

UBS001MY

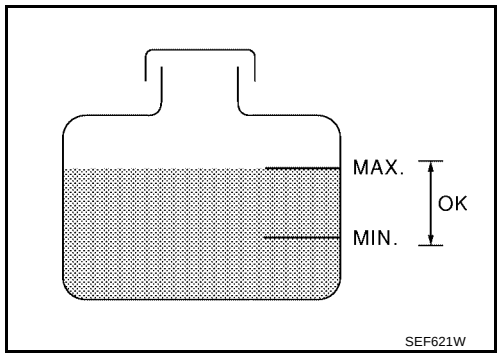
Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-442, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-442, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.



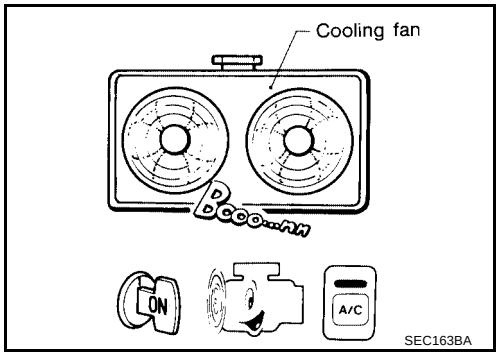
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-442, "Diagnostic Procedure" .

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF646X

WITH GST

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-442, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-442, "Diagnostic Procedure" .
3. Start engine.
   Be careful not to overheat engine.
4. Set temperature control lever to full cold position.
5. Turn air conditioner switch “ON”.
6. Turn blower fan switch “ON”.
7. Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.
8. Make sure that cooling fan operates at low speed.
   If NG, go to EC-442, "Diagnostic Procedure" .
   If OK, go to the following step.
9. Turn ignition switch “OFF”.
10. Turn air conditioner switch and blower fan switch “OFF”.
11. Disconnect engine coolant temperature sensor harness connector.
12. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
13. Restart engine and make sure that cooling fan operates at higher speed than low speed.
    Be careful not to overheat engine.
14. If NG, go to EC-442, "Diagnostic Procedure" .



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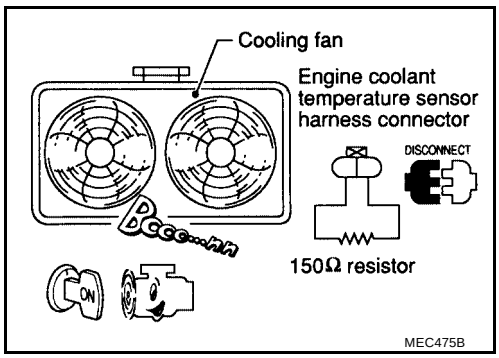
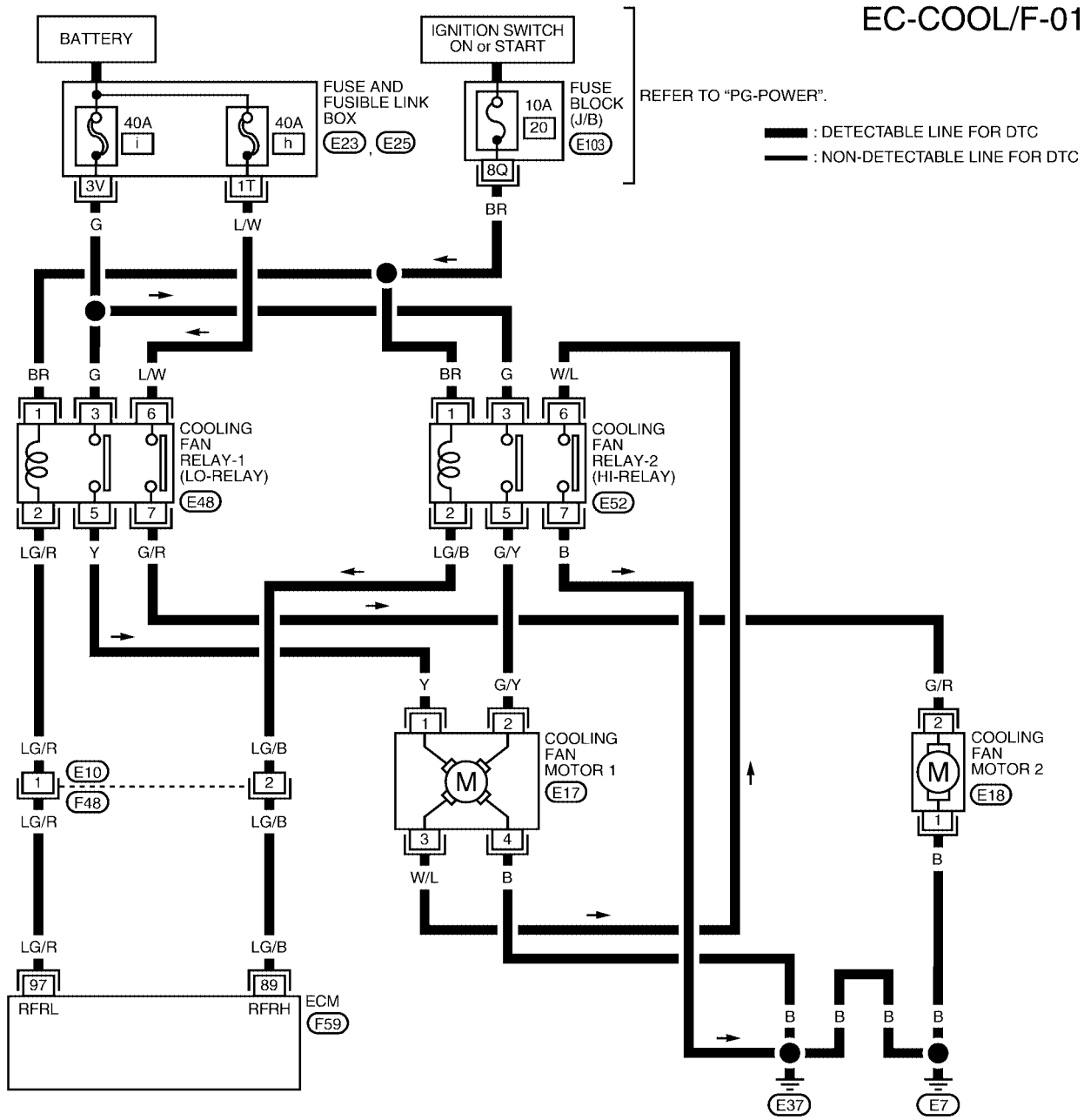
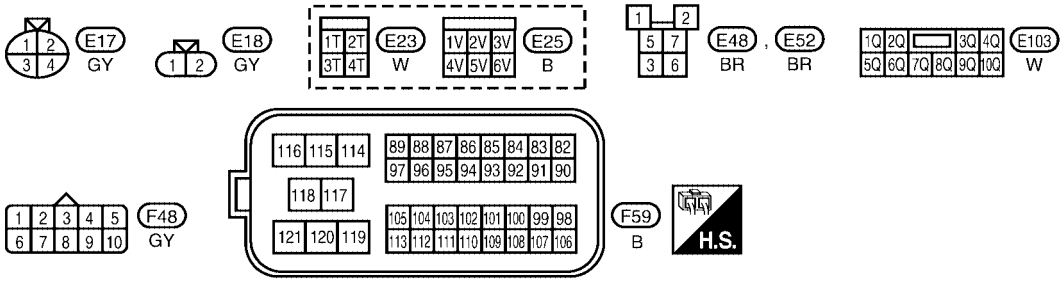


MEC475B

Wiring Diagram

UBS001MZ





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Diagnostic Procedure

UBS001N0

1. INSPECTION START

Do you have CONSULT-II?

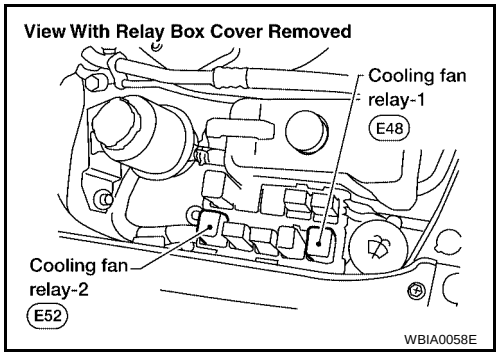
Yes or No

Yes >> GO TO 2.
No >> GO TO 4.

2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

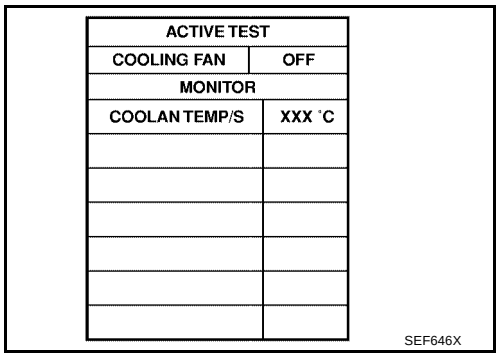
1. Disconnect cooling fan relay-2.
2. Turn ignition switch “ON”.



3. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 3.
NG >> Check cooling fan low speed control circuit. (Go to EC-446, "PROCEDURE A" .)



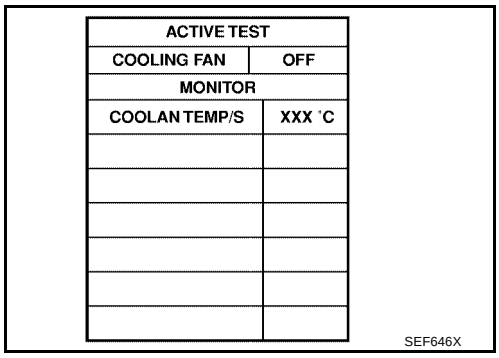
3. CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relay-2.
3. Disconnect cooling fan relay-1.
4. Turn ignition switch “ON”.
5. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
6. Make sure that cooling fan-1 operates at higher speed than low speed.

OK or NG

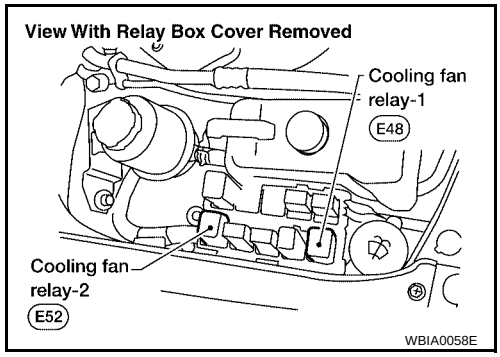
OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-448, "PROCEDURE B" .)



4. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

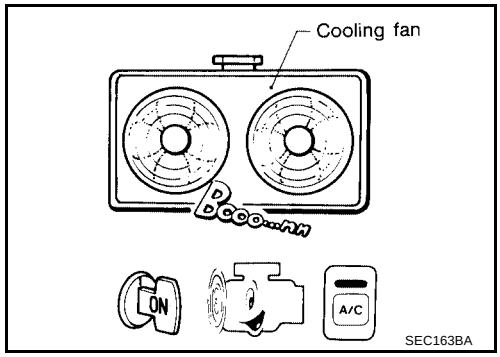
1. Disconnect cooling fan relay-2.
2. Start engine and let it idle.
3. Set temperature lever at full cold position.
4. Turn air conditioner switch “ON”.
5. Turn blower fan switch “ON”.



6. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 5.
NG >> Check cooling fan low speed control circuit. (Go to EC-446, "PROCEDURE A" .)



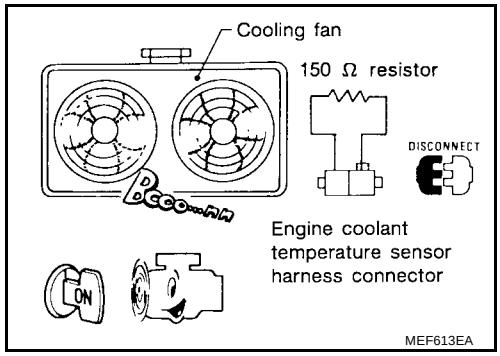
5. CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relay-2.
3. Disconnect cooling fan relay-1.
4. Turn air conditioner switch and blower fan switch “OFF”.
5. Disconnect engine coolant temperature sensor harness connector.
6. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
7. Restart engine and make sure that cooling fan-1 operate at higher speed than low speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-448, "PROCEDURE B" .)

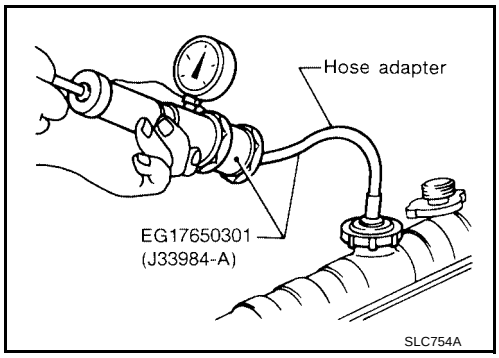


6. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.6 kg/cm^2 , 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.
Pressure should not drop.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following for leaks.

- Hose
- Radiator
- Water pump (Refer to CO-9, "WATER PUMP" .)

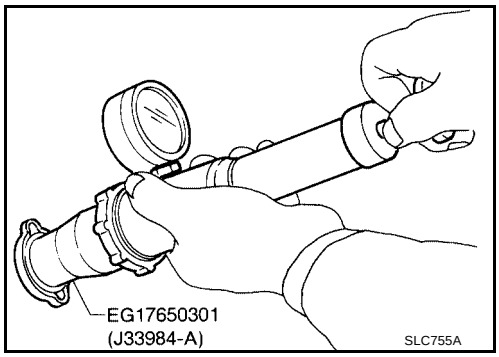
>> Repair or replace.

8. CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.

Radiator cap relief pressure:

59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 9.
NG >> Replace radiator cap.

9. CHECK THERMOSTAT

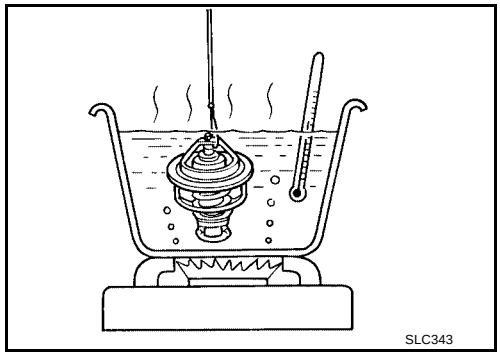
1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.
   It should seat tightly.
3. Check valve opening temperature and valve lift.

   Valve opening temperature:

   76.5°C (170°F) [standard]

   Valve lift:

   More than 9 mm/90°C (0.35 in/194°F)



4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to CO-11, "THERMOSTAT AND THERMOSTAT HOUSING" .

OK or NG

OK >> GO TO 10.
NG >> Replace thermostat

10. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-185, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace engine coolant temperature sensor.

11. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to EC-449, "Main 12 Causes of Overheating" .

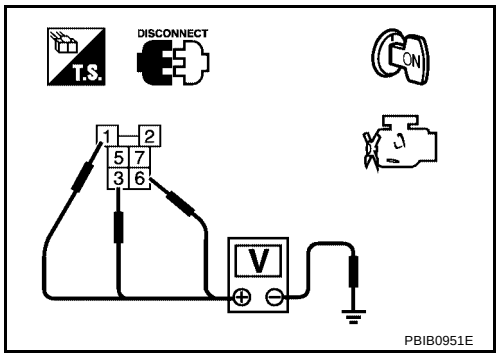
>> **INSPECTION END**

PROCEDURE A

1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

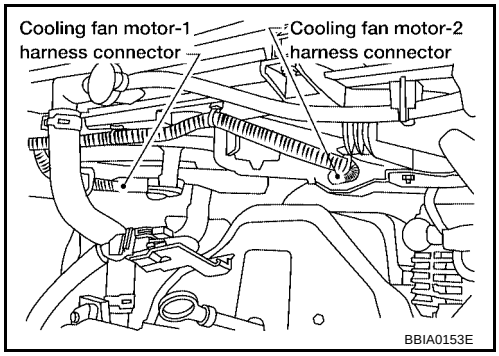
- 10A fuse
- 40A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 4 and ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 2, cooling fan motor-2 terminal 1 and ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 13 and cooling fan relay-1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relay-1 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-450, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-450, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

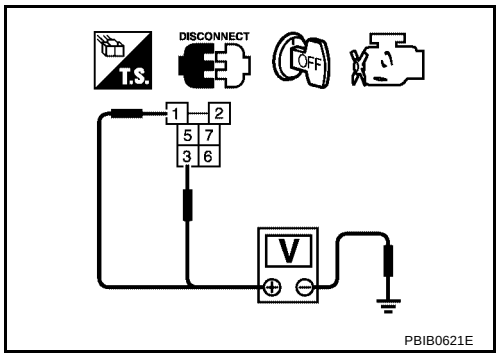
Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

PROCEDURE B

1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-2.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relay-2 terminals 1, 3 and ground with CONSULT-II or tester.



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relay-2 and fuse
- Harness for open or short between cooling fan relay-2 and fusible link

>> Repair harness or connectors.

3. CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-2 terminal 5 and cooling fan motor-1 terminal 2, cooling fan relay-2 terminal 6 and cooling fan motor-1 terminal 3, cooling fan relay-2 terminal 7 and ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 12 and cooling fan relay-2 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relay-2 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-2

Refer to EC-450, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relays.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-450, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

UBS001N1

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-16, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See CO-7, "System Check" .
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-7, "System Check" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-11, "THERMOSTAT AND THERMOSTAT HOUSING" , and CO-13, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for EC-438, "DTC P1217 ENGINE OVER TEMPERATURE"
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—

Engine	Step	Inspection item	Equipment	Standard	Reference page
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-16, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-7, "System Check" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-58, "Inspection after Disassembly" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-69, "Inspection" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-5, "OVERHEATING CAUSE ANALYSIS" .

Component Inspection

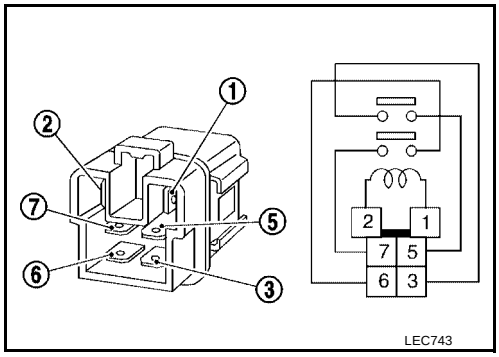
UBS001N2

COOLING FAN RELAYS-1 AND -2

Check continuity between terminals 3 and 5, 6 and 7.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace relay.

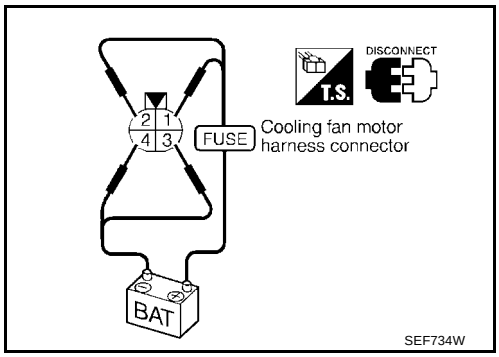


COOLING FAN MOTOR-1

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(+)	(–)
Cooling fan motor	Low	1	4
	High	1, 2	3, 4

Cooling fan motor should operate.
If NG, replace cooling fan motor.

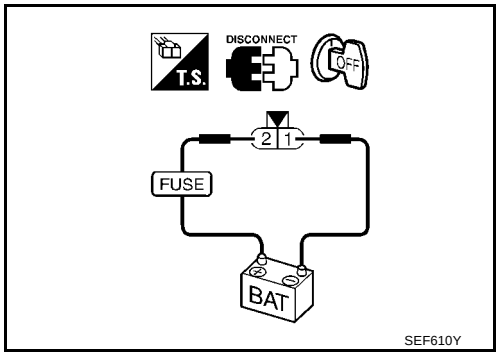


COOLING FAN MOTOR-2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(–)
Cooling fan motor	2	1

Cooling fan motor should operate.
If NG, replace cooling fan motor.



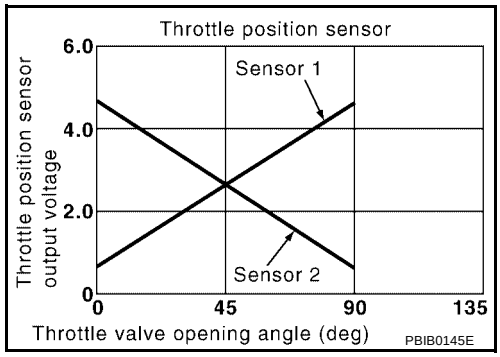
DTC P1225 TP SENSOR

PFP:16119

Component Description

UBS00400

Electric Throttle Control Actuator consists of throttle control motor, acceleration pedal position sensor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

UBS00401

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

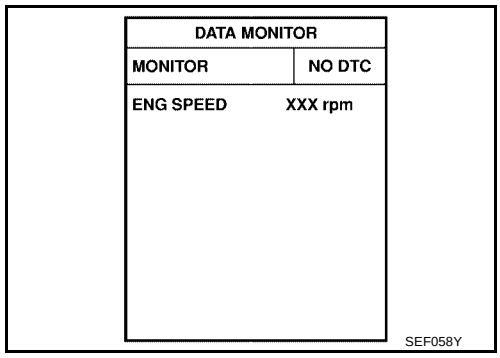
DTC Confirmation Procedure

UBS00402

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-452, "Diagnostic Procedure"
.



WITH GST

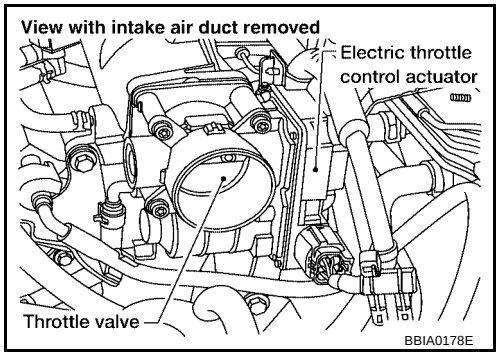
Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS00403

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

UBS00404

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

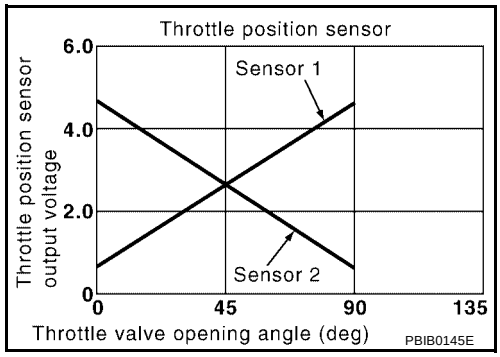
DTC P1226 TP SENSOR

PFP:16119

Component Description

UBS00405

Electric Throttle Control Actuator consists of throttle control motor, acceleration pedal position sensor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

UBS00406

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

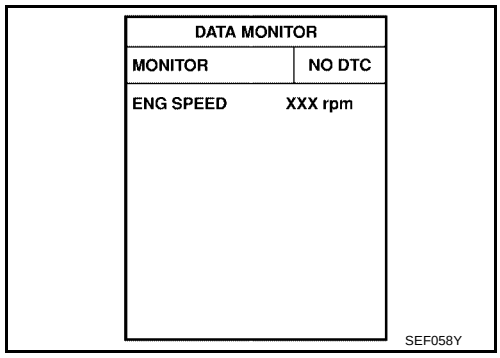
DTC Confirmation Procedure

UBS00407

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-454, "Diagnostic Procedure"
.



WITH GST

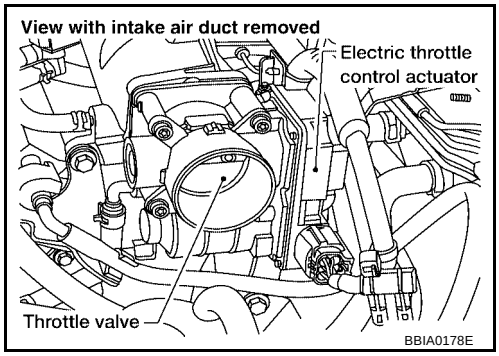
Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS00408

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

UBS00409

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

UBS0040I

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (APP sensor 1 circuit is shorted.) (Mass air flow sensor is shorted.) (PSP sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) ● Accelerator pedal position sensor (APP sensor 1) ● Power steering pressure sensor ● Mass air flow sensor ● Refrigerant pressure sensor ● EVAP control system pressure sensor

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

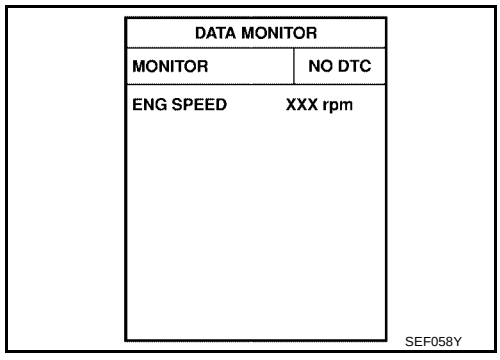
UBS0040J

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-457, "Diagnostic Procedure" .



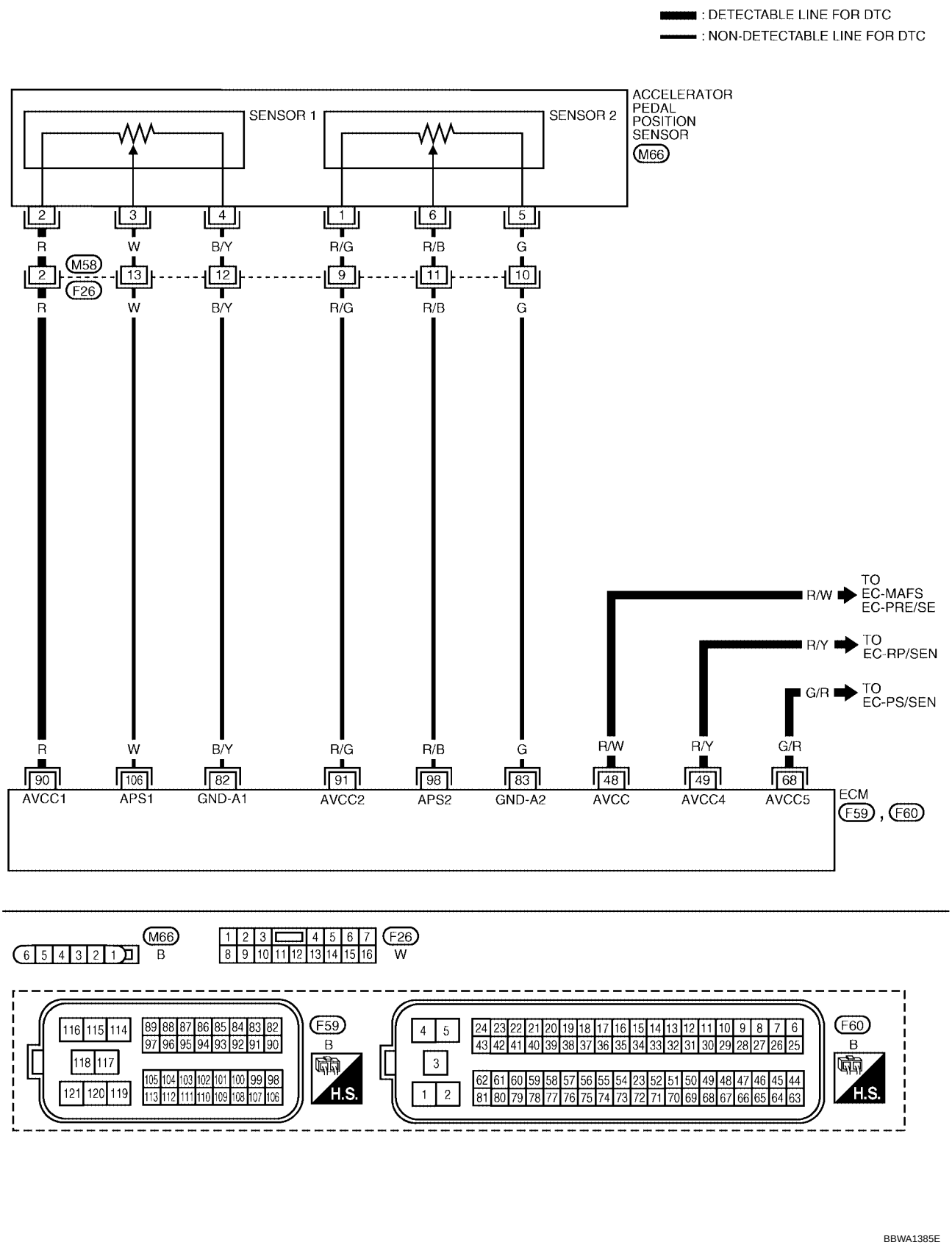
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0040K

EC-APPS1-01



BBWA1385E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	R/W	Sensor power supply	**[Ignition switch “ON”]**	Approximately 5V
49	R/Y	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch “ON”]**	Approximately 5V
68	G/R	Sensor power supply (Power steering pressure sensor)	**[Ignition switch “ON”]**	Approximately 5V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch “ON”]**	Approximately 5V

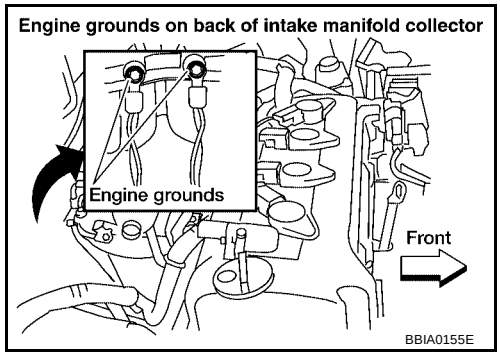
Diagnostic Procedure

UBS0040L

1. RETIGHTEN GROUND SCREWS

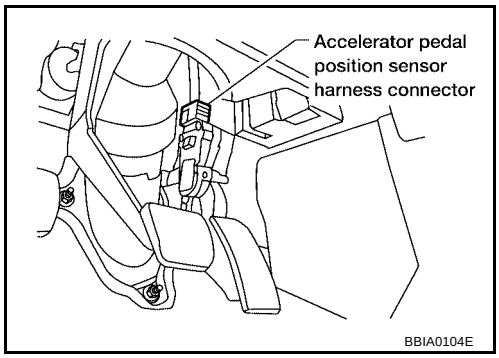
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



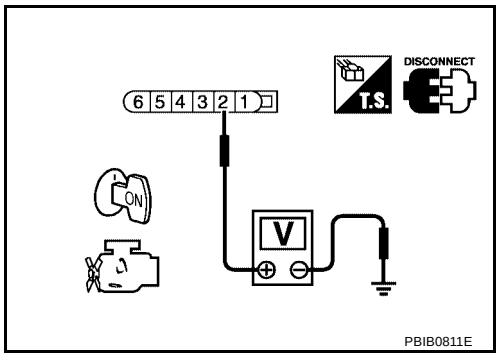
2. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 5.
NG >> GO TO 3.

3. CHECK SENSOR POWER SUPPLY CIRCUITS

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
90	APP sensor terminal 2	EC-506
48	Mass air flow sensor terminal 2	EC-166
48	EVAP control system pressure sensor terminal 3	EC-326
49	Refrigerant pressure sensor terminal 1	EC-560
68	PSP sensor terminal 1	EC-368

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Refrigerant pressure sensor (Refer to MTC-55, "Electrical Component Inspection" .)
- Power steering pressure sensor (Refer to EC-371, "Component Inspection" .)
- EVAP control system pressure sensor (Refer to EC-329, "Component Inspection" .)
- Mass air flow sensor (Refer to EC-170, "Component Inspection" .)

OK or NG

OK >> GO TO 7.
NG >> Replace malfunctioning component.

5. CHECK APP SENSOR

Refer to EC-509, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

UBS001NE

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed signal*2	Vehicle speed		

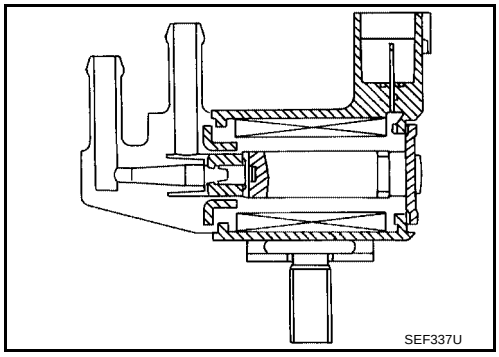
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM through CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor bypass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

UBS001NF

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch “OFF” ● Shift lever: “N” ● No-load	Idle (Vehicle stopped)	0%
		2,000 rpm	—

On Board Diagnosis Logic

UBS006GT

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1444 1444	EVAP canister purge volume control solenoid valve	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	● EVAP control system pressure sensor ● EVAP canister purge volume control solenoid valve (The valve is stuck open.) ● EVAP canister vent control valve ● EVAP canister ● Hoses (Hoses are connected incorrectly or clogged.)

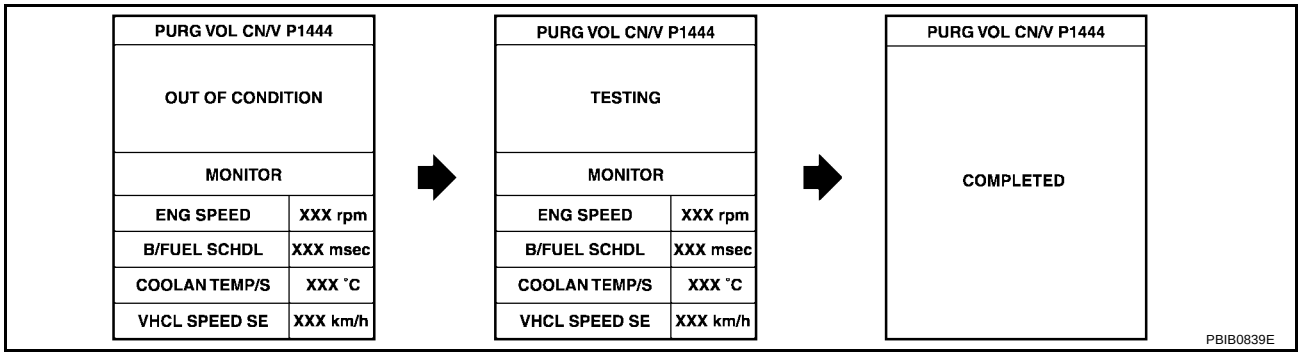
DTC Confirmation Procedure

UBS001NI

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
For best results, perform test at a temperature of 0°C (32°F) or more.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
5. Touch “START”.



6. Start engine and let it idle until “TESTING” on CONSULT-II changes to “COMPLETED”. (It will take for approximately 10 seconds.)

   If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-464, "Diagnostic Procedure" .

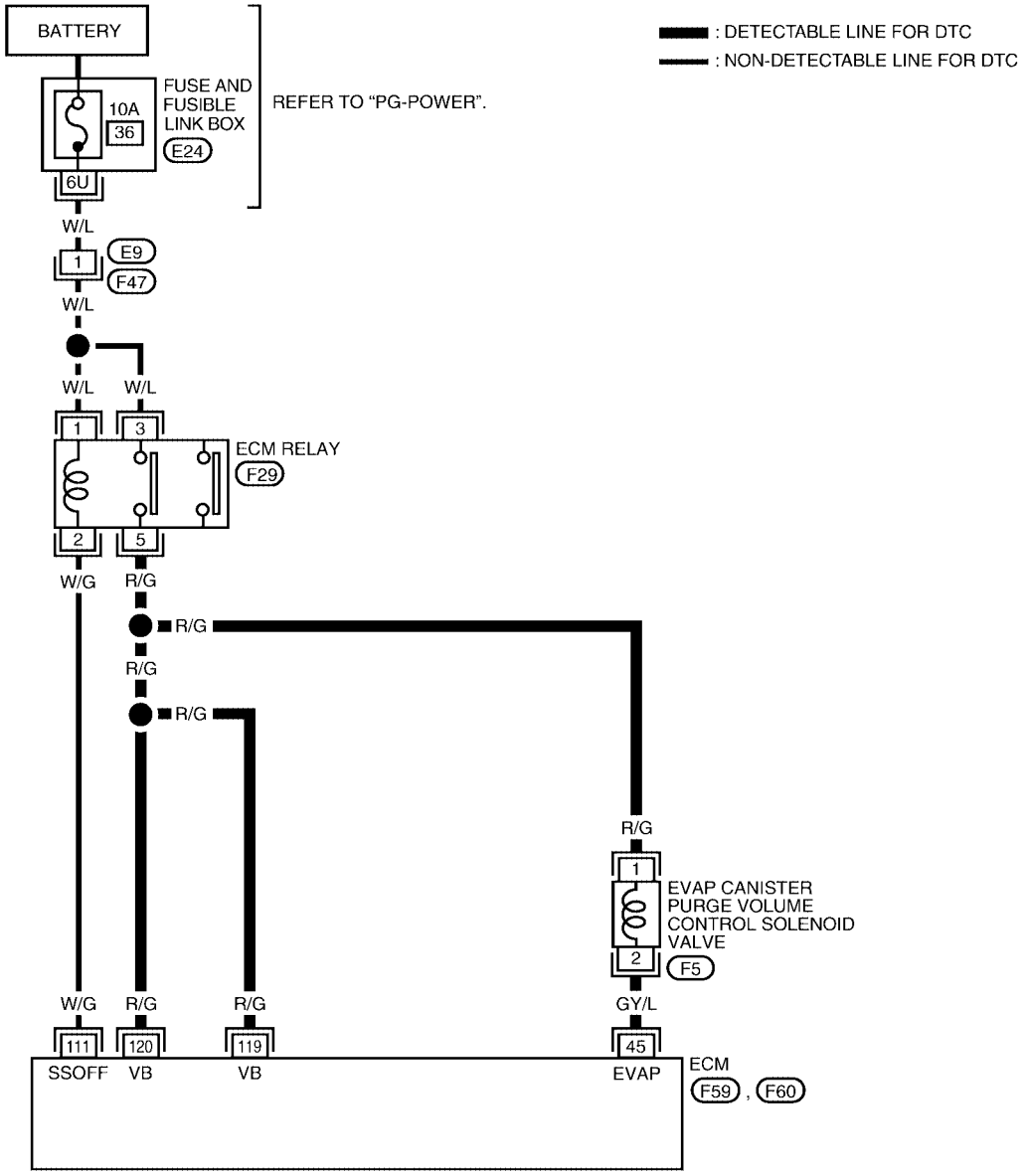
WITH GST

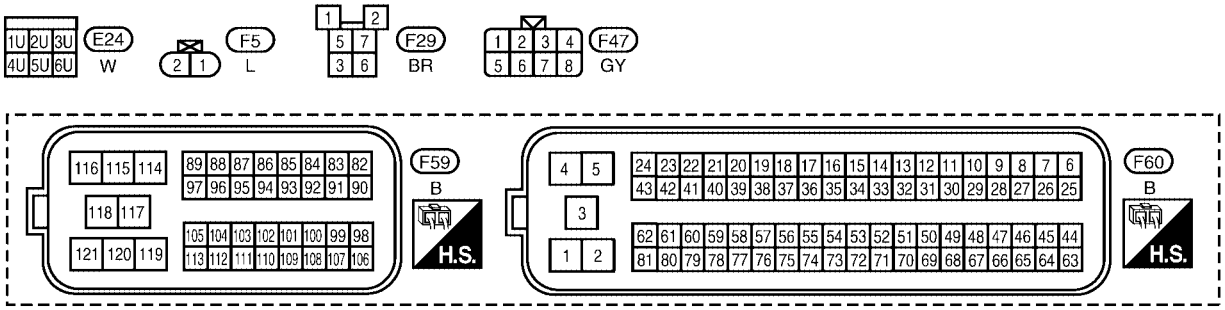
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and let it idle for at least 20 seconds.
4. Select “MODE 7” with GST.
5. If 1st trip DTC is detected, go to EC-464, "Diagnostic Procedure" .

Wiring Diagram

UBS001NJ

EC-PGC/V-01



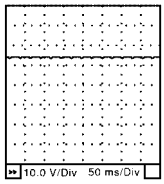
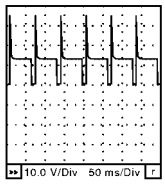


BBWA0785E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	G/YL	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  SEC990C
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	BATTERY VOLTAGE (11 - 14V)★  SEC991C
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

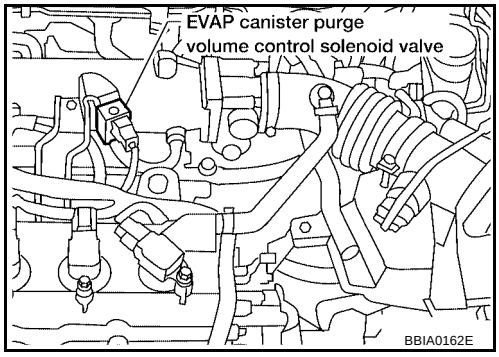
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS001NK

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.

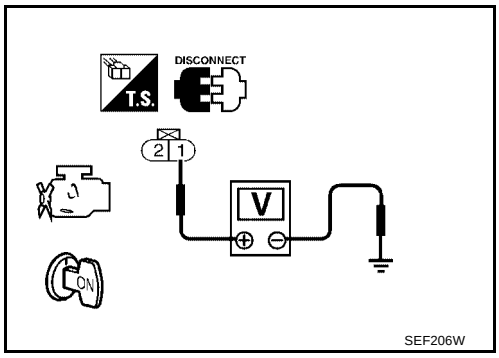


4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and engine ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Replace EVAP control system pressure sensor.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-337, "Component Inspection" .

OK or NG

OK (With CONSULT-II)>>GO TO 6.
OK (Without CONSULT-II)>>GO TO 7.
NG >> Replace EVAP control system pressure sensor.

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect harness connectors disconnected.
3. Start engine.
4. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
HO2S1 MNTR (B1)	LEAN

PBIB0828E

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-466, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 9.
NG >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-472, "Component Inspection" .

OK or NG

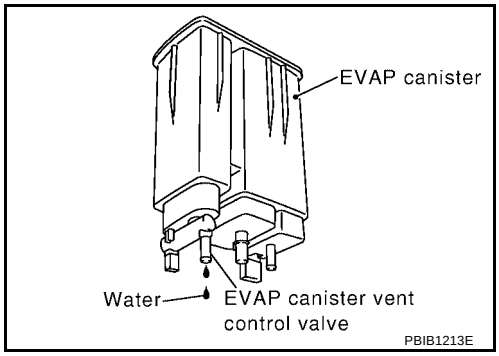
OK >> GO TO 10.
NG >> Replace EVAP canister vent control valve.

10. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.

OK or NG

OK >> GO TO 11.
NG >> GO TO 14.



11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.

The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK >> GO TO 13.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage

>> Repair hose or replace EVAP canister.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

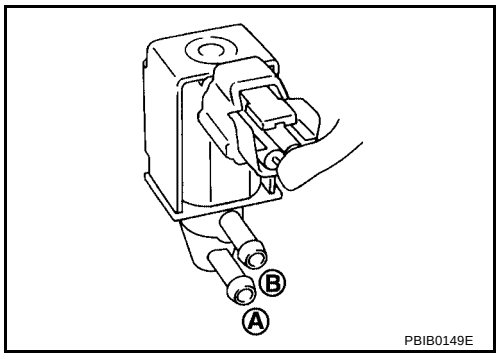
UBS001NL

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

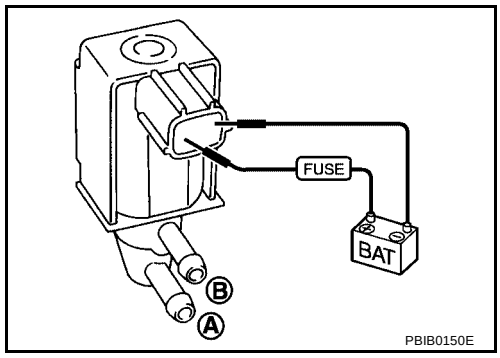
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



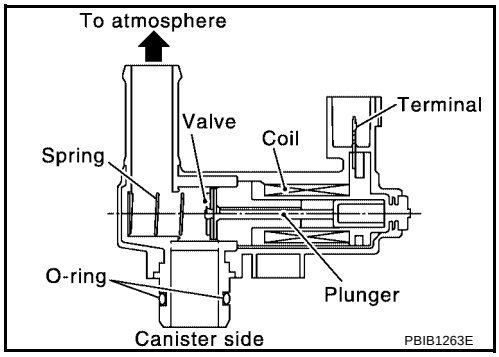
DTC P1446 EVAP CANISTER VENT CONTROL VALVE

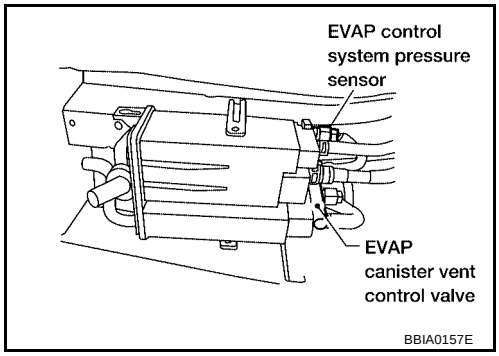
PFP:14935

Component Description

UBS001NM

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows “EVAP Control System” diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS001NN

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS006GU

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1446 1446	EVAP canister vent control valve close	EVAP canister vent control valve remains closed under specified driving conditions.	● EVAP canister vent control valve ● EVAP control system pressure sensor and the circuit ● Blocked rubber tube to EVAP canister vent control valve ● EVAP canister is saturated with water

DTC Confirmation Procedure

UBS001NQ

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 5 seconds.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and let it idle for at least 1 minute.
5. Repeat next procedures 3 times.

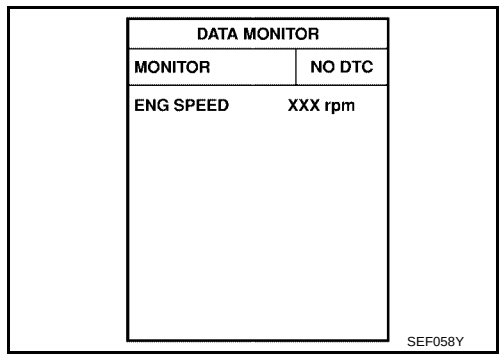
a. Increase the engine speed up to 3,000 to 3,500 rpm and keep it for 2 minutes and 50 seconds to 3 minutes.
Never exceed 3 minutes.

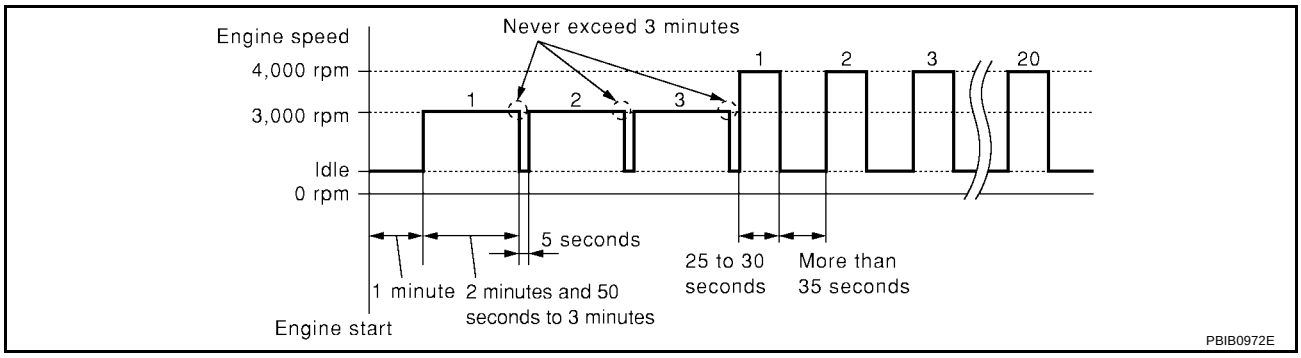
b. Fully released accelerator pedal and keep engine idle for about 5 seconds.

6. If 1st trip DTC is detected, go to EC-471, "Diagnostic Procedure" .
If 1st trip DTC is not detected, go to the next step.
7. Repeat next procedure 20 times.

a. Quickly increase the engine speed up to 4,000 to 4,500 rpm or more and keep it for 25 to 30 seconds.

b. Fully released accelerator pedal and keep engine idle for at least 35 seconds.





8. If 1st trip DTC is detected, go to EC-471, "Diagnostic Procedure" .

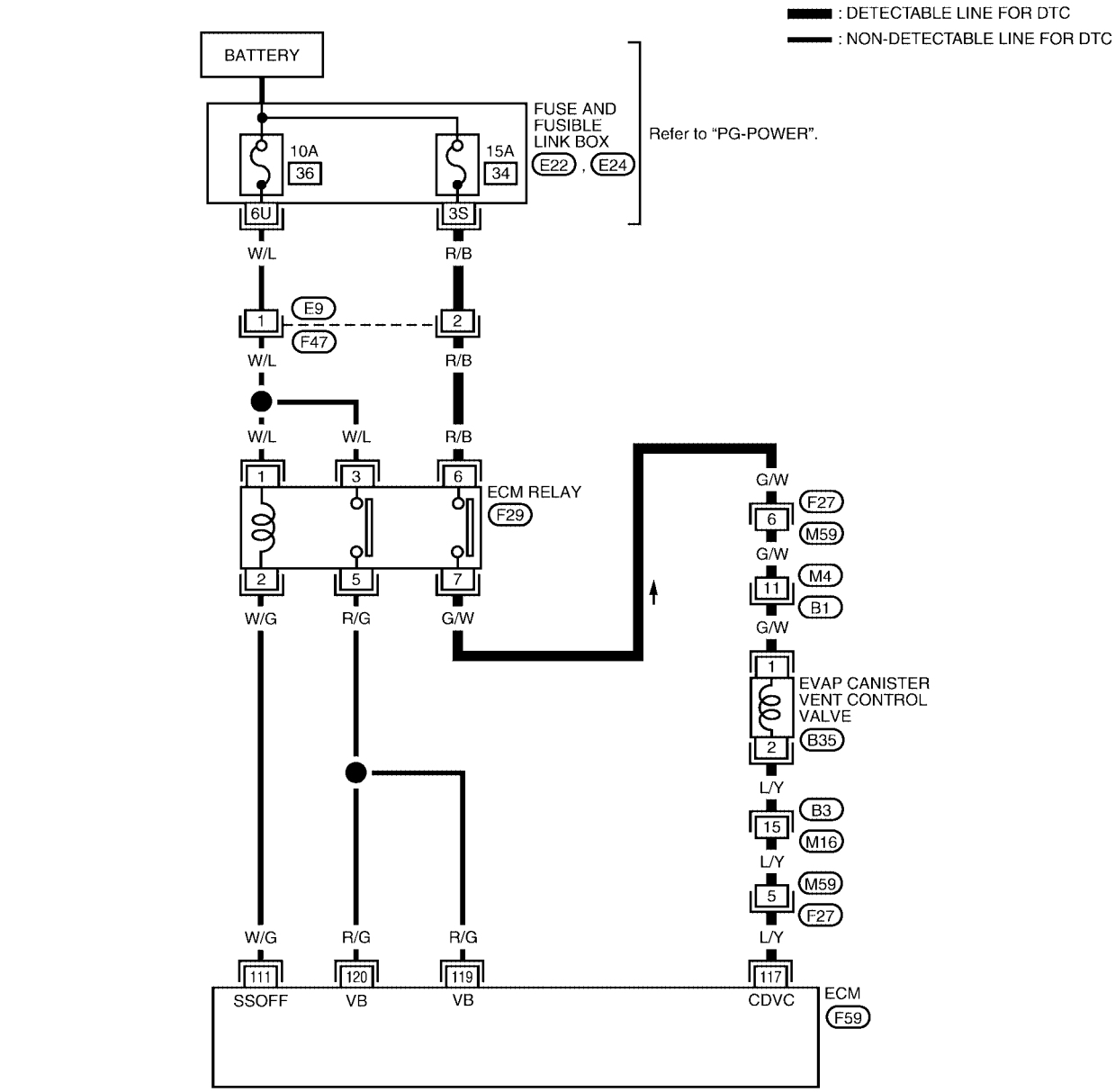
WITH GST

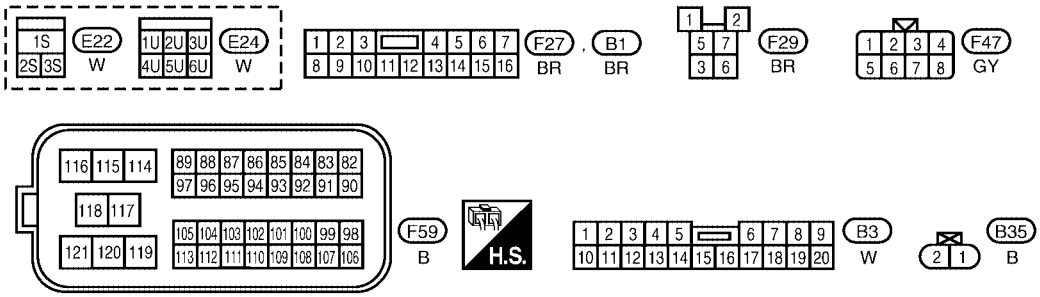
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS001NR

EC-VENT/V-01





BBWA0291E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
117	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

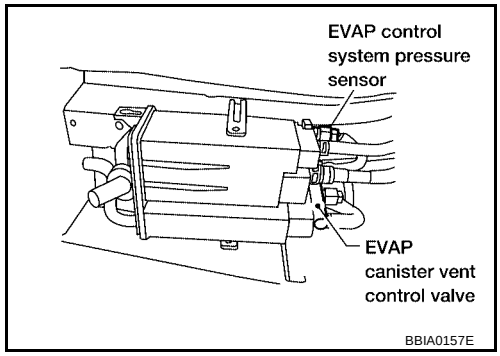
UBS001NS

1. CHECK RUBBER TUBE

1. Turn ignition switch "OFF".
2. Disconnect rubber tube connected to EVAP canister vent control valve.
3. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 2.
NG >> Clean rubber tube using an air blower.



2. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-472, "Component Inspection" .

OK or NG

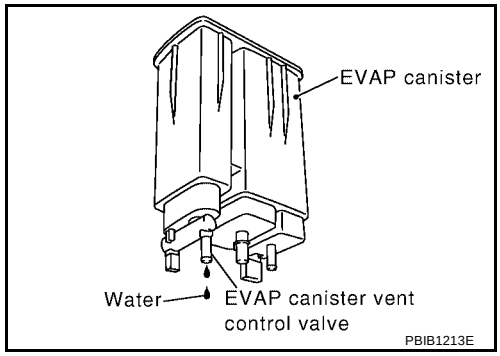
OK >> GO TO 3.
NG >> Replace EVAP canister vent control valve.

3. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.

OK or NG

OK >> GO TO 4.
NG >> GO TO 6.



4. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage

>> Repair hose or replace EVAP canister.

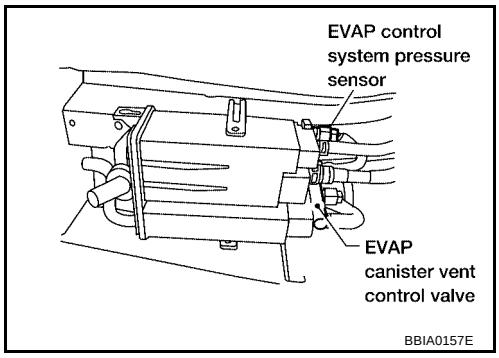
6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 7.
NG >> Replace EVAP control system pressure sensor.



7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-337, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP control system pressure sensor.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

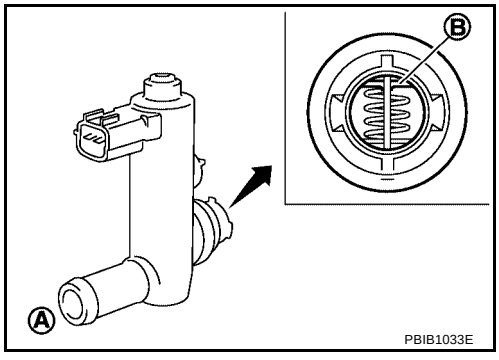
Component Inspection

UBS001NT

EVAP CANISTER VENT CONTROL VALVE

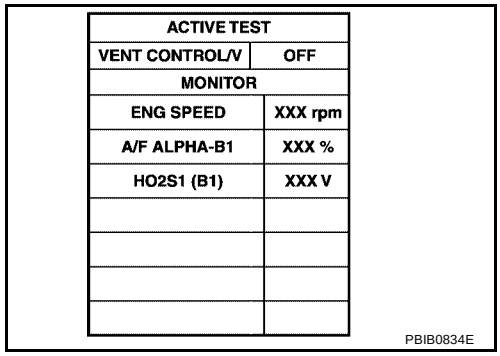
With CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

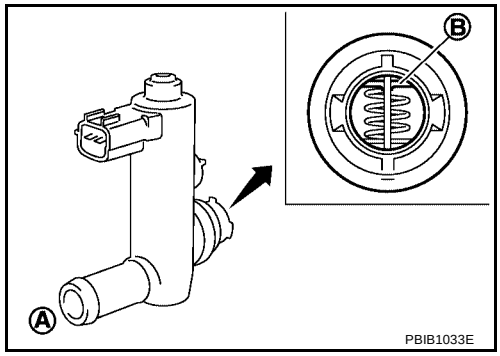


Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform step 5 again.

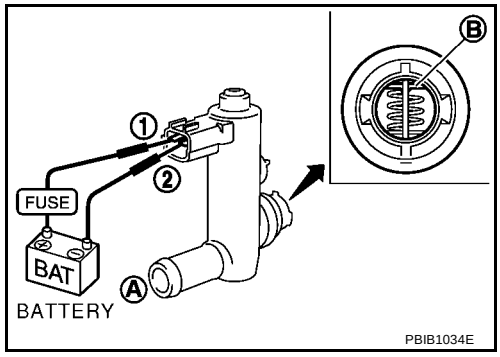
Without CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes



Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.

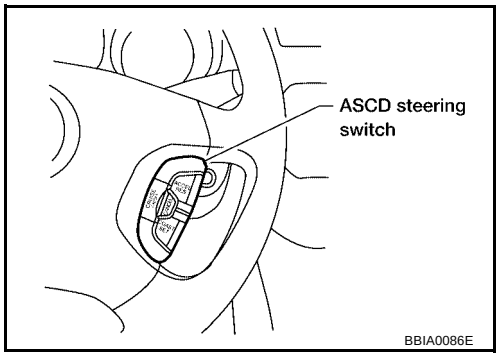
DTC P1564 ASCD STEERING SWITCH

PFP:25551

Component Description

UBS0040M

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to EC-598, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS0040N

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAIN SW	● Ignition switch: ON	CRUISE switch: Depressed	ON
		CRUISE switch: Released	OFF
CANCEL SW	● Ignition switch: ON	CANCEL switch: Depressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	ACCEL/RES switch: Depressed	ON
		ACCEL/RES switch: Released	OFF
SET SW	● Ignition switch: ON	COAST/SET switch: Depressed	ON
		COAST/SET switch: Released	OFF

On Board Diagnosis Logic

UBS0040O

This self-diagnoses has the one trip detection logic.
The MIL will not light up for this diagnosis.

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-372.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1564 1564	ASCD steering switch	● An excessively high voltage signal from the ASCD steering switch is sent to ECM. ● ECM detects that input signal from the ASCD steering switch is out of the specified range. ● ECM detects that the ASCD steering switch is stuck ON.	● Harness or connectors (The switch circuit is open or shorted.) ● ASCD steering switch ● ECM

DTC Confirmation Procedure

UBS0040P

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 10 seconds.
4. Press “CRUISE” switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press “ACCEL/RES” switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press “COAST/SET” switch for at least 10 seconds, then release it and wait at least 10 seconds.

7. Press “CANCEL” switch for at least 10 seconds, then release it and wait at least 10 seconds.
8. If DTC is detected, go to EC-478, "Diagnostic Procedure" .

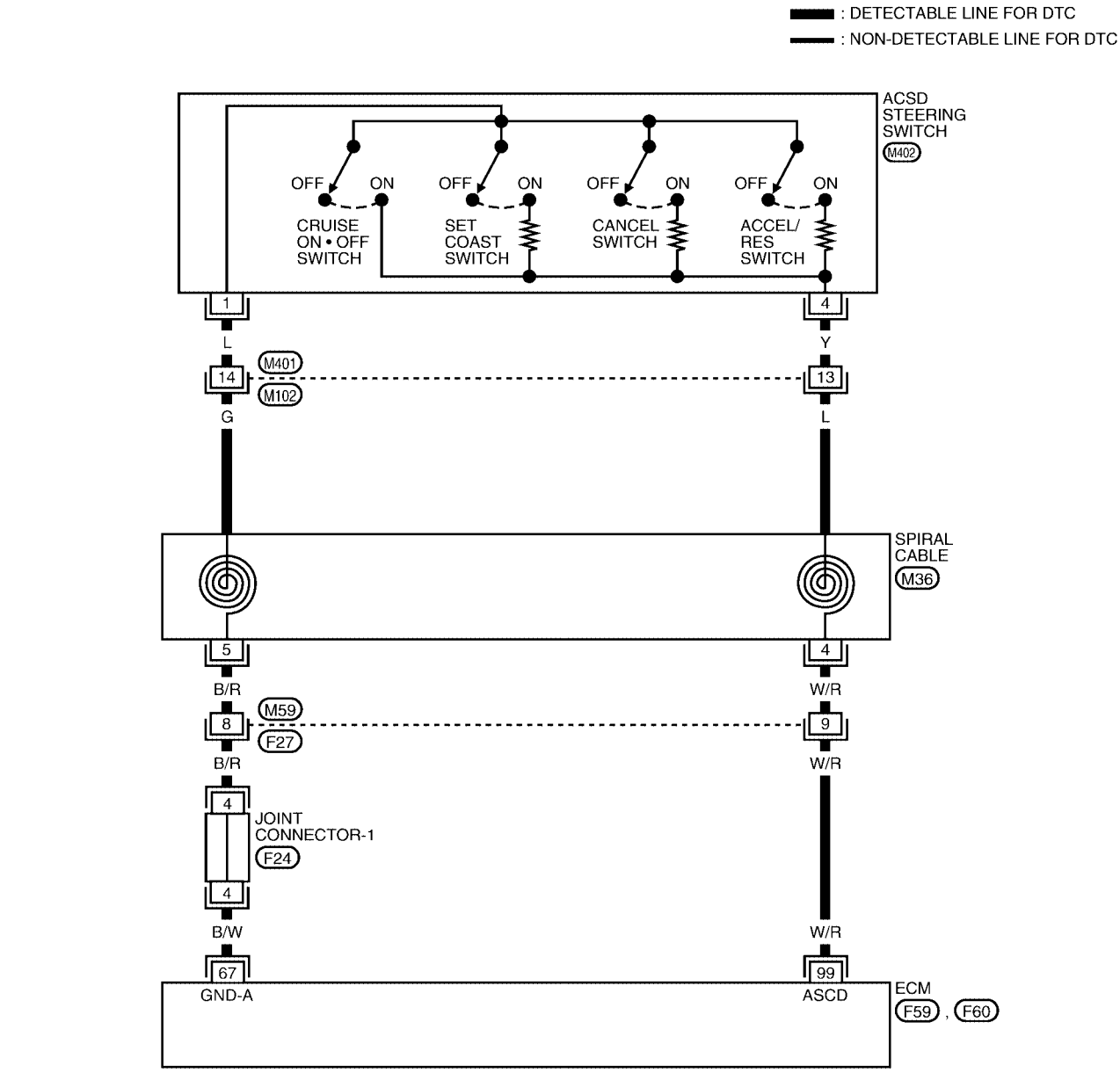
WITH GST

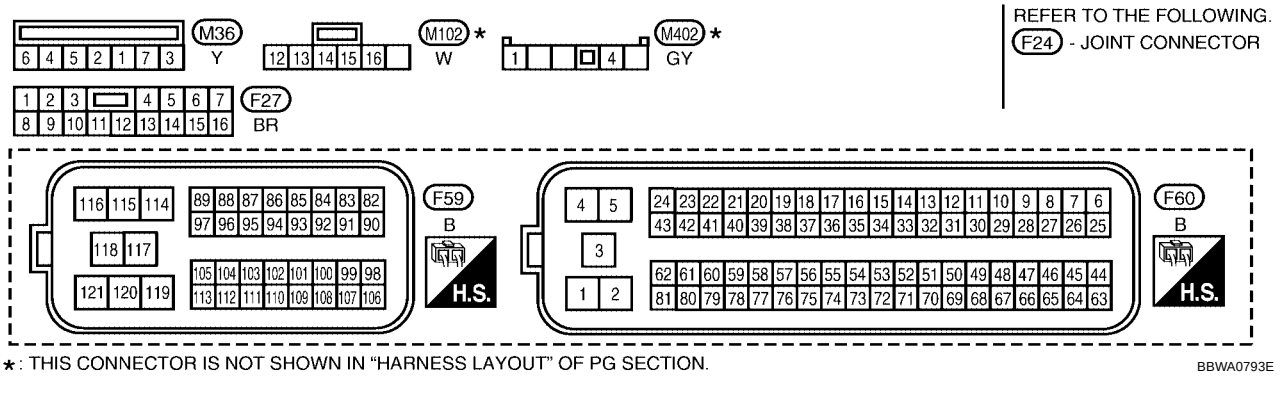
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0040Q

EC-ASC/SW-01





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" OF PG SECTION.

BBWA0793E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
67	B/W	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
99	W/R	ASCD steering switch	**[Ignition switch "ON"]** ● ASCD steering switch is "OFF".	Approximately 4V
			[Ignition switch "ON"] ● CRUISE switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1V
			[Ignition switch "ON"] ● COAST/SET switch is "ON".	Approximately 2V
			[Ignition switch "ON"] ● ACCEL/RESUME switch is "ON".	Approximately 3V

Diagnostic Procedure

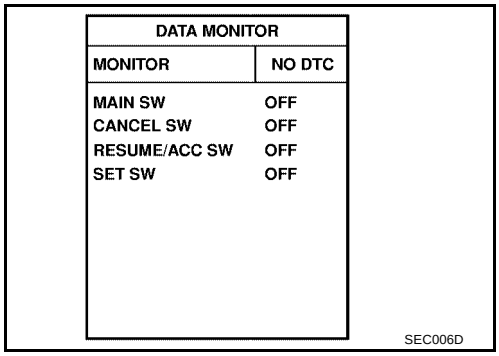
UBS0040R

1. CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “MAIN SW”, “RESUME/ACC SW”, “SET SW” and “CANCEL SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check each item indication under the following conditions.

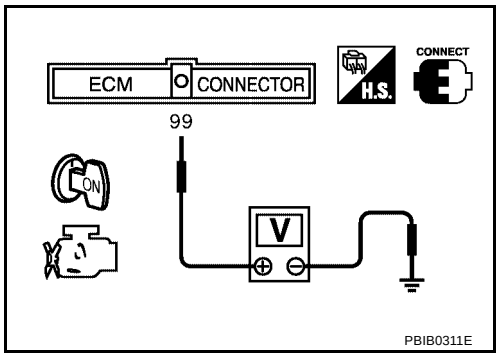
Switch	Monitor item	Condition	Indication
CRUISE	MAIN SW	Pressed	ON
		Released	OFF
COAST/SET	SET SW	Pressed	ON
		Released	OFF
ACCEL/RES	RESUME/ACC SW	Pressed	ON
		Released	OFF
CANCEL	CANCEL SW	Pressed	ON
		Released	OFF



Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 99 and ground with pressing each button.

Switch	Condition	Voltage [V]
CRUISE SW	Pressed	Approx. 0
	Released	Approx. 4
COAST/SET SW	Pressed	Approx. 2
	Released	Approx. 4
ACCEL/RES SW	Pressed	Approx. 3
	Released	Approx. 4
CANCEL SW	Pressed	Approx. 1
	Released	Approx. 4



OK or NG

OK >> GO TO 7.
NG >> GO TO 2.

2. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

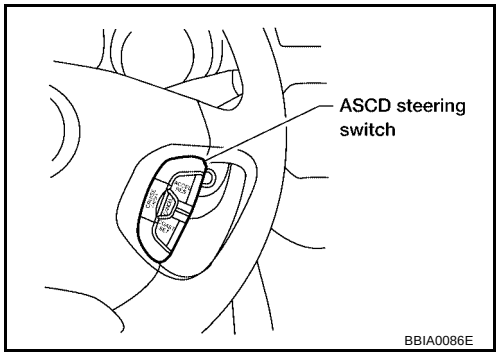
1. Turn ignition switch “OFF”.
2. Disconnect ASCD steering switch harness connector.
3. Check harness continuity between ASCD steering switch terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors M401, M102
- Joint connector-1
- Spiral cable
- Harness for open and short between ECM and ASCD steering switch

>> Repair open circuit or short to power in harness or connectors.

4. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 99 and ASCD steering switch terminal 4. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors M401, M102
- Spiral cable
- Harness for open and short between ECM and ASCD steering switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD STEERING SWITCH

Refer to EC-480, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace steering wheel.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

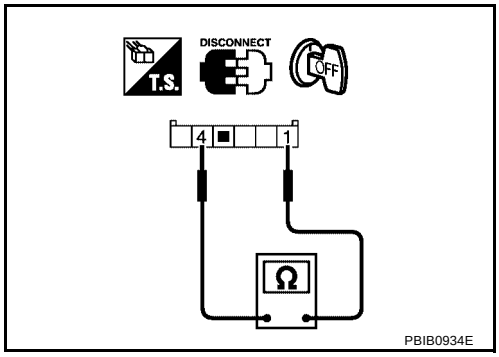
>> **INSPECTION END**

Component Inspection

UBS0040S

ASCD STEERING SWITCH

1. Disconnect ASCD steering switch.
2. Check continuity between ASCD steering switch terminals 1 and 4 with pushing each switch.



Switch	Condition	Resistance [kΩ]
CRUISE SW	Pressed	Approx. 0
	Released	Approx. 4.0
COAST/SET SW	Pressed	Approx. 0.7
	Released	Approx. 4.0
ACCEL/RES SW	Pressed	Approx. 1.5
	Released	Approx. 4.0
CANCEL SW	Pressed	Approx. 0.3
	Released	Approx. 4.0

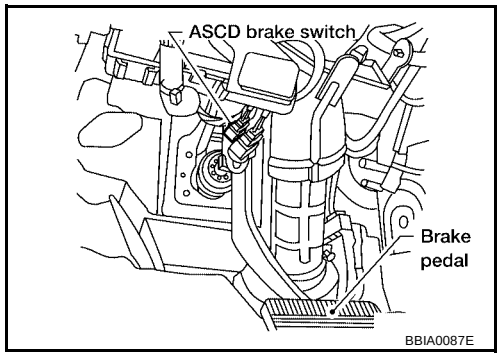
DTC P1572 ASCD BRAKE SWITCH

PFP:25320

Component Description

UBS0040T

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to EC-598, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS0040U

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW 1 (ASCD brake switch)	● Ignition switch: ON	● Brake pedal fully released	ON
		● Brake pedal depressed	OFF
BRAKE SW 2 (stop lamp switch)	● Ignition switch: ON	● Brake pedal fully released	OFF
		● Brake pedal depressed	ON

On Board Diagnosis Logic

UBS0040V

This self-diagnosis has the one trip detection logic.
The MIL will not light up for this diagnosis.

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-372**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfuntion A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition		Possible Cause
P1572 1572	ASCD brake switch	A)	● When the vehicle speed is above 30km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to ECM at the same time.	● Harness or connectors (The stop lamp switch circuit is shorted.) ● Harness or connectors (The ASCD brake switch circuit is shorted.) ● Harness or connectors (The ASCD clutch switch circuit is shorted.) (M/T models) ● Stop lamp switch ● ASCD brake switch ● ASCD clutch switch (M/T models) ● Incorrect stop lamp switch installation ● Incorrect ASCD brake switch installation ● Incorrect ASCD clutch switch installation (M/T models) ● ECM
		B)	● ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is driving	

DTC Confirmation Procedure

UBS0040W

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
- Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.

TESTING CONDITION:

Steps 4 and 5 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

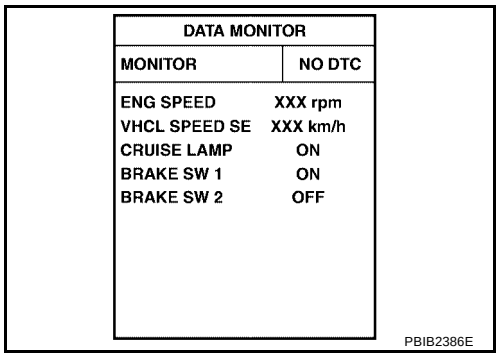
WITH CONSULT-II

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Press CRUISE switch and make sure that CRUISE indicator lights up.
4. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position

If 1st trip DTC is detected, go to EC-484, "Diagnostic Procedure" .

If 1st trip DTC is not detected, go to the following step.



5. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned vehicle speed.

6. If 1st trip DTC is detected, go to EC-484, "Diagnostic Procedure" .

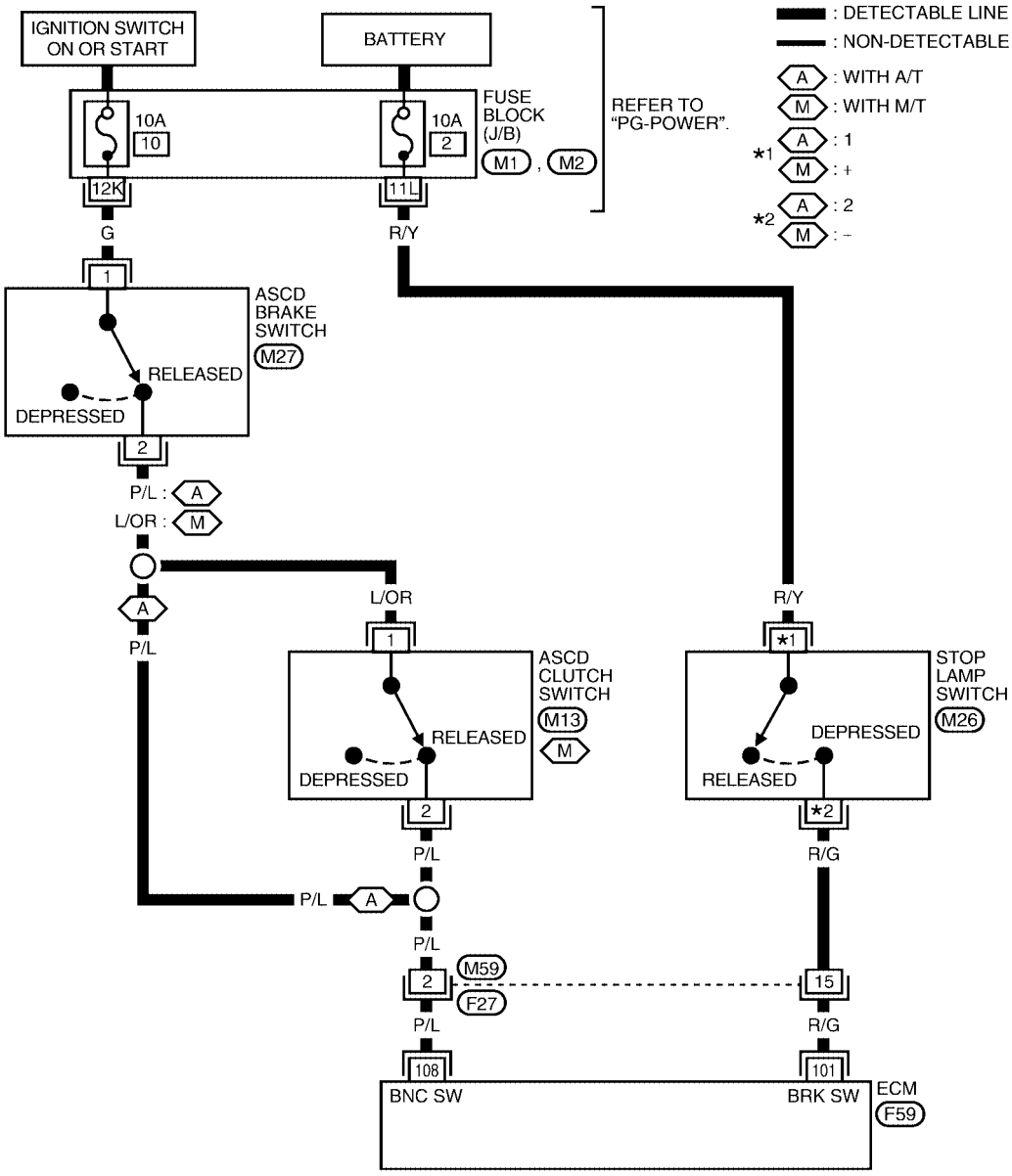
WITH GST

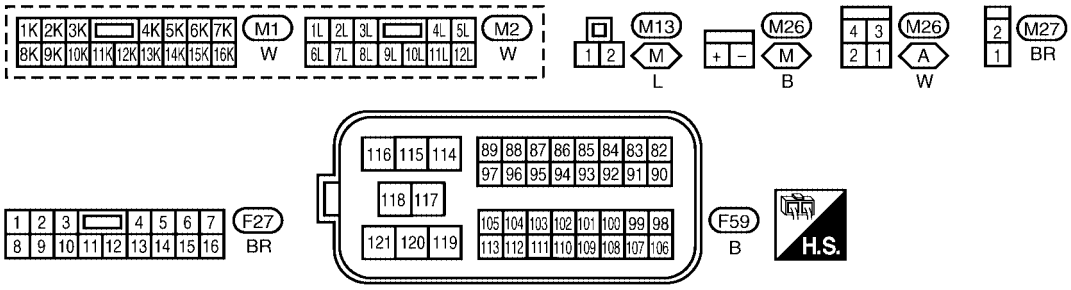
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0040X

EC-ASC/BS-01





BBWA0303E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal is fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is depressed	BATTERY VOLTAGE (11 - 14V)
108	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS0040Y

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

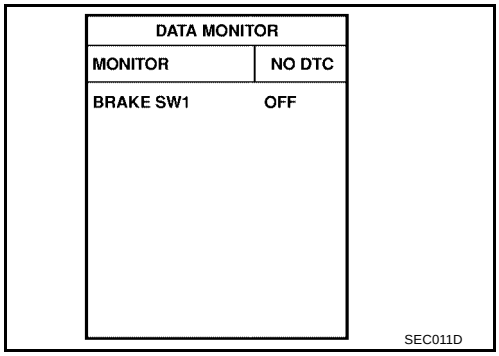
1. Turn ignition switch "ON".
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-II.
3. Check "BRAKE SW1" indication under the following conditions.

M/T models

CONDITION	INDICATION
When clutch pedal or brake pedal is depressed	OFF
When clutch pedal and brake pedal are fully released	ON

A/T models

CONDITION	INDICATION
When brake pedal is depressed	OFF
When brake pedal is fully released	ON



Without CONSULT-II

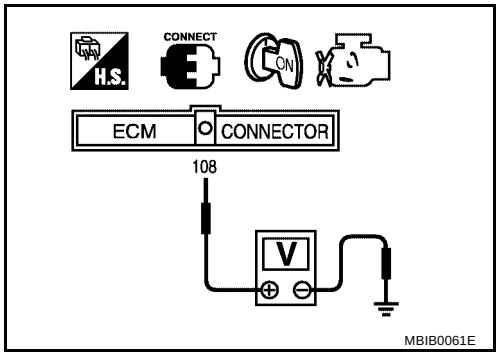
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 108 and ground under the following conditions.

M/T models

CONDITION	VOLTAGE
When clutch pedal or brake pedal is depressed	Approximately 0V
When clutch pedal and brake pedal are fully released	Battery voltage

A/T models

CONDITION	VOLTAGE
When brake pedal is depressed	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

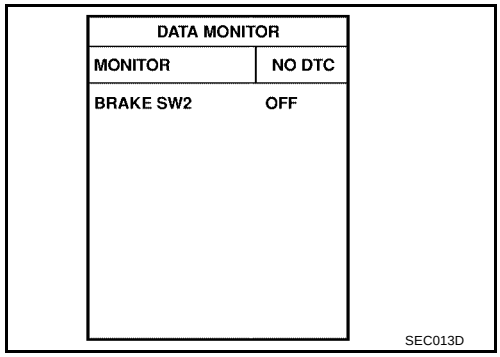
OK >> GO TO 2.
NG (M/T models) >>GO TO 3.
NG (A/T models) >>GO TO 4.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

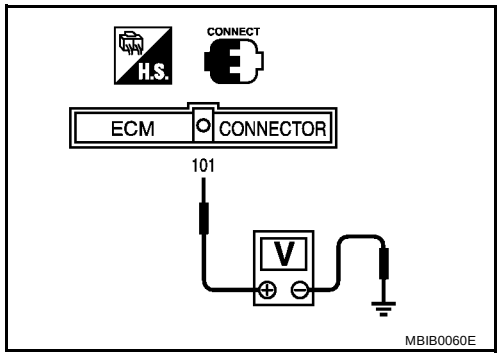
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

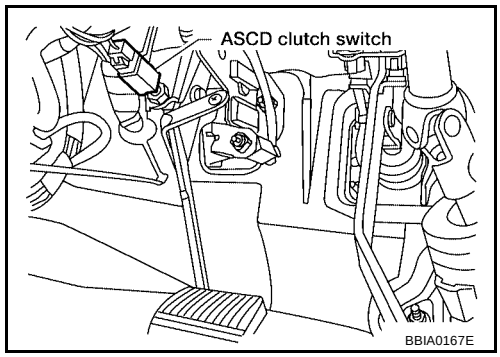


OK or NG

OK >> GO TO 18.
NG >> GO TO 13.

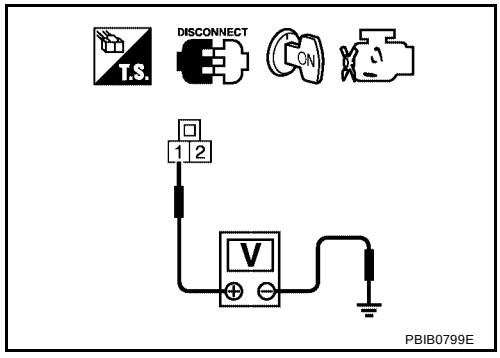
3. CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-II or tester.

CONDITION	VOLTAGE
When brake pedal is released	Battery voltage
When brake pedal is depressed	Approx. 0V

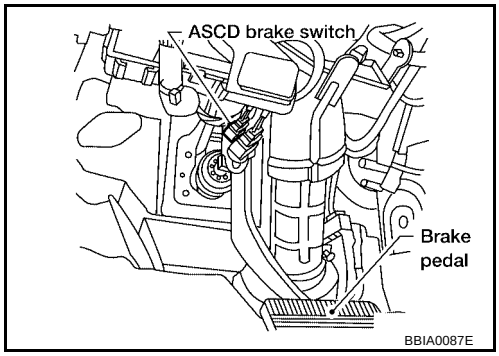


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

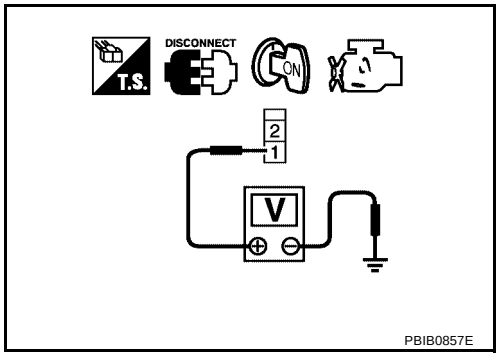
4. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK (M/T models)>>GO TO 6.
OK (A/T models)>>GO TO 7.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ASCD BRAKE SWITCH

Refer to EC-489, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD brake switch.

10. CHECK ASCD CLUTCH SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD clutch switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD clutch switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

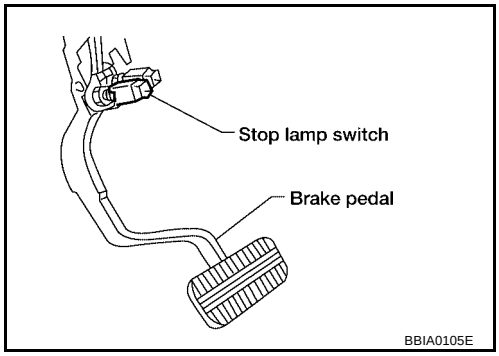
Refer to EC-489, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD clutch switch.

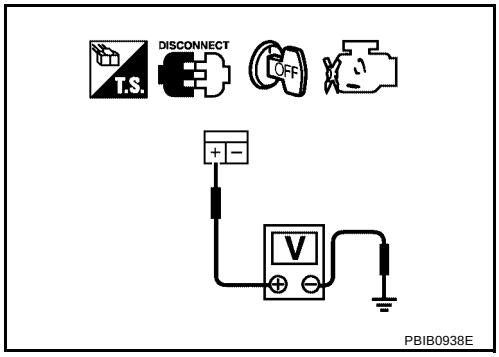
13. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

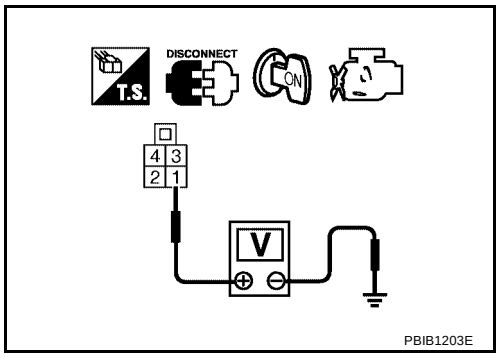
1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal **+** (M/T models) or 1 (A/T models) and ground with CONSULT-II or tester.

Voltage: Battery voltage





OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal – (M/T models) or 2 (A/T models).
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK STOP LAMP SWITCH

Refer to EC-489, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace stop lamp switch.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

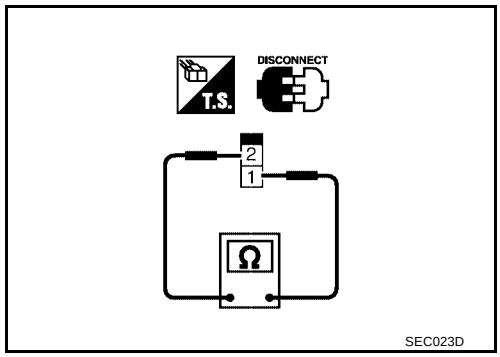
UBS0040Z

ASCD BRAKE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Check harness continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should exist.
When brake pedal is depressed.	Should not exist.

If NG, adjust ASCD brake switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.



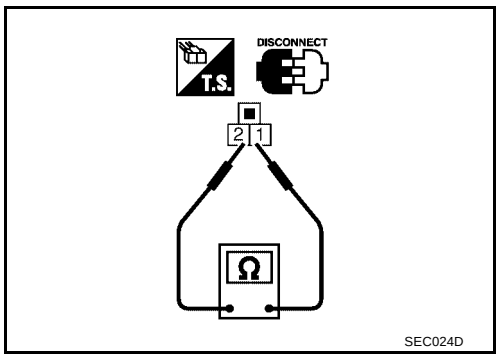
ASCD CLUTCH SWITCH (FOR M/T MODELS)

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.

3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When clutch pedal is fully released.	Should exist.
When clutch pedal is depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to CL-6, "CLUTCH SYSTEM" , and perform step 3 again.



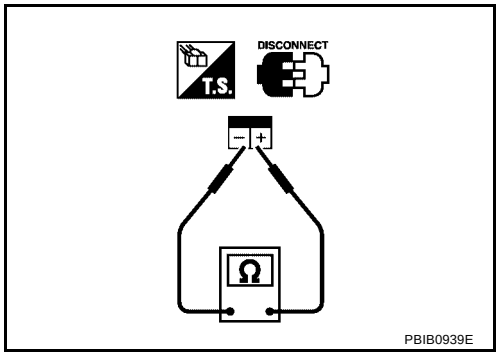
STOP LAMP SWITCH

M/T Models

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals + and – under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.

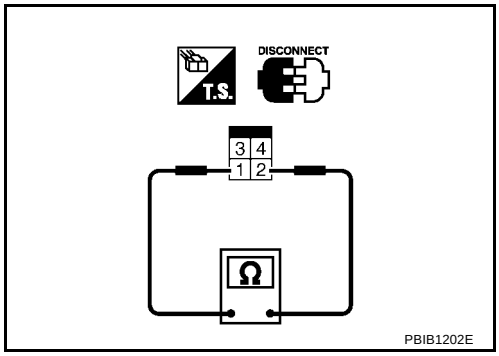


A/T Models

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.



DTC P1574 ASCD VEHICLE SPEED SENSOR

PFP:31036

Component Description

UBS00410

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to EC-598, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for ASCD functions.

On Board Diagnosis Logic

UBS00411

This self-diagnosis has the one trip detection logic.
The MIL will not light up for this diagnosis.

NOTE:

- **If DTC P1574 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE" .**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-361, "DTC P0500 VSS"**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-372, "DTC P0605 ECM"**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1574 1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	● Harness or connectors (The CAN communication line is open or shorted.) ● Combination meter ● Wheel sensor ● TCM ● ECM

DTC Confirmation Procedure

UBS00412

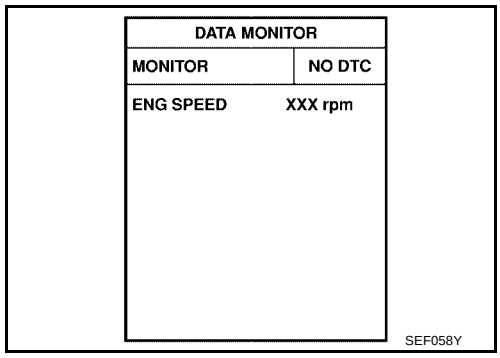
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Step 3 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Drive the vehicle at more than 40 km/h (25 MPH).
4. If DTC is detected, go to EC-492, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS00413

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-38 .

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-8, "Combination Meter" .

>> **INSPECTION END**

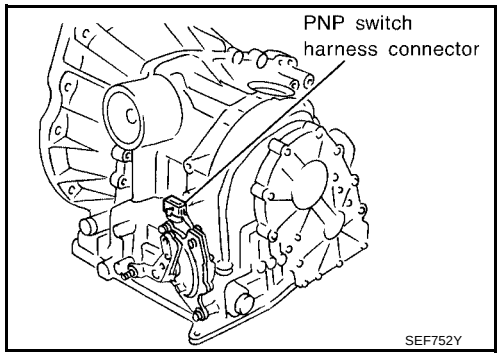
DTC P1706 PNP SWITCH

PFP:32006

Component Description

UBS001OU

When the gear position is “P” (A/T models only) or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the park/neutral position when continuity with ground exists.



CONSULT-II Reference Value in Data Monitor Mode

UBS001OV

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF

On Board Diagnosis Logic

UBS006HA

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706 1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	● Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.] ● Park/neutral position (PNP) switch

DTC Confirmation Procedure

UBS006IF

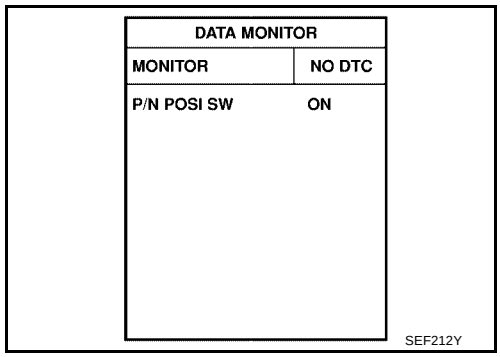
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II. Then check the “P/N POSI SW” signal under the following conditions.

Position (Selector lever)	Known-good signal
“N” and “P” position	ON
Except the above position	OFF

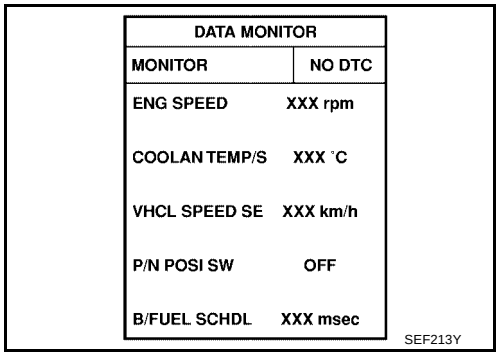


If NG, go to EC-496, "Diagnostic Procedure" .
If OK, go to following step.

3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and warm it up to normal operating temperature.

5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	More than 1,550 rpm (A/T models) More than 1,850 rpm (M/T models)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	More than 3.0 msec (A/T models) More than 2.2 msec (M/T models)
VHCL SPEED SE	More than 64 km/h (40 MPH)
Selector lever	Suitable position



6. If 1st trip DTC is detected, go to EC-496, "Diagnostic Procedure" .

Overall Function Check

UBS006IG

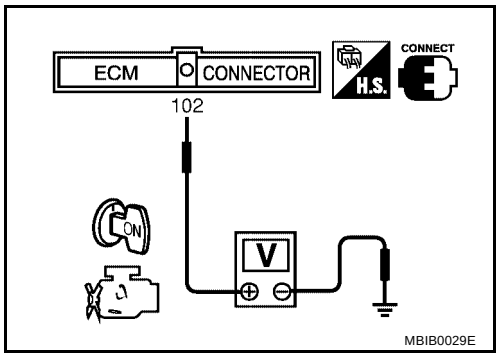
Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 102 (PNP switch signal) and ground under the following conditions.

Condition (Gear position)	Voltage V (Known-good data)
“P” (A/T models only) and “N” position	Approx. 0
Except the above position	A/T models: Battery voltage M/T models: Approximately 5V

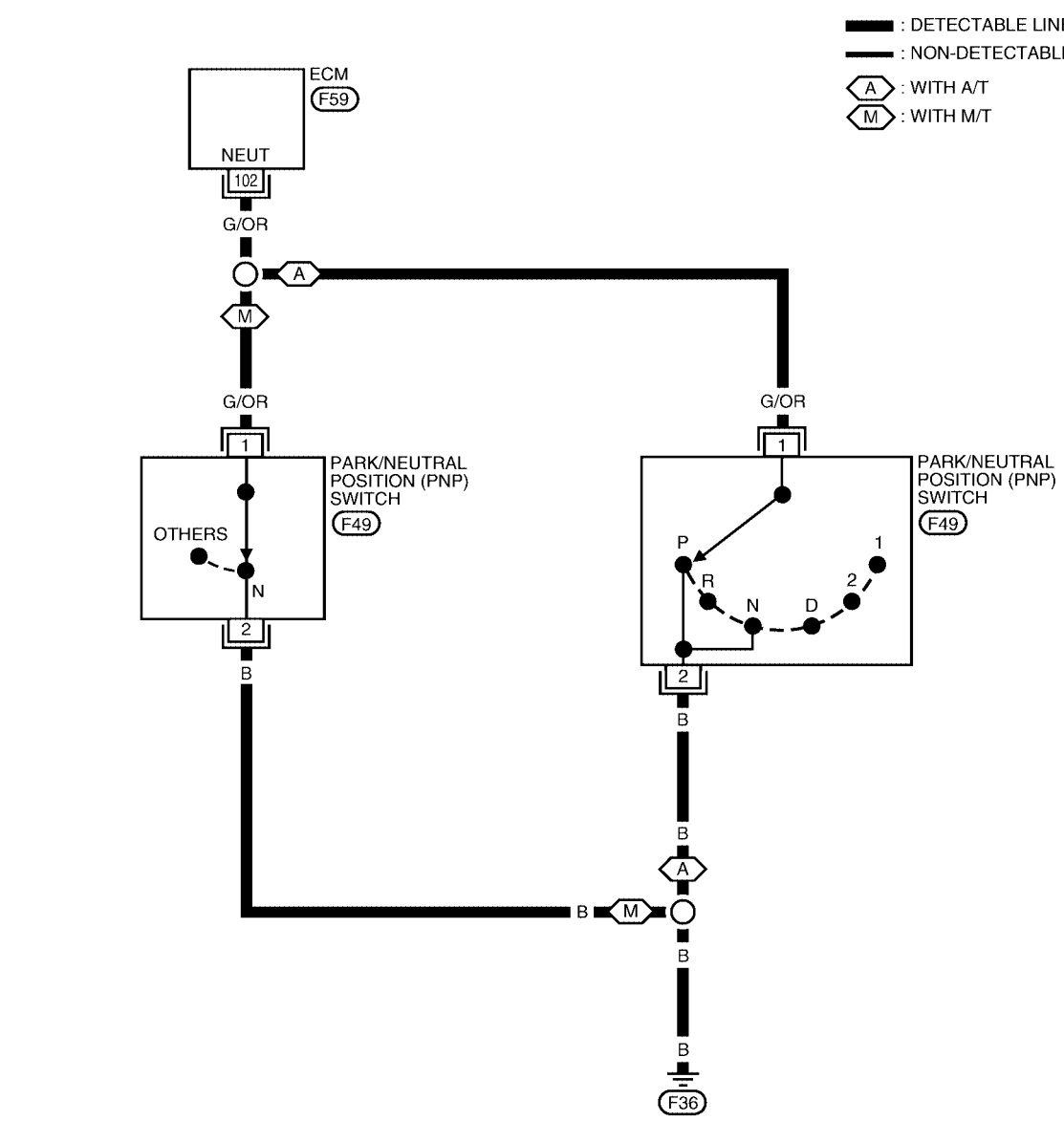
3. If NG, go to EC-496, "Diagnostic Procedure" .

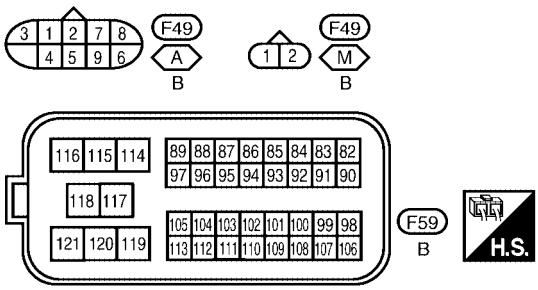


Wiring Diagram

UBS006IH

EC-PNP/SW-01





BBWA0304E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	G/OR	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models), "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

UBS006II

1. CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to power in harness or connectors.

2. CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and PNP switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK PNP SWITCH

Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" (A/T models), MT-13, "POSITION SWITCH" (M/T models).

OK or NG

OK >> GO TO 4.
NG >> Replace PNP switch.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

UBS00414

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

UBS00415

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

UBS00416

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

FALI-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

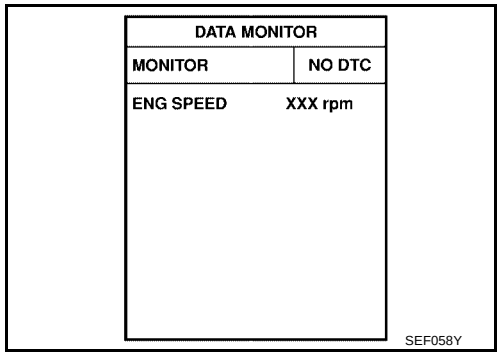
Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.	
	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

UBS00417

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-499, "Diagnostic Procedure"
.



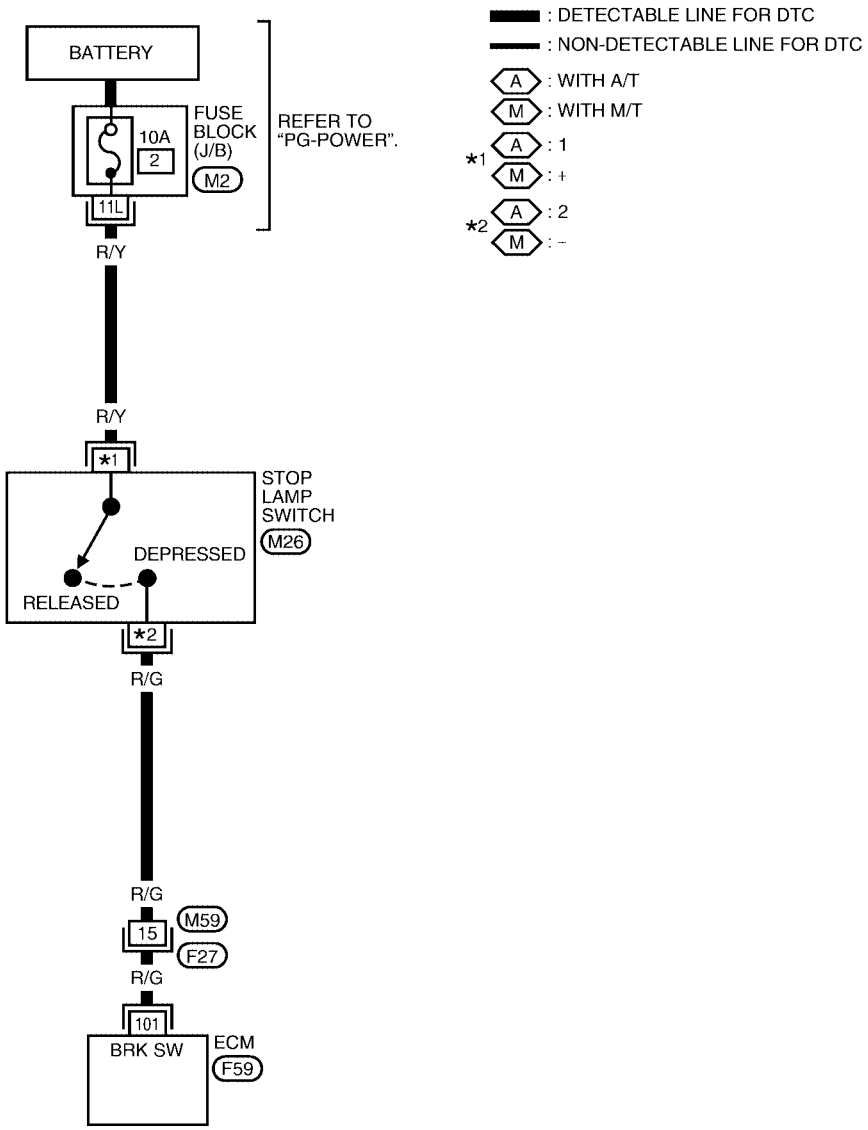
WITH GST

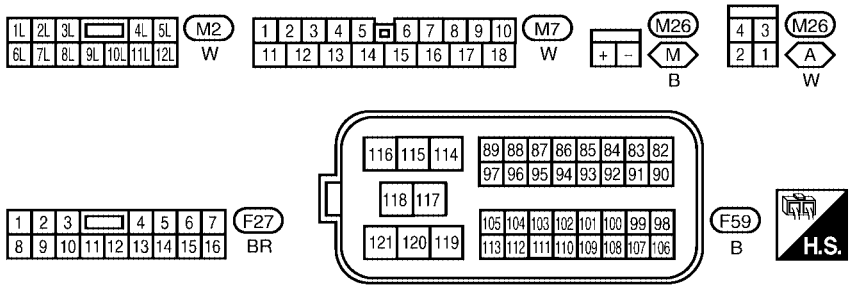
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS00418

EC-BRK/SW-01





BBWA0305E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal is fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS00419

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch "OFF".
2. Check the stop lamp when depressing and releasing the brake pedal.

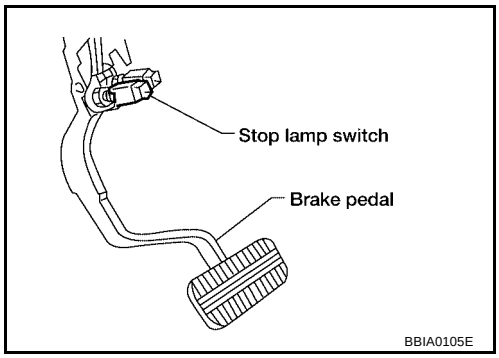
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

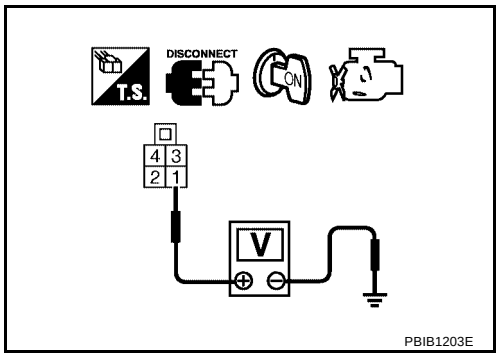
2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

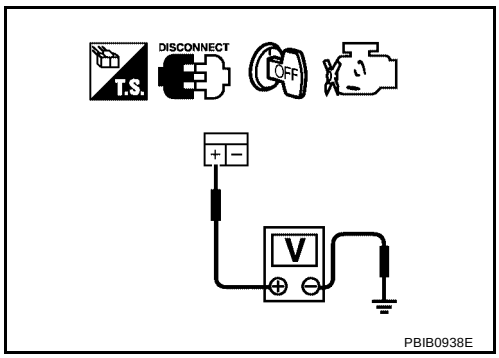
1. Disconnect stop lamp switch harness connector.



2. Check voltage between stop lamp switch terminal 1 (A/T models) or + (M/T models) and ground with CONSULT-II or tester.

Voltage: Battery voltage





OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

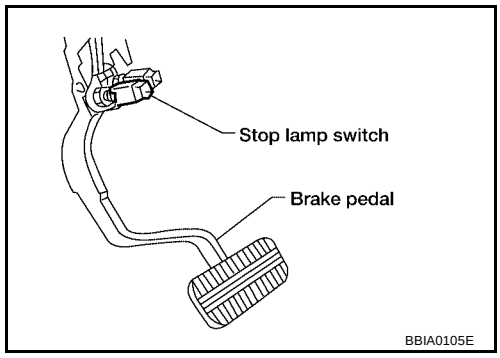
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.
4. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2 (A/T models) or - (M/T models). Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-501, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

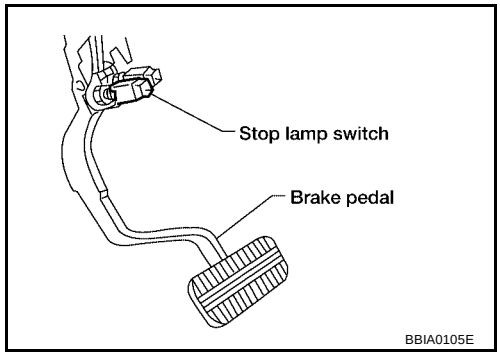
Component Inspection

UBS0041A

STOP LAMP SWITCH

A/T Models

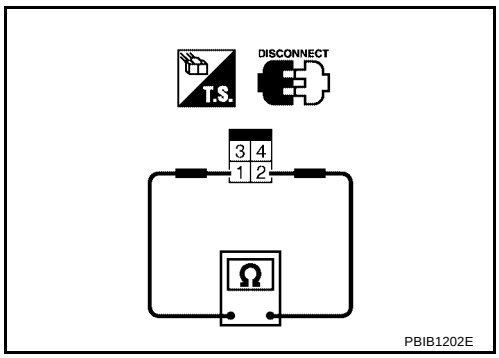
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

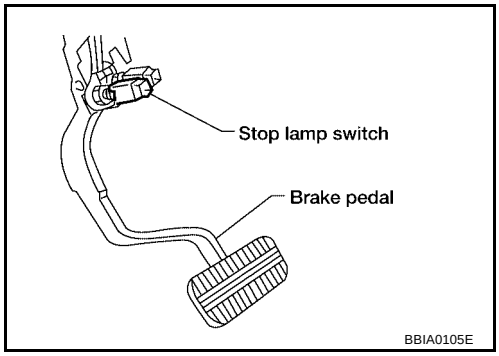
Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

3. If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 2 again.



M/T Models

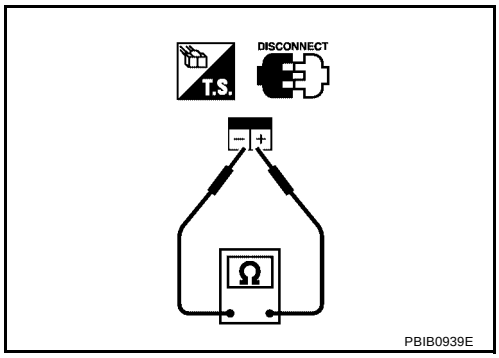
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals + and - under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

3. If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 2 again.



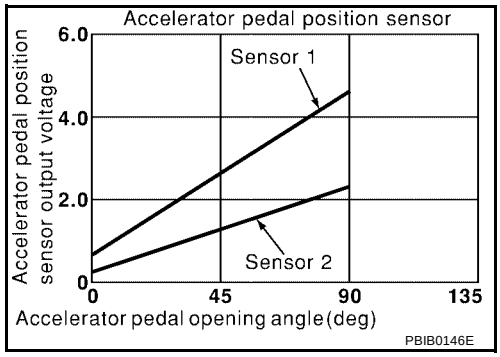
DTC P2122, P2123 APP SENSOR

PFP:18002

Component Description

UBS003ZC

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS003ZD

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87V
		Accelerator pedal: Fully depressed	More than 4.3V
ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96V
		Accelerator pedal: Fully depressed	More than 4.0V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal

On Board Diagnosis Logic

UBS003ZE

These self-diagnoses have the one trip detection logic.

NOTE:
If DTC P2122 or P2123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-455, "DTC P1229 SENSOR POWER SUPPLY" .

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122 2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P2123 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

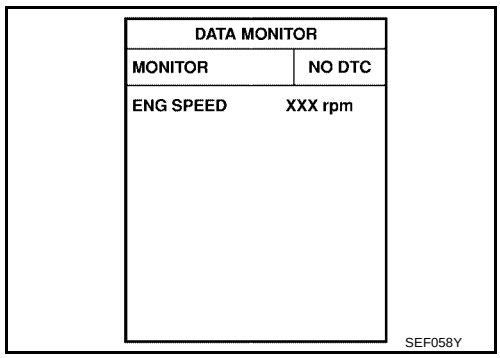
UBS003ZF

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-507, "Diagnostic Procedure" .



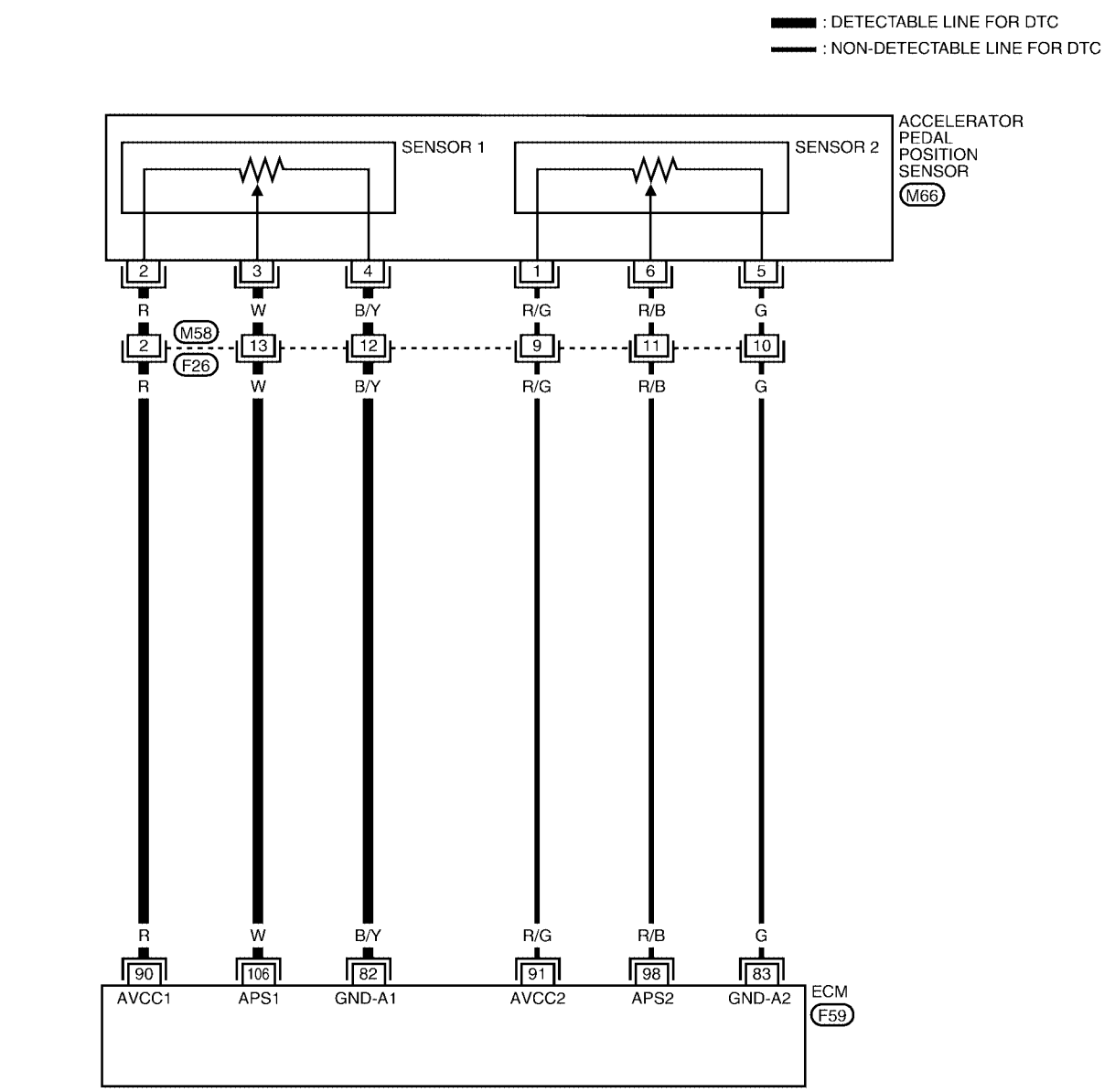
WITH GST

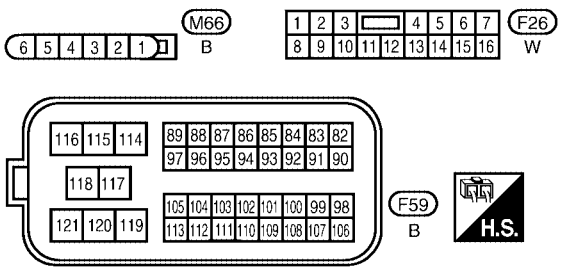
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003ZG

EC-APPS1-01





BBWA0306E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B/Y	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	G	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.28 - 0.48V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 2.0V
106	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.65 - 0.87V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 4.3V

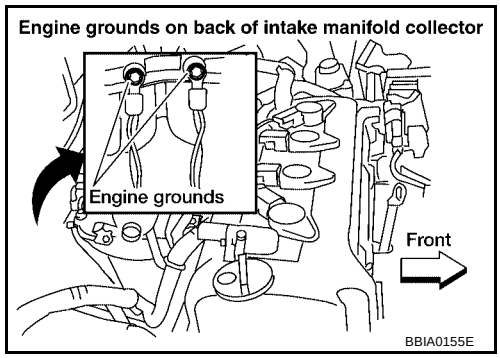
Diagnostic Procedure

UBS003ZH

1. RETIGHTEN GROUND SCREWS

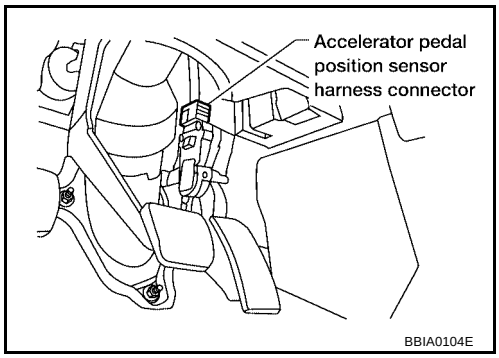
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



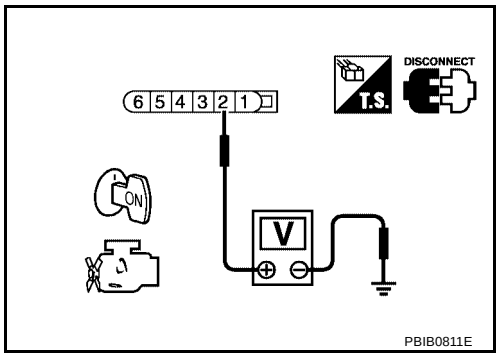
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between APP sensor terminal 4 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 106 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-509, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

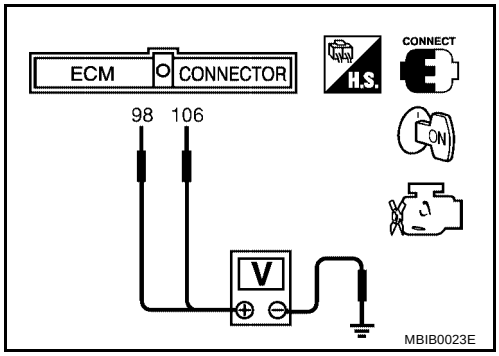
UBS003ZI

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.

3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



4. If NG, replace accelerator pedal assembly.
5. Perform EC-52, "Accelerator Pedal Released Position Learning" .
6. Perform EC-53, "Throttle Valve Closed Position Learning" .
7. Perform EC-53, "Idle Air Volume Learning" .

Removal and Installation

UBS003ZJ

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

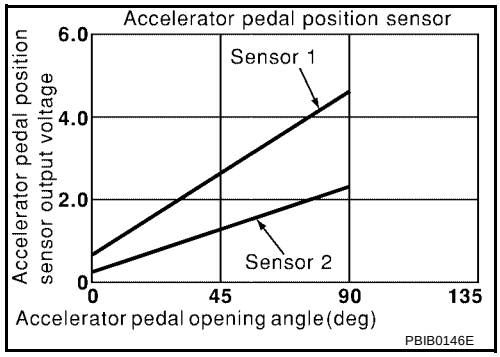
DTC P2127, P2128 APP SENSOR

PFP:18002

Component Description

UBS0040A

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS0040B

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87V
		Accelerator pedal: Fully depressed	More than 4.3V
ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96V
		Accelerator pedal: Fully depressed	More than 4.0V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS0040C

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1227 1227	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) (TP sensor circuit is shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2) ● Electric throttle control actuator (TP sensor 1 and 2)
P1228 1228	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

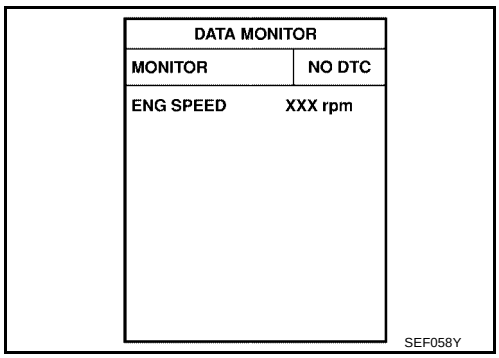
DTC Confirmation Procedure

UBS0040D

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-514, "Diagnostic Procedure" .

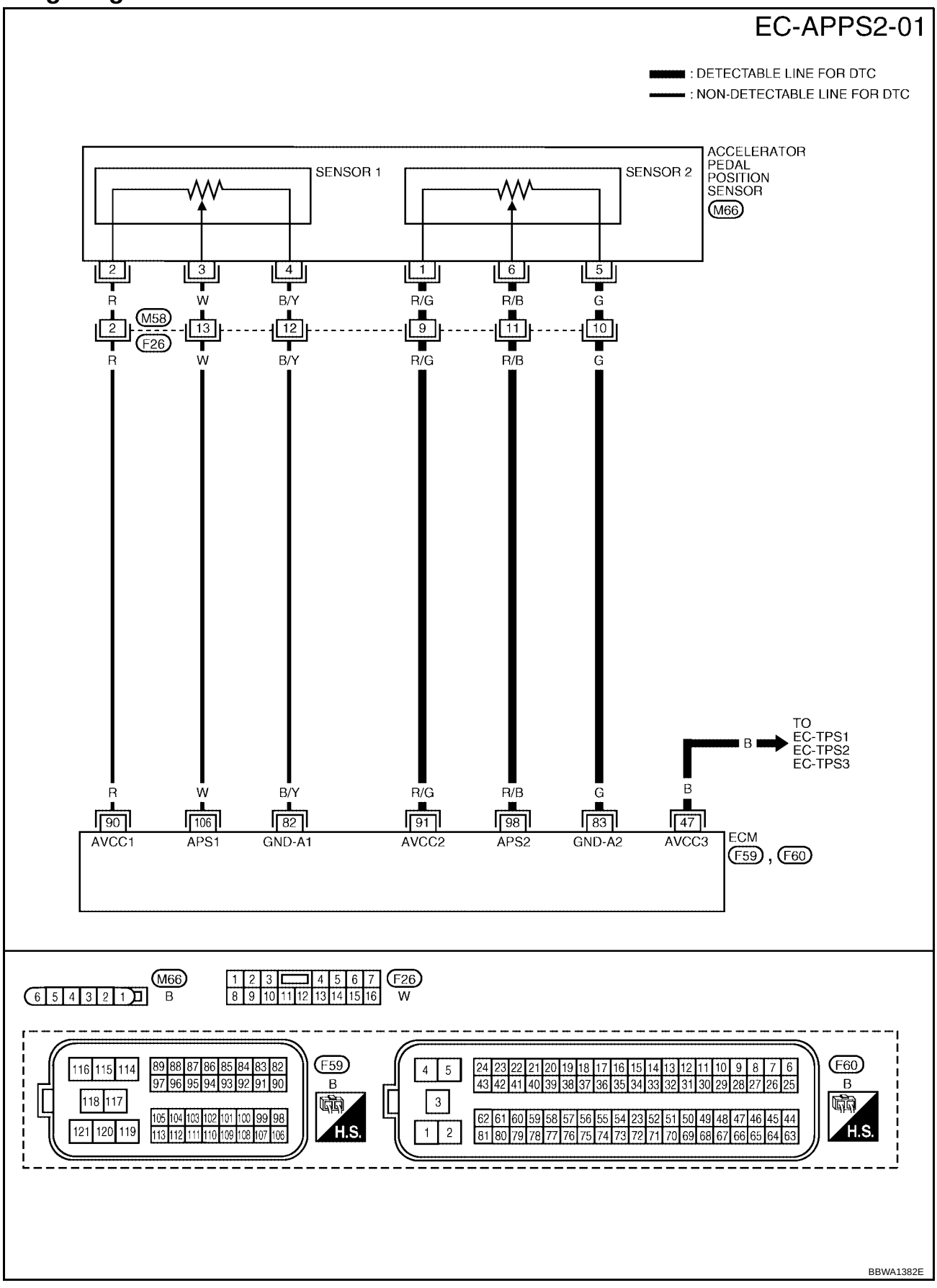


WITH GST

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS0040E



BBWA1382E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
82	B/Y	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	G	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.28 - 0.48V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 2.0V
106	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.65 - 0.87V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 4.3V

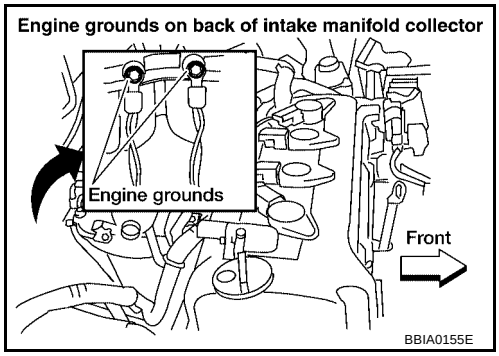
Diagnostic Procedure

UBS0040F

1. RETIGHTEN GROUND SCREWS

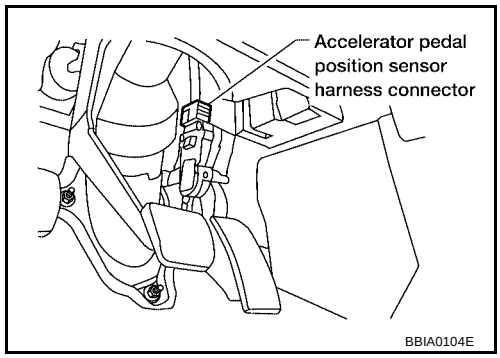
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



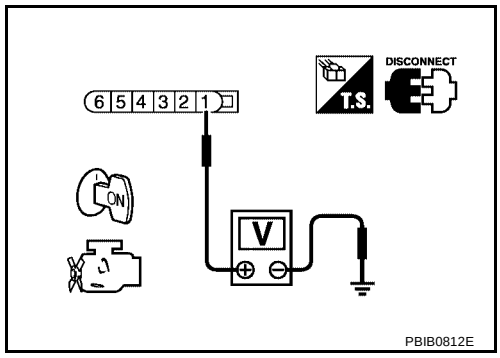
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 2.5V



OK or NG

OK >> GO TO 8.
NG >> GO TO 3.

3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 1 and ECM terminal 91. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open between ECM and accelerator pedal position sensor

>> Repair or replace open circuit.

5. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
91	APP sensor terminal 1	EC-513
47	Electric throttle control actuator terminal 1	EC-188

OK or NG

OK >> GO TO 6.
NG >> Repair short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR

Refer to EC-192, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> GO TO 7.

7. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

8. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECM terminal 83 APP sensor terminal 5.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK APP SENSOR

Refer to EC-517, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

14. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

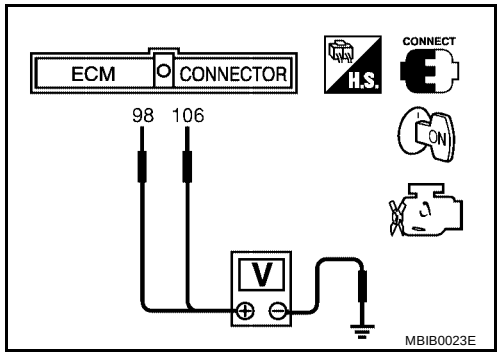
>> **INSPECTION END**

Component Inspection

UBS0040G

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V

4. If NG, replace accelerator pedal assembly.
5. Perform EC-52, "Accelerator Pedal Released Position Learning" .
6. Perform EC-53, "Throttle Valve Closed Position Learning" .
7. Perform EC-53, "Idle Air Volume Learning" .

Removal and Installation

UBS0040H

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

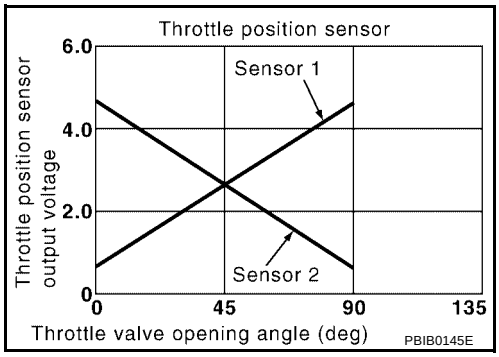
DTC P2135 TP SENSOR

PFP:16119

Component Description

UBS003R3

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS003R4

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS003R5

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0221 0221	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) (APP sensor circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2) ● Accelerator pedal position sensor (APP sensor 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

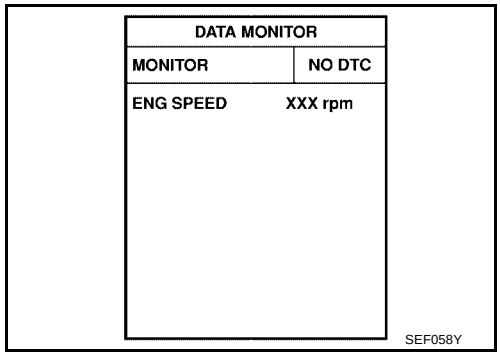
UBS003R6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-521, "Diagnostic Procedure" .



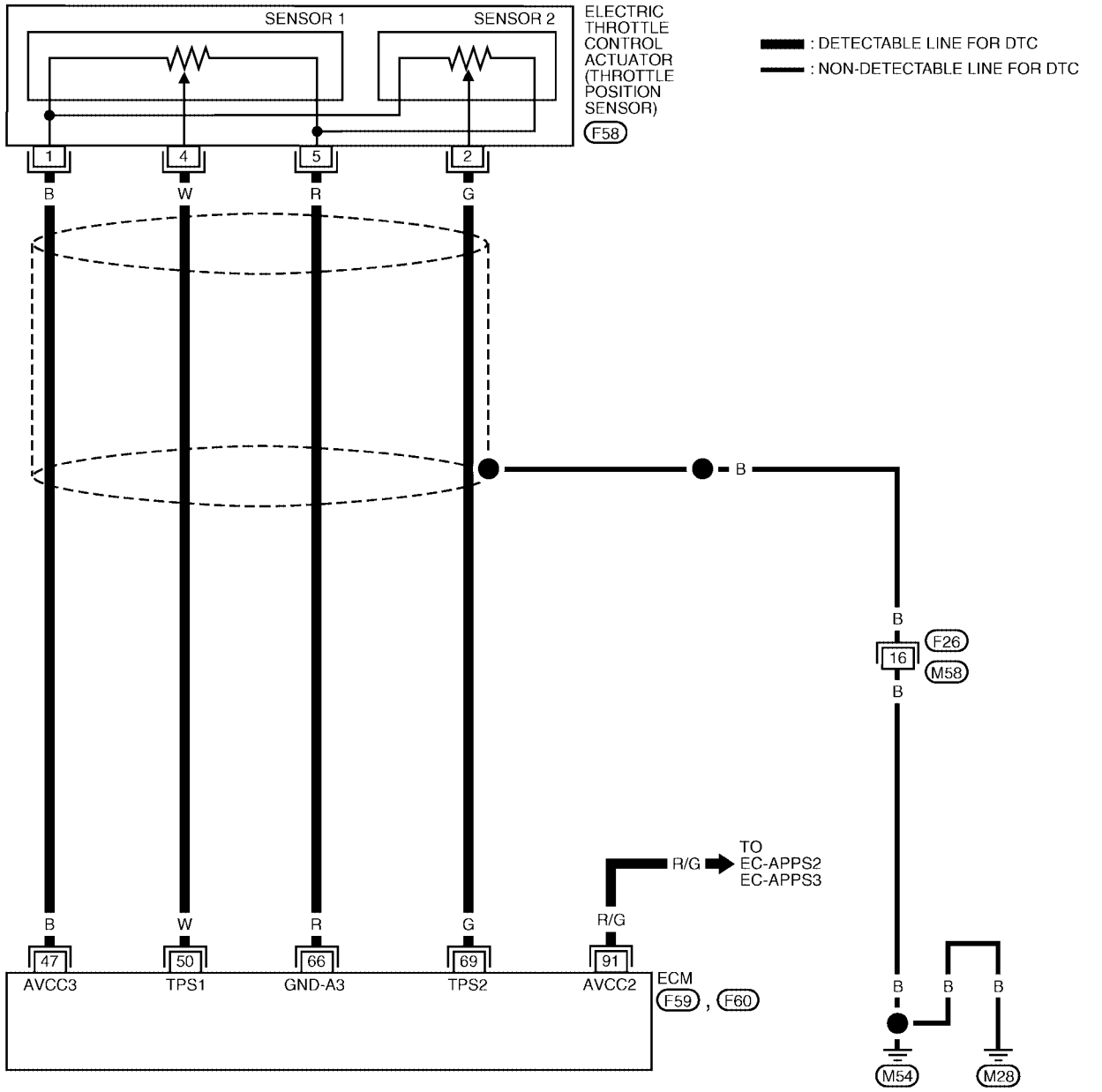
WITH GST

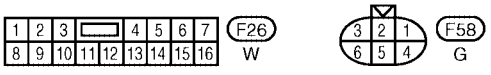
Follow the procedure “WITH CONSULT-II” above.

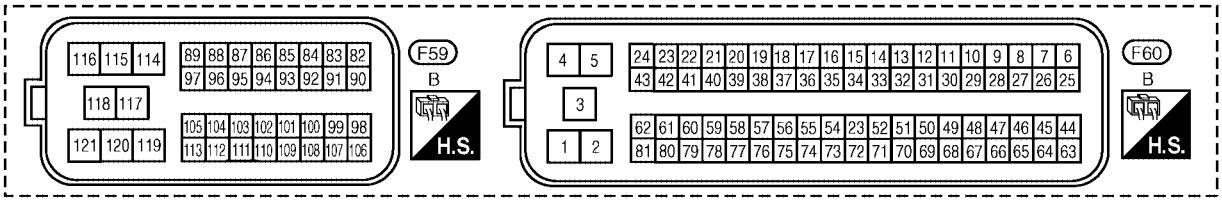
Wiring Diagram

UBS003R7

EC-TPS3-01







BBWA1383E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	R	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V

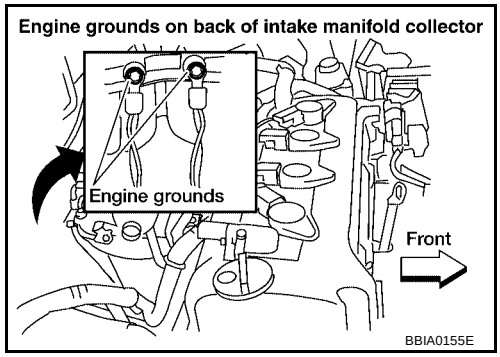
Diagnostic Procedure

UBS003R8

1. RETIGHTEN GROUND SCREWS

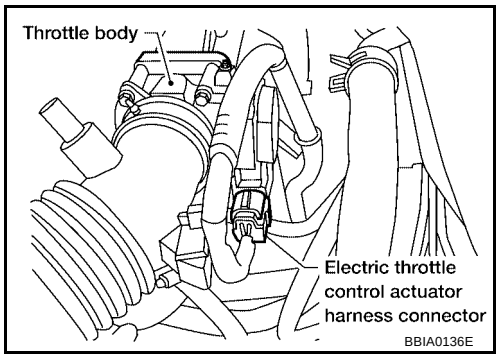
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



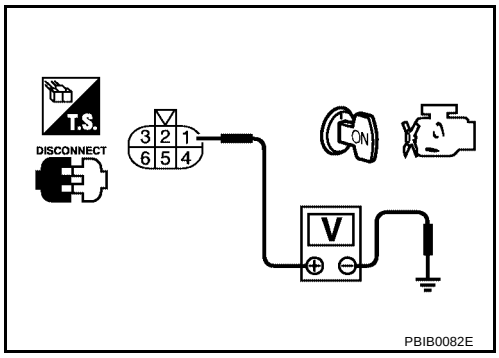
2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace open circuit.

4. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-520
91	APP sensor terminal 1	EC-513

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-517 .

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 4, ECM terminal 69 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to EC-524, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

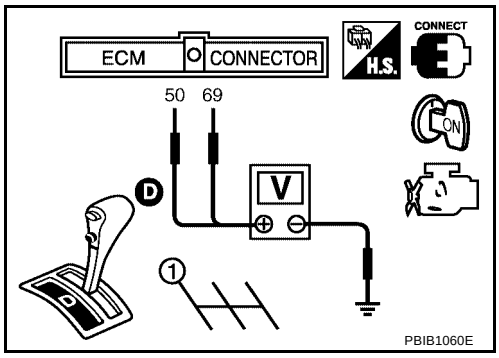
>> **INSPECTION END**

Component Inspection

UBS003R9

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 50 (TP sensor 1 signal), 69 (TP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-53, "Throttle Valve Closed Position Learning" .
8. Perform EC-53, "Idle Air Volume Learning" .

Remove and Installation

UBS003RA

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

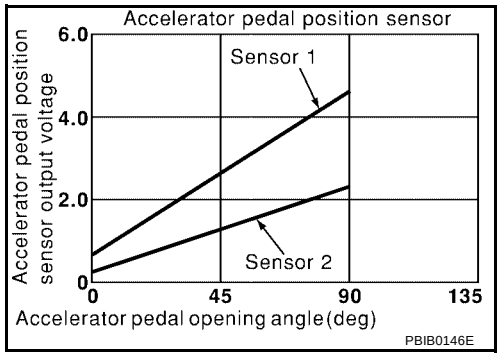
DTC P2138 APP SENSOR

PFP:18002

Component Description

UBS003Z4

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

UBS003Z5

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87V
		Accelerator pedal: Fully depressed	More than 4.3V
ACCEL SEN2*	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96V
		Accelerator pedal: Fully depressed	More than 4.0V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS003Z6

This self-diagnosis has the one trip detection logic.

NOTE:
If DTC P2138 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-455

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0226 0226	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) (TP sensor circuit is shorted) ● Accelerator pedal position sensor 1 and 2 ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

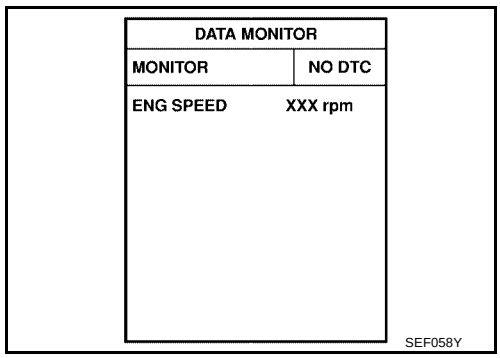
DTC Confirmation Procedure

UBS003Z7

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-529, "Diagnostic Procedure" .



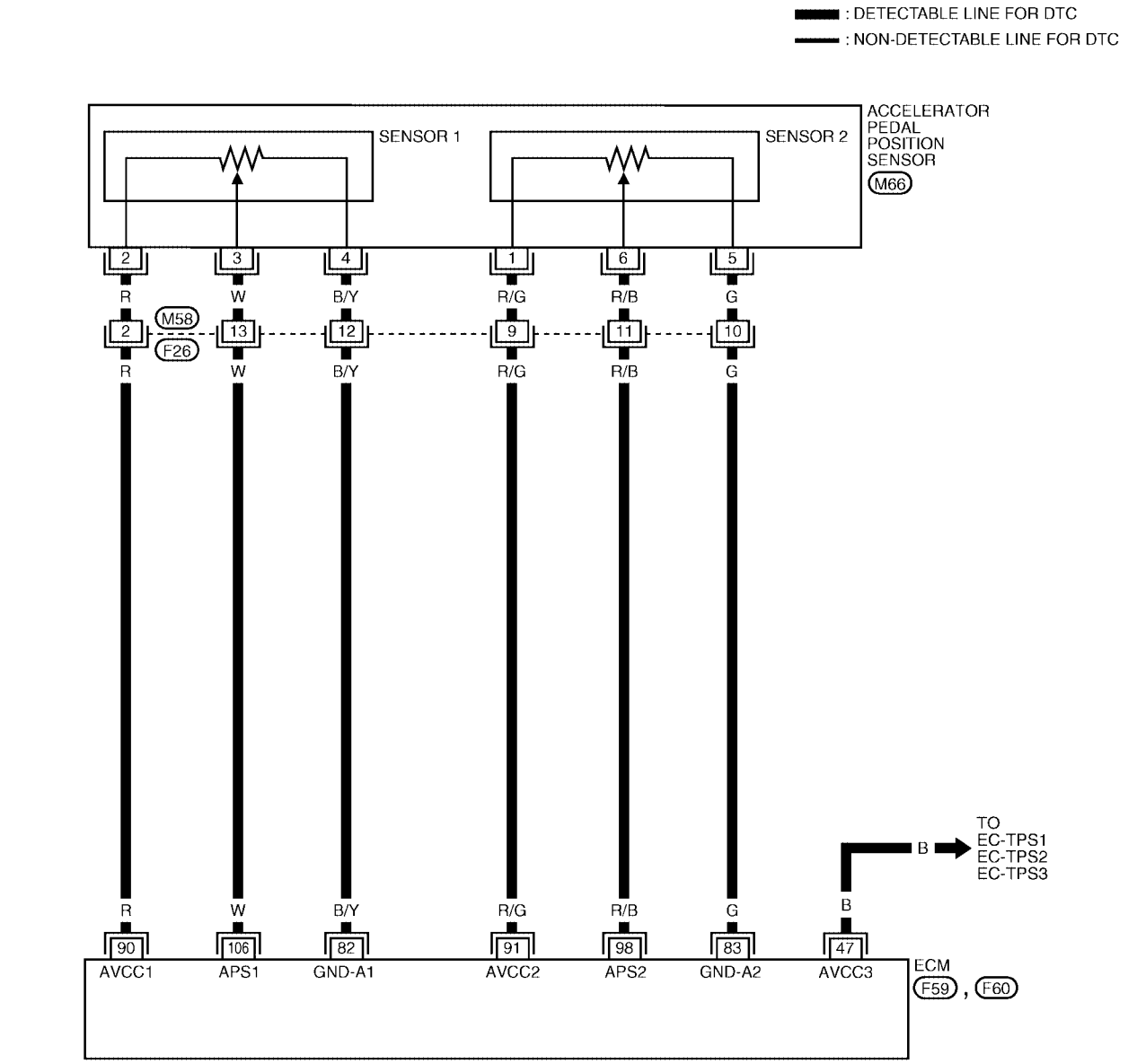
WITH GST

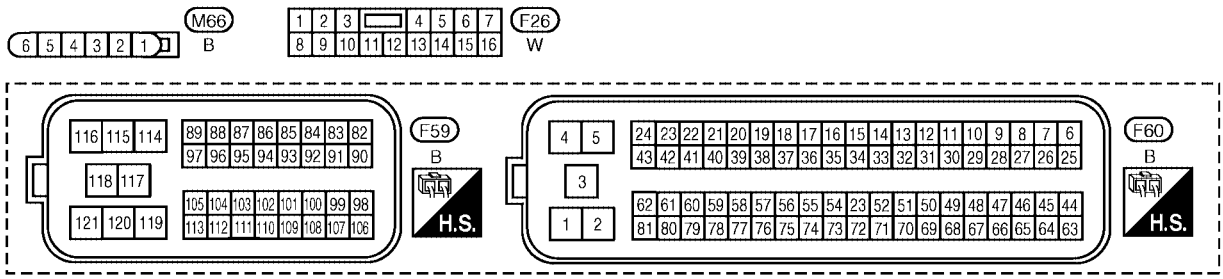
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003Z8

EC-APPS3-01





BBWA1384E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
82	B/Y	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	G	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.28 - 0.48V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 2.0V
106	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.65 - 0.87V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 4.3V

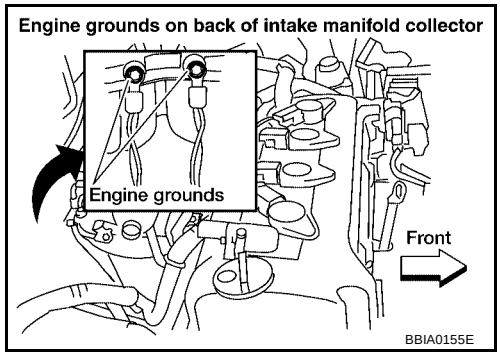
Diagnostic Procedure

UBS003Z9

1. RETIGHTEN GROUND SCREWS

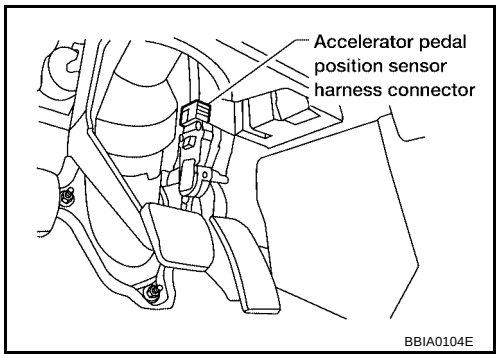
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch "ON".

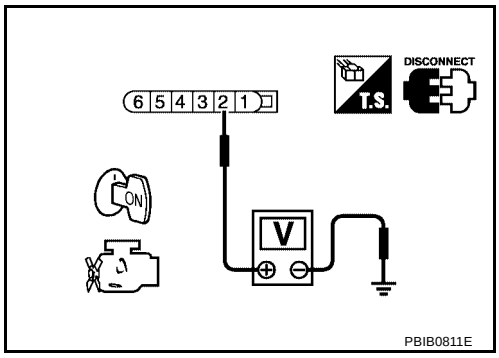


3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

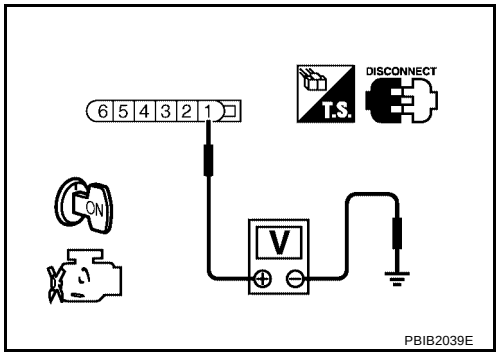
4. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 10.
NG >> GO TO 5.



5. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 1 and ECM terminal 91. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open between ECM and accelerator pedal position sensor

>> Repair or replace open circuit.

7. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
91	APP sensor terminal 1	EC-513
47	Electric throttle control actuator terminal 1	EC-188

OK or NG

OK >> GO TO 8.
NG >> Repair short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR

Refer to EC-192, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> GO TO 9.

9. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-53, "Throttle Valve Closed Position Learning" .
3. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECM terminal 82 and APP sensor terminals 4, ECM terminal 83 and APP sensor terminal 5.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors EM58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK APP SENSOR

Refer to EC-534, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

16. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

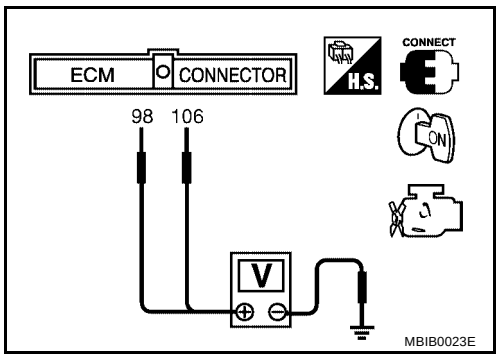
>> **INSPECTION END**

Component Inspection

UBS003ZA

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V

4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-52, "Accelerator Pedal Released Position Learning" .
6. Perform EC-53, "Throttle Valve Closed Position Learning" .
7. Perform EC-53, "Idle Air Volume Learning" .

Removal and Installation

UBS003ZB

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

IGNITION SIGNAL

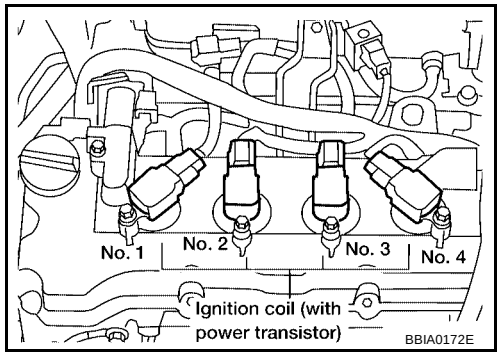
PFP:22448

Component Description

UBS0057Y

IGNITION COIL & POWER TRANSISTOR

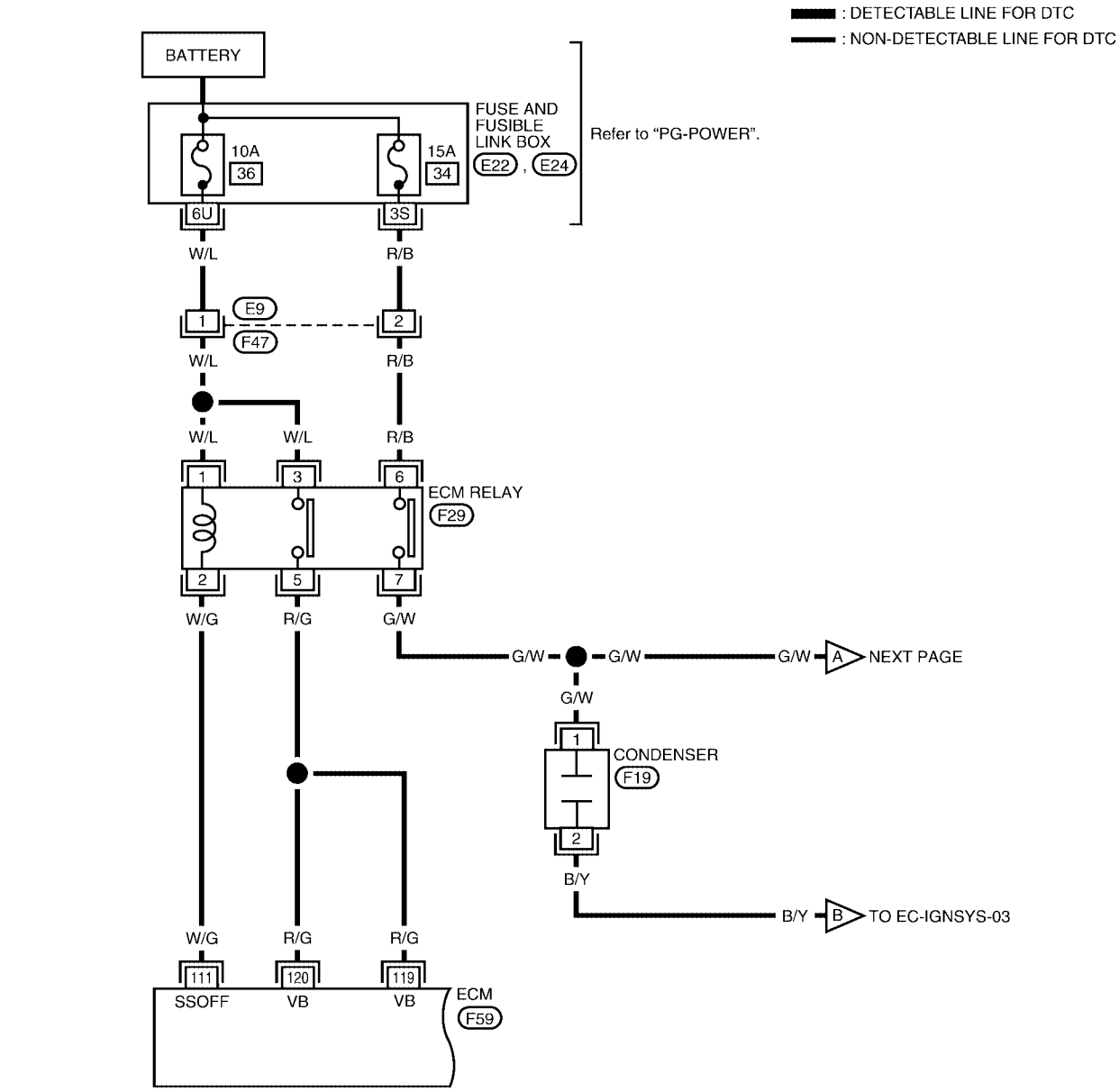
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

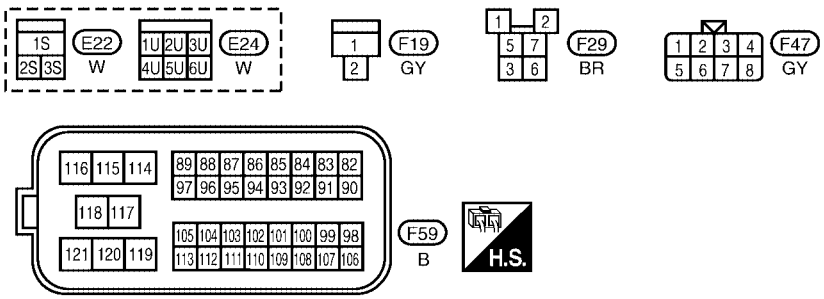


Wiring Diagram

UBS0057Z

EC-IGNSYS-01





BBWA0310E

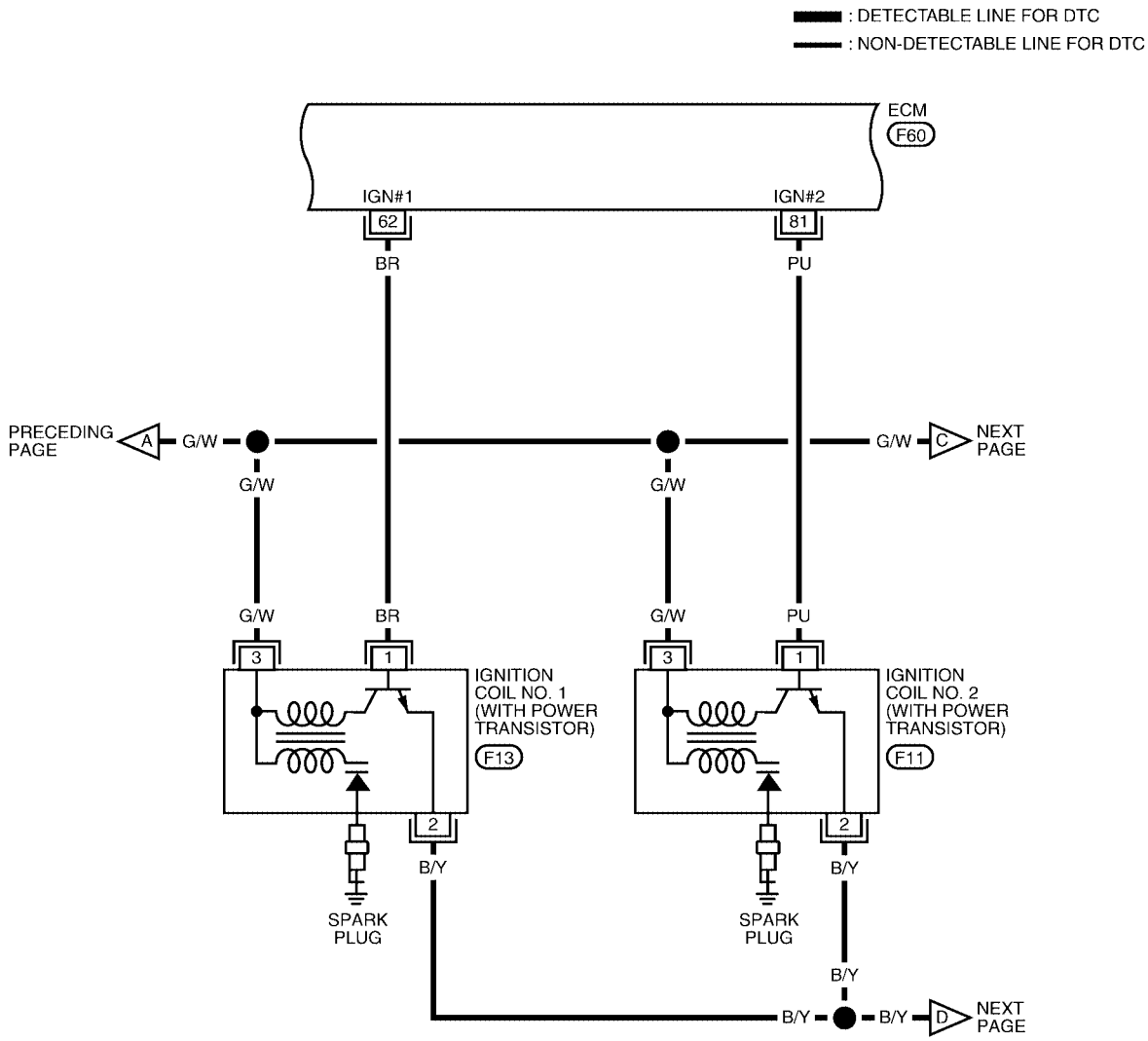
Specification data are reference values and are measured between each terminal and ground.

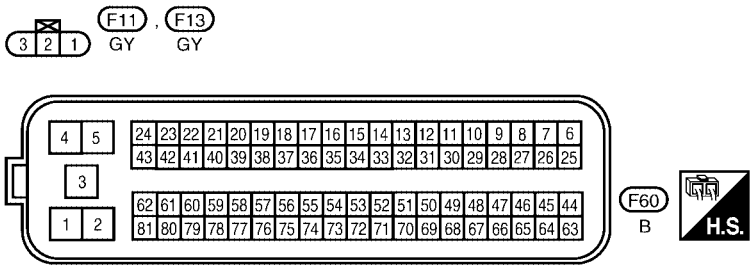
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02



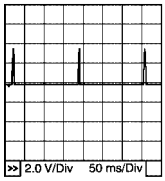
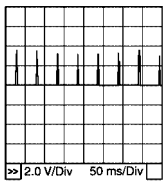


BBWA0795E

Specification data are reference values and are measured between each terminal and ground.

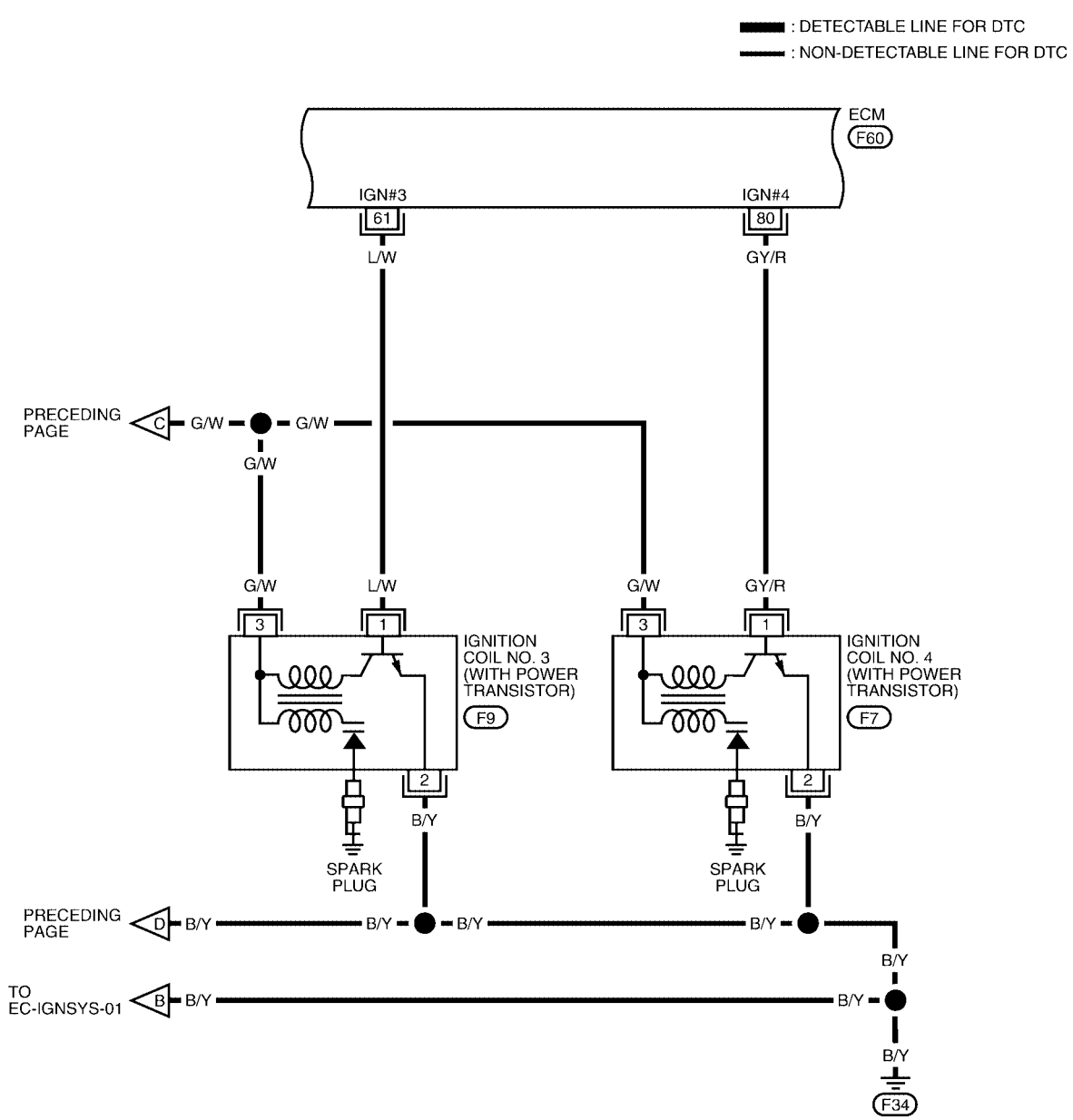
CAUTION:

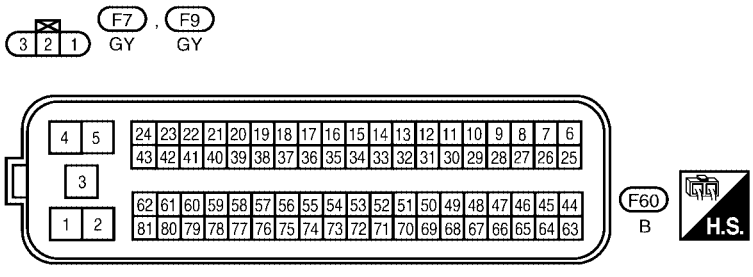
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62 81	BR PU	Ignition signal No. 1 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-IGNSYS-03



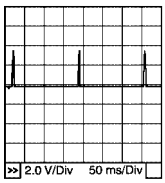
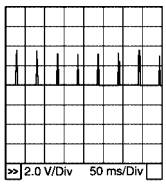


BBWA0796E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
61 80	L/W GY/R	Ignition signal No. 3 Ignition signal No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS006GW

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.

Is engine running?

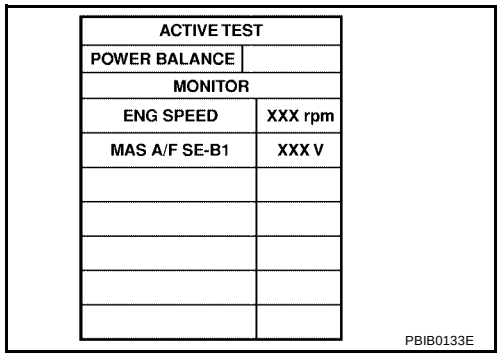
Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.



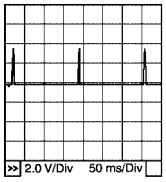
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

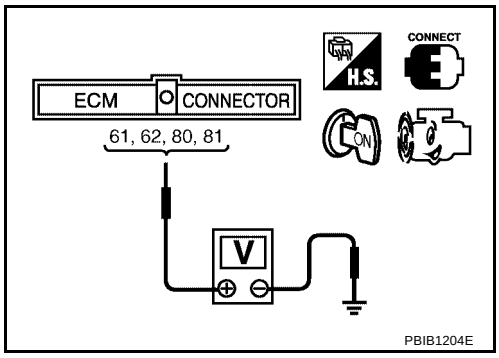
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 60, 61, 79, 80 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



PBIB1204E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

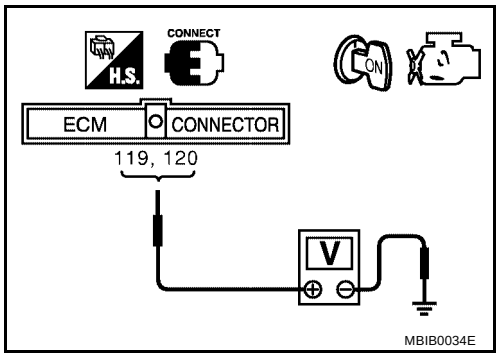
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-138, "POWER SUPPLY CIRCUIT FOR ECM"
.



MBIB0034E

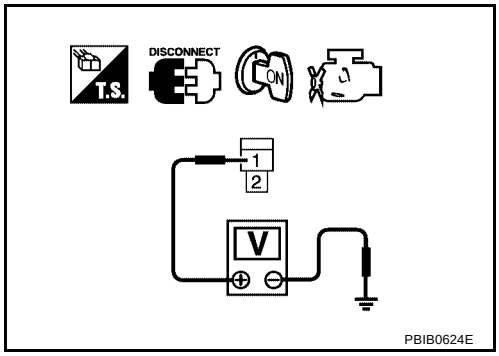
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 6.



PBIB0624E

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

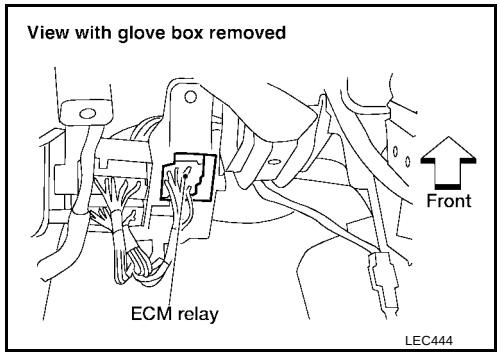
1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



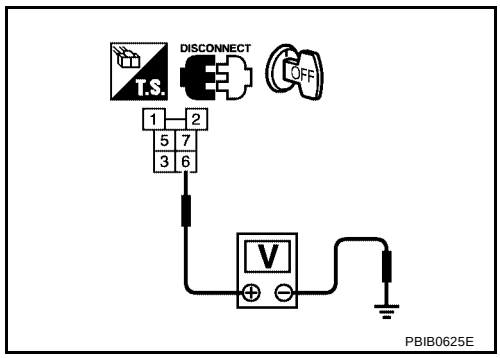
7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.



8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 15A fuse
- Harness for open or short between ECM relay and battery

>> Repair or replace harness or connectors.

9. CHECK ECM RELAY

Refer to EC-545, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ECM relay.

10. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground.
   Refer to Wiring diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 11.
NG >> Repair open circuit or short to power in harness or connector.

11. CHECK CONDENSER

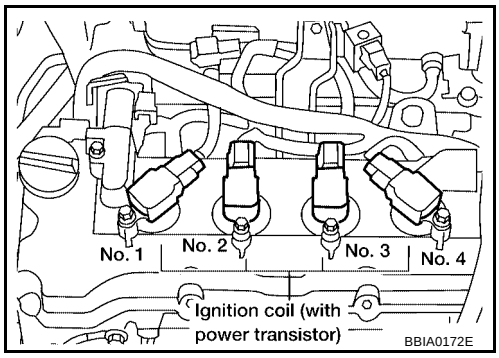
Refer to EC-545, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace condenser.

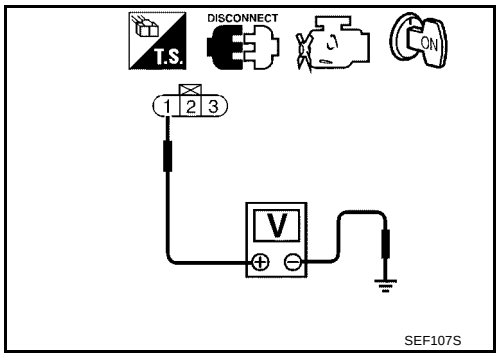
12. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ignition coil and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ignition coil terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 15.
NG >> Repair open circuit or short to power in harness or connectors.

15. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 61, 62, 80, 81 and ignition coil terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-545, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ignition coil with power transistor.

17. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

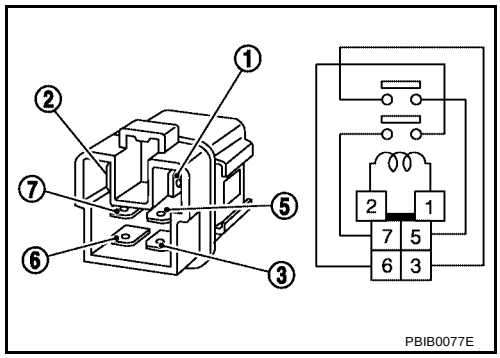
UBS006GX

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

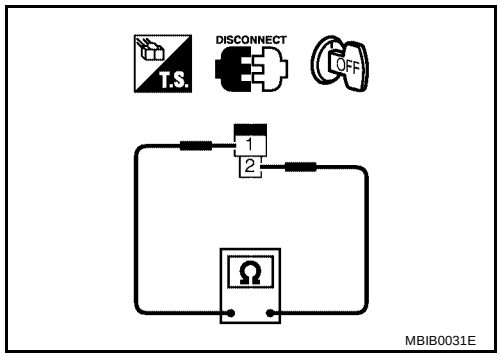
3. If NG, replace ECM relay.



CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals 1 and 2.

Resistance: Above 1 MΩ at 25°C (77°F)

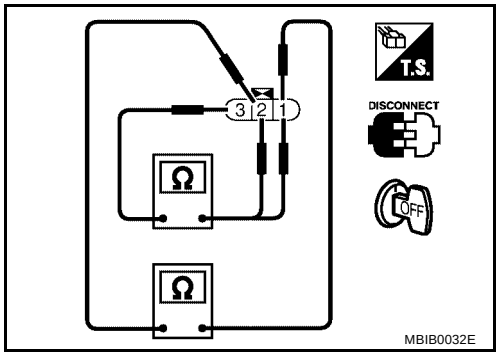


IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.

3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
3 and 1	Except 0 or ∞
3 and 2	Except 0
1 and 2	



Removal and Installation

UBS00582

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-12, "Removal and Installation" .

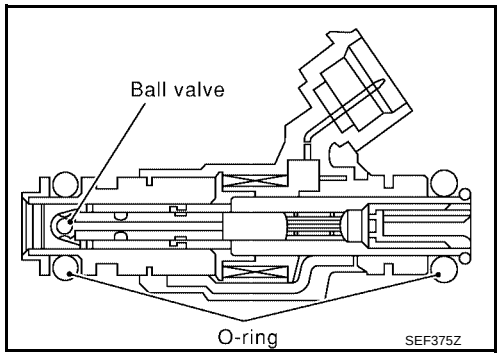
INJECTOR

PFP:16600

Component Description

UBS001P1

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

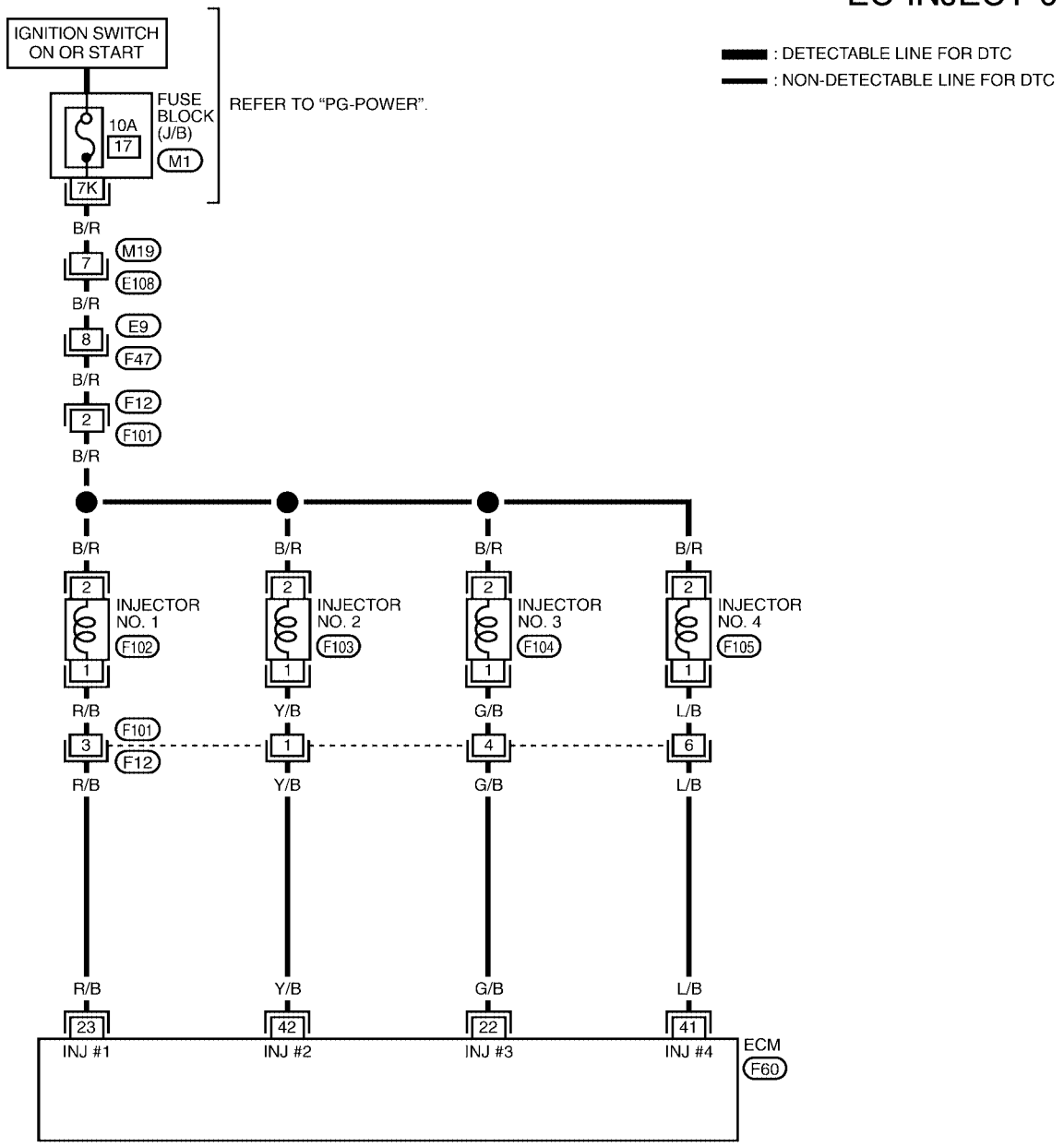
UBS001P2

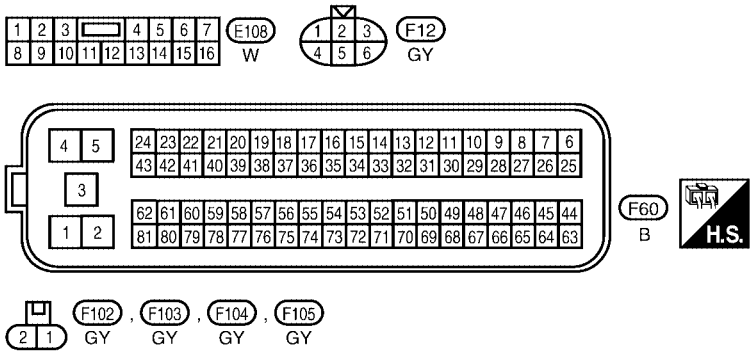
MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T), Neutral (M/T) ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 3.2 msec
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N (A/T), Neutral (M/T) ● No-load	Idle	1.0 - 1.6 msec
		2,000 rpm	0.7 - 1.3 msec

Wiring Diagram

UBS001P3

EC-INJECT-01





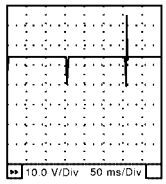
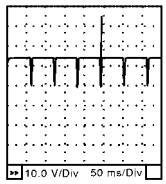
Refer to the following.
M1 - FUSE BLOCK - JUNCTION BOX (J/B)

BBWA0797E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  SEC984C
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  SEC985C

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS001P4

1. CHECK OVERALL FUNCTION

With CONSULT-II

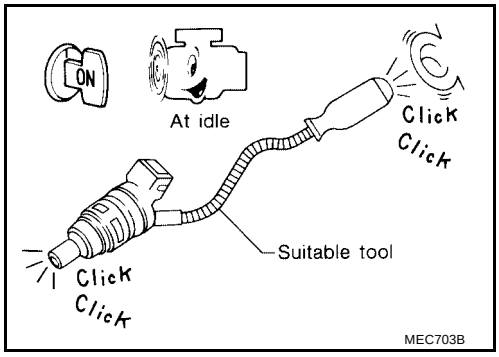
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



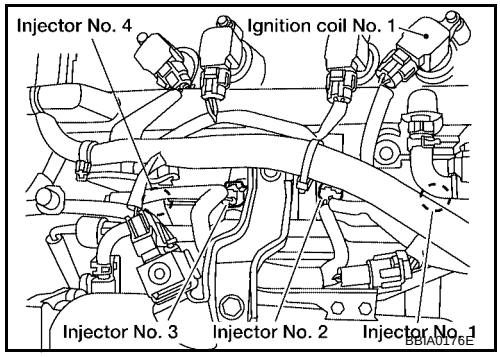
MEC703B

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

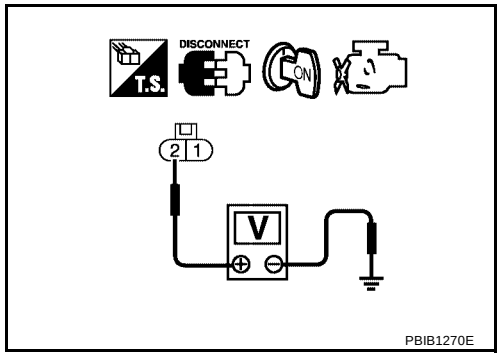
2. CHECK POWER SUPPLY

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between injector terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness connectors M19, E108
- Harness connectors E9, F47
- Harness connectors F12, F101
- Harness for open or short between injector and fuse

>> Repair harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal 1 and ECM terminals 22, 23, 41, 42.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F12, F101
- Harness for open or short between injector and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK INJECTOR

Refer to EC-552, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace injector.

7. CHECK INTERMITTENT INCIDENT

Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

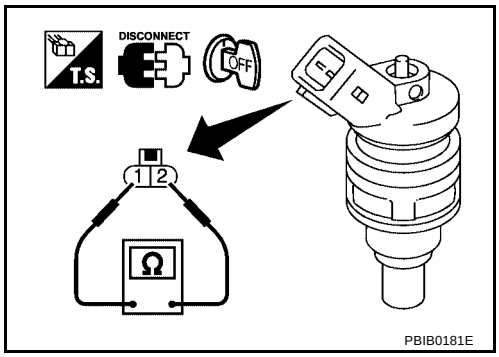
Component Inspection

UBS001P5

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 13.5 - 17.5Ω [at 20°C (68°F)]



Removal and Installation

UBS001P6

INJECTOR

Refer to EM-12, "Removal and Installation" .

FUEL PUMP

PFP:17042

Description

UBS006IU

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

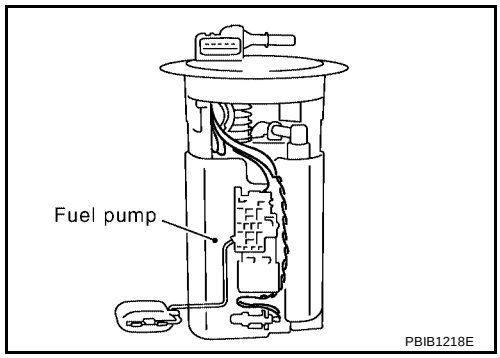
*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to perform. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

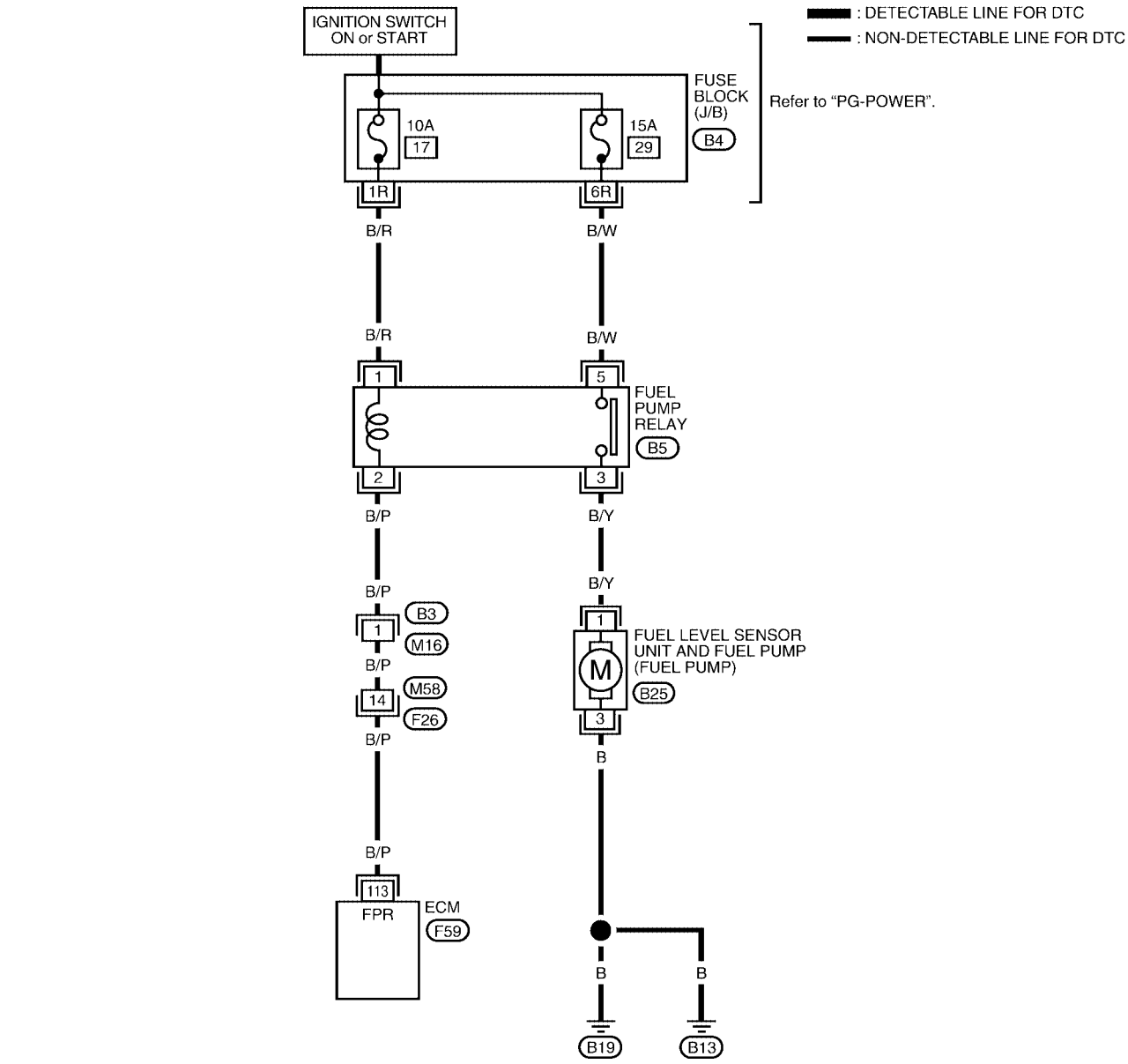
UBS001PC

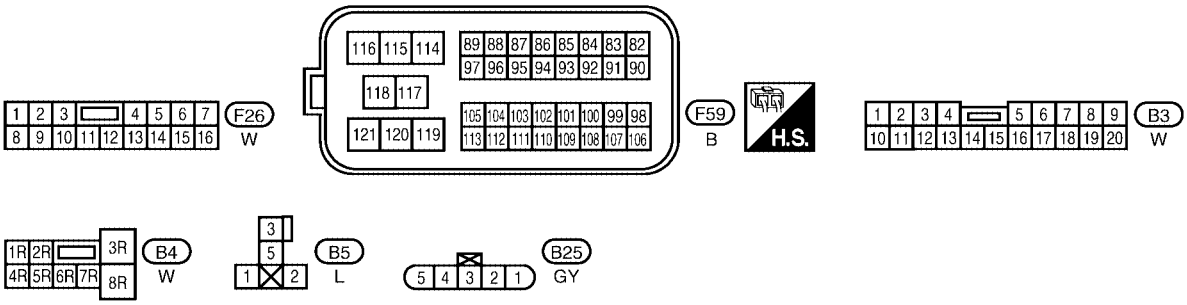
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (stops in 1.0 seconds)	ON
	● Except as shown above	OFF

Wiring Diagram

UBS001PD

EC-F/PUMP-01





BBWA0314E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

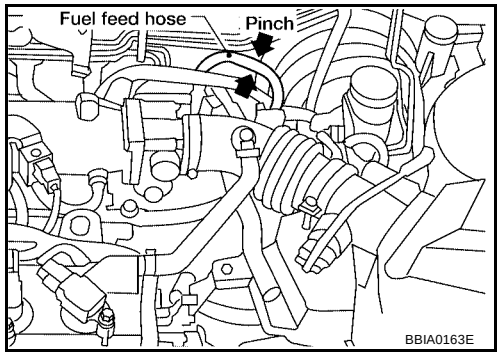
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS001PE

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.
   Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

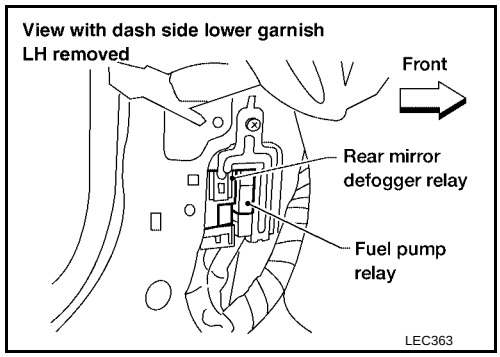


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

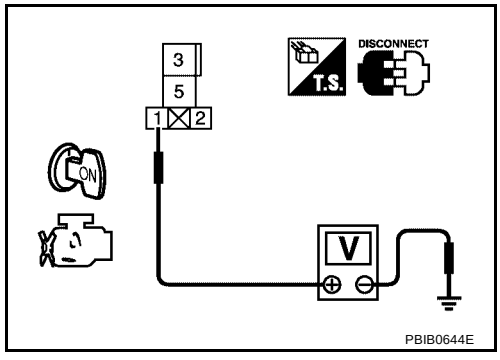
2. CHECK POWER SUPPLY-I

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminal 1 and ground with CONSULT-II or tester.

   Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

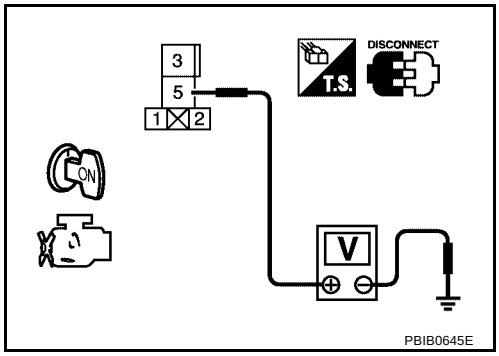
- Fuse block (J/B) connector B4
- 10A fuse
- Harness for open or short between fuse and fuel pump relay

>> Repair harness or connectors.

4. CHECK POWER SUPPLY-II

Check voltage between fuel pump relay terminal 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B4
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

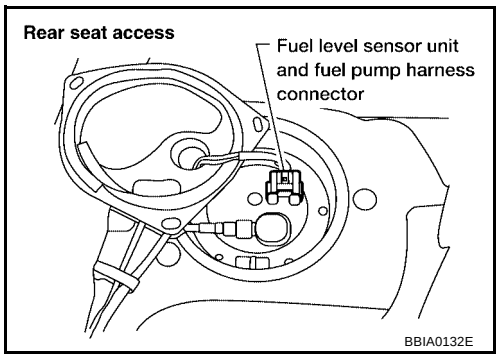
>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel pump harness connector.
3. Check harness continuity between fuel pump terminal 3 and body ground, fuel pump terminal 1 and fuel pump relay terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between fuel pump and body ground
- Harness for open or short between fuel pump and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 113 and fuel pump relay connector terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connector M58, F26
- Harness for open or short between ECM and fuel pump relay

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK FUEL PUMP RELAY

Refer to EC-557, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace fuel pump relay.

11. CHECK FUEL PUMP

Refer to EC-557, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace fuel pump.

12. CHECK INTERMITTENT INCIDENT

Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

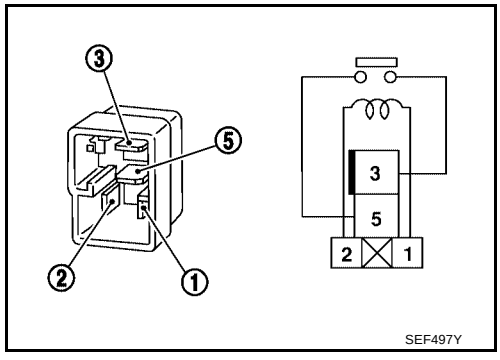
UBS001PF

FUEL PUMP RELAY

Check continuity between terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace relay.



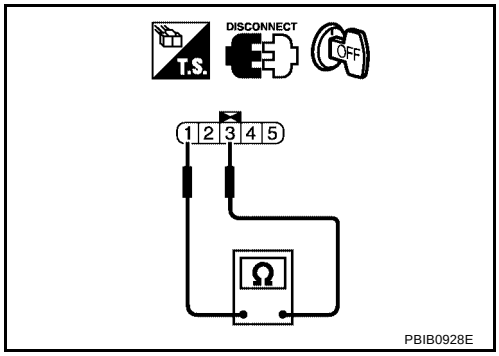
FUEL PUMP

1. Disconnect fuel pump harness connector.

2. Check resistance between terminals 1 and 3.

Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]

If NG, replace fuel pump.



Removal and Installation

UBS001PG

FUEL PUMP

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

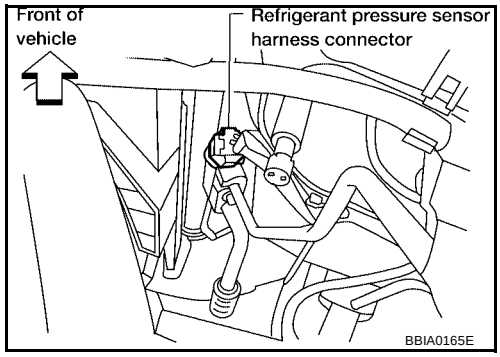
REFRIGERANT PRESSURE SENSOR

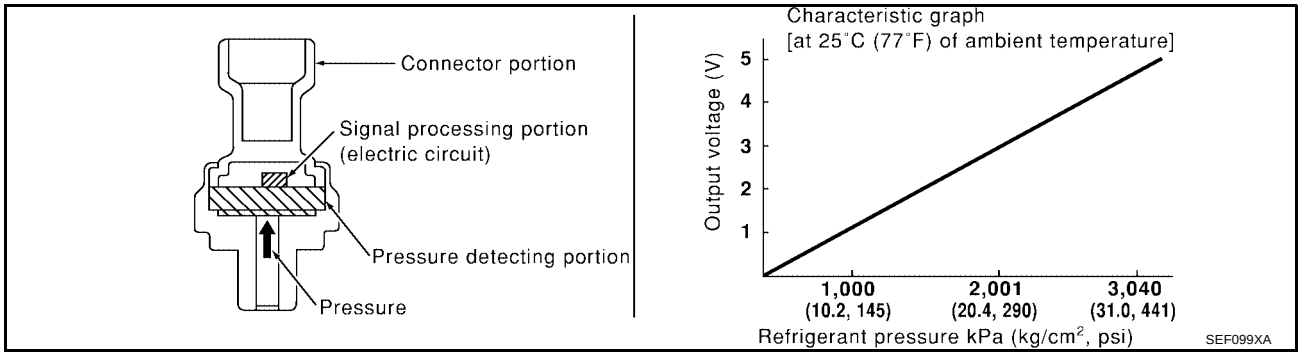
PFP:92136

Description

UBS001PN

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

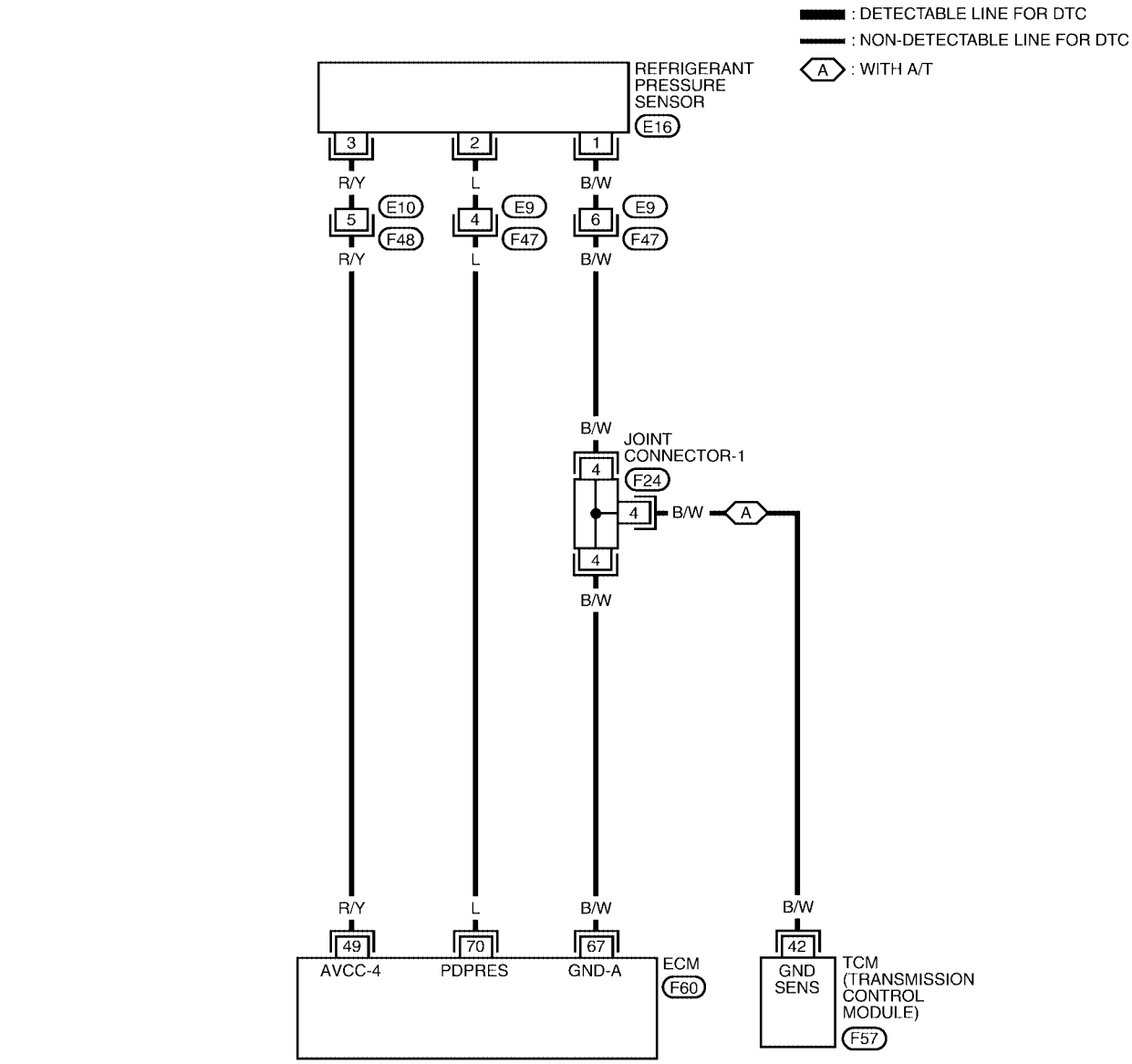


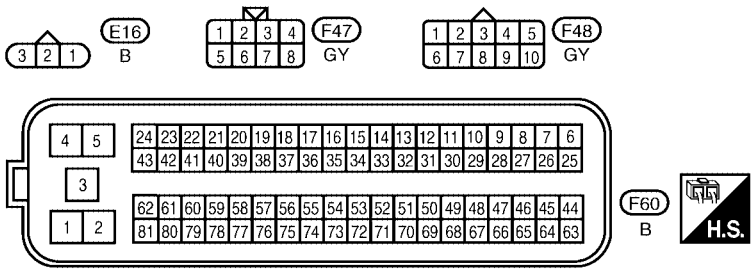


Wiring Diagram

UBS001PO

EC-RP/SEN-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

BBWA0798E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	R/Y	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
67	B/W	Sensor ground (Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
70	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

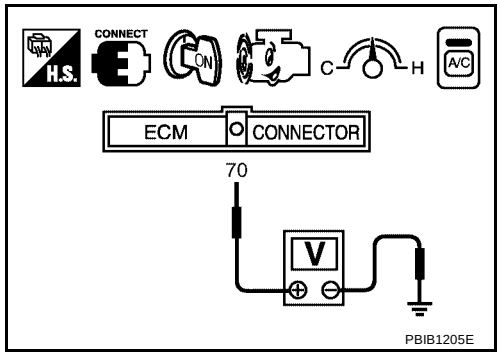
Diagnostic Procedure

UBS001PP

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 70 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

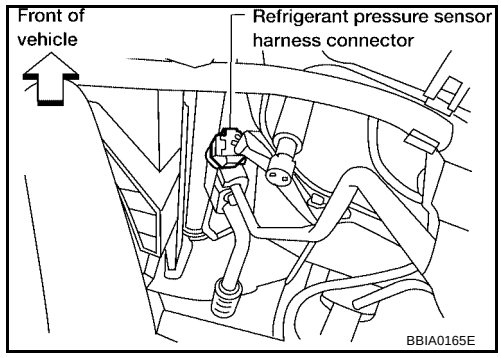


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

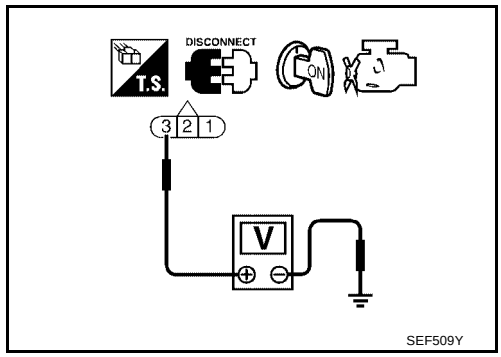
2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between refrigerant pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Joint connector-1
- Harness for open or short between ECM and refrigerant pressure sensor
- Harness for open or short between TCM (Transmission control module) and refrigerant pressure sensor

>> Repair open circuit or short to power in harness or connectors.

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 70 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK REFRIGERANT PRESSURE SENSOR

Refer to MTC-15, "Refrigerant Pressure Sensor" .

OK or NG

OK >> GO TO 9.
NG >> Replace refrigerant pressure sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

ELECTRICAL LOAD SIGNAL

PFP:25350

CONSULT-II Reference Value in Data Monitor Mode

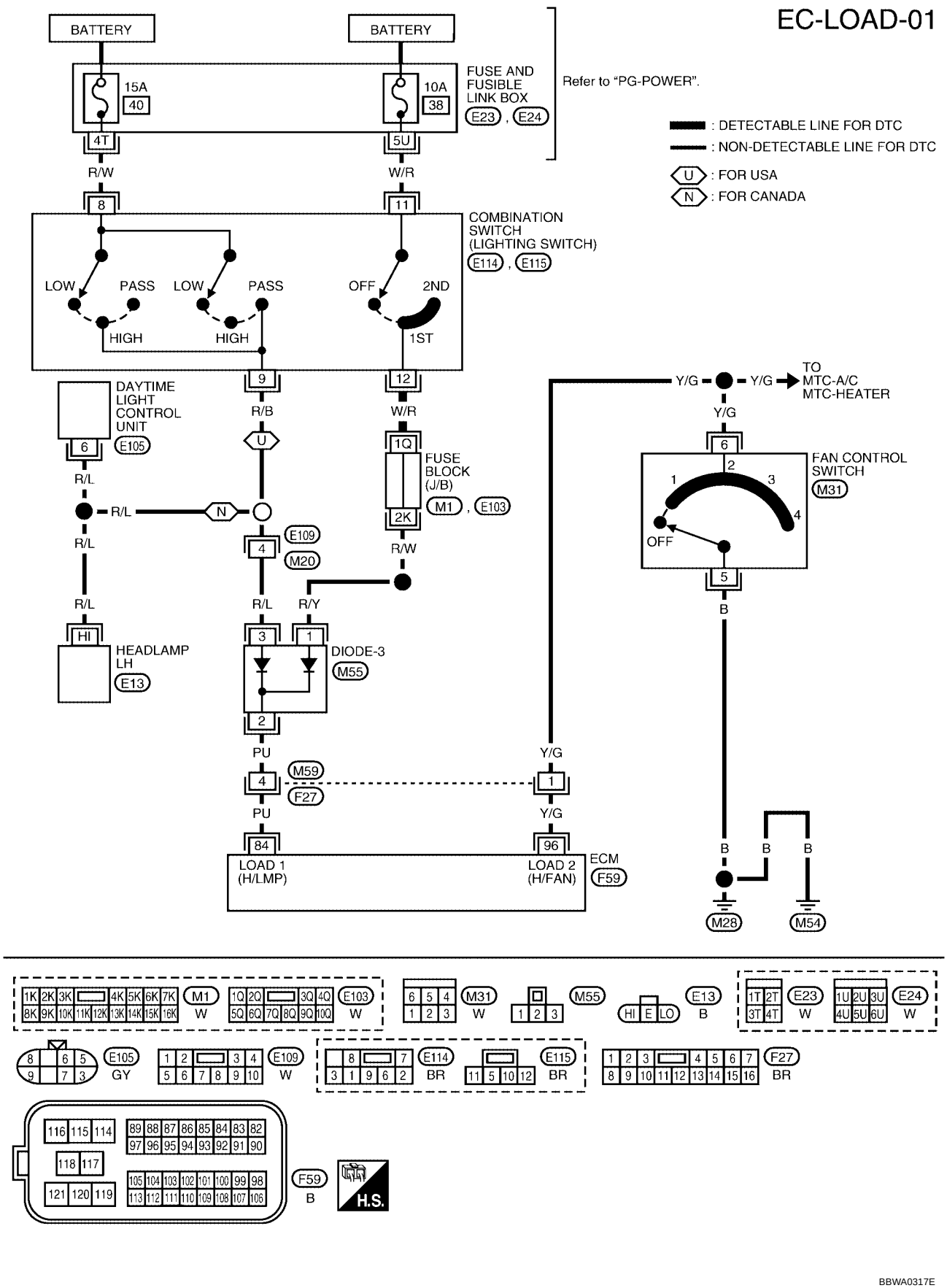
UBS001PQ

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Lighting switch “ON”	ON
		Lighting switch “OFF”	OFF

Wiring Diagram

UBS001PR



BBWA0317E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
84	PU	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V
96	Y/G	Electrical load signal (Heater fan signal)	**[Engine is running]** ● Heater fan switch "ON"	Approximately 0V
			[Engine is running] ● Heater fan switch "OFF"	Approximately 5V

Diagnostic Procedure

UBS001PS

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

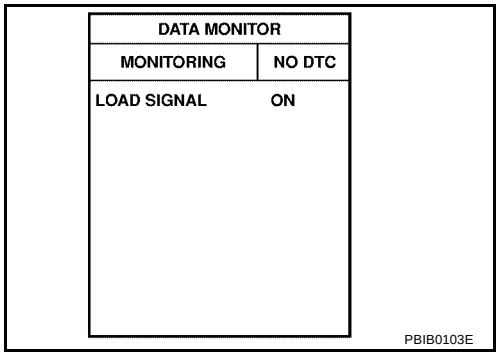
Yes >> GO TO 2.
No >> GO TO 4.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

1. Turn ignition switch "ON".
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Lighting switch "ON" at 1st or 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

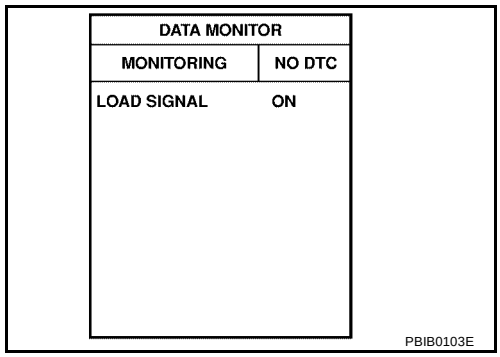
OK >> GO TO 3.
NG >> GO TO 6.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-III

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Fan control switch “ON”	ON
Fan control switch “OFF”	OFF



OK or NG

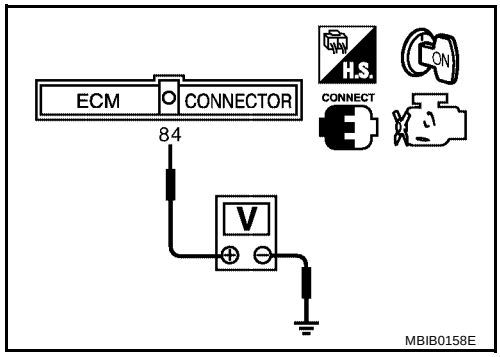
OK >> **INSPECTION END**
NG >> GO TO 7.

4. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch “ON” at 2nd position	Battery voltage
Lighting switch “OFF”	0V



OK or NG

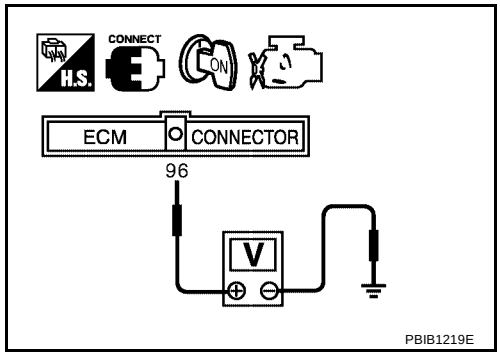
OK >> GO TO 5.
NG >> GO TO 6.

5. CHECK FAN CONTROL SWITCH CIRCUIT OVERALL FUNCTION-III

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 96 and ground under the following conditions.

Condition	Voltage
Fan control switch “ON”	0V
Fan control switch “OFF”	5V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

6. CHECK HEADLAMP FUNCTION

1. Start engine.
2. Turn the lighting switch “ON” at 2nd position.
3. Check that headlamp are illuminated.

OK or NG

OK >> GO TO 8.
NG >> Refer to LT-6, "HEADLAMP (FOR USA)" or LT-10, "HEADLAMP (FOR CANADA) — DAYTIME LIGHT SYSTEM —" .

7. CHECK FAN CONTROL FUNCTION

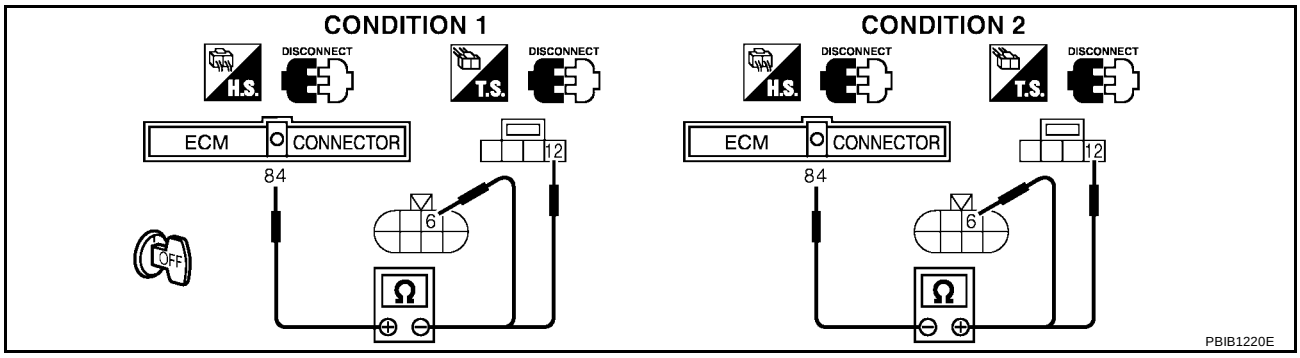
1. Start engine.
2. Turn “ON” the fan control switch.
3. Check the blower fan motor. Does the blower fan motor activate?

YES or NO

YES >> GO TO 10.
NO >> Refer to MTC-46, "BLOWER MOTOR" .

8. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect combination switch harness connectors (Models for USA), daytime light control unit harness connector (Models for Canada).
4. Check harness continuity between ECM terminal 84 and combination switch terminal 12 or daytime light control unit terminal 6 under the following conditions.



Condition	Continuity
1	Should not exist.
2	Should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M20, E109 (Models for Canada)
- Harness connectors M59, F27
- Harness connectors E108, M19 (Models for USA)
- Fuse block M1, E103
- Diode M52
- Diode M55
- Harness for open and short between ECM and combination switch or daytime light control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK FAN CONTROL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect fan control switch harness connector.
4. Check harness continuity between ECM terminal 96 and fan control switch terminal 6.

Continuity should exist.

5. Check harness continuity between fan control switch terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open and short between ECM and fan control switch
- Harness for open or short between fan control switch and body ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK INTERMITTENT INCIDENT

Perform EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

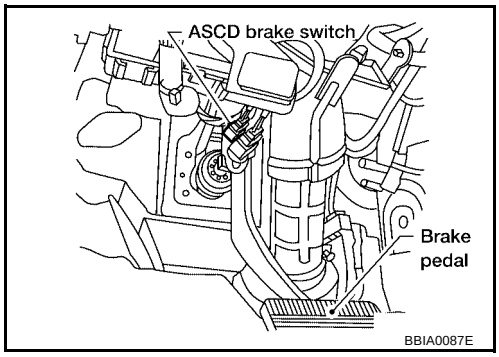
ASCD BRAKE SWITCH

PFP:25320

Component Description

UBS0041B

When depress on the brake pedal, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal)
Refer to EC-598, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS0041C

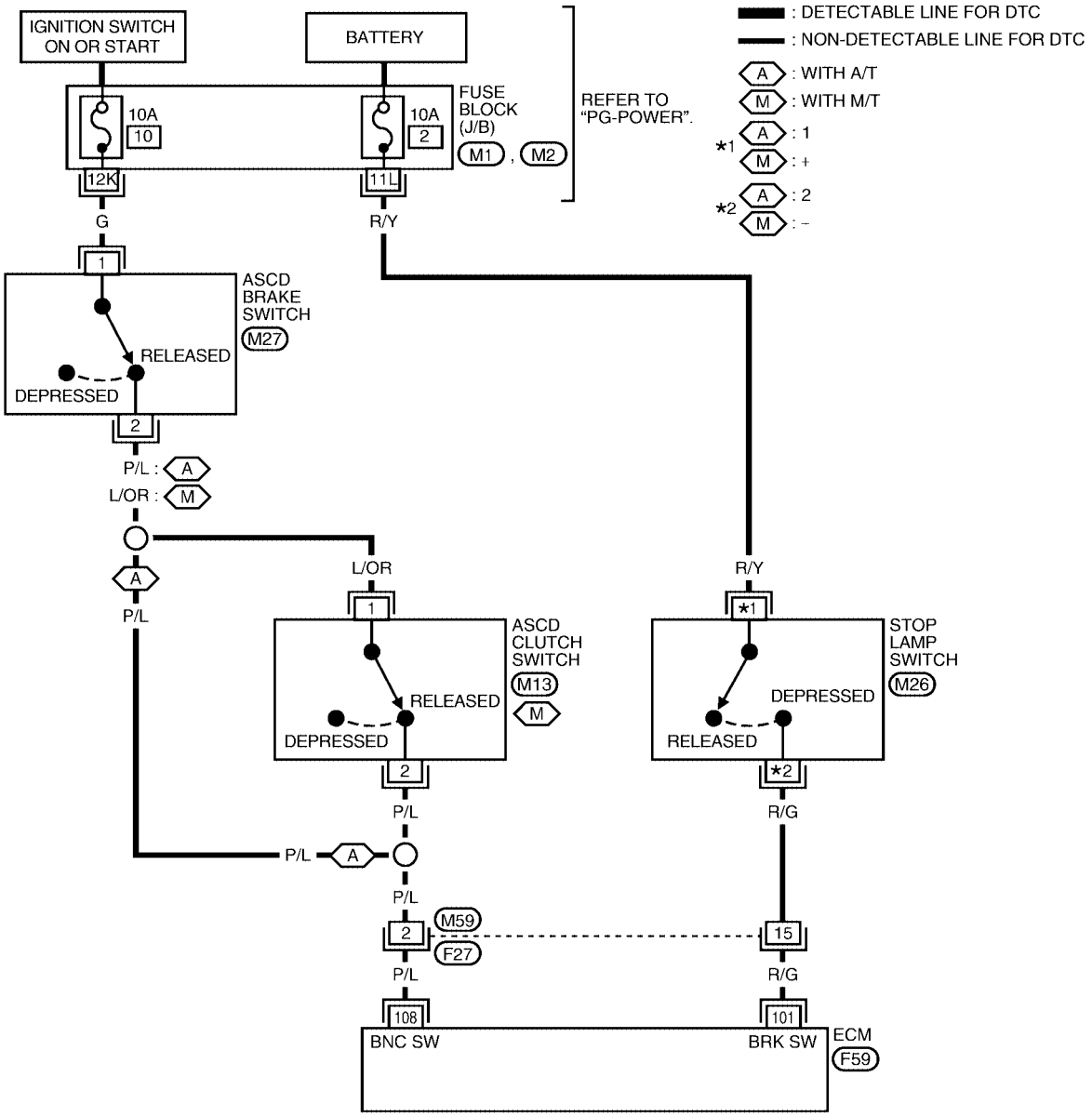
Specification data are reference values.

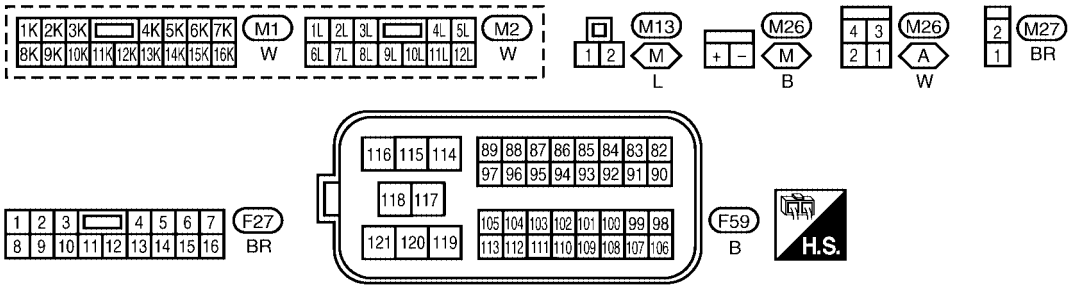
MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW 1 (ASCD brake switch)	● Ignition switch: ON	● Brake pedal fully released	ON
		● Brake pedal depressed	OFF
BRAKE SW 2 (stop lamp switch)	● Ignition switch: ON	● Brake pedal fully released	OFF
		● Brake pedal depressed	ON

Wiring Diagram

UBS0041D

EC-ASCBOF-01





BBWA0316E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal is fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is depressed	BATTERY VOLTAGE (11 - 14V)
108	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS006GY

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

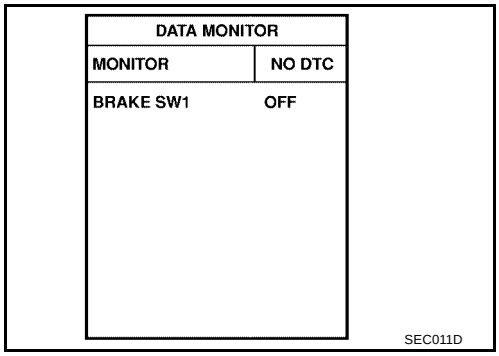
1. Turn ignition switch "ON".
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-II.
3. Check "BRAKE SW1" indication under the following conditions.

M/T models

CONDITION	INDICATION
When clutch pedal or brake pedal is depressed	OFF
When clutch pedal and brake pedal are fully released	ON

A/T models

CONDITION	INDICATION
When brake pedal is depressed	OFF
When brake pedal is fully released	ON



Without CONSULT-II

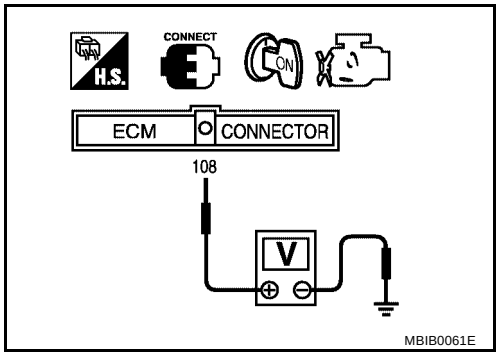
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 108 and ground under the following conditions.

M/T models

CONDITION	VOLTAGE
When clutch pedal or brake pedal is depressed	Approximately 0V
When clutch pedal and brake pedal are fully released	Battery voltage

A/T models

CONDITION	VOLTAGE
When brake pedal is depressed	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

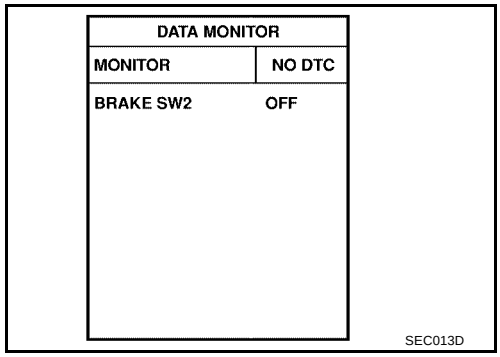
OK >> GO TO 2.
NG (M/T models) >>GO TO 3.
NG (A/T models) >>GO TO 4.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

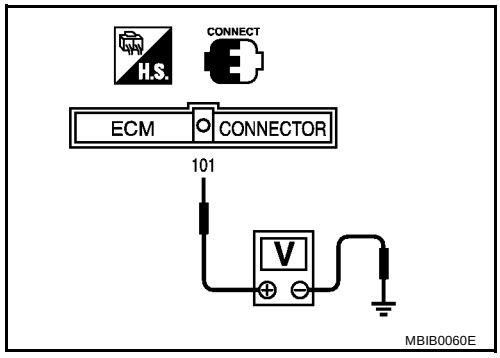
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

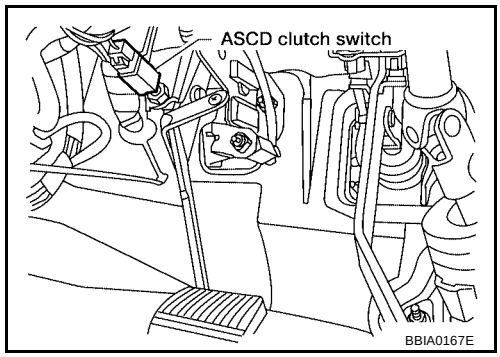


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 13.

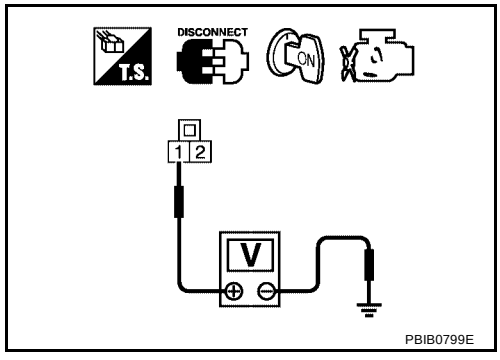
3. CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-II or tester.

CONDITION	VOLTAGE
When brake pedal is released	Battery voltage
When brake pedal is depressed	Approx. 0V

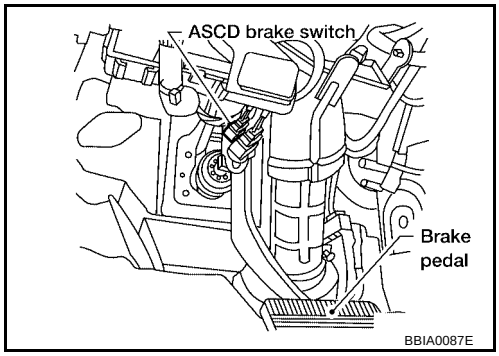


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

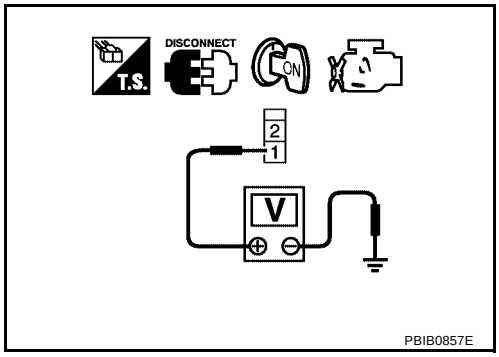
4. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK (M/T models)>>GO TO 6.
OK (A/T models)>>GO TO 7.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ASCD BRAKE SWITCH

Refer to EC-577, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD brake switch.

10. CHECK ASCD CLUTCH SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD clutch switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD clutch switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

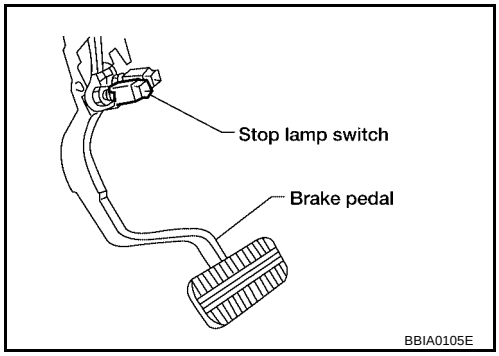
Refer to EC-577, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD clutch switch.

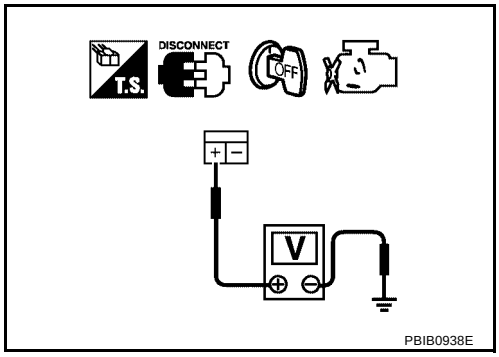
13. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

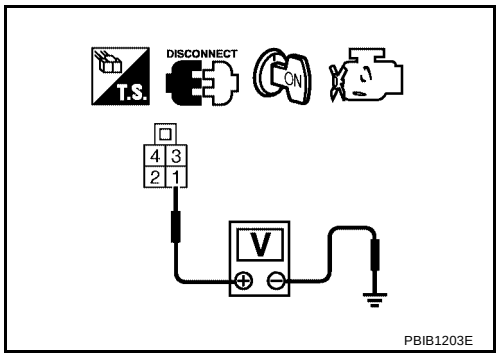
1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal **+** (M/T models) or 1 (A/T models) and ground with CONSULT -II or tester.

Voltage: Battery voltage





OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal – (M/T models) or 2 (A/T models).
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK STOP LAMP SWITCH

Refer to EC-577, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace stop lamp switch.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

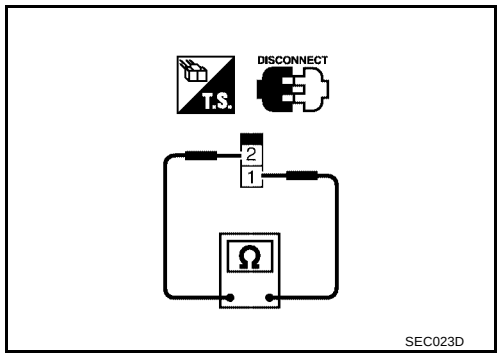
UBS006IP

ASCD BRAKE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Check harness continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should exist.
When brake pedal is depressed.	Should not exist.

If NG, adjust ASCD brake switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.



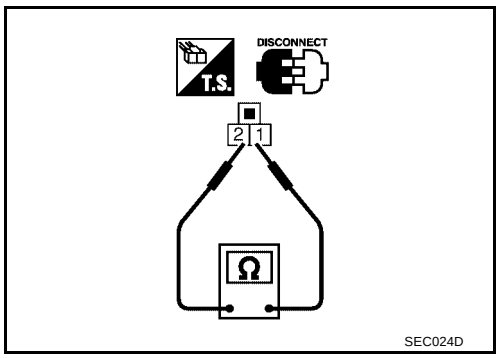
ASCD CLUTCH SWITCH (FOR M/T MODELS)

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.

3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When clutch pedal is fully released.	Should exist.
When clutch pedal is depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to CL-6, "CLUTCH SYSTEM" , and perform step 3 again.



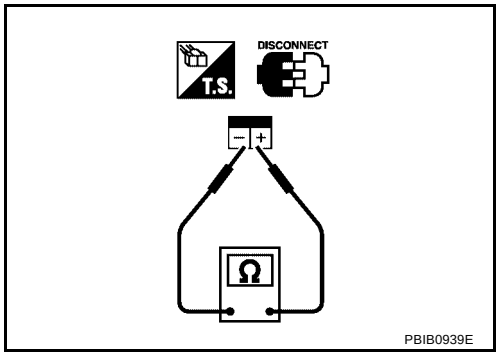
STOP LAMP SWITCH

M/T Models

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals + and – under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.

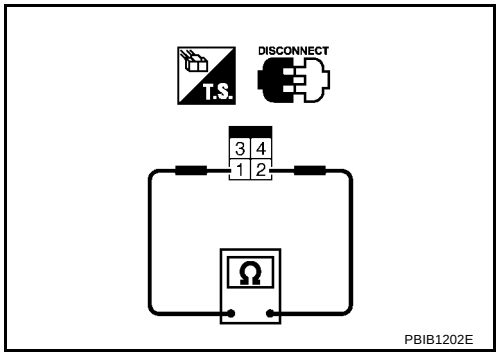


A/T Models

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.



ASCD INDICATOR

PFP:24814

Component Description

UBS0041F

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.
CRUISE indicator illuminates when CRUISE switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.
SET indicator illuminates when following conditions are met.

- CRUISE indicator is illuminated.
- SET switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET indicator remains lit during ASCD control.
Refer to EC-598, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.

CONSULT-II Reference Value in Data Monitor Mode

UBS0041G

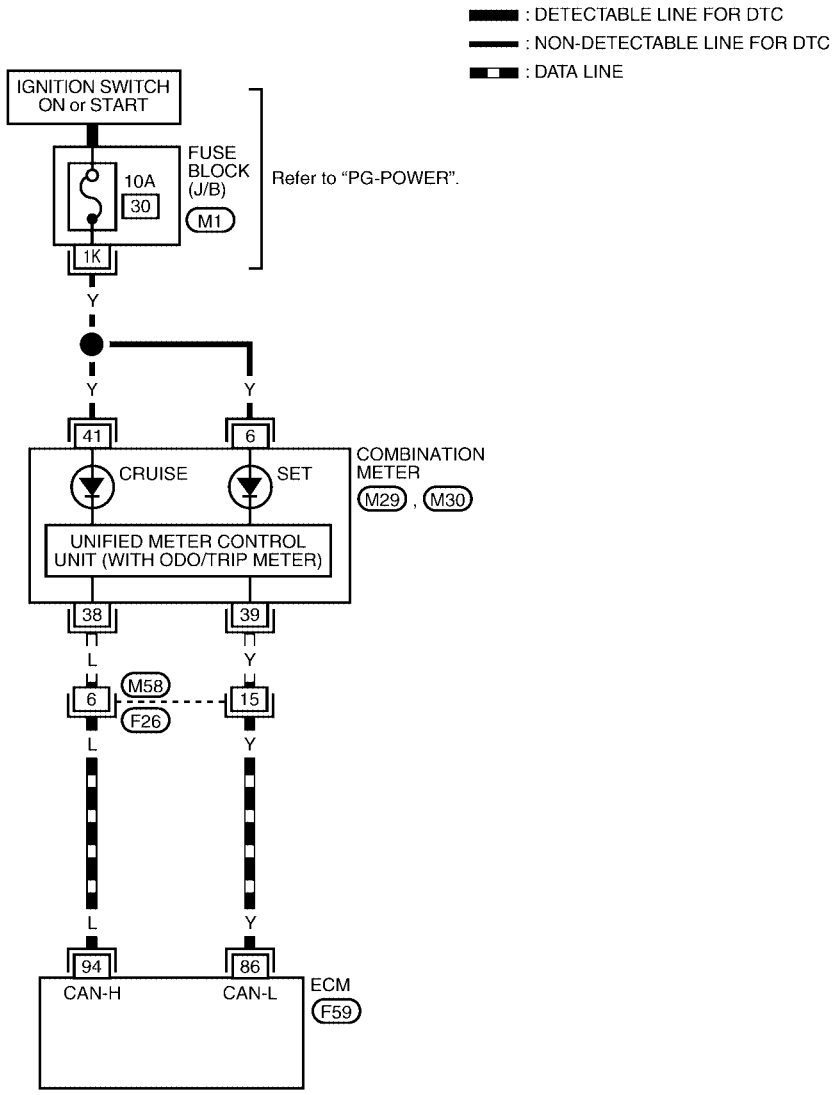
Specification data are reference value.

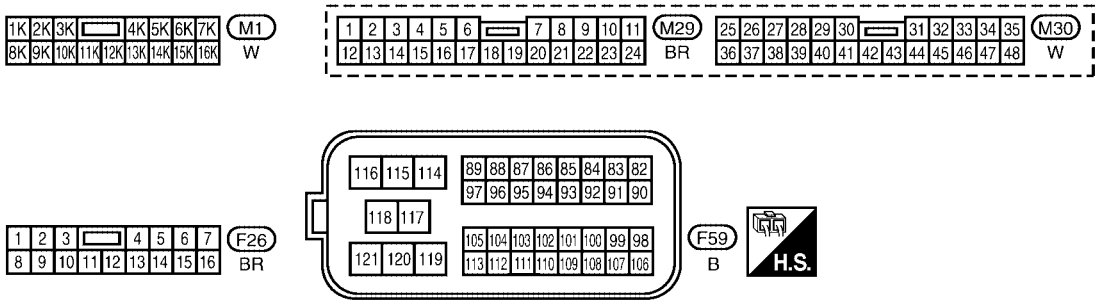
MONITOR ITEM	CONDITION		SPECIFICATION
CRUISE LAMP	● Ignition switch: ON	● CRUISE switch pressed	ON
		● CRUISE switch released	OFF
SET LAMP	● CRUISE switch: ON ● When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	● COAST/SET switch pressed	ON
		● COAST/SET switch released	OFF

Wiring Diagram

UBS0041H

EC-ASCIND-01





BBWA0433E

Diagnostic Procedure

UBS0041I

1. CHECK OVERALL FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	● Ignition switch: ON	● CRUISE switch pressed	ON
		● CRUISE switch released	OFF
SET LAMP	● CRUISE switch: ON ● When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	● COAST/SET switch pressed	ON
		● COAST/SET switch released	OFF

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK DTC

Check that DTC U1000 or U1001 is not displayed.

OK or NG

OK >> Perform trouble diagnoses for DTC U1000, U1001, refer to EC-145, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
NG >> GO TO 3.

3. CHECK COMBINATION METER OPERATION

Does combination meter operate normally?

Yes or No

Yes >> GO TO 4.
No >> Check combination meter circuit. Refer to DI-8, "Combination Meter" .

4. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

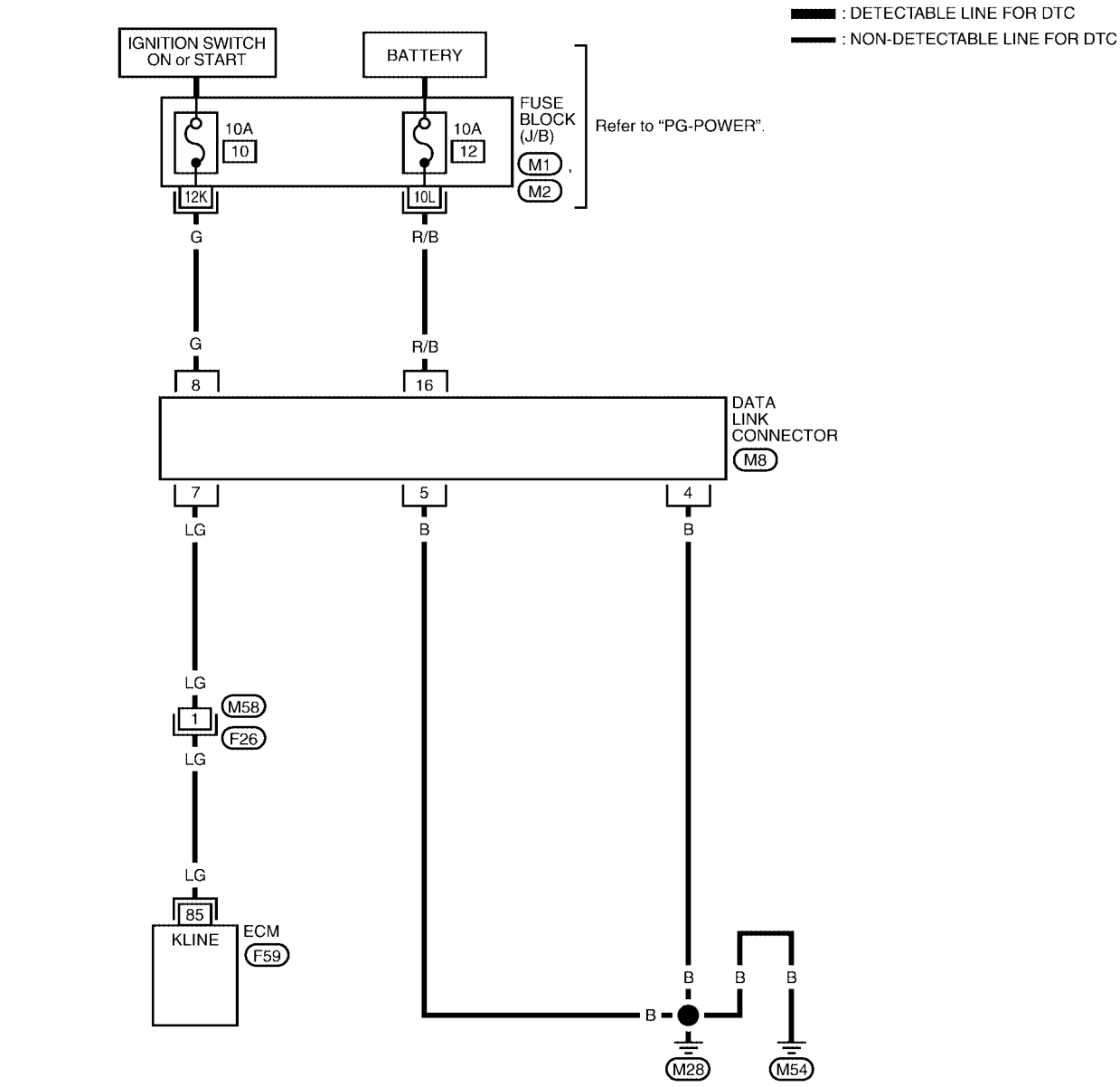
DATA LINK CONNECTOR

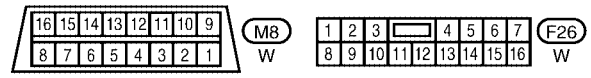
PFP:24814

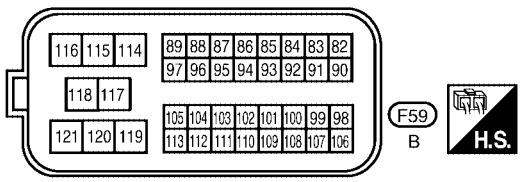
Wiring Diagram

UBS002N3

EC-DLC-01







REFER TO THE FOLLOWING.
M1, M2 - FUSE BLOCK-JUNCTON BOX (J/B)

BBWA0318E

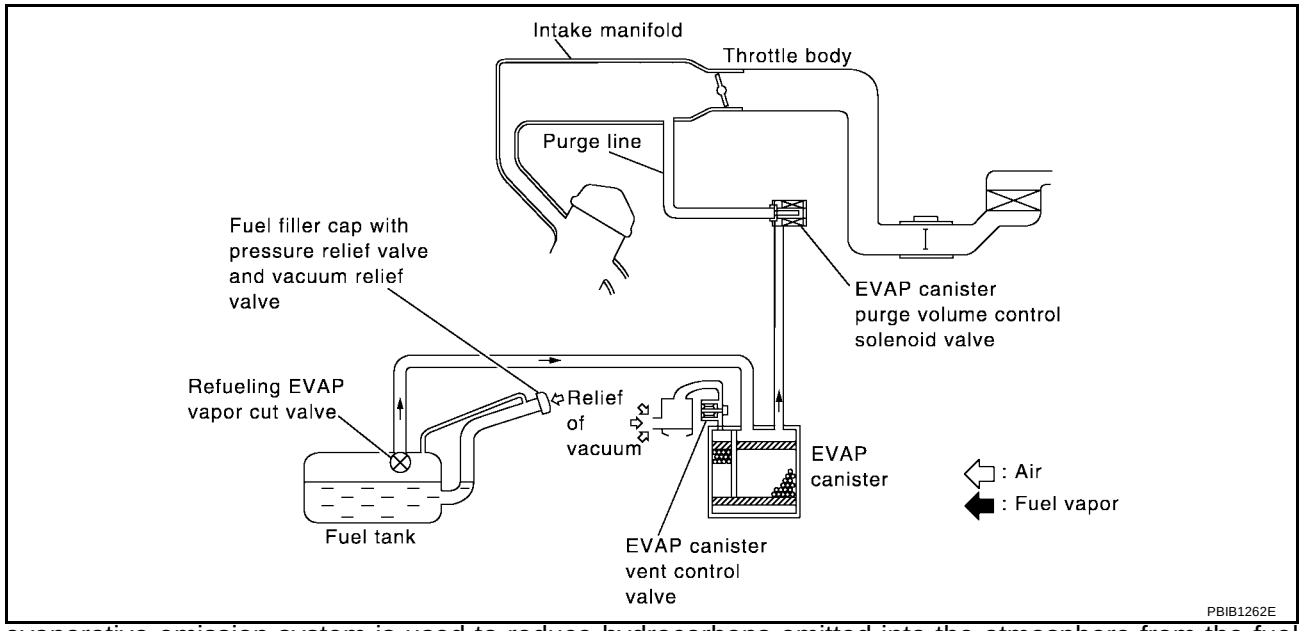
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

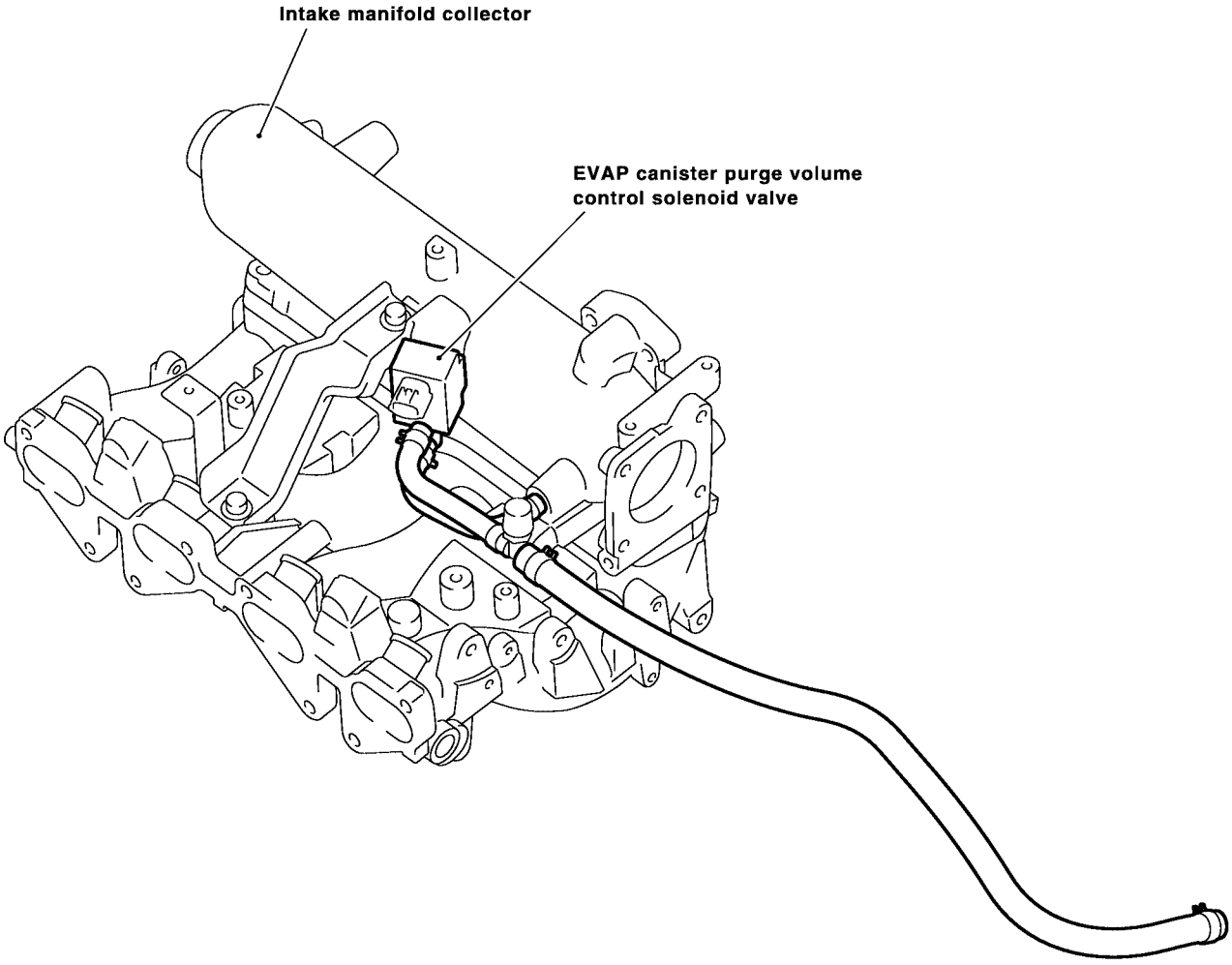
UBS001PU

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating.
EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge control solenoid valve also shuts off the vapor purge line during decelerating and idling.

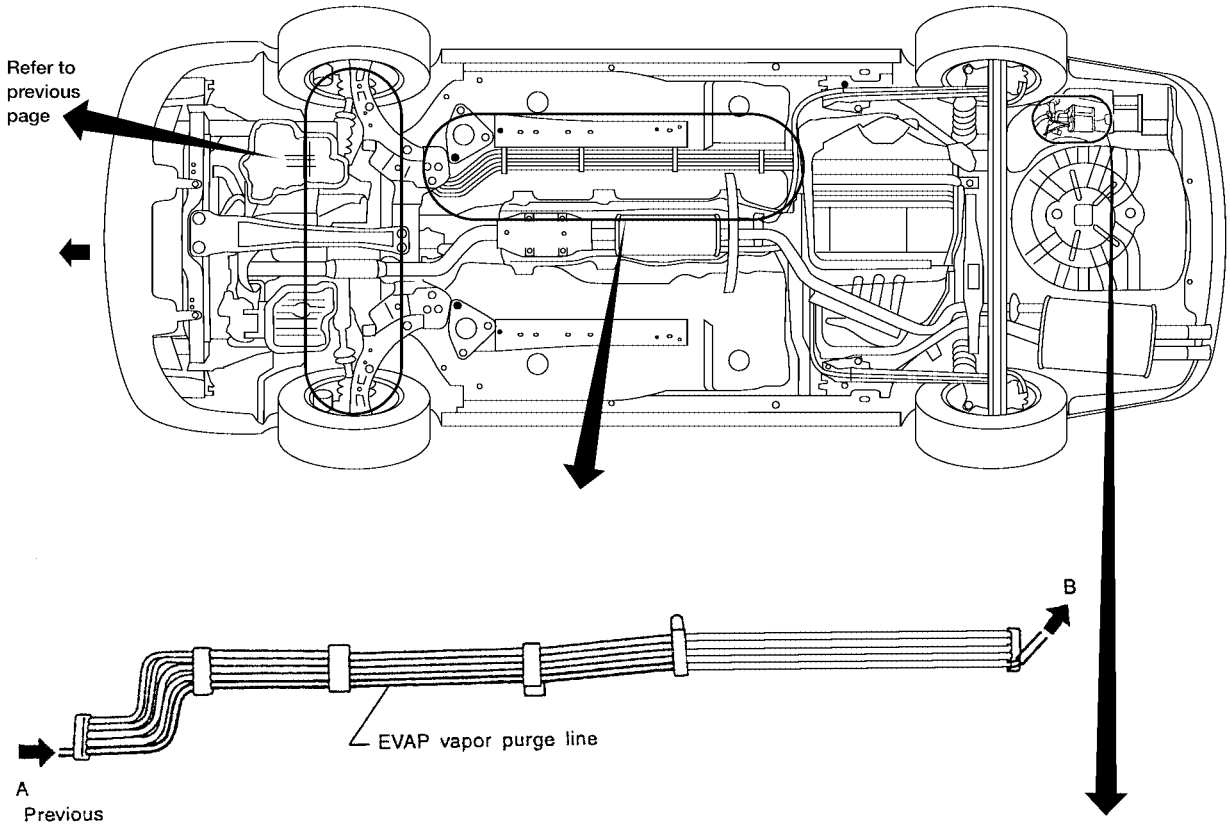
EVAPORATIVE EMISSION LINE DRAWING

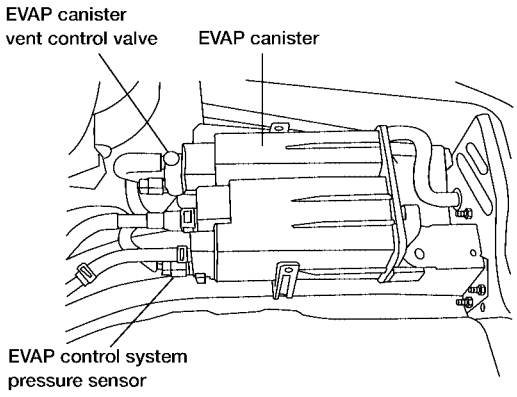


NOTE : Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

PBIB1056E

NOTE:
Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.





BBIA0166E

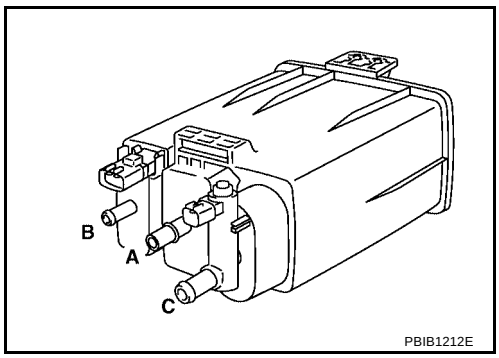
Component Inspection

UBS006HY

EVAP CANISTER

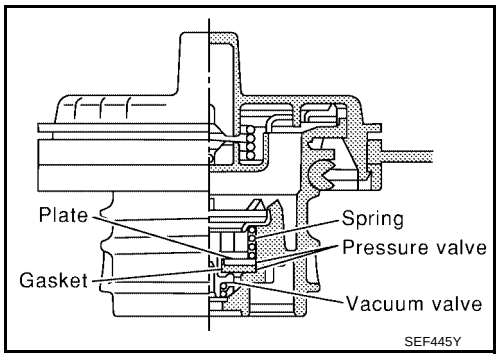
Check EVAP canister as follows:

1. Block port **B** .
2. Blow air into port **A** and check that it flows freely out of port **C** .
3. Release blocked port **B** .
4. Apply vacuum pressure to port **B** and check that vacuum pressure exists at the ports **A** and **C** .
5. Block port **A** and **B** .
6. Apply pressure to port **C** and check that there is no leakage.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.

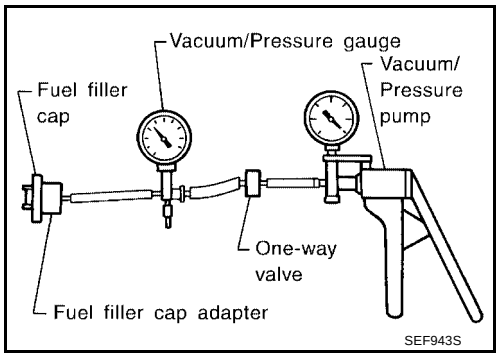


2. Check valve opening pressure and vacuum.

Pressure: **15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)**

Vacuum: **–6.0 to –3.4 kPa (–0.061 to –0.035 kg/cm^2 , –0.87 to –0.48 psi)**

3. If out of specification, replace fuel filler cap as an assembly.



CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-316 .

FUEL TANK TEMPERATURE SENSOR

Refer to EC-255 .

EVAP CANISTER VENT CONTROL VALVE

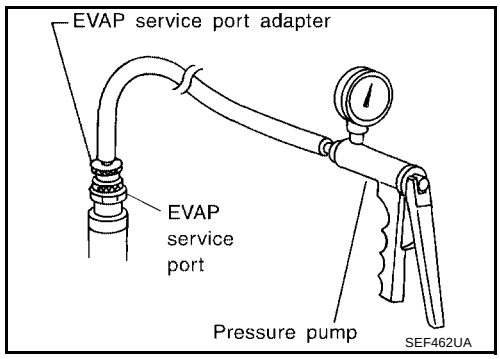
Refer to EC-322 .

EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-329 .

EVAP SERVICE PORT

Positive pressure is delivered to the EVAP system through the EVAP service port. If fuel vapor leakage in the EVAP system occurs, use a leak detector to locate the leak.

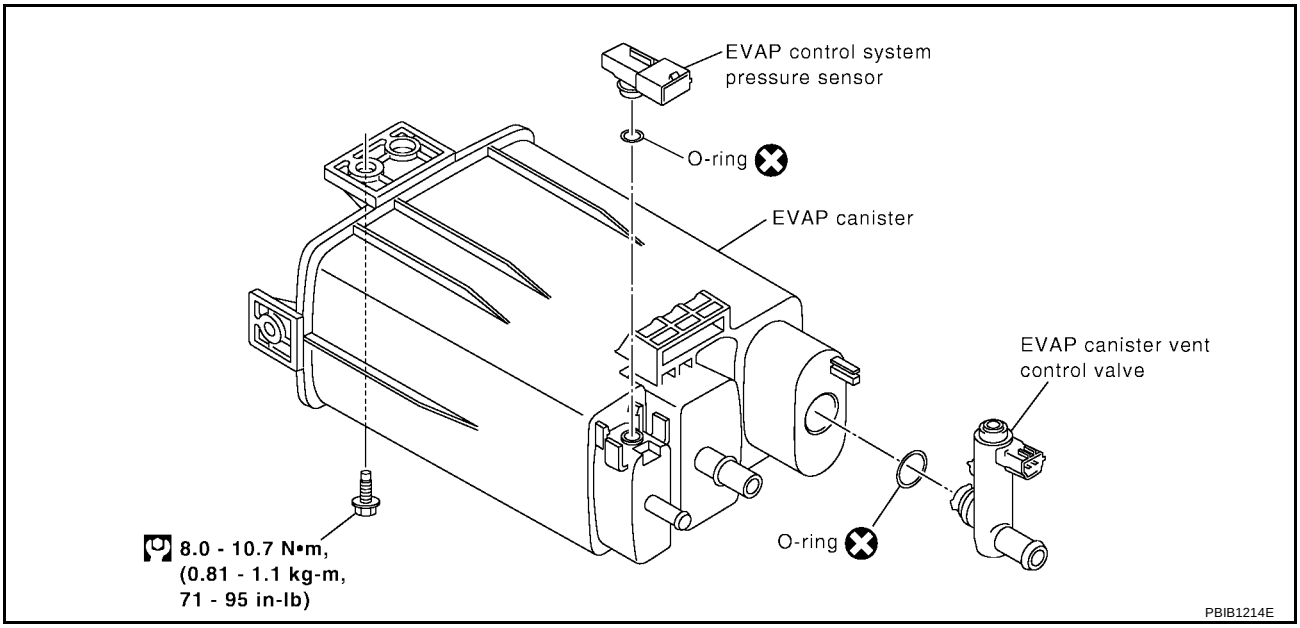


Removal and Installation

UBS006HZ

EVAP CANISTER

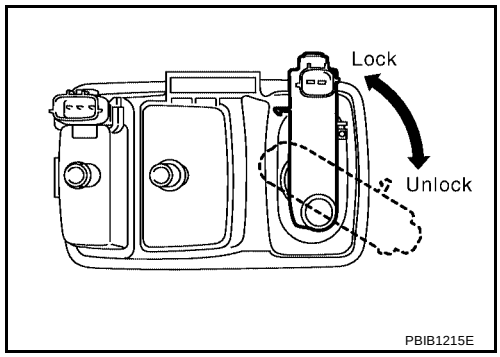
Tighten EVAP canister as shown in the figure.



EVAP CANISTER VENT CONTROL VALVE

1. Turn EVAP canister vent control valve counterclockwise.
2. Remove the EVAP canister vent control valve.

Do not reuse the O-ring, replace it with a new one.



How to Detect Fuel Vapor Leakage

UBS006I0

CAUTION:

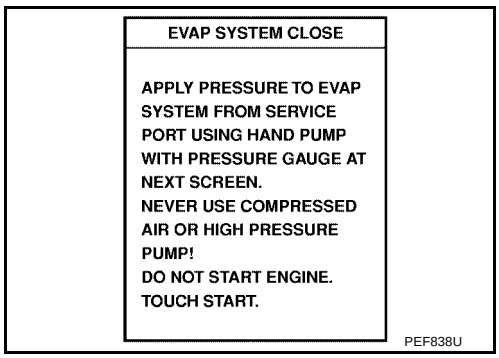
- **Never use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in EVAP system.**

NOTE:

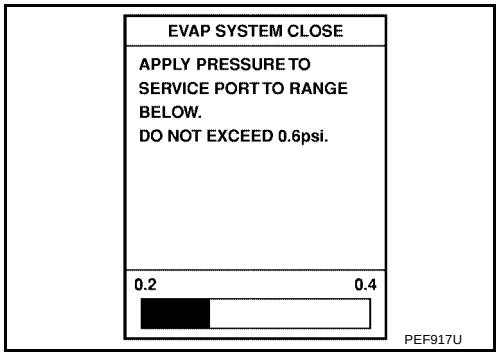
- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

WITH CONSULT-II

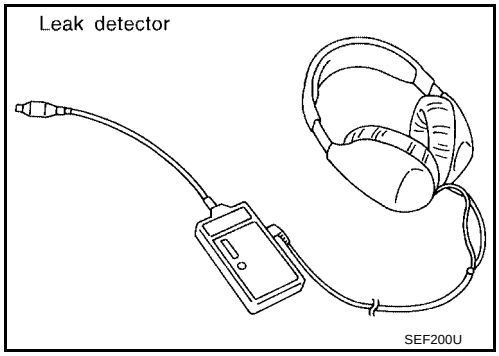
1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump and hose to the EVAP service port adapter.
3. Turn ignition switch “ON”.
4. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT MODE” with CONSULT-II.
5. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.



6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7. Remove EVAP service port adapter and hose with pressure pump.

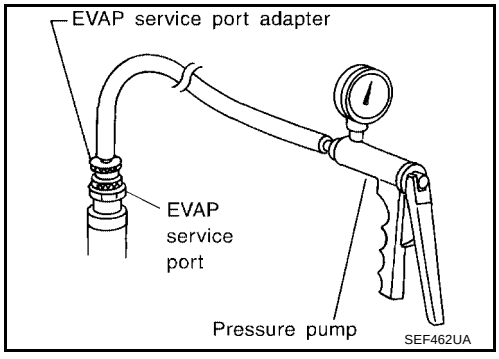


8. Locate the leak using a leak detector. Refer to EC-584, "EVAPORATIVE EMISSION LINE DRAWING" .

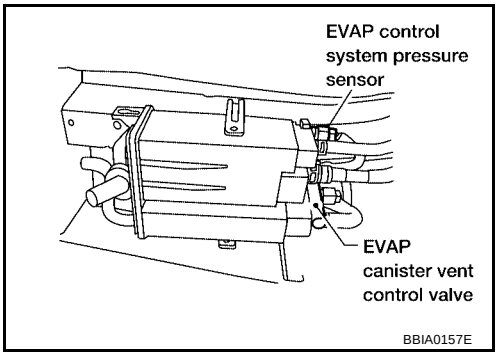


WITHOUT CONSULT-II

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump with pressure gauge to the EVAP service port adapter.



3. Apply battery voltage to between the terminals of EVAP canister vent control valve to make a closed EVAP system.
4. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2 , 0.2 to 0.4 psi).
5. Remove EVAP service port adapter and hose with pressure pump.
6. Locate the leak using a leak detector. Refer to EC-584, "EVAPORATIVE EMISSION LINE DRAWING" .

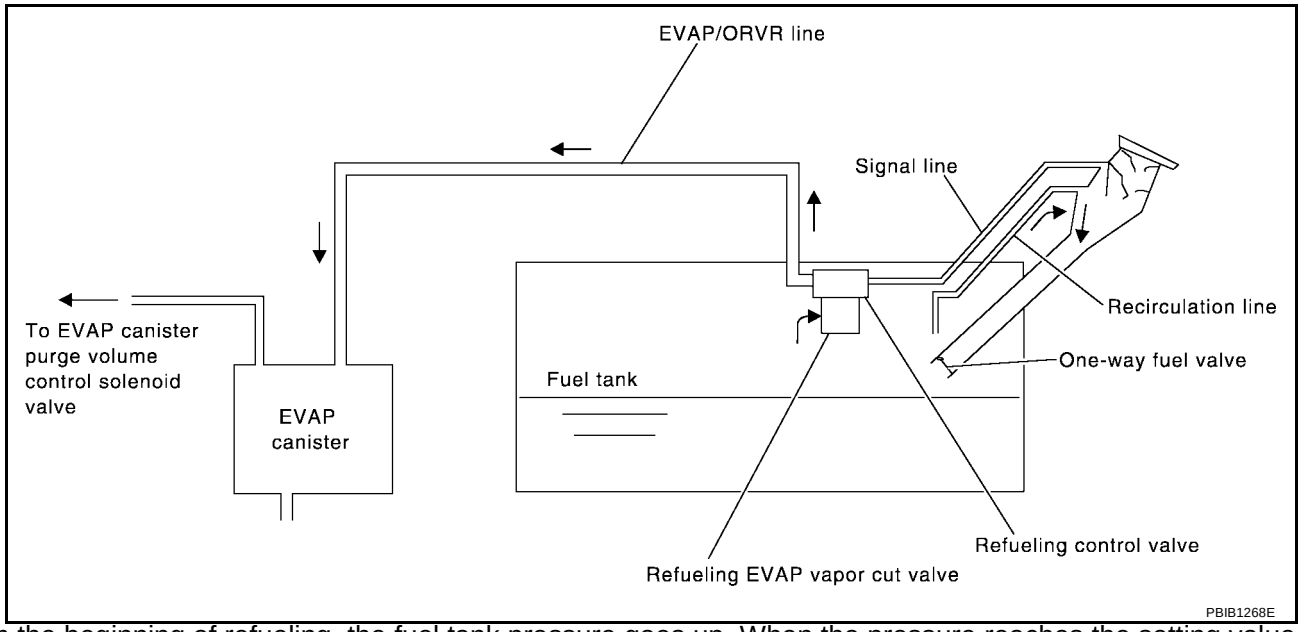


ON BOARD REFUELING VAPOR RECOVERY (ORVR)

PFP:00032

System Description

UBS003T7



From the beginning of refueling, the fuel tank pressure goes up. When the pressure reaches the setting value of the refueling control valve (RCV) opening pressure, the RCV is opened. After RCV opens, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve, RCV and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.
When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.
The RCV is always closed during driving and the evaporative emission control system is operated the same as conventional system.

WARNING:

When conducting inspections below, be sure to observe the following:

- **Put a “CAUTION: INFLAMMABLE” sign in workshop.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to furnish the workshop with a CO_2 fire extinguisher.**

CAUTION:

- **Before removing fuel line parts, carry out the following procedures:**
  - **Put drained fuel in an explosion-proof container and put lid on securely.**
  - **Release fuel pressure from fuel line. Refer to “Fuel Pressure Release”, EC-56 .**
  - **Disconnect battery ground cable.**
- **Always replace O-ring when the fuel gauge retainer is removed.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose and clamps excessively to avoid damaging hoses.**
- **After installation, run engine and check for fuel leaks at connection.**
- **Do not attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.**

Diagnostic Procedure

UBS003T8

SYMPTOM: FUEL ODOR FROM EVAP CANISTER IS STRONG.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Weigh the EVAP canister with EVAP canister vent control valve attached.
   The weight should be less than 1.9 kg (4.2 lb).

OK or NG

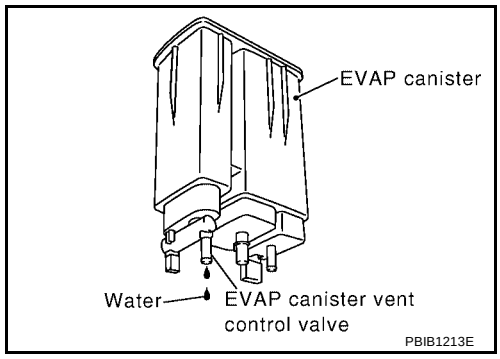
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.
No >> GO TO 6.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> Repair or replace EVAP hose.

4. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-593, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

5. CHECK REFUELING CONTROL VALVE

Refer to EC-593, "Component Inspection" .

OK or NG

OK >> **INSPECTION END**
NG >> Replace refueling control valve with fuel tank.

SYMPTOM: CANNOT REFUEL/FUEL ODOR FROM THE FUEL FILLER OPENING IS STRONG WHILE REFUELING.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Weigh the EVAP canister with EVAP canister vent control valve attached.
   The weight should be less than 1.9 kg (4.2 lb).

OK or NG

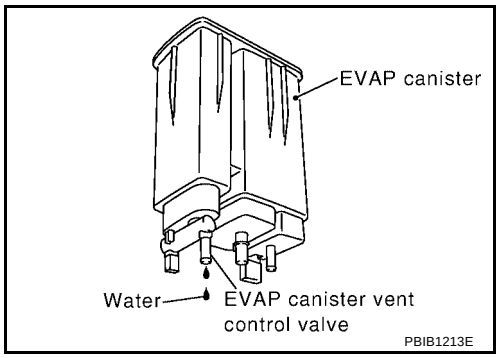
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.
No >> GO TO 6.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kink, looseness and improper connection.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace hoses and tubes.

5. CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

OK or NG

OK >> GO TO 6.
NG >> Replace filler neck tube.

6. CHECK REFUELING CONTROL VALVE

Refer to EC-593, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace refueling control valve with fuel tank.

7. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-593, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

8. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

OK or NG

OK >> GO TO 9.
NG >> Replace fuel filler tube.

9. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

OK or NG

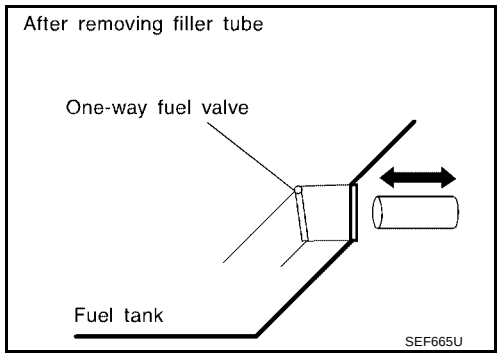
OK >> GO TO 10.
NG >> Repair or replace one-way fuel valve with fuel tank.

10. CHECK ONE-WAY FUEL VALVE-II

1. Make sure that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as follows.
   When a stick is inserted, the valve should open, when removing stick it should close.
   Do not drop any material into the tank.

OK or NG

OK >> **INSPECTION END**
NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.



Component Inspection

UBS003T9

REFUELING EVAP VAPOR CUT VALVE

With CONSULT-II

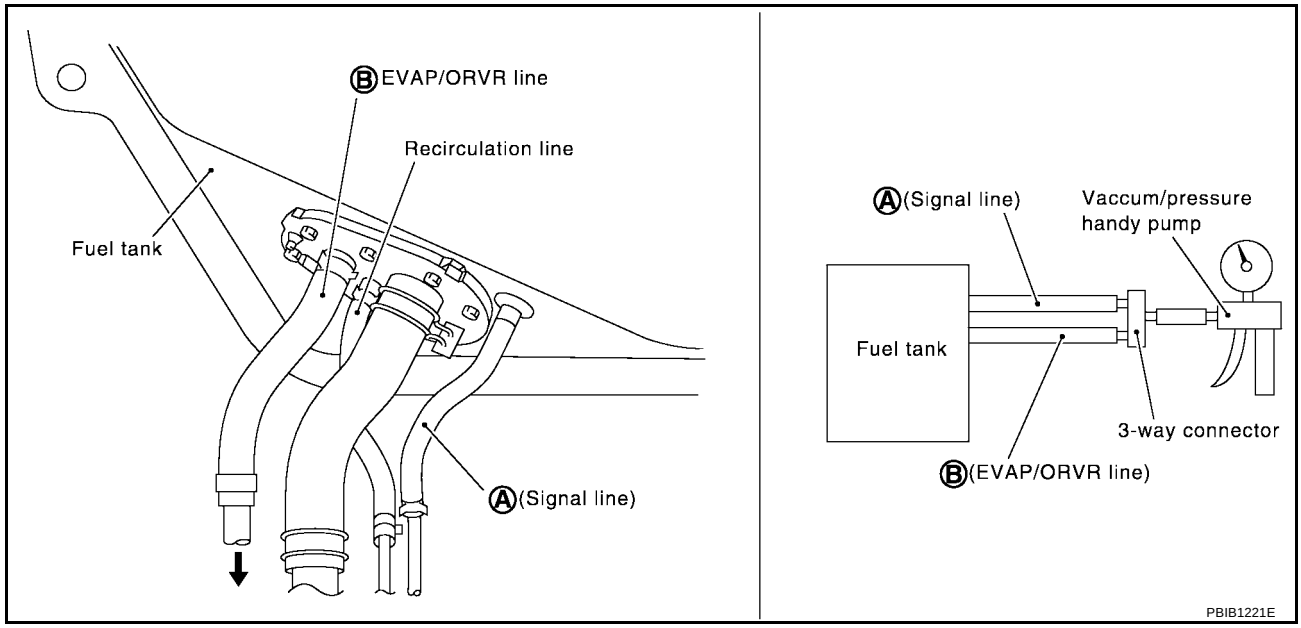
1. Remove fuel tank. Refer to FL-7, "FUEL TANK" .
2. Drain fuel from the tank as follows:

a. Remove fuel feed hose located on the fuel gauge retainer.
b. Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
c. Drain fuel using “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT-II.

3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end B), and check that the air flows freely into the tank.
4. Check refueling EVAP vapor cut valve for being stuck to open as follows.

a. Connect vacuum pump to hose ends A and B using a suitable 3-way connector.
b. Remove fuel gauge retainer with fuel gauge unit.
   Always replace O-ring with new one.
c. Put fuel tank upside down.

d. Apply vacuum pressure to hose end [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Without CONSULT-II

1. Remove fuel tank. Refer to FL-7, "FUEL TANK" .
2. Drain fuel from the tank as follows:

a. Remove fuel gauge retainer.

b. Drain fuel from the tank using a handy pump into a fuel container.

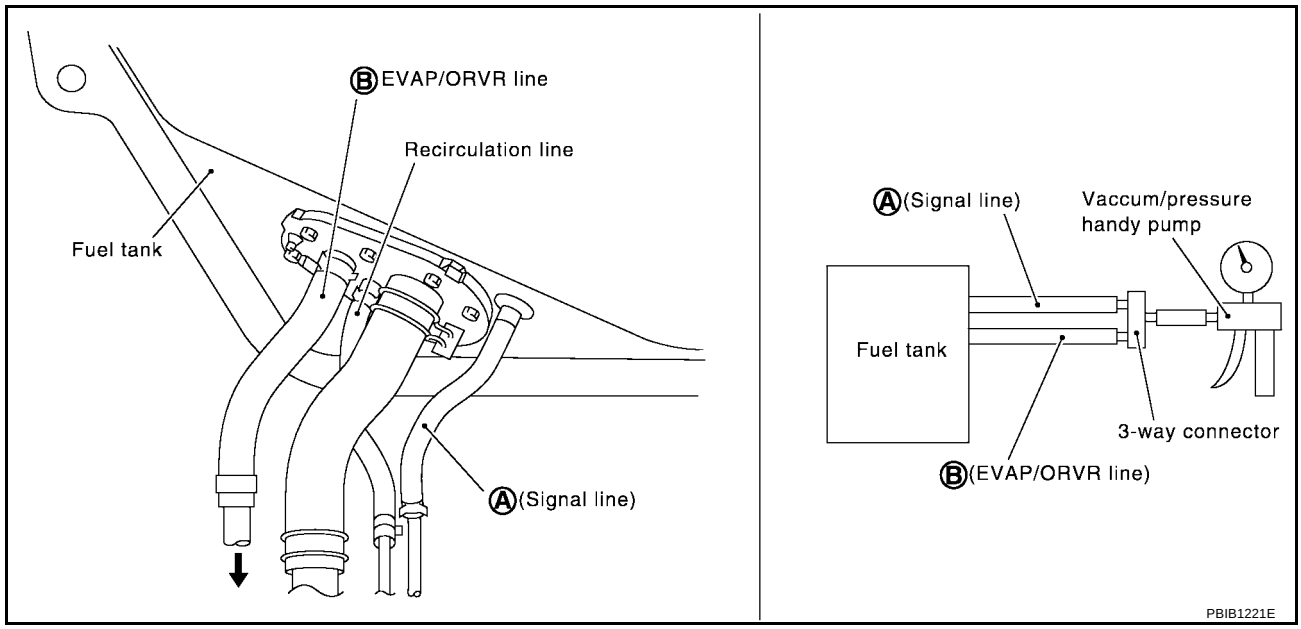
3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end B), and check that the air flows freely into the tank.
4. Check refueling EVAP vapor cut valve for being stuck to open as follows.

a. Connect vacuum pump to hose ends A and B using a suitable 3-way connector.

b. Remove fuel gauge retainer with fuel gauge unit.
   Always replace O-ring with new one.

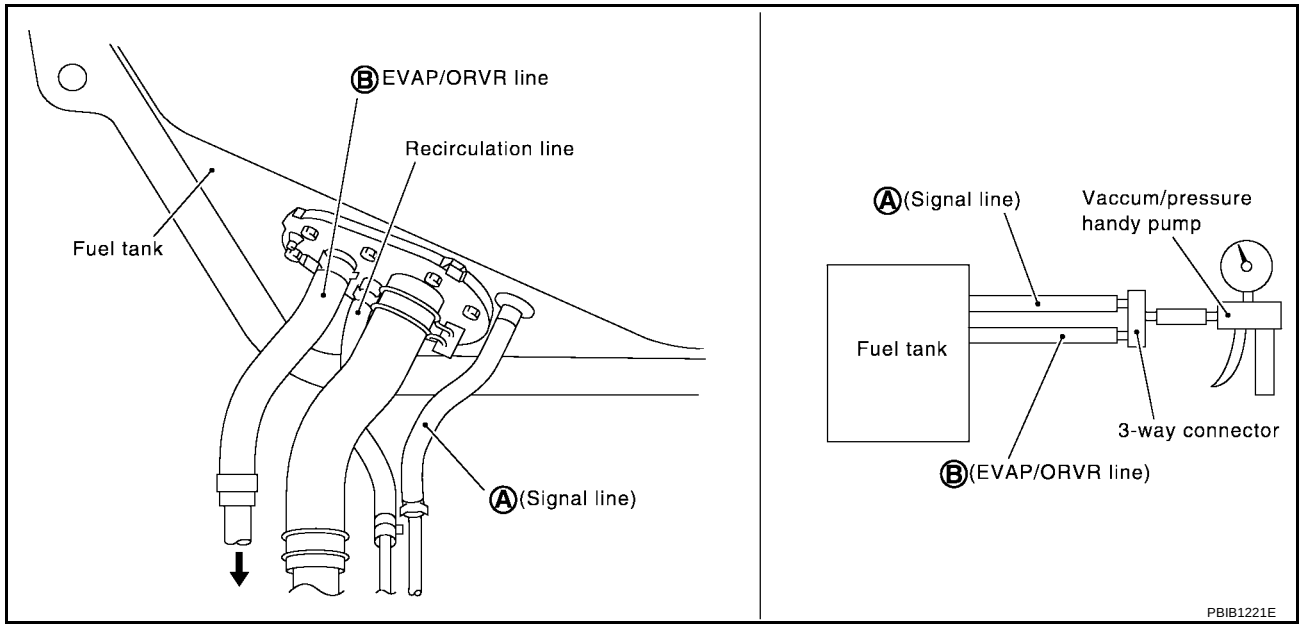
c. Put fuel tank upside down.

d. Apply vacuum pressure to hose end [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



REFUELING CONTROL VALVE

1. Remove fuel filler cap.
2. Check air into continuity between hose ends A and B.
   Blow air into the hose end B. Air should flow freely into the fuel tank.
3. Blow air into hose end A and check there is no leakage.
4. Apply pressure to both hose ends A and B [20 kPa (150 mmHg, 5,91 inHg)] using a pressure pump and a suitable 3-way connector. Check that there is no leakage.

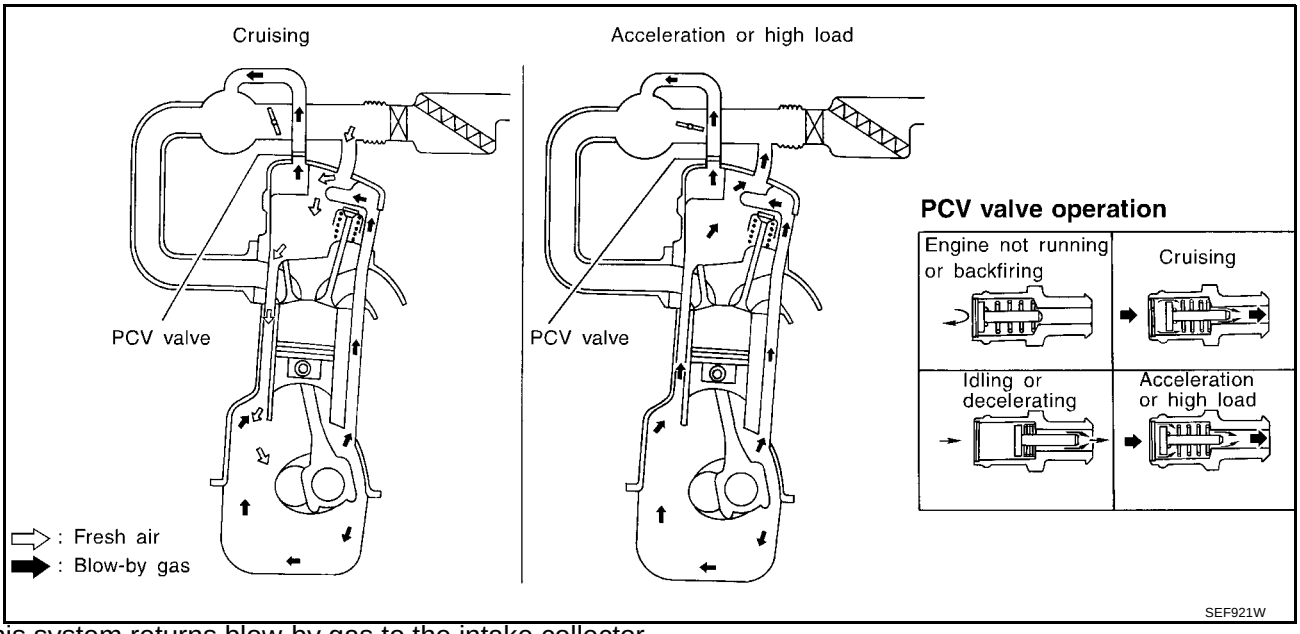


POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

UBS001Q0



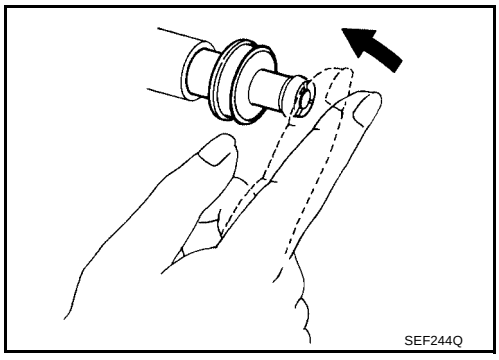
This system returns blow-by gas to the intake collector.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air duct into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the intake collector under all conditions.

Inspection

UBS001Q1

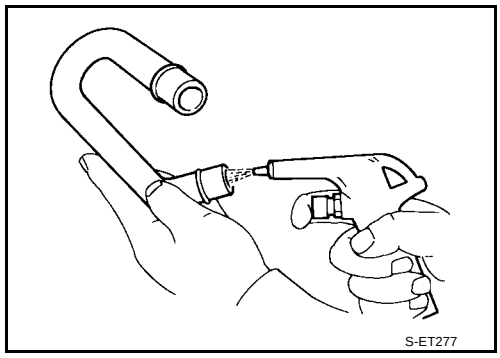
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



AUTOMATIC SPEED CONTROL DEVICE (ASCD)

PFP:18930

System Description

UBS0041J

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation	ASCD vehicle speed control	Electric throttle control actuator
Stop lamp switch	Brake pedal operation		
ASCD steering switch	ASCD steering switch operation		
Park/Neutral position (PNP) switch	Gear position		
Combination meter	Vehicle speed		
TCM	Powertrain revolution		

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.
Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).
ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
Operation status of ASCD is indicated by CRUISE indicator and SET indicator in combination meter. If any malfunction occurs in ASCD system, it automatically deactivates control.

SET OPERATION

Press ASCD CRUISE switch (Main switch). (The CRUISE indicator in combination meter illuminates.)
When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press SET switch. (Then SET indicator in combination meter illuminates.)

ACCEL OPERATION

If the RESUME/ACCEL switch is depressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.
And then ASCD will keep the new set speed.

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is depressed
- More than 2 switches at ASCD steering switch are depressed at the same time (Set speed will be cleared.).
- Brake pedal is depressed
- Clutch pedal is depressed or gear position is changed to the neutral position (M/T models)
- Selector lever is changed to “N”,″P″,″R″ position (A/T models).
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator lamp.

- Engine coolant temperature is slightly higher than the normal operating temperature: CRUISE lamp may blink slowly.
  When the engine coolant temperature decreases to the normal operating temperature, CRUISE lamp will stop blinking and the cruise operation will be able to work by depressing SET switch or RESUME switch.
- Malfunction for some self-diagnoses regarding ASCD control: SET lamp will blink quickly.

If MAIN switch is turned to OFF during ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

COAST OPERATION

When the SET/COAST switch is depressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will keep the new set speed.

RESUME OPERATION

When the RESUME/ACCEL switch is depressed after cancel operation other than depressing MAIN switch is performed, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- Brake pedal is released.
- A/T selector lever is in other than P and N positions (A/T models)
- Clutch pedal is released (M/T models)
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

Component Description

UBS0041K

ASCD STEERING SWITCH

Refer to EC-474 .

ASCD BRAKE SWITCH

Refer to EC-481 , and EC-570 .

ASCD CLUTCH SWITCH

Refer to EC-481 , andEC-570 .

STOP LAMP SWITCH

Refer to EC-481 , EC-497 and EC-570 .

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EC-390 , EC-392 , EC-399 and EC-404 .

ASCD INDICATOR

Refer to EC-579 .

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

UBS006GZ

Fuel pressure at idle	Approximately 350 kPa (3.57kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

UBS001Q3

Target idle speed*1 rpm	A/T	No-load*1 (in “P” or “N” position)	800±50 rpm
	M/T	No-load*1 (in ″Neutral″ position)	650±50 rpm
Air conditioner: ON rpm	A/T	In “P” or “N” position	850 or more
	M/T	In ″Neutral″ position	
Ignition timing	A/T	In “P” or “N” position	18°±5° BTDC
	M/T	In ″Neutral″ position	7°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electrical load: OFF (Lights & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Mass Air Flow Sensor

UBS001Q4

Supply voltage V	Battery voltage (11 - 14)
Output voltage V	1.0 - 1.7*
Mass air flow (Using CONSULT-II or GST) g·m/sec	1.4 - 4.0 at idle* 5.0 - 10.0 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and idling under no-load.

Engine Coolant Temperature Sensor

UBS001Q5

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Fuel Pump

UBS001Q7

Resistance [at 25°C (77°F)] Ω	0.2 - 5.0

Injector

UBS001Q9

Resistance [at 20°C (68°F)] Ω	13.5 - 17.5

Resistor

UBS001QA

Resistance [at 25°C (77°F)] Ω	4 - 8

Throttle Control Motor

UBS006H0

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Heated Oxygen Sensor 1 Heater

UBS001QC

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

Calculated Load Value

UBS001QD

	Calculated load value % (Using CONSULT-II or GST)
At idle	20.0 - 35.5
At 2,500 rpm	12.0 - 27.0

Intake Air Temperature Sensor

UBS001QE

Temperature °C (°F)	Resistance kΩ
20 (68)	1.9 - 2.1
80 (176)	0.31 - 0.37

EVAP Canister Purge Volume Control Valve

UBS001QF

Resistance [at 20°C (68°F)] Ω	22 - 26

Heated Oxygen Sensor 2 Heater

UBS001QG

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

Crankshaft Position Sensor (POS)

UBS001QH

Resistance [at 20°C (68°F)] Ω	166 - 204

Fuel Tank Temperature Sensor

UBS001QI

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

INDEX FOR DTC

PFP:00024

Alphabetical Index

UBS001QJ

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-728 .

×: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
A/F SENSOR1 (B1)	P1271	1271	2	×	EC-1033
A/F SENSOR1 (B1)	P1272	1272	2	×	EC-1039
A/F SENSOR1 (B1)	P1273	1273	2	×	EC-1045
A/F SENSOR1 (B1)	P1274	1274	2	×	EC-1052
A/F SENSOR1 (B1)	P1276	1276	2	×	EC-1059
A/F SENSOR1 (B1)	P1278	1278	2	×	EC-1065
A/F SENSOR1 (B1)	P1279	1279	2	×	EC-1073
A/F SEN1 HTR (B1)	P1031	1031	2	×	EC-930
A/F SEN1 HTR (B1)	P1032	1032	2	×	EC-930
APP SEN 1/CIRC	P2122	2122	1	×	EC-1125
APP SEN 1/CIRC	P2123	2123	1	×	EC-1125
APP SEN 2/CIRC	P2127	2127	1	×	EC-1132
APP SEN 2/CIRC	P2128	2128	1	×	EC-1132
APP SENSOR	P2138	2138	1	×	EC-1147
ASCD BRAKE SW	P1572	1572	1	—	EC-1102
ASCD SW	P1564	1564	1	—	EC-1095
ASCD VHL SPD SEN	P1574	1574	1	—	EC-1113
A/T 1ST GR FNCTN	P0731	0731	2	×	AT-136
A/T 2ND GR FNCTN	P0732	0732	2	×	AT-141
A/T 3RD GR FNCTN	P0733	0733	2	×	AT-146
A/T 4TH GR FNCTN	P0734	0734	2	×	AT-151
A/T TCC S/V FNCTN	P0744	0744	2	×	AT-164
ATF TEMP SEN/CIRC	P0710	0710	2	×	AT-121
BRAKE SW/CIRCUIT	P1805	1805	2	—	EC-1119
CMP SEN/CIRCUIT	P0340	0340	2	×	EC-842
CLOSED LOOP-B1	P1148	1148	1	×	EC-1008
CKP SEN/CIRCUIT	P0335	0335	2	×	EC-836
CAN COMM CIRCUIT	U1000	1000*5	1	×	EC-728
CAN COMM CIRCUIT	U1001	1001*5	2	—	EC-728
CTP LEARING	P1225	1225	2	—	EC-1024
CTP LEARING	P1226	1226	2	—	EC-1026
CYL 1 MISFIRE	P0301	0301	2	×	EC-825
CYL 2 MISFIRE	P0302	0302	2	×	EC-825
CYL 3 MISFIRE	P0303	0303	2	×	EC-825
CYL 4 MISFIRE	P0304	0304	2	×	EC-825
ECM	P0605	0605	1 or 2	× or —	EC-927
ECM BACK UP/CIRC	P1065	1065	2	×	EC-936

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
ECT SEN/CIRC	P0117	0117	1	×	EC-760
ECT SEN/CIRC	P0118	0118	1	×	EC-760
ECT SENSOR	P0125	0125	1	×	EC-772
ENGINE SPEED SIG	P0725	0725	2	×	AT-132
ENG OVER TEMP	P1217	1217	1	×	EC-1009
ETC ACTR	P1121	1121	1	×	EC-952
ETC FUNCTION/CIRC	P1122	1122	1	×	EC-954
ETC MOT	P1128	1128	1	×	EC-966
ETC MOT PWR	P1124	1124	1	×	EC-961
ETC MOT PWR	P1126	1126	1	×	EC-961
EVAP GROSS LEAK	P0455	0455	2	×	EC-893
EVAP PURG FLOW/MON	P0441	0441	2	×	EC-852
EVAP SYS PRES SEN	P0452	0452	2	×	EC-880
EVAP SYS PRES SEN	P0453	0453	2	×	EC-886
EVAP SMALL LEAK	P0442	0442	2	×	EC-858
EVAP VERY SML LEAK	P0456	0456	2	×	EC-901
FUEL LEVL SEN/CIRC	P0462	0462	2	×	EC-914
FUEL LEVL SEN/CIRC	P0463	0463	2	×	EC-914
FUEL LEVEL SENSOR	P0461	0461	2	×	EC-912
FUEL LEV SEN SLOSH	P0460	0460	2	×	EC-910
FUEL SYS-LEAN-B1	P0171	0171	2	×	EC-795
FUEL SYS-RICH-B1	P0172	0172	2	×	EC-802
FTT SENSOR	P0181	0181	2	×	EC-809
FTT SEN/CIRCUIT	P0182	0182	2	×	EC-814
FTT SEN/CIRCUIT	P0183	0183	2	×	EC-814
HO2S2 (B1)	P1146	1146	2	×	EC-992
HO2S2 (B1)	P1147	1147	2	×	EC-1000
HO2S2 (B1)	P0138	0138	2	×	EC-780
HO2S2 (B1)	P0139	0139	2	×	EC-787
HO2S2 HTR (B1)	P0037	0037	2	×	EC-734
HO2S2 HTR (B1)	P0038	0038	2	×	EC-734
IAT SEN CIRCUIT	P0112	0112	2	×	EC-755
IAT SEN CIRCUIT	P0113	0113	2	×	EC-755
IAT SEN CIRCUIT	P0127	0127	2	×	EC-775
INT/V TIM CONT-B1	P0011	0011	2	×	EC-731
INT/V TIM V/CIR-B1	P1111	1111	2	×	EC-947
ISC SYSTEM	P0506	0506	2	×	EC-918
ISC SYSTEM	P0507	0507	2	×	EC-920
KNOCK SEN/CIRC-B1	P0327	0327	2	—	EC-832
KNOCK SEN/CIRC-B1	P0328	0328	2	—	EC-832
L/PRES SOL/CIRC	P0745	0745	2	×	AT-174
MAF SEN/CIRCUIT	P0101	0101	1	×	EC-740

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
MAF SEN/CIRCUIT	P0102	0102	1	×	EC-748
MAF SEN/CIRCUIT	P0103	0103	1	×	EC-748
MAF SEN/CIRCUIT	P1102	1102	1	×	EC-940
MULTI CYL MISFIRE	P0300	0300	2	×	EC-825
NO DTC IS DETECTED. FURTHER TESTING MY BE REQUIRED.	No DTC	Flashing*4	—	Flashing*4	EC-654
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	0000	—	—	—
O/R CLTCH SOL/CIRC	P1760	1760	2	×	AT-194
P-N POS SW/CIRCUIT	P1706	1706	2	×	EC-1115
PW ST P SEN/CIRC	P0550	0550	2	—	EC-922
PNP SW/CIRC	P0705	0705	2	×	AT-116
PURG VOLUME CONT/V	P0444	0444	2	×	EC-867
PURG VOLUME CONT/V	P0445	0445	2	×	EC-867
PURG VOLUME CONT/V	P1444	1444	2	×	EC-1081
SFT SOL A/CIRC	P0750	0750	1	×	AT-180
SFT SOL B/CIRC	P0755	0755	1	×	AT-180
SENSOR POWER/CIRC	P1229	1229	1	×	EC-1028
SWIRL CONT VALVE	P1138	1138	2	×	EC-984
SWL CON/V POSI SEN	P1137	1137	2	×	EC-976
TCC SOLENOID/CIRC	P0740	0740	2	×	AT-160
THERMSTAT FNCTN	P0128	0128	2	×	EC-814
TP SEN/CIRC A/T	P1705	1705	1	×	AT-188
TP SEN 1/CIRC	P0222	0222	1	×	EC-818
TP SEN 1/CIRC	P0223	0223	1	×	EC-818
TP SEN 2/CIRC	P0122	0122	1	×	EC-765
TP SEN 2/CIRC	P0123	0123	1	×	EC-765
TP SENSOR	P2135	2135	1	×	EC-1140
TW CATALYST SYS-B1	P0420	0420	2	×	EC-848
VARI SWL CON/SV-B1	P1132	1132	2	×	EC-971
VEH SPEED SEN/CIRC*6	P0500	0500	2	×	EC-916
VEH SPD SEN/CIR A/T*6	P0720	0720	2	×	AT-127
VENT CONTROL VALVE	P0447	0447	2	×	EC-873
VENT CONTROL VALVE	P1446	1446	2	×	EC-1089

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

DTC No. Index

UBS001QK

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-728 .

×: Applicable —: Not Applicable

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
No DTC	Flashing*4	**NO DTC IS DETECTED. FURTHER TESTING MY BE REQUIRED.**	—	Flashing*4	EC-654
U1000	1000*5	CAN COMM CIRCUIT	1	×	EC-728
U1001	1001*5	CAN COMM CIRCUIT	2	—	EC-728
P0000	0000	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	—
P0011	0011	INT/V TIM CONT-B1	2	×	EC-731
P0037	0037	HO2S2 HTR (B1)	2	×	EC-734
P0038	0038	HO2S2 HTR (B1)	2	×	EC-734
P0101	0101	MAF SEN/CIRCUIT	1	×	EC-740
P0102	0102	MAF SEN/CIRCUIT	1	×	EC-748
P0103	0103	MAF SEN/CIRCUIT	1	×	EC-748
P0112	0112	IAT SEN/CIRCUIT	2	×	EC-755
P0113	0113	IAT SEN/CIRCUIT	2	×	EC-755
P0117	0117	ECT SEN/CIRC	1	×	EC-760
P0118	0118	ECT SEN/CIRC	1	×	EC-760
P0122	0122	TP SEN 2/CIRC	1	×	EC-765
P0123	0123	TP SEN 2/CIRC	1	×	EC-765
P0125	0125	ECT SENSOR	1	×	EC-772
P0127	0127	IAT SEN/CIRCUIT	2	×	EC-775
P0128	0128	THERMSTAT FNCTN	2	×	EC-778
P0138	0138	HO2S2 (B1)	2	×	EC-780
P0139	0139	HO2S2 (B1)	2	×	EC-787
P0171	0171	FUEL SYS-LEAN-B1	2	×	EC-795
P0172	0172	FUEL SYS-RICH-B1	2	×	EC-802
P0181	0181	FTT SENSOR	2	×	EC-809
P0182	0182	FTT SEN/CIRCUIT	2	×	EC-814
P0183	0183	FTT SEN/CIRCUIT	2	×	EC-814
P0222	0222	TP SEN 1/CIRC	1	×	EC-818
P0223	0223	TP SEN 1/CIRC	1	×	EC-818
P0300	0300	MULTI CYL MISFIRE	2	×	EC-825
P0301	0301	CYL 1 MISFIRE	2	×	EC-825
P0302	0302	CYL 2 MISFIRE	2	×	EC-825
P0303	0303	CYL 3 MISFIRE	2	×	EC-825
P0304	0304	CYL 4 MISFIRE	2	×	EC-825
P0327	0327	KNOCK SEN/CIRC-B1	2	—	EC-832
P0328	0328	KNOCK SEN/CIRC-B1	2	—	EC-832
P0335	0335	CKP SEN/CIRCUIT	2	×	EC-836
P0340	0340	CMP SEN/CIRCUIT	2	×	EC-842
P0420	0420	TW CATALYST SYS-B1	2	×	EC-848
P0441	0441	EVAP PURG FLOW/MON	2	×	EC-852
P0442	0442	EVAP SMALL LEAK	2	×	EC-858

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P0444	0444	PURG VOLUME CONT/V	2	×	EC-867
P0445	0445	PURG VOLUME CONT/V	2	×	EC-867
P0447	0447	VENT CONTROL VALVE	2	×	EC-873
P0452	0452	EVAP SYS PRES SEN	2	×	EC-880
P0453	0453	EVAP SYS PRES SEN	2	×	EC-886
P0455	0455	EVAP GROSS LEAK	2	×	EC-893
P0456	0456	EVAP VERY SML LEAK	2	×	EC-901
P0460	0460	FUEL LEV SEN SLOSH	2	×	EC-910
P0461	0461	FUEL LEVEL SENSOR	2	×	EC-912
P0462	0462	FUEL LEVL SEN/CIRC	2	×	EC-914
P0463	0463	FUEL LEVL SEN/CIRC	2	×	EC-914
P0500	0500	VEH SPEED SEN/CIRC*6	2	×	EC-916
P0506	0506	ISC SYSTEM/CIRC	2	×	EC-918
P0507	0507	ISC SYSTEM/CIRC	2	×	EC-920
P0550	0550	PW ST P SEN/CIRC	2	—	EC-922
P0605	0605	ECM	1 or 2	× or —	EC-927
P0705	0705	PNP SW/CIRC	2	×	AT-116
P0710	0710	ATF TEMP SEN/CIRC	2	×	AT-121
P0720	0720	VEH SPD SEN/CIR A/T*6	2	×	AT-127
P0725	0725	ENGINE SPEED SIG	2	×	AT-132
P0731	0731	A/T 1ST GR FNCTN	2	×	AT-136
P0732	0732	A/T 2ND GR FNCTN	2	×	AT-141
P0733	0733	A/T 3RD GR FNCTN	2	×	AT-146
P0734	0734	A/T 4TH GR FNCTN	2	×	AT-151
P0740	0740	TCC SOLENOID/CIRC	2	×	AT-160
P0744	0744	A/T TCC S/V FNCTN	2	×	AT-164
P0745	0745	L/PRESS SOL/CIRC	2	×	AT-174
P0750	0750	SFT SOL A/CIRC	1	×	AT-180
P0755	0755	SFT SOL B/CIRC	1	×	AT-184
P1031	1031	A/F SEN1 HTR (B1)	2	×	EC-930
P1032	1032	A/F SEN1 HTR (B1)	2	×	EC-930
P1065	1065	ECM BACK UP/CIRC	2	×	EC-936
P1102	1102	MAF SENSOR	1	×	EC-940
P1111	1111	INT/V TIM V/CIR-B1	2	×	EC-947
P1121	1121	ETC ACTR	1	×	EC-952
P1122	1122	ETC FUNCTION/CIRC	1	×	EC-954
P1124	1124	ETC MOT PWR	1	×	EC-961
P1126	1126	ETC MOT PWR	1	×	EC-961
P1128	1128	ETC MOT	1	×	EC-966
P1132	1132	VARI SWL CON/SV-B1	2	×	EC-971
P1137	1137	SWL CON/V POSI SEN	2	—	EC-976
P1138	1138	SWIRL CONT VALVE	2	×	EC-984

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P1146	1146	HO2S2 (B1)	2	×	EC-992
P1147	1147	HO2S2 (B1)	2	×	EC-1000
P1148	1148	CLOSED LOOP-B1	1	×	EC-1008
P1217	1217	ENG OVER TEMP	1	×	EC-1009
P1225	1225	CTP LEARNING	2	—	EC-1024
P1226	1226	CTP LEARNING	2	—	EC-1026
P1229	1229	SENSOR POWER/CIRC	1	×	EC-1028
P1271	1271	A/F SENSOR1 (B1)	2	×	EC-1033
P1272	1272	A/F SENSOR1 (B1)	2	×	EC-1039
P1273	1273	A/F SENSOR1 (B1)	2	×	EC-1045
P1274	1274	A/F SENSOR1 (B1)	2	×	EC-1052
P1276	1276	A/F SENSOR1 (B1)	2	×	EC-1059
P1278	1278	A/F SENSOR1 (B1)	2	×	EC-1065
P1279	1279	A/F SENSOR1 (B1)	2	×	EC-1073
P1444	1444	PURG VOLUME CONT/V	2	×	EC-1081
P1446	1446	VENT CONTROL VALVE	2	×	EC-1089
P1564	1564	ASCD SW	1	—	EC-1095
P1572	1572	ASCD BRAKE SW	1	—	EC-1102
P1574	1574	ASCD VHL SPD SEN	1	—	EC-1113
P1705	1705	TP SEN/CIRC A/T	1	×	AT-188
P1706	1706	P-N POS SW/CIRCUIT	2	×	EC-1115
P1760	1760	O/R CLTCH SOL/CIRC	2	×	AT-194
P1805	1805	BRAKE SW/CIRCUIT	2	—	EC-1119
P2122	2122	APP SEN 1/CIRC	1	×	EC-1125
P2123	2123	APP SEN 1/CIRC	1	×	EC-1125
P2127	2127	APP SEN 2/CIRC	1	×	EC-1132
P2128	2128	APP SEN 2/CIRC	1	×	EC-1132
P2135	2135	TP SENSOR	1	×	EC-1140
P2138	2138	APP SENSOR	1	×	EC-1147

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SEA J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

UBS001QL

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

On Board Diagnostic (OBD) System of Engine and A/T

UBS001QM

The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

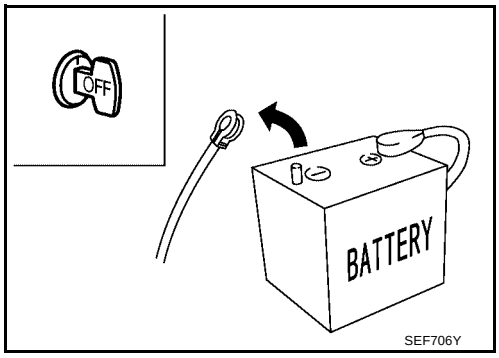
CAUTION:

- **Be sure to turn the ignition switch “OFF” and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector.**
  For description and how to disconnect, refer to EL section, “Description”, “HARNESS CONNECTOR”.
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the EVAP system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission Control Module) before returning the vehicle to the customer.**

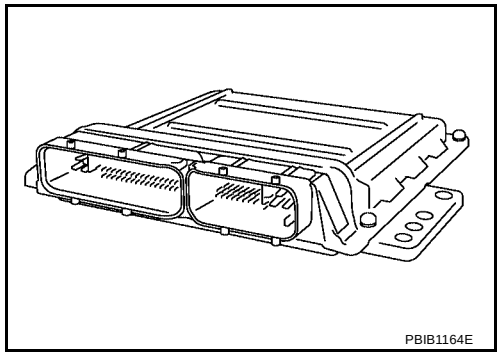
Precautions

UBS001QN

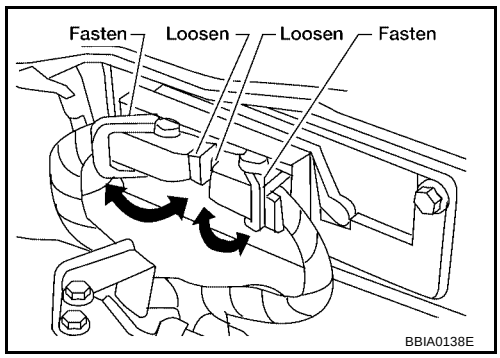
- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the engine control system harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn off ignition switch and then disconnect battery ground cable.**



- **Do not disassemble ECM.**
- **If a battery terminal is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

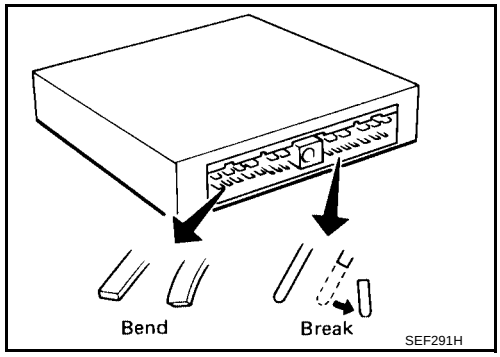

PBIB1164E

- **When connecting engine control system harness connector, fasten it securely with a lever as far as it will go as shown at right.**

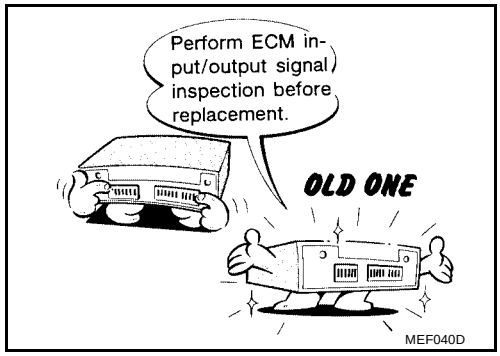


BBIA0138E

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminals when connecting pin connectors.
- **Securely connect engine control system harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**
- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-686 .**

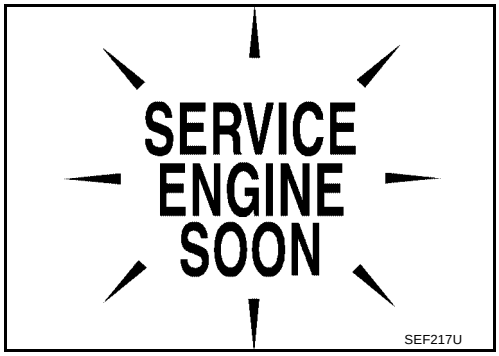


SEF291H

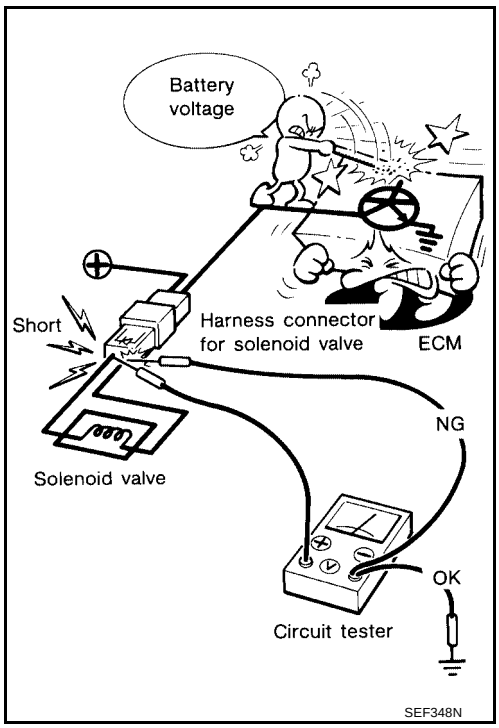


MEF040D

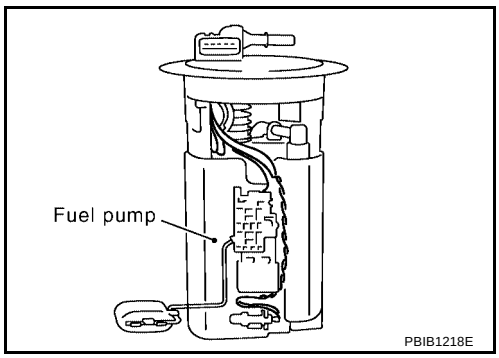
- **After performing each TROUBLE DIAGNOSIS, perform "Overall Function Check" or "DTC Confirmation Procedure".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



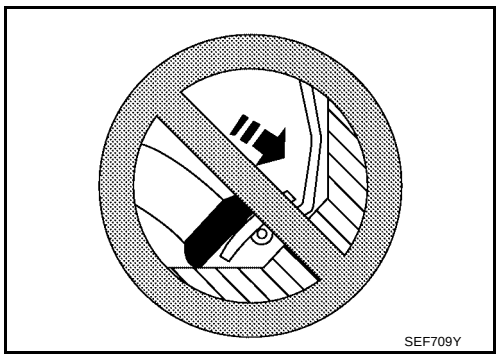
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the body ground.**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Even a slight leak in the air intake system can cause serious problems.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**



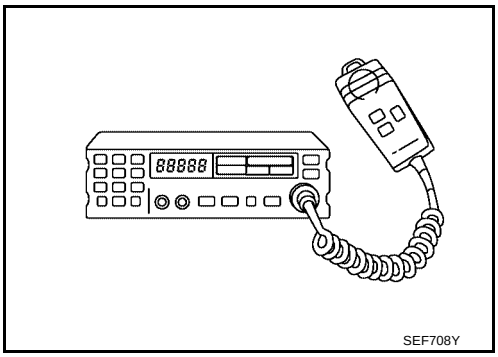
- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**



- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**



Wiring Diagrams and Trouble Diagnosis

UBS001QO

When you read Wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams".
- PG-2, "POWER SUPPLY ROUTING". for power distribution circuit

When you perform trouble diagnosis, refer to the following:

- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES".
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident".

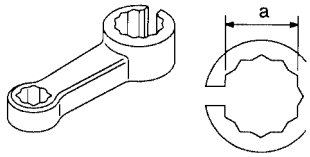
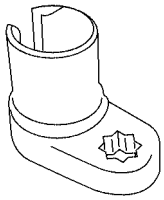
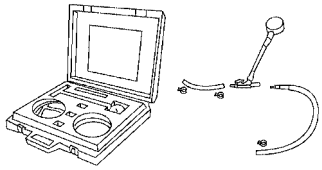
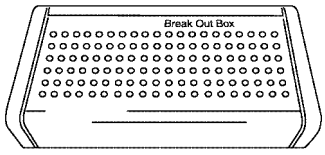
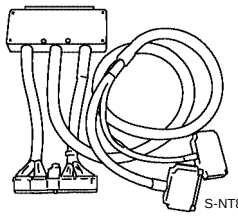
PREPARATION

PFP:00002

Special Service Tools

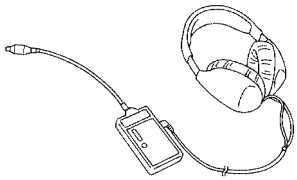
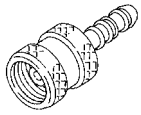
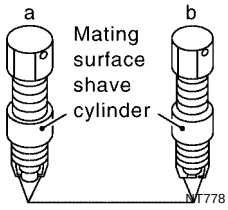
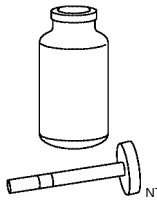
UBS001QP

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description	
KV10114400 (J-38365) Heated oxygen sensor wrench	 NT636	Loosening or tightening heated oxygen sensor **a: 22 mm (0.87 in)**
(J-44626) Air fuel ratio (A/F) sensor wrench	 LEM054	Loosening or tightening air fuel ratio (A/F) sensor 1
(J-44321) Fuel pressure gauge kit	 LEC642	Checking fuel pressure
(J-45356) Fuel filler cap adapter	 NT815	Checking fuel tank vacuum relief valve opening pressure
KV109E0010 (J-46209) Break-out box	 S-NT825	Measuring the ECM signals with a circuit tester
KV109E0080 (J-45819) Y-cable adapter	 S-NT826	Measuring the ECM signals with a circuit tester

Commercial Service Tools

UBS001QQ

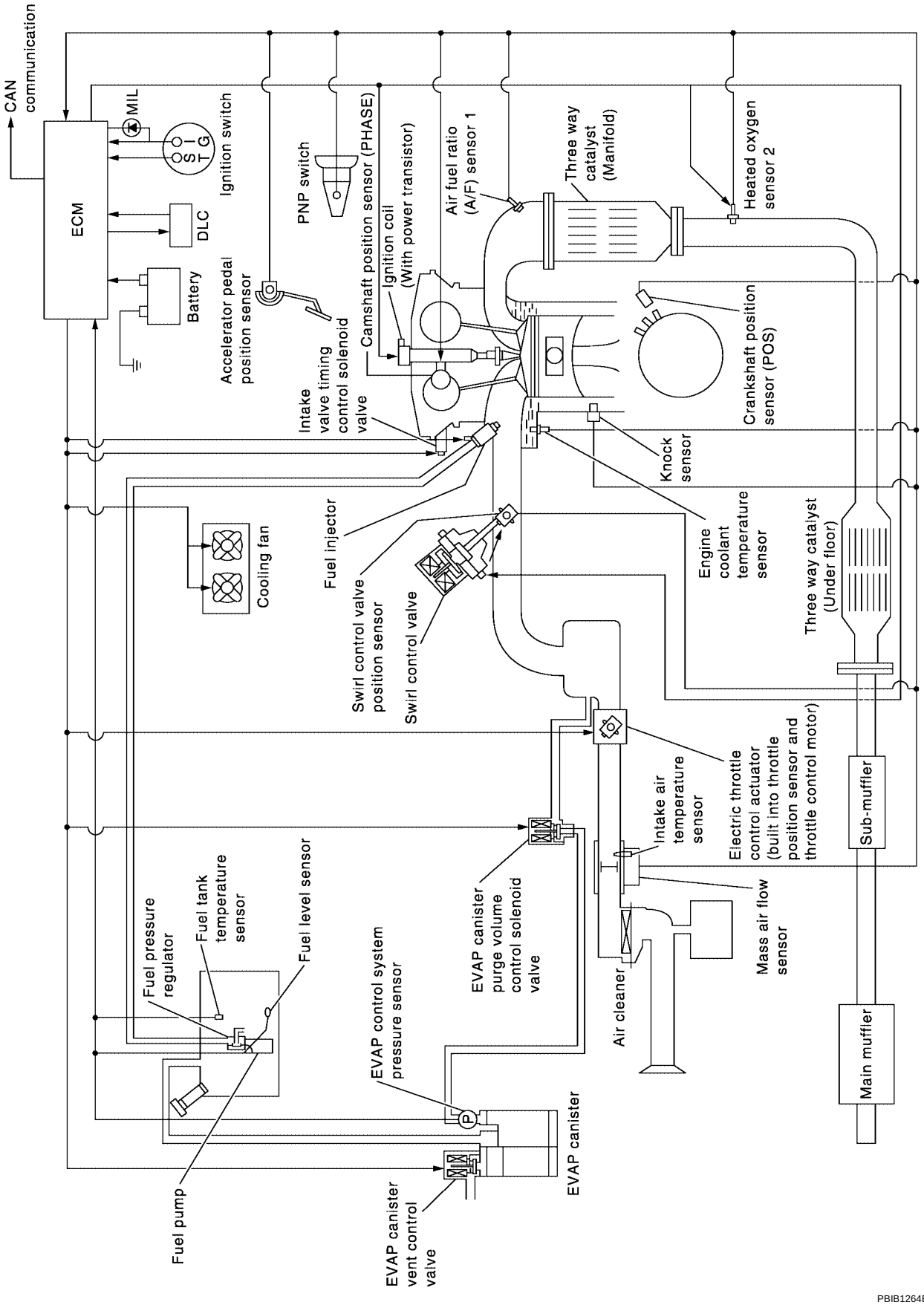
Tool name	Description	
Leak detector i.e.: (J41416)	 NT703	Locating the EVAP leak
EVAP service port adapter i.e.: (J41413-OBD)	 NT704	Applying positive pressure through EVAP service port
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	 NT778	Reconditioning the exhaust system threads before installing a new oxygen sensor or A/F sensor. Use with anti-seize lubricant shown below. **a: J-43897-18 18 mm with 1.5 mm pitch dia., for Zirconia Oxygen Sensor or A/F sensor** **b: J-43897-12 12 mm with 1.25 mm pitch dia., for Titania Oxygen Sensor**
Anti-seize lubricant i.e: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.
Fuel tube removal tool	 LEC643	For disconnecting fuel tube quick connectors **a: 7.9 mm (5/16 in)**

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

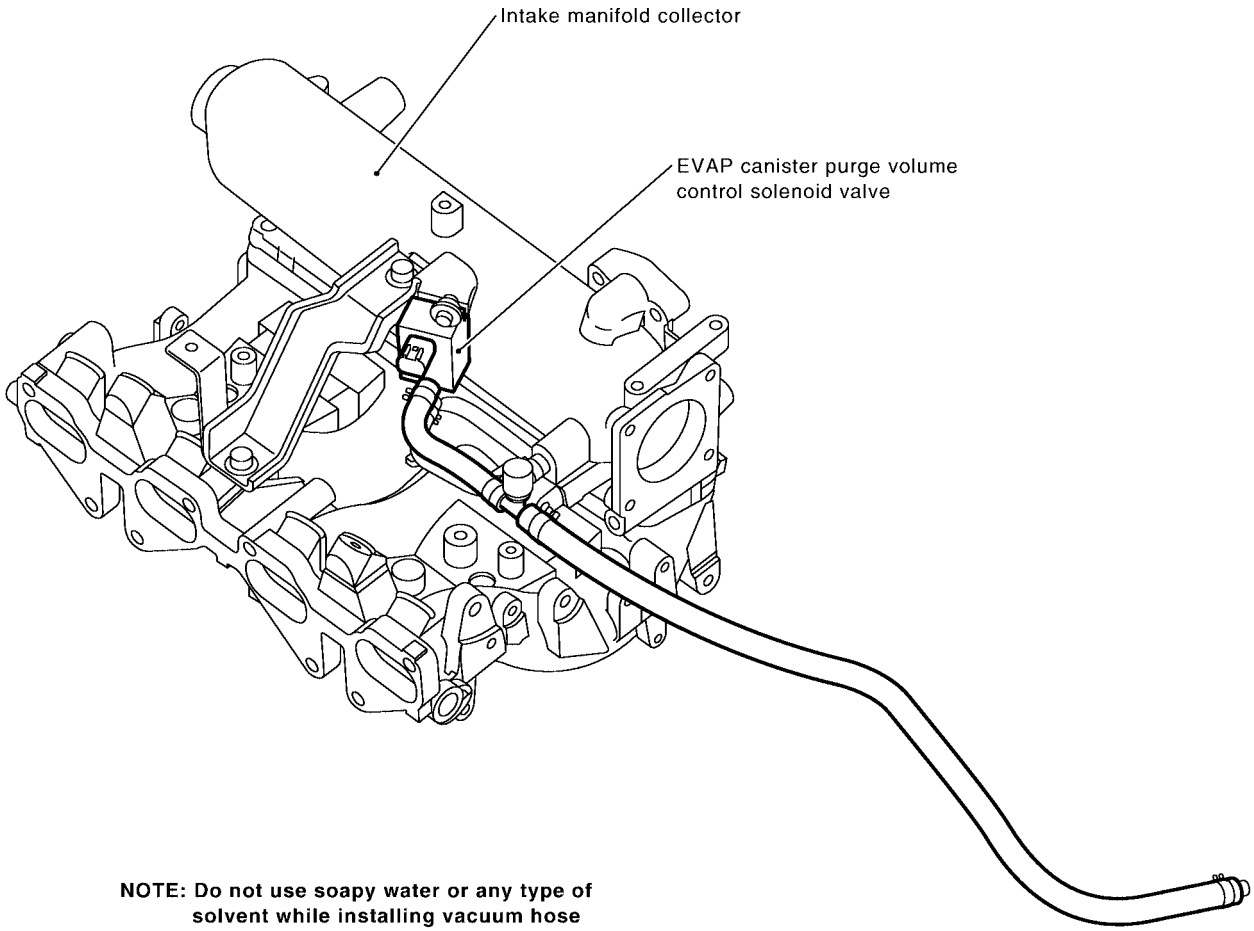
UBS001QR



PBIB1264E

Vacuum Hose Drawing

UBS006F2



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

PBIB1180E

System Chart

UBS001QS

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Air fuel ratio (A/F) sensor 1 ● Ignition switch ● Throttle position sensor ● PNP switch ● Air conditioner switch ● Knock sensor ● EVAP control system pressure sensor ● Fuel tank temperature sensor*1 ● Battery voltage ● Power steering oil pressure switch ● Vehicle speed signal*3 ● Intake air temperature sensor ● Heated oxygen sensor 2*2 ● TCM (Transmission control module)*3 ● Accelerator pedal position sensor ● Electrical load ● Swirl control valve position sensor*1 ● Fuel level sensor*3 ● Refrigerant pressure sensor ● Stop lamp switch ● ASCD steering switch ● ASCD clutch switch ● ASCD brake switch	Fuel injection & mixture ratio control	Injectors
	Distributor ignition system	Power transistor
	Intake valve timing control	Intake valve timing control solenoid valve
	Fuel pump control	Fuel pump relay
	On board diagnostic system	Malfunction indicator lamp (On the instrument panel)
	Swirl control valve control	Swirl control valve
	A/F sensor 1 heater and heated oxygen sensor 2 heater control	A/F sensor 1 heater and heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Cooling fan control	Cooling fan relays
	Air conditioning cut control	Air conditioner relay
	ASCD vehicle speed control	Electric throttle control actuator
	ON BOARD DIAGNOSIS for EVAP system	● EVAP canister vent control valve

*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.
*2: This sensor is not used to control the engine system under normal conditions.
*3: These input signals are sent to the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

UBS001QT

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed*3 and piston number	Fuel injection & mixture ratio control	Injector
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
PNP switch	Gear position		
Vehicle speed signal*2	Vehicle speed		
Ignition switch	Start signal		
Air conditioner switch	Air conditioner operation		
Knock sensor	Engine knocking condition		
Electrical load	Electrical load signal		
Battery	Battery voltage*3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		

*1: Under normal conditions, this sensor is not for engine control operation.
*2: This signal is sent to the ECM through CAN communication line.
*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the camshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

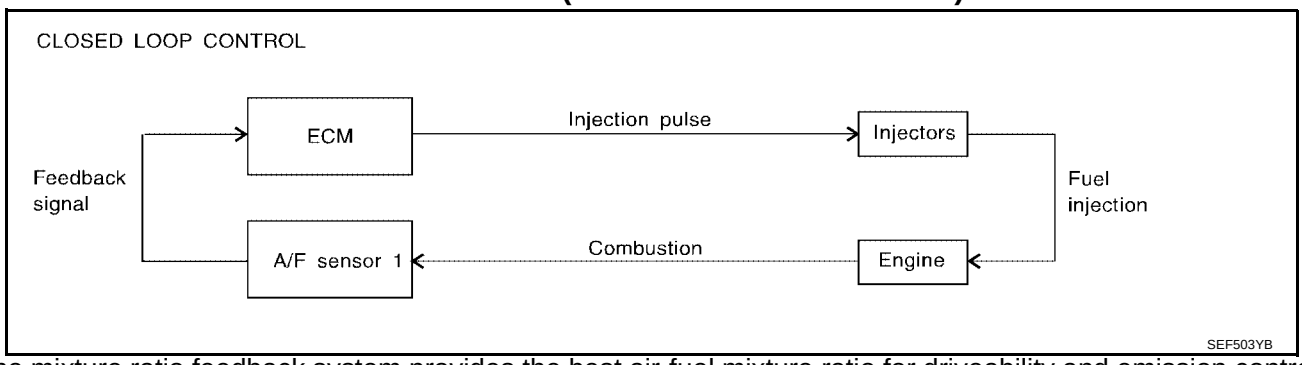
In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (A/T models only)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation
- During high vehicle speed operation
- Extremely high engine coolant temperature

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses an air fuel ratio (A/F) sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the air fuel ratio (A/F) sensor 1, refer to EC-1033 . This maintains the mixture ratio within the stoichiometric range (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst. Even if the switching characteristics of the A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

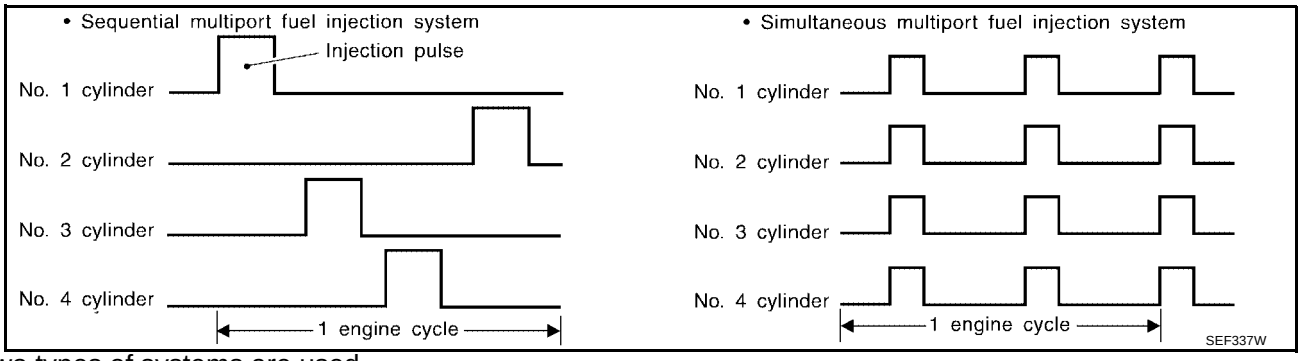
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of A/F sensor 1 or its circuit
- Insufficient activation of A/F sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (A/T models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from A/F sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from A/F sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

UBS001QU

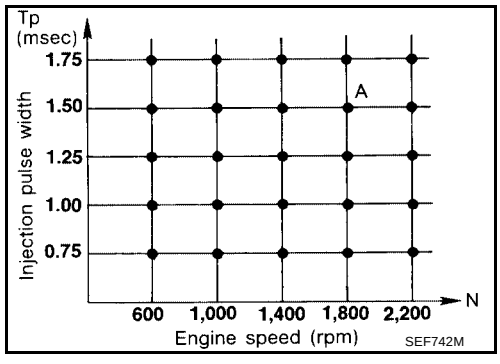
INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed*2 and piston number	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Vehicle speed signal*1	Vehicle speed		
Knock sensor	Engine knocking		
PNP switch	Gear position		
Battery	Battery voltage*2		

*1: This signal sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown above.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A°BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.



- At starting

- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions.
If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

UBS001QV

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
PNP switch	Neutral position		
Throttle position sensor	Throttle valve opening angle		
Accelerator pedal position sensor	Accelerator pedal position		
Camshaft position sensor (PHASE)	Engine speed*1		
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		

*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When the refrigerant pressure is excessively high or low.

Fuel Cut Control (at No Load & High Engine Speed)

UBS001QW

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed signal*1	Vehicle speed	Fuel cut control	Injectors
PNP switch	Neutral position		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS)	Engine speed		
Camshaft position sensor (PHASE)			

*1: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 2,500 rpm with no load, (for example, in Neutral and engine speed over 2,500 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 2,000 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under EC-617, "Multiport Fuel Injection (MFI) System" .

CAN communication

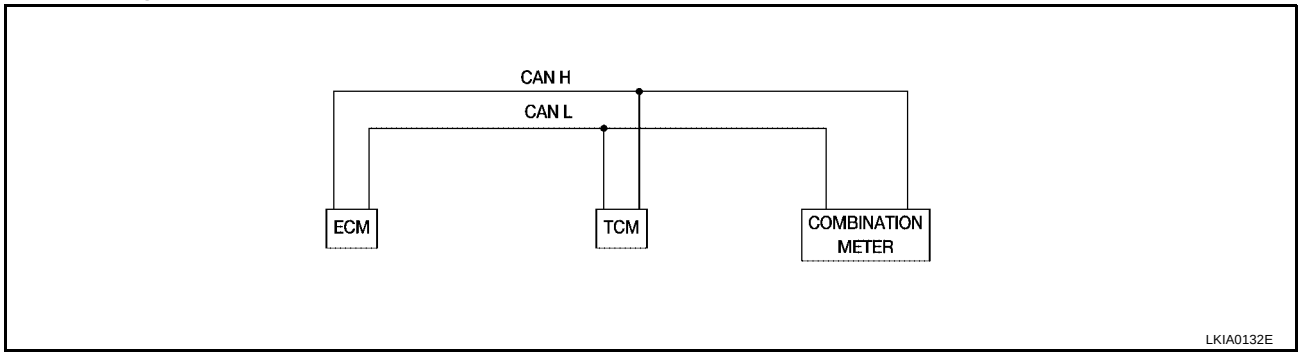
UBS003W9

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

MODELS WITH A/T

System Diagram



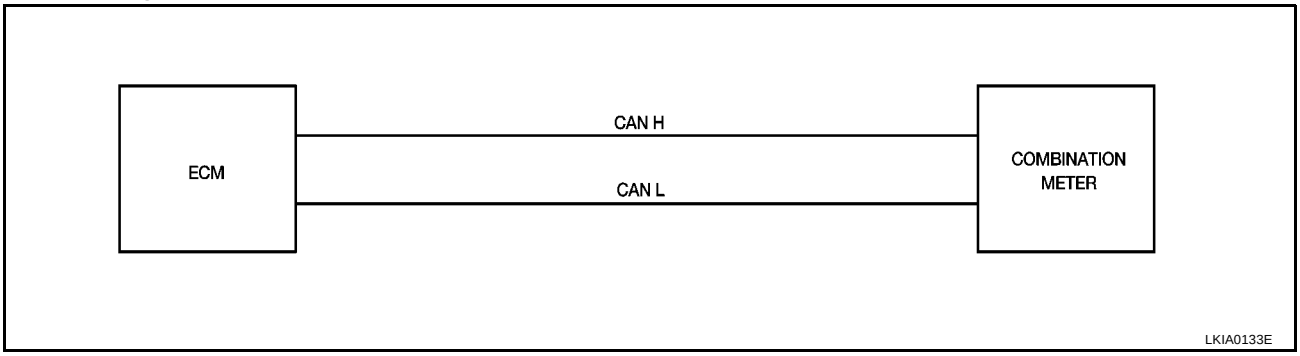
Input/Output Signal Chart

T: Transmit R: Receive

Signals	ECM	TCM	Combination meter
Accelerator pedal position signal	T	R	
Output shaft revolution signal	R	T	
A/T self-diagnosis signal	R	T	
Closed throttle position signal	T	R	
Wide open throttle position signal	T	R	
Stop lamp switch signal		R	T
Overdrive control switch signal		R	T
O/D OFF indicator signal		T	R
Engine speed signal	T		R
Engine coolant temperature signal	T		R
Vehicle speed signal	R		T
Fuel level sensor signal	R		T
Malfunction indicator lamp signal	T		R
ASCD SET lamp signal	T		R
ASCD CRUISE lamp signal	T		R

MODELS WITH M/T

System Diagram



Input/Output Signal Chart

T: Transmit R: Receive

Signals	ECM	Combination meter
Engine speed signal	T	R
Engine coolant temperature signal	T	R
Vehicle speed signal	R	T
Fuel level sensor signal	R	T
Malfunction indicator lamp signal	T	R
ASCD SET lamp signal	T	R
ASCD CRUISE lamp signal	T	R

BASIC SERVICE PROCEDURE

PFP:00018

Idle Speed and Ignition Timing Check

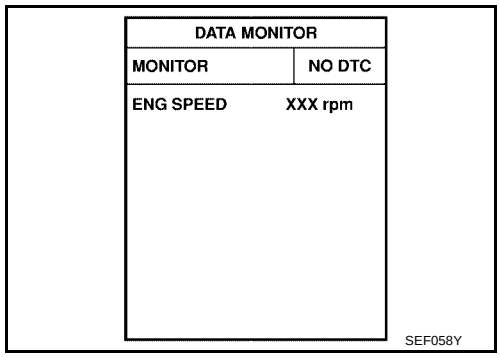
UBS001QX

IDLE SPEED

Using CONSALT-II

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.



With GST

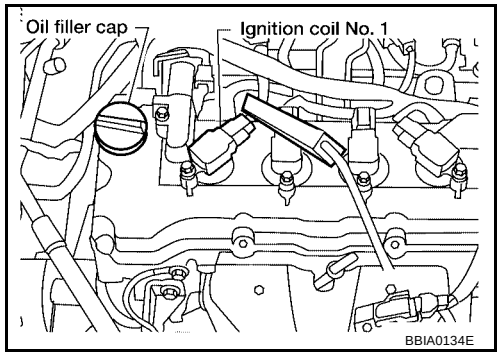
Check idle speed in “MODE 1” with GST.

IGNITION TIMING

Any of following two methods may be used.

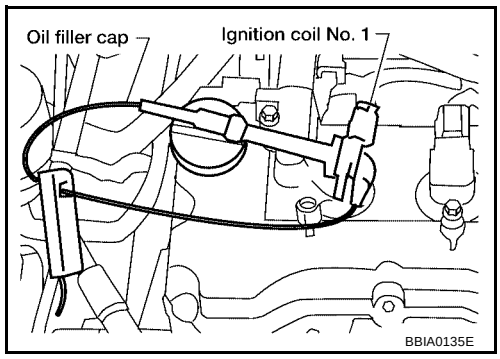
Method A

1. Slide the harness protector off ignition coil No. 1 to clear the wires.
2. Attach timing light to the wires as shown in the figure.
3. Check ignition timing.

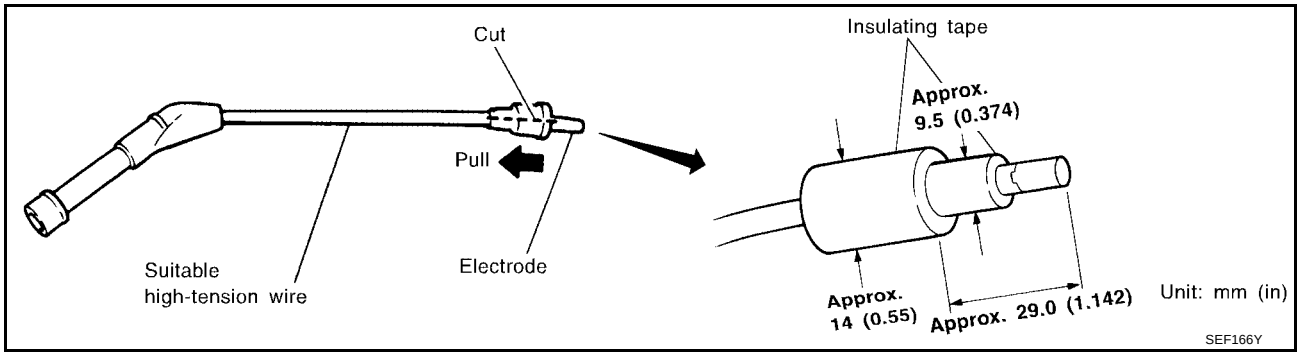


Method B

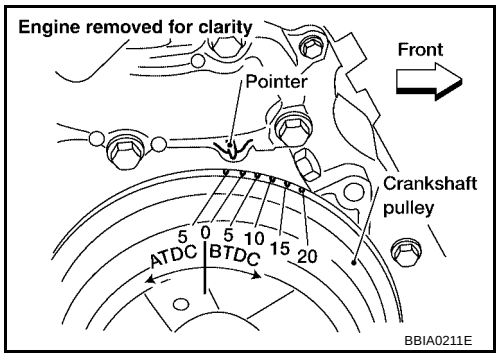
1. Remove No. 1 ignition coil.



2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.



3. Check ignition timing.



Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

UBS001QY

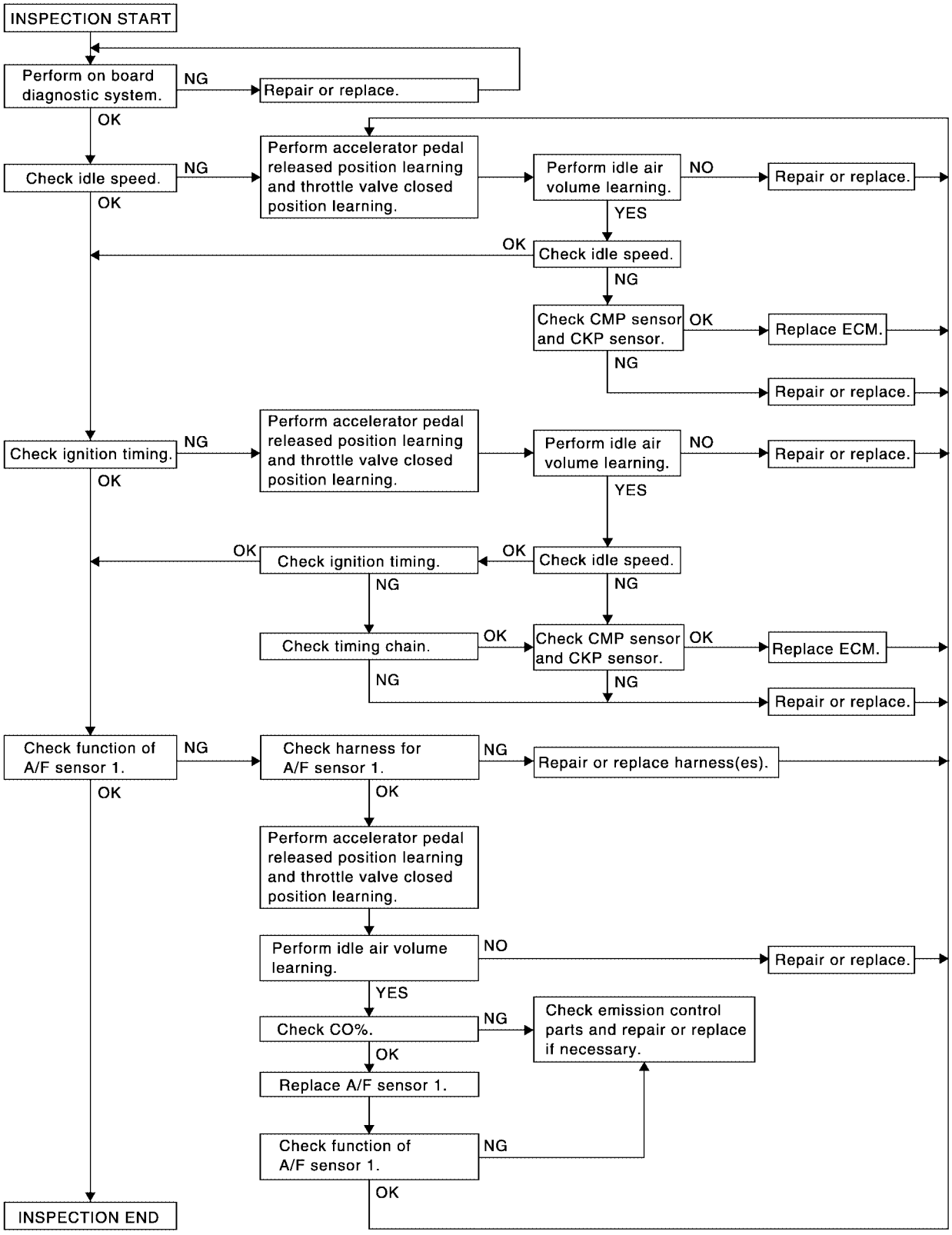
PREPARATION

1. Make sure that the following parts are in good order.

- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- Throttle valve
- EVAP system

2. On models equipped with air conditioner, checks should be carried out while the air conditioner is “OFF”.
3. On models equipped with automatic transaxle, when checking idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in “P” or “N” position.
4. When measuring “CO” percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear window defogger.
6. Keep front wheels pointed straight ahead.
7. Make the check after the cooling fan has stopped.

OVERALL INSPECTION SEQUENCE



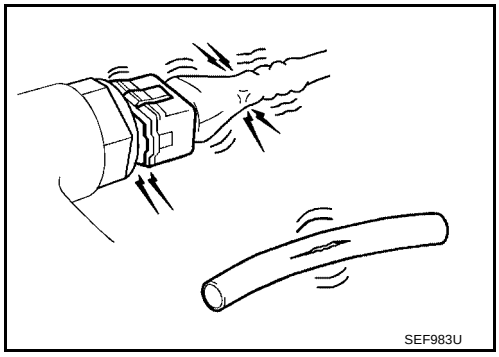
NOTE:
If a vehicle contains a part which is operating outside of design specifications with no MIL illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system cannot reasonably be expected to detect the resulting malfunction.

PBIB1206E

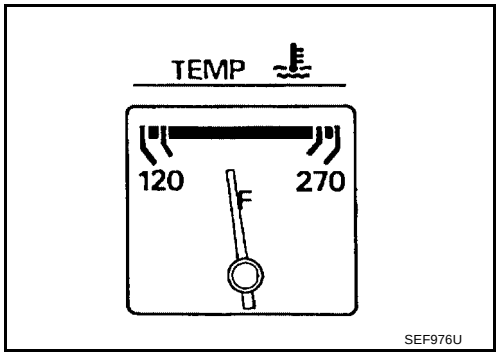
INSPECTION PROCEDURE

1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket
- Throttle valve and throttle position sensor operation


SEF983U

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
   Ensure engine stays below 1,000 rpm.

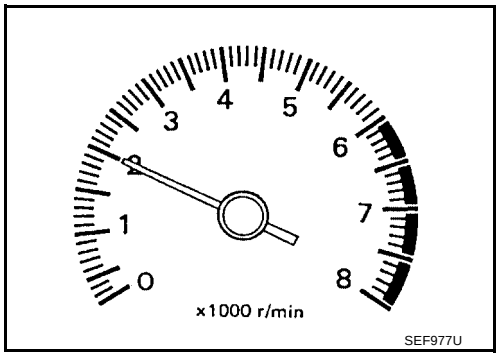


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

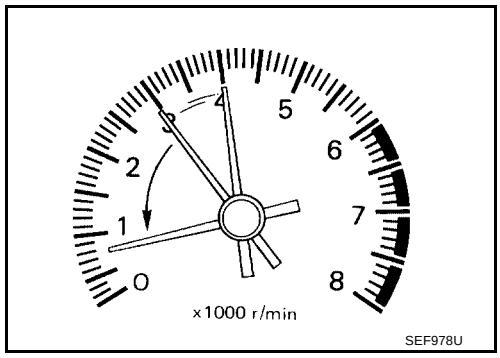
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

With CONSULT-II

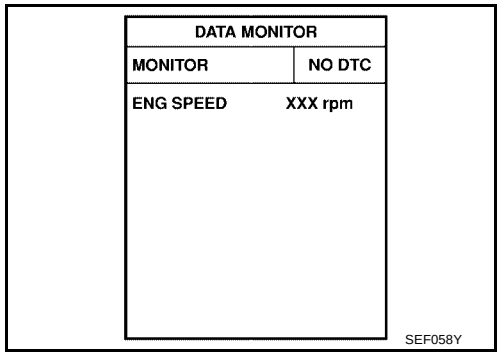
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm

A/T: 800 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 650 ± 50 rpm

A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-634, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-635, "Idle Air Volume Learning" .
Is Idle Air Volume Learning carried out successfully?

Yes or No

Yes >> GO TO 7.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-842 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-836 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 7 ± 5° BTDC
A/T: 18 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK (With CONSULT-II)>>GO TO 19.
OK (Without CONSULT-II)>>GO TO 20.
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-634, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-635, "Idle Air Volume Learning" .
Is Idle Air Volume Learning carried out successfully?
Yes or No

Yes >> GO TO 14.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 7 ± 5° BTDC
A/T: 18 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK (With CONSULT-II)>>GO TO 19.
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-45 .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-842 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-836 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

19. CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

With CONSULT-II

1. Turn off the ignition key and keep the key off more than 10 seconds.
2. Start engine and warm it up to normal operating temperature.
3. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or 4th position (M/T).

   NOTE:
   Keep the accelerator pedal as steady as possible during the cruising.
4. Set “OD” ON, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

   NOTE:
   Never apply brake during releasing the accelerator pedal.
5. Repeat steps 2 to 3 five times.
6. Stop the vehicle and connect CONSULT-II to the vehicle.
7. Make sure that no 1st trip DTC is displayed in “SELF-DIAG RESULTS” mode.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 21.

20. CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

Without CONSULT-II

1. Turn off the ignition key and keep the key off more than 10 seconds.
2. Start engine and warm it up to normal operating temperature.
3. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or 4th position (M/T).
   NOTE:
   Keep the accelerator pedal as steady as possible during the cruising.
4. Set “OD” ON, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).
   NOTE:
   Never apply brake during releasing the accelerator pedal.
5. Repeat steps 2 to 3 five times.
6. Stop the vehicle and turn ignition switch “OFF”.
7. Stop vehicle and connect GST to the vehicle.
8. Make sure that no DTC is displayed.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 21.

21. CHECK AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1) HARNESS

1. Turn ignition switch “OFF” and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM Terminal	A/F sensor 1 terminal
16	1
35	5
56	6
75	2

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 22.
NG >> 1. Repair or replace harness between ECM and A/F sensor 1.
2. GO TO 4.

22. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Reconnect ECM harness connector.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .

>> GO TO 23.

23. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-634, "Throttle Valve Closed Position Learning" .

>> GO TO 24.

24. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-635, "Idle Air Volume Learning" .
Is Idle Air Volume Learning carried out successfully?

Yes or No

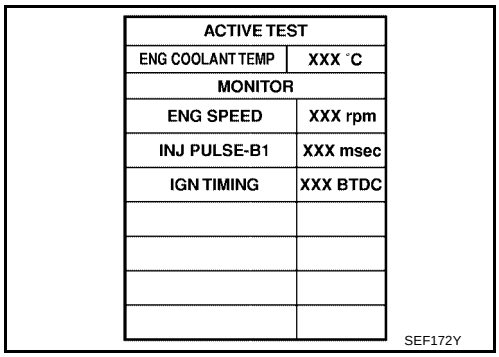
Yes (With CONSULT-II)>>GO TO 25.
Yes (Without CONSULT-II)>>GO TO 26.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

25. CHECK “CO”%

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Select “ENG COOLANT TEMP” in “ACTIVE TEST” mode.
4. Set “ENG COOLANT TEMP” to 5°C (41°F) by touching “DWN” and “Qd”.
5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
6. Check “CO”%.

Idle CO: 3 – 11% and engine runs smoothly.



OK or NG

OK >> GO TO 28.
NG >> GO TO 27.

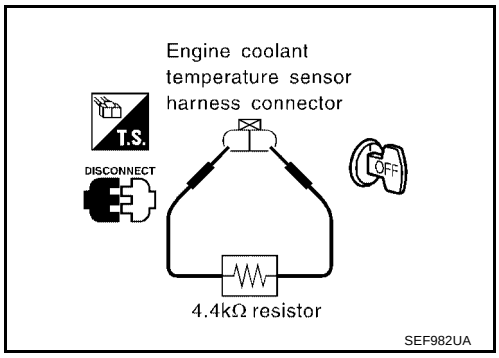
26. CHECK “CO”%

Without CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
2. Turn ignition switch “OFF”.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.
5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
6. Check “CO”%.

Idle CO: 3 – 11% and engine runs smoothly.

7. After checking “CO”%, turn ignition switch “OFF”, disconnect the resistor from the terminals of engine coolant temperature sensor harness connector, and then connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.



OK or NG

OK >> GO TO 28.
NG >> GO TO 27.

27. RECONNECT AIR FUEL RATIO (A/F) SENSOR 1 HARNESS CONNECTOR

1. Turn ignition switch “OFF”.
2. Reconnect A/F sensor 1 harness connector.

>> GO TO 31.

28. REPLACE HEATED OXYGEN SENSOR 1

1. Stop engine.
2. Replace A/F sensor 1.

With CONSULT-II>>GO TO 29.
Without CONSULT-II>>GO TO 30.

29. CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

With CONSULT-II

1. Turn off the ignition key and keep the key off more than 10 seconds.
2. Start engine and warm it up to normal operating temperature.
3. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or 4th position (M/T).

   NOTE:
   Keep the accelerator pedal as steady as possible during the cruising.
4. Set “OD” ON, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

   NOTE:
   Never apply brake during releasing the accelerator pedal.
5. Repeat steps 2 to 3 five times.
6. Stop the vehicle and connect CONSULT-II to the vehicle.
7. Make sure that no 1st trip DTC is displayed in “SELF-DIAG RESULTS” mode.

OK or NG

OK >> GO TO 4.
NG >> GO TO 31.

30. CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

Without CONSULT-II

1. Turn off the ignition key and keep the key off more than 10 seconds.
2. Start engine and warm it up to normal operating temperature.
3. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or 4th position (M/T).

   NOTE:
   Keep the accelerator pedal as steady as possible during the cruising.
4. Set “OD” ON, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

   NOTE:
   Never apply brake during releasing the accelerator pedal.
5. Repeat steps 2 to 3 five times.
6. Stop the vehicle and turn ignition switch “OFF”.
7. Stop vehicle and connect GST to the vehicle.
8. Make sure that no DTC is displayed.

OK or NG

OK >> GO TO 4.
NG >> GO TO 31.

31. DETECT MALFUNCTIONING PART

Check the following.

- Check fuel pressure regulator and repair or replace if necessary. Refer to EC-637, "Fuel Pressure Check" .
- Check mass air flow sensor and its circuit, and repair or replace if necessary. Refer to EC-740 , EC-748 and EC-940 .
- Check injector and its circuit, and repair or replace if necessary. Refer to EC-1168 .
- Check engine coolant temperature sensor and its circuit, and repair or replace if necessary. Refer to EC-760 and EC-772 .

OK or NG

OK >> GO TO 33.
NG >> 1. Repair or replace.
2. GO TO 32.

32. ERASE UNNECESSARY DTC

After this inspection, unnecessary DTC might be displayed.
Erase the stored memory in ECM and TCM. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and AT-40 .

>> GO TO 4.

33. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

Accelerator Pedal Released Position Learning

UBS006IE

DESCRIPTION

“Accelerator Pedal Released Position Learning” is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch “ON” and wait at least 2 seconds.
3. Turn ignition switch “OFF” wait at least 10 seconds.
4. Turn ignition switch “ON” and wait at least 2 seconds.
5. Turn ignition switch “OFF” wait at least 10 seconds.

Throttle Valve Closed Position Learning

UBS001QZ

DESCRIPTION

“Throttle Valve Closed Position Learning” is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator of ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch “ON”.
3. Turn ignition switch “OFF” wait at least 10 seconds.
Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

UBS006F3

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

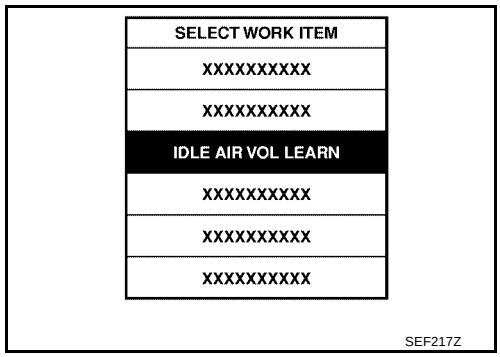
Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
  For models without CONSULT-II, drive vehicle for 10 minutes.

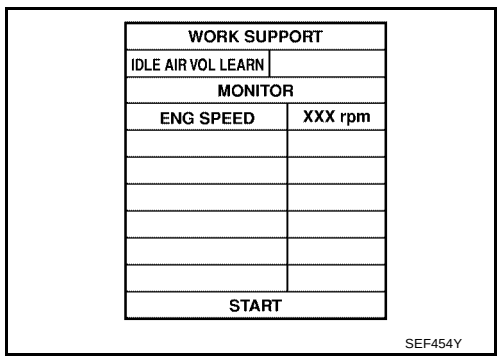
OPERATION PROCEDURE

With CONSULT-II

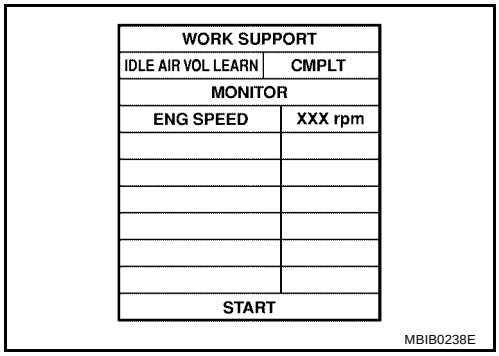
1. Perform EC-634, "Accelerator Pedal Released Position Learning" .
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic PREPARATION" (previously mentioned) are in good order.
5. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.



6. Touch "START" and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “CMPLT” is not displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	M/T: 650±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 7±5° BTDC A/T: 18±5° BTDC (in “P” or “N” position)

Without CONSULT-II

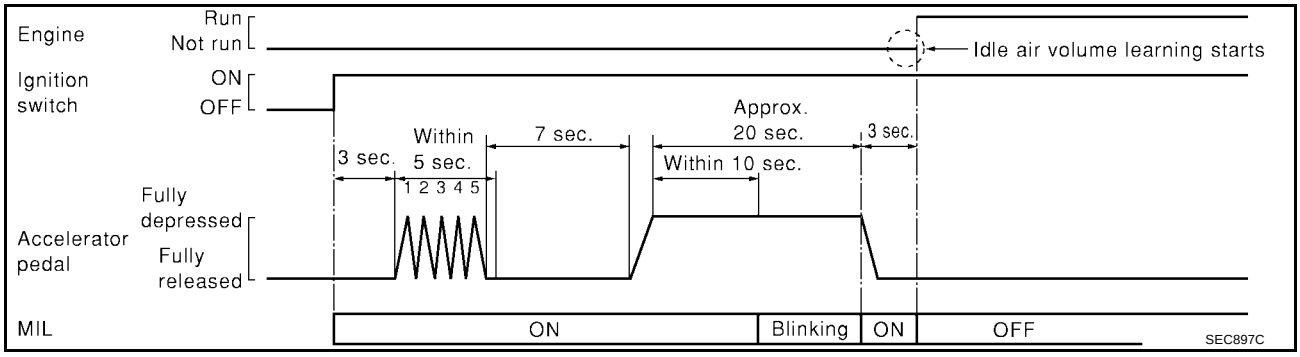
NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-634, "Accelerator Pedal Released Position Learning" .
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MIL goes off.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 650±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 7±5° BTDC A/T: 18±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, the result will be incomplete. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.**
   It is useful to perform EC-716, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform "Idle air volume learning" all over again:**

- **Engine stalls.**
- **Erroneous idle.**

Fuel Pressure Check

UBS001R0

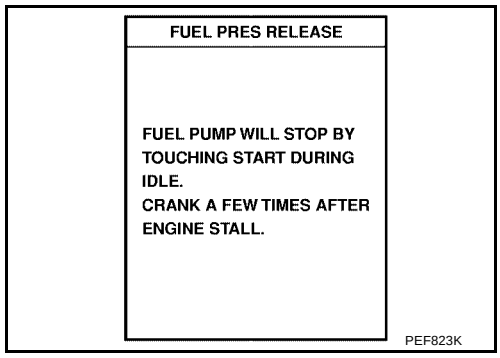
FUEL PRESSURE RELEASE

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because B15 models do not have fuel return system.

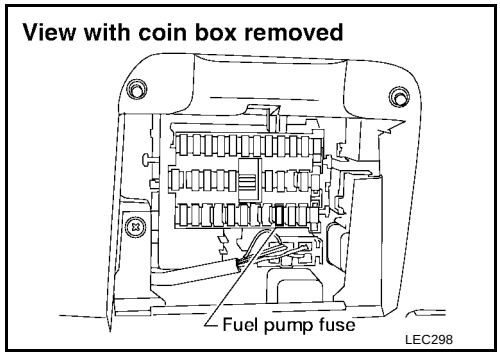
With CONSULT-II

1. Start engine.
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-II.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch "OFF".



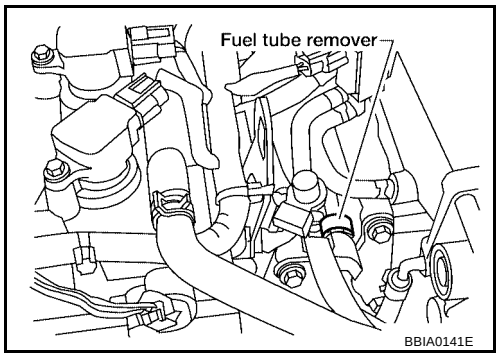
Without CONSULT-II

1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch "OFF" and reconnect fuel pump fuse.



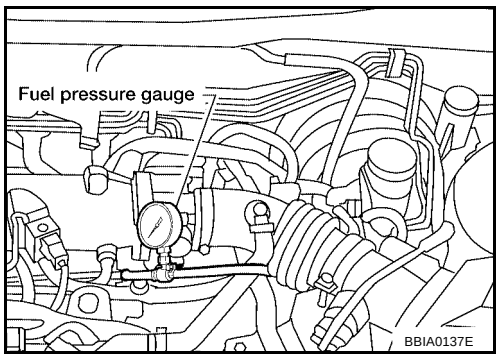
FUEL PRESSURE CHECK

- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screws do not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Fuel Pressure Gauge Kit J-44321 to check fuel pressure.**
- **Do not perfrom fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C switch, etc.). Fuel pressure guage may indicate false readings due to varying engine loads and changes in manifold vacuum.**



1. Release fuel pressure to zero.
2. Disconnect fuel hose from fuel feed tube (engine side) using fuel tube quick connect removal tool.
3. Release quick connector and disconnect fuel hose from fuel feed tube (underbody side). Remove fuel hose assembly.

   CAUTION:
   Do not install hose clamps over flared portions of fuel feed tubes or damage to fuel feed tubes may result.
4. Install fuel pressure gauge from kit J-44321 between fuel tubes using hose and clamps from kit.
5. Turn ignition switch “ON” and check for fuel leakage.
6. Start engine and read the indication on fuel pressure gauge.



At idle speed:

Approximately 350 kPa (3.57 kg/cm^2 , 51 psi)

If results are unsatisfactory, check for fuel leakage in fuel line between fuel tank and injector, and check fuel filter for clogging.
If fuel line and fuel filter are OK, replace fuel pressure regulator. Refer to EC-1168 .

ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

UBS001R1

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information	SAE Mode
Diagnostic Trouble Code (DTC)	Mode 3 of SAE J1979
Freeze Frame data	Mode 2 of SAE J1979
System Readiness Test (SRT) code	Mode 1 of SAE J1979
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of SAE J1979
1st Trip Freeze Frame data	
Test values and Test limits	Mode 6 of SAE J1979
Carbration ID	Mode 9 of SAE J1979

The above information can be checked using procedures listed in the table below.

X: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	×	×	×	×	×	—
GST	×	×*1	×	—	×	×
ECM	×	×*2	—	—	—	—

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.

*2: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-668)

Two Trip Detection Logic

UBS001R2

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time as when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

X: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip display-ing	2nd trip display-ing	1st trip display-ing	2nd trip display-ing
	Blinking	Lighting up	Blinking	Lighting up				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-1008)	—	×	—	—	×	—	×	—
Except above	—	—	—	×	—	×	×	—

When there is an open circuit on MIL circuit, the ECM can not warn the driver by lighting MIL up when there is malfunction on engine control system.
Therefore, when electrical controlled throttle and part of ECM related diagnoses is continuously detected as NG for 5-trips, ECM warns the driver that engine control system has trouble and MIL circuit is open by means of operating fail-safe function.

The fail-safe function also operate when above diagnoses except MIL circuit and demands the driver to repair the malfunction.

Engine operating condition in fail-safe mode	Engine speed will not rise more then 2,500 rpm due to the fuel cut.

Emission-related Diagnostic Information

UBS001R3

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM*3				
CAN COMM CIRCUIT	U1000	1000*7	—	—	—	EC-728
CAN COMM CIRCUIT	U1001	1001*7	—	—	×	EC-728
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	0000	—	—	—	—
INT/V TIMING CONT	P0011	0011	—	—	×	EC-731
HO2S2 HTR (B1)	P0037	0037	×	×	×*5	EC-734
HO2S2 HTR (B1)	P0038	0038	×	×	×*5	EC-734
MAF SEN/CIRCUIT	P0101	0101	—	—	—	EC-740
MAF SEN/CIRCUIT	P0102	0102	—	—	—	EC-748
MAF SEN/CIRCUIT	P0103	0103	—	—	—	EC-748
IAT SEN/CIRCUIT	P0112	0112	—	—	×	EC-755
IAT SEN/CIRCUIT	P0113	0113	—	—	×	EC-755
ECT SEN/CIRC	P0117	0117	—	—	—	EC-760
ECT SEN/CIRC	P0118	0118	—	—	—	EC-760
TP SEN2/CIRC	P0122	0122	—	—	—	EC-765
TP SEN2/CIRC	P0123	0123	—	—	—	EC-765
ECT SEN/CIRC	P0125	0125	—	—	—	EC-772
IAT SEN/CIRCUIT	P0127	0127	—	—	×	EC-775
THERMSTAT FNCTN	P0128	0128	—	—	×	EC-778
HO2S2 (B1)	P0138	0138	×	×	×*5	EC-780
HO2S2 (B1)	P0139	0139	×	×	×*5	EC-787
FUEL SYS-LEAN-B1	P0171	0171	—	—	×	EC-795
FUEL SYS-RICH-B1	P0172	0172	—	—	×	EC-802
FTT SENSOR	P0181	0181	—	—	×	EC-809
FTT SEN/CIRCUIT	P0182	0182	—	—	×	EC-814
FTT SEN/CIRCUIT	P0183	0183	—	—	×	EC-814
TP SEN 1/CIRC	P0222	0222	—	—	—	EC-818
TP SEN 1/CIRC	P0223	0223	—	—	—	EC-818
MULTI CYL MISFIRE	P0300	0300	—	—	×	EC-825
CYL 1 MISFIRE	P0301	0301	—	—	×	EC-825
CYL 2 MISFIRE	P0302	0302	—	—	×	EC-825
CYL 3 MISFIRE	P0303	0303	—	—	×	EC-825
CYL 4 MISFIRE	P0304	0304	—	—	×	EC-825
KNOCK SEN/CIRC-B1	P0327	0327	—	—	×	EC-832
KNOCK SEN/CIRC-B1	P0328	0328	—	—	×	EC-832
CKP SEN/CIRCUIT	P0335	0335	—	—	×	EC-836

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM*3				
CMP SEN/CIRCUIT	P0340	0340	—	—	×	EC-842
TW CATALYST SYS-B1	P0420	0420	×	×	×*5	EC-848
EVAP PURG FLOW/MON	P0441	0441	×	×	×*5	EC-852
EVAP SMALL LEAK	P0442	0442	×	×	×*5	EC-858
PURG VOLUME CONT/V	P0444	0444	—	—	×	EC-867
PURG VOLUME CONT/V	P0445	0445	—	—	×	EC-867
VENT CONTROL VALVE	P0447	0447	—	—	×	EC-873
EVAPO SYS PRES SEN	P0452	0452	—	—	×	EC-880
EVAPO SYS PRES SEN	P0453	0453	—	—	×	EC-886
EVAP GROSS LEAK	P0455	0455	—	×	×*5	EC-893
EVAP VERY SML LEAK	P0456	0456	×*4	—	×*5	EC-901
FUEL LEV SEN SLOSH	P0460	0460	—	—	×	EC-910
FUEL LEVEL SENSOR	P0461	0461	—	—	×	EC-912
FUEL LEVEL SEN/CIRC	P0462	0462	—	—	×	EC-914
FUEL LEVEL SEN/CIRC	P0463	0463	—	—	×	EC-914
VEH SPEED SEN/CIRC*6	P0500	0500	—	—	×	EC-916
ISC SYSTEM/CIRC	P0506	0506	—	—	×	EC-918
ISC SYSTEM/CIRC	P0507	0507	—	—	×	EC-920
PW ST P SEN/CIRC	P0550	0550	—	—	×	EC-922
ECM	P0605	0605	—	—	×	EC-927
PNP SW/CIRC	P0705	0705	—	—	×	AT-116
ATF TEMP SEN/CIRC	P0710	0710	—	—	×	AT-121
VEH SPD SEN/CIR AT*6	P0720	0720	—	—	×	AT-127
ENGINE SPEED SIG	P0725	0725	—	—	×	AT-132
A/T 1ST GR FNCTN	P0731	0731	—	—	×	AT-136
A/T 2ND GR FNCTN	P0732	0732	—	—	×	AT-141
A/T 3RD GR FNCTN	P0733	0733	—	—	×	AT-146
A/T 4TH GR FNCTN	P0734	0734	—	—	×	AT-151
TCC SOLENOID/CIRC	P0740	0740	—	—	×	AT-160
A/T TCC S/V FNCTN	P0744	0744	—	—	×	AT-164
L/PRESS SOL/CIRC	P0745	0745	—	—	×	AT-174
SFT SOL A/CIRC	P0750	0750	—	—	—	AT-180
SFT SOL B/CIRC	P0755	0755	—	—	—	AT-184
A/F SEN1 HTR (B1)	P1031	1031	×	×	×*5	EC-930
A/F SEN1 HTR (B1)	P1032	1032	×	×	×*5	EC-930
ECM BACK UP/CIRC	P1065	1065	—	—	×	EC-936
MAF SENSOR	P1102	1102	—	—	—	EC-940
INT/V TIM V/CIR-B1	P1111	1111	—	—	×	EC-947
ETC ACTR	P1121	1121	—	—	—	EC-952
ETC FUNCTION/CIRC	P1122	1122	—	—	—	EC-954
ETC MOT PWR	P1124	1124	—	—	—	EC-961

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM*3				
ETC MOT PWR	P1126	1126	—	—	—	EC-961
ETC MOT PWR	P1128	1128	—	—	—	EC-966
VARI SWL CON/SV-B1	P1132	1132	—	—	×	EC-971
SWIRL CON/V POSI SEN	P1137	1137	—	—	×	EC-976
SWIRL CONT VALVE	P1138	1138	—	—	×	EC-984
HO2S2 (B1)	P1146	1146	×	×	×*5	EC-992
HO2S2 (B1)	P1147	1147	×	×	×*5	EC-1000
CLOSED LOOP-B1	P1148	1148	—	—	—	EC-1008
ENG OVER TEMP	P1217	1217	—	—	—	EC-1009
CTP LEARNING	P1225	1225	—	—	×	EC-1024
CTP LEARNING	P1226	1226	—	—	×	EC-1026
SENSOR POWER/CIRC	P1229	1229	—	—	—	EC-1028
A/F SENSOR 1 (B1)	P1271	1271	×	×	×*5	EC-1033
A/F SENSOR 1 (B1)	P1272	1272	×	×	×*5	EC-1039
A/F SENSOR 1 (B1)	P1273	1273	×	×	×*5	EC-1045
A/F SENSOR 1 (B1)	P1274	1274	×	×	×*5	EC-1052
A/F SENSOR 1 (B1)	P1276	1276	×	×	×*5	EC-1059
A/F SENSOR 1 (B1)	P1278	1278	×	×	×*5	EC-1065
A/F SENSOR 1 (B1)	P1279	1279	×	×	×*5	EC-1073
PURG VOLUME CONT/V	P1444	1444	—	—	×	EC-1081
VENT CONTROL VALVE	P1446	1446	—	—	×	EC-1089
ASCD SW	P1564	1564	—	—	—	EC-1095
ASCD BRAKE SW	P1572	1572	—	—	—	EC-1102
ASCD VHL SPD SEN	P1574	1574	—	—	—	EC-1113
TP SEN/CIRC A/T	P1705	1705	—	—	—	AT-188
P-N POS SW/CIRCUIT	P1706	1706	—	—	×	EC-1115
O/R CLTCH SOL/CIRC	P1760	1760	—	—	×	AT-194
BRAKE SW/CIRCUIT	P1805	1805	—	—	×	EC-1119
APP SEN 1/CIRC	P2122	2122	—	—	—	EC-1125
APP SEN 1/CIRC	P2123	2123	—	—	—	EC-1125
APP SEN 2/CIRC	P2127	2127	—	—	—	EC-1132
APP SEN 2/CIRC	P2128	2128	—	—	—	EC-1132
TP SENSOR	P2135	2135	—	—	—	EC-1140
APP SENSOR	P2138	2138	—	—	—	EC-1147

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: SRT code will not be set if the self-diagnostic result is NG.
*5: These are not displayed with GST.
*6: When the fail-safe operations for both self-diagnoses occur at the same time, the MIL illuminates.
*7: The trouble shooting for these DTCs needs CONSULT-II.

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”,EC-651 .
For malfunctions in which 1st trip DTCs are displayed, refer to EC-643 . These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-II.
1st trip DTC is specified in Mode 7 of SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-662 . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II

With GST

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P0350, P0705, P0750, etc.
These DTCs are prescribed by SAE J2012.
(CONSULT-II also displays the malfunctioning component or system.)

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST does not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

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FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed and absolute pressure at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or

GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-700 .

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-651 .

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:

The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If MIL is “ON” during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”) and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item (CONSULT-II indication)	Performance Priority*1	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
EVAP SYSTEM	1	EVAP control system	P0442
	—	EVAP control system	P1442
	2	EVAP control system	P0441
HO2S	2	Air fuel ratio (A/F) sensor 1	P1271
		Air fuel ratio (A/F) sensor 1	P1272
		Air fuel ratio (A/F) sensor 1	P1273
		Air fuel ratio (A/F) sensor 1	P1274
		Air fuel ratio (A/F) sensor 1	P1276
		Air fuel ratio (A/F) sensor 1	P1278, P1279
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139
		Heated oxygen sensor 2	P1146
		Heated oxygen sensor 2	P1147
HO2S HTR	2	Air fuel ratio (A/F) sensor heater	P1031, P1032
		Heated oxygen sensor 2 heater	P0037

*1: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the performance priority for models with CONSULT-II.

SRT Set Timing

SRT is set as “CMPLT” after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON →	OFF ← ON →	OFF ← ON →	OFF ← ON →
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MIL “ON”)
		SRT of EGR	“INCMP”	“INCMP”	“INCMP”	“CMPLT”

OK: Self-diagnosis is carried out and the result is OK.
NG: Self-diagnosis is carried out and the result is NG.
—: Self-diagnosis is not carried out.

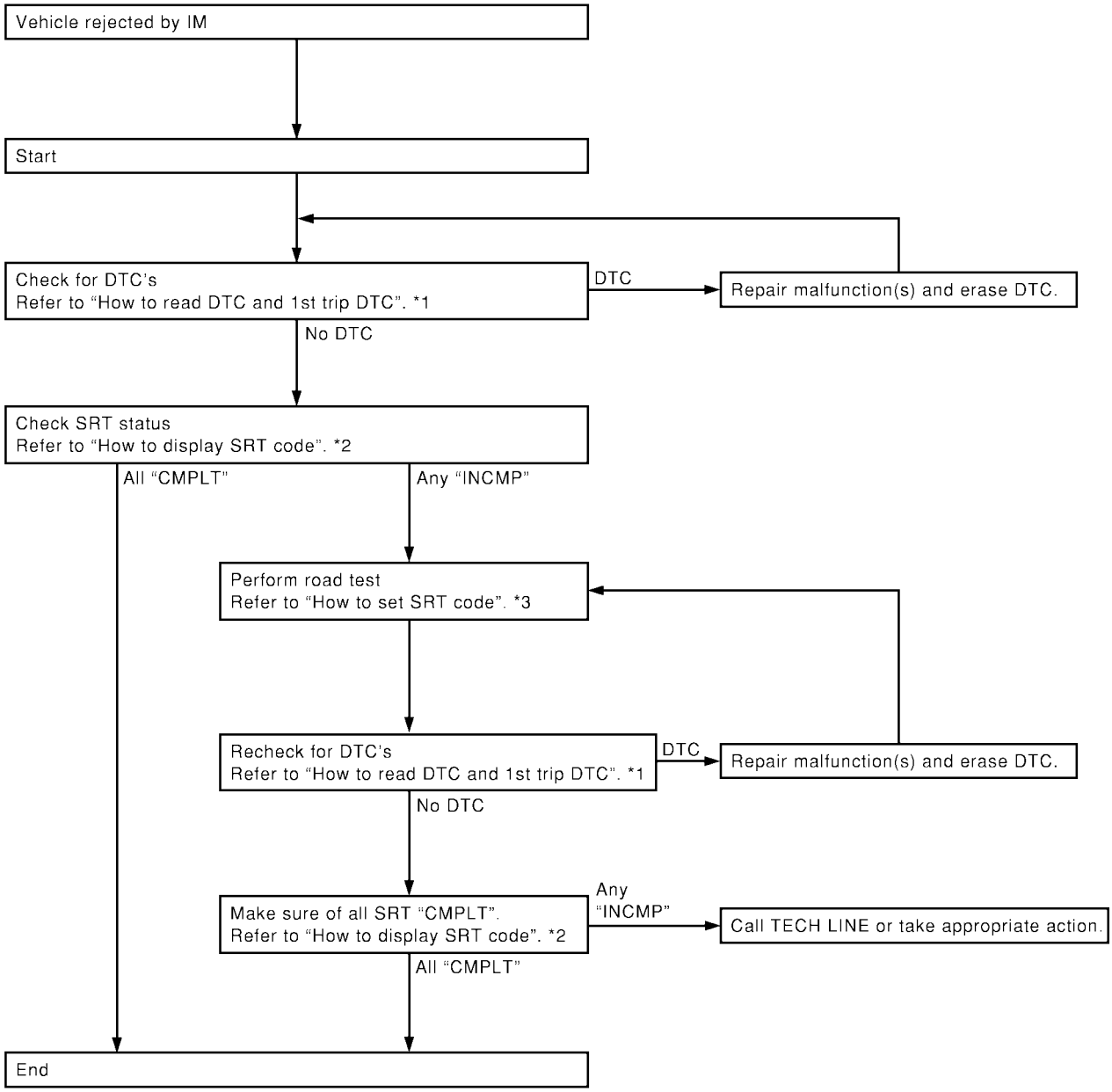
When all SRT related self-diagnoses show OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above
When all SRT related self-diagnoses show OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above
If one or more SRT related self-diagnoses show NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above
The table above shows that the minimum number of cycles for setting SRT as “INCMP” is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to “CMPLT” of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:
SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

SRT Service Procedure

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating “INCMP”, review the flowchart diagnostic sequence on the next page.



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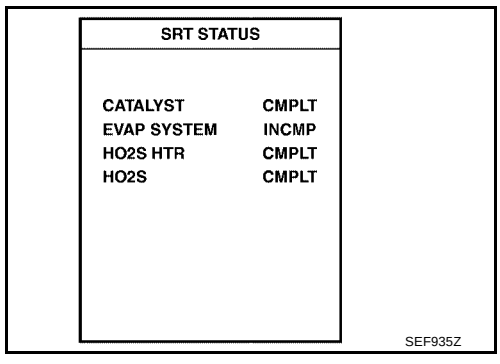
*1 EC-643 *2 EC-647 *3 EC-648

How to Display SRT Code

With CONSULT-II

Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.
For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.



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With GST

Selecting Mode 1 with GST (Generic Scan Tool)
A sample of CONSULT-II display for SRT code is shown below.
"INCMP" means the self-diagnosis is incomplete and SRT is not set.
"CMPLT" means the self-diagnosis is complete and SRT is set.

How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

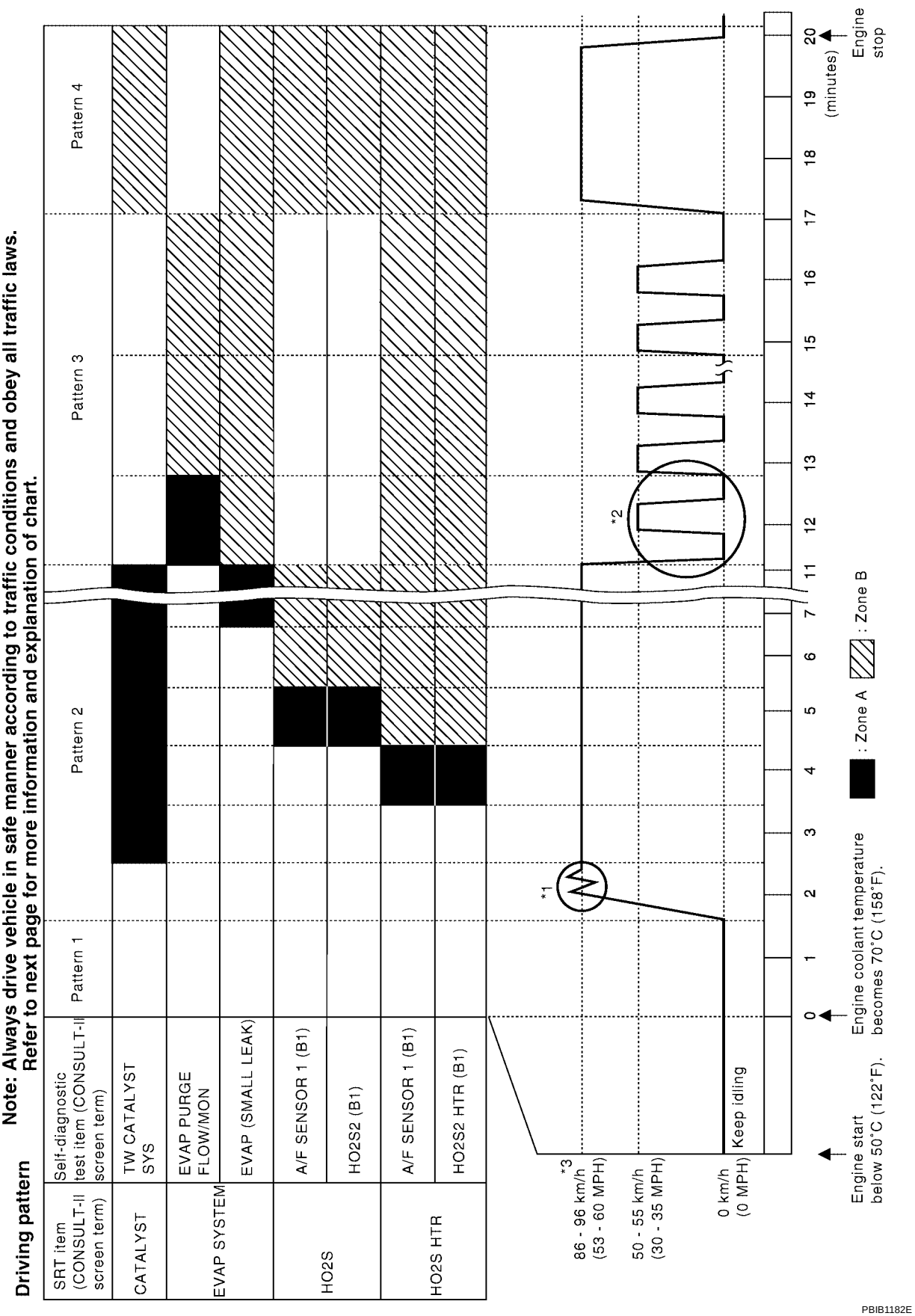
With CONSULT-II

Perform corresponding DTC Confirmation Procedure one by one based on “Performance Priority” in the table onEC-645 .

Without CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern



- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time required for the diagnosis under normal conditions* is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 73 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 73 and ground is lower than 1.4V).**
- **The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 107 and ground is less than 4.1V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

Pattern 3:

- The driving pattern outlined in *2 must be repeated at least 3 times.

Pattern 4:

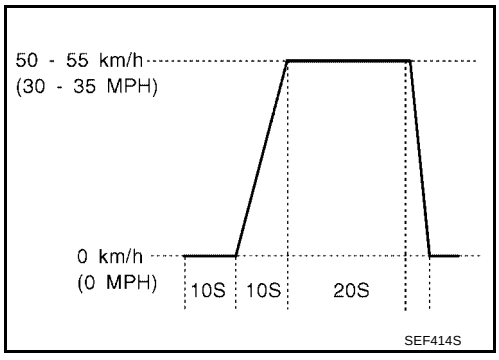
- Tests are performed after the engine has been operated for at least 17 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Operate the vehicle in the following driving pattern.

1. Decelerate vehicle to 0 km/h (0 MPH) and let engine idle.
2. Repeat driving pattern shown below at least 10 times.

– **During acceleration, hold the accelerator pedal as steady as possible.**



*3: Checking the vehicle speed with GST is advised.

Suggested Transmission Gear Position for A/T Models

Set the selector lever in the “D” position with the overdrive switch turned ON.

Suggested Upshift Speeds for M/T Models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:	For quick acceleration in low altitude areas and high altitude areas [over 1,219 m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	km/h (MPH)
1st to 2nd	24 (15)	24 (15)
2nd to 3rd	40 (25)	40 (25)
3rd to 4th	65 (40)	65 (40)
4th to 5th	75 (45)	75 (45)

Suggested Maximum Speed in Each Gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.
Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted speed limits and drive according to the road conditions to ensure safe operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

Gear	km/h (MPH)
1st	48 (30)
2nd	84 (52)
3rd	128 (80)
4th	—
5th	—

TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-II)

The following is the information specified in Mode 6 of SAE J1979.
The test value is a parameter used to determine whether a system/circuit diagnostic test is “OK” or “NG” while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items (15 test items).
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

X: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function	01H	01H	Max.	×
		02H	81H	Min.	×
EVAP SYSTEM	EVAP control system (Small leak)	05H	03H	Max.	×
	EVAP control system purge flow monitoring	06H	83H	Min.	×
HO2S	A/F sensor 1	43H	0EH	Max.	×
		44H	8EH	Min.	×
		45H	8EH	Min.	×
	Heated oxygen sensor 2	19H	86H	Min.	×
		1AH	86H	Min.	×
		1BH	06H	Max.	×
		1CH	06H	Max.	×
HO2S HTR	A/F sensor 1 heater	57H	10H	Max.	×
		58H	90H	Min.	×
	Heated oxygen sensor 2 heater	2DH	0AH	Max.	×
		2EH	8AH	Min.	×

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

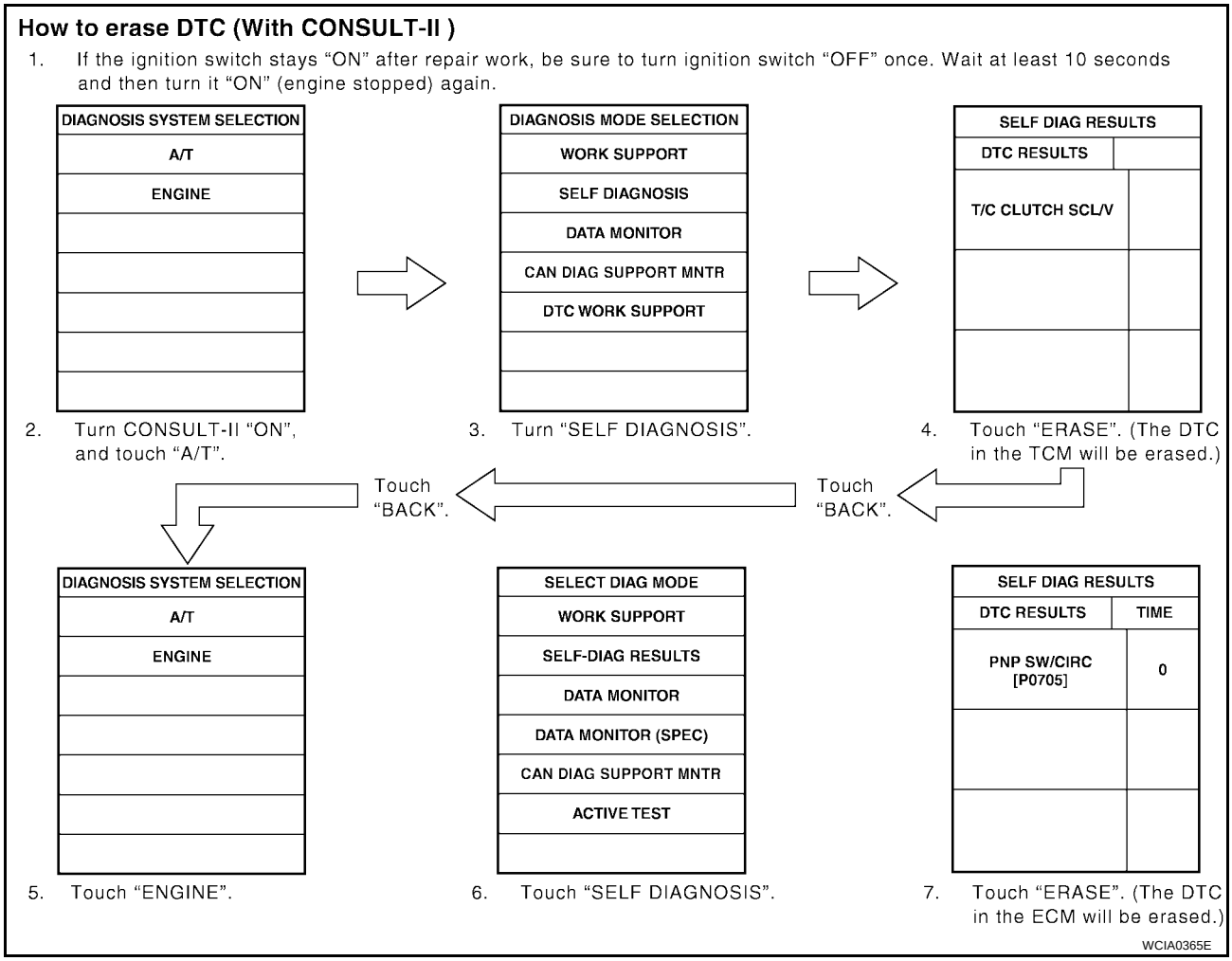
How to Erase DTC (With CONSULT-II)

NOTE:
If the DTC is not for A/T related items (see EC-602), skip steps 2 through 4.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “A/T”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. [The DTC in the TCM (Transmission control module) will be erased.] Then touch “BACK” twice.

5. Touch “ENGINE”.
6. Touch “SELF-DIAG RESULTS”.
7. Touch “ERASE”. (The DTC in the ECM will be erased.)

- If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).



The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.

How to Erase DTC (With GST)

The emission related diagnostic information in the ECM can be erased by selecting Mode 4 with GST.

NOTE:
If the DTC is not for A/T related items (see EC-602), skip step 2.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Perform “SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)” in AT section titled “TROUBLE DIAGNOSIS”, “Self-diagnosis”. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data

4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

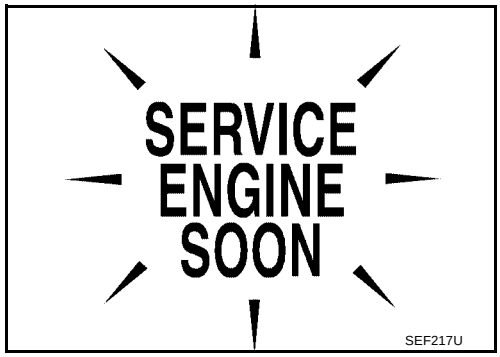
Malfunction Indicator Lamp (MIL)

UBS001R5

DESCRIPTION

The MIL is located on the instrument panel.

1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   - If the MIL does not light up, refer to DI-27, "WARNING LAMPS" .
2. When the engine is started, the MIL should go off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.



ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following three functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position Engine stopped	BULB CHECK	This function checks the MIL bulb for damage (blown, open circuit, etc.). If the MIL does not come on, check MIL circuit.
	Engine running	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip. ● “Misfire (Possible three way catalyst damage)” ● “One trip detection diagnoses”
Mode II	Ignition switch in “ON” position Engine stopped	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.

When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting MIL up when there is malfunction on engine control system.
Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating fail-safe function.
The fail-safe function also operates when above diagnoses except MIL circuit and demands the driver to repair the trouble.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

MIL Flashing Without DTC

If the ECM is in Diagnostic Test Mode II, MIL may flash when engine is running. In this case, check ECM diagnostic test mode. EC-654, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later. EC-654, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

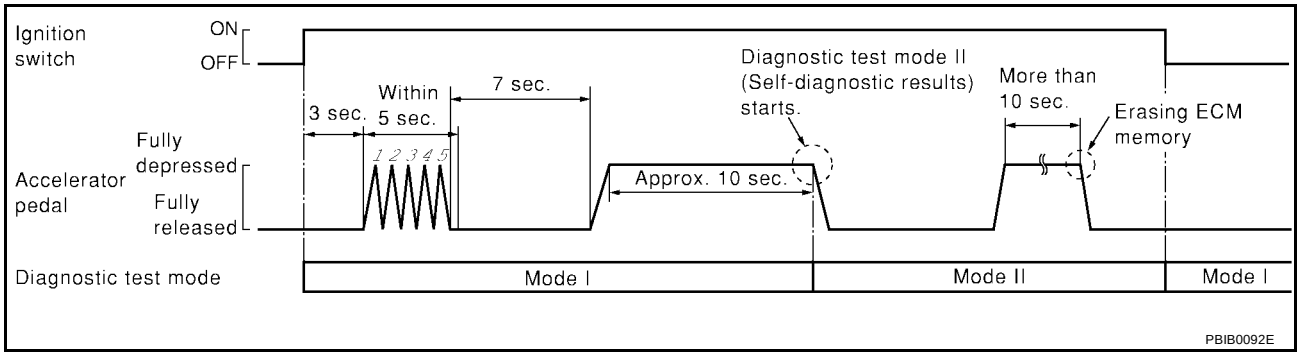
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned “OFF”.**

How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MIL starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-655, "DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS" .
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

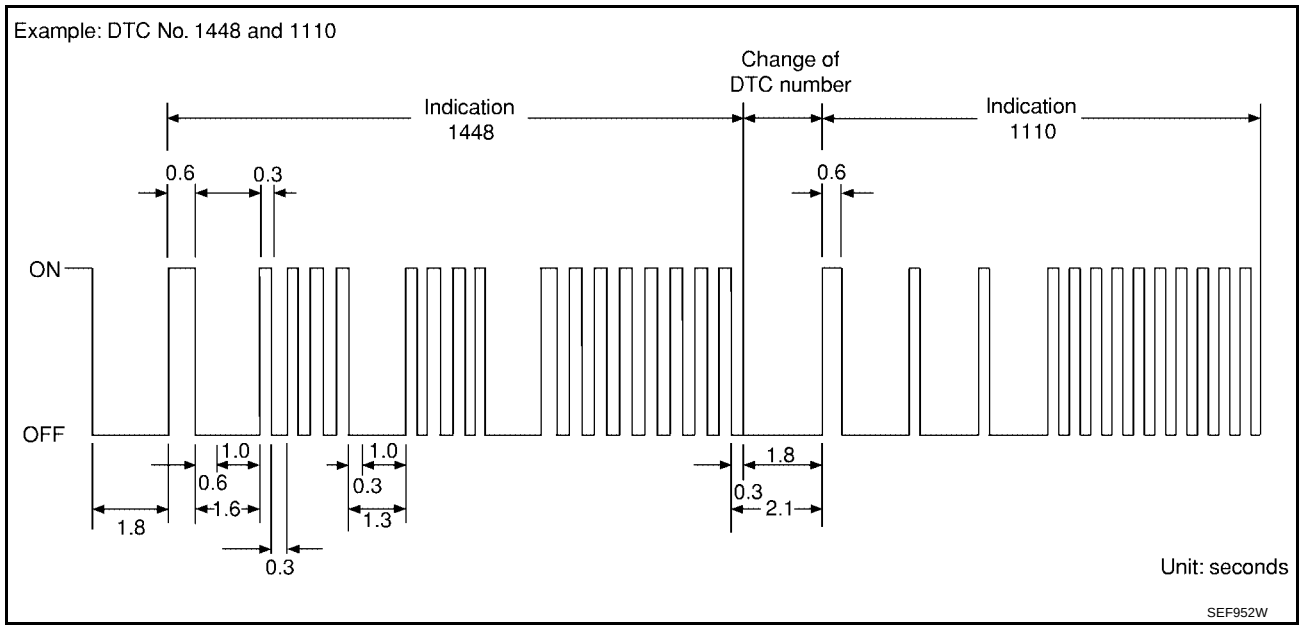
In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-27, "WARNING LAMPS" .

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MIL	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below.
The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-II or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-602, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

OBD System Operation Chart

UBS001R6

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to “Two Trip Detection Logic” on EC-639 .
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in “OK” for the 2nd trip.

SUMMARY CHART

Items	Fuel Injection System	Misfire	Other
MIL (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

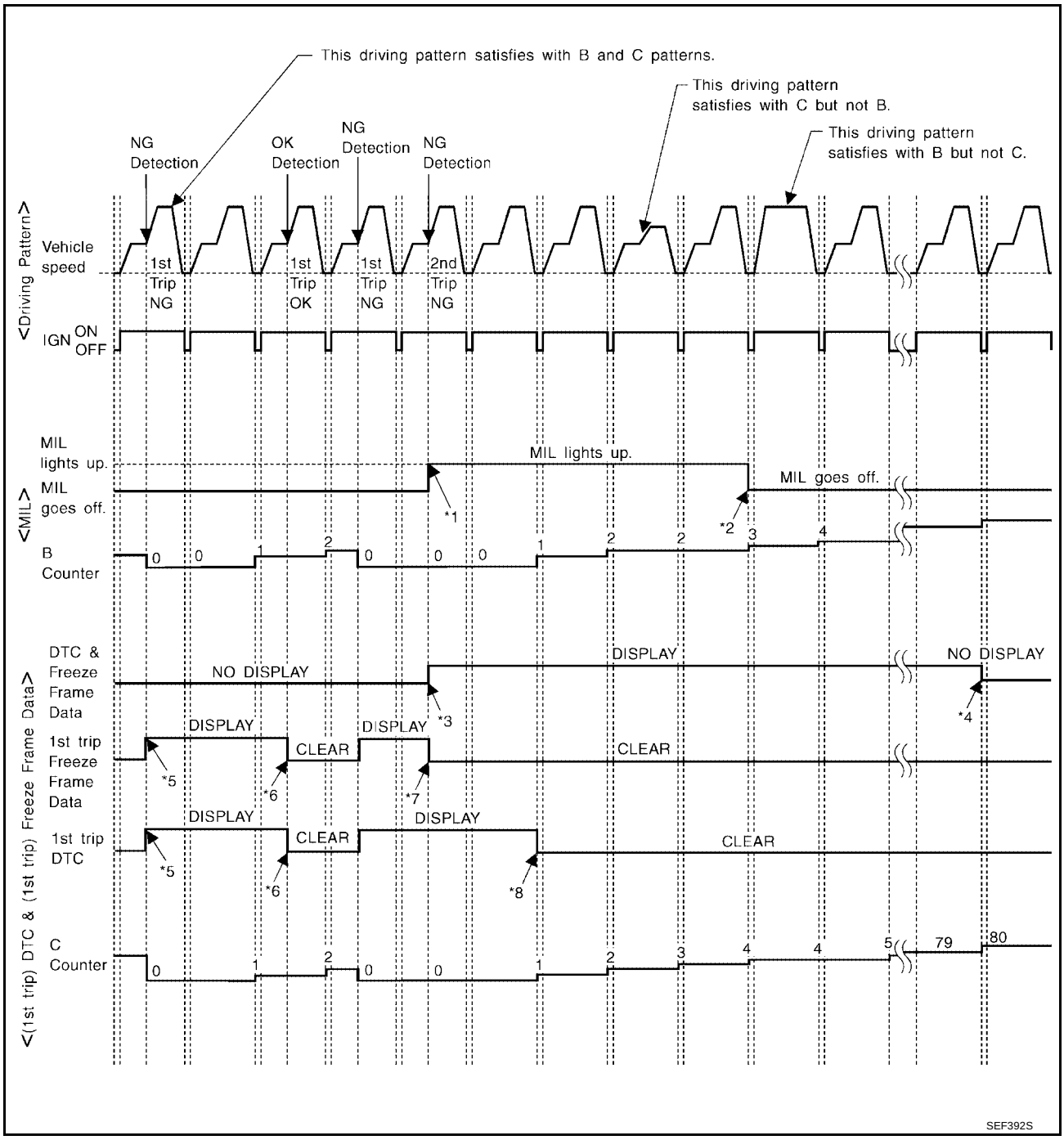
For details about patterns “B” and “C” under “Fuel Injection System” and “Misfire”, see EC-649 .

For details about patterns “A” and “B” under “Other”, see EC-649 .

*1: Clear timing is at the moment OK is detected.

*2: Clear timing is when the same malfunction is detected in the 2nd trip.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>, "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”

Driving Pattern B

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will go off when the B counter reaches 3. ($*^2$ in “OBD SYSTEM OPERATION CHART”)

Driving Pattern C

Driving pattern C means the vehicle operation as follows:

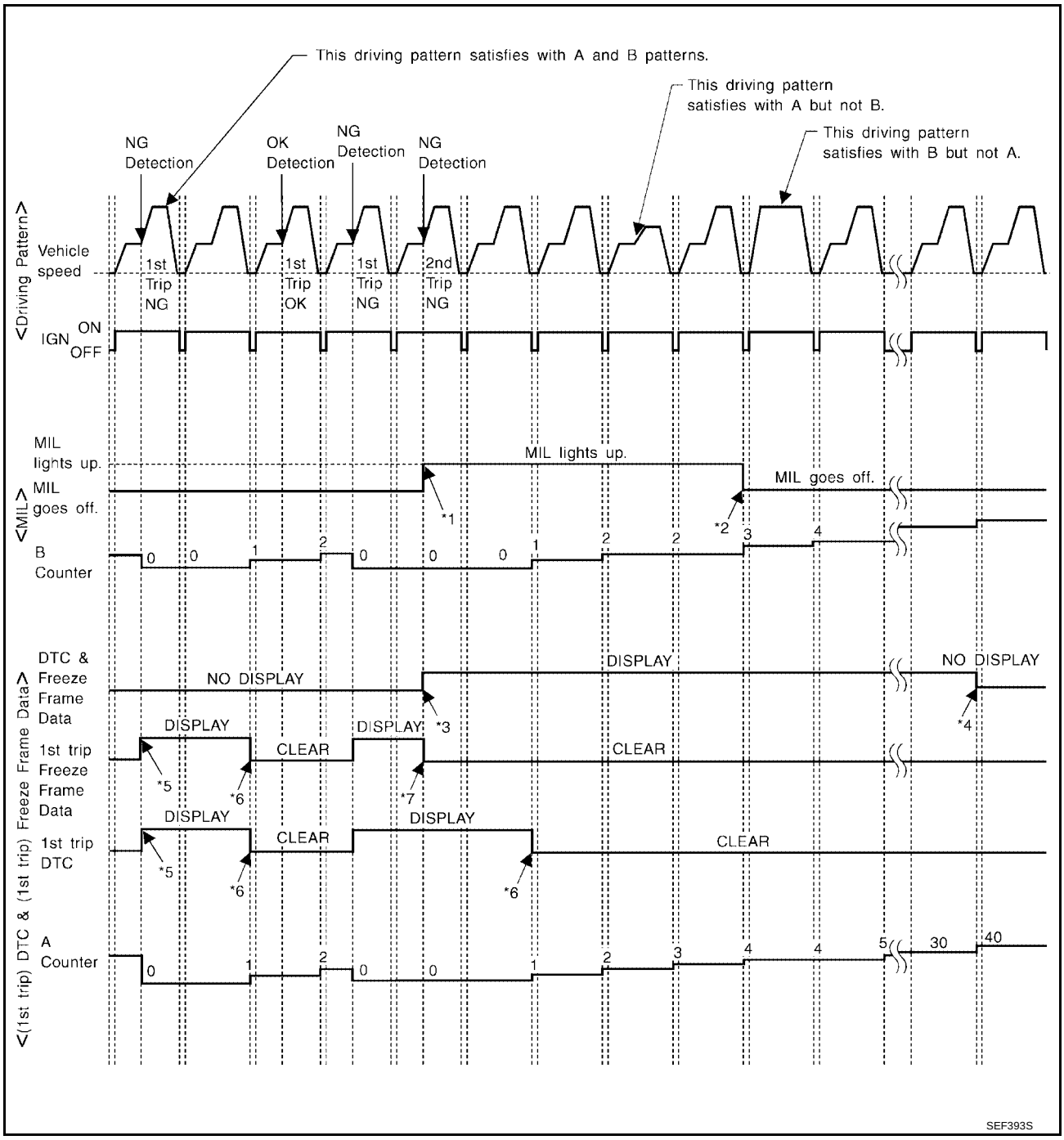
1. The following conditions should be satisfied at the same time:
   Engine speed: (Engine speed in the freeze frame data) ±375 rpm
   Calculated load value: (Calculated load value in the freeze frame data) × (1±0.1) [%]
   Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), “T” should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), “T” should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of vehicle conditions above.
- The C counter will be counted up when vehicle conditions above is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

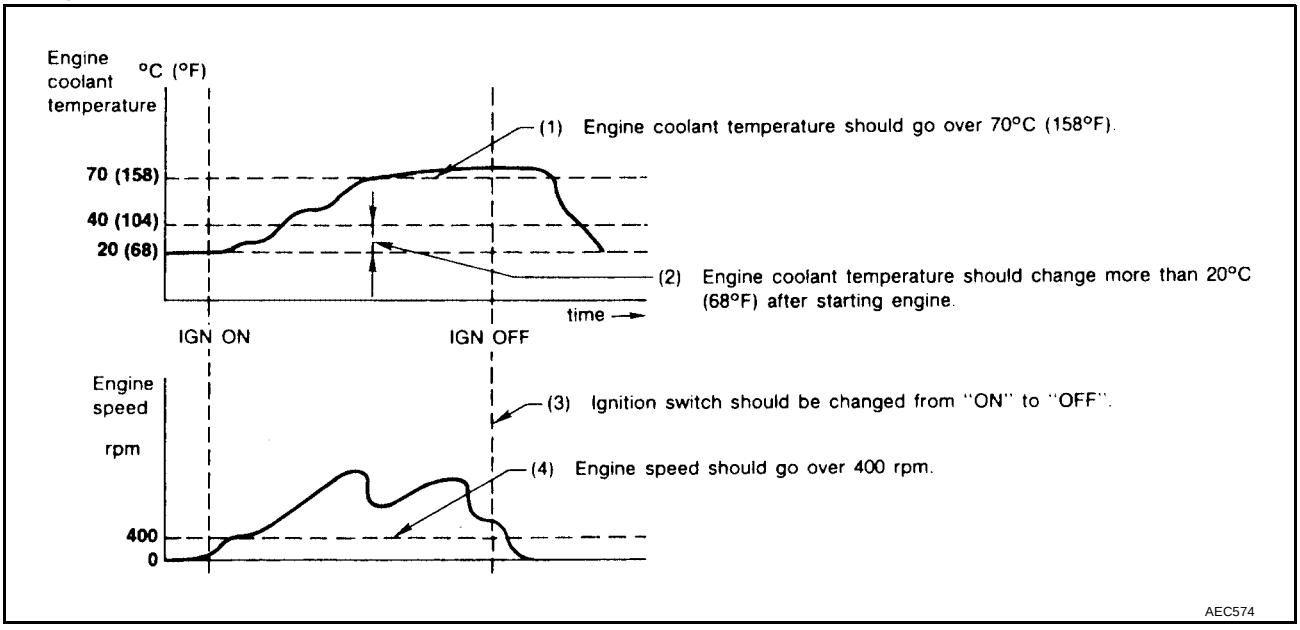
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

Driving Pattern A



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

Driving Pattern B

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").

TROUBLE DIAGNOSIS

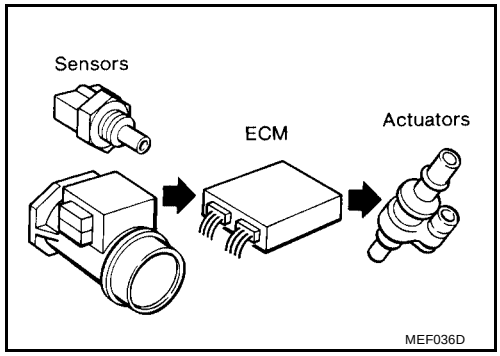
PFP:00004

Trouble Diagnosis Introduction

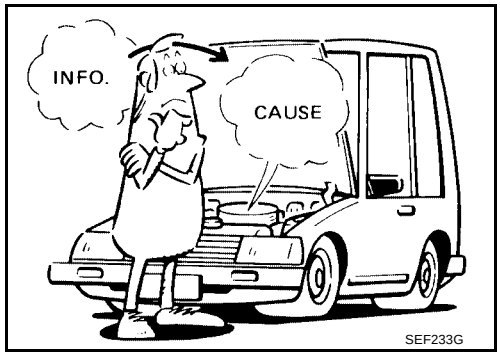
UBS001R7

INTRODUCTION

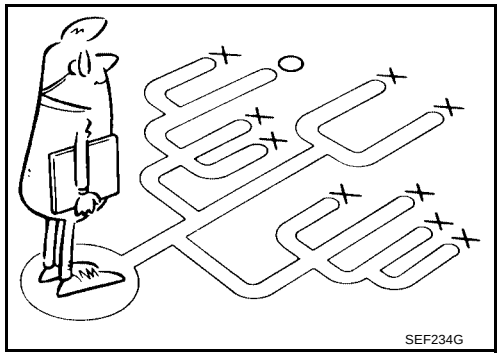
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.



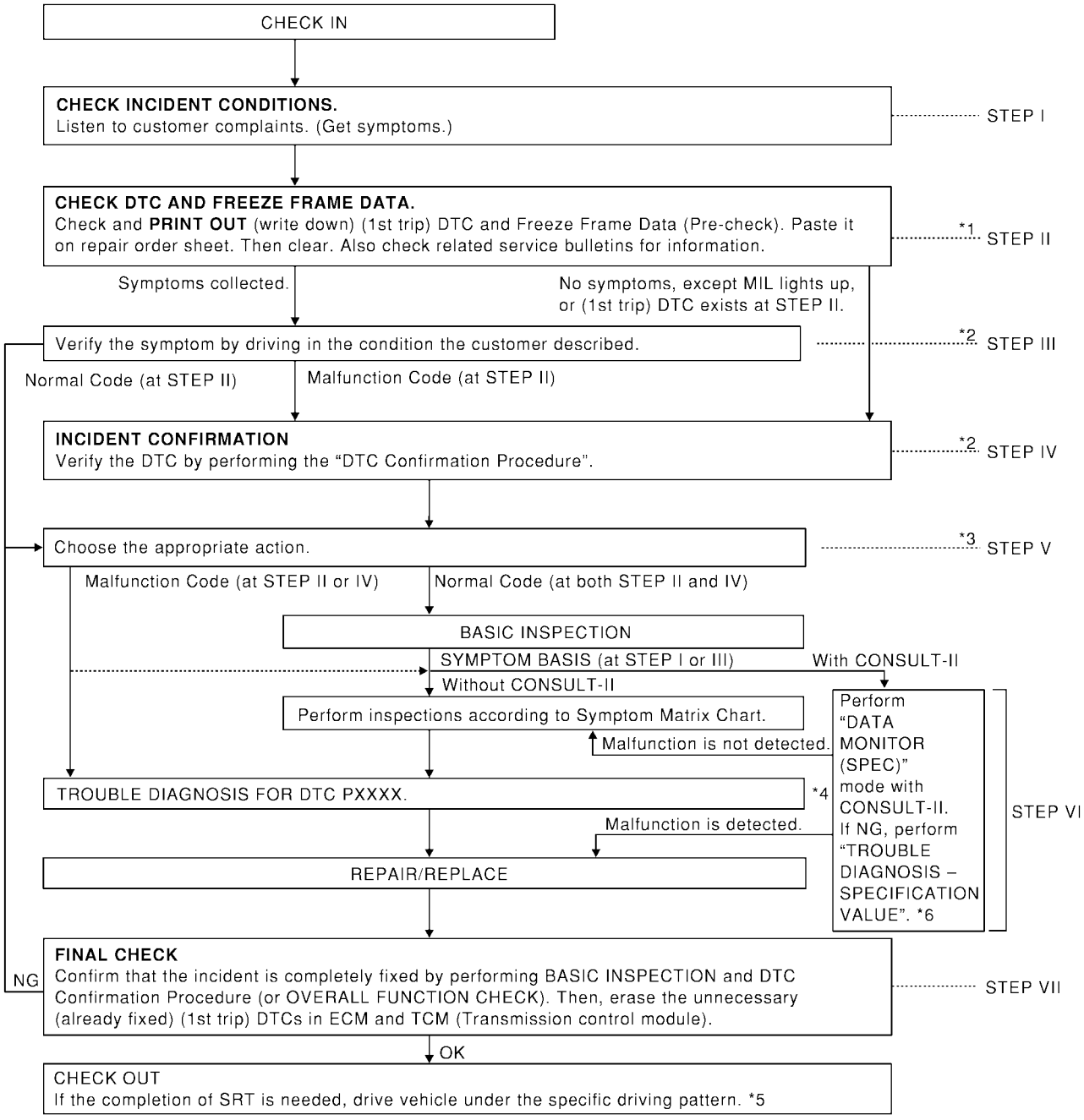
It is much more difficult to diagnose a incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.
A visual check only may not find the cause of the incidents. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the EC-662 .
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on next page should be used.



Start your diagnosis by looking for “conventional” malfunctions first. This will help troubleshoot driveability malfunctions on an electronically controlled engine vehicle.



WORK FLOW



PBIB1043E

*1: If time data of "SELF-DIAG RESULTS" is other than "0" or "1t", refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2: If the incident cannot be duplicated, refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-721, "POWER SUPPLY CIRCUIT FOR ECM" .

*4: If the malfunctioning part cannot be found, refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5: EC-649

*6: EC-716

DESCRIPTION FOR WORK FLOW

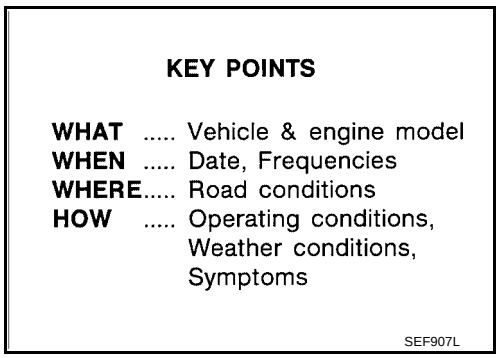
STEP	DESCRIPTION FOR WORK FLOW
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the EC-664, "DIAGNOSTIC WORKSHEET" .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or Generic Scan Tool) the (1st trip) Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-639 .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-674 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSUTL-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" .) If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) Diagnostic Trouble Code by driving in (or performing) The “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSUTL-II or Generic Scan Tool. During the (1st trip) DTC verification, be sure to connect CONSUTL-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" .) In case the “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” is not available, perform the “OVERALL FUNCTION CHECK” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “OVERALL FUNCTION CHECK” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-669 .) If CONSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the EC-716, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" . If malfunction is detected, proceed to “REPAIR/REPLACE”. Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-674 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-686 . The “DIAGNOSTIC PROCEDURE” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section (“HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”, “Circuit Inspection”). Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC CONFIRMATION PROCEDURE” and confirm the normal code [DTC No. P0000 or 0505] is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-640 .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.
Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Example:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.



Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

UBS001R8

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-728 .

Priority	Detected items (DTC)
1	● U1000, U1001 CAN communication line ● P0101, P0102, P0103, P1102 MAF sensor ● P0112, P0113, P0127 IAT sensor ● P0117, P0118, P0125 ECT sensor ● P0122, P0123 TP sensor ● P0128 Thermostat function ● P0181, P0182, P0183 FTT sensor ● P0327, P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0460, P0461, P0462, P1463 Fuel level sensor ● P0500 Vehicle speed sensor ● P0605 ECM ● P0705 Park/Neutral position (PNP) switch ● P1229 Sensor power supply ● P1706 Park/Neutral position (PNP) switch ● P2122, P2123, P2127, P2128, P2138 Accelerator pedal position sensor

Priority	Detected items (DTC)
2	● P0037, P0038 HO2S2 ● P0138, P0139, P1146, P1148 HO2S2 ● P0441 EVAP control system ● P0444, P0445, P1444 EVAP canister purge volume control solenoid valve ● P0447, P1446, P1448 EVAP canister vent control valve ● P0452, P0453 EVAP control system pressure sensor ● P0550 Power steering pressure sensor ● P0705, P0710, P0720, P0725, P0740, P0745, P0750, P0755, P1705, P1706, P1760 A/T related sensors, solenoid valves and switches ● P1031, P1032 A/F sensor 1 heater ● P1065 ECM power supply ● P1122 Electric throttle control function ● P1124, P1126, P1128 Electric throttle control actuator ● P1137 Swirl control valve control position sensor ● P1138 Swirl control valve ● P1217 Engine over temperature (OVER HEAT) ● P1271, P1272, P1273, P1274, P1276, P1278, P1279 A/F sensor 1 ● P1805 Brake switch
3	● P0011 IVT control ● P0171, P0172 Fuel injection system function ● P0300-P0304 Cylinder misfire ● P0420 Three way catalyst function ● P0442, P1442 P0456 EVAP control system ● P0455 EVAP control system ● P0506, P0507 Idle speed control system ● P0731-P0734, P0744 A/T function ● P1111 IVT control solenoid valve ● P1121 Electric throttle control actuator ● P1132 Swirl control valve ● P1148 Closed loop control ● P1564 ASCD steering switch ● P1572 ASCD brake switch ● P1574 ASCD vehicle speed sensor

Fail-safe Chart

UBS001R9

- When the DTC listed below is detected, the ECM enters fail-safe mode and the MIL lights up.

DTC No.	Detected items	Engine operating condition in fail-safe mode	
P0102 P0103 P1102	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.	
P0117 P0118	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
		Condition	Engine coolant temperature decided (CONSULT-II display)
		Just as ignition switch is turned ON or Start	40°C (104°F)
		More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.	
P1121	Electric throttle control actuator (ECM detect the throttle valve is stuck open.)	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.	
P1122	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P1124 P1126	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P1128	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P1129	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.	

- When there is an open circuit on MIL circuit, the ECM can not warn the driver by lighting MIL up when there is malfunction on engine control system.
  Therefore, when Electrical controlled throttle and part of ECM related diagnoses is continuously detected as NG for 5-trips, ECM warns the driver that engine control system has malfunction and MIL circuit is open by means of operating fail-safe function.
  The fail-safe function also operates when above diagnoses except MIL circuit and demands the driver to repair the malfunction.

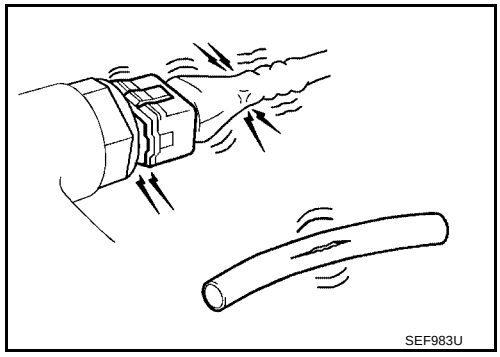
Engine operating condition in fail-safe mode	Engine speed will not rise more then 2,500 rpm due to the fuel cut.

Basic Inspection

UBS001RA

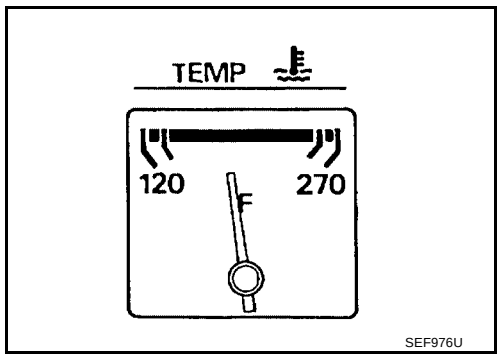
1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket


SEF983U

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.

4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.

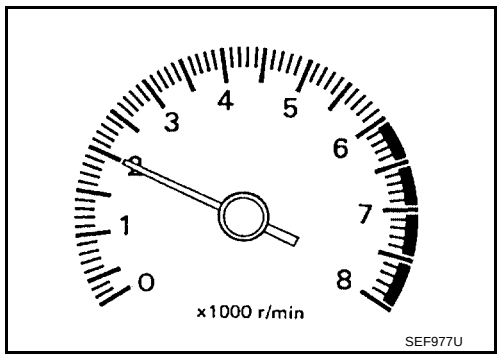


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

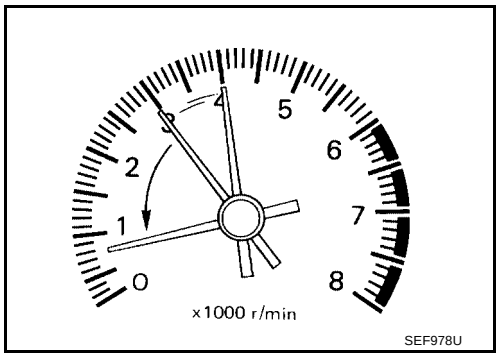
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

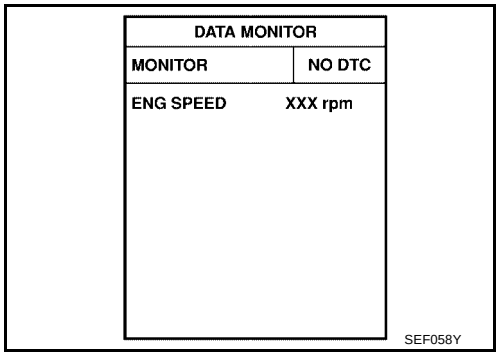
With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 9.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-634, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-635, "Idle Air Volume Learning" .
Is “Idle Air Volume Learning” carried out successfully?

Yes or No

Yes >> GO TO 7.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-842 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-836 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 7 ± 5° BTDC
A/T: 18 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-634, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-635, "Idle Air Volume Learning" .
Is “Idle Air Volume Learning” carried out successfully?
Yes or No

Yes >> GO TO 14.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 650 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 7 ± 5° BTDC
A/T: 18 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-45, "INSTALLATION" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-842 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-836 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)

>> GO TO 4.

Symptom Matrix Chart

UBS001RB

SYSTEM — ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-1174
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-637
	Injector circuit	1	1	2	3	2		2	2			2			EC-1168
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-1205
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-1218
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-624
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-952, EC-954
Igni-tion	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-669
	Ignition circuit	1	1	2	2	2		2	2			2			EC-1156
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3		2	EC-721
Air conditioner circuit		2	2	3	3	3	3	3	3	3		3		2	MTC-19

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Camshaft position sensor (PHASE) circuit	2	2	3	3	3		3	3			3			EC-825
Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-740, EC-748
A/F sensor 1		1	2	3	2		2	2			2			EC-1033
Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-760, EC-772
Throttle position sensor circuit		1	2		2	2	2	2	2		2			EC-765, EC-818, EC-1024, EC-1026, EC-1140
Accelerator pedal position sensor circuit			3	2	1	2			2					EC-1028, EC-1125, EC-1132, EC-1147
Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-669
Swirl control valve circuit	3	3						2						EC-984
Intake valve timing control system		3	3		3		3				3			EC-947
Vehicle speed sensor circuit		2	3		3						3			EC-916
Knock sensor circuit			2								3			EC-832
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-927, EC-668
Start signal circuit	2													SC-10
PNP switch circuit			3		3		3	3			3			EC-1115
Power steering pressure sensor circuit		2					3	3						EC-922
Electrical load signal circuit							3	3						EC-1185

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-7
	Fuel piping			5	5	5		5	5			5			—
	Vapor lock														
	Valve deposit	5		5	5	5		5	5			5			
	Poor fuel (Heavy weight gasoline, Low octane)														
Air	Air duct	5	5	5	5	5	5	5	5	5		5			
	Air cleaner														
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)														
	Electric throttle control actuator, Throttle wire														EM-12
	Air leakage from intake manifold/Collector/Gasket														—
Cranking	Battery	1	1	1		1		1	1			1		1	SC-4
	Generator circuit														
	Starter circuit	3													
	Flywheel/Drive plate/Signal plate	6													EM-67
	PNP switch	4													EC-1115

1 - 6: The numbers refer to the order of inspection.

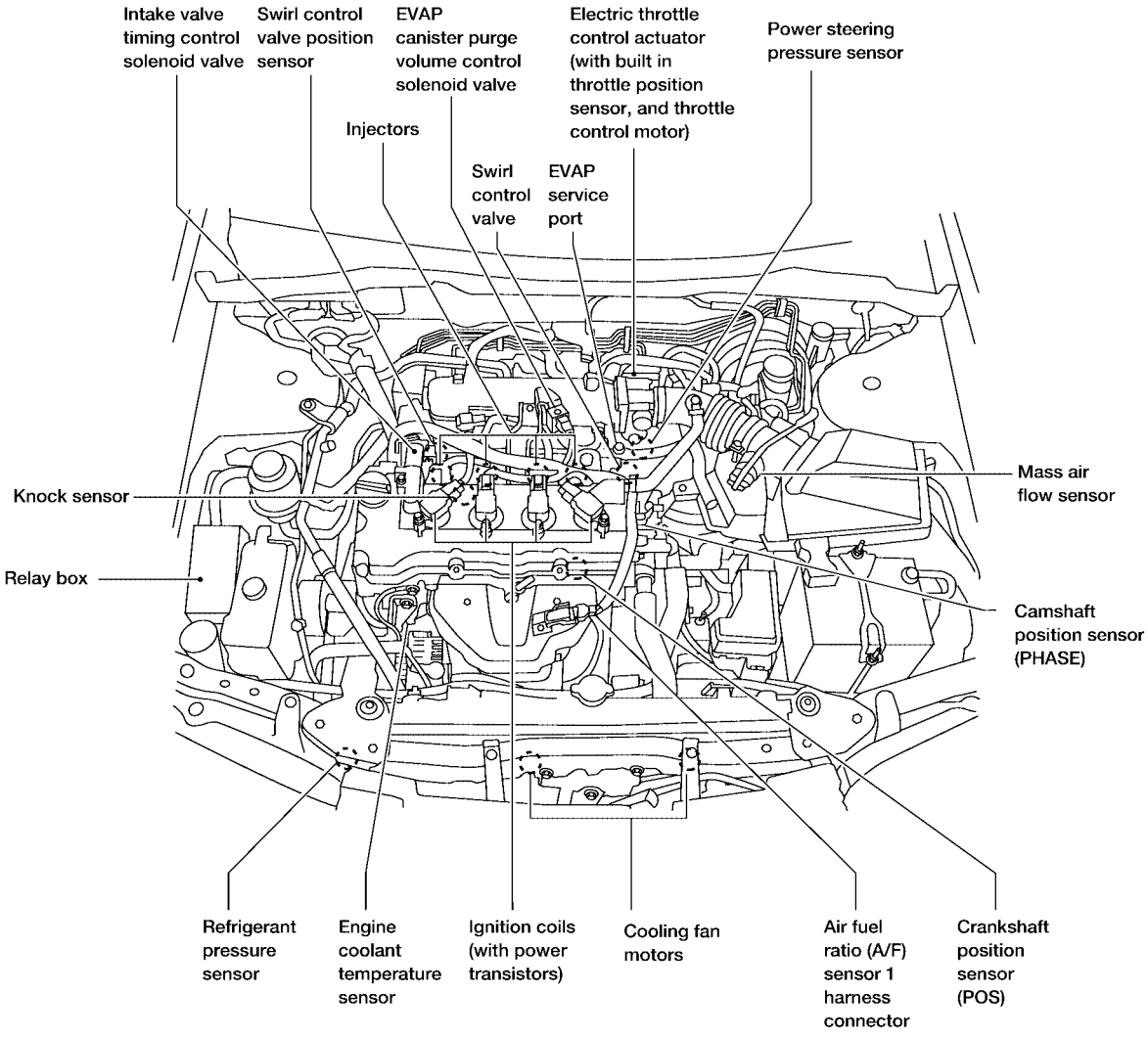
(continued on next page)

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-52,EM-67
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			EM-52
	Camshaft														
	Intake valve timing control														
	Intake valve												3		
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-52
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			EM-16, LU-8, LU-7
	Oil level (Low)/Filthy oil														
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-6, CO-7
	Thermostat									5					
	Water pump														
	Water gallery														
	Cooling fan									5					EC-1009
	Coolant level (low)/Contaminated coolant														CO-7

1 - 6: The numbers refer to the order of inspection.

Engine Control Component Parts Location

UBS001RC



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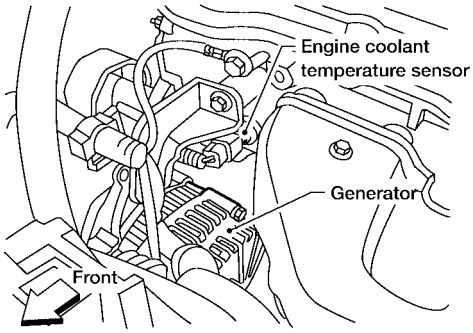
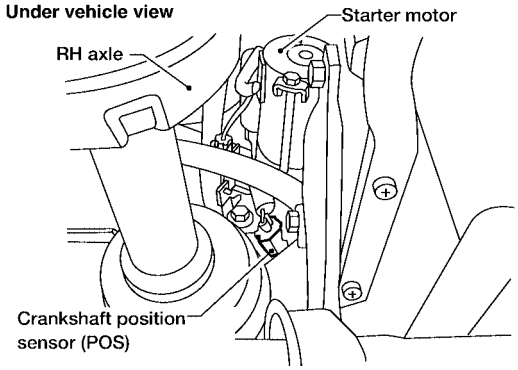
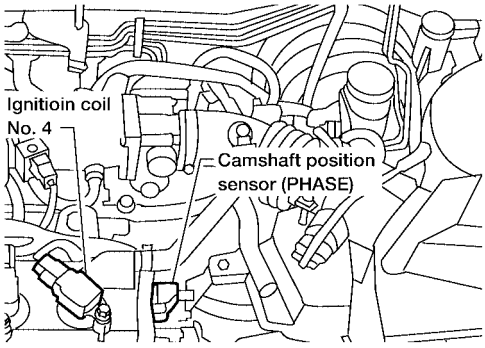
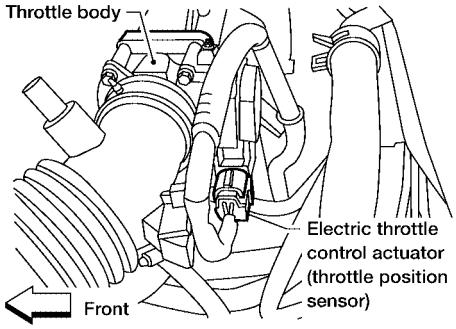
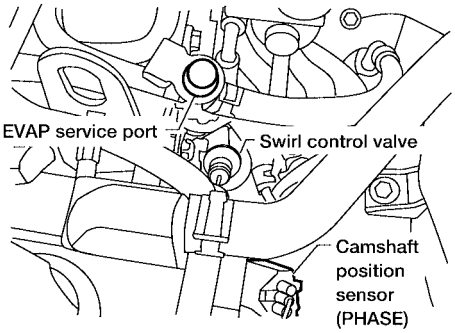
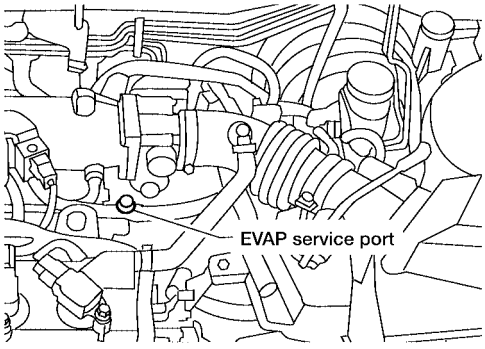

Engine coolant temperature sensor
Generator
Front


Under vehicle view
Starter motor
RH axle
Crankshaft position sensor (POS)

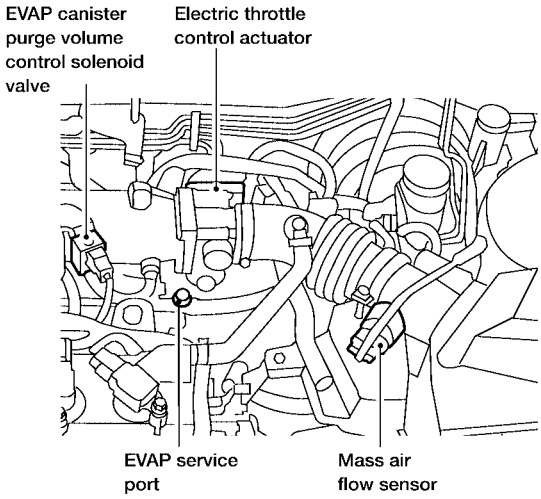

Ignitioin coil No. 4
Camshaft position sensor (PHASE)

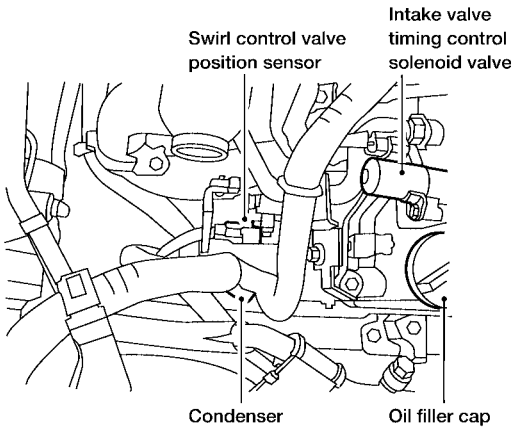

Throttle body
Electric throttle control actuator (throttle position sensor)
Front


EVAP service port
Swirl control valve
Camshaft position sensor (PHASE)

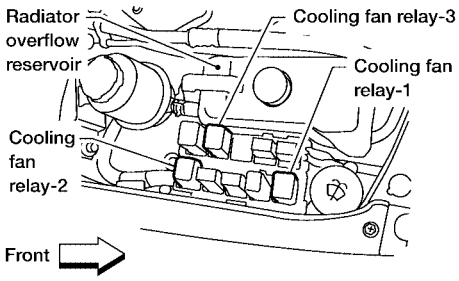

EVAP service port

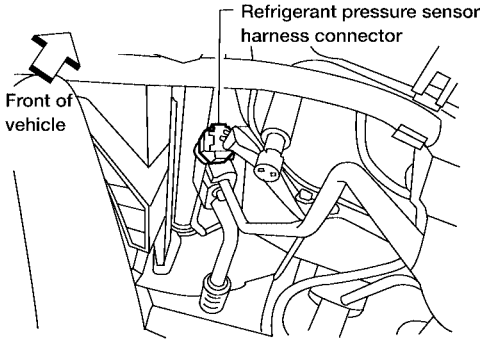
BBIA0169E



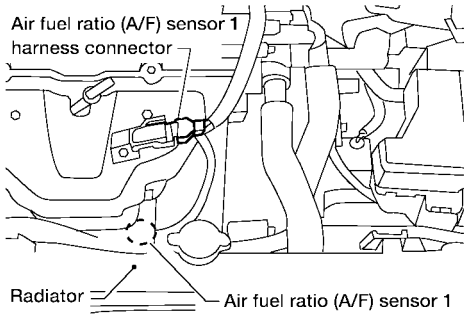


View with relay box cover removed

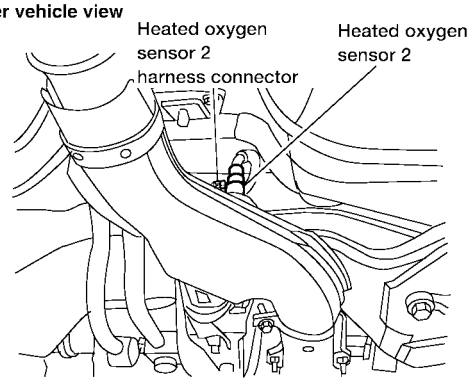




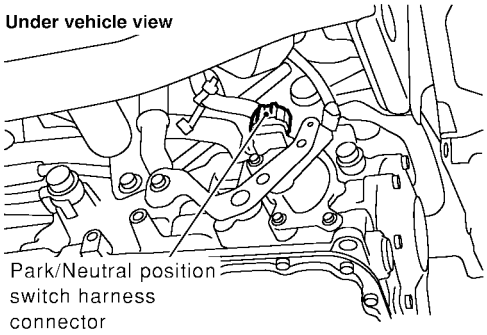
BBIA0170E



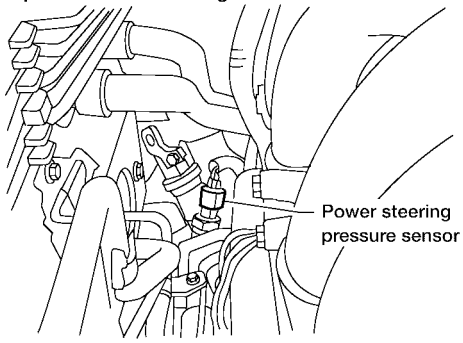
Under vehicle view



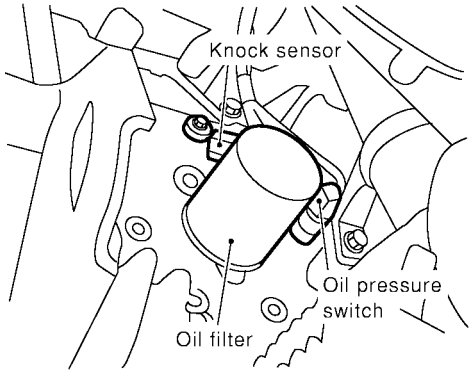
Under vehicle view

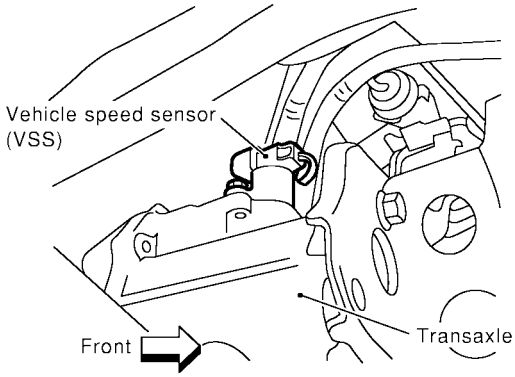


Top view from rear of engine



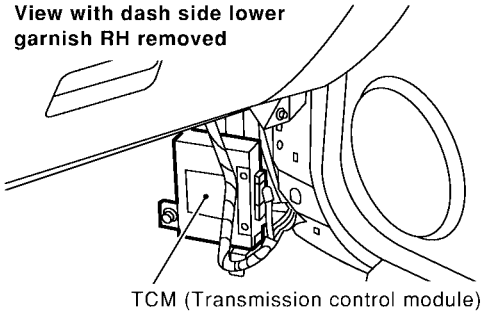
Under vehicle view



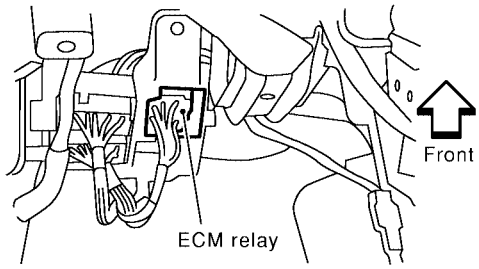


BBIA0139E

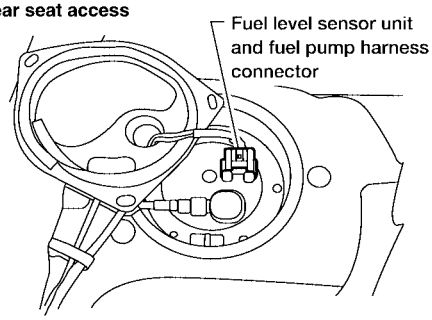
View with dash side lower garnish RH removed

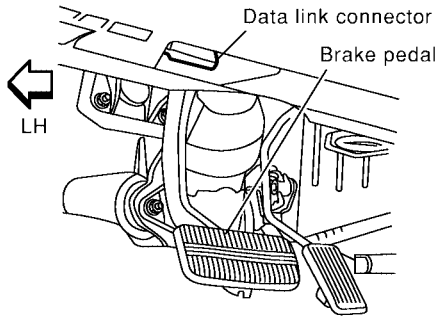


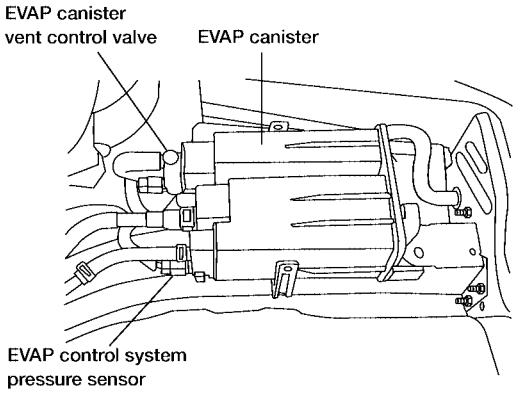
Passenger side view with instrument panel removed for clarity



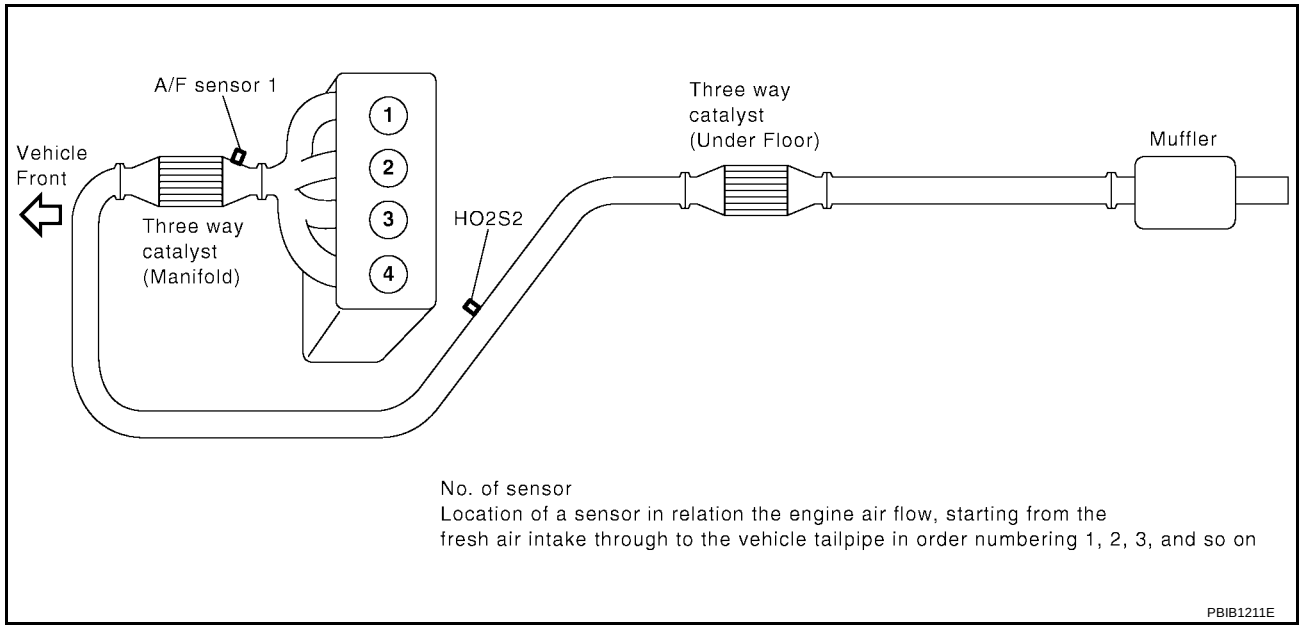
Rear seat access

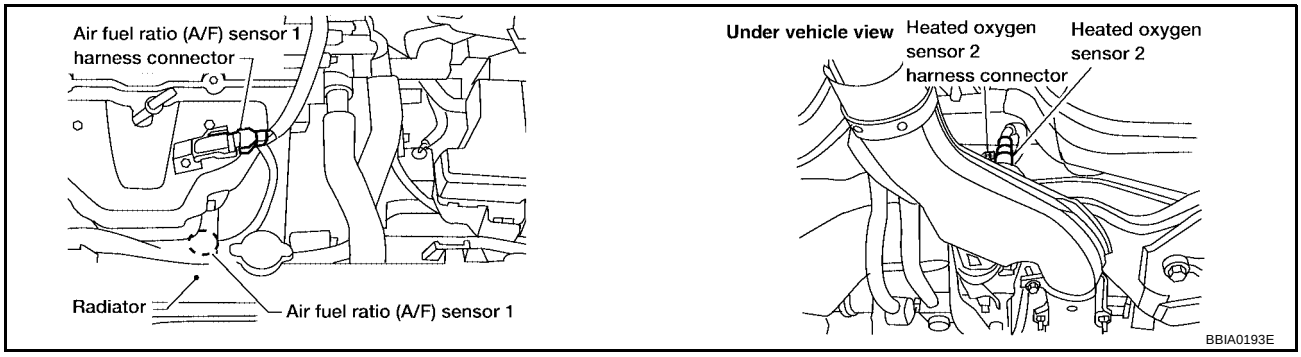






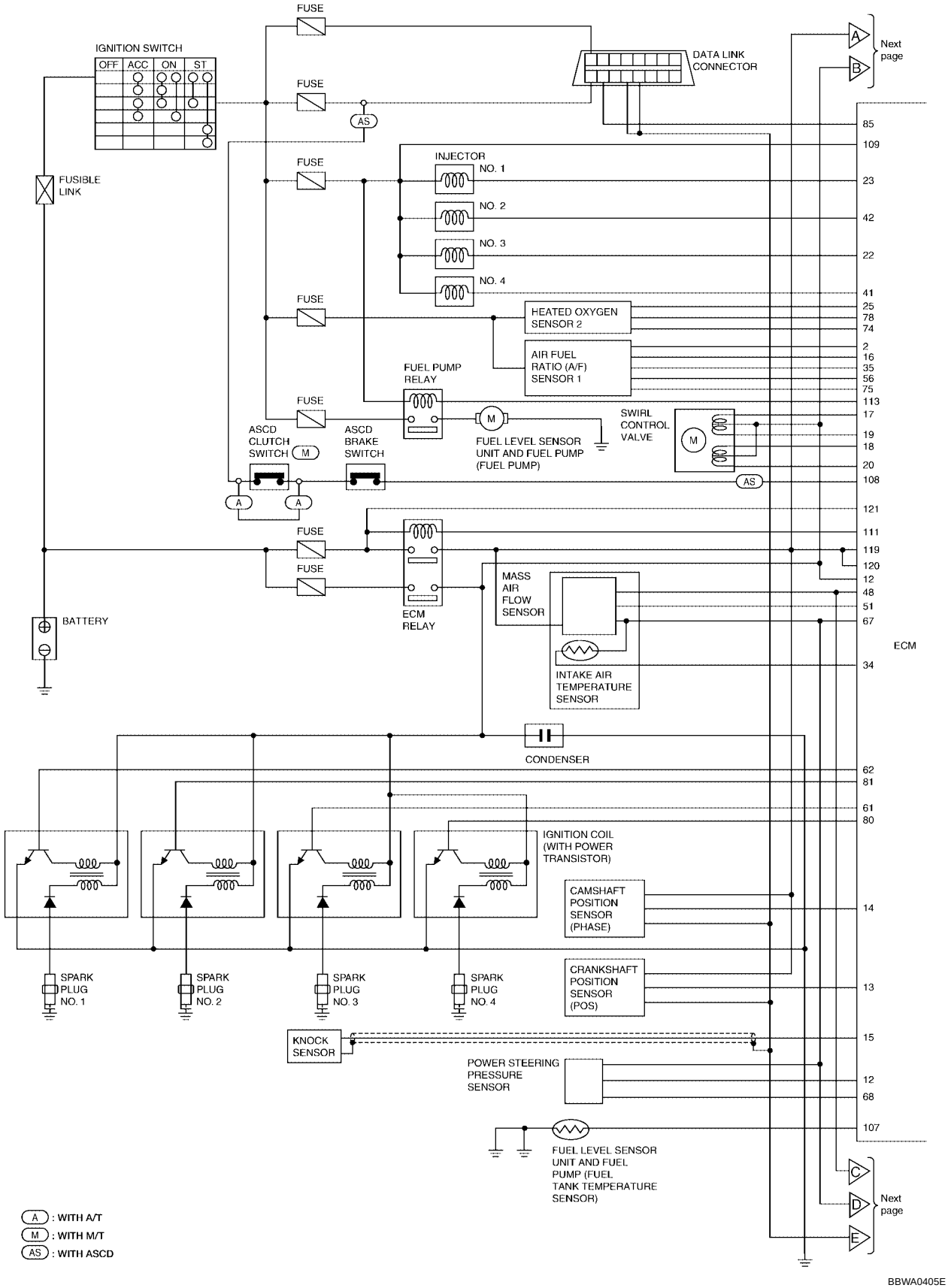
BBIA0171E

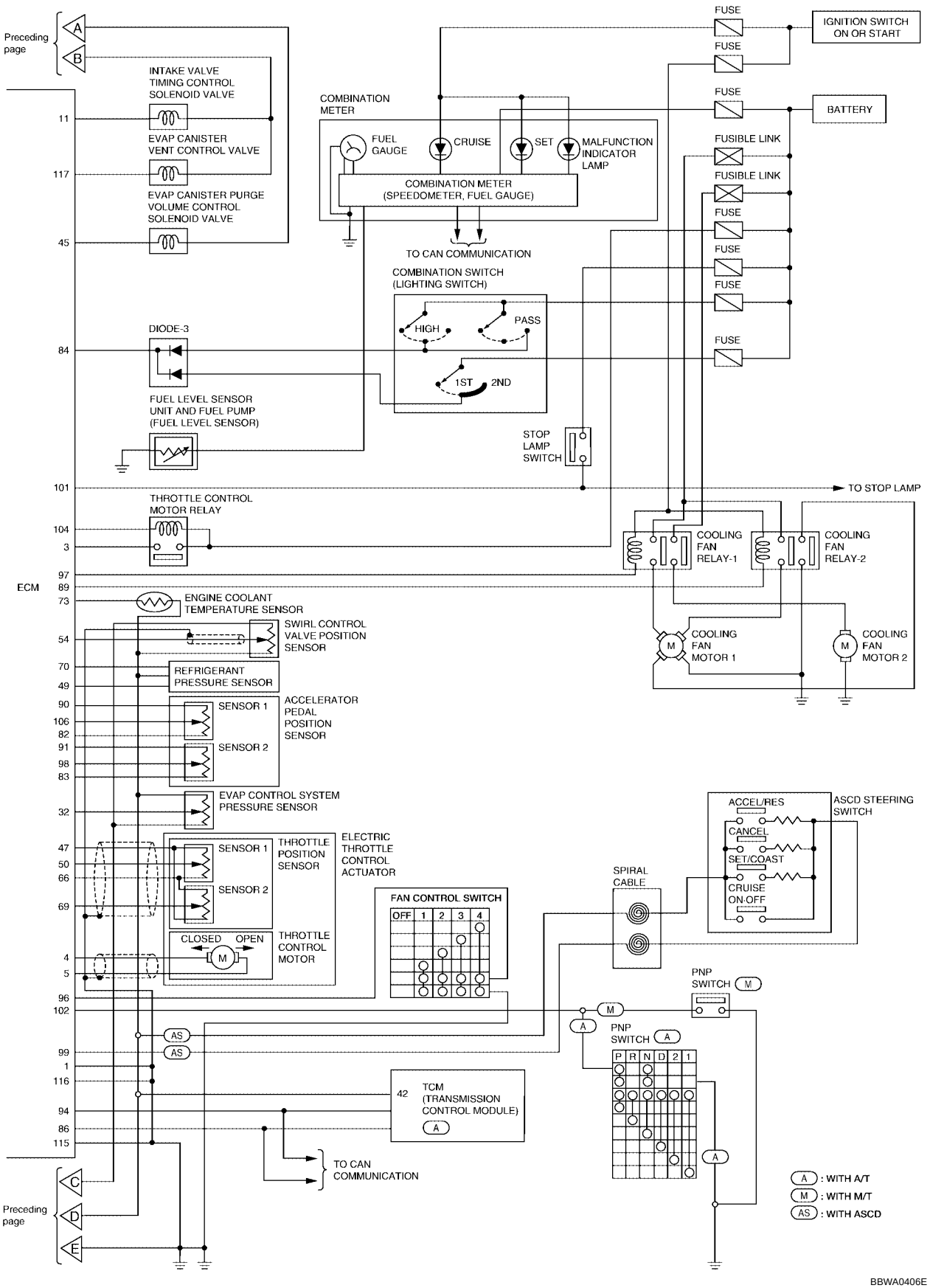

A/F sensor 1
Vehicle
Front
Three way
catalyst
(Manifold)
1
2
3
4
HO2S2
Three way
catalyst
(Under Floor)
Muffler
No. of sensor
Location of a sensor in relation the engine air flow, starting from the
fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on
PBIB1211E


Air fuel ratio (A/F) sensor 1
harness connector
Radiator
Air fuel ratio (A/F) sensor 1
Under vehicle view
Heated oxygen
sensor 2
harness connector
Heated oxygen
sensor 2
BBIA0193E

Circuit Diagram

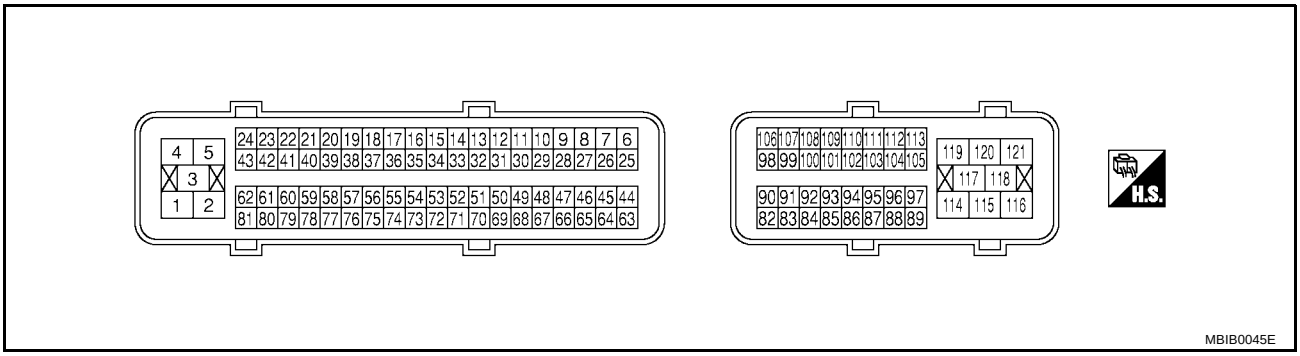
UBS001RD




Preceding page
A
B
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
EVAP CANISTER VENT CONTROL VALVE
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
11
117
45
COMBINATION METER
FUEL GAUGE
CRUISE
SET
MALFUNCTION INDICATOR LAMP
COMBINATION METER (SPEEDOMETER, FUEL GAUGE)
TO CAN COMMUNICATION
COMBINATION SWITCH (LIGHTING SWITCH)
HIGH
PASS
1ST
2ND
DIODE-3
84
FUEL LEVEL SENSOR UNIT AND FUEL PUMP (FUEL LEVEL SENSOR)
STOP LAMP SWITCH
FUSE
IGNITION SWITCH ON OR START
BATTERY
FUSIBLE LINK
101
TO STOP LAMP
THROTTLE CONTROL MOTOR RELAY
104
3
97
89
73
COOLING FAN RELAY-1
COOLING FAN RELAY-2
COOLING FAN MOTOR 1
COOLING FAN MOTOR 2
ECM
ENGINE COOLANT TEMPERATURE SENSOR
SWIRL CONTROL VALVE POSITION SENSOR
54
REFRIGERANT PRESSURE SENSOR
70
49
ACCELERATOR PEDAL POSITION SENSOR
SENSOR 1
SENSOR 2
90
106
82
91
98
83
EVAP CONTROL SYSTEM PRESSURE SENSOR
32
ELECTRIC THROTTLE CONTROL ACTUATOR
THROTTLE POSITION SENSOR
THROTTLE CONTROL MOTOR
CLOSED
OPEN
47
50
66
69
4
5
96
102
99
1
116
94
86
115
FAN CONTROL SWITCH
OFF 1 2 3 4
ACCEL/RES
CANCEL
SET/COAST
CRUISE ON·OFF
ASCD STEERING SWITCH
SPIRAL CABLE
PNP SWITCH M
PNP SWITCH A
P R N D 2 1
AS
42
TCM (TRANSMISSION CONTROL MODULE)
TO CAN COMMUNICATION
C
D
E
: WITH A/T
: WITH M/T
: WITH ASCD
BBWA0406E

ECM Harness Connector Terminal Layout

UBS001RE

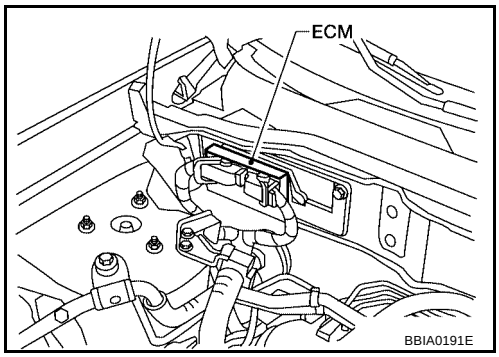


ECM Terminals and Reference Value

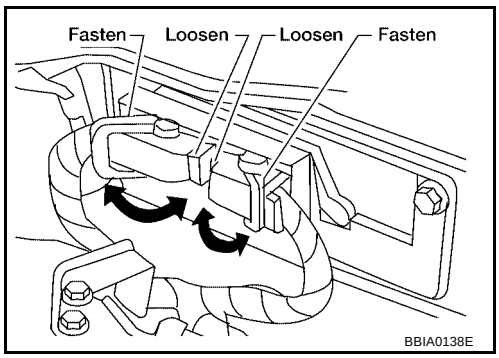
UBS0067T

PREPARATION

1. ECM is located in the right side of the cowl top (behind the strut tower).
   For this inspection:
2. Remove ECM harness protector.



3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as show at right.
4. Connect a bread-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



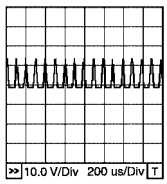
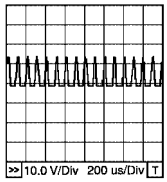
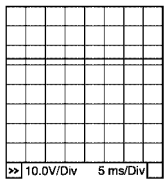
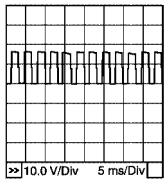
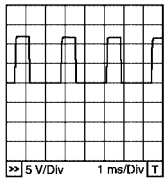
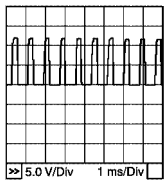
ECM INSPECTION TABLE

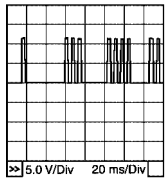
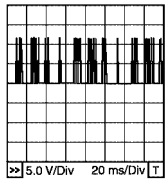
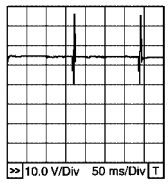
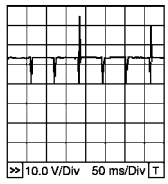
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

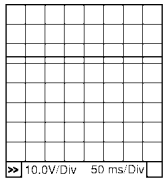
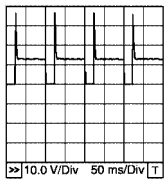
CAUTION:

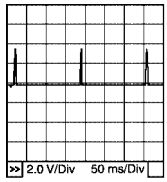
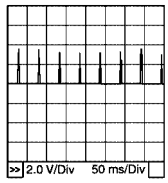
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
2	R	A/F sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 5V
3	R/W	Throttle control motor power supply	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
11	G/Y	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● Engine speed 2,500 rpm	7 - 10V★  PBIB0532E
12	P	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned	0.4 - 0.8V
13	Y	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	W/R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	OR/L	A/F sensor 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.1V
35	B/Y			Approximately 2.6V
56	OR			2 - 3V
75	W/L			2 - 3V
17 18 19 20	LG R/W PU/W L/Y	Swirl control valve	**[Engine is running]** ● Idle speed	0.1 - 14V
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	W/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed: Below 3,600 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under on load	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
32	L	EVAP control system pressure sensor	**[Ignition switch "ON"]**	Approximately 1.8 - 4.8V
34	Y/G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
45	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
48	R/W	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
49	R/Y	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
51	L/R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
54	Y	Swirl control valve position sensor	**[Engine is running]** ● Idle speed ● Engine coolant temperature is below 44°C (111°F).	Approximately 5V
			[Engine is running] ● **Warm-up condition** ● Idle speed ● Engine coolant temperature is above 45°C (113°F).	0 - 1.0V
61 62 80 81	L/W BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E
66	R	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
67	B/W	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	G/R	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
69	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 0.36V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
70	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON" (Compressor operates.)	1.0 - 4.0V
73	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
78	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82	B/Y	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	G	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
84	PU	Electrical load signal (Headlamp signal)	**[Lighting switch "ON"]** ● Lighting switch is "2nd" position	BATTERY VOLTAGE (11 - 14V)
			[Lighting switch "ON"] ● Lighting switch is "OFF"	Approximately 0V
85	LG	DATA link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	Y	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.3V
89	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is high speed operating	0 - 1.0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
94	L	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.8V
96	Y/G	Heater fan switch	**[Engine is running]** ● Heater fan switch "ON"	Approximately 0V
			[Engine is running] ● Heater fan switch "OFF"	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
97	LG/R	Cooling fan relay (Low)	**[Ignition switch "ON"]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Cooling fan is operating	0 - 1.0V
98	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.28 - 0.48V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 2.0V
99	W/R	ASCD steering switch	**[Ignition switch "ON"]** ● ASCD steering switch is "OFF".	Approximately 4V
			[Ignition switch "ON"] ● CRUISE switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1V
			[Ignition switch "ON"] ● COAST/SET switch is "ON".	Approximately 2V
			[Ignition switch "ON"] ● ACCEL/RESUME switch is "ON".	Approximately 3V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
102	G/OR	PNP switch	**[Ignition switch "ON"]** ● Gear position is "P" or "N"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V
104	P	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Accelerator pedal fully released	0.65 - 0.87V
			[Ignition switch "ON"] ● Engine stopped ● Accelerator pedal fully depressed	More than 4.3V
107	OR	Fuel tank temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
108	P/L	ASCD brake switch	**[Ignition switch “ON”]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch “ON”] ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	BATTERY VOLTAGE (11 - 14V)
109	B/R	Ignition switch	**[Ignition switch “OFF”]**	0V
			[Ignition switch “ON”]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch “OFF”]** ● For 5 seconds after turning ignition switch “OFF”	0 - 1.0V
			[Ignition switch “OFF”] ● 5 seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch “ON”]** ● For 1 second after turning ignition switch “ON” **[Engine is running]**	0 - 1.0V
			[Ignition switch “ON”] ● More than 1 second after turning ignition switch “ON”.	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
117	L/Y	EVAP canister vent control valve	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch “OFF”]**	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

CONSULT-II Function

UBS001RG

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output specification of the Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
CAN diagnostic support monitor	The results of transmit/receive diagnosis of CAN communication can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
Function test	Conducted by CONSULT-II instead of a technician to determine each system is “OK” or “NG”.
ECM part number	ECM part number can be read.

*1 The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE							
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Camshaft position sensor (PHASE)		×	×					
		Crankshaft position sensor (POS)		×			×			
		Mass air flow sensor		×		×	×			
		Engine coolant temperature sensor		×	×	×	×	×		
		A/F sensor 1		×		×			×	×
		Heated oxygen sensor 2		×		×	×		×	×
		Vehicle speed sensor		×	×	×	×			
		Accelerator pedal position sensor		×		×	×			
		Throttle position sensor		×		×	×			
		Fuel tank temperature sensor		×		×	×	×		
		EVAP control system pressure sensor		×		×	×			
		Intake air temperature sensor		×	×	×	×			
		Knock sensor		×						
		Closed throttle position switch (Accelerator pedal position sensor signal)				×	×			
		Air conditioner switch				×	×			
		Park/neutral position (PNP) switch		×		×	×			
		Stop lamp switch		×		×	×			
		Power steering oil pressure switch				×	×			
		Battery voltage				×	×			
		Load signal				×	×			
		Swirl control valve position sensor		×		×	×			
		Fuel level sensor		×		×	×			
		ASCD steering switch		×		×	×			
		ASCD brake switch		×		×	×			

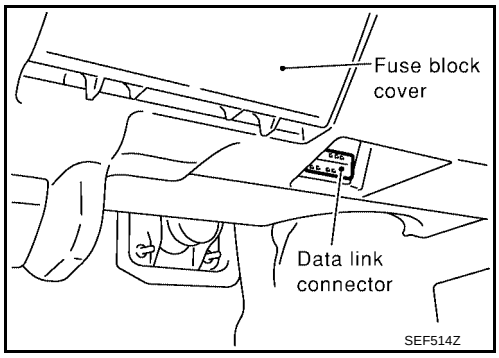
Item			DIAGNOSTIC TEST MODE							
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				×	×	×		
		Power transistor (Ignition timing)	×			×	×	×		
		Throttle control motor relay		×		×	×			
		Throttle control motor		×						
		EVAP canister purge volume control solenoid valve		×		×	×	×		×
		Air conditioner relay				×	×			
		Fuel pump relay	×			×	×	×		
		Cooling fan		×		×	×	×		
		A/F sensor 1 heater		×		×	×		×	
		Heated oxygen sensor 2 heater		×		×	×		×	
		EVAP canister vent control valve		×		×	×	×		
		Swirl control valve		×		×	×	×		
		Intake valve timing control solenoid valve		×		×	×	×		
		Calculated load value			×	×	×			

X: Applicable
*1: This item includes 1st trip DTCs.
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer toEC-640 .

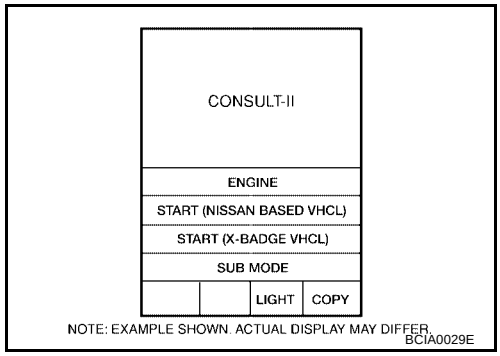
CONSULT-II INSPECTION PROCEDURE

CAUTION:
If CONSULT-II is used with no connection of CONSULT-II CONVERTER, malfunctions might be detected in self-diagnosis depending on control unit which carry out CAN communication.

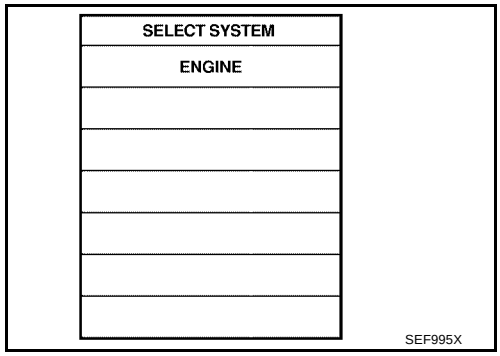
1. Turn ignition switch OFF.
2. Connect CONSULT-II and “CONSULT-II CONVERTER” to data link connector, which is located under LH dash panel near the fuse box cover.



3. Turn ignition switch ON.
4. Touch “START”.

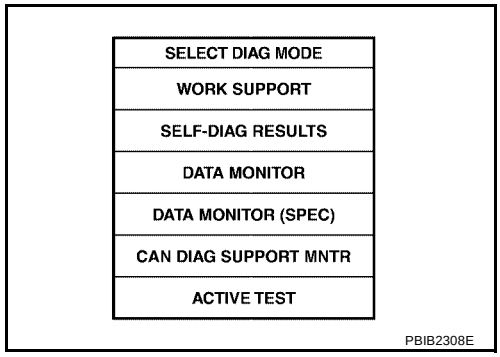


5. Touch “ENGINE”.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value

WORK ITEM	CONDITION	USAGE
EVAP SYSTEM CLOSE	CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. ● IGN SW “ON” ● ENGINE NOT RUNNING ● AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). ● NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM ● TANK FUEL TEMP. IS MORE THAN 0°C (32°F). ● WITHIN 10 MINUTES AFTER STARTING “EVAP SYSTEM CLOSE” ● WHEN TRYING TO EXECUTE “EVAP SYSTEM CLOSE” UNDER ANY CONDITION OTHER THAN THE ABOVE, CONSULT-II WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTIONS. **NOTE:** **WHEN STARTING ENGINE, CONSULT-II MAY DISPLAY “BATTERY VOLTAGE IS LOW. CHARGE BATTERY”, EVEN IN USING CHARGED BATTERY.**	When detecting EVAP vapor leak point of EVAP system
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGNITION TIMING ADJ*	● IDLE CONDITION	● When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light. ● If the “TARGET IDLE RPM ADJ” has been done, the Idle Air Volume Learning procedure will not be completed.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to “TROUBLE DIAGNOSIS — INDEX” (See EC-602 .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to “TROUBLE DIAGNOSIS — INDEX”, EC-602 .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.

Freeze frame data item*1	Description
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VEHICLE SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*1: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE
Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×	● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	×	×	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
A/F SEN1 (B1) [V]	×	×	● The A/F signal computed from the input signal of the A/F sensor 1 is displayed.	
HO2S2 (B1) [V]	×	×	● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 MNTR (B1) [RICH/LEAN]	×		● Display of heated oxygen sensor 2 signal: RICH... means the amount of oxygen after three way catalyst is relatively small. LEAN... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	×	×	● The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	×	×	● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	×	×	● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×			
THRTL SEN 1 [V]	×	×	● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×			
FUEL T/TMP SE [°C] or [°F]	×		● The fuel temperature judged from the fuel tank temperature sensor signal voltage is displayed.	
INT/A TEMP SE [°C] or [°F]	×	×	● The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated.	

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	Description	Remarks
EVAP SYS PRES [V]	×		● The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE [V]	×		● The signal voltage of the fuel level sensor is displayed.	
START SIGNAL [ON/OFF]	×	×	● Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×	● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×	● [ON/OFF] condition of the power steering system determined by the power steering pressure sensor signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the electrical load signal. ON... rear defogger is operating and/or lighting switch is on. OFF... rear defogger is not operating and lighting switch is not on.	
IGNITION SW [ON/OFF]	×		● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×		● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]		×	● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		×	● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]			● “Calculated load value” indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor.	
PURG VOL C/V [%]			● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
SWRL C/V (B1)[step]			● Indicates the swirl control valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]			● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL-B1 [ON/OFF]			● The control condition of the intake valve timing control solenoid valve is indicated. ON... Intake valve timing control solenoid is operating. OFF... Intake valve timing control solenoid is not operating.	
AIR COND RLY [ON/OFF]		×	● The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
FUEL PUMP RLY [ON/OFF]		×	● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
VENT CONT/V [ON/OFF]			● The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated. ● ON... Closed OFF... Open	
THRTL RELAY [ON/OFF]		×	● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [ON/OFF]			● Indicates the control condition of the cooling fan (determined by ECM according to the input signal). HIGH... High speed operation LOW... Low speed operation OFF... Stop	
HO2S2 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
IDL A/V LEARN [ON/OFF]			● Display the condition of idle air volume learning YET... Idle air volume learning has not been performed yet. CMPLT... Idle air volume learning has already been performed successfully.	
TRVL AFTER MIL [km] or [Mile]			● Distance traveled while MIL is activated	
AC PRESS SEN [V]			● The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE [km/h] or [mph]			● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	Description	Remarks
SET VHCL SPD [km/h] or [mph]			● The preset vehicle speed is displayed.	
MAIN SW [ON/OFF]			● Indicates [ON/OFF] condition from CRUISE switch signal.	
CANSEL SW [ON/OFF]			● Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW [ON/OFF]			● Indicates [ON/OFF] condition from ACCEL/RES switch signal.	
SET SW [ON/OFF]			● Indicates [ON/OFF] condition from COAST/SET switch signal.	
BRAKE SW1 SW [ON/OFF]			● Indicates [ON/OFF] condition from ASCD brake switch signal, and ASCD clutch switch signal (M/T models).	
BRAKE SW2 SW [ON/OFF]			● Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT [NON/CUT]			● Indicates the vehicle cruise condition. NON... Vehicle speed is maintained at the ASCD set speed. CUT... Vehicle speed increased to excessively high compared with the ASCD set speed, and ASCD operation is cut off.	
LO SPEED CUT [NON/CUT]			● Indicates the vehicle cruise condition. NON... Vehicle speed is maintained at the ASCD set speed. CUT... Vehicle speed increased to excessively low compared with the ASCD set speed, and ASCD operation is cut off.	
AT OD MONITOR [ON/OFF]			● Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM.	
AT OD CANCEL [ON/OFF]			● Indicates [ON/OFF] condition of A/T O/D cancel signal sent from the TCM.	
CRUISE LAMP [ON/OFF]			● Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	
A/F S1 HTR (B1) [%]			● Indicates A/F sensor 1 heater control value computed by ECM according to the input signal. ● The current flow to the heater becomes larger as the value increases.	
SWL/C POSI SE [degree]	×		● Indicates the swirl control value opening angle computed by ECM according to signal voltage of the swirl control valve position sensor.	
SET LAMP [ON/OFF]			● Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
Voltage [V]			● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only “#” is displayed if item is unable to be measured. ● Figures with “#”s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]				
DUTY-HI				
SUTY-LOW				
PLS WIDTH-HI				
PLS WIDTH-LOW				

NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE

Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the POS signal of the crankshaft position sensor.	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running, specification range is indicated.
B/FUEL SCHDL [msec]		×	● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running, specification range is indicated.
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running, specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

NOTE:
Any monitored item that dose not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Fuel injectors ● A/F sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● “Idle Air Volume Learning” (Refer toEC-634 .) ● Crankshaft position sensor (POS) ● Crankshaft position sensor (PHASE) ● Engine component parts and installing conditions
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever “N” ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” using CONSULT-II.	Cooling fan moves and stops.	● Harness and connector ● Cooling fan motor ● Cooling fan relay
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connector ● Fuel pump relay

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
VALVE TIMING SOL	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve “ON” and “OFF” with CONSULT-II and listen for operating sound	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connector ● Solenoid valve
FUEL/T TEMP SEN	● Change the fuel tank temperature using CONSULT-II.		
VENT CONTROL/V	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve “ON” and “OFF” with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
SWIRL CONTROL VALVE	● Ignition switch: ON (Engine stopped) ● Change swirl control valve opening step using CONSULT-II.	Swirl control valve makes an operating sound.	● Harness and connector ● Swirl control valve

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to EC-644, "SYSTEM READINESS TEST (SRT) CODE" .

SRT Work Support Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

DTC Work Support Mode

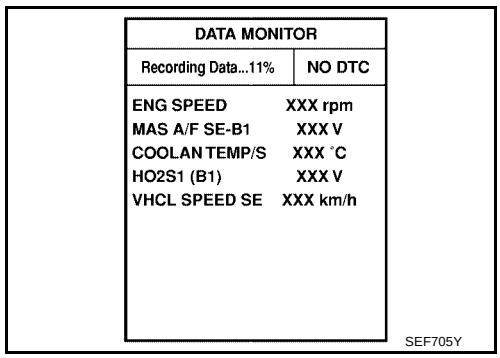
Test mode	Test item	Condition	Reference page
EVAPORATIVE SYSTEM	EVAP SML LEAK P0442/P1442*	Refer to corresponding trouble diagnosis for DTC.	EC-858
	EVAP V/S LEAK P0456/P1456*		EC-1081
	PURG VOL CN/V P1444		EC-1081
	PURGE FLOW P0441		EC-852
A/F SEN1	A/F SEN1 (B1) P1273		EC-1045
	A/F SEN1 (B1) P1274		EC-1052
	A/F SEN1 (B1) P1278		EC-1065
	A/F SEN1 (B1) P1279		EC-1073
	A/F SEN1 (B1) P1276		EC-1059
HO2S2	HO2S2 (B1) P1146		EC-992
	HO2S2 (B1) P1147		EC-1000
	HO2S2 (B1) P0139		EC-787

*: DTC P1442 and P1456 does not apply to B15 models but appears in DTC Work Support Mode screen.

REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.



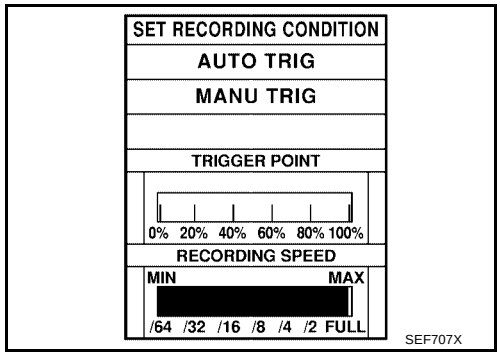
1. “AUTO TRIG” (Automatic trigger):

- The malfunction will be identified on the CONSULT-II screen in real time.
  In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data... xx%” as shown at left, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “ Recording Data... xx%”, “REAL-TIME DIAG” screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.

2. “MANU TRIG” (Manual trigger):

- DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
  DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:



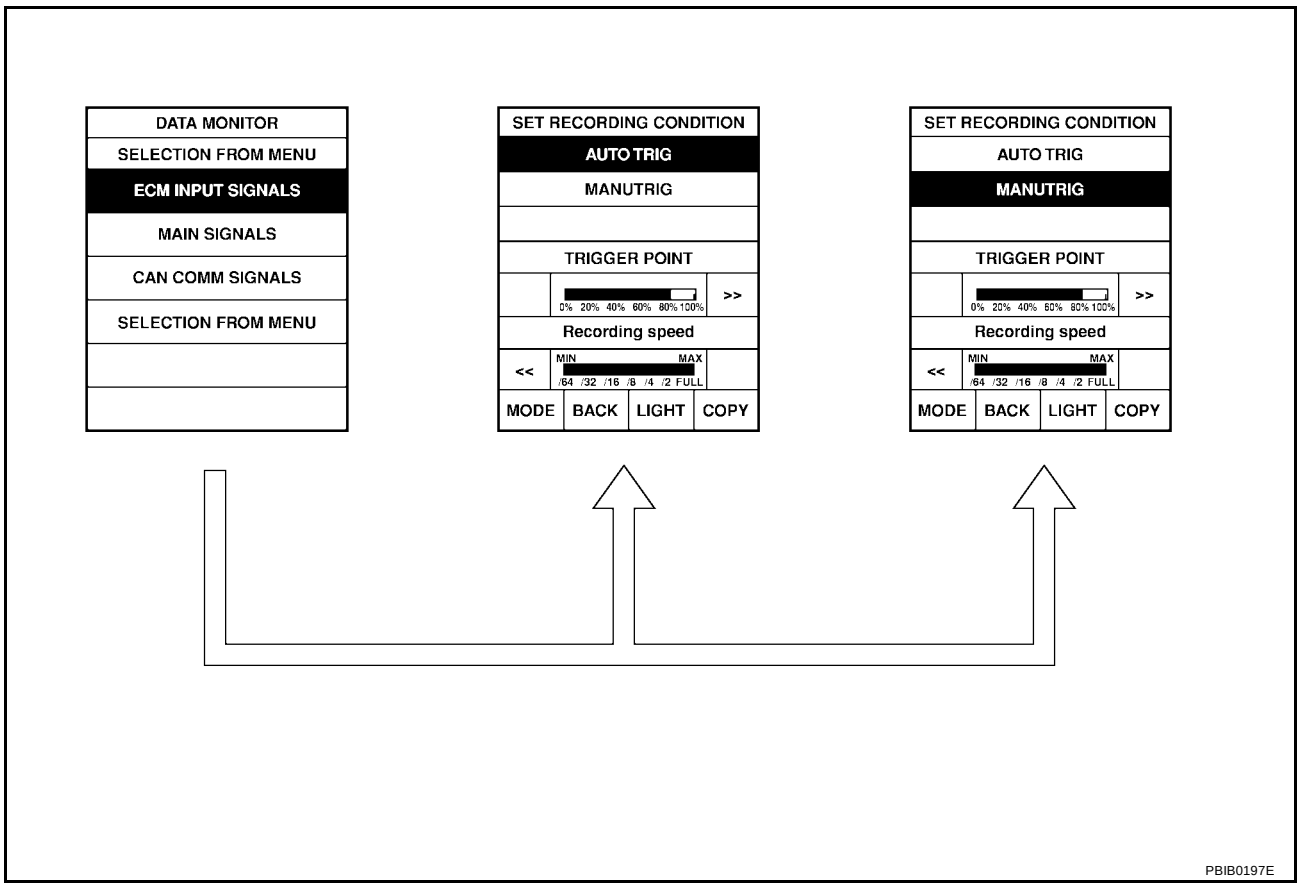
Operation

1. “AUTO TRIG”

- While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
  When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.)

2. “MANU TRIG”

- If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

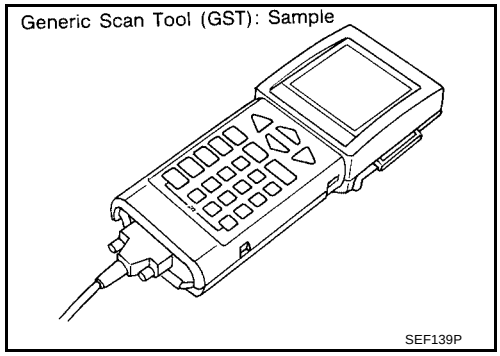


Generic Scan Tool (GST)

UBS001RH

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained on the next page.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.

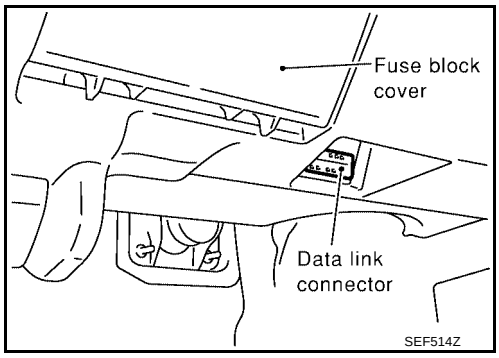


FUNCTION

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to “Freeze Frame Data” EC-643).]
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode can close EVAP system in ignition switch “ON” position (Engine stopped). When this mode is performed, following parts can be opened or closed. ● EVAP canister vent control valve open ● Vacuum cut valve bypass valve closed In the following conditions, this mode cannot function. ● Low ambient temperature ● Low battery voltage ● Engine running ● Ignition switch “OFF” ● Low fuel temperature ● Too much pressure is applied to EVAP system
MODE 9	(CALIBRATION ID)	This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

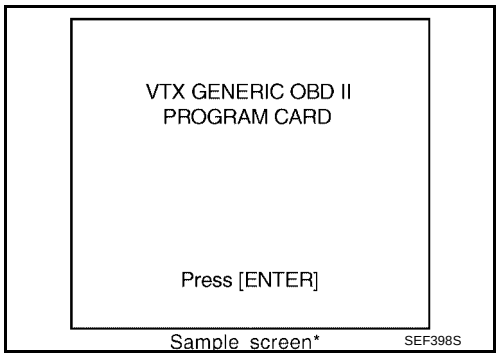
GST INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect GST to data link connector for GST which is located under LH dash panel near the fuse box cover.



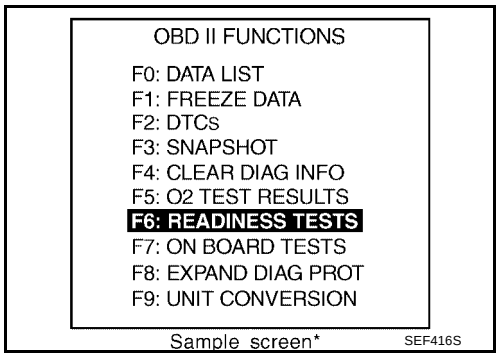
3. Turn ignition switch ON.
4. Enter the program according to instruction on the screen or in the operation manual.

(*: Regarding GST screens in this section, sample screens are shown.)



5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.



CONSULT-II Reference Value in Data Monitor Mode

UBS001RI

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  (i.e., Adjust ignition timing with a timing light before monitoring IGN TIMING. Specification data might be displayed even when ignition timing is not adjusted to specification. This IGN TIMING monitors the data calculated by the ECM according to the input signals from the camshaft position sensor and other ignition timing related sensors.)

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.4V
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.0 - 1.6 msec
		2,000 rpm	0.7 - 1.3 msec

MONITOR ITEM	CONDITION		SPECIFICATION
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	53 - 155%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
A/F SEN1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5V
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87V
		Accelerator pedal: Fully depressed	More than 4.3V
ACCEL SEN2*	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96V
		Accelerator pedal: Fully depressed	More than 4.0V
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever D: (A/T model) 1st: (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
EVAP SYS PRES	● Ignition switch: ON		1.8 - 4.8V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch “OFF”	OFF
		A/C switch “ON” (Compressor operates)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever “P” or “N” (A/T), Neutral (M/T)	ON
		Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (Forward direction)	OFF
		The steering wheel is turned	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch and/or lighting switch is in 2nd	ON
		Rear window defogger switch is OFF and lighting switch is OFF	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF

MONITOR ITEM	CONDITION		SPECIFICATION
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 3.2 msec
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	A/T 18°+5° BTDC M/T 7°±5° BTDC
		2,000 rpm	More than 25° BTDC
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	12.0 - 27.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.4 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	0%
		2,000 rpm	—
SWL C/V (B1)	● Engine: Idle the engine	Engine coolant temperature is below 44°C (111°F)	0 - 5 step
		Engine coolant temperature is above 45°C (113°F)	115 - 120 step
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T), Neutral (M/T) ● Air conditioner switch: OFF ● No - load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 80%
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (Stops in 1 seconds)		ON
	● Except as shown above		OFF
VENT CONT/V	● Ignition switch: ON		OFF
THRTL RELAY	● Ignition switch: ON		ON
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T), Neutral (M/T) ● Air conditioner switch: OFF ● No - load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH
HO2S2 HTR (B1)	● Engine speed: Above 3,600 rpm		OFF
	● Engine speed is below 3,600 rpm after the following conditions are met. – Engine: After warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.		ON
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MIL has turned ON	0 - 65,535 km (0 - 40,723 mile)
A/F S1 HTR (B1)	● Engine: After warming up, idle the engine		0 - 100%
SWL/C POSI SE	● Engine: Idle the engine	Engine coolant temperature is below 44°C (111°F)	Approx. 0 deg.
		Engine coolant temperature is above 45°C (113°F)	Approx. 80 deg.
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indiction with the CONSULT-II value.		Almost the same speed as the CONSULT-II valve
SET VHCL SPD	● Engine: Running	ASCD: Operating	The preset vehicle speed is displayed.
MAIN SW	● Ignition switch: ON	CRUISE switch: Depressed	ON
		CRUISE switch: Released	OFF
CANCEL SW	● Ignition switch: ON	CRUISE switch: Depressed	ON
		CRUISE switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	ACCEL/RES switch: Depressed	ON
		ACCEL/RES switch: Released	OFF
SET SW	● Ignition switch: ON	COAST/SET switch: Depressed	ON
		COAST/SET switch: Released	OFF
BRAKE SW1	● Ignition switch: ON	Clutch pedal (M/T) and brake pedal: Fully released	ON
		Clutch pedal (M/T) and brake pedal: Fully released	OFF
BRAKE SW2	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
CRUISE LAMP	● Ignition switch: ON	CRUISE Lamp: Illuminated	ON
		CRUISE Lamp: Not illuminated	OFF
SET LAMP	● Ignition switch: ON	SET Lamp: Illuminated	ON
		SET Lamp: Not illuminated	OFF

*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

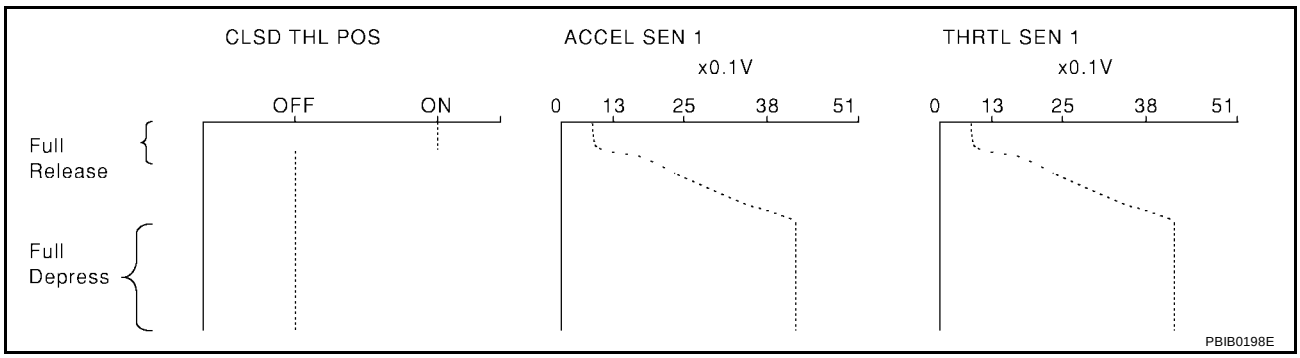
Major Sensor Reference Graph in Data Monitor Mode

UBS001RJ

The following are the major sensor reference graphs in “DATA MONITOR” mode.

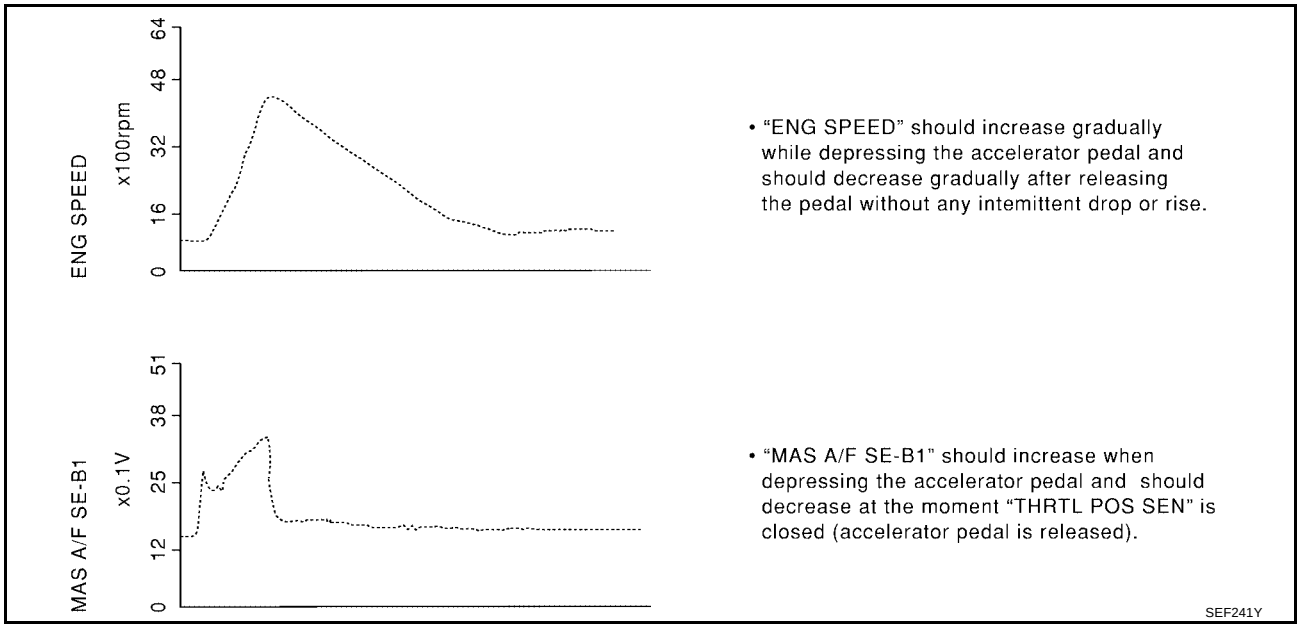
CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

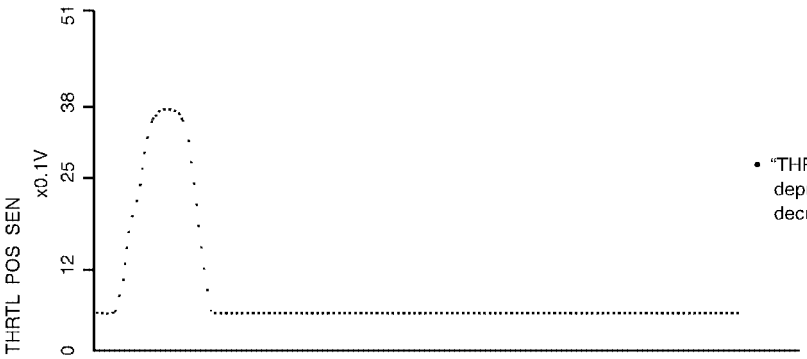
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position.
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.



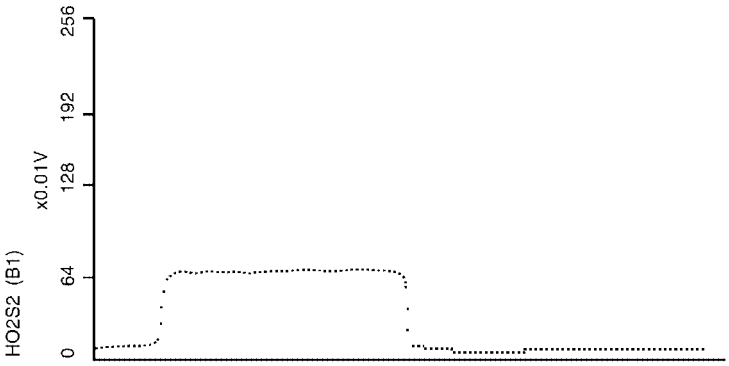
ENG SPEED, MAS A/F SE-B1, THRTL POS SEN, HO2S2 (B1), INJ PULSE-B1

Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL POS SEN”, “HO2S2 (B1/B2)” and “INJ PULSE” when revving engine quickly up to 4,800 rpm under no load after warming up engine to normal operating temperature.
Each value is for reference, the exact value may vary.

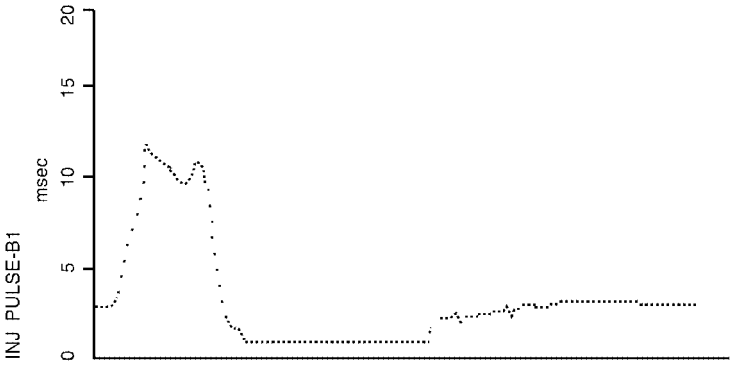




- "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



- "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



- "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

SEF600Z

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

UBS001RK

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

UBS001RL

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

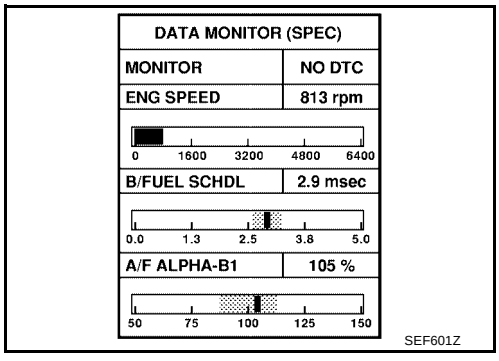
*1: For A/T or CVT models, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T or CVT fluid temperature sensor signal) indicates more than 60°C (140°F). For MT models, drive vehicle for 5 minutes after the engine is warmed up to normal operating temperature.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Cooling fans are not operating. Steering wheel is straight ahead.

Inspection Procedure

UBS001RM

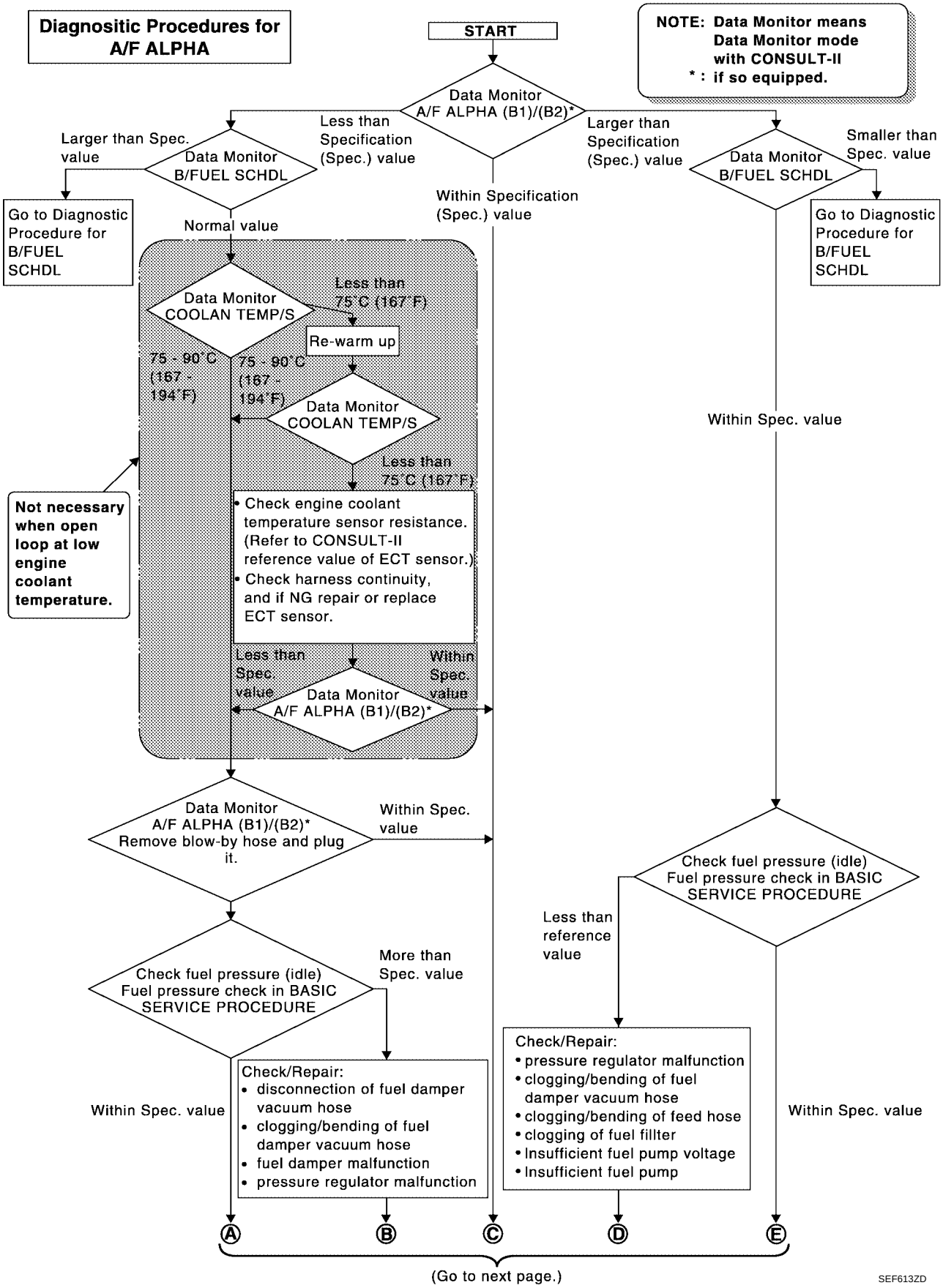
NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

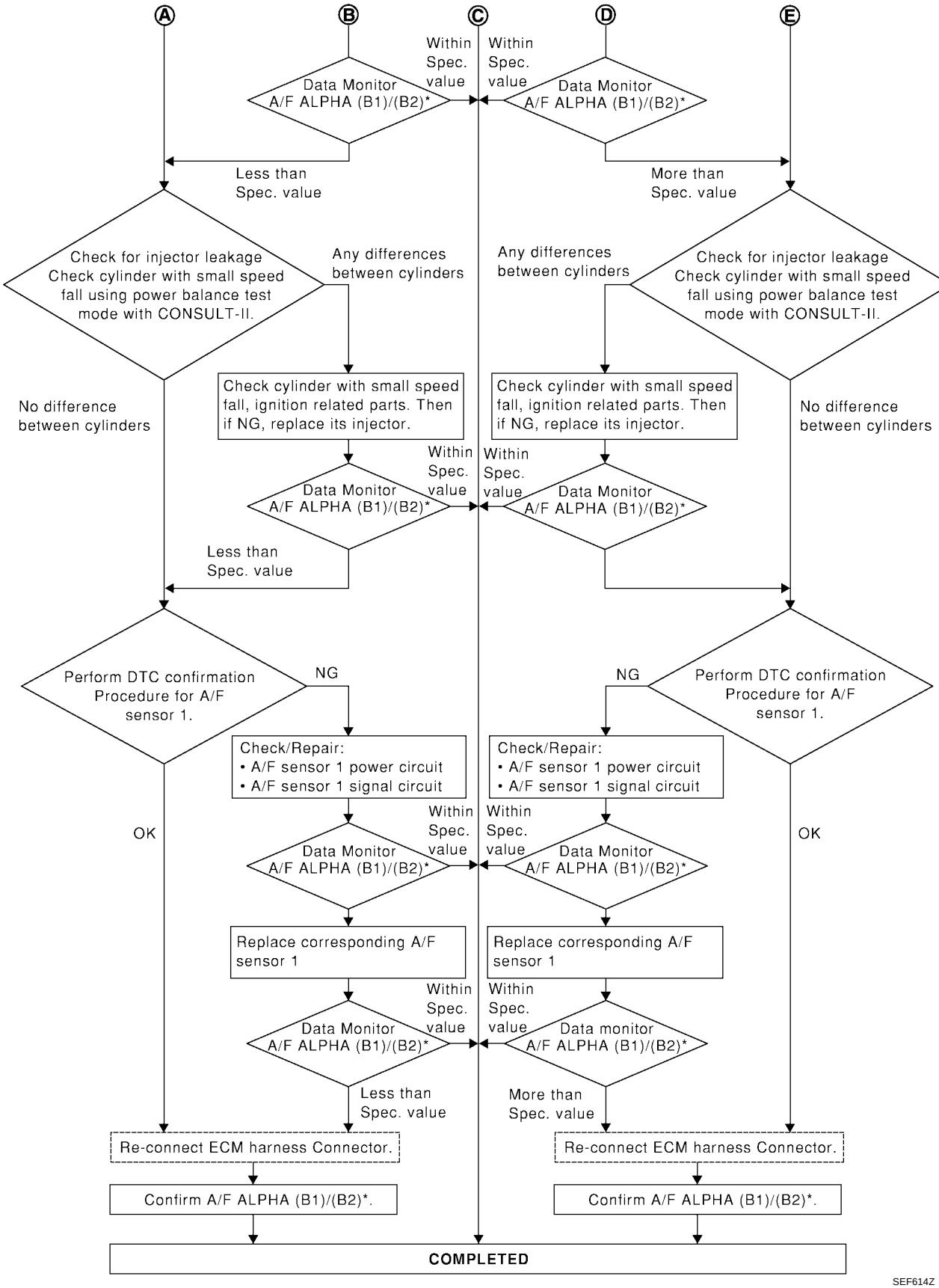
1. Perform EC-669, "Basic Inspection" “.
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-717, "Diagnostic Procedure" .

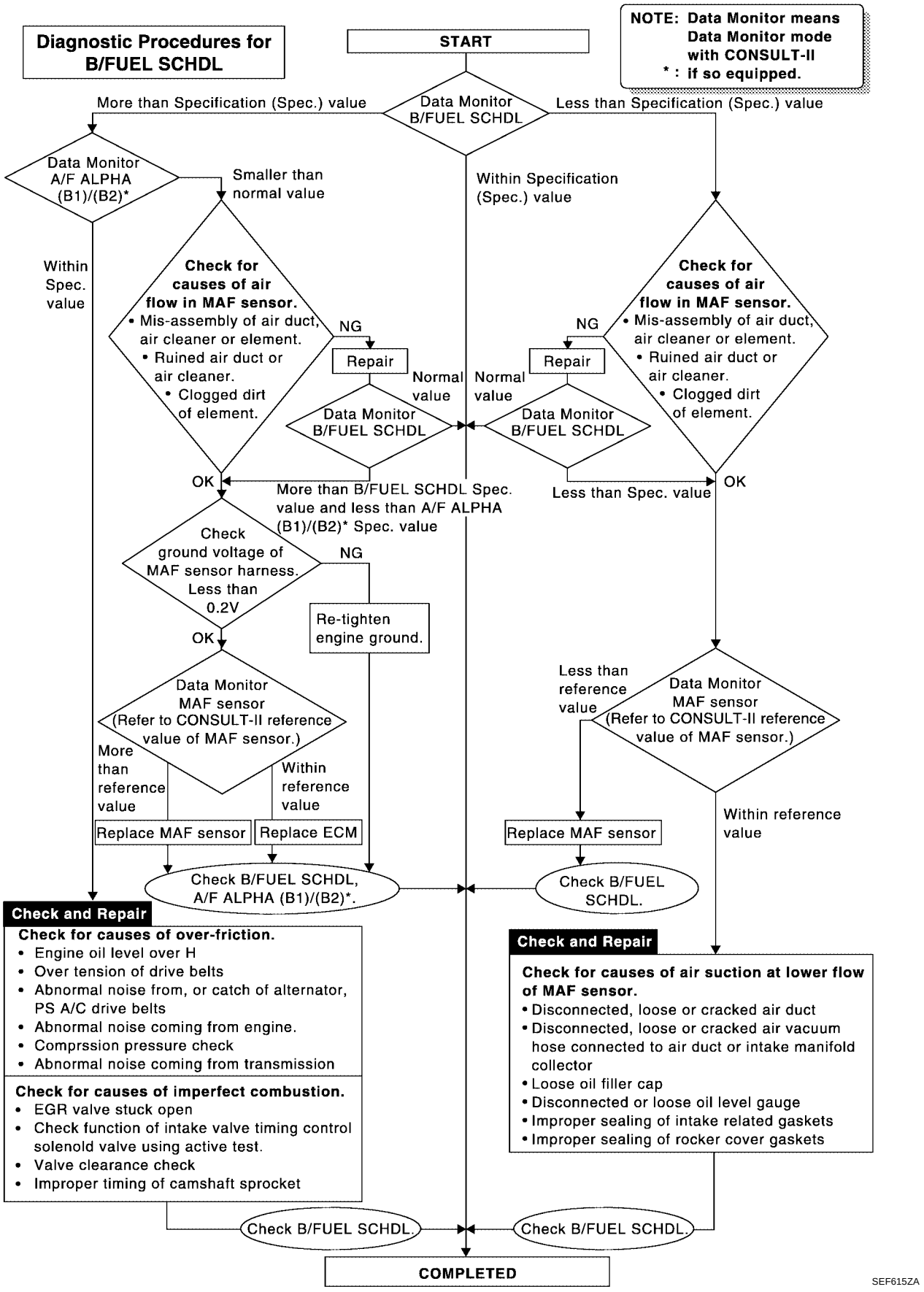


Diagnostic Procedure

UBS001RN




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for A/F sensor 1.
NG
NG
Perform DTC confirmation Procedure for A/F sensor 1.
Check/Repair:
• A/F sensor 1 power circuit
• A/F sensor 1 signal circuit
Check/Repair:
• A/F sensor 1 power circuit
• A/F sensor 1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding A/F sensor 1
Replace corresponding A/F sensor 1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED
SEF614Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
Re-tighten engine ground.
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Less than reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check B/FUEL SCHDL.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check and Repair
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

UBS001RO

Intermittent incidents (I/I) may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on DTC (1st trip) visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “1t”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC data does not appear during the DTC CONFIRMATION PROCEDURE.
VI	The TROUBLE DIAGNOSIS for PXXXX does not indicate the malfunctioning area.

Diagnostic Procedure

UBS001RP

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection. Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “GROUND INSPECTION”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK CONNECTOR TERMINALS

Refer to GI-23, "How to Check Terminal" , “How to Check Enlarged Contact Spring of Terminal”.

OK or NG

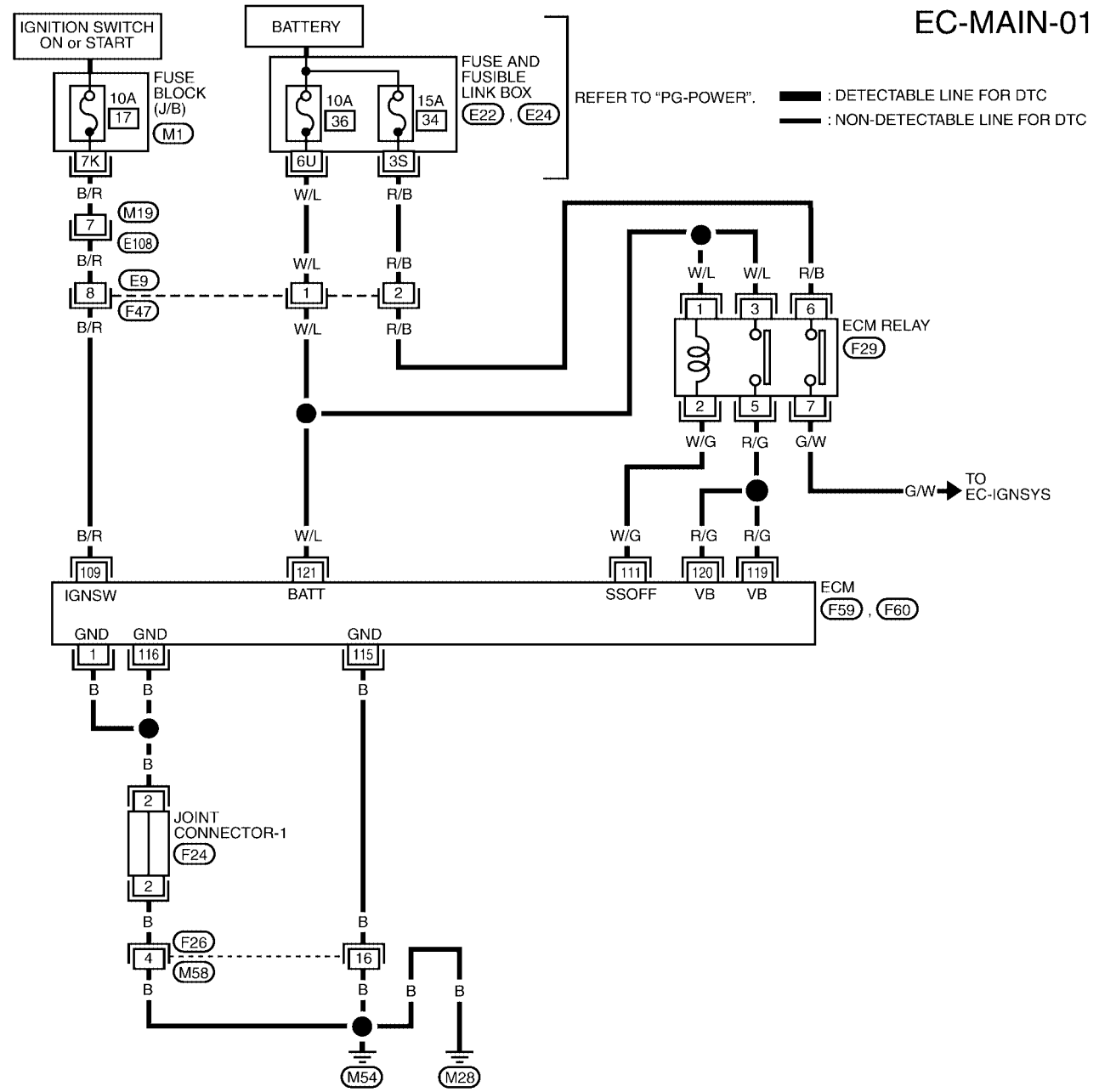
OK >> **INSPECTION END**
NG >> Repair or replace connector.

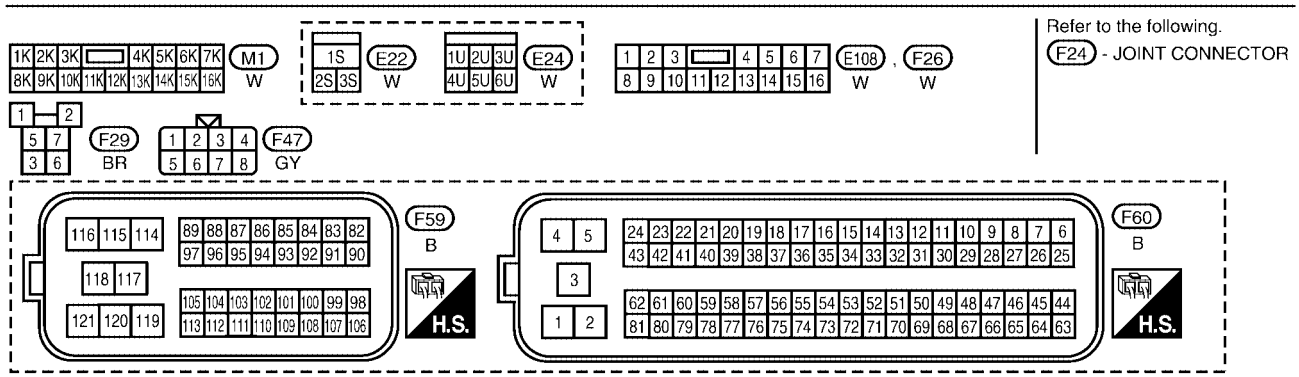
POWER SUPPLY CIRCUIT FOR ECM

PFP:24110

Wiring Diagram

UBS001RQ





BBWA0771E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS001RR

1. INSPECTION START

Start engine.

Is engine running?

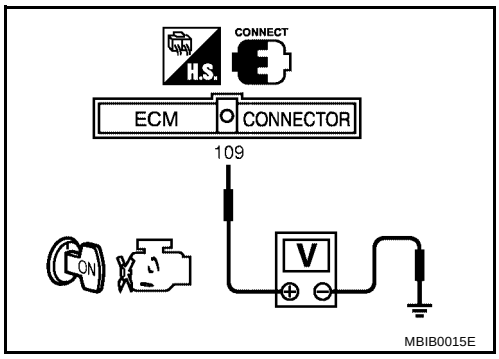
Yes or No

Yes >> GO TO 9.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Harness connectors M19, E108
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and 10A fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116, and engine ground.
   Refer to WIRING DIAGRAM.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

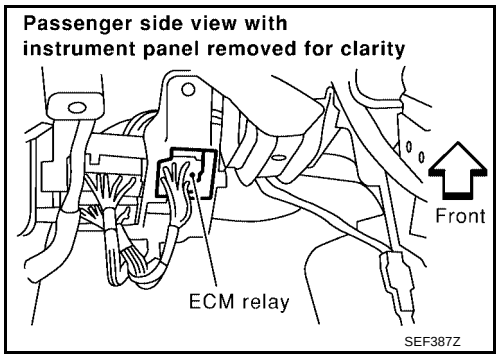
Check the following.

- Harness connectors F26, M58
- Joint connector-1
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

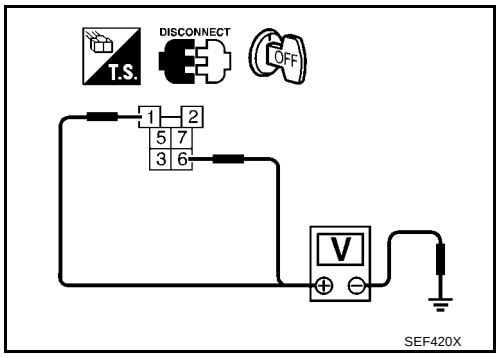
6. CHECK ECM POWER SUPPLY-II

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminals 1, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse and fusible link box connectors E22, E24
- 10A fuse
- 15A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2.

Continuity should exist.

2. Also check harness for short to ground and short to power.

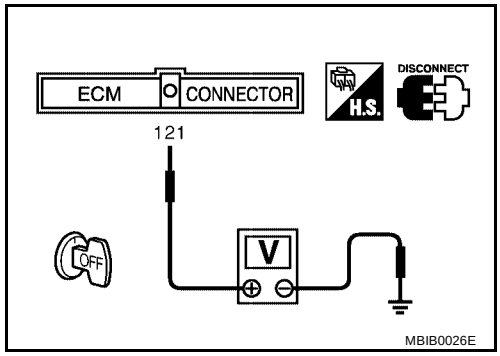
OK or NG

OK >> Go to EC-1156, "IGNITION SIGNAL" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ECM POWER SUPPLY-III

1. Stop engine.
2. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

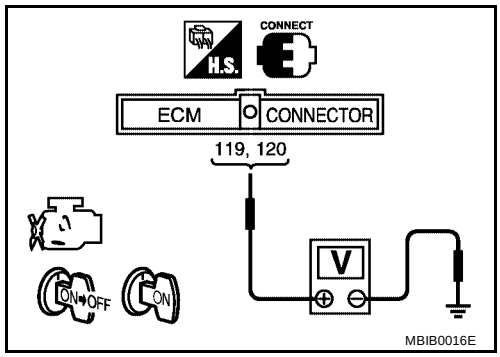
Check the harness for open or short between ECM and harness connector F47.

>> Repair harness or connectors.

11. CHECK POWER SUPPLY-III

1. Turn ignition switch “ON” and then “OFF”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop to approximately 0V.

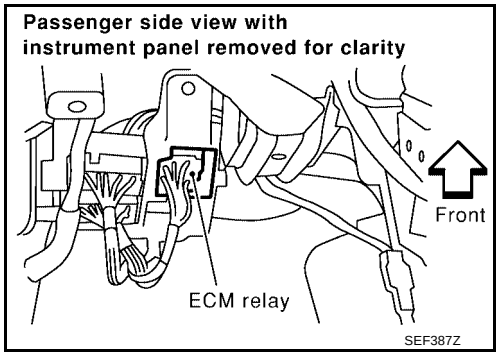


OK or NG

OK >> GO TO 17.
NG (Battery voltage does not exist.)>>GO TO 12.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 14.

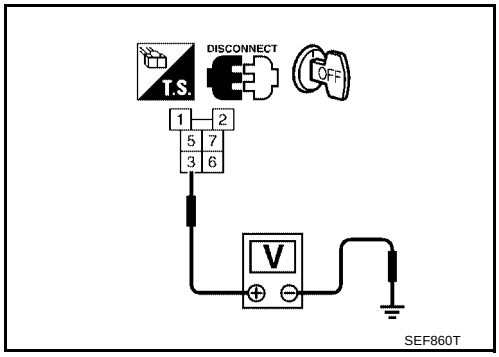
12. CHECK VOLTAGE BETWEEN ECM RELAY AND GROUND

1. Disconnect ECM harness connector.
2. Disconnect ECM relay.



3. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM relay and harness connector F47.

>> Repair harness or connectors.

14. CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM

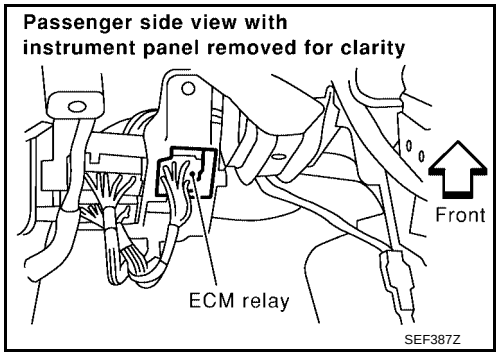
1. Check harness continuity between ECM terminals 119, 120 and ECM relay terminal 5.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 15.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



15. CHECK OUTPUT SIGNAL CIRCUIT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

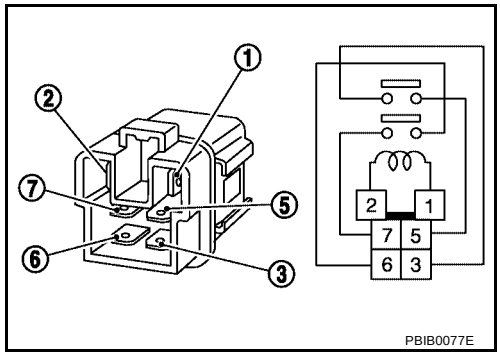
OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No



OK or NG

OK >> GO TO 17.
NG >> Replace ECM relay.

17. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116, and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 18

18. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F26, M58
- Joint connector-1
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

19. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

UBS003WA

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

UBS003WB

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000*2 1000*2	CAN communication line	● ECM cannot communicate to other control units. ● ECM cannot communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted)
U1001*1 1001*1			

*1: **The MIL will not light up for this diagnosis.**

*2: **This self-diagnosis has the one trip detection logic.**

DTC Confirmation Procedure

UBS003WC

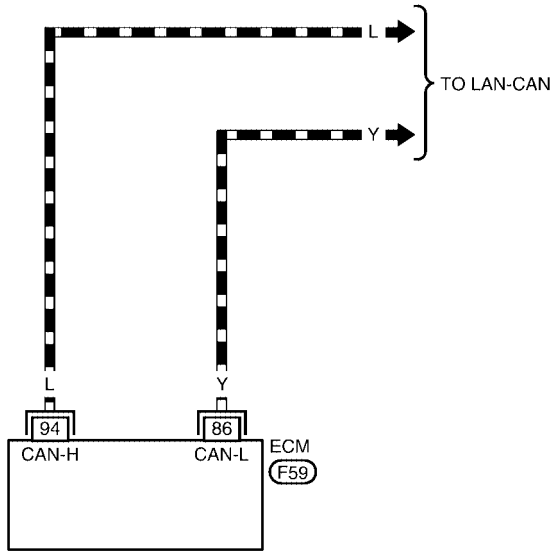
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-730, "Diagnostic Procedure" .

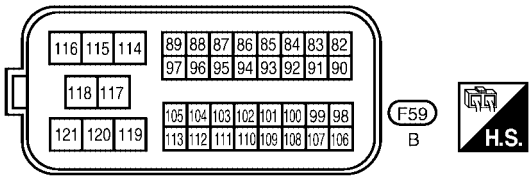
Wiring Diagram

UBS003WD

EC-CAN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
: DATA LINE





BBWA0274E

Diagnostic Procedure

UBS003WE

Go to LAN-3, "CAN COMMUNICATION" .

DTC P0011 IVT CONTROL

PFP:23796

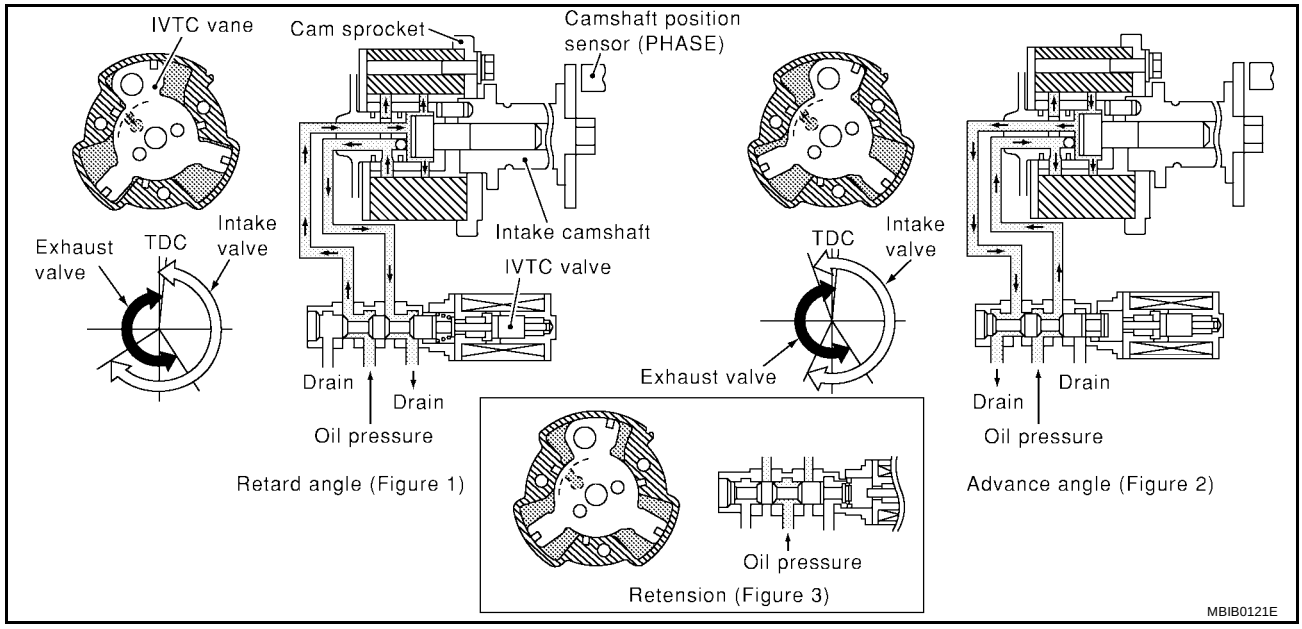
Description

UBS0067U

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

CONSULT-II Reference Value in Data Monitor Mode

UBS0067V

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N (A/T), Neutral (M/T) ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T), Neutral (M/T) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 80%

On Board Diagnosis Logic

UBS0067W

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	● Crankshaft position sensor (POS) ● Camshaft position sensor (PHASE) ● Accumulation of debris to the signal pick-up portion of the camshaft

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

UBS0067X

CAUTION:
Always drive at a safe speed.

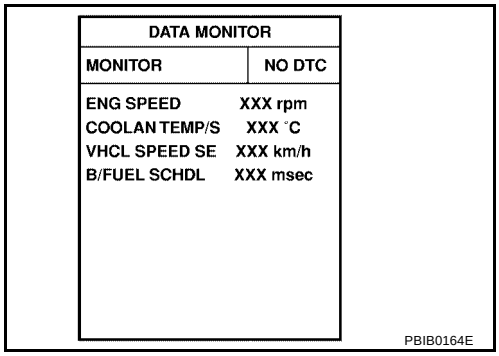
NOTE:

- **If DTC P0011 is displayed with DTC P1111, first perform trouble diagnosis for "DTC P1111". See EC-947, "DTC P1111 IVT CONTROL SOLENOID VALVE" .**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch "ON" and select ″DATA MONITOR″ mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Maintain the following conditions for at least 6 consecutive seconds.
   Hold the accelerator pedal as steady as possible.



VHCL SPEED SE	100 - 120 km/h (63 - 75 MPH)
ENG SPEED	2,000 - 4,000 rpm
COOLAN TEMP/S	60 - 120°C (140 - 248°F)
B/FUEL SCHDL	More than 3.38 msec
Selector lever	A/T models: "D" position M/T models: 5th position

4. Stop vehicle with engine running and let engine idle for 10 seconds.
5. If 1st trip DTC is detected, go to EC-150, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
6. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLANT TEMPS	70 - 105°C (176 - 194°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

7. If 1st trip DTC is detected, go to EC-950, "Diagnostic Procedure" .

WITH GST

Follow the procedure "WITH CONSULT-II" above.

Diagnostic Procedure

UBS0067Y

1. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-841, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace crankshaft position sensor (POS).

2. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-847, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace camshaft position sensor (PHASE).

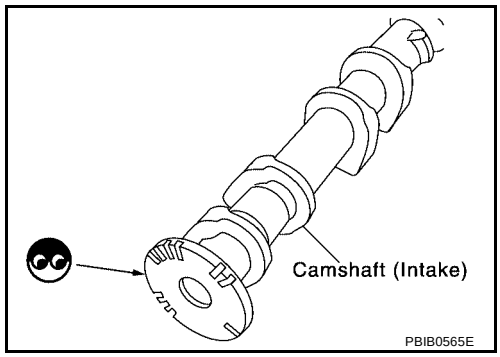
3. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 4.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



4. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For wiring diagram refer to EC-838, "Wiring Diagram" for CKP sensor (POS) and EC-843, "Wiring Diagram" for CMP sensor (PHASE).

>> **INSPECTION END**

DTC P0037, P0038 HO2S2 HEATER

PFP:226A0

Description

UBS0067Z

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
● Below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	ON

CONSULT-II Reference Value in Data Monitor Mode

UBS00680

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH

On Board Diagnosis Logic

UBS00681

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) ● Heater oxygen sensor 2 heater
P0038 0038	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) ● Heater oxygen sensor 2 heater

DTC Confirmation Procedure

UBS00682

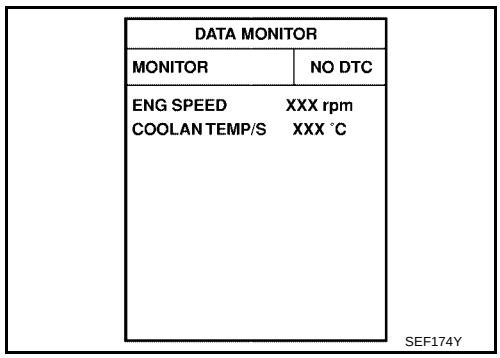
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.

4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minute.
6. If 1st trip DTC is detected, go to EC-737, "Diagnostic Procedure" .



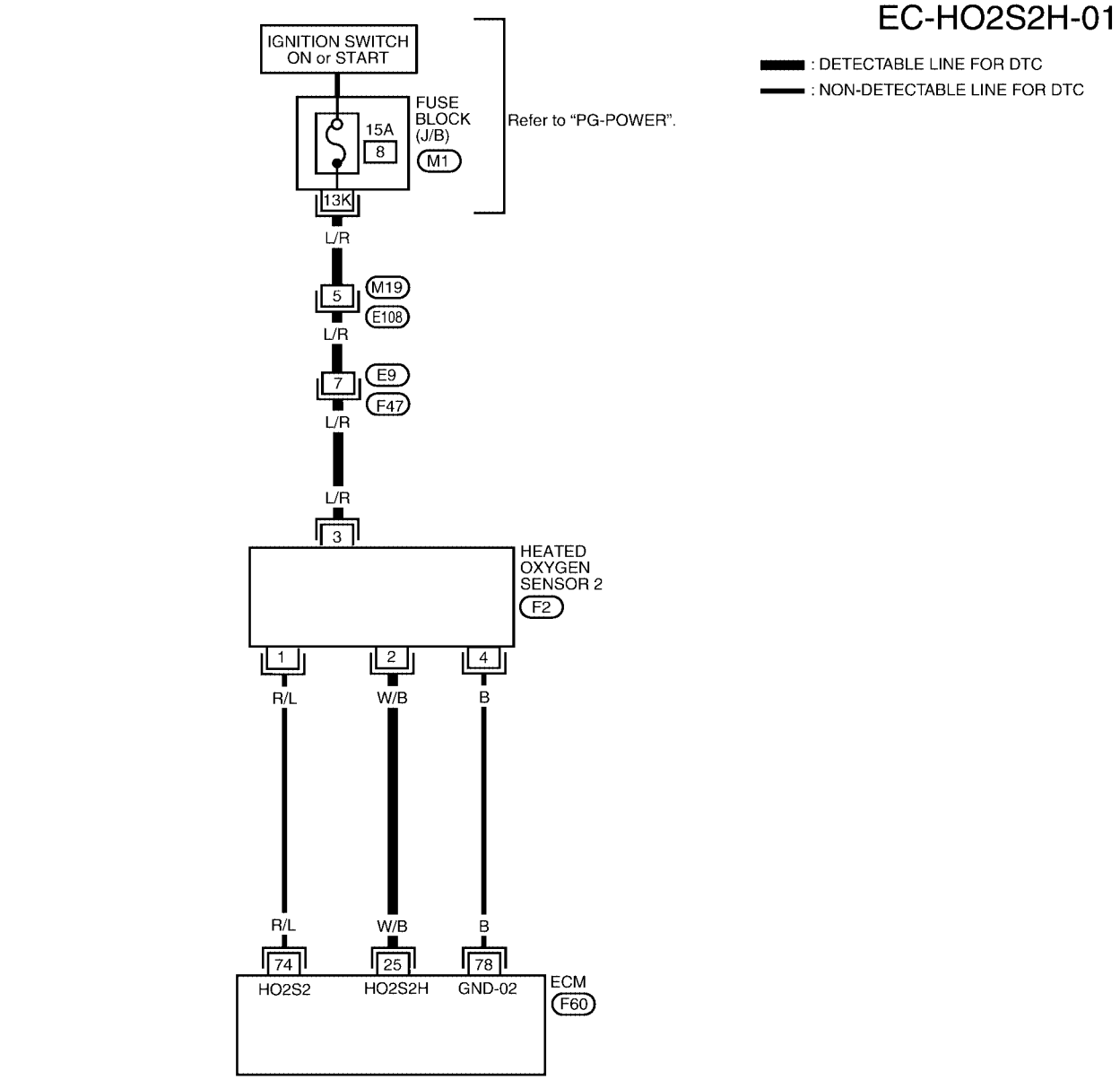
WITH GST

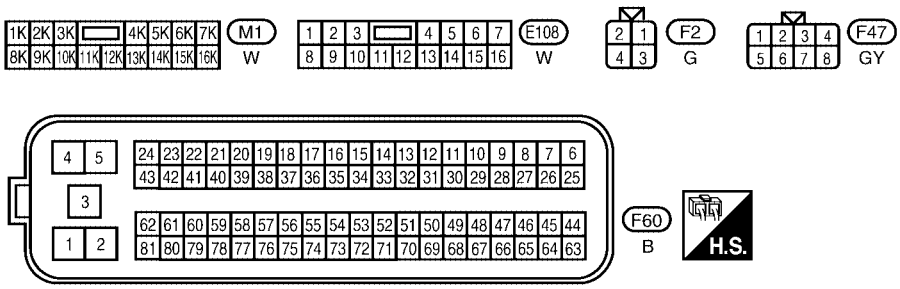
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF”and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Turn ignition switch “OFF”and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for one minute.
8. Select “MODE 3” with GST.
9. If DTC is detected, go to EC-737, "Diagnostic Procedure" .

- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS00683





BBWA0773E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

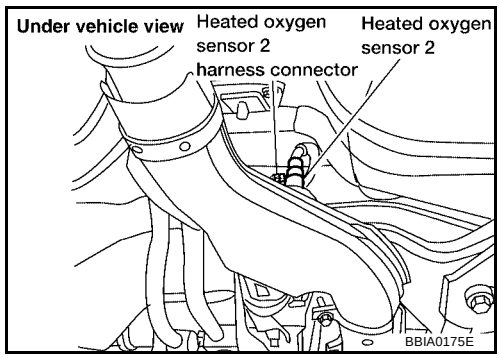
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	W/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed: Below 3,600 rpm after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under on load	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS00684

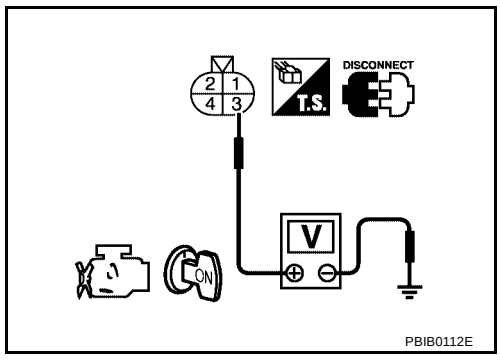
1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch "ON".



4. Check voltage between HO2S2 terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Harness connectors E108, M19
- Fuse block (J/B) connector M1
- 15A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 25 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-739, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS00685

HEATED OXYGEN SENSOR 2 HEATER

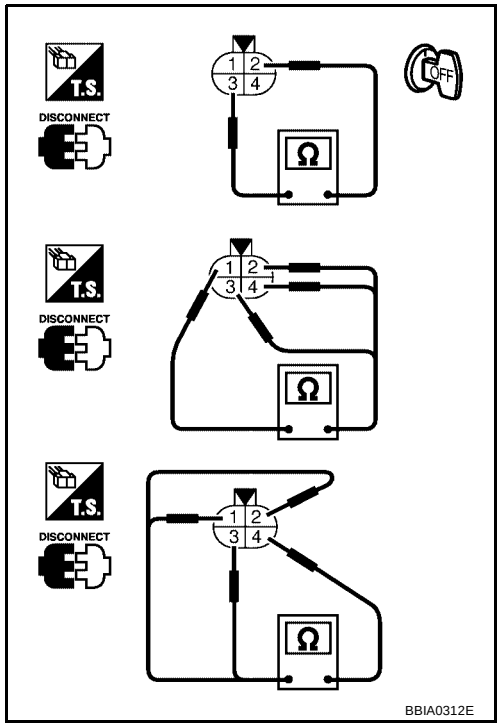
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

2. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

UBS00686

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

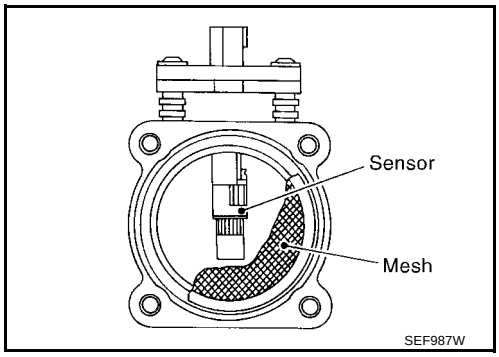
DTC P0101 MAF SENSOR

PFP:22680

Component Description

UBS003M1

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS003M2

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.4V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	12.0 - 30.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.4 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS003M3

This self-diagnosis has the one trip detection logic.

NOTE:
If DTC P0101 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-455, "DTC P1229 SENSOR POWER SUPPLY".

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0101 0101	Mass air flow sensor circuit range/performance problem	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor
		B)	A low voltage from the sensor is sent to ECM under heavy load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor

DTC Confirmation Procedure

UBS003M4

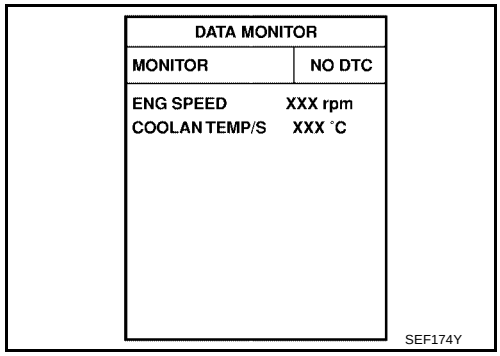
Perform “PROCEDURE FOR MALFUNCTION A” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION “B”.

PROCEDURE FOR MALFUNCTION A

NOTE:
If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch “ON”) instead of running engine at idle speed.

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and warm it up to normal operating temperature.
4. Run engine for at least 10 seconds at idle speed.
5. If DTC is detected, go to EC-744, "Diagnostic Procedure" .



With GST

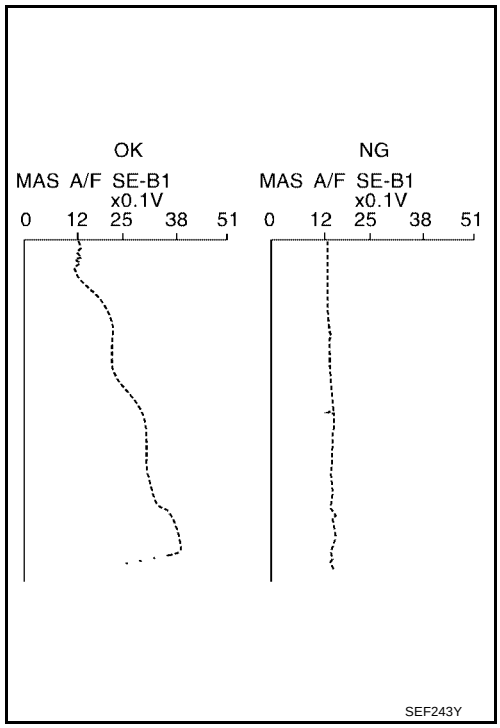
Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

CAUTION:
Always driver vehicle at a safe speed.

With CONSULT-II

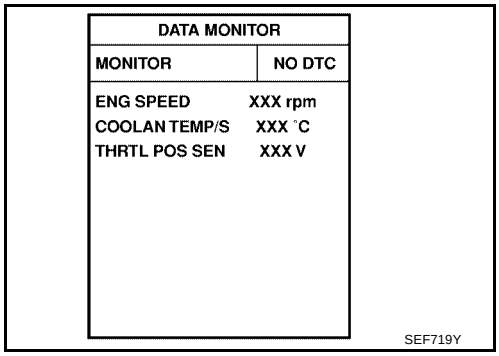
1. Turn ignition switch “ON”.
2. Start engine and warm it up to normal operating temperature.
   If engine cannot be started, go to EC-744, "Diagnostic Procedure" .
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Check the voltage of “MAS A/F SE-B1” with “DATA MONITOR”.
5. Increases engine speed to about 4,000 rpm.
6. Monitor the linear voltage rise in response to engine speed increases.
   If NG, go to EC-744, "Diagnostic Procedure" .
   If OK, go to following step.



7. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
THRTL POS SEN	More than 3.0V
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

8. If DTC is detected, go to EC-744, "Diagnostic Procedure" .



Overall Function Check

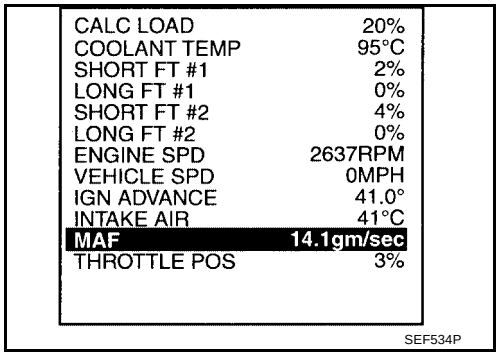
UBS003M5

Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a DTC might not be confirmed.

PROCEDURE FOR MALFUNCTION B

With GST

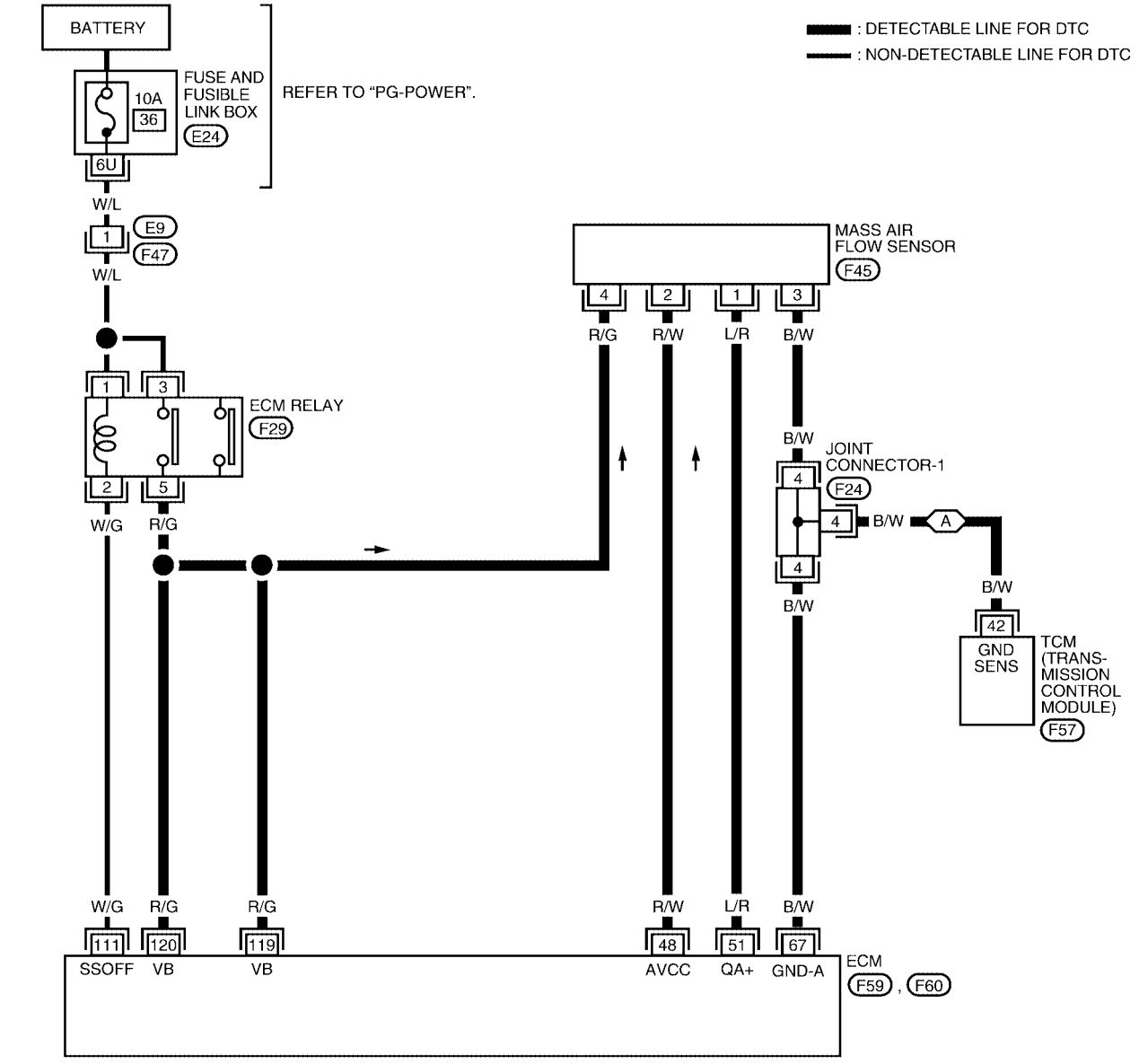
1. Turn ignition switch “ON”.
2. Start engine and warm it up to normal operating temperature.
3. Select “MODE 1” with GST.
4. Check the mass air flow sensor signal with “MODE 1”.
5. Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.
6. If NG, go to EC-744, "Diagnostic Procedure" .

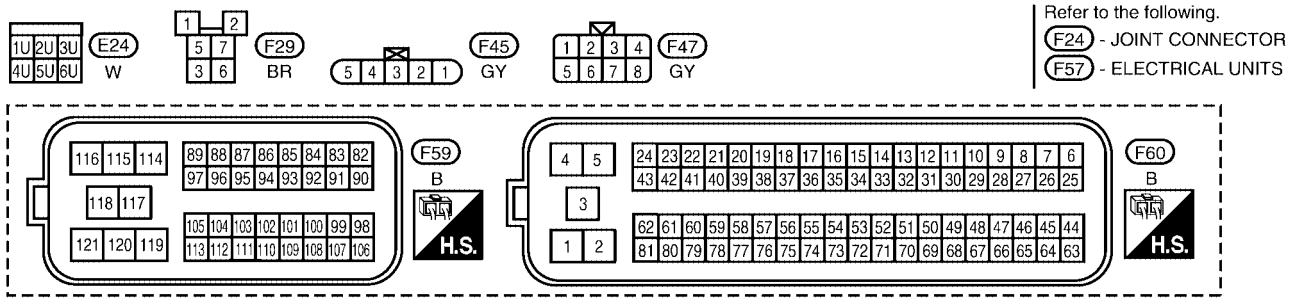


Wiring Diagram

UBS003M6

EC-MAFS-01





BBWA0774E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	R/W	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
51	L/R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B/W	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS003M7

1. INSPECTION START

Which malfunction (A or B) is duplicated?

A or B

A >> GO TO 3.
B >> GO TO 2.

2. CHECK INTAKE SYSTEM

Check the following for connections.

- Air duct
- Vacuum hoses
- Intake air passage between air duct and collector

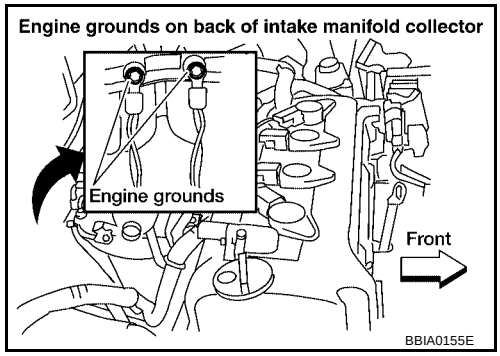
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

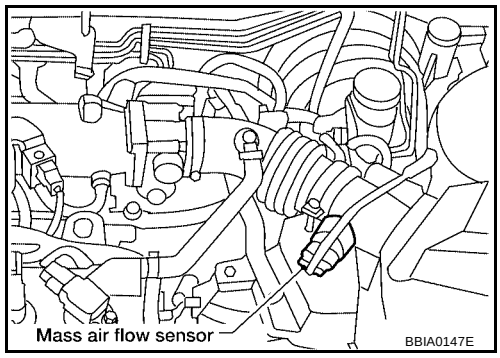
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 4.



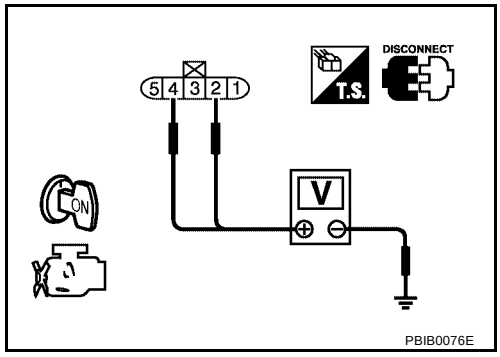
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and TCM

>> Repair harness or connectors.

8. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 51.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short or short to power in harness or connectors.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-747, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

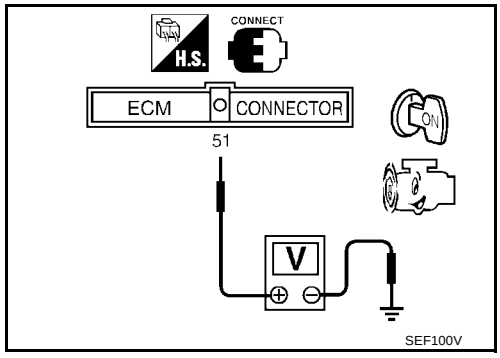
>> **INSPECTION END**

Component Inspection

UBS003M8

MASS AIR FLOW SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.



Conditions	Voltage V
Ignition switch “ON” (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

4. If the voltage is out of specification, proceed the following.
   - Turn ignition switch “OFF”.
   - Disconnect mass air flow sensor harness connector and reconnect it again.
   - Perform step 2 and 3 again.
5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

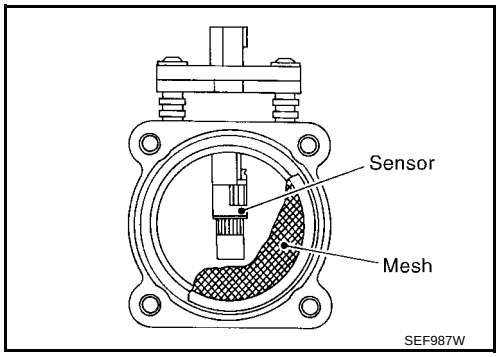
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

UBS003MA

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS003MB

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	12.0 - 30.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.4 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS003MC

These self-diagnoses have the one trip detection logic.

NOTE:
If DTC P0102 or P0103 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-1028.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

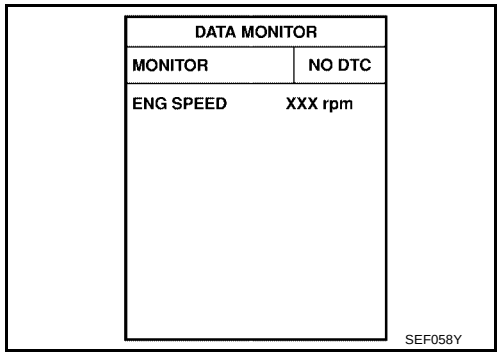
UBS003MD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-758, "Diagnostic Procedure" .



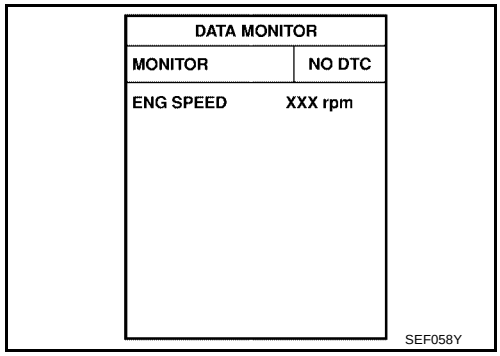
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait 5 seconds at most.
4. If DTC is detected, go to EC-758, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is derected, go to EC-758, "Diagnostic Procedure" .



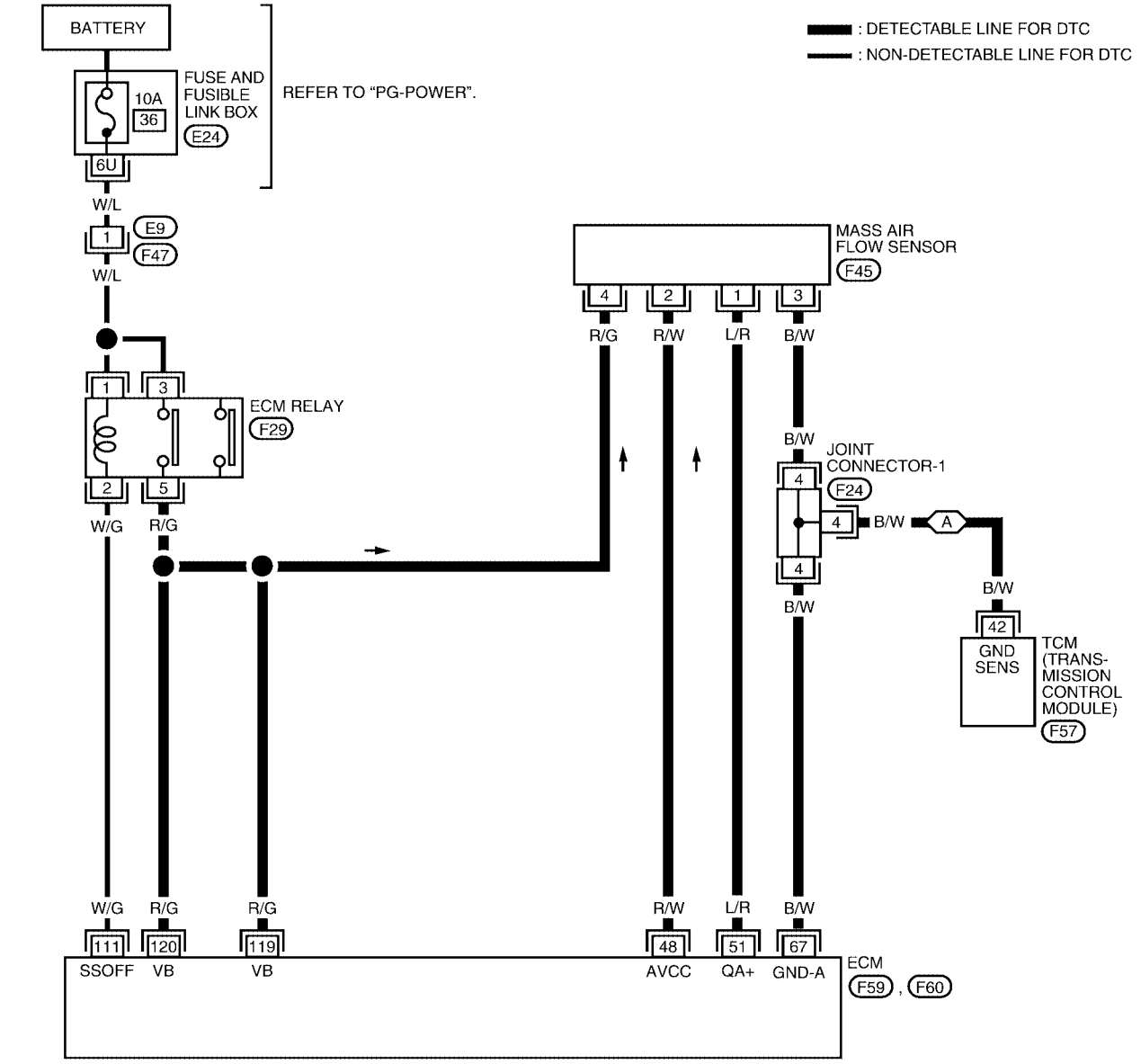
With GST

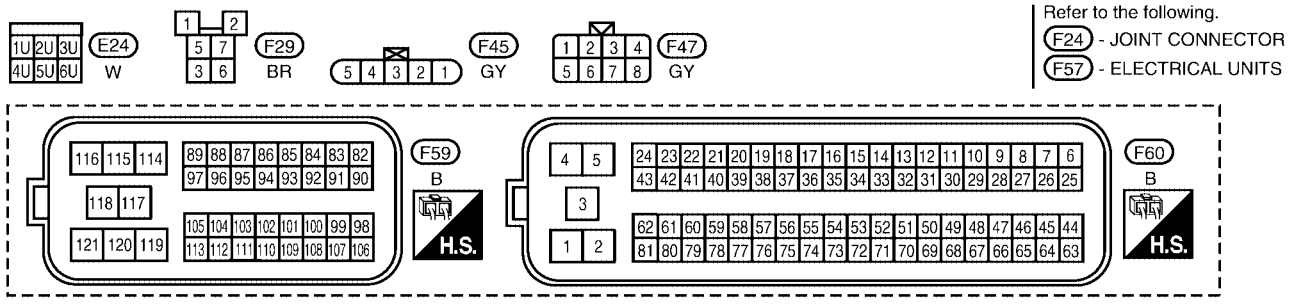
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS003MF

EC-MAFS-01





BBWA0774E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	R/W	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
51	L/R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B/W	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS003MG

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connections.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to manifold

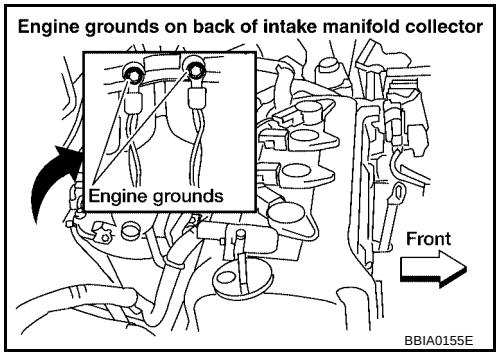
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

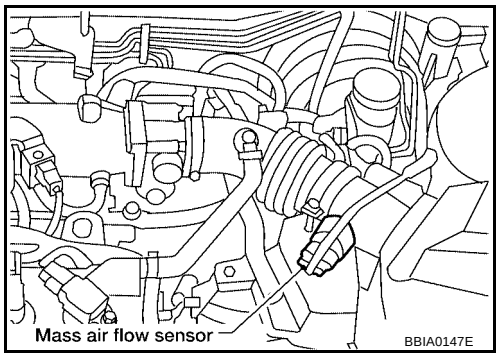
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 4.



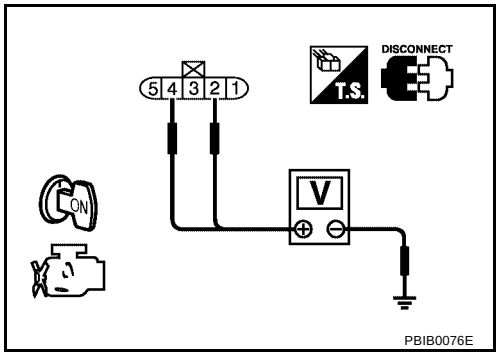
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR POEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 51.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-759, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

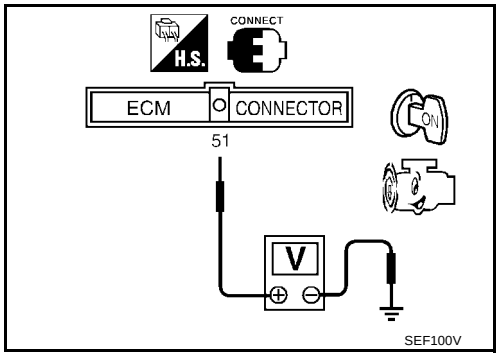
>> **INSPECTION END**

Component Inspection

UBS003MH

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.



Conditions	Voltage V
Ignition switch “ON” (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.4
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

4. If the voltage is out of specification, proceed the following.
   - Turn ignition switch “OFF”.
   - Disconnect mass air flow sensor harness connector and reconnect it again.
   - Perform step 2 and 3 again.
5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

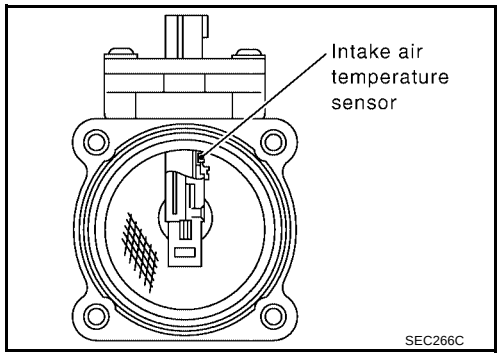
DTC P0112, P0113 IAT SENSOR

PFP:22630

Component Description

UBS003MJ

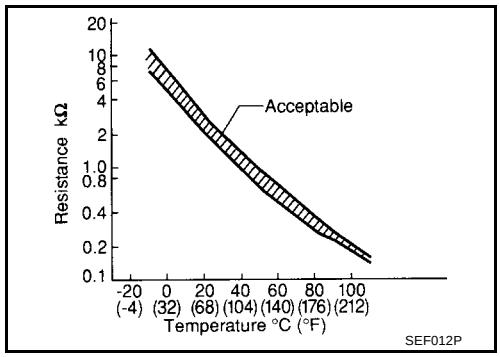
The intake air temperature sensor is built-into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS003MK

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

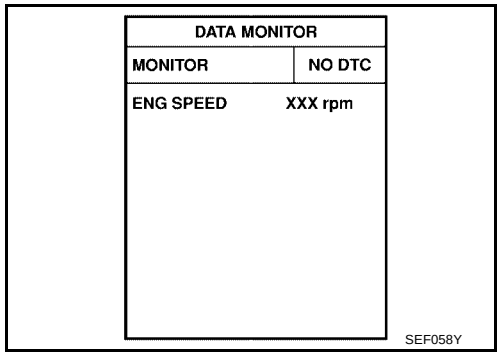
DTC Confirmation Procedure

UBS003ML

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-758, "Diagnostic Procedure"
.



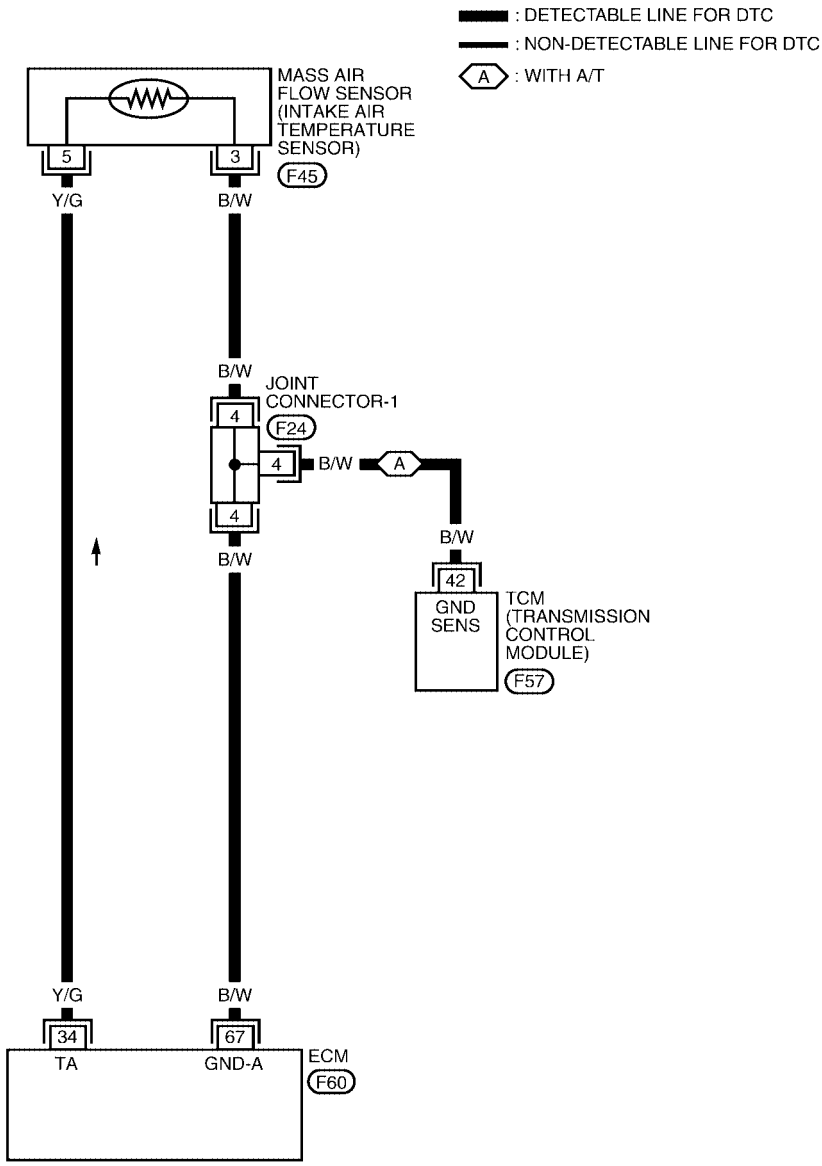
WITH GST

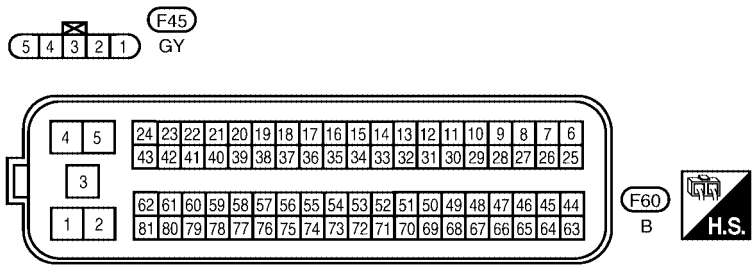
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS003MM

EC-IATS-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

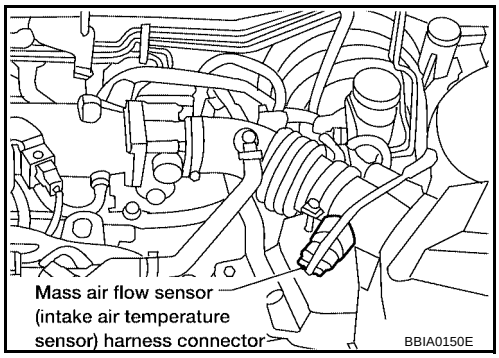
BBWA0775E

Diagnostic Procedure

UBS003MN

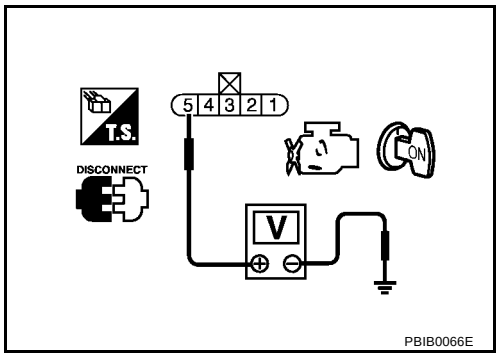
1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between MAF sensor terminal 5 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between terminal 3 and engine ground. Refer to wiring diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between TCM and intake air temperature sensor
- Harness for open or short between ECM and intake air temperature sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-759, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace intake air temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

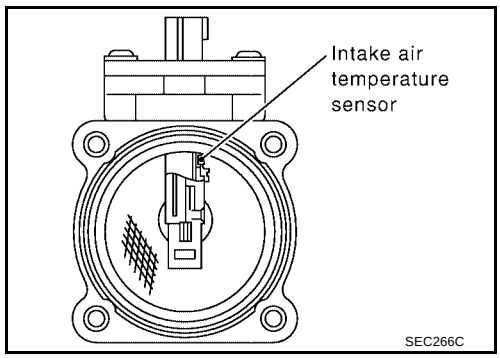
UBS003MO

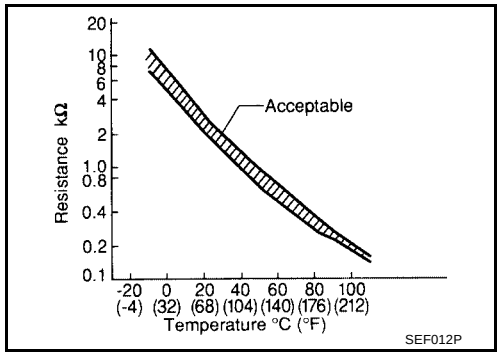
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





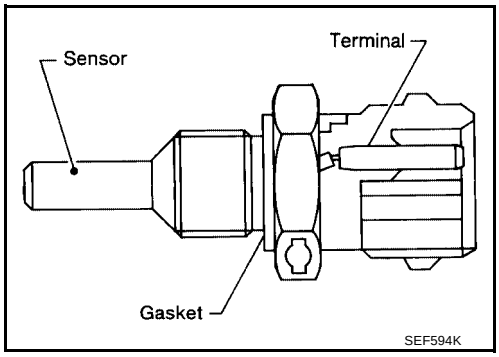
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

UBS001T1

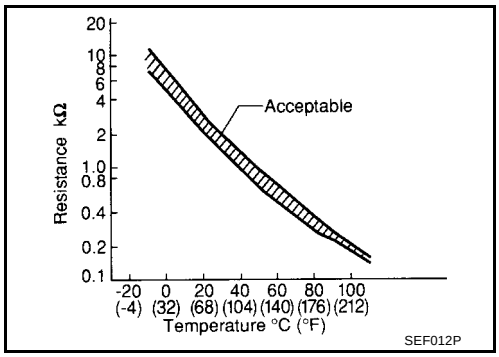
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use ground other than ECM, such as body ground.

On Board Diagnosis Logic

UBS001T3

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while the engine is running.	

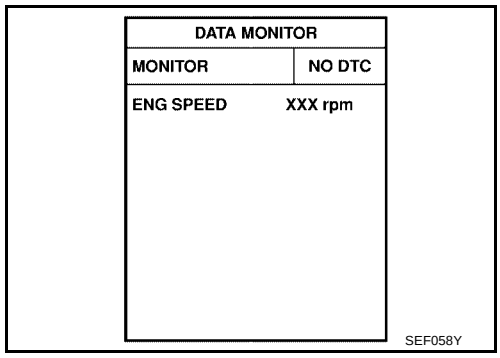
DTC Confirmation Procedure

UBS001T4

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-763, "Diagnostic Procedure" .



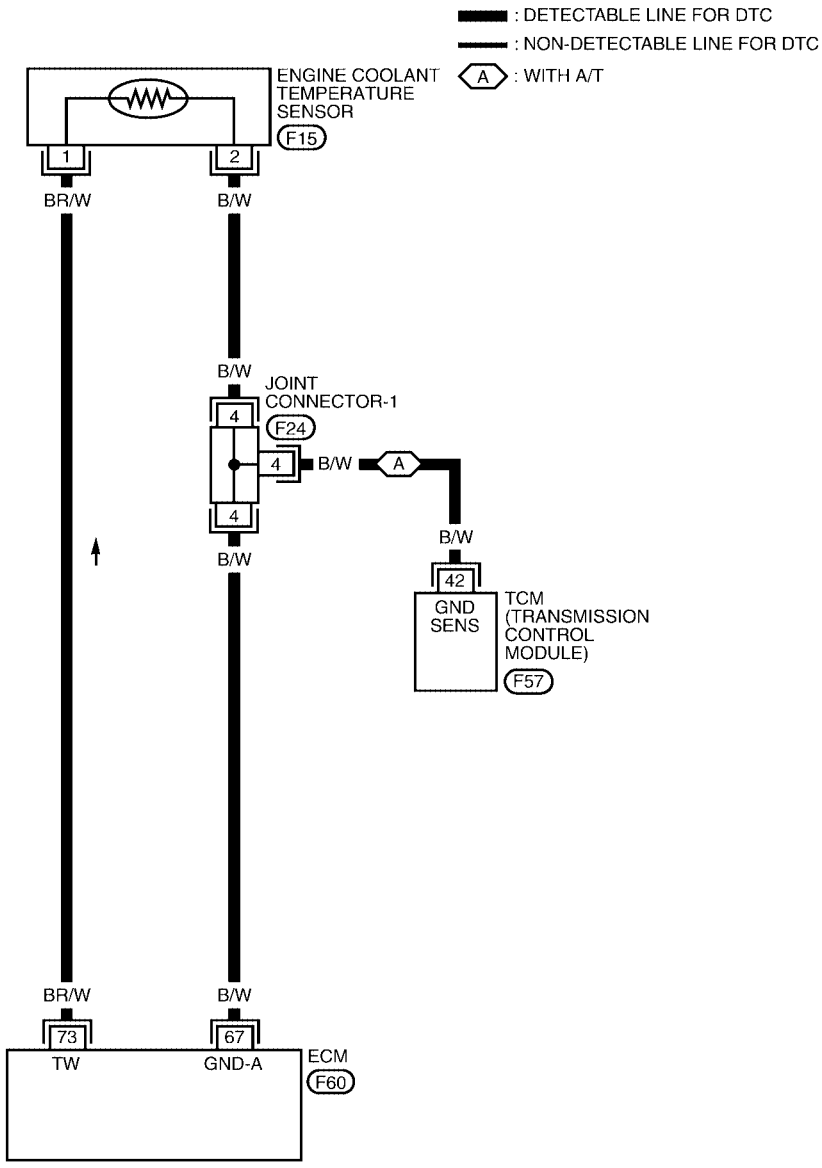
WITH GST

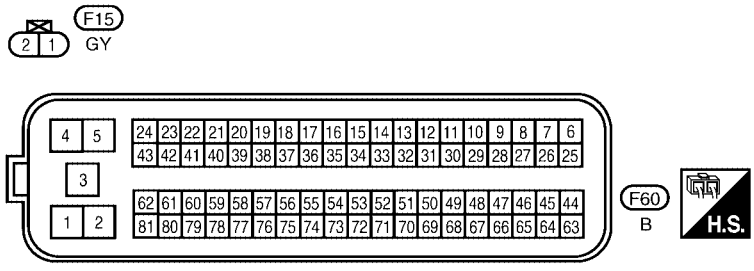
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS001T5

EC-ECTS-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

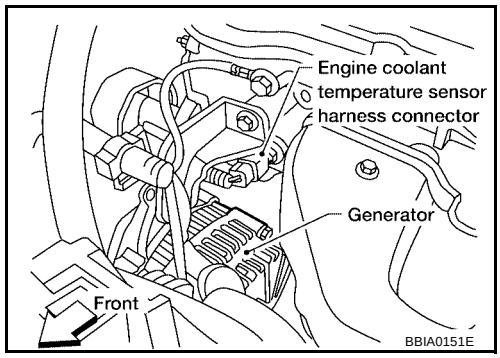
BBWA0776E

Diagnostic Procedure

UBS001T6

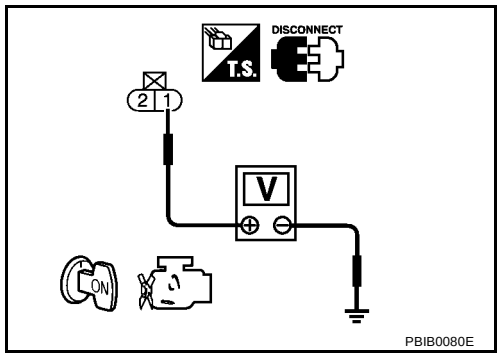
1. CHECK ETC SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair or replace harness or connectors.

2. CHECK ETC SENSOR GROUND CIRCUIT FOR OPEN AND SHORRT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT terminal 2 and engine ground. Refer to wiring diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between TCM and engine coolant temperature sensor
- Harness for open or short between ECM and engine coolant temperature sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-764, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

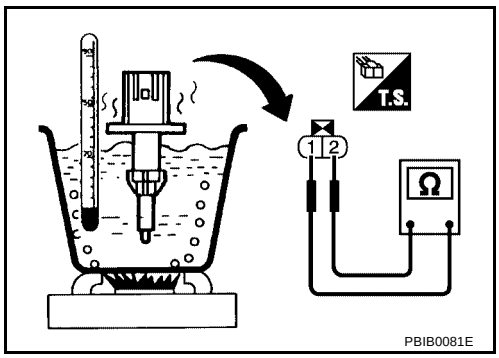
>> **INSPECTION END**

Component Inspection

UBS001T7

ENGINE COOLANT TEMPERATURE SENSOR

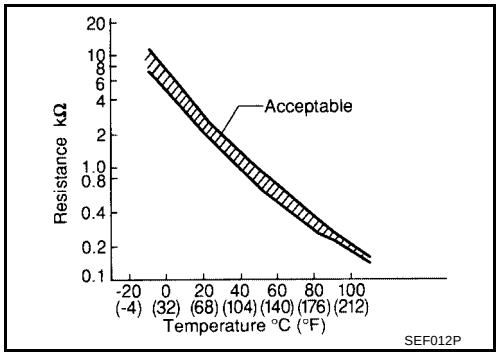
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS001T8

ENGINE COOLANT TEMPERATURE SENSOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

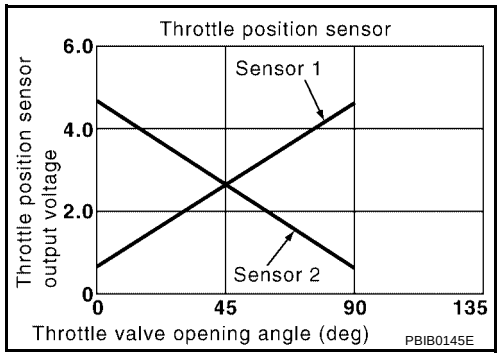
DTC P0122, P0123 TP SENSOR

PFP:16119

Component Description

UBS00687

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS00688

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever D: (A/T model) 1st: (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS00689

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122 0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 2) ● Accelerator pedal position sensor (APP sensor)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

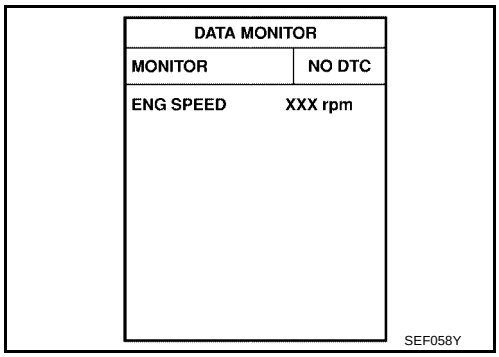
DTC Confirmation Procedure

UBS0068A

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go toEC-768, "Diagnostic Procedure" .

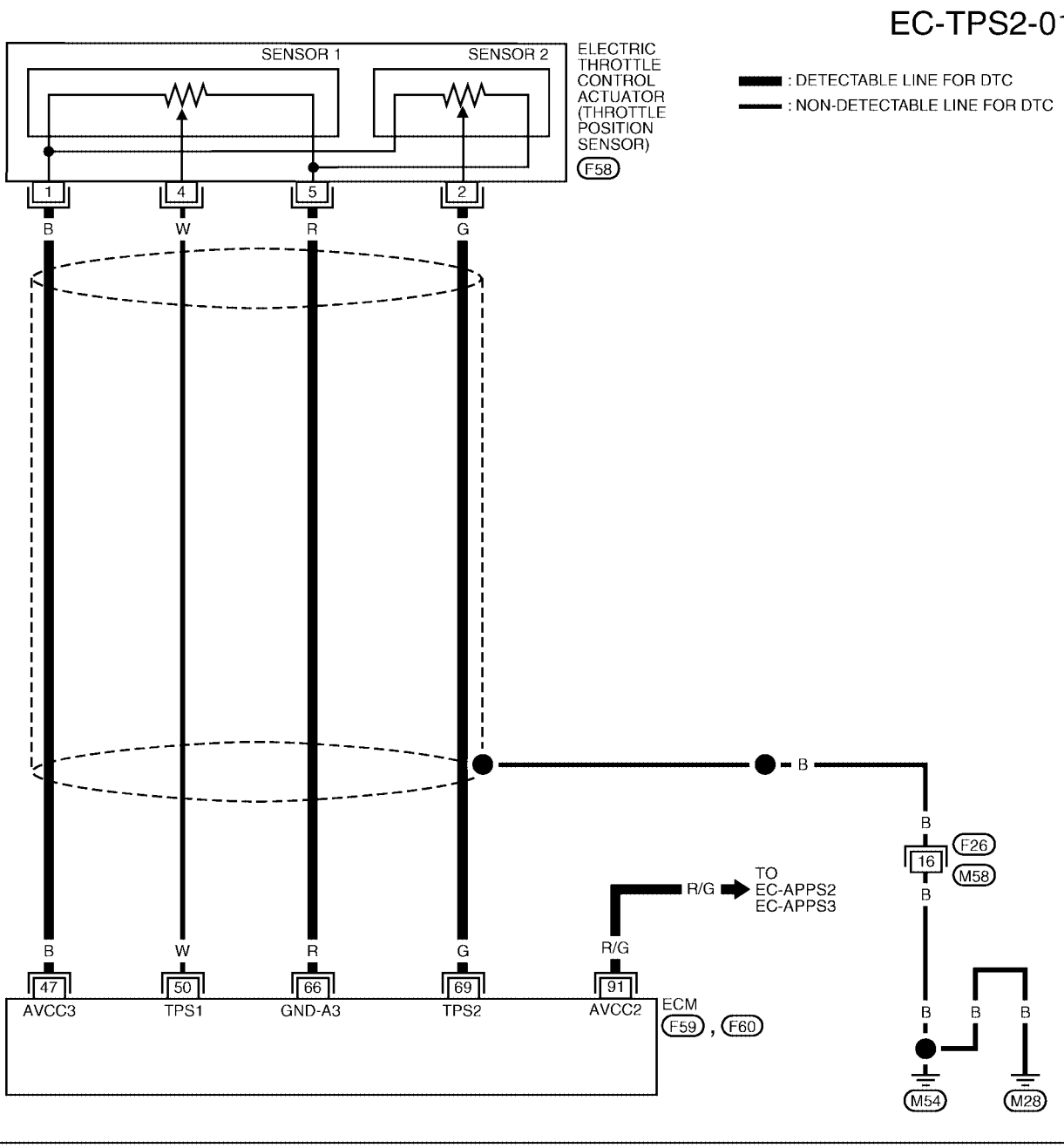


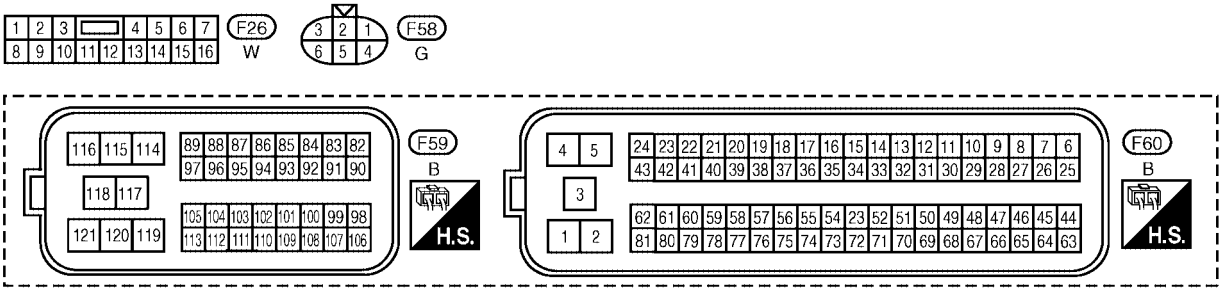
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0068B





BBWA1380E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	R	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 0.36V
91	R/G	Sensors power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V

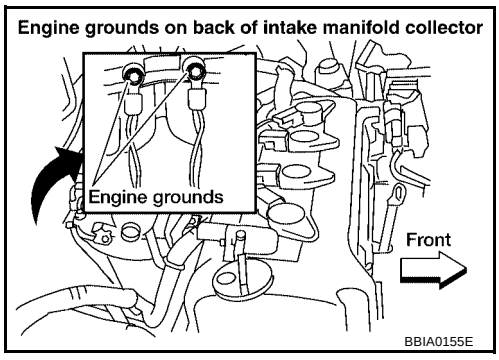
Diagnostic Procedure

UBS0068C

1. RETIGHTEN GROUND SCREWS

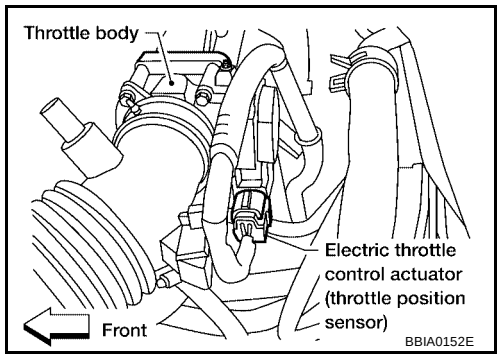
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

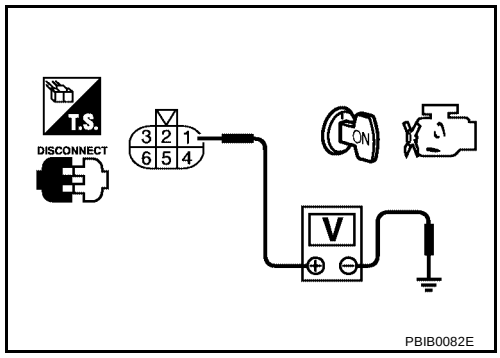


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 7.
NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace open circuit.

4. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-767
91	APP sensor terminal 1	EC-1134

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-1132, "DTC P2127, P2128 APP SENSOR" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .
3. Perform EC-634, "Throttle Valve Closed Position Learning" .
4. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to EC-771, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

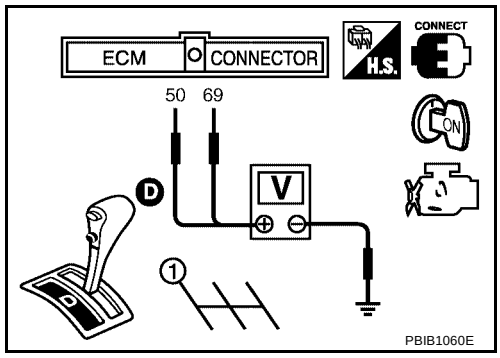
>> **INSPECTION END**

Component Inspection

UBS0068D

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 50 (TP sensor 1 signal), 69 (TP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-634, "Throttle Valve Closed Position Learning" .
8. Perform EC-635, "Idle Air Volume Learning" .

Remove and Installation

UBS0068E

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

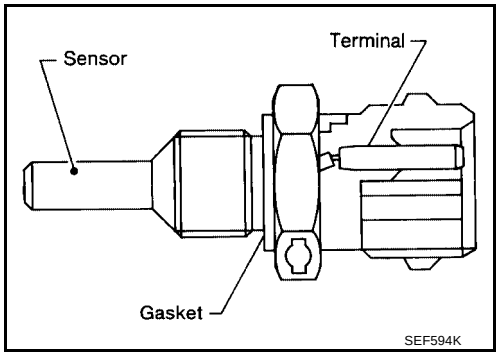
DTC P0125 ECT SENSOR

PFP:22630

Component Description

UBS001TH

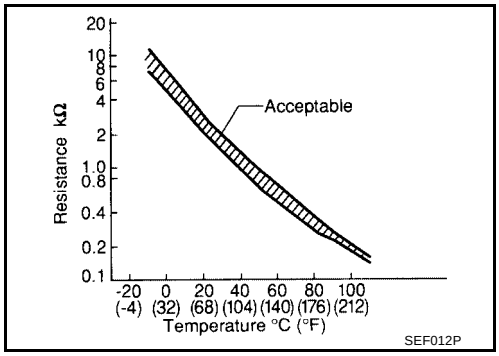
NOTE:
If DTC P0125 is displayed with P0117, P0118, first perform trouble diagnosis for DTC P0117, P0118, EC-760 .
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use ground other than ECM, such as body ground.

On Board Diagnosis Logic

UBS001TJ

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	Insufficient engine coolant temperature for closed loop fuel control	● Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. ● Engine coolant temperature is insufficient for closed loop fuel control.	● Harness or connectors (High resistance in the circuit) ● Engine coolant temperature sensor ● Thermostat

DTC Confirmation Procedure

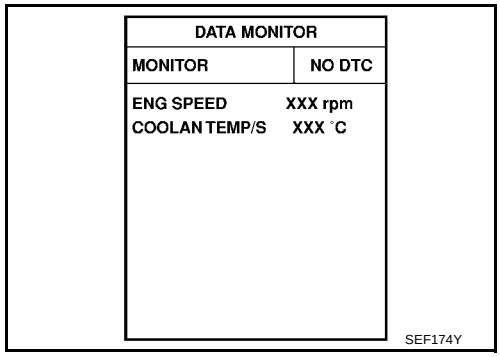
UBS001TK

CAUTION:
Be careful not to overheat engine.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Check that “COOLAN TEMP/S” is above 15°C (59°F).
   If it is above 15°C (59°F), the test result will be OK. If it is below 15°C (59°F), go to following step.
4. Start engine and run it for 65 minutes at idle speed.
   If “COOLAN TEMP/S” increases to more than 15°C (59°F) within 65 minutes, stop engine because the test result will be OK.
5. If DTC is detected, go to EC-773, "Diagnostic Procedure" .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS001TM

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-773, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace engine coolant temperature sensor.

2. CHECK THERMOSTAT OPERATION

When the engine is cooled [lower than 75°C (167°F)], grasp lower radiator hose and confirm the engine coolant does not flow.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace thermostat. Refer to CO-11, "THERMOSTAT AND THERMOSTAT HOUSING" .

3. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

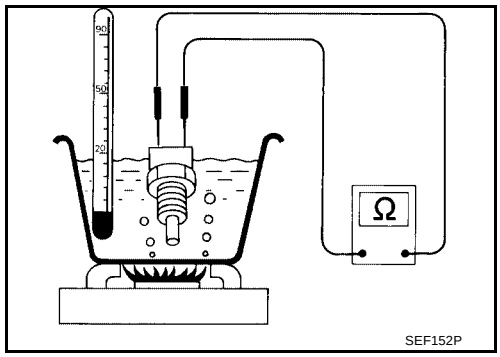
>> **INSPECTION END**

Component Inspection

UBS001TN

ENGINE COOLANT TEMPERATURE SENSOR

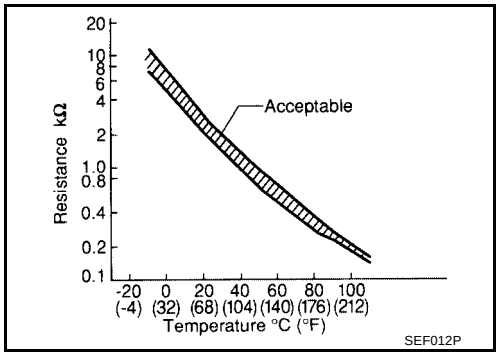
Check resistance as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
90 (194)	0.236 - 0.260

If NG, replace engine coolant temperature sensor.



Removal and Installation

UBS001TO

ENGINE COOLANT TEMPERATURE SENSOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

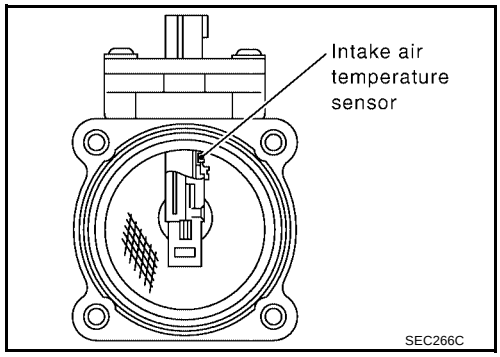
DTC P0127 IAT SENSOR

PFP:22630

Component Description

UBS003N6

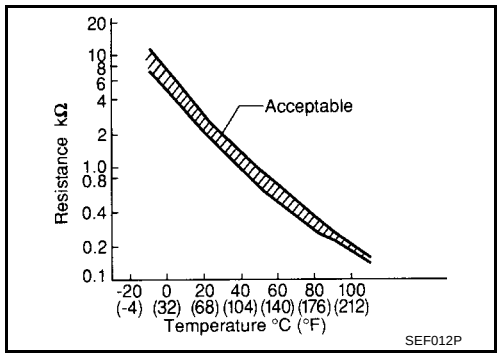
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS003N7

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127 0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Intake air temperature sensor

DTC Confirmation Procedure

UBS003N8

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

CAUTION:
Always drive vehicle at a safe speed.
TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Wait until engine coolant temperature is less than 90°C (194°F)

a. Turn ignition switch “ON”.

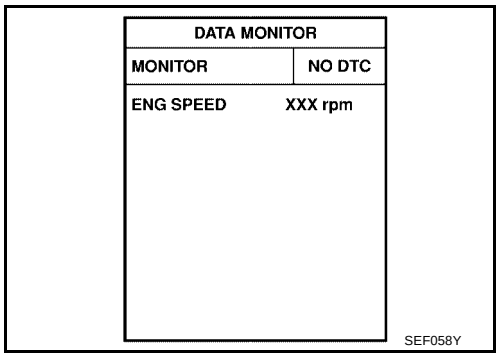
b. Select “DATA MONITOR” mode with CONSULT-II.

c. Check the engine coolant temperature.

d. If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch “OFF” and cool down engine.

- Perform the following steps before engine coolant temperature is above 90°C (194°F).

2. Turn ignition switch “ON”.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6. If 1st trip DTC is detected, go to EC-776, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS003NA

1. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-777, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace intake air temperature sensor.

2. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

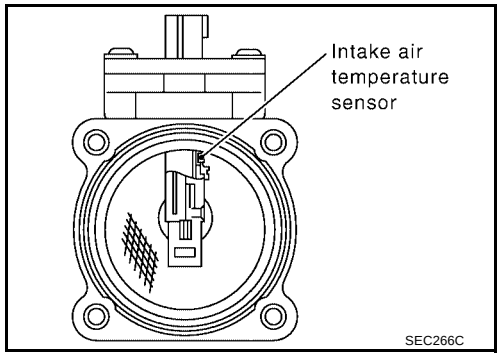
>> **INSPECTION END**

Component Inspection

UBS003NB

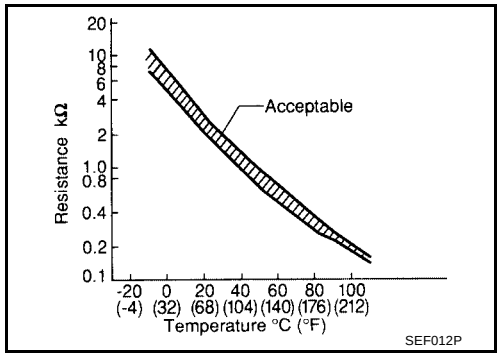
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.



Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).



DTC P0128 THERMOSTAT FUNCTION

PFP:21200

On Board Diagnosis Logic

UBS001TP

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.
This is due to a leak in the seal or the thermostat stuck open.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128 0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	● Thermostat ● Leakage from sealing portion of thermostat ● Engine coolant temperature sensor

DTC Confirmation Procedure

UBS001TR

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:

- **For best results, perform at ambient temperature of –10°C (14°F) or higher.**
- **For best results, perform at engine coolant temperature of –10°C (14°F) to 68°C (154°F).**

WITH CONSULT-II

1. Replace thermostat with new one. Refer to CO-11, "THERMOSTAT AND THERMOSTAT HOUSING" . Use only a genuine NISSAN thermostat as a replacement. If an incorrect thermostat is used, the MIL may come on.
2. Turn ignition switch “ON”.
3. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
4. Check that the “COOLAN TEMP/S” is above 68°C (154°F).
   If it is below 68°C (154°F), go to following step.
   If it is above 68°C (154°F), stop engine and cool down the engine to less than 60°C (140°F), then retry from step 1.
5. Drive vehicle for 10 consecutive minutes under the following conditions.

VHCL SPEED SE	80 - 120 km/h (50 - 75 MPH)

If 1st trip DTC is detected, go to EC-778, "Diagnostic Procedure" .

WITH GST

1. Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS001TS

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-779, "Component Inspection" .

OK or NG

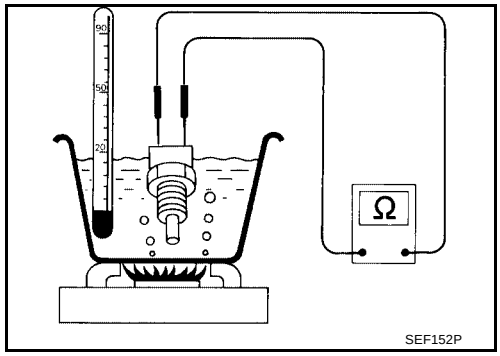
OK >> **INSPECTION END**
NG >> Replace engine coolant temperature sensor.

Component Inspection

UBS006I1

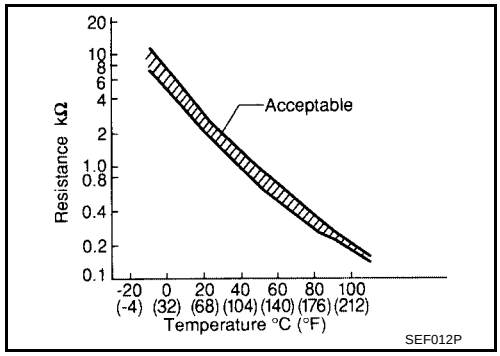
ENGINE COOLANT TEMPERATURE SENSOR

Check resistance as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
90 (194)	0.236 - 0.260



If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS001TT

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-11, "THERMOSTAT AND THERMOSTAT HOUSING" .

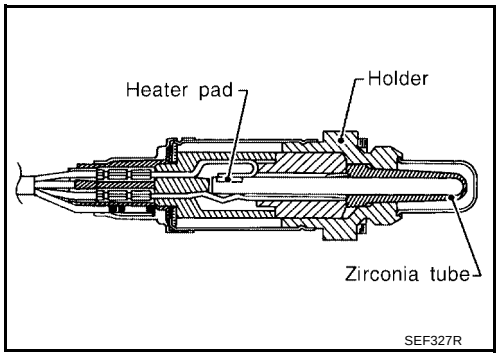
DTC P0138 HO2S2

PFP:226A0

Component Description

UBS0068F

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS0068G

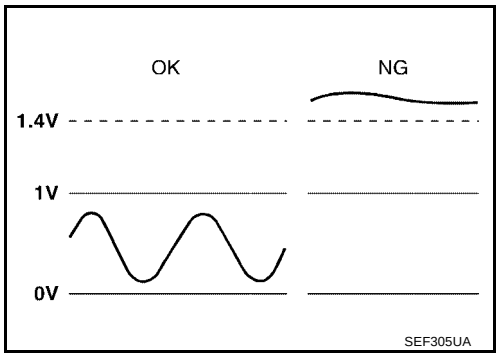
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH

On Board Diagnosis Logic

UBS0068H

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor 2, ECM monitors whether the or not the voltage is too high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138 (Bank 1)	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2

DTC Confirmation Procedure

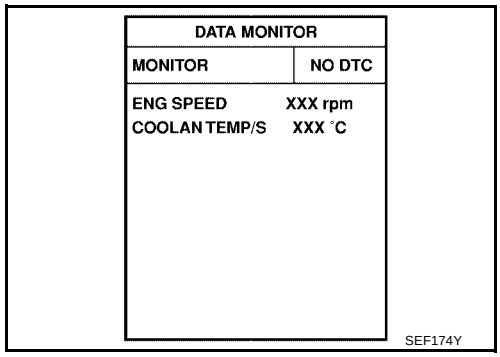
UBS0068I

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for two minutes.
6. If 1st trip DTC is detected, go to EC-783, "Diagnostic Procedure" .



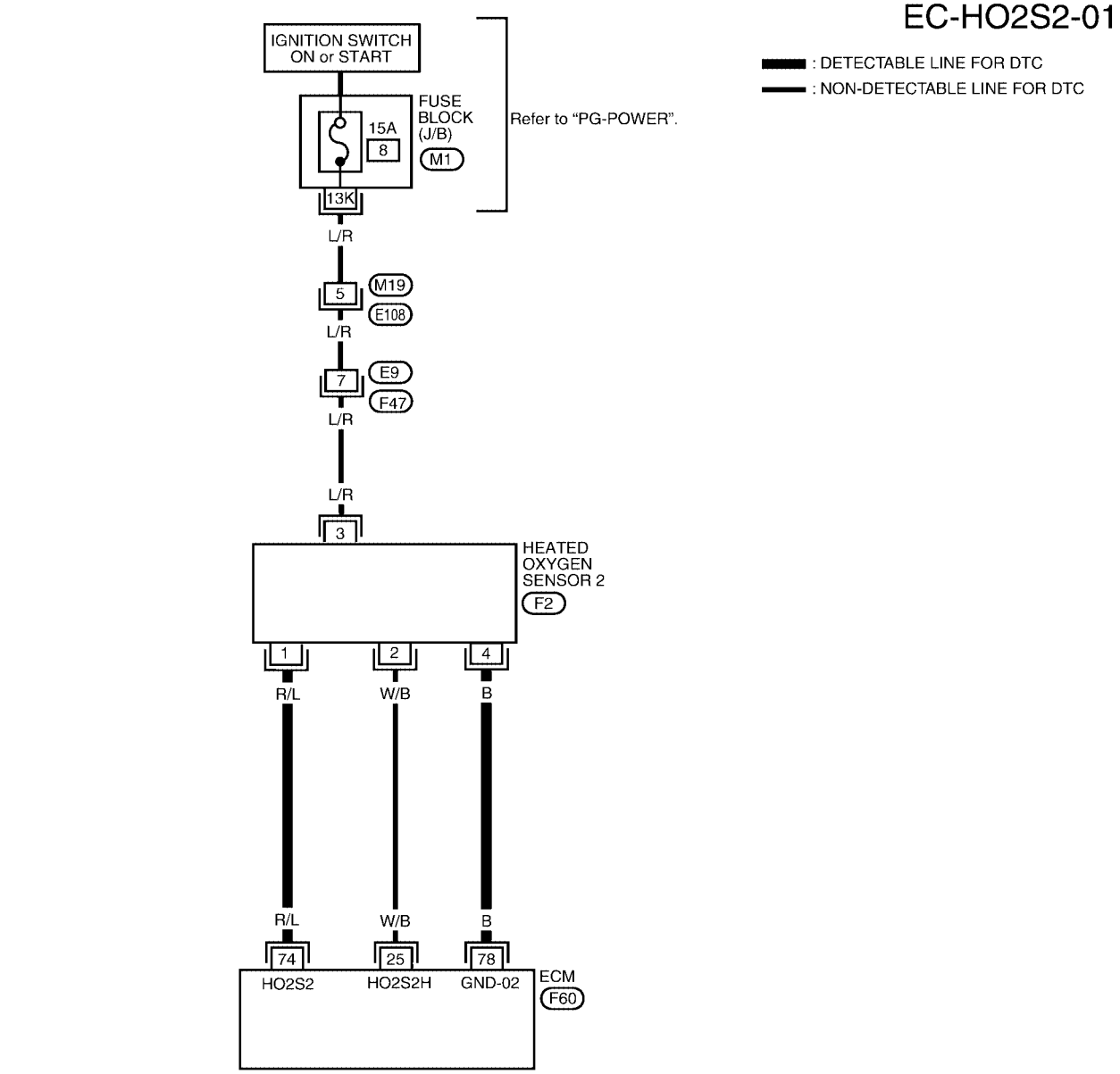
WITH GST

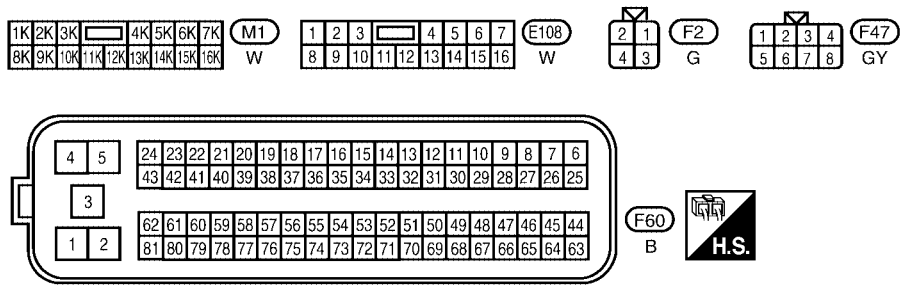
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for two minutes.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for two minutes.
8. Select “Mode 3” with GST.
9. If NG, go to EC-783, "Diagnostic Procedure" .

- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS0068J





BBWA0779E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
78	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

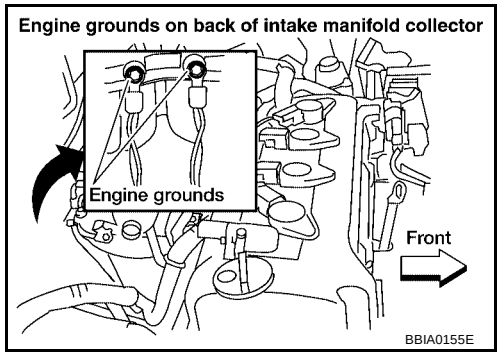
Diagnostic Procedure

UBS0068K

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

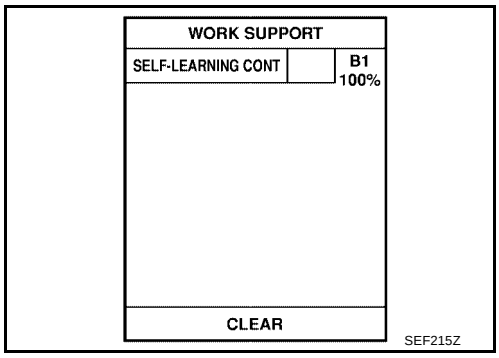
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

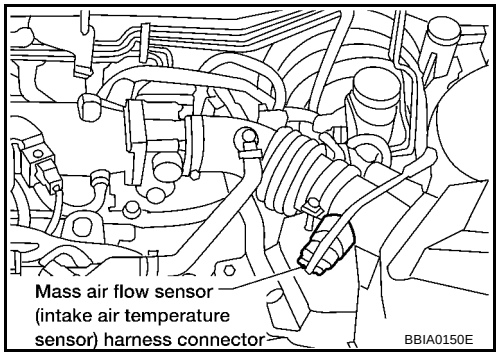
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-802 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

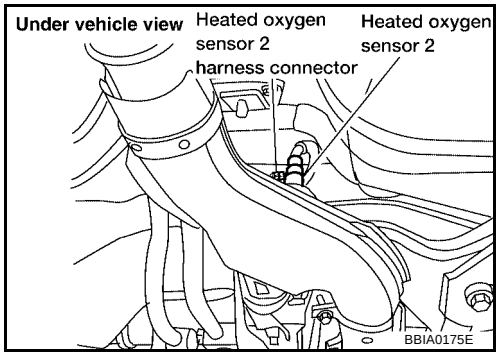
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 74 and HO2S2 terminal 1. Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 74 or HO2S2 terminal 1 and ground. Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-785, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

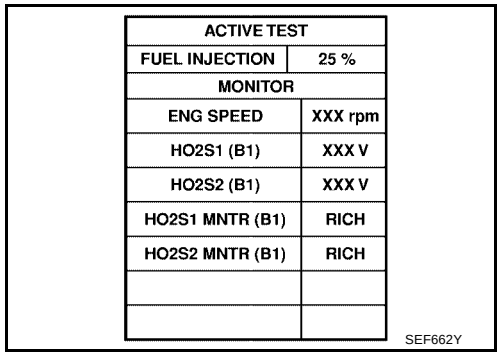
Component Inspection

UBS0068L

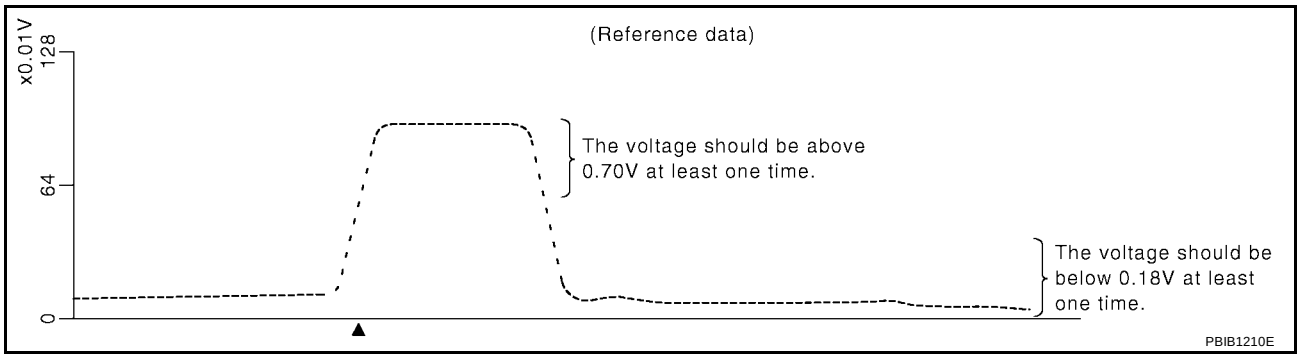
HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



6. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



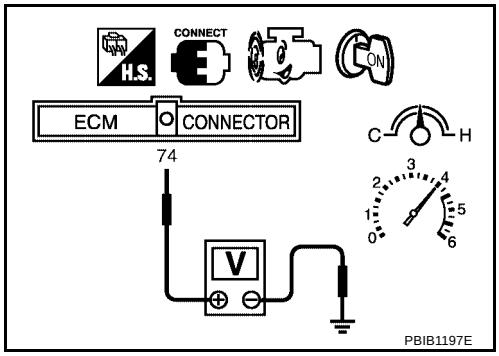
“HO2S2 (B1)” should be above 0.70V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.18V at least once when the “FUEL INJECTION” is –25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed at between 3,500 to 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.70V at least once during this procedure.
   If the voltage is above 0.70V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T) “3rd” gear position (M/T).
   The voltage should be below 0.18V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS0068M

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

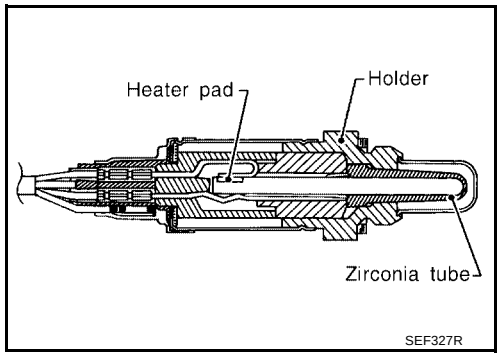
DTC P0139 HO2S2

PFP:226A0

Component Description

UBS0068N

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS0068O

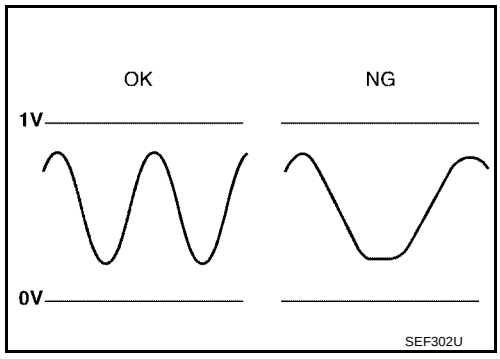
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH

On Board Diagnosis Logic

UBS0068P

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

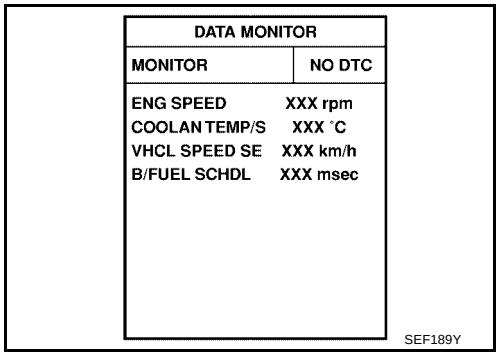
UBS0068Q

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

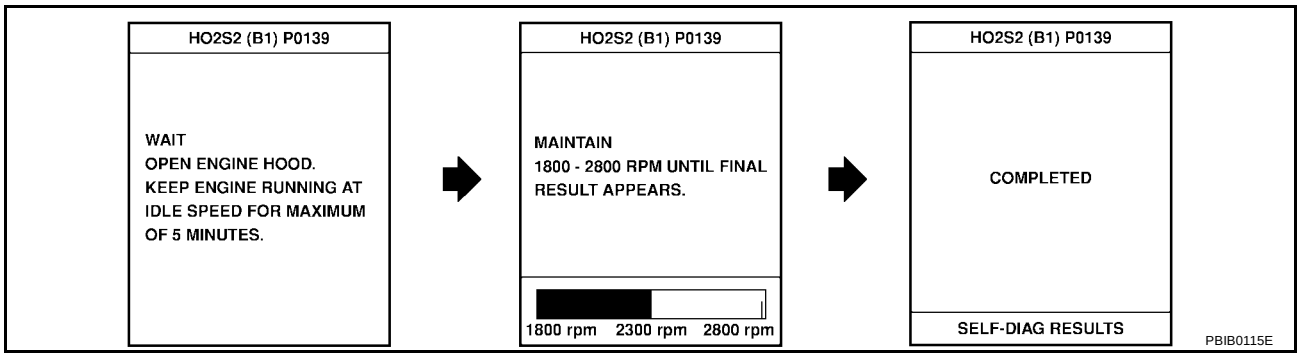
WITH CONSULT-II

For the best results, perform ″DTC WORK SUPPORT″ at a temperature of 0 to 30°C (32 to 86°F)

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.



5. Select “HO2S2 (B1) P0139” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-791 .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 3.

Overall Function Check

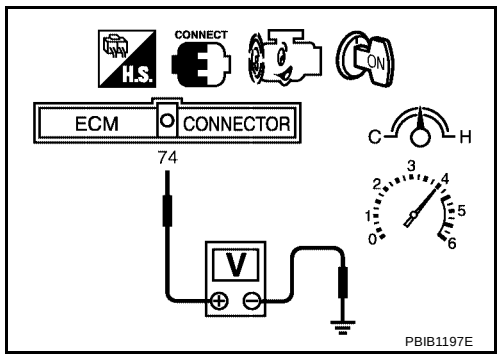
UBS0068R

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

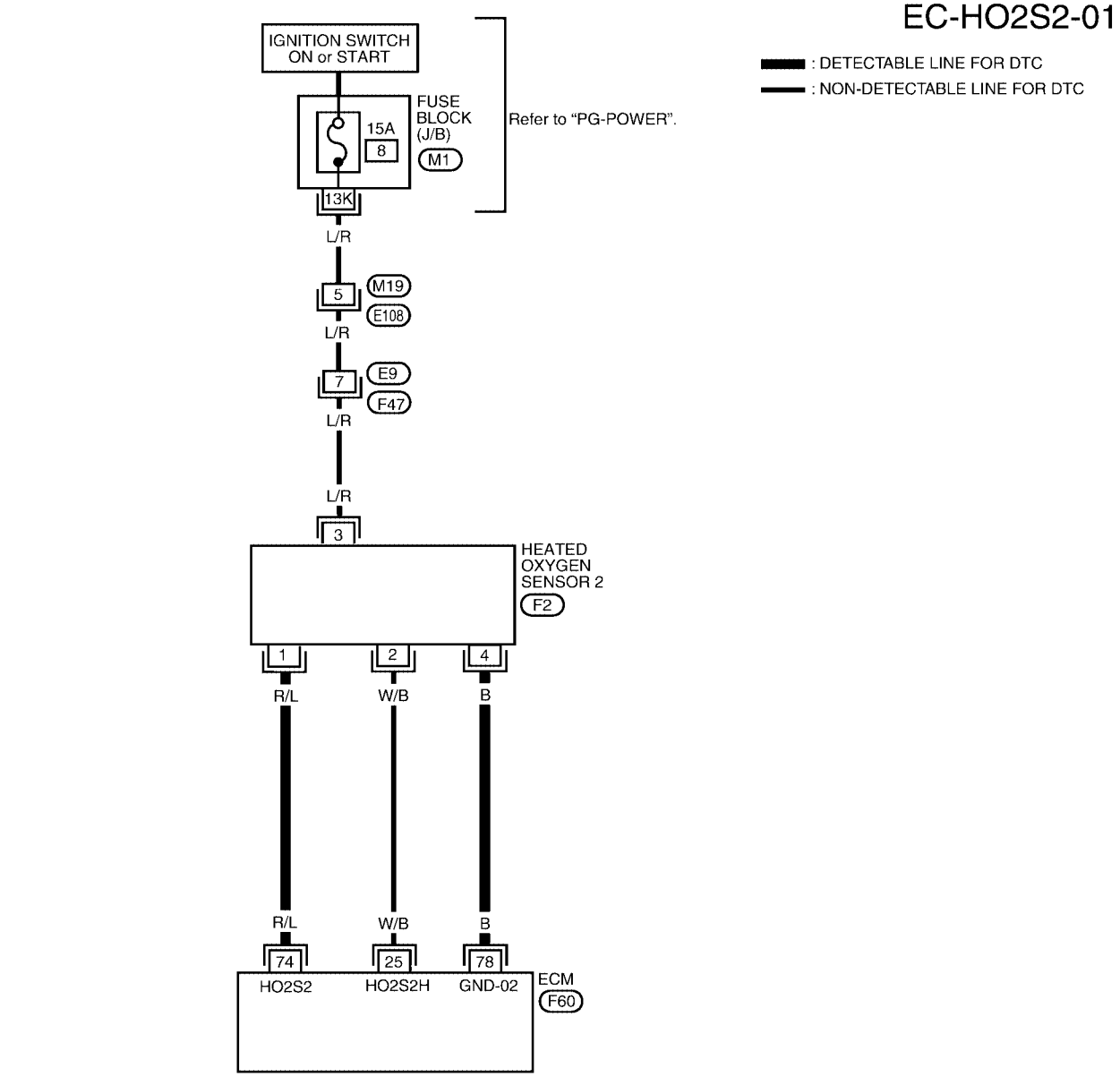
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.

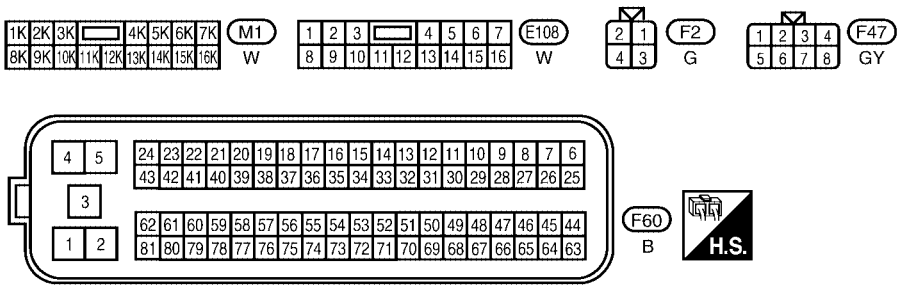
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   A change of voltage should be more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T) “3rd” gear position (M/T).
   A change of voltage should be more than 0.06V for 1 second during this procedure.
8. If NG, go to EC-791, "Diagnostic Procedure" .



Wiring Diagram

UBS0068S





BBWA0779E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
78	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

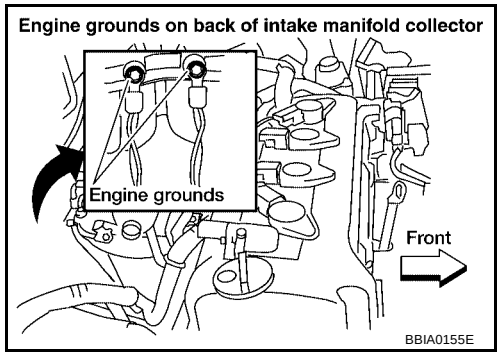
Diagnostic Procedure

UBS0068T

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

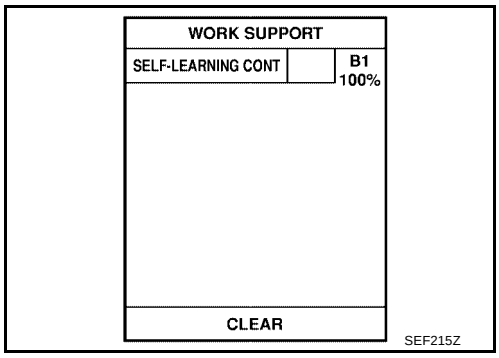
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

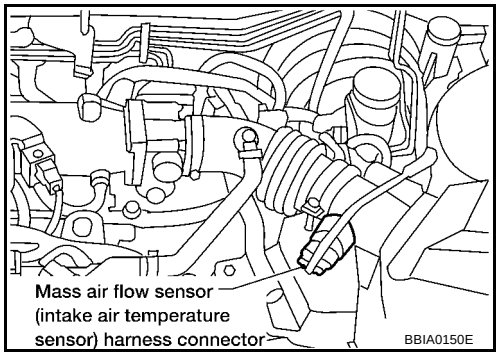
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-795 or EC-802 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

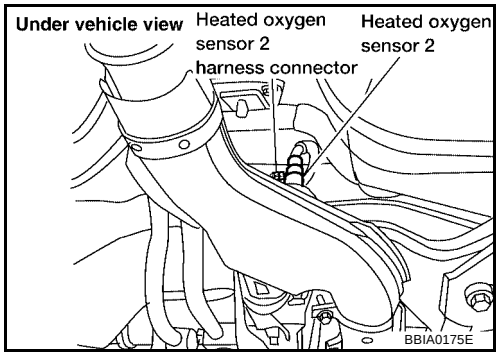
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 74 and HO2S2 terminal 1. Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 74 or HO2S2 terminal 1 and ground. Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-793, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

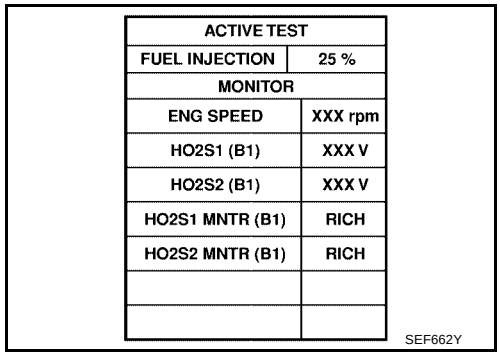
Component Inspection

UBS0068U

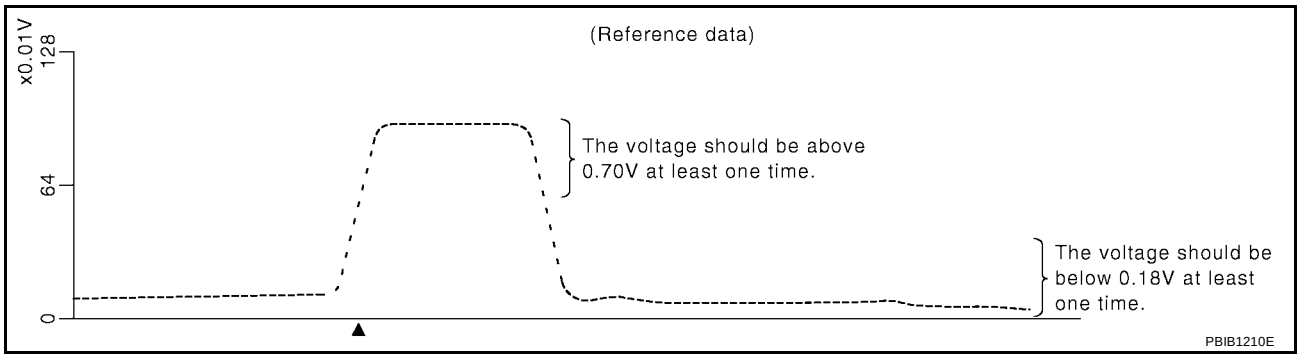
HEATED OXYGEN SENSOR 2

With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



6. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



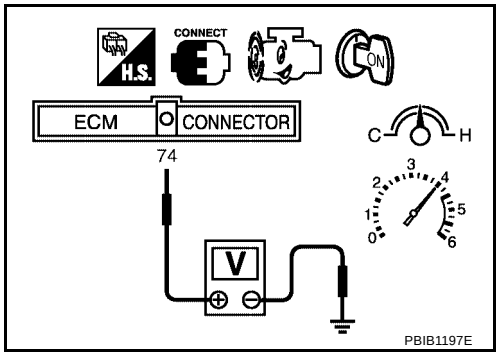
“HO2S2 (B1)” should be above 0.70V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.18V at least once when the “FUEL INJECTION” is –25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.70V at least once during this procedure.
   If the voltage is above 0.70V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.18V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS0068V

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P0171 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

UBS001UU

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the air fuel ratio (A/F) sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and lights up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection & mixture ratio control	Injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0171 0171	Fuel injection system too learn	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Air fuel ratio (A/F) sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor ● Incorrect PCV hose connection

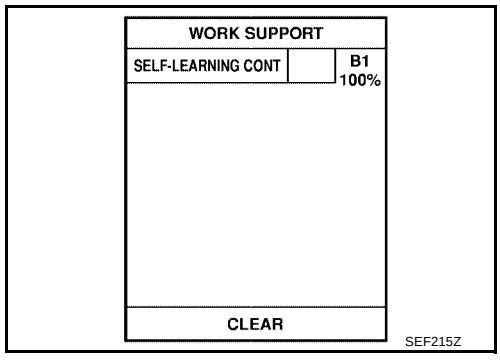
DTC Confirmation Procedure

UBS001UV

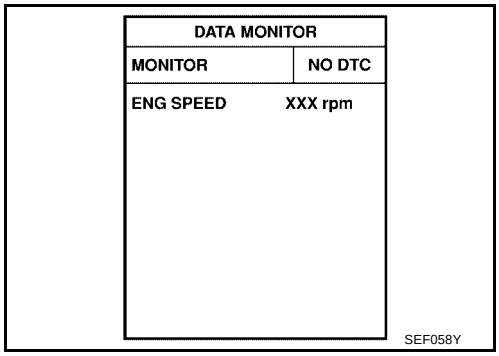
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.

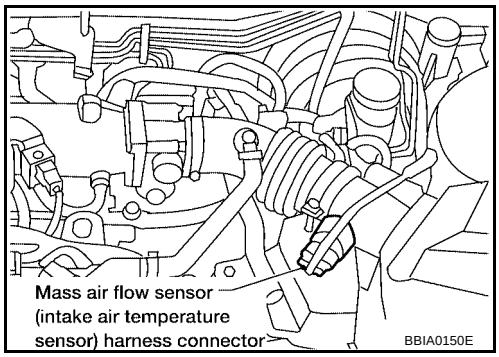


6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-798, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-798, "Diagnostic Procedure" . If engine does not start, visually check for exhaust and intake air leak.



WITH GST

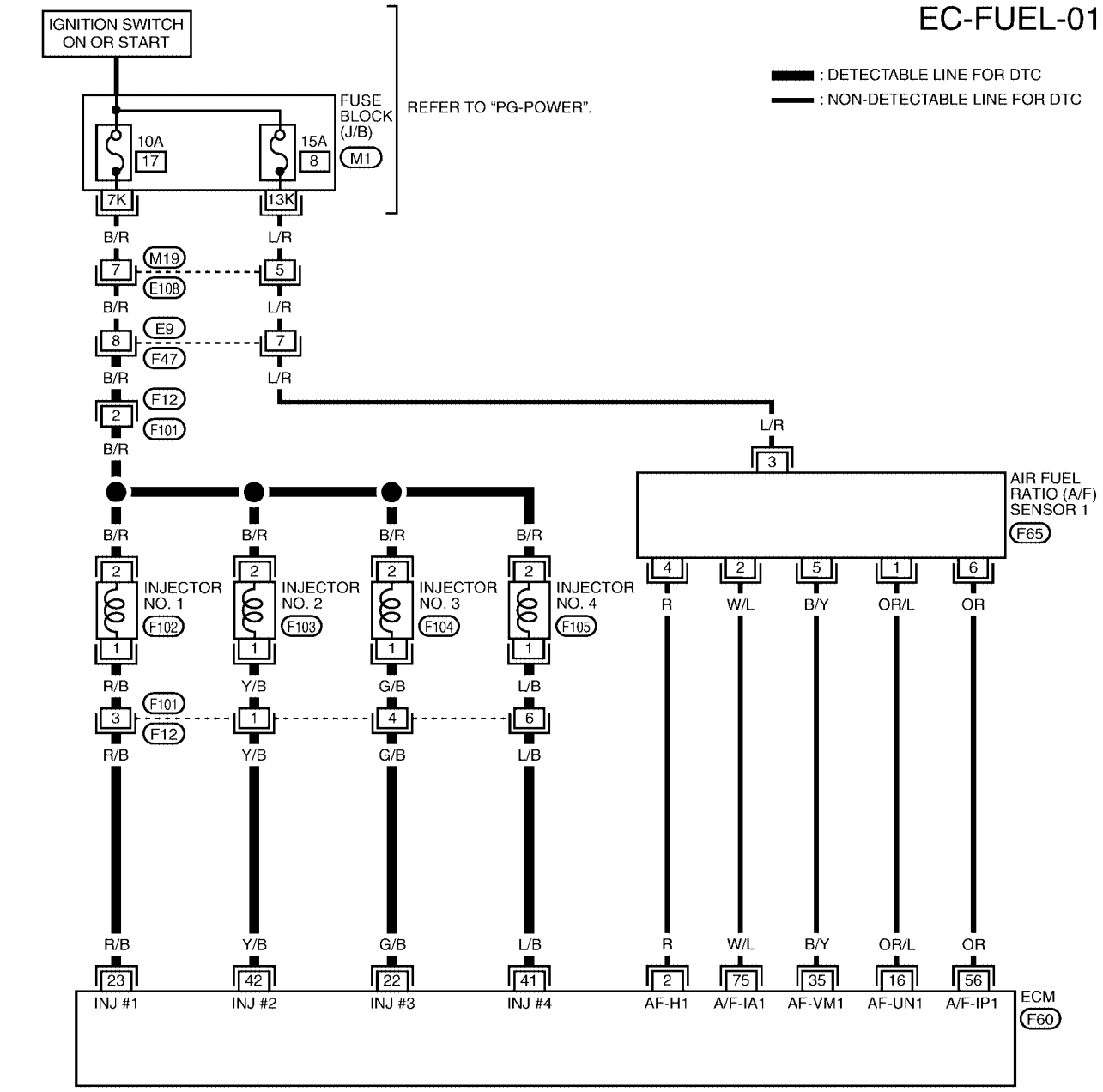
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 7” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and run it for at least 10 minutes at idle speed.

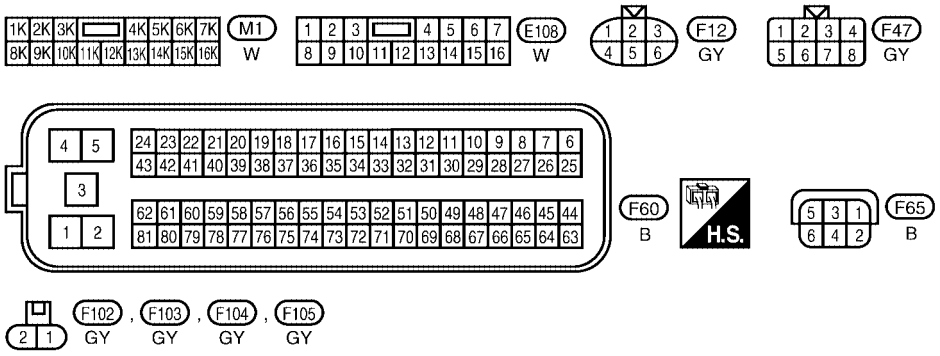


8. Select “MODE 7” with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-798, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-798, "Diagnostic Procedure" . If engine does not start, visually check for exhaust and intake air leak.

Wiring Diagram

UBS001UW





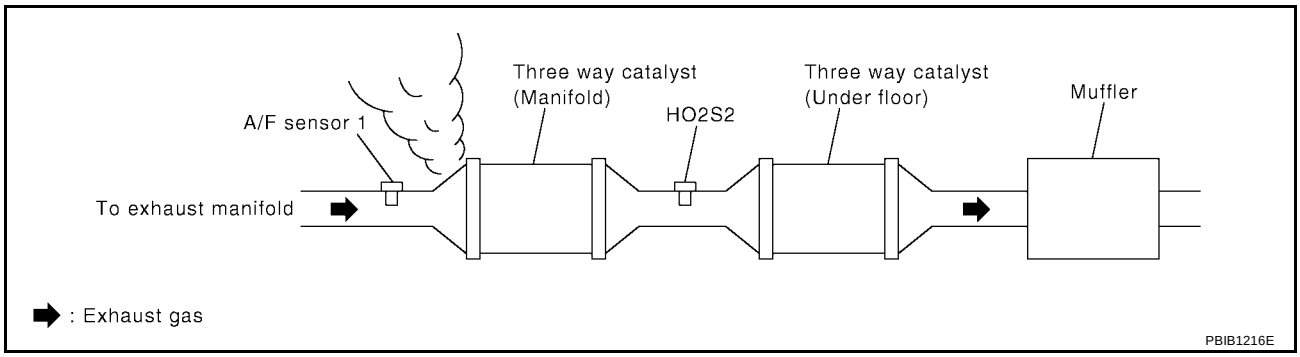
BBWA0799E

Diagnostic Procedure

UBS001UX

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

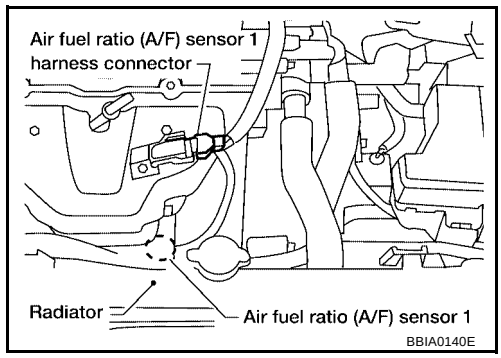
1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK AIR FUEL RATIO (A/F) SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect A/F sensor 1 harness connector and ECM harness connector.
3. Check harness continuity between ECM terminals and A/F sensor 1 terminals as follows.
   Refer to Wiring Diagram.



ECM terminal	A/F sensor 1
16	1
35	5
56	6
75	2

Continuity should exist.

4. Check harness continuity between ECM terminals 16, 35, 56, 75 and ground, or A/F sensor 1 terminals 1, 2, 5, 6 and ground.
   Refer to Wiring Diagram.

Continuity should not exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero.
   Refer to EC-638 .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-637, "Fuel Pressure Check" .

At idling: 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit Refer to EC-1174 .
- Fuel lines. Refer to MA-19, "Checking Fuel Lines" .
- Fuel filter for clogging

OK or NG

OK >> Replace fuel pressure regulator.
NG >> Repair or replace.

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

at idling:	**1.4 - 4.0 g·m/sec**
at 2,500 rpm:	**5.0 - 10.0 g·m/sec**

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

at idling:	**1.4 - 4.0 g·m/sec**
at 2,500 rpm:	**5.0 - 10.0 g·m/sec**

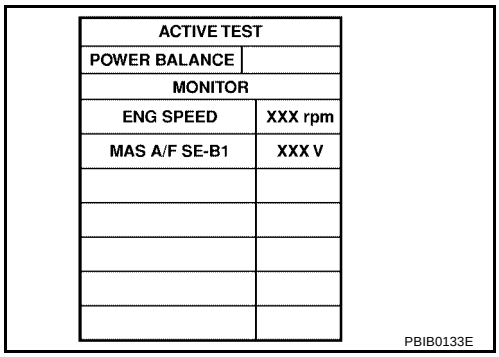
OK or NG

OK >> GO TO 7.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-740 .

7. CHECK FUNCTION OF INJECTORS

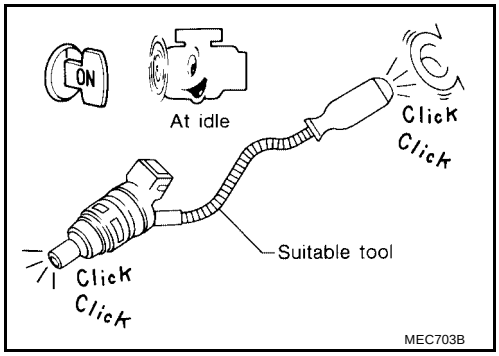
With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



OK or NG

OK >> GO TO 8.
NG >> Perform trouble diagnosis for EC-1168, "INJECTOR" .

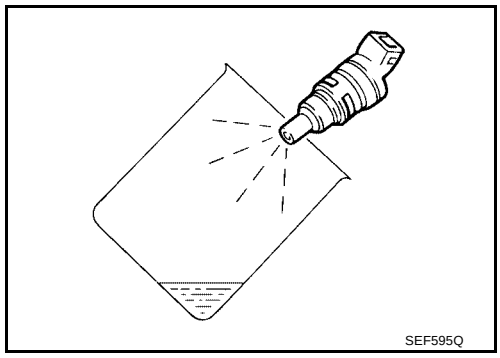
8. REMOVE INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Remove injector with fuel tube assembly. Refer to EM-19, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery. The injector harness connectors should remain connected.

>> GO TO 9.

9. CHECK INJECTOR

1. Disconnect all ignition wires.
2. Place pans or saucers under each injector.
3. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.
   Fuel should be sprayed evenly for each cylinder.



OK or NG

OK >> GO TO 10.
NG >> Replace injectors from which fuel does not spray out. Always replace O-ring with new one.

10. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0172 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

UBS001UY

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the air fuel ratio (A/F) sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and lights up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection & mixture ratio control	Injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0172 0172	Fuel injection system too rich	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Air fuel ratio (A/F) sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

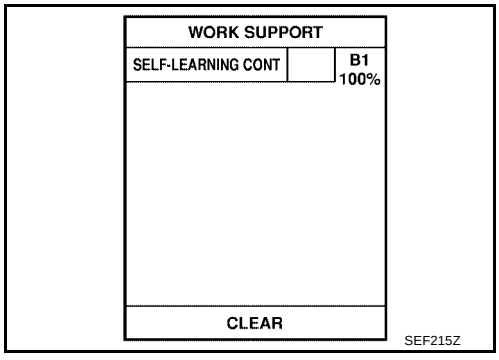
DTC Confirmation Procedure

UBS001UZ

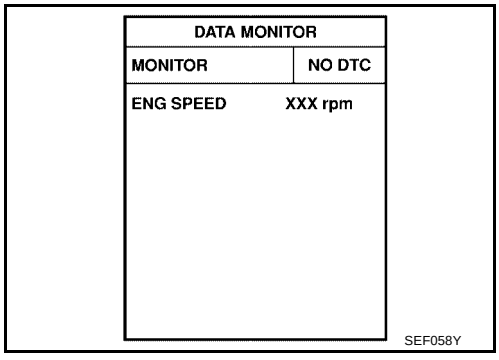
NOTE:
If “DTC Confirmation Procedure ” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR” or “START”.
5. Select “DATA MONITOR” mode with CONSULT-II.

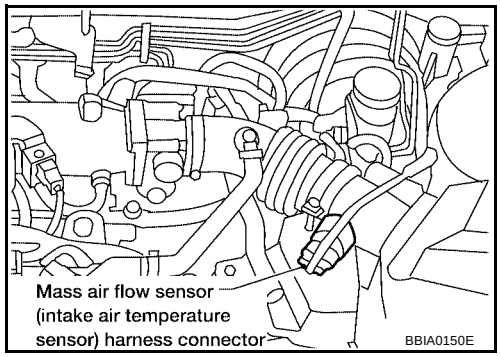


6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-805, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-805, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.



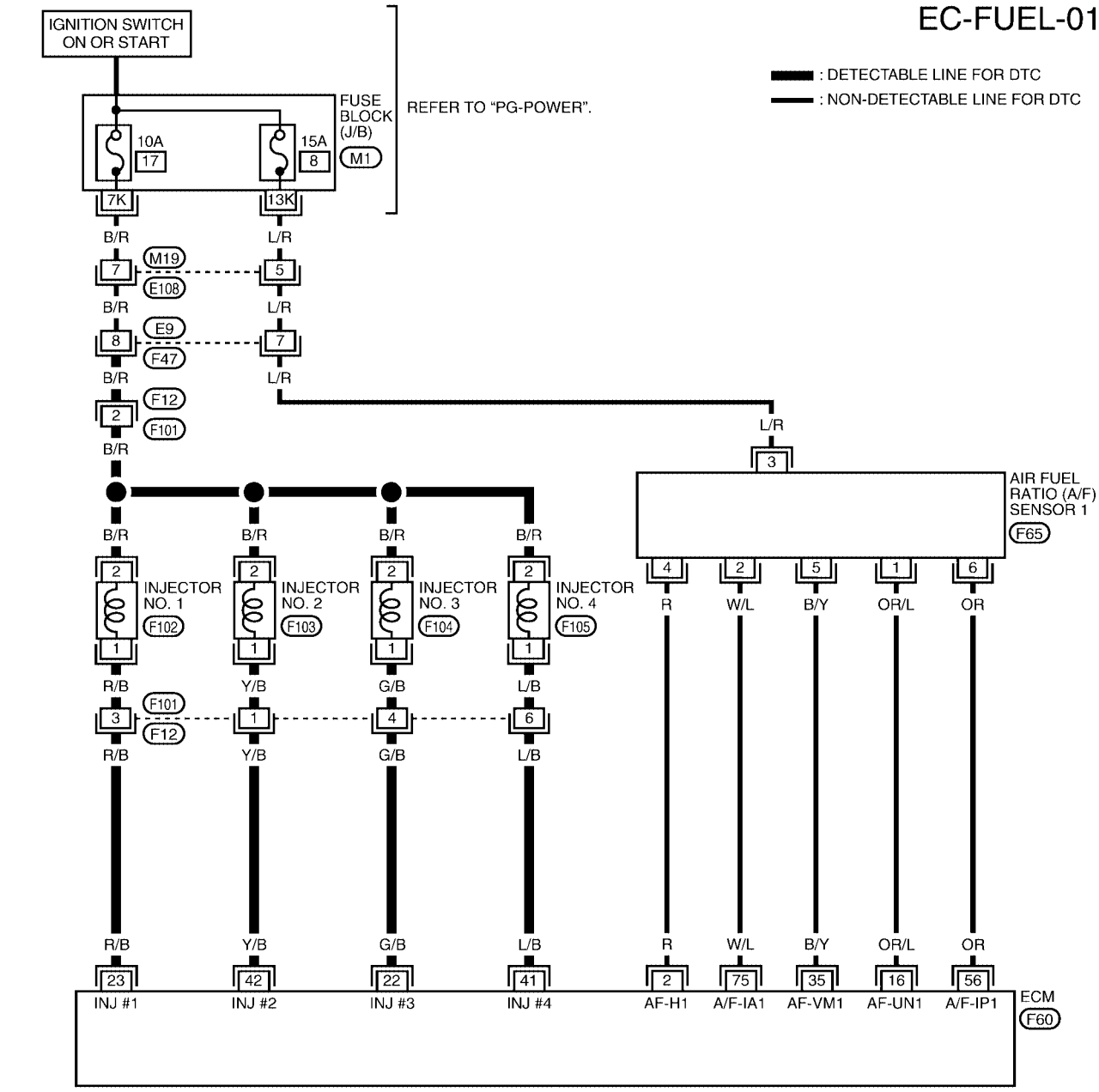
WITH GST

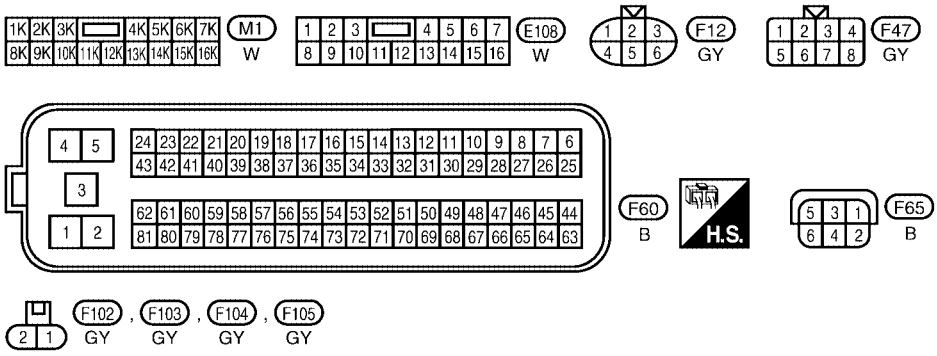
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 7” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and run it for at least 10 minutes at idle speed.
8. Select “MODE 7” with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-805, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-805, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.



Wiring Diagram

UBS001V0





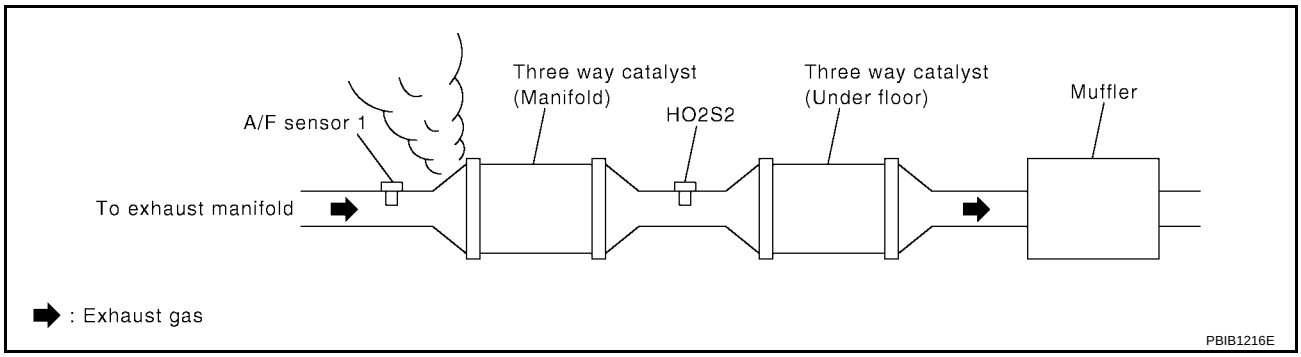
BBWA0799E

Diagnostic Procedure

UBS001V1

1. CHECK FOR EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (manifold).

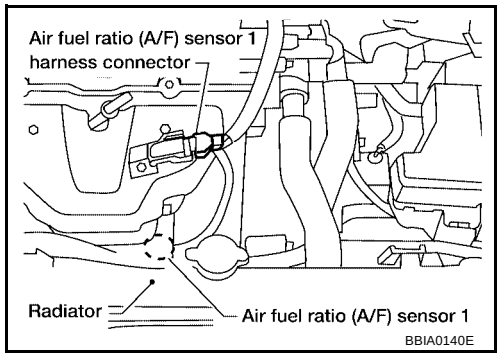


OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect A/F sensor 1 harness connector and ECM harness connector.
3. Check harness continuity between ECM terminals and A/F sensor 1 terminals as follows.
   Refer to Wiring Diagram.



ECM terminal	A/F sensor 1
16	1
35	5
56	6
75	2

Continuity should exist.

4. Check harness continuity between ECM terminals 16, 35, 56, 75 and ground, or A/F sensor 1 terminals 1, 2, 5, 6 and ground.
   Refer to Wiring Diagram.

Continuity should not exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUEL PRESSURE

1. Release fuel pressure to zero.
   Refer to EC-637 .
2. Install fuel pressure gauge and check fuel pressure.

At idling: Approximately 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to EC-1174 .)

OK or NG

OK >> Replace fuel pressure regulator.
NG >> Repair or replace.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

at idling : 1.4 - 4.0 g·m/sec
at 2,500 rpm : 5.0 - 10.0 g·m/sec

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

at idling : 1.4 - 4.0 g·m/sec
at 2,500 rpm : 5.0 - 10.0 g·m/sec

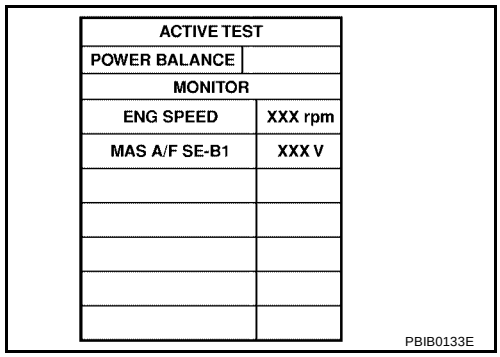
OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer toEC-740 .

6. CHECK FUNCTION OF INJECTORS

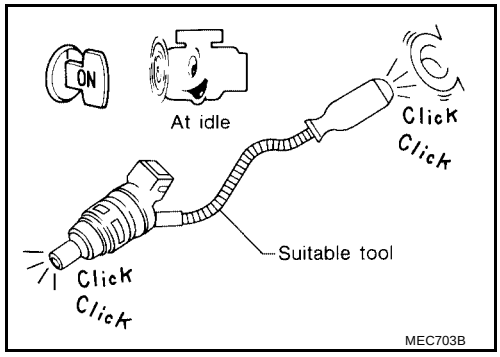
With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for “Injector”, EC-1168 .

7. REMOVE INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Remove injector assembly. Refer to EM-19, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.

>> GO TO 8.

8. CHECK INJECTOR

1. Disconnect all injector harness connectors.
2. Disconnect all ignition coil harness connectors.
3. Prepare pans or saucers under each injectors.
4. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip)>>GO TO 9.
NG (Drips)>>Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

9. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

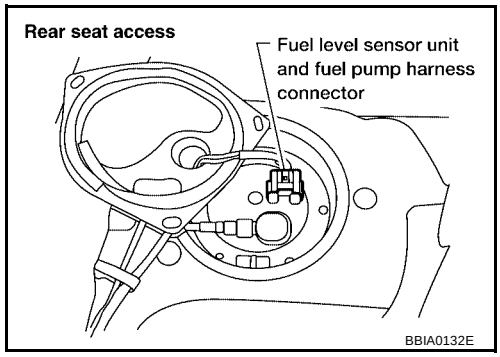
DTC P0181 FTT SENSOR

PFP:22630

Component Description

UBS003ND

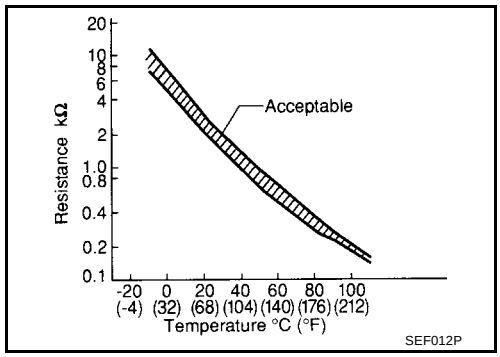
The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 107 (Fuel tank temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use ground other than ECM, such as body ground.

On Board Diagnosis Logic

UBS003NE

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181 0181	Fuel tank temperature sensor circuit range/ performance	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel tank temperature sensor

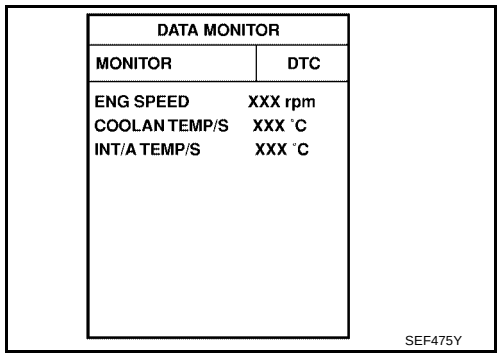
DTC Confirmation Procedure

UBS003NF

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 10 seconds.
   If 1st trip DTC is detected, go to .
   If the result is OK, go to following step.
4. Check “COOLAN TEMP/S” signal.
   If the signal is less than 60°C (140°F), the result will be OK.
   If the signal is above 60°C (140°F), go to the following step.
5. Cool engine down until “COOLAN TEMP/S” signal is less than 60°C (140°F).
6. Wait at least 10 seconds.
7. If 1st trip DTC is detected, go to EC-812, "Diagnostic Procedure"
   .



WITH GST

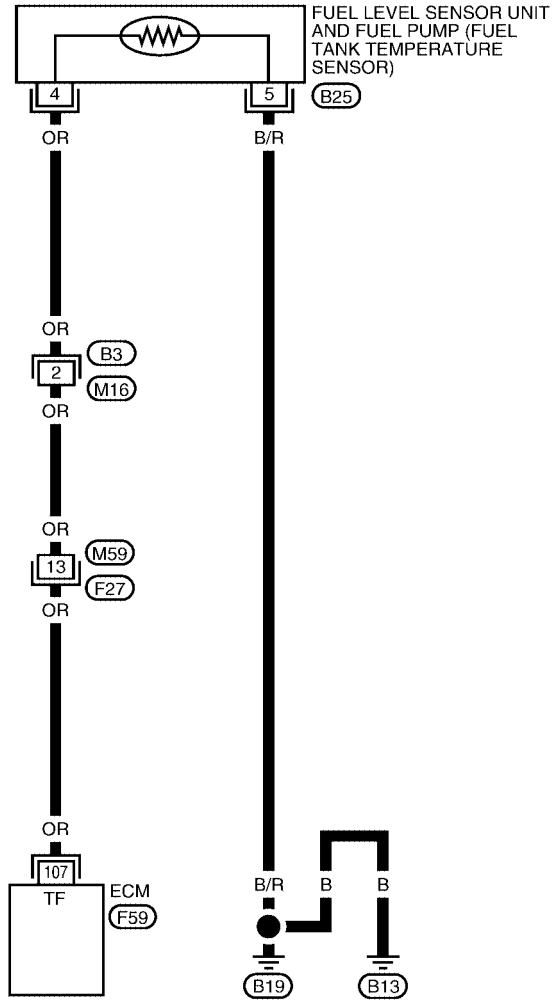
Follow the procedure “With CONSULT-II” above.

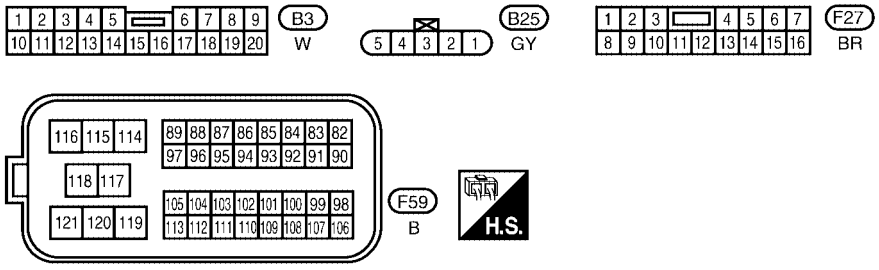
Wiring Diagram

UBS003NG

EC-FTTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





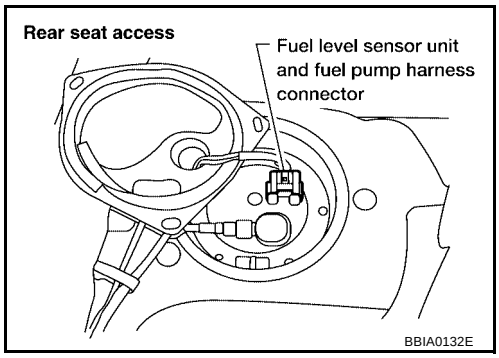
BBWA0285E

Diagnostic Procedure

UBS003NH

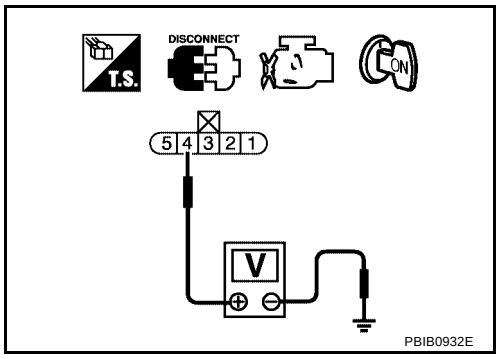
1. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors B3, M16
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair harness or connector.

3. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to, EC-813, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel level sensor unit.

5. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

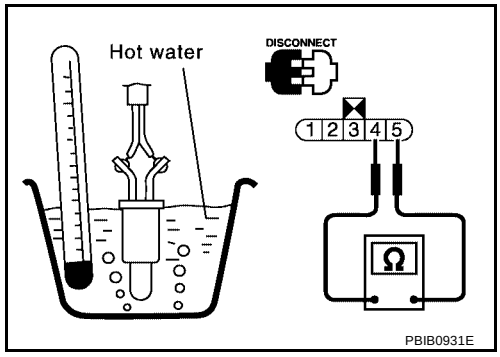
Component Inspection

UBS003NI

FUEL TANK TEMPERATURE SENSOR

Check resistance by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90



Removal and Installation

UBS003NJ

FUEL TANK TEMPERATURE SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

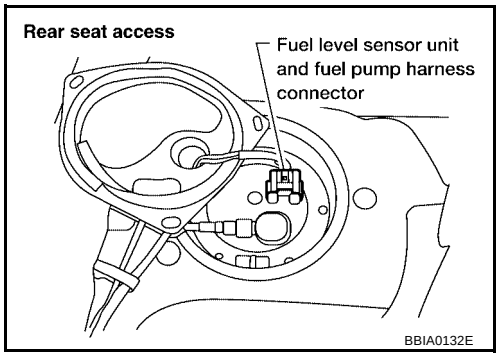
DTC P0182, P0183 FTT SENSOR

PFP:22630

Component Description

UBS003NK

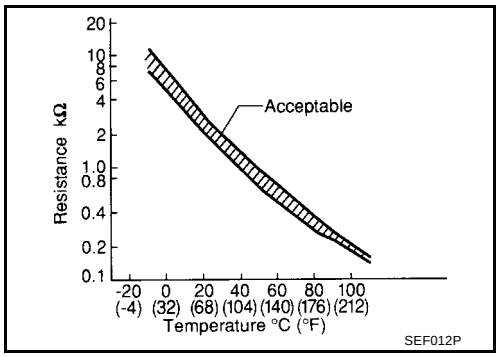
The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 107 (Fuel tank temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use ground other than ECM, such as body ground.

On Board Diagnosis Logic

UBS003NL

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182 0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Fuel tank temperature sensor
P0183 0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

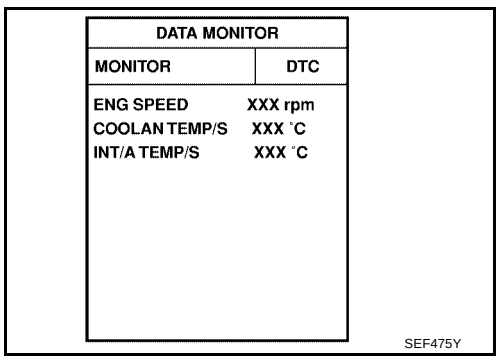
UBS003NM

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-816, "Diagnostic Procedure" .



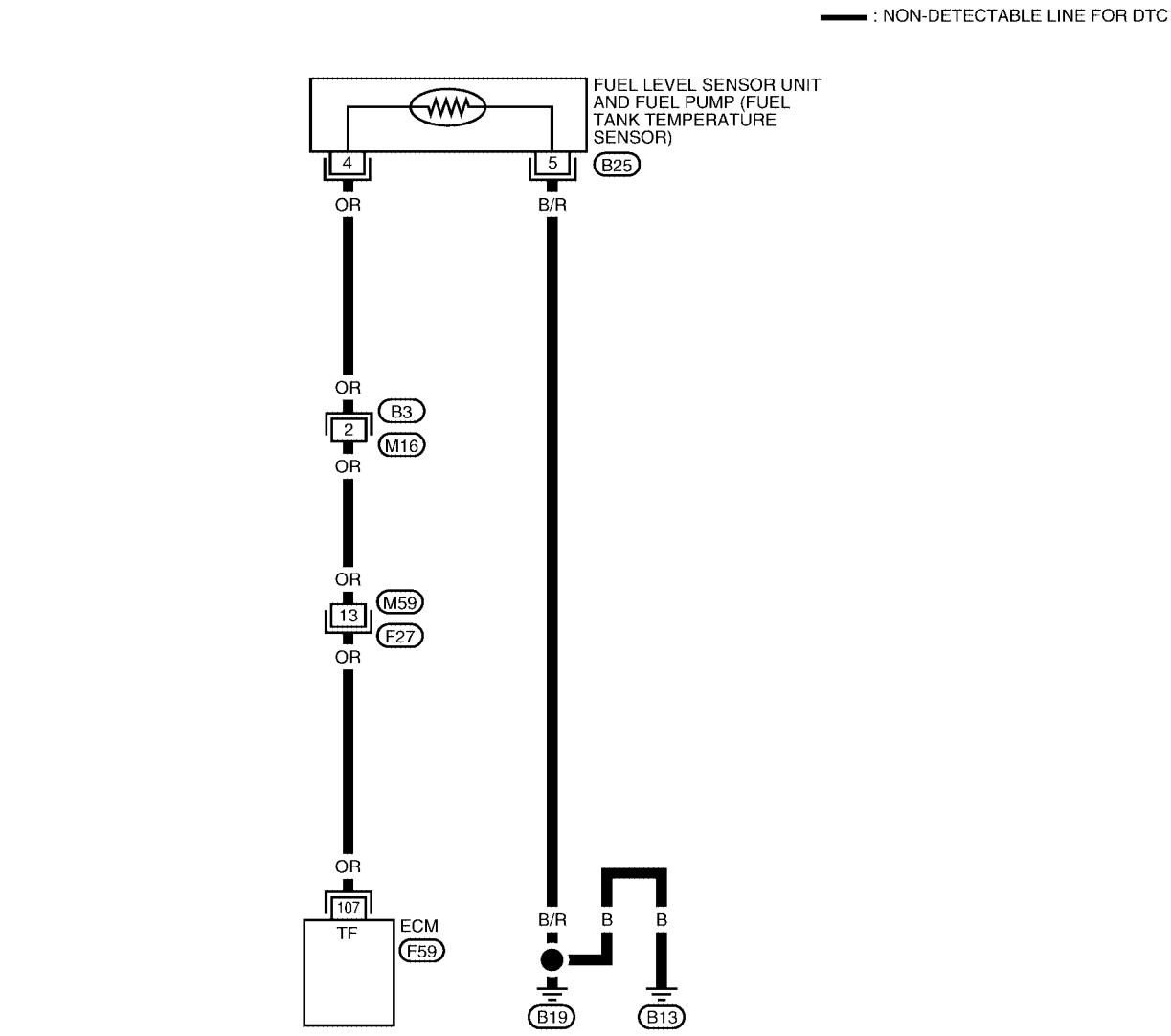
WITH GST

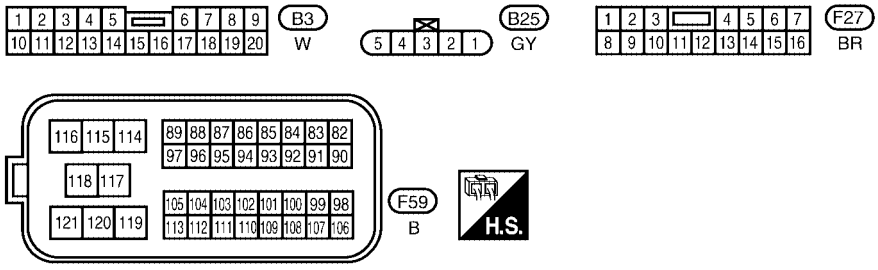
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS003NN

EC-FTTS-01





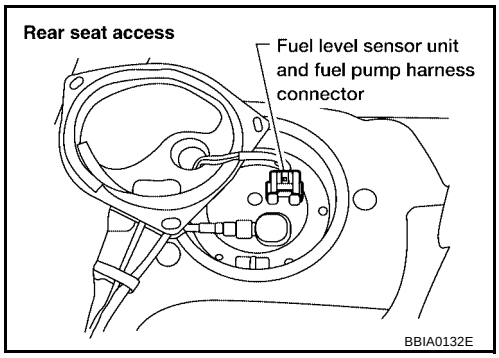
BBWA0285E

Diagnostic Procedure

UBS003NO

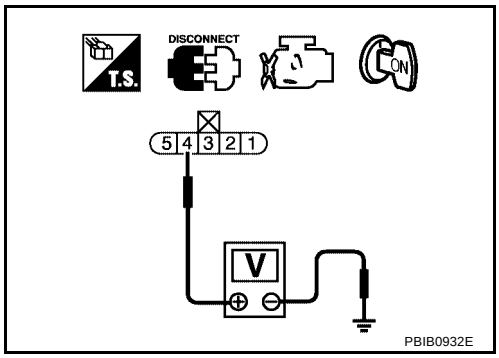
1. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors B3, M16
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair harness or connector.

3. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to, EC-817, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel level sensor unit and fuel pump.

5. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

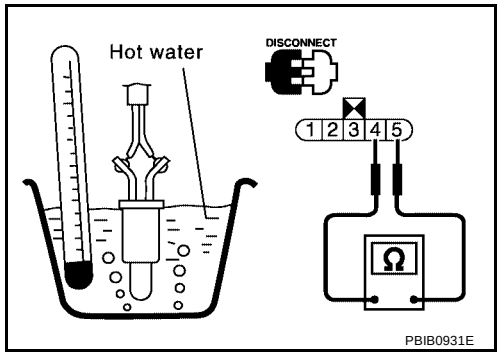
UBS003NP

FUEL TANK TEMPERATURE SENSOR

Check resistance by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace fuel level sensor unit and fuel pump.



Removal and Installation

UBS003NQ

FUEL TANK TEMPERATURE SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

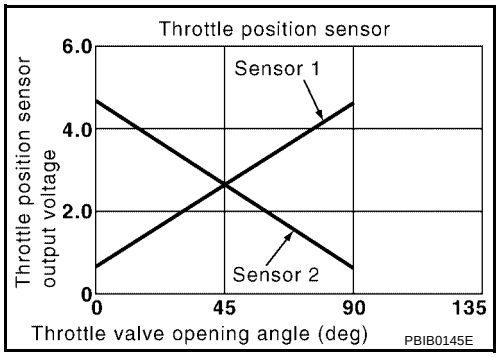
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

UBS003WN

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS003WO

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever D: (A/T model) 1st: (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS003WP

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1) ● Accelerator pedal position sensor (APP sensor 2)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode an the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

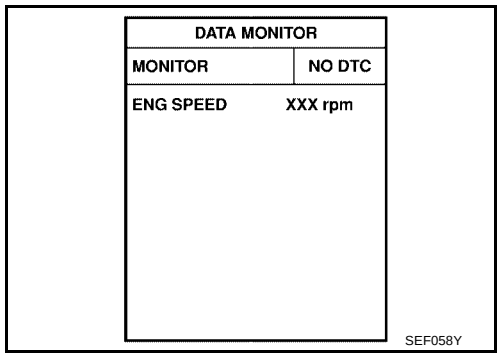
DTC Confirmation Procedure

UBS003WQ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-821, "Diagnostic Procedure" .



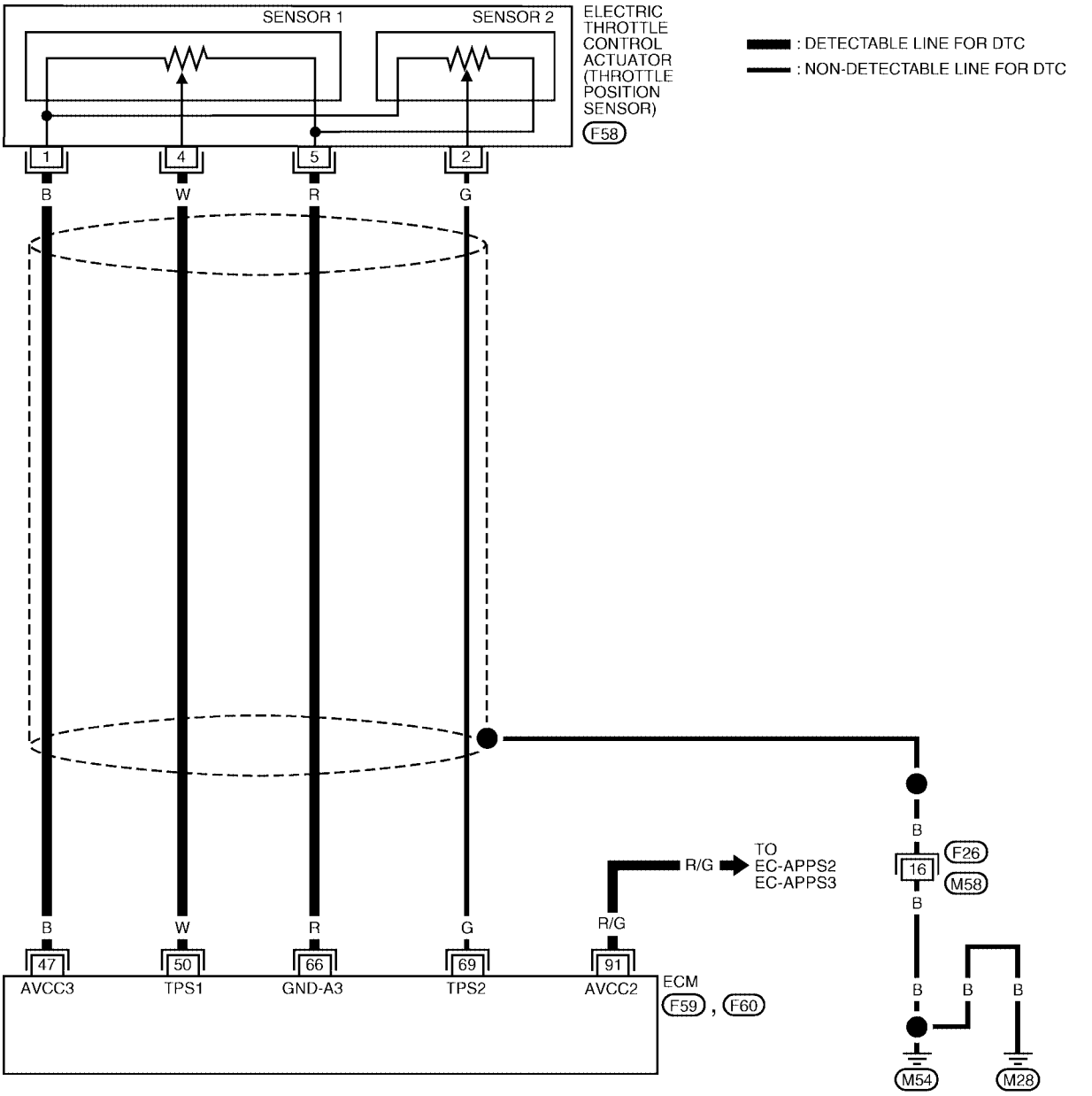
WITH GST

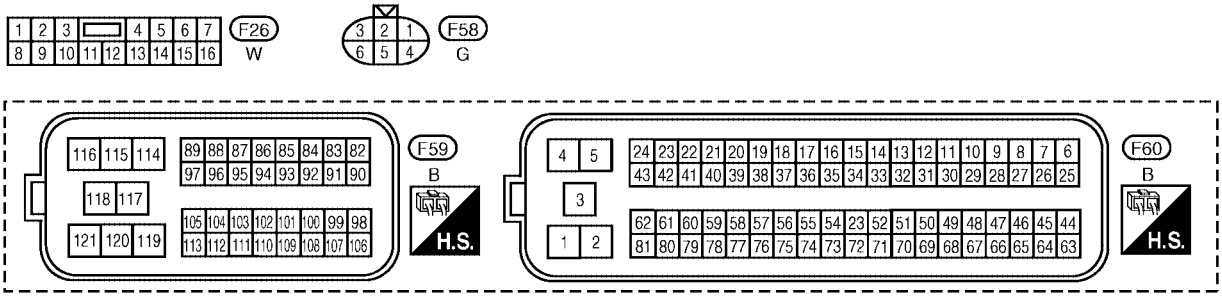
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003WR

EC-TPS1-01





BBWA1381E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	R	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 0.36V
91	R/G	Sensor power supply (Accelerator pedal position sensor)	**[Ignition switch "ON"]**	Approximately 5V

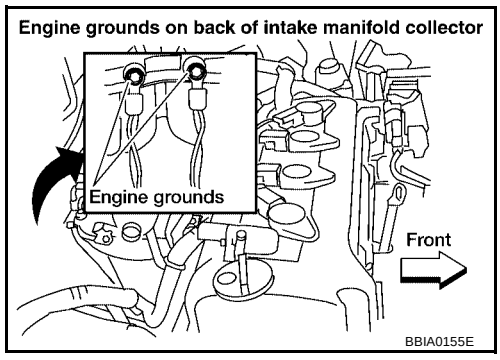
Diagnostic Procedure

UBS003WS

1. RETIGHTEN GROUND SCREWS

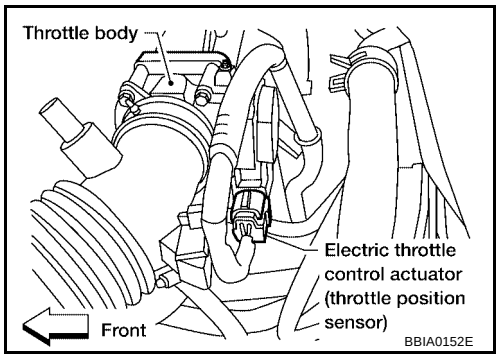
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

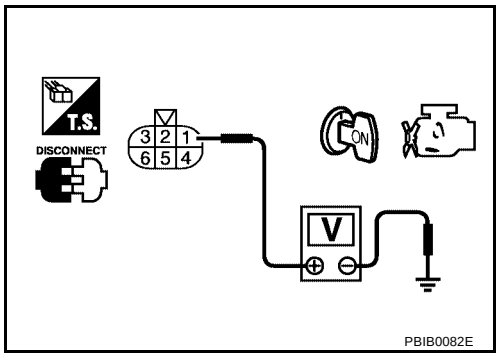


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 7.
NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace open circuit.

4. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-262
91	APP sensor terminal 1	EC-513

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-517 .

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-52, "Accelerator Pedal Released Position Learning" .
3. Perform EC-53, "Throttle Valve Closed Position Learning" .
4. Perform EC-53, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to EC-824, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

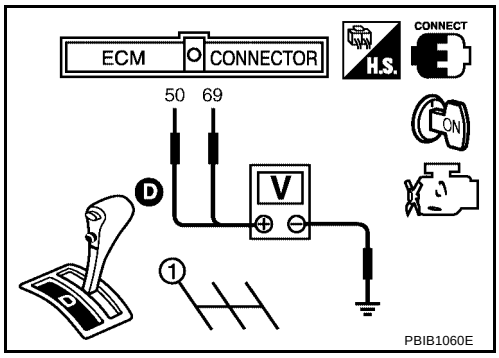
>> **INSPECTION END**

Component Inspection

UBS003WT

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 50 (TP sensor 1 signal), 69 (TP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-634, "Throttle Valve Closed Position Learning" .
8. Perform EC-635, "Idle Air Volume Learning" .

Removal and Installation

UBS003WU

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

DTC P0300 - P0304 NO. 4 - 1 CYLINDER MISFIRE, MULTIPLE CYLINDER MISFIRE

PFP:00020

On Board Diagnosis Logic

UBS001VI

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● The injector circuit is open or shorted ● Injectors ● Intake air leak ● The ignition signal circuit is open or shorted ● Lack of fuel ● Drive plate ● Air fuel ratio (A/F) sensor 1 ● Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	

DTC Confirmation Procedure

UBS001VJ

CAUTION:

Always drive vehicle at a safe speed.

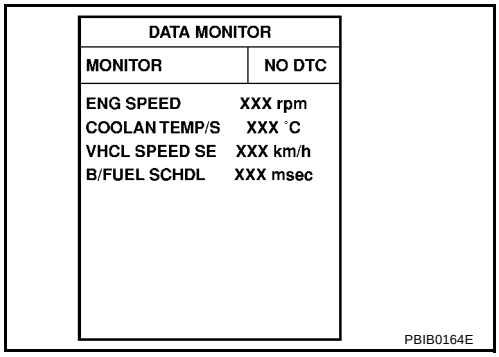
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”, and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.

   NOTE:
   Refer to the freeze frame data for the test driving conditions.
5. If 1st trip DTC is detected, go to EC-826, "Diagnostic Procedure".



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS001VK

1. CHECK FOR INTAKE AIR LEAK

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

OK or NG

OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, TWC (Manifold three way catalyst) and muffler for dents.

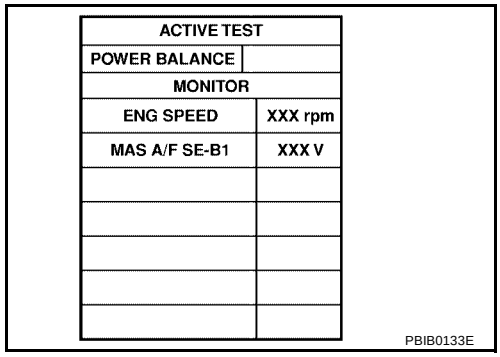
OK or NG

OK >> GO TO 3.
NG >> Repair or replace it.

3. PERFORM POWER BALANCE TEST

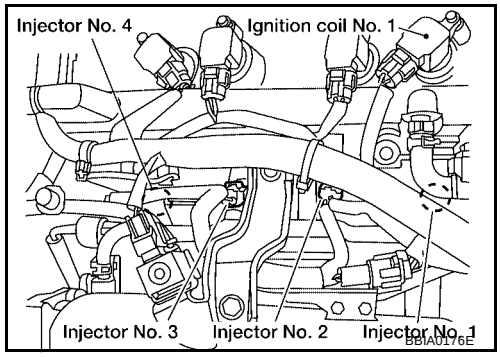
With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?



Without CONSULT-II

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



Yes or No

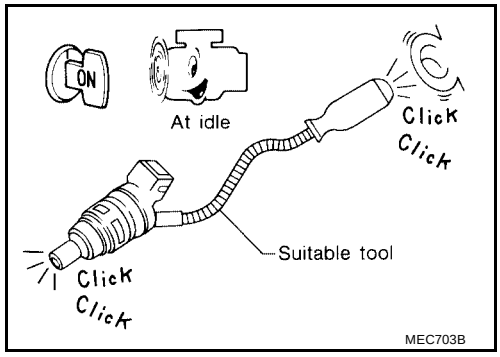
Yes >> GO TO 4.
No >> GO TO 7.

4. CHECK INJECTOR

Does each injector make an operating sound at idle?

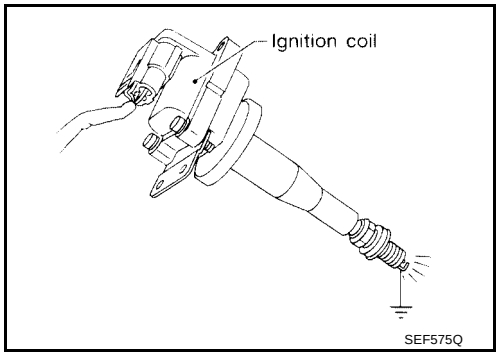
Yes or No

Yes >> GO TO 5.
No >> Check injector(s) and circuit(s). Refer to EC-1168 .



5. CHECK IGNITION SPARK

1. Remove ignition coil assembly from rocker cover.
2. Remove spark plug from ignition coil assembly.
3. Connect a known good spark plug to ignition coil.
4. Place and of spark plug against a suitable ground crank engine.
5. Check for spark.

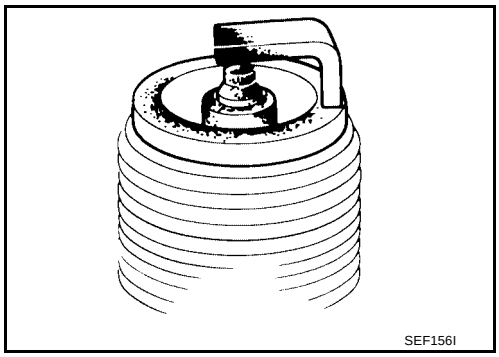


OK or NG

OK >> GO TO 6.
NG >> Check ignition coil, power transistor and their circuits. Refer to EC-1156, "IGNITION SIGNAL" .

6. CHECK SPARK PLUGS

Check the spark plugs and check for fouling, etc.



OK or NG

OK >> GO TO 7.
NG >> Repair or replace spark plug (s) with standard type one (s). For spark plug type ignition coil. Refer to EM-12 .

7. CHECK COMPRESSION PRESSURE

Refer to EM-52, "CHECKING COMPRESSION PRESSURE" .
Check compression pressure.

Standard:	**1,324 kPa (13.5 kg/cm^2 , 192 psi)/300 rpm**
Minimum:	**1,128 kPa (11.5 kg/cm^2 , 164 psi)/300 rpm**
Difference between each cylinder:	**98 kPa (1.0 kg/cm^2 , 14 psi)/300 rpm**

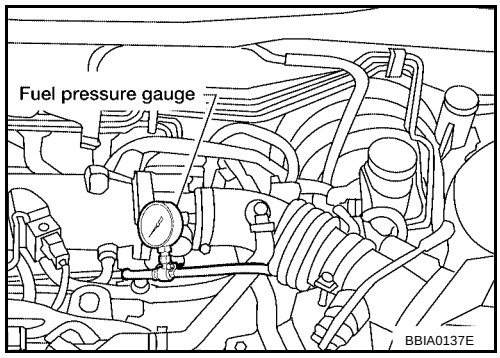
OK or NG

OK >> GO TO 8.
NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

8. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-637, "FUEL PRESSURE RELEASE" .
3. Install fuel pressure gauge and check fuel pressure.

At idle: Approx. 350 kPa (3.57 kg/cm^2 , 51 psi)



OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to EC-1174, "FUEL PUMP" .)
- Fuel pressure regulator (Refer to FL-3 .)
- Fuel lines (Refer to MA-19, "Checking Fuel Lines" .)
- Fuel filter for clogging

>> Repair or replace.

10. CHECK IGNITION TIMING

Perform EC-669, "Basic Inspection" .

Items		Specifications
Target idle speed	A/T	800 ± 50 rpm (in “P” or “N” position)
	M/T	650 ± 50 rpm
Ignition timing	A/T	18 ± 5°BTDC (in “P” or “N” position)
	M/T	7 ± 5°BTDC

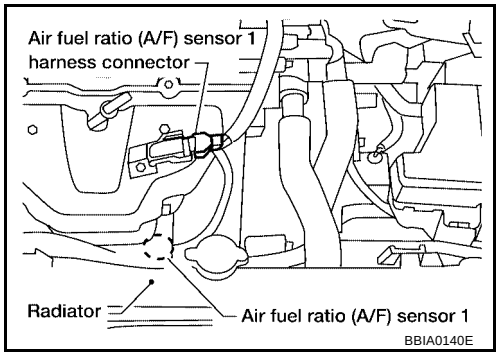
OK or NG

OK >> GO TO 11.
NG >> Adjust ignition timing.

11. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and A/F sensor 1 harness connector.
3. Check harness continuity between the following terminals. Refer to “Wiring Diagram”.

ECM terminal	A/F sensor 1 terminal
16	1
35	5
56	6
75	2



Continuity should exist.

4. Check harness continuity between ECM terminals 16, 35, 56, 75 or A/F sensor 1 terminals 1, 2, 5, 6 and ground. Refer to Wiring Diagram.

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK A/F SENSOR 1 HEATER

Refer to EC-935, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace A/F sensor 1.

13. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

at idling: 1.4 - 4.0 g·m/sec
at 2,500 rpm: 5.0 - 10.0 g·m/sec

With GST

Check mass air flow sensor signal in MODE 1 with GST.

at idling: 1.4 - 4.0 g·m/sec
at 2,500 rpm: 5.0 - 10.0 g·m/sec

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. CHECK CONNECTORS

Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-740, "DTC P0101 MAF SENSOR" , EC-748, "DTC P0102, P0103 MAF SENSOR" and EC-940, "DTC P1102 MAF SENSOR" .

OK or NG

OK >> GO TO 15.
NG >> Repair or replace it.

15. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-674, "Symptom Matrix Chart" .

OK or NG

OK >> GO TO 16.
NG >> Repair or replace.

16. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 17.

17. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

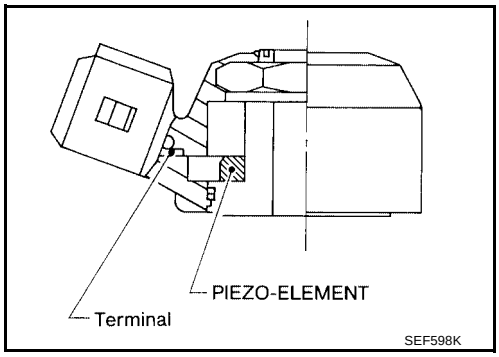
DTC P0327, P0328 KS

PFP:22060

Component Description

UBS001VL

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

UBS001VM

The MIL will not light up for these diagnoses.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

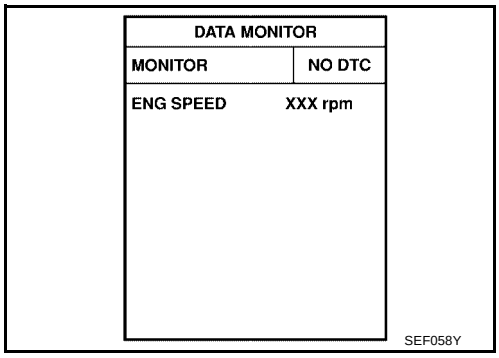
DTC Confirmation Procedure

UBS001VN

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-834, "Diagnostic Procedure" .



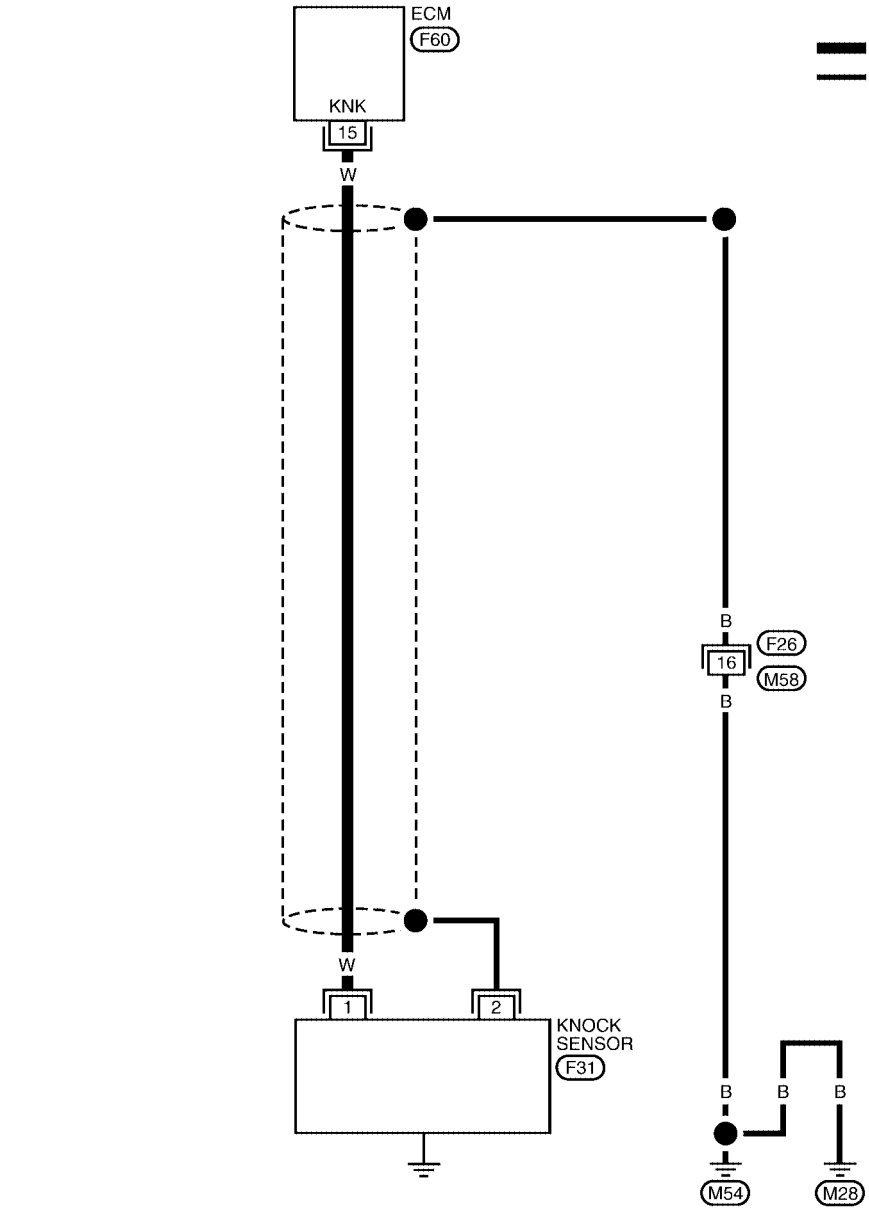
WITH GST

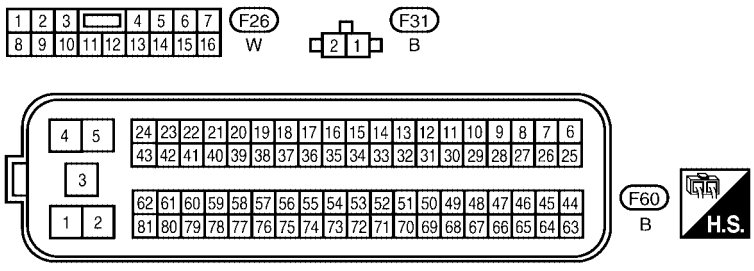
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS001VO

EC-KS-01





BBWA0782E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V

Diagnostic Procedure

UBS001VP

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.

   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

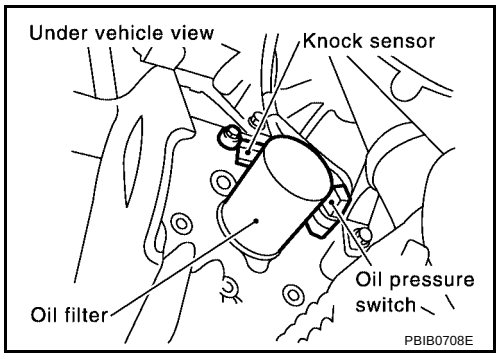
OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and knock sensor harness connector.
3. Check harness continuity between knock sensor terminal 1 and ECM terminal 15.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

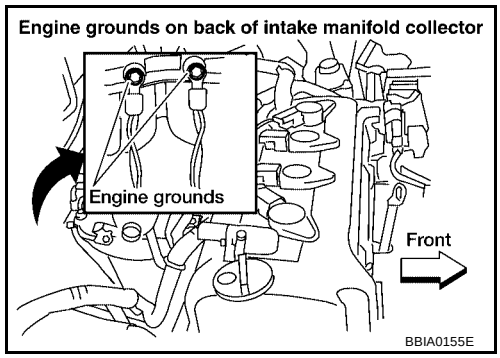
Refer to EC-835, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.



>> GO TO 5.

5. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

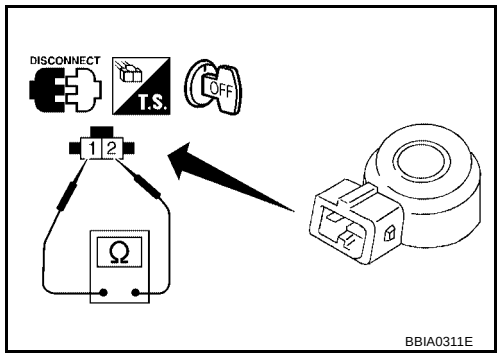
UBS001VQ

KNOCK SENSOR

Use an ohmmeter which can measure more than 10 MΩ.

1. Disconnect knock sensor harness connector.
2. Check resistance between terminal 1 and ground.

Resistance: 530 - 590 kΩ [at 20°C (68°F)]



CAUTION:

Discard any knock sensors that have been dropped or physically damaged. Use only new ones.

Removal and Installation

UBS001VR

KNOCK SENSOR

Refer to EM-67, "CYLINDER BLOCK" .

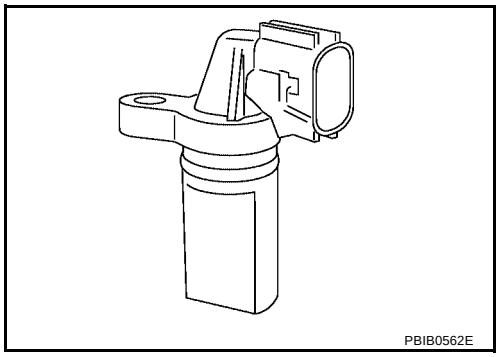
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

UBS001VS

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

UBS006IY

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

UBS001VT

Specification data are reference values.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted) ● Crankshaft position sensor (POS) ● Signal plate

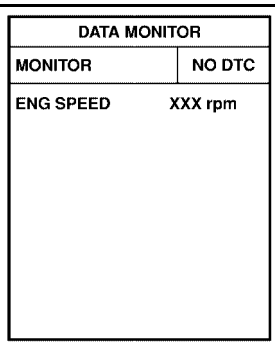
DTC Confirmation Procedure

UBS001VU

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-839, "Diagnostic Procedure"
   .
   If 1st trip DTC is not detected, go to next step.
4. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
5. If 1st trip DTC is detected, go toEC-839, "Diagnostic Procedure"
   .



SEF058Y

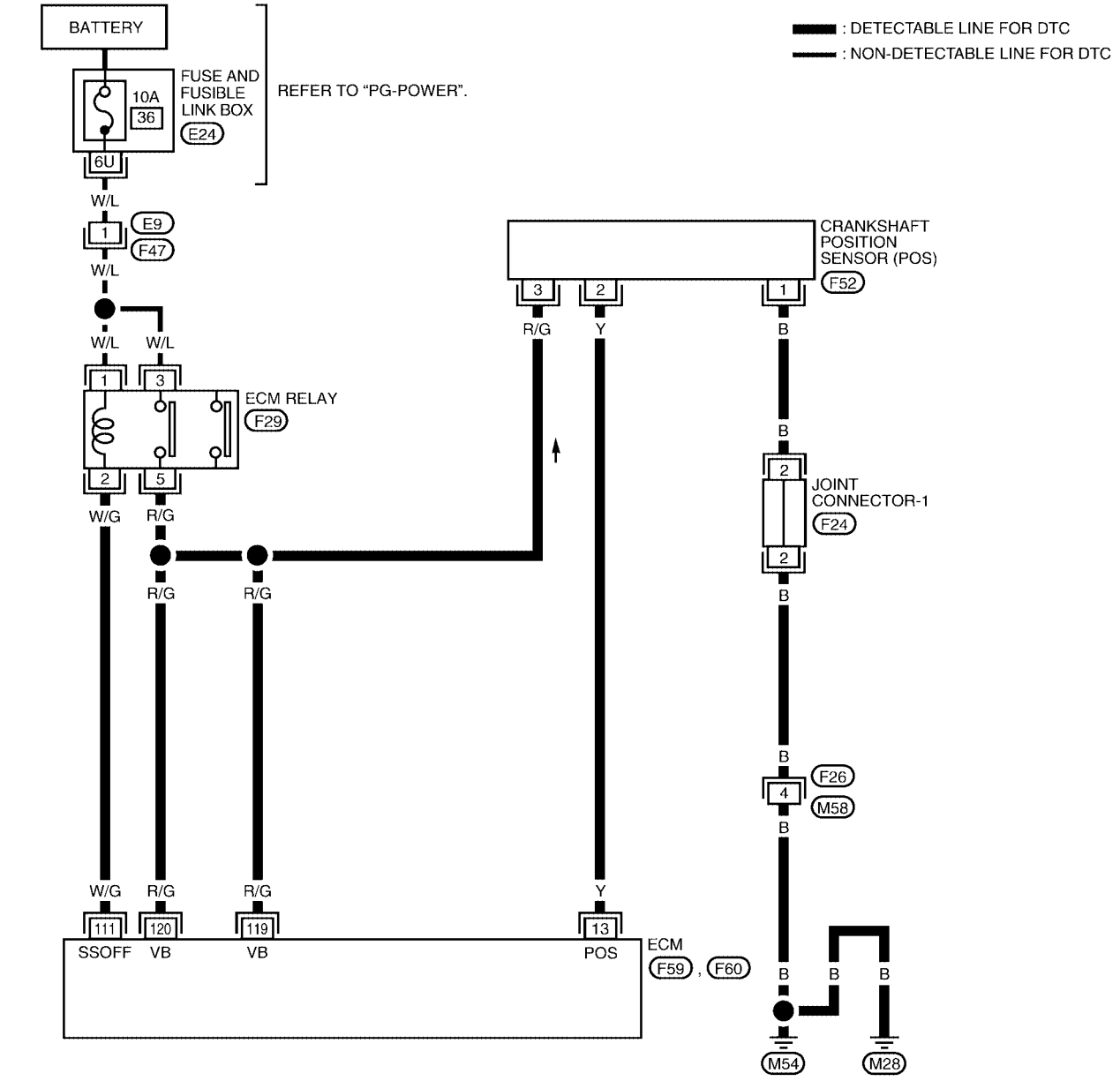
WITH GST

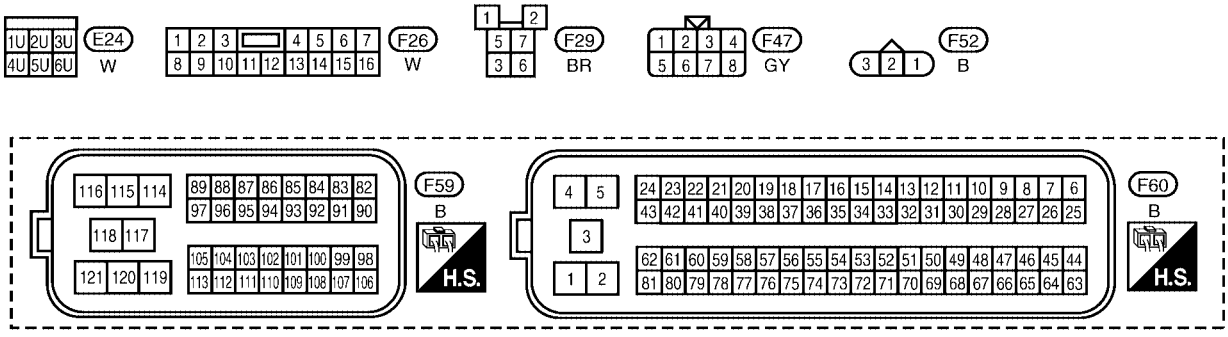
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS001VV

EC-POS-01



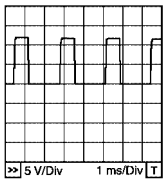
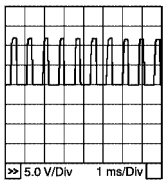


BBWA0783E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	Y	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 3.0V★  PBIB0528E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

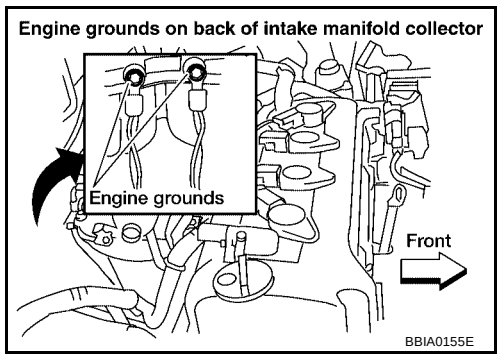
Diagnostic Procedure

UBS001VW

1. RETIGHTEN GROUND SCREWS

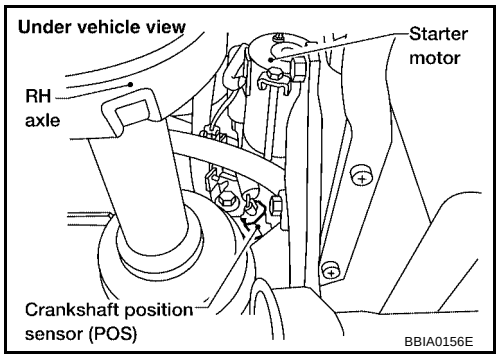
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK POWER SUPPLY

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch “ON”.



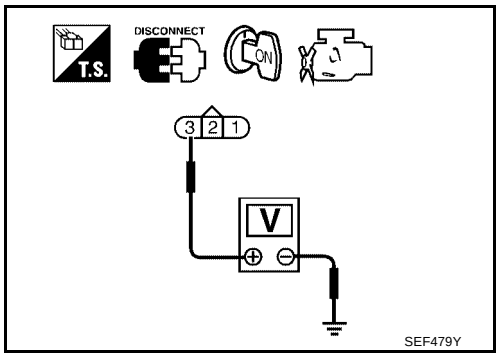
3. Check voltage between CKP sensor (POS) harness connector terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open and short between ECM and crankshaft position sensor (POS)
- Harness for open or short between ECM relay and crankshaft position sensor (POS)

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between CKP sensor (POS) terminal 1 and engine ground. Refer to the wiring diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-841, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

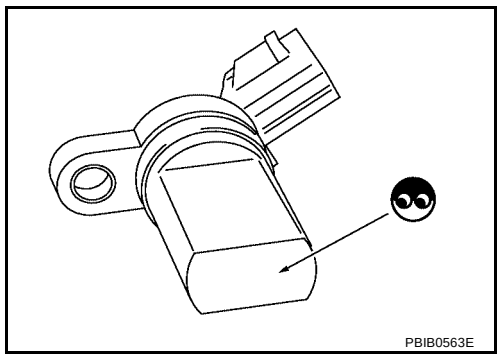
>> **INSPECTION END**

Component Inspection

UBS001VX

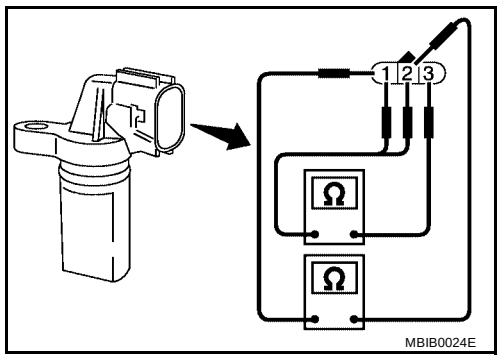
CRANKSHAFT POSITION SENSOR (POS)

1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (–)	Except 0 or ∞
3 (+) - 2 (–)	
2 (+) - 1 (–)	



If NG, replace crankshaft position sensor (POS).

Removal and Installation

UBS001VY

CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-67, "CYLINDER BLOCK" .

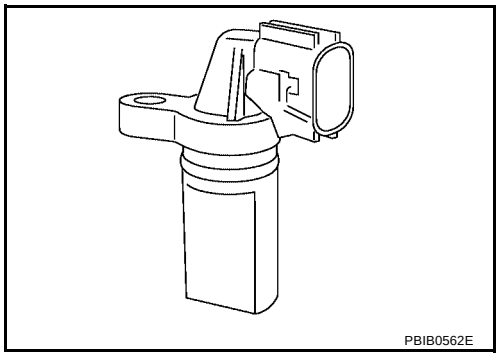
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

UBS001VZ

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

UBS001W0

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not sent to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-9 .) ● Starting system circuit (Refer to SC-9 .) ● Dead (Weak) battery

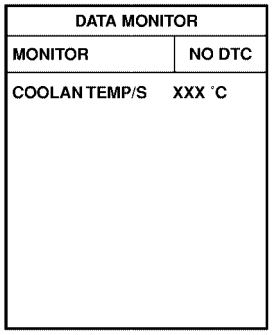
DTC Confirmation Procedure

UBS001W1

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-844, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-844, "Diagnostic Procedure" .



SEF013Y

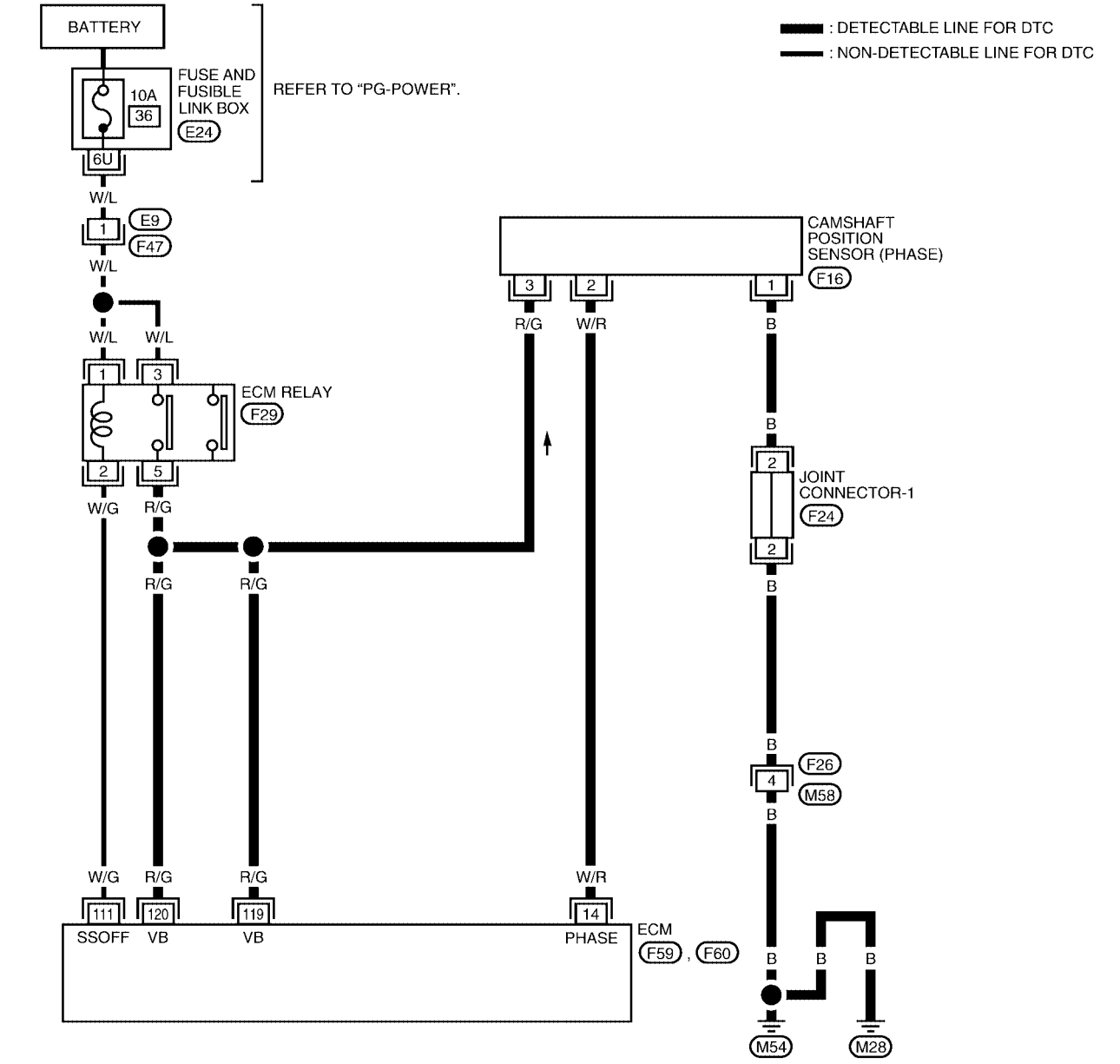
WITH GST

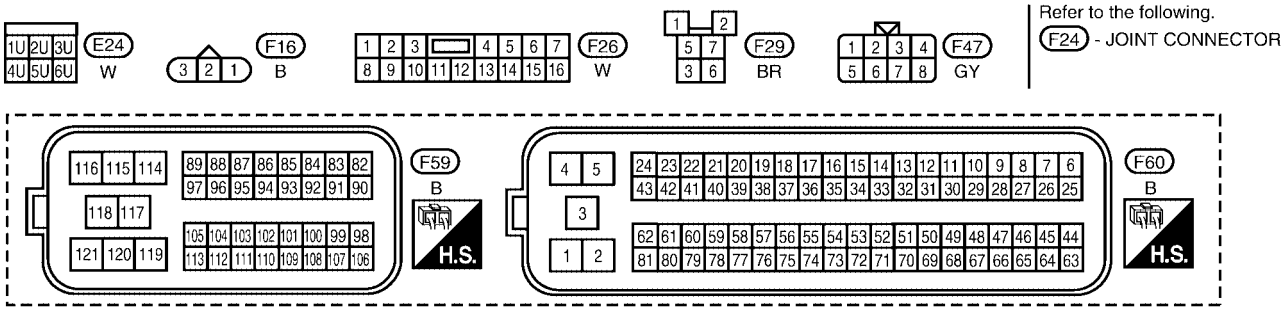
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS001W2

EC-PHASE-01



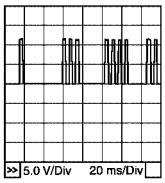
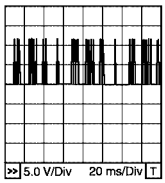


BBWA0784E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	W/R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS001W3

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

Yes or No

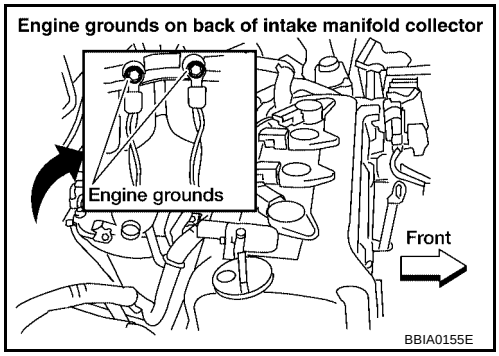
Yes >> GO TO 2.

No >> Check starting system. (Refer to SC-9, "STARTING SYSTEM" .)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

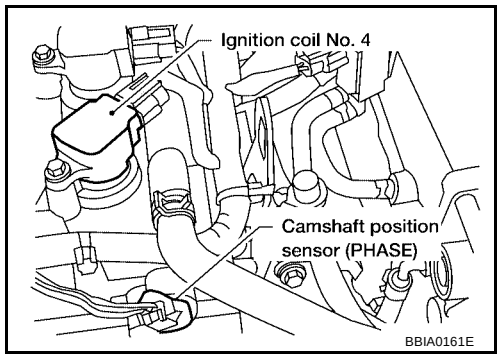
>> GO TO 3.



BBIA0155E

3. CHECK CMP SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



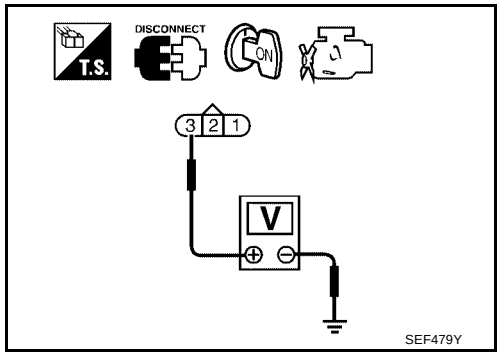
3. Check voltage between CMP sensor (PHASE) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM relay
- Harness for open or short between camshaft position sensor (PHASE) and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between (CMP) sensor (PHASE) terminal 1 and engine ground. Refer to the wiring diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to power in harness or connectors.

6. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between CMP sensor (PHASE) terminal 2 and ECM terminal 14. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-847, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

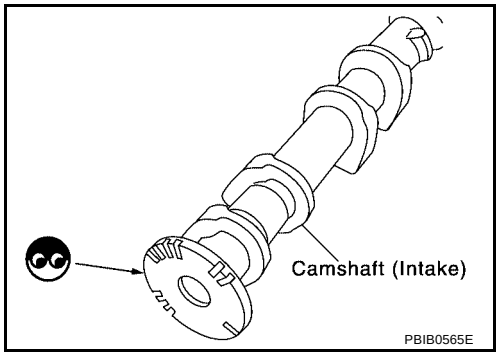
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

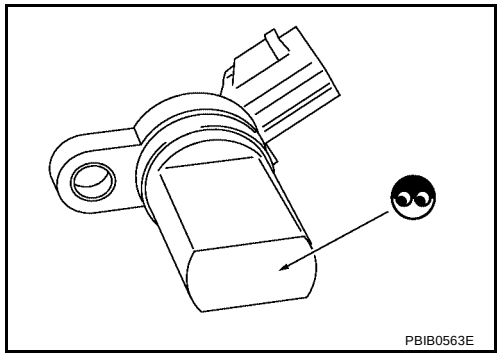
>> **INSPECTION END**

Component Inspection

UBS001W4

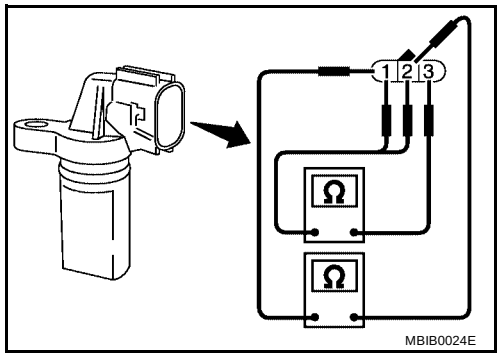
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



Removal and Installation

UBS001W5

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-39, "TIMING CHAIN" .

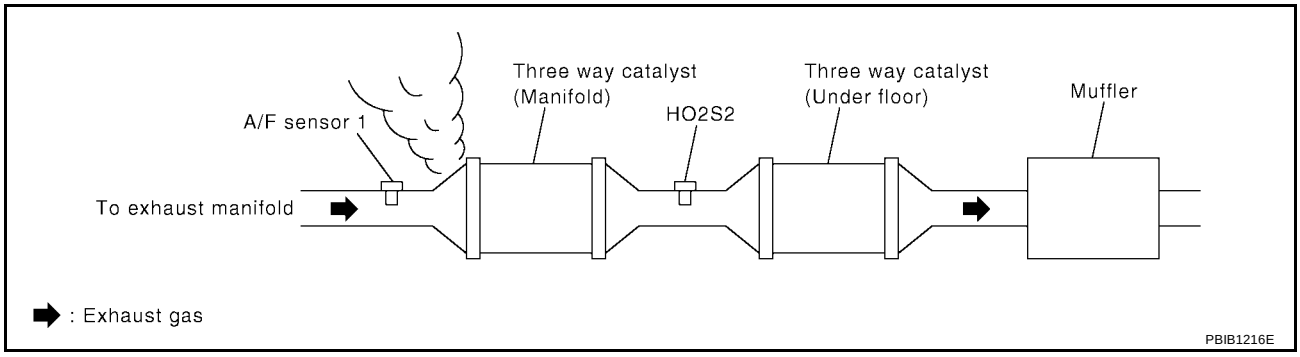
DTC P0420 THREE WAY CATALYST FUNCTION

PFP:20905

On Board Diagnosis Logic

UBS001WZ

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.



A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	● Three way catalyst 1 does not operate properly. ● Three way catalyst 1 does not have enough oxygen storage capacity.	● Three way catalyst (manifold) ● Exhaust tube ● Intake air leaks ● Fuel injectors ● Fuel injector leaks ● Spark plug ● Improper ignition timing

DTC Confirmation Procedure

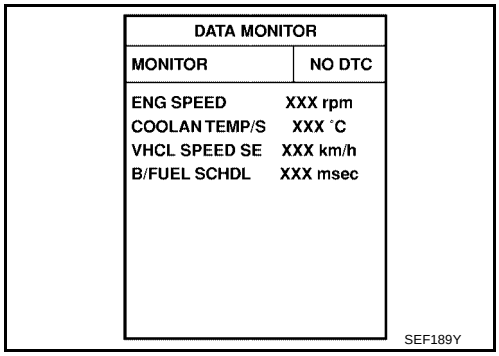
UBS001X0

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

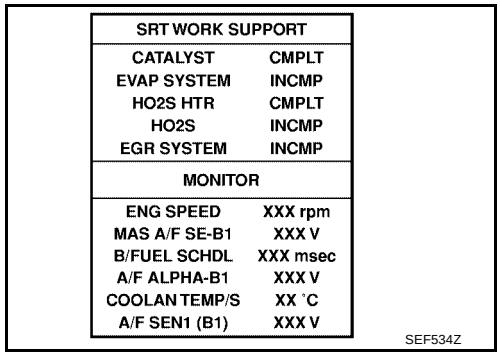
WITH CONSULT-II

TESTING CONDITION:
Do not hold engine speed for more than the specified minutes below.

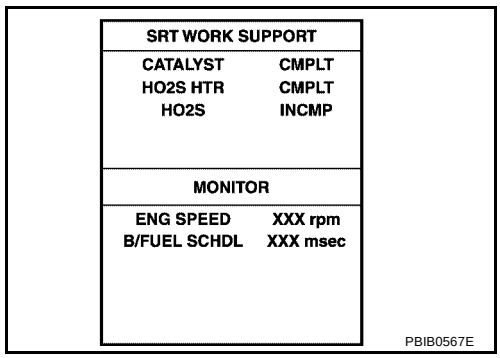
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minute.
6. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
7. Open engine hood.



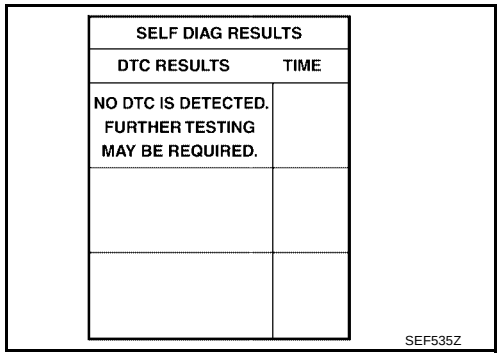
8. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
9. Rev engine up to 2,500 to 3,500 rpm and hold it for 3 consecutive minutes, then release the accelerator pedal completely.
   If “CMPLT” of “CATALYST” changed to “COMPLT”, GO TO STEP 12.
10. Wait 5 seconds at idle.



11. Rev engine up to 2,000 to 3,000 rpm and maintain it until “IMCMP” of “CATALYST” changes to “CMPLT” (it will take approximately 5 minutes).
    If not “CMPLT”, stop engine and cool it down to less than 70°C (158°F) and then retest step 1.



12. Select “SELF-DIAG RESULTS” mode with CONSULT-II.
13. Confirm that the 1st trip DTC is not detected.
    If the 1st trip DTC is detected, go to EC-850, "Diagnostic Procedure" .



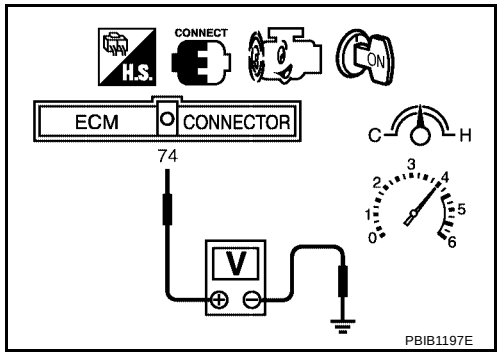
Overall Function Check

UBS001X1

Use this procedure to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Open engine hood.
6. Set voltmeter probe between ECM terminal 74 and ground.
7. Keep engine speed at 2,500 rpm constant under no load.
8. Make sure that the voltage does not vary for more than 5 seconds.
   If the voltage fluctuation cycle takes less than 5 seconds, go to EC-850, "Diagnostic Procedure" .
   - 1 cycle: 0.6 - 1.0 V → 0 - 0.3 V → 0.6 - 1.0 V



Diagnostic Procedure

UBS001X2

1. CHECK EXHAUST SYSTEM

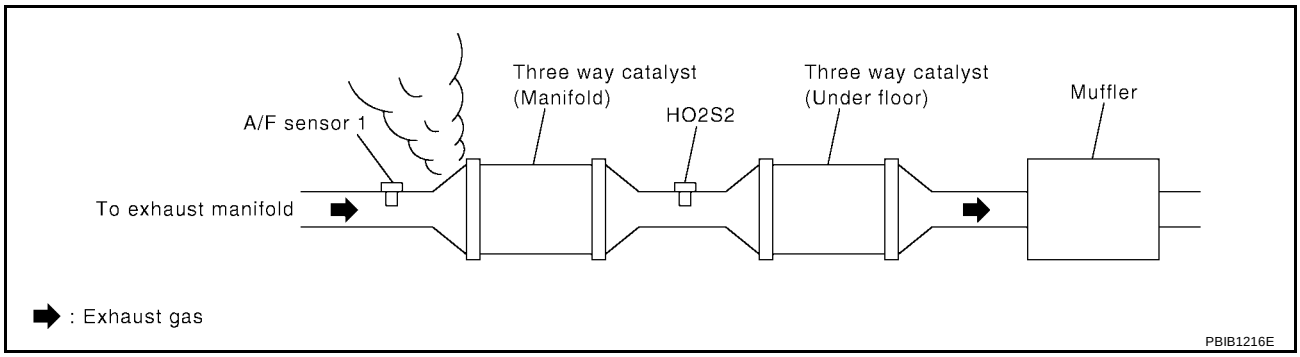
Visually check exhaust tubes and muffler for dent.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before the three way catalyst (manifold).



OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check for ignition timing. Refer to EC-669, "Basic Inspection" .

Items		Specifications
Target idle speed	A/T	800 ± 50 rpm (in “P” or “N” position)
	M/T	650 ± 50 rpm
Ignition timing	A/T	18 ± 5°BTDC (in “P” or “N” position)
	M/T	7 ± 5°BTDC

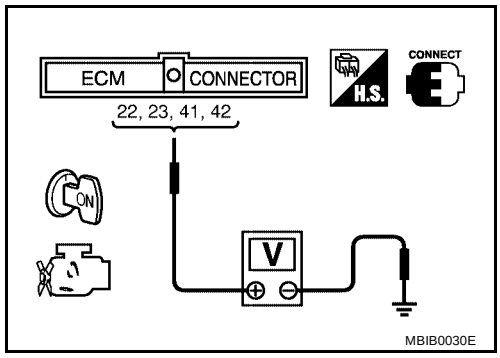
OK or NG

OK >> GO TO 5.
NG >> Follow the “Basic Inspection”.

5. CHECK INJECTORS

1. Refer to Wiring Diagram for Injectors, EC-1169 .
2. Stop engine and then turn ignition switch “ON”.
3. Check voltage between ECM terminals 22, 23, 41, 42 and ground with CONSULT-II or tester.

Battery voltage should exist.

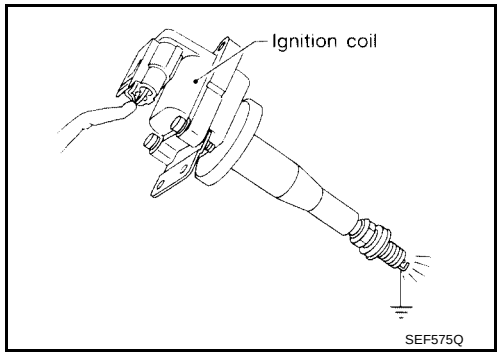


OK or NG

OK >> GO TO 6.
NG >> Perform “Diagnostic Procedure” INJECTOR, EC-1169 .

6. CHECK IGNITION SPARK

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known-good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



OK or NG

OK >> GO TO 7.
NG >> Check ignition coil with power transistor and their circuit.

7. CHECK INJECTOR

1. Turn ignition switch “OFF”.
2. Remove injector assembly. Refer to EM-19, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect ignition coil assembly harness connector.
4. Turn ignition switch “ON”.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip)>>GO TO 8.
NG (Drips)>>Replace the injector(s) from which fuel is dripping.

8. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Trouble is fixed>>**INSPECTION END**
Trouble is not fixed>>Replace three way catalyst (manifold).

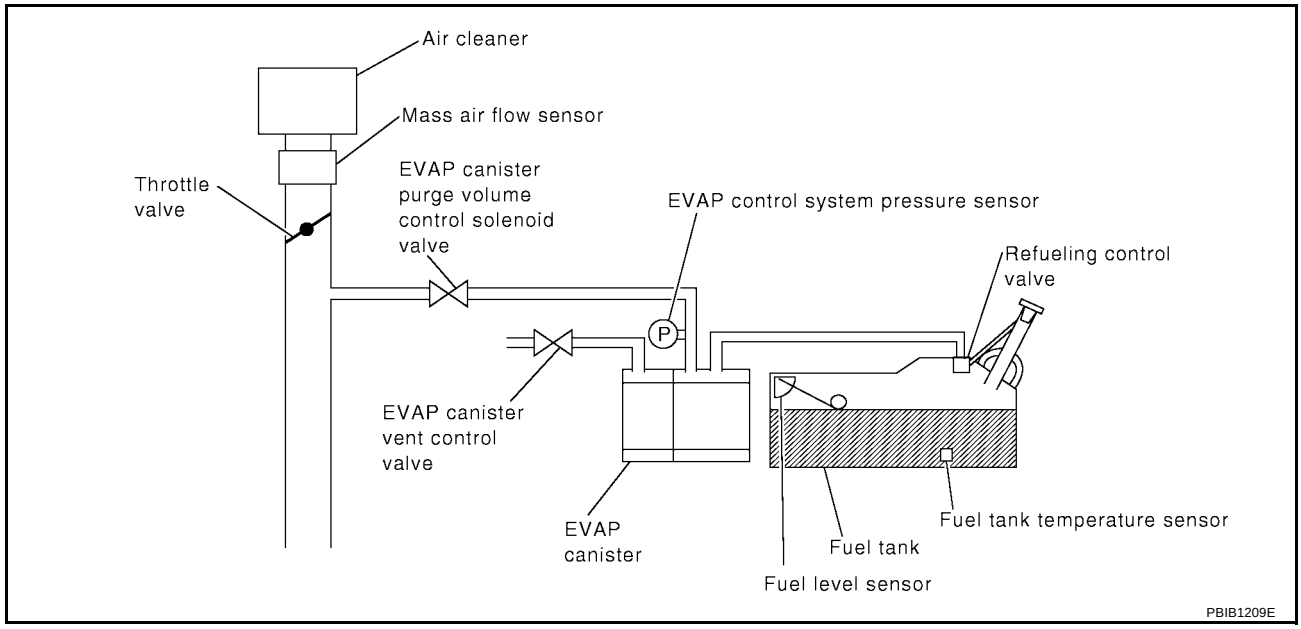
DTC P0441 EVAP CONTROL SYSTEM

PFP:14950

System Description

UBS001X3

NOTE:
If DTC P0441 is displayed with other DTC such as P2122, P2123 P2127, P2128, P2138, first perform trouble diagnosis for other DTC.



In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

On Board Diagnosis Logic

UBS001X4

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441 0441	EVAP control system incorrect purge flow	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	● EVAP canister purge volume control solenoid valve stuck closed ● EVAP control system pressure sensor and the circuit ● Loose, disconnected or improper connection of rubber tube ● Blocked rubber tube ● Cracked EVAP canister ● EVAP canister purge volume control solenoid valve circuit ● Accelerator pedal position sensor ● Blocked purge port ● EVAP canister vent control valve

DTC Confirmation Procedure

UBS001X6

CAUTION:
Always drive vehicle at a safe speed.

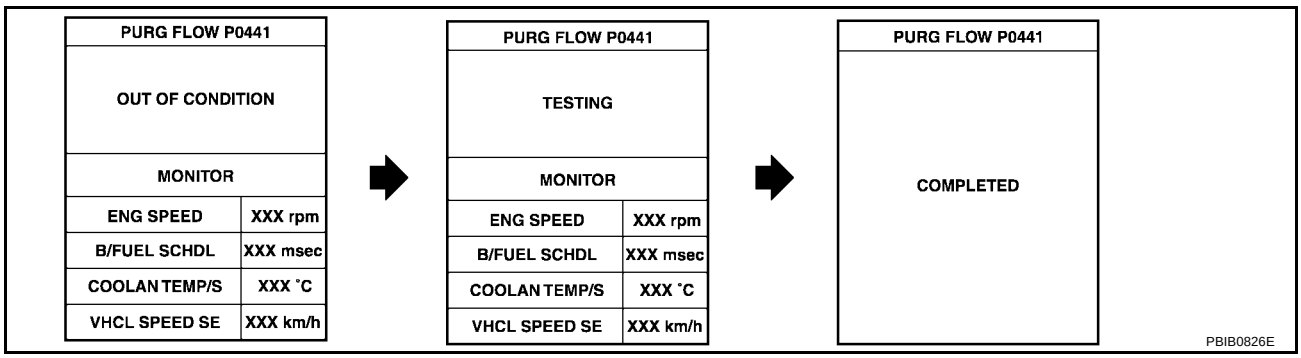
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Always perform test at a temperature of 0°C (32°F) or more.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and let it idle for at least 70 seconds.
4. Select “PURG FLOW P0441” of “EVAPORATIVE SYSTEM” in “DTC CONFIRMATION” mode with CONSULT-II.
5. Touch “START”.
   If “COMPLETED” is displayed, go to step 7.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take at least 35 seconds.)

Selector lever	Suitable position
Vehicle speed	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,800 rpm
B/FUEL SCHDL	1.0 - 8.2 msec
Engine coolant temperature	More than 70°C (158°F)



If “TESTING” is not changed for a long time, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-854, "Diagnostic Procedure" .

Overall Function Check

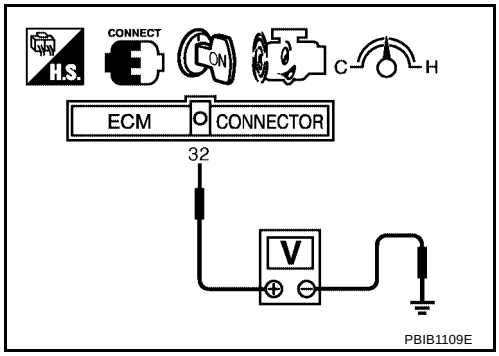
UBS001X7

Use this procedure to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Start engine and wait at least 70 seconds.

5. Set voltmeter probes to ECM terminals 32 (EVAP control system pressure sensor signal) and ground.
6. Check EVAP control system pressure sensor value at idle speed and note it.
7. Establish and maintain the following conditions for at least 1 minute.



Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than “P”, “N” or “R”

8. Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed (measured at step 6) for at least 1 second.
9. If NG, go to EC-854, "Diagnostic Procedure" .

Diagnostic Procedure

UBS001X8

1. CHECK EVAP CANISTER

1. Turn ignition switch “OFF”.
2. Check EVAP canister for cracks.

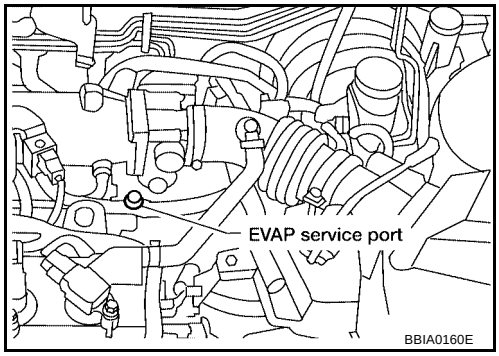
OK or NG

OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> Replace EVAP canister.

2. CHECK PURGE FLOW

With CONSULT-II

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
2. Start engine and let it idle.
3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II.
4. Rev engine up to 2,000 rpm.

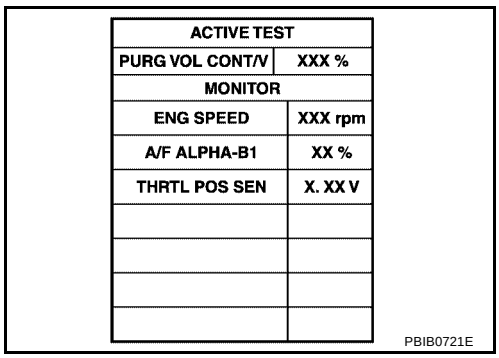


5. Touch “Qd” and “Qu” on CONSULT-II screen to adjust “PURG VOL CONT/V” opening and check vacuum existence.

PURG VOL CONT/V	VACUUM
100.0%	Should exist.
0.0%	should not exist.

OK or NG

OK >> GO TO 7.
NG >> GO TO 4.



3. CHECK PURGE FLOW

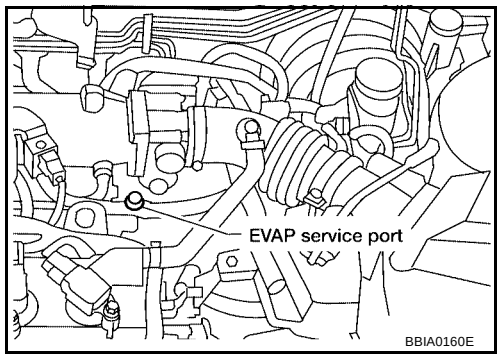
Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum gauge indication when revving engine up to 2,000 rpm.

   Vacuum should exist.

6. Release the accelerator pedal fully and let idle.

   Vacuum should not exist.



OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

4. CHECK EVAP PURGE LINE

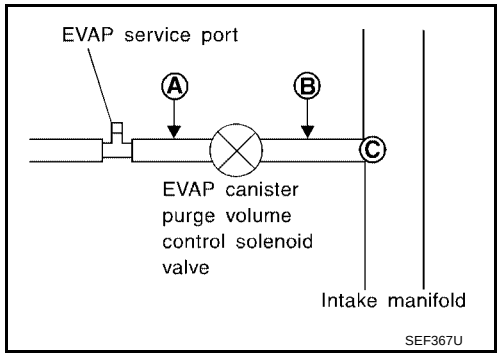
1. Turn ignition switch “OFF”.
2. Check EVAP purge line for improper connection or disconnection. Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 5.
NG >> Repair it.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

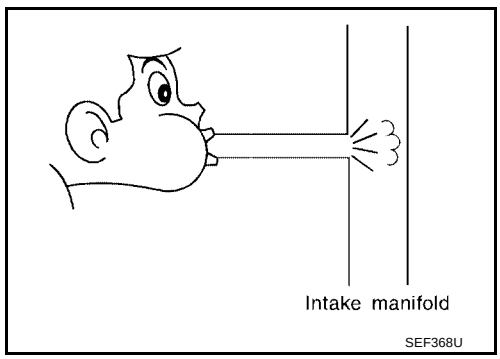
1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B** .
2. Blow air into each hose and EVAP purge port **C** .



3. Check that air flows freely.

OK or NG

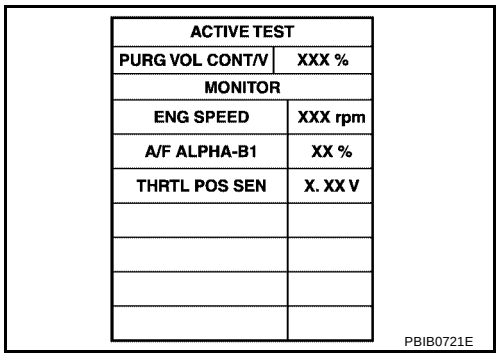
OK (With CONSULT-II)>>GO TO 6.
OK (Without CONSULT-II)>>GO TO 7.
NG >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

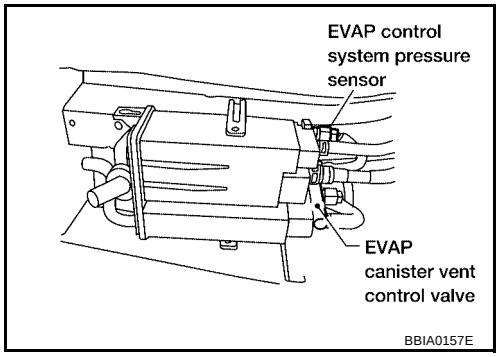
Refer to EC-867 .

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.



OK or NG

OK >> GO TO 9.
NG >> Replace EVAP control system pressure sensor.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to “DTC Confirmation Procedure” for DTC P0452, EC-880 P0453, EC-886 .

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 11.
NG >> Clean the rubber tube using an air blower.

11. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-878 .

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP canister vent control valve.

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.
Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 13.
NG >> Replace it.

13. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

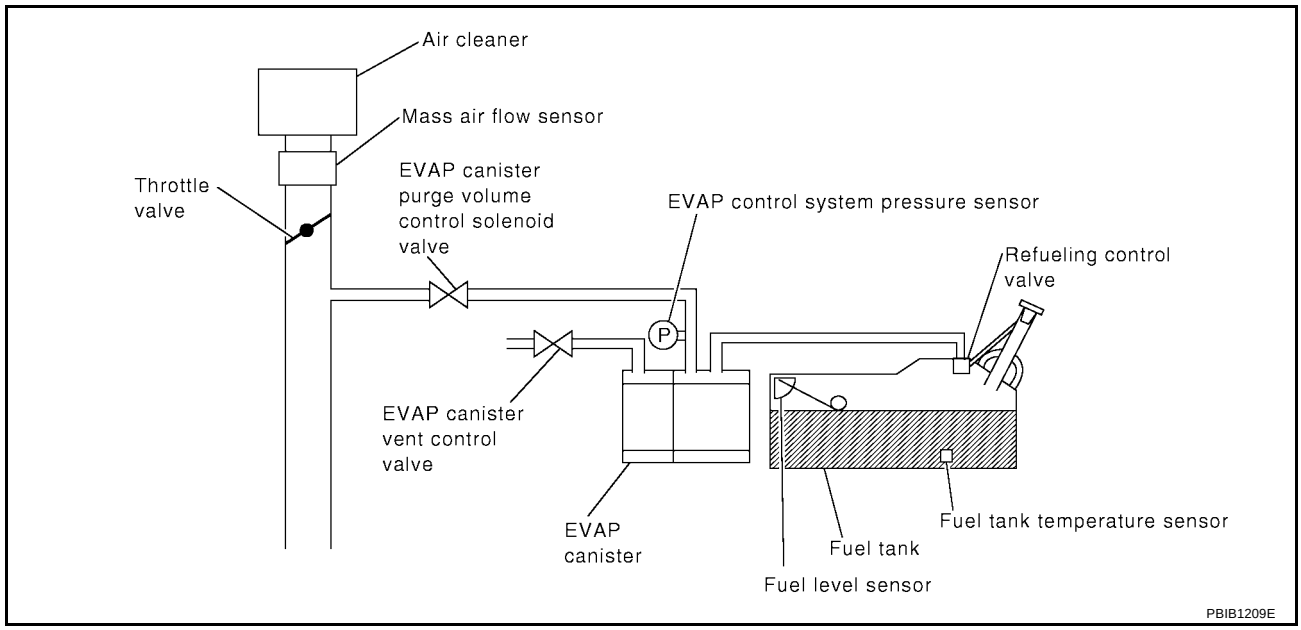
DTC P0442 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS001X9

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.
The EVAP canister vent control valve is closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve will then be opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0442 0442	EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Fuel level sensor and the circuit ● Refueling EVAP vapor cut valve ● ORVR system leaks

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS001XB

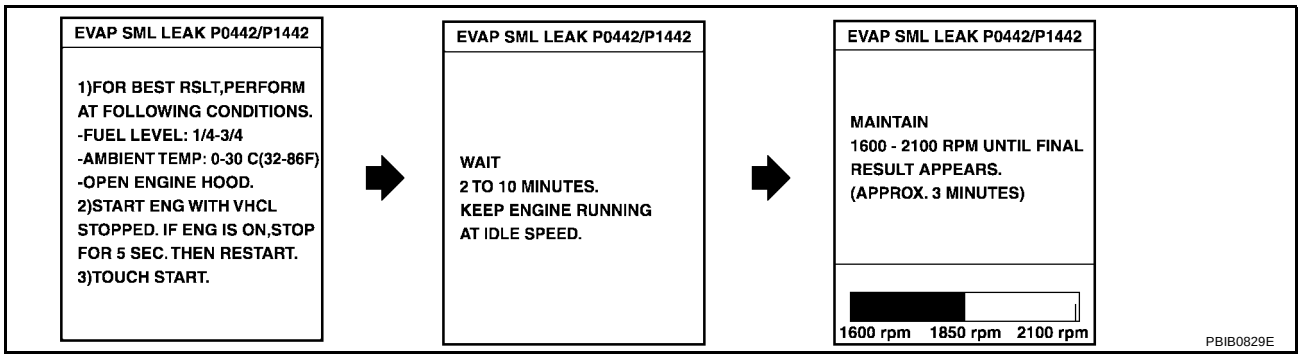
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Always perform test at a temperature of 0 to 30°C (32 to 86°F).**
- **Open engine hood before conducting following procedure.**

WITH CONSULT-II

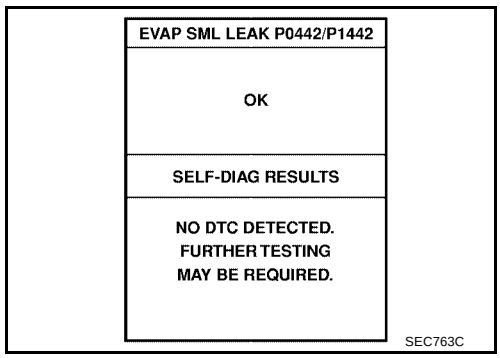
1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Check the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
5. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.



NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-669, "Basic Inspection" .

6. Make sure that “OK” is displayed.
   If “NG” is displayed, refer to EC-860, "Diagnostic Procedure" .

   NOTE:
   Make sure that EVAP hoses are connected to the EVAP canister purge volume control solenoid valve properly.



WITH GST

NOTE:
Be sure to read the explanation of “Driving Pattern” on EC-649 before driving vehicle.

1. Start engine.

2. Drive vehicle according to “Driving Pattern”, EC-649 .
3. Stop vehicle.
4. Select “MODE 1” with GST.
- If SRT of EVAP system is not set yet, go to the following step.
- If SRT of EVAP system is set, the result will be OK.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine.
   It is not necessary to cool engine down before driving.
7. Drive vehicle again according to the “Driving Pattern”, EC-649 .
8. Stop vehicle.
9. Select “MODE 3” with GST.
- If P0442 is displayed on the screen, go to EC-860, "Diagnostic Procedure" .
- If P0441 is displayed on the screen, go to “Diagnostic Procedure” for DTC P0441, EC-854 .
- If P0442 and P0441 are not displayed on the screen, go to the following step.
10. Select “MODE 1” with GST.
- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

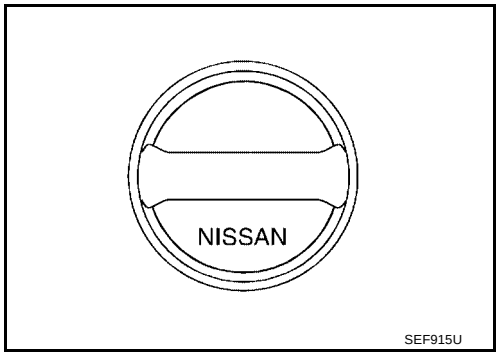
UBS001XC

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

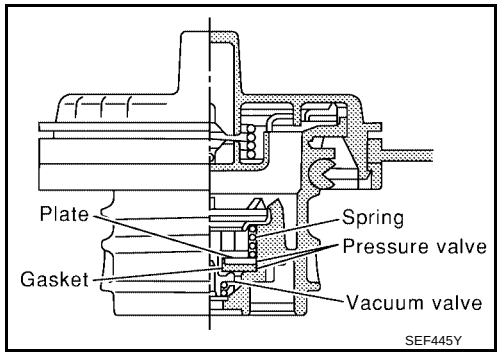
1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.

Pressure:

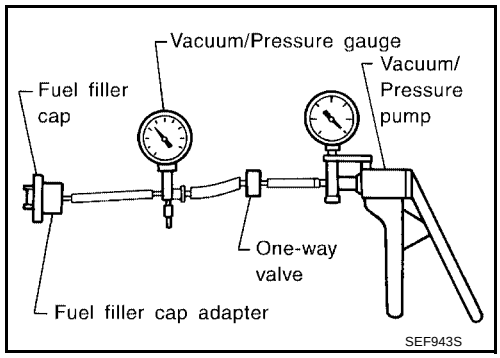
15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)

Vacuum:

−6.0 to −3.3 kPa (−0.061 to −0.035 kg/cm^2 , −0.87 to −0.50 psi)



CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.



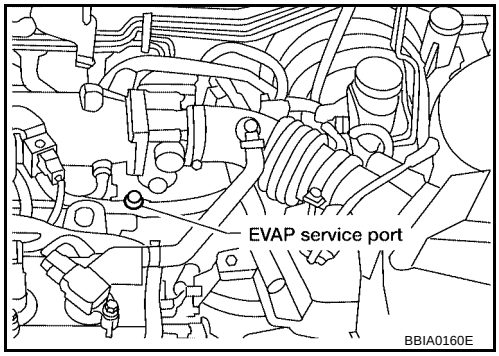
OK or NG

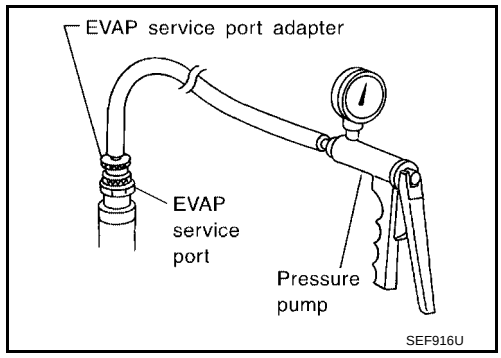
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.
For the location of EVAP service port, refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





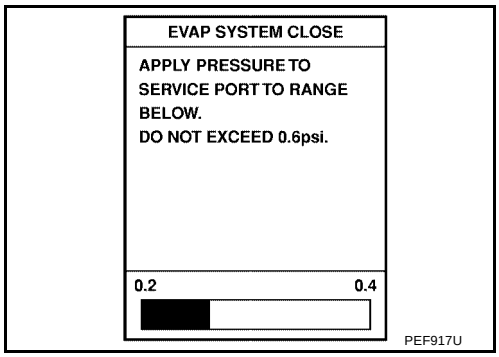
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

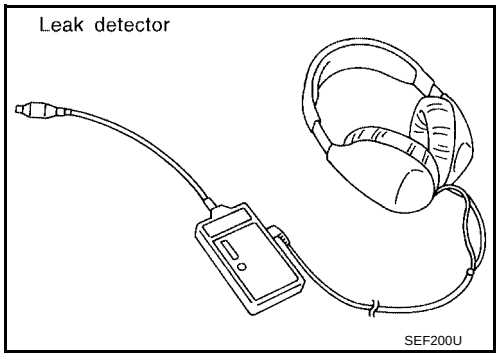
With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

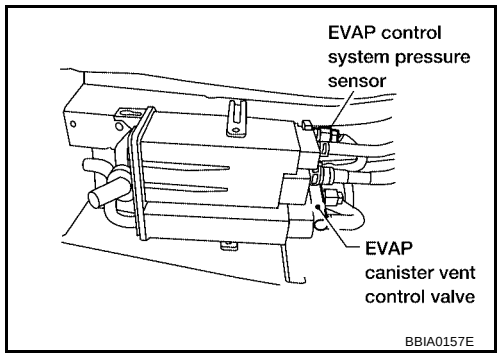
OK >> GO TO 8.
NG >> Repair or replace.

7. CHECK FOR EVAP LEAK

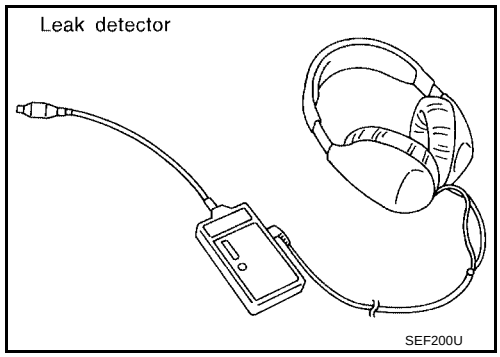
Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-859, "DTC Confirmation Procedure" .

OK or NG

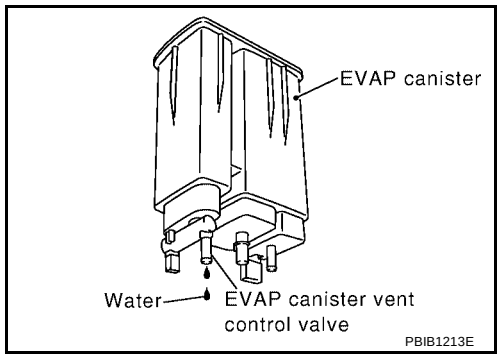
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose cennected to EVAP canister for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vuccum should exist.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
THRTL POS SEN	X. XX V

PBIB0726E

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-872, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-813, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-885, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-1205, "EVAPORATIVE EMISSION SYSTEM" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1212, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses, tubes or filler neck tube.

22. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1215, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

UBS001XD

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Air fuel ratio (A/F) sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*1	Vehicle speed		

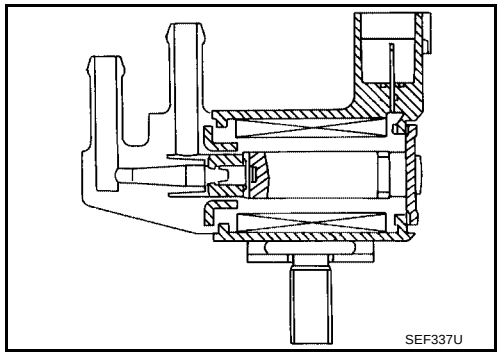
*1: This signal is sent to the ECM through CAN communication line.

*2: The ECM determines the start signal status by the signal of engine speed and battery voltage.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

UBS001XE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle (Vehicle stopped)	0%
		2,000 rpm	—

On Board Diagnosis Logic

UBS001XF

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	● Harness or connectors (The solenoid valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	● Harness or connectors (The solenoid valve circuit is shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

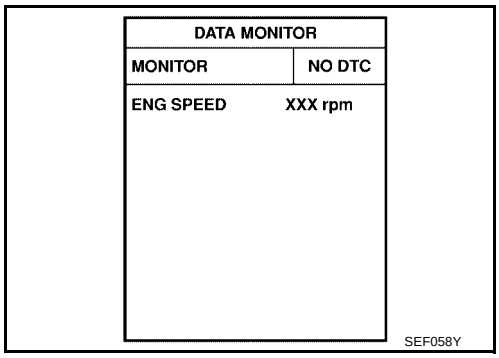
UBS001XH

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 13 seconds.
4. If 1st trip DTC is detected, go to EC-870, "Diagnostic Procedure"
.



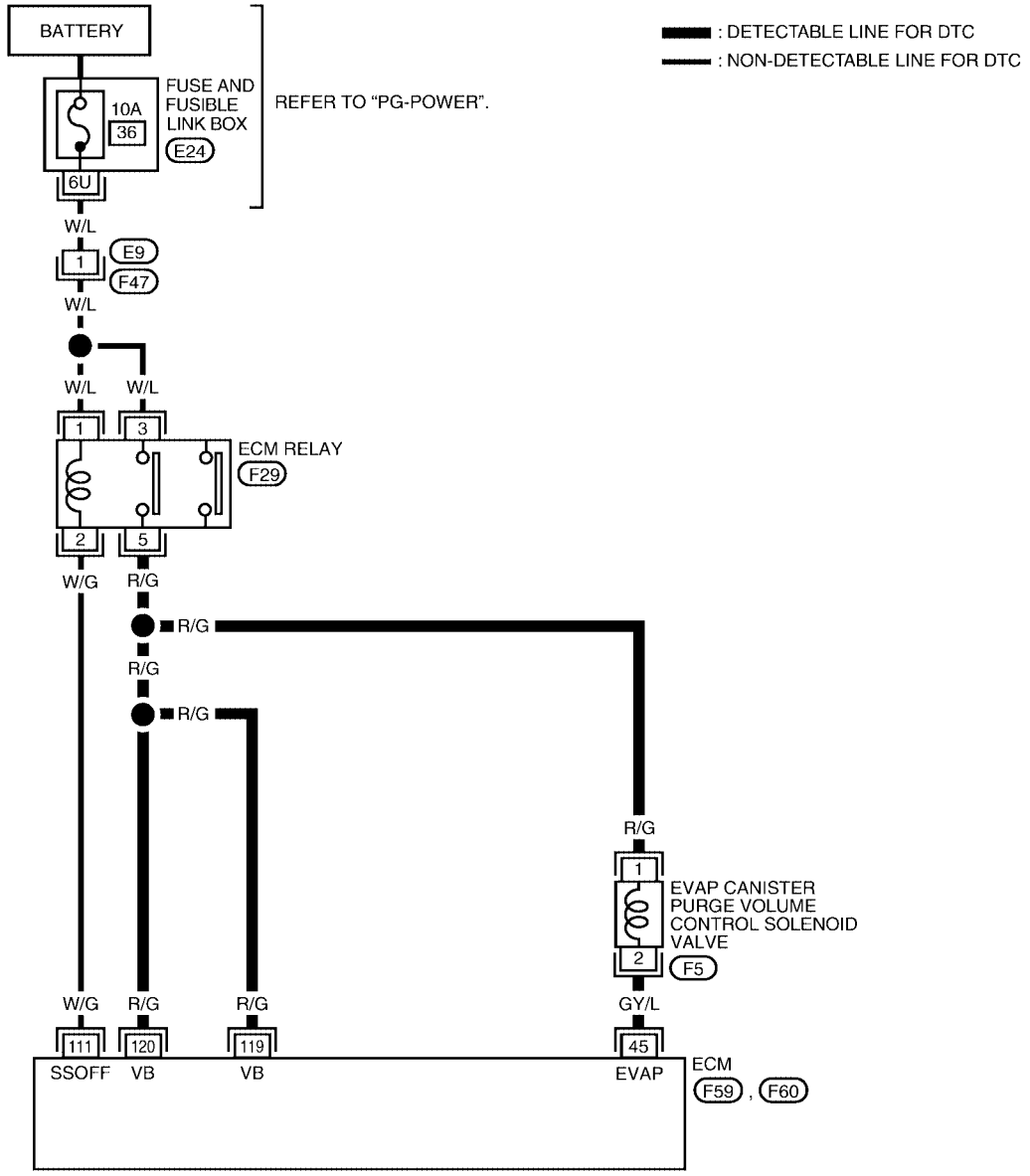
WITH GST

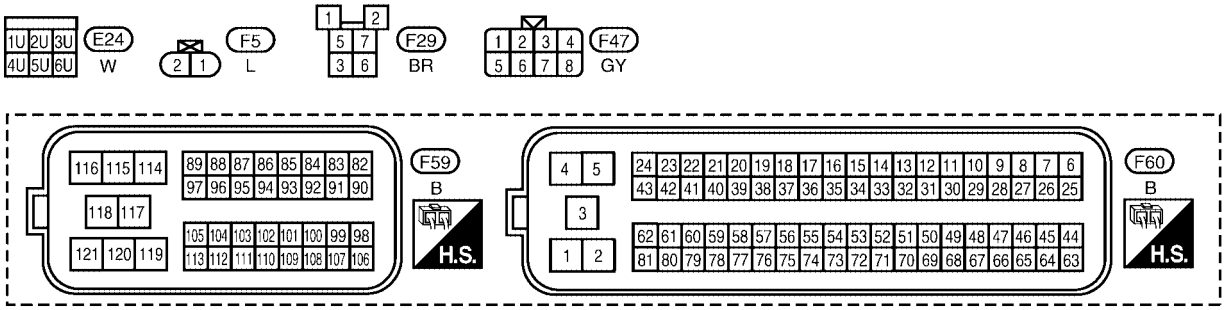
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS001XI

EC-PGC/V-01



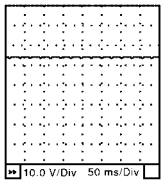
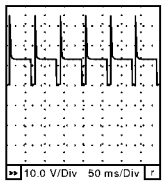


BBWA0785E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  SEC990C
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	Approximately 10V★  SEC991C

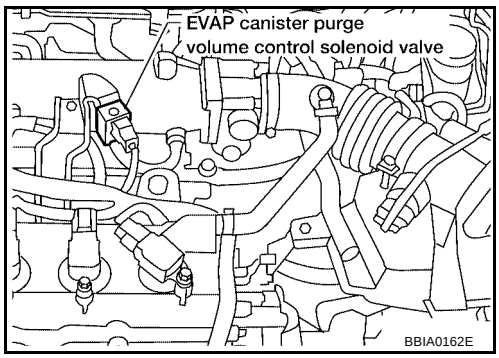
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS001XJ

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



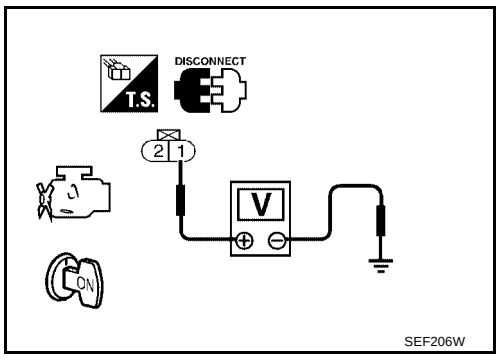
BBIA0162E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF206W

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay.

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

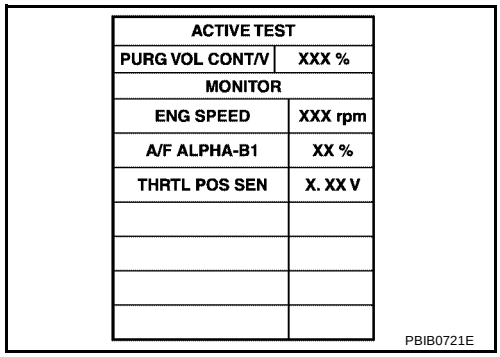
OK or NG

OK (With CONSULT-II)>>GO TO 4.
OK (Without CONSULT-II)>>GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-872, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

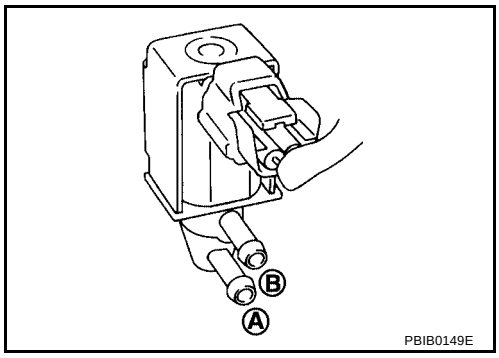
UBS006IJ

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

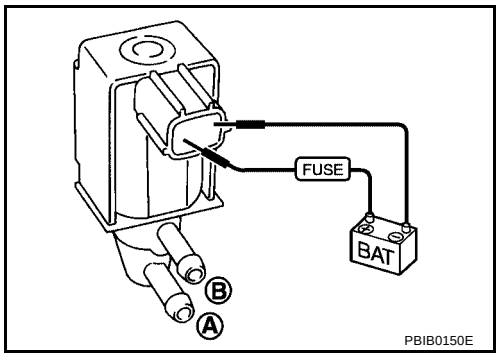
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



Removal and Installation

UBS006IK

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-12, "OUTER COMPONENT PARTS" .

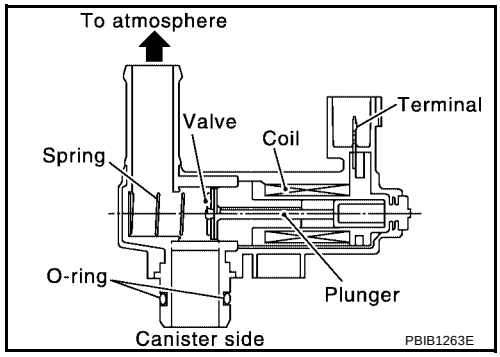
DTC P0447 EVAP CANISTER VENT CONTROL VALVE

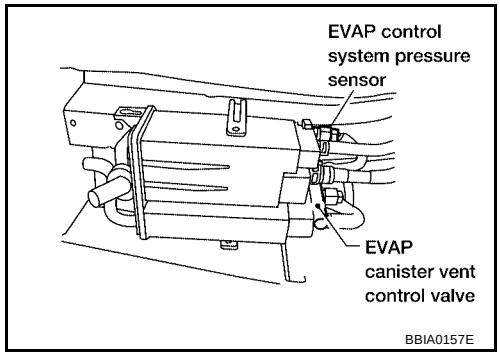
PFP:14935

Component Description

UBS001XK

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnoses.





CONSULT-II Reference Value in Data Monitor Mode

UBS001XL

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS001XM

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447 0447	EVAP canister vent control valve circuit open	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister vent control valve

DTC Confirmation Procedure

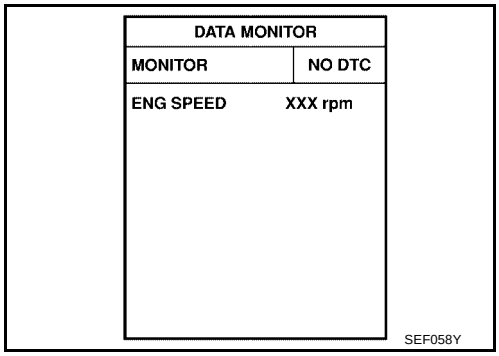
UBS001XO

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch "ON".

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 8 seconds.
4. If 1st trip DTC is detected, go to EC-876, "Diagnostic Procedure"
.



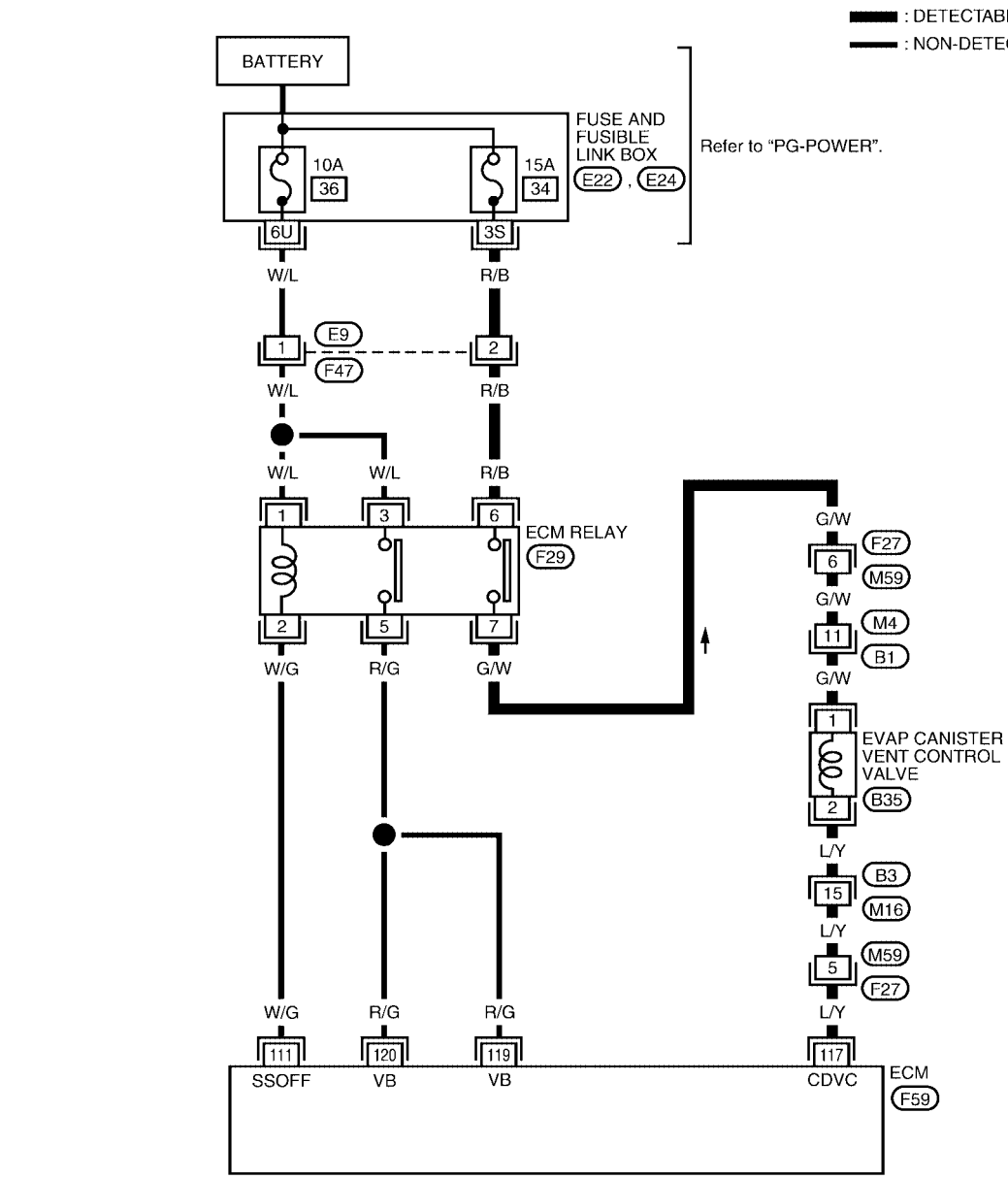
WITH GST

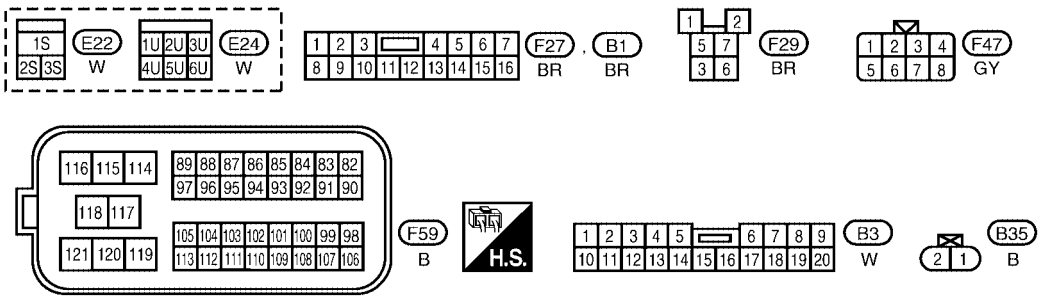
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS001XP

EC-VENT/V-01





BBWA0291E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.5V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
117	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS001XQ

1. INSPECTION START

1. Do you have CONSULT-II?

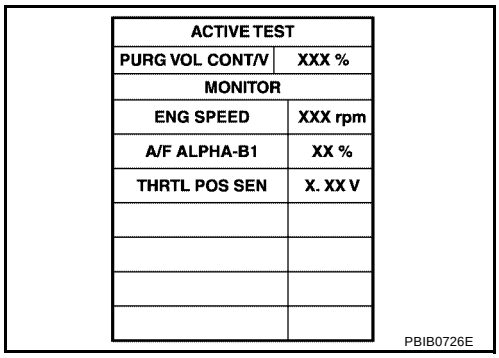
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch "OFF" and then turn "ON".
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON/OFF" on CONSULT-II screen.
4. Check for operating sound of the valve.
   Clicking noise should be heard.

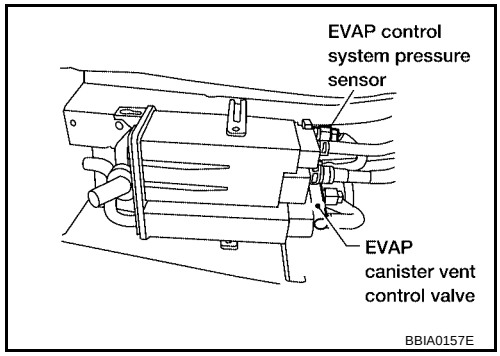


OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

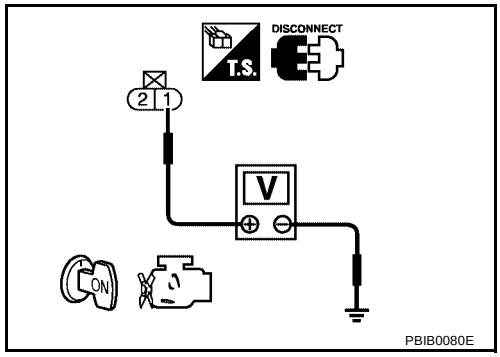
3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister vent control valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between EVAP canister vent control valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F27, M59
- Harness connectors B1, M4
- Harness for open or short between EVAP canister vent control valve and ECM relay

>> Repair harness or connectors.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 117 and EVAP canister vent control valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M59, F27
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 8.
NG >> Clean the rubber tube using an air blower.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-878, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister vent control valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

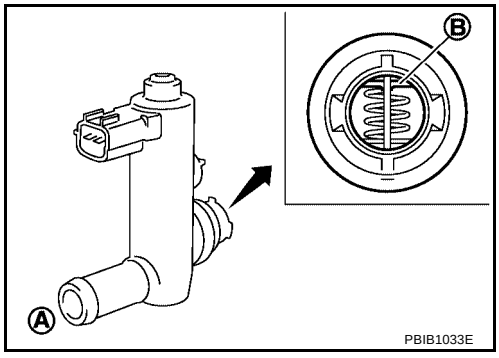
Component Inspection

UBS006I3

EVAP CANISTER VENT CONTROL VALVE

With CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
   If NG, replace EVAP canister vent control valve.
   If OK, go to next step.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.
   Make sure new O-ring is installed properly.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
THRTL POS SEN	X. XX V

PBIB0721E

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

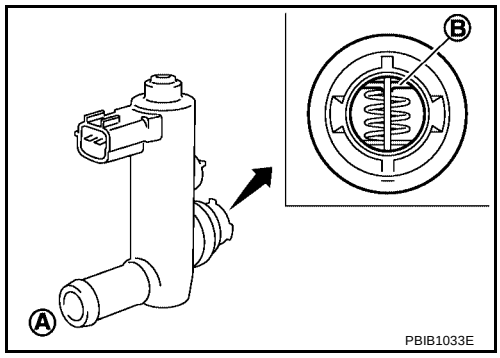
Operation takes less than 1 second.

If NG, replace EVAP canister vent control valve.
If OK, go to next step.

7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform step 6 again.

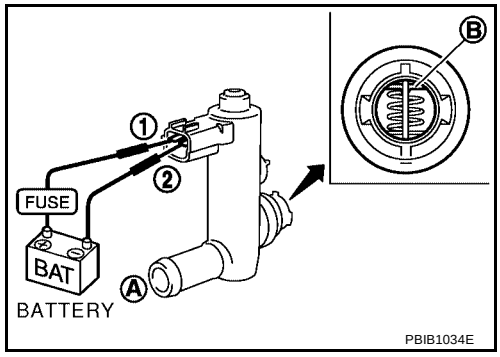
Without CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



PBIB1033E

3. Check air passage continuity and operation delay time under the following conditions.
   Make sure new O-ring is installed properly.



PBIB1034E

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes

Operation takes less than 1 second.

If NG, replace EVAP canister vent control valve.
If OK, go to next step.

4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.

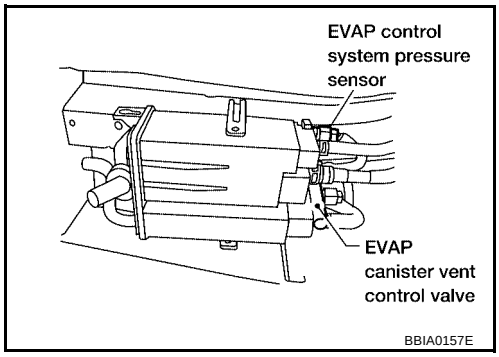
DTC P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

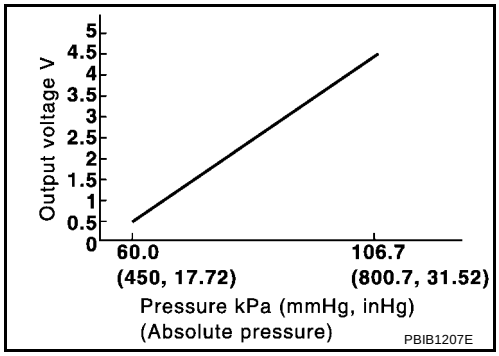
PFP:25085

Component Description

UBS003NR

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.





CONSULT-II Reference Value in Data Monitor Mode

UBS003NS

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	Approx. 1.8 - 4.8V

On Board Diagnosis Logic

UBS003NT

NOTE:
If DTC P0452 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-1028.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452 0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP control system pressure sensor

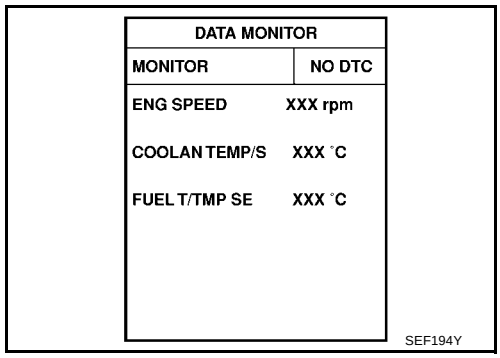
DTC Confirmation Procedure

UBS003NV

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 0°C (32°F) or more.

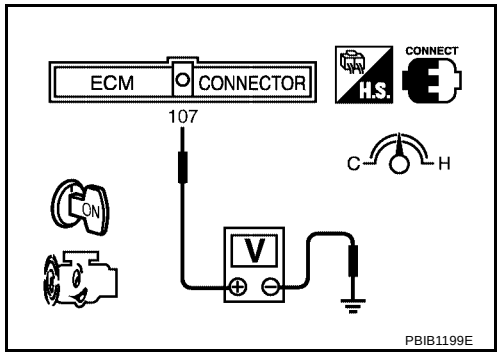
WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
7. If 1st trip DTC is detected, go to EC-883, "Diagnostic Procedure"
.



WITH GST

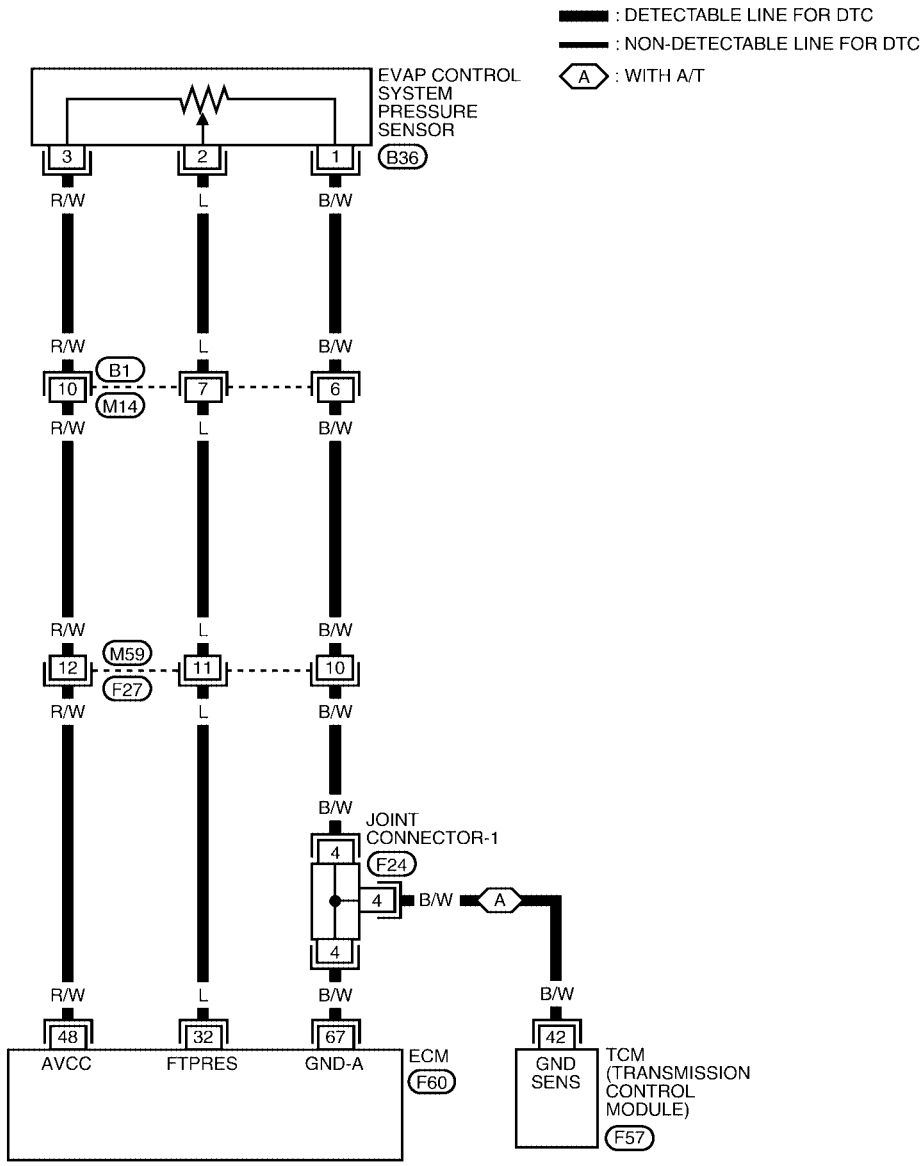
1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and wait at least 20 seconds.
5. Select “MODE 7” with GST.
6. If 1st trip DTC is detected, go to EC-883, "Diagnostic Procedure"
.

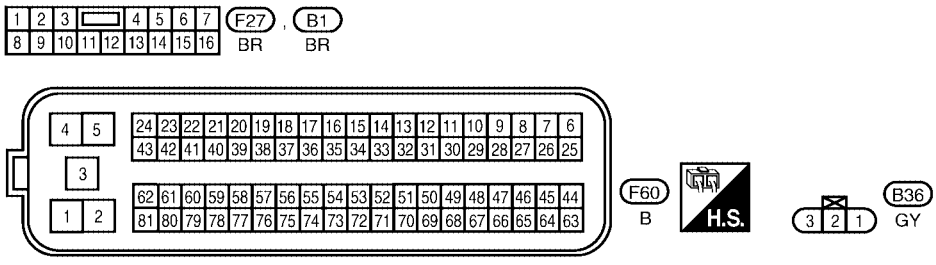


Wiring Diagram

UBS003NW

EC-PRE/SE-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

BBWA0786E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	L	EVAP control system pressure sensor	**[Ignition switch "ON"]**	Approximately 1.8 - 4.8V
48	L/W	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
67	B/W	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

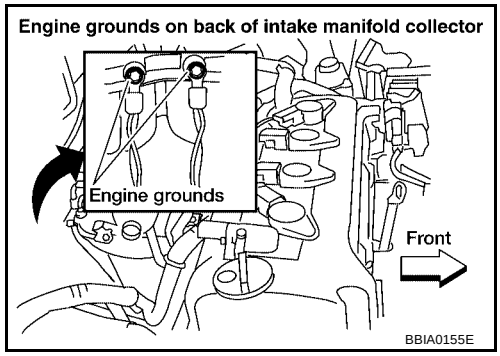
Diagnostic Procedure

UBS003NX

1. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 2.



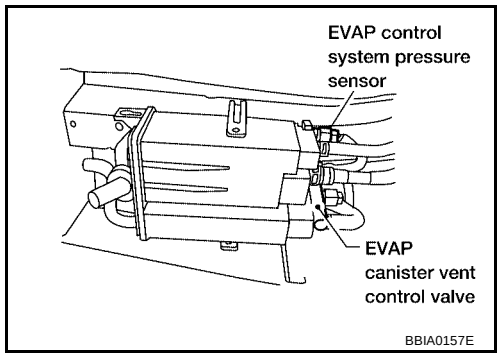
2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.

Water should not exist.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.



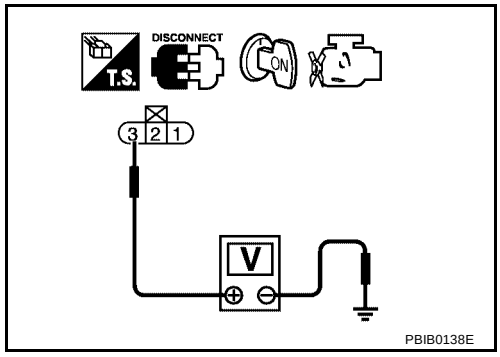
3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "ON".
2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EVAP control system pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between EVAP control system pressure sensor and TCM
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between ECM and EVAP control system pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-885, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

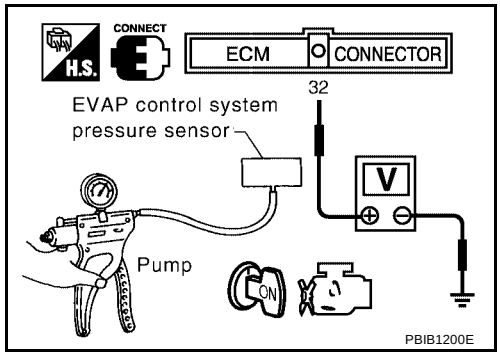
Component Inspection

UBS006I4

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove EVAP control system pressure sensor from EVAP canister.
   Do not reuse the O-ring, replace it with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch “ON” and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value



CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).**

5. If NG, replace EVAP control system pressure sensor.

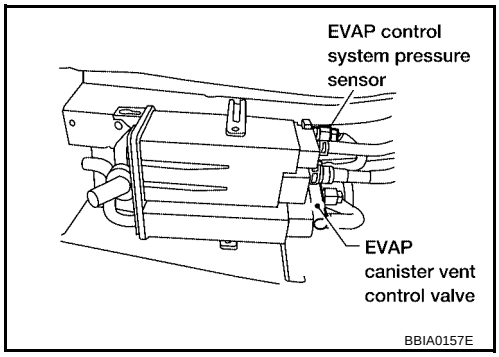
DTC P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

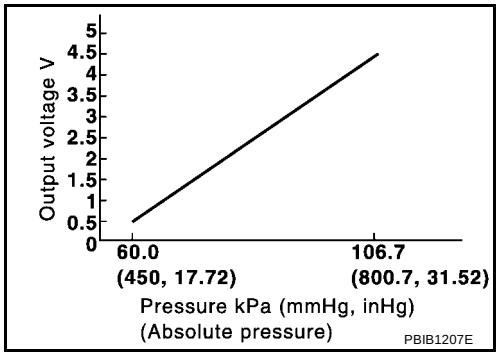
PFP:25085

Component Description

UBS003NY

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.





CONSULT-II Reference Value in Data Monitor Mode

UBS003NZ

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	Approx. 1.8 - 4.8V

On Board Diagnosis Logic

UBS003O0

NOTE:
If DTC P0453 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-1028.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453 0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP control system pressure sensor ● EVAP canister vent control valve ● EVAP canister ● Rubber hose to EVAP canister vent control valve ● EVAP canister purge volume control solenoid valve

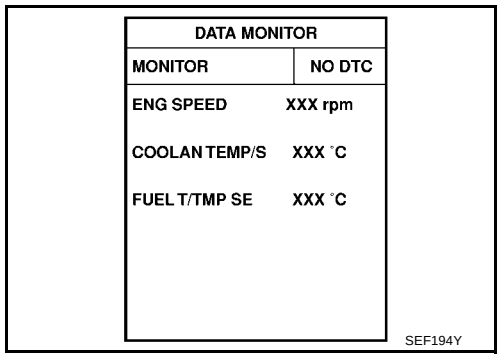
DTC Confirmation Procedure

UBS003O2

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 0°C (32°F) or more.

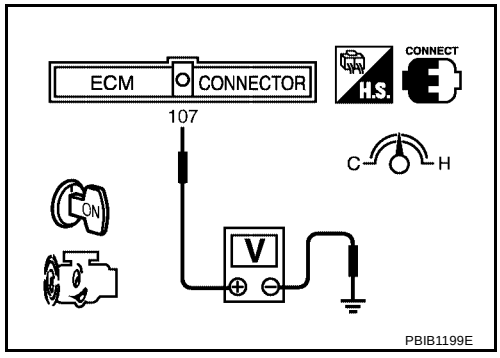
WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
7. If 1st trip DTC is detected, go to EC-889, "Diagnostic Procedure".



WITH GST

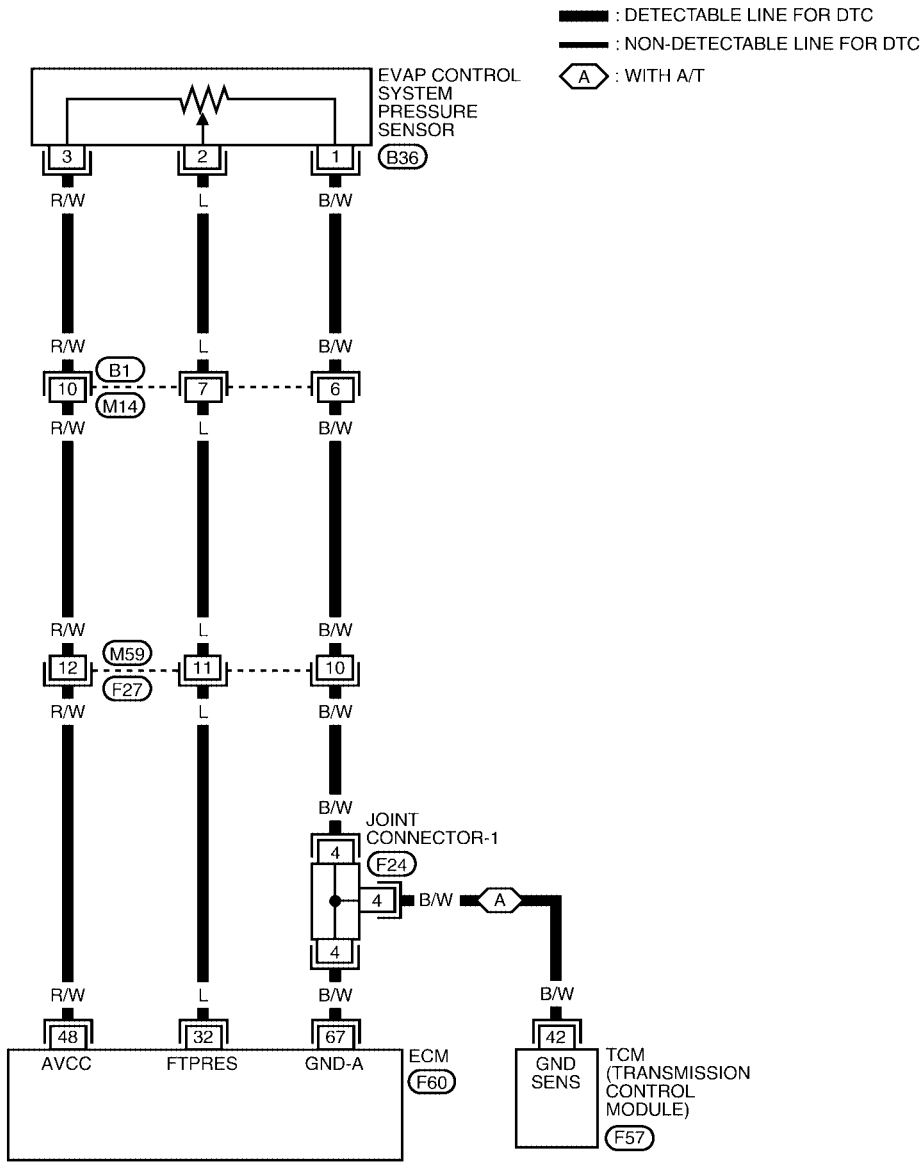
1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and wait at least 20 seconds.
5. Select “MODE 7” with GST.
6. If 1st trip DTC is detected, go to EC-889, "Diagnostic Procedure".

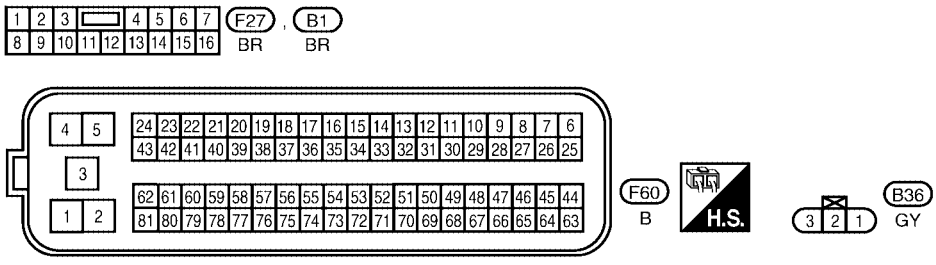


Wiring Diagram

UBS003O3

EC-PRE/SE-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

BBWA0786E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	L	EVAP control system pressure sensor	**[Ignition switch "ON"]**	Approximately 1.8 - 4.8V
48	R/W	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
67	B/W	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

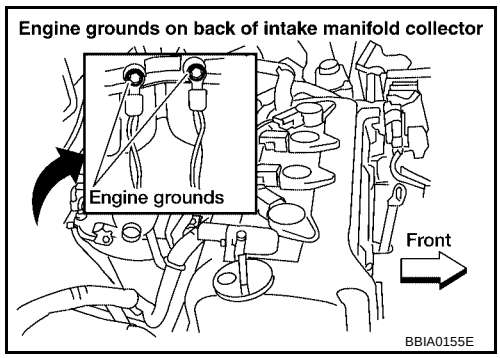
Diagnostic Procedure

UBS003O4

1. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 2.



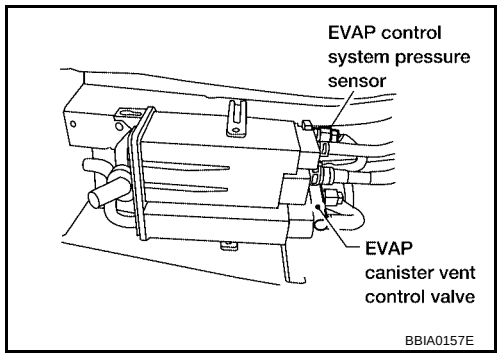
2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.

Water should not exist.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.



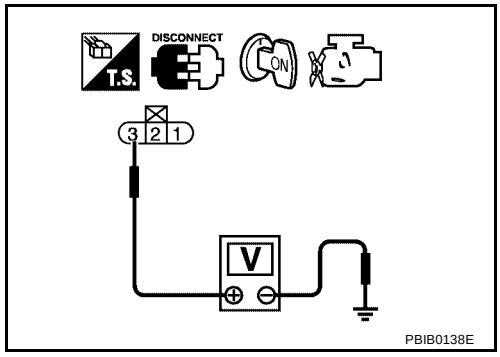
3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "ON".
2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EVAP control system pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between EVAP control system pressure sensor and TCM
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between ECM and EVAP control system pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 10.
NG >> Clean the rubber tube using an air blower.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-878, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP canister vent control valve.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-892, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP control system pressure sensor.

12. CHECK RUBBER TUBE

Check obstructed rubber tube connected to EVAP canister vent control valve.

OK or NG

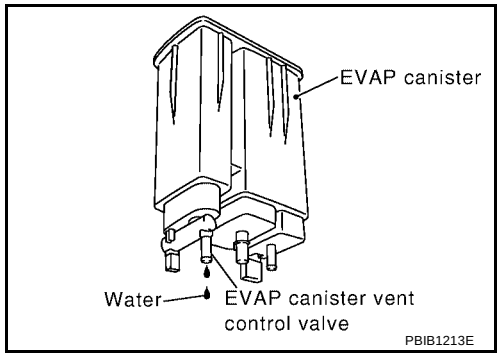
OK >> GO TO 13.
NG >> Clean rubber tube using an air blower, repair or replace rubber tube.

13. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Check if water will drain from the EVAP canister.

Yes or No

Yes >> GO TO 14.
No >> GO TO 16.



14. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose connected to EVAP canister for clogging or poor connection

>> Repair hose or replace EVAP canister.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

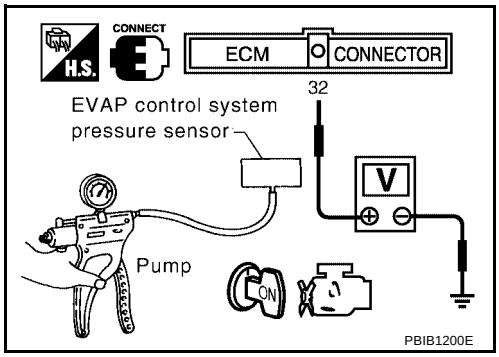
Component Inspection

UBS006I5

EVAP CONTROL PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove EVAP control system pressure sensor from EVAP canister.
   Do not reuse the O-ring, replace it with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch “ON” and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value



CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).**

5. If NG, replace EVAP control system pressure sensor.

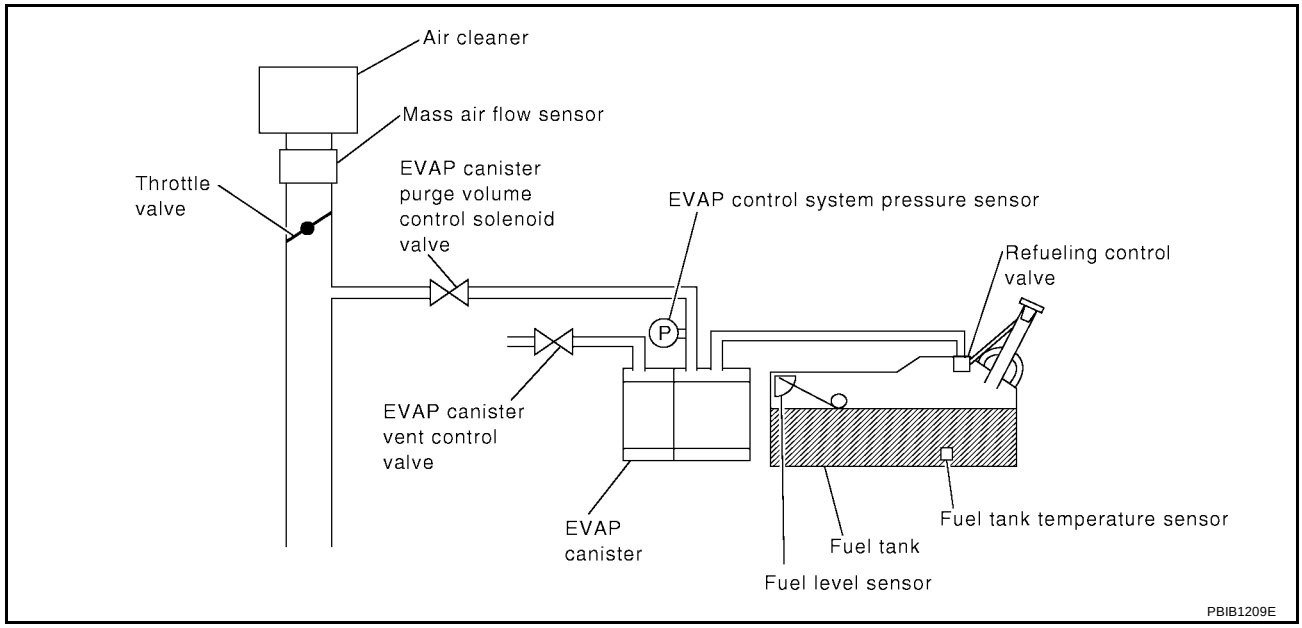
DTC P0455 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS001XY

This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0455 0455	EVAP control system gross leak detected	EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.	● Fuel filler cap remains open or fails to close. ● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent. ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged. ● EVAP control system pressure sensor ● Refueling EVAP vapor cut valve ● ORVR system leaks

DTC Confirmation Procedure

UBS001Y0

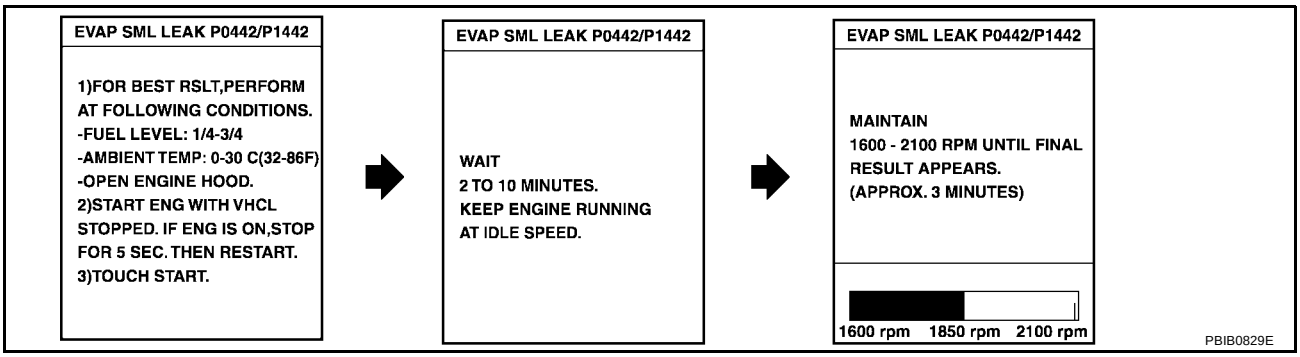
CAUTION:
Never remove fuel filler cap during the DTC Confirmation Procedure.

NOTE:
- **Make sure that EVAP hose are connected to EVAP canister purge volume control solenoid valve properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedure.**

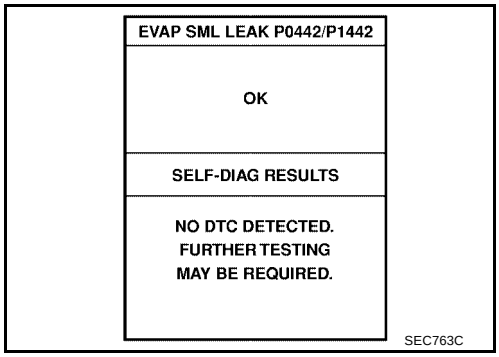
WITH CONSULT-II

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch “ON”.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.



NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-669, "Basic Inspection" .

7. Make sure that “OK” is displayed.
   If “NG” is displayed, select “SELF-DIAG RESULTS” mode with CONSULT-II and make sure that “EVAP GROSS LEAK [P0455]” is displayed. If it is displayed, refer to EC-895, "Diagnostic Procedure" .
   If P0442 is displayed, perform “Diagnostic Procedure” for DTC P0442, EC-860 .



WITH GST

NOTE:
Be sure to read the explanation of “Driving Pattern” on EC-649 before driving vehicle.

1. Start engine.
2. Drive vehicle according to “Driving Pattern”, EC-649 .
3. Stop vehicle.
4. Select “MODE 1” with GST.

- If SRT of EVAP system is not set yet, go to the following step.
- If SRT of EVAP system is set, the result will be OK.

5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine.
   It is not necessary to cool engine down before driving.
7. Drive vehicle again according to the “Driving Pattern”, EC-649 .
8. Stop vehicle.
9. Select “MODE 3” with GST.

- If P0455 is displayed on the screen, go to EC-895, "Diagnostic Procedure" .
- If P0442 is displayed on the screen, go to “Diagnostic Procedure”, for DTC P0442, EC-860 .
- If P0441 is displayed on the screen, go to “Diagnostic Procedure” for DTC P0441, EC-854 .
- If P0441, P0442 and P0455 are not displayed on the screen, go to the following step.

10. Select “MODE 1” with GST.

- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

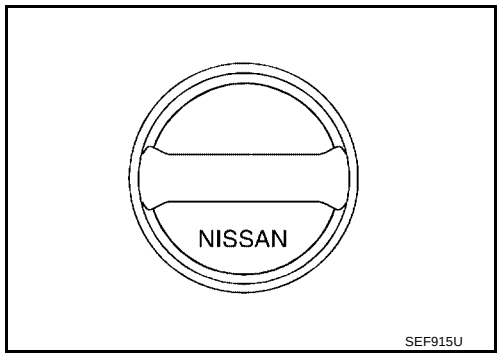
UBS001Y1

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

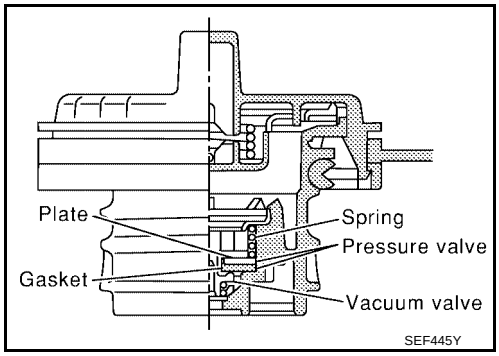
OK or NG

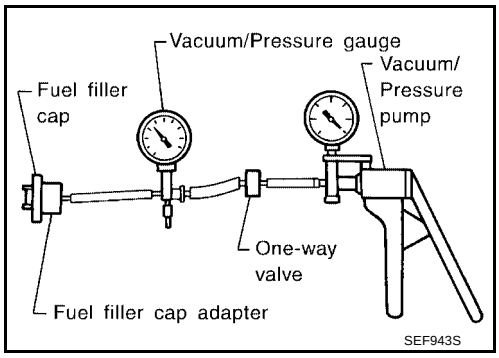
OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.

Pressure:
15.3 - 20.0 kPa
(0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)
Vacuum:
–6.0 to –3.4 kPa
(–0.061 to –0.035 kg/cm^2 , –0.87 to –0.48 psi)





CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

OK or NG

OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.
Refer to EC-1205, "EVAPORATIVE EMISSION SYSTEM" .

OK or NG

OK >> GO TO 6.
NG >> Repair or reconnect the hose.

6. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control is installed properly.
  Refer to EC-1209, "Removal and Installation"
- EVAP canister vent control valve.
  Refer to EC-878, "Component Inspection"

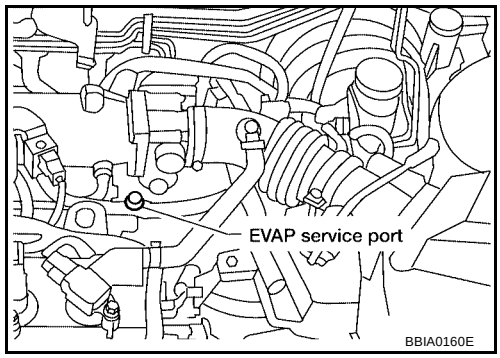
OK or NG

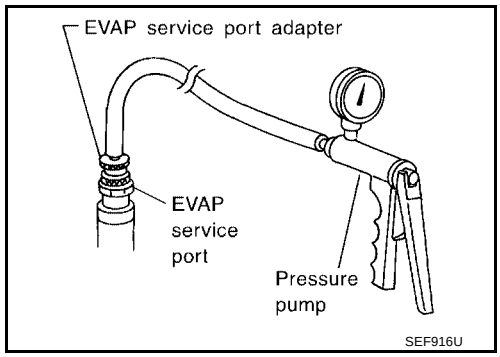
OK >> GO TO 8.
NG >> Repair or replace EVAP canister vent control valve and O-ring.

8. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





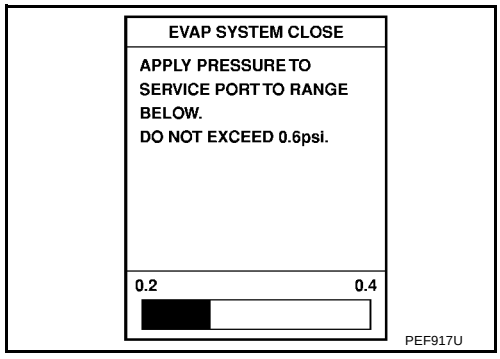
Models with CONSULT-II>>GO TO 9.
Models without CONSULT-II>>GO TO 10.

9. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

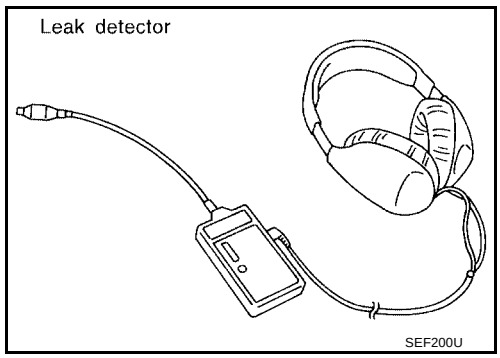
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 11.
NG >> Repair or replace.

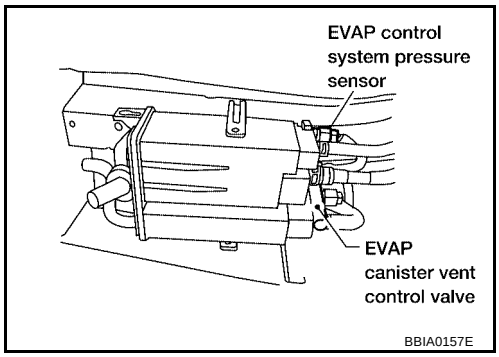


10. CHECK FOR EVAP LEAK

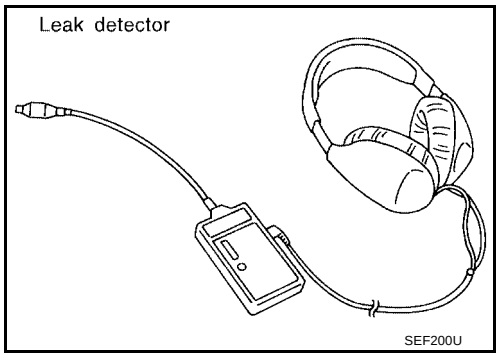
Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

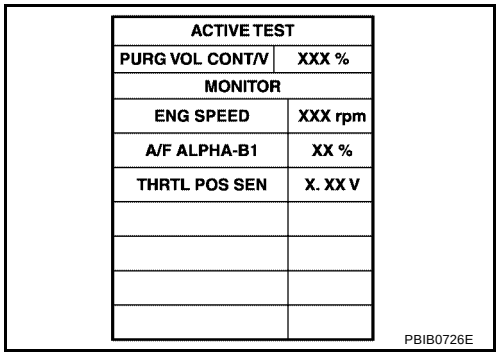
OK >> GO TO 12.
NG >> Repair or replace.

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

   Vacuum should exist.



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

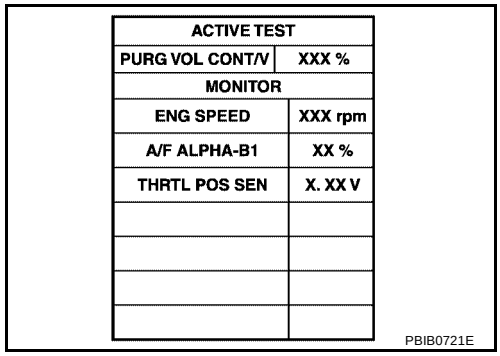
OK or NG

OK (With CONSULT-II)>>GO TO 14.
OK (Without CONSULT-II)>>GO TO 15.
NG >> Repair or reconnect the hose.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-872, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-813, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-885, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP/ORVR VAPOR LINE

Check refueling EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1212, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 19.
>> Repair or replace hoses and tubes.

19. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 20.
>> Repair or replace hoses, tubes or filler neck tube.

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1215, "Component Inspection" .

OK or NG

OK >> GO TO 21.
>> Replace refueling EVAP vapor cut valve with fuel tank.

21. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

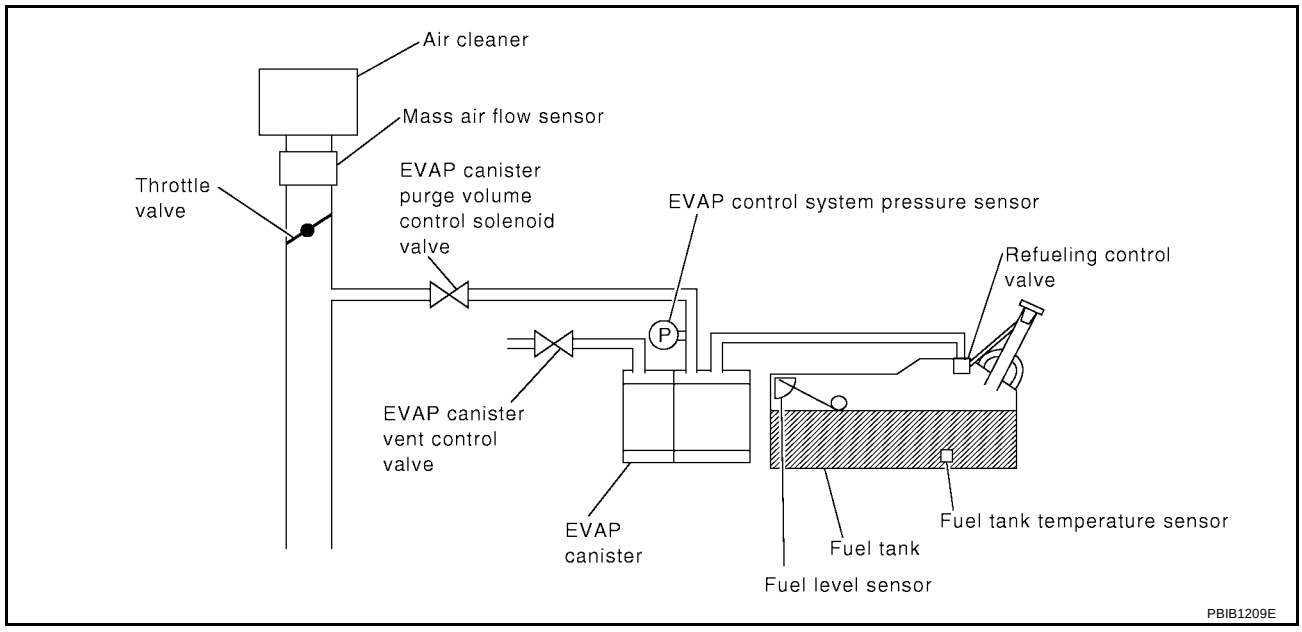
DTC P0456 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS0068W

This diagnosis detects very small leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the intake manifold vacuum in the same way as conventional EVAP small leak diagnosis.
If ECM judges a leak which corresponds to a very small leak, the very small leak P0456 will be detected.
If ECM judges a leak equivalent to a small leak, EVAP small leak P0442 will be detected.
If ECM judges there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456 0456	Evaporative emission control system very small leak (negative pressure check)	● EVAP system has a very small leak. ● EVAP system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Refueling EVAP vapor cut valve ● ORVR system leaks ● Fuel level sensor and the circuit ● Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS0068X

NOTE:

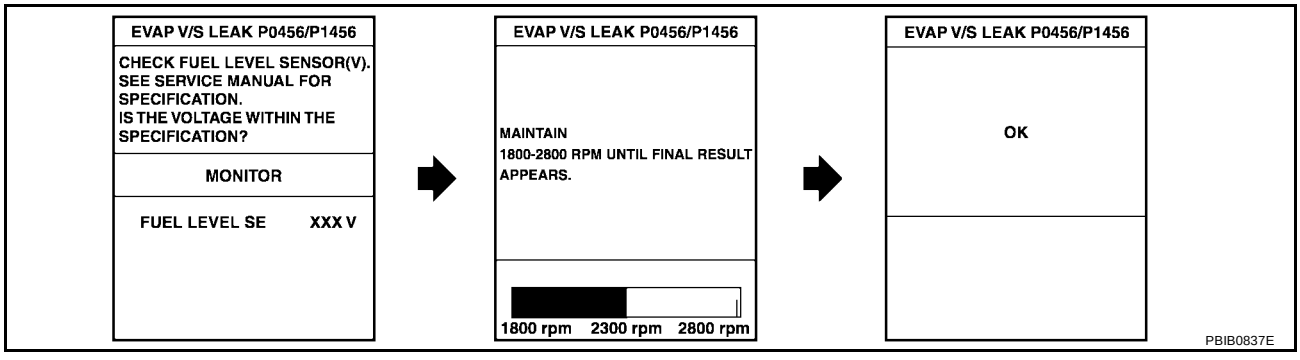
- **If DTC P0456 is displayed with P0442, perform first trouble diagnosis for DTC P0456.**
- **After repair, make sure that the hoses and clips are installed properly.**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Open engine hood before conducting following procedure.**
- **If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**
  - **Fuel filler cap is removed.**
  - **Refilled or drained the fuel.**
  - **EVAP component parts is/are removed.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2. Make sure the following conditions are met.
   FUEL LEVEL SE: 0.25 - 1.4V
   COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
   FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
   INT A/TEMP SE: More than 0°C (32°F)
   If NG, turn ignition switch "OFF" and leave the vehicle in a cool place (soak the vehicle) or refilling/draining fuel until the output voltage condition of the "FUEL LEVEL SE" meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1).
3. Turn ignition switch "OFF" and wait at least 10 seconds.
4. Turn ignition switch "ON".
5. Select "EVAP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
   Follow the instruction displayed.



6. Make sure that "OK" is displayed.
   If "NG" is displayed, refer to EC-904, "Diagnostic Procedure" .

   NOTE:
   - **If the engine speed cannot be maintained within the range displayed on CONSULT-II screen, go to EC-669, "Basic Inspection" .**
   - **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

Overall Function Check

UBS0068Y

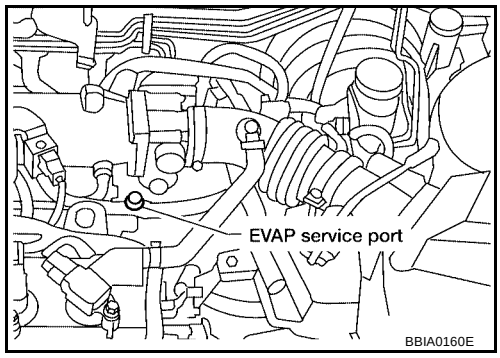
WITH GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a DTC might not be confirmed.

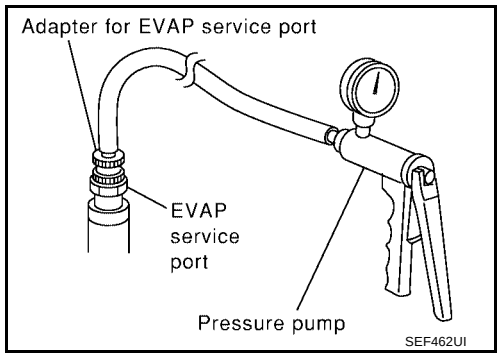
CAUTION:

- **Never use compressed air, doing so may damage the EVAP system.**
- **Do not start engine.**
- **Do not exceeded 4.12 kPa (0.042 kg/cm^2 , 0.6 psi).**

1. Attach the EVAP service port adapter securely to the EVAP service port.



2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch “ON”.
5. Connect GST and select mode 8.
6. Using mode 8 control the EVAP canister vent control valve (close).
7. Apply pressure and make sure the following conditions are satisfied.



Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg)
Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (3 mmHg, 0.12 inHg).
If NG, go to EC-904, "Diagnostic Procedure" .
If OK, go to next step.

8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.
10. Turn ignition switch “OFF” and wait at least 10 seconds.
11. Restart engine and let it idle for 90 seconds.
12. Keep engine speed at 2,000 rpm for 30 seconds.
13. Turn ignition switch “OFF”.

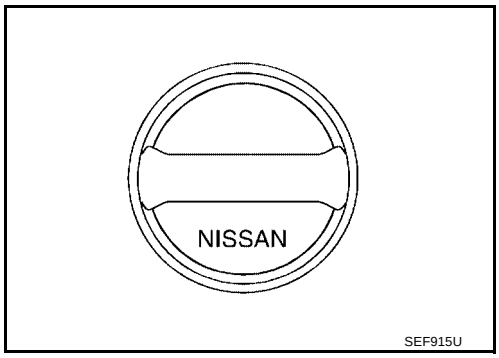
NOTE:
For more information, refer to GST instruction manual.

Diagnostic Procedure

UBS0068Z

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.



OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.

2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

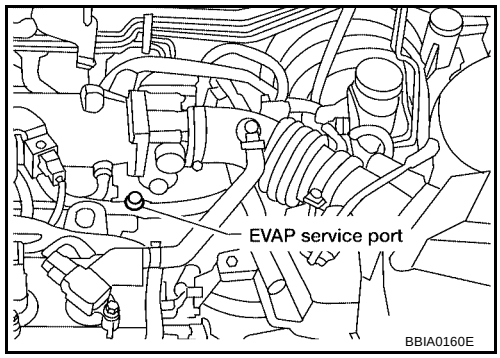
Refer to EC-1208, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)" .

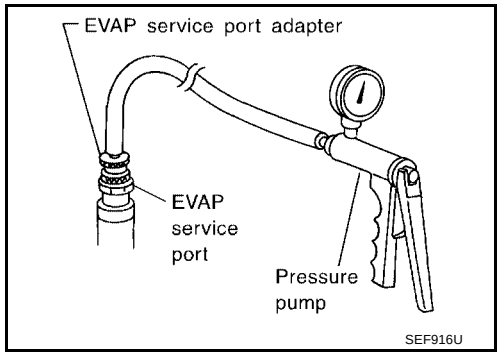
OK or NG

OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.





NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.

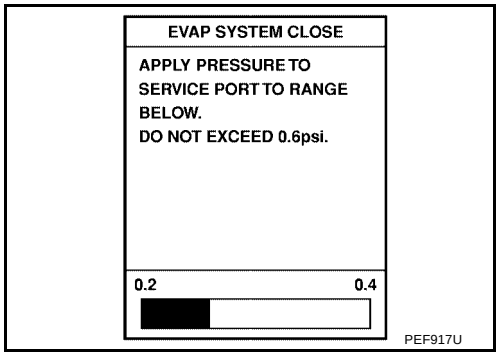
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

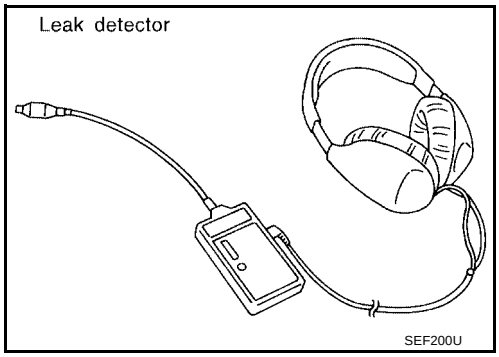
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

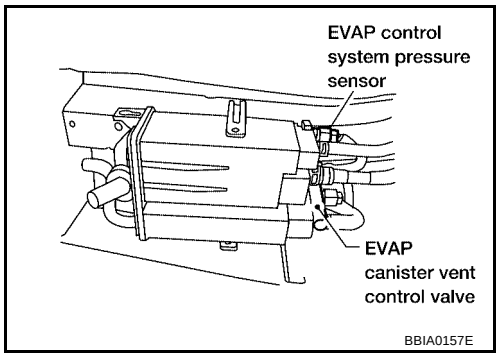


7. CHECK FOR EVAP LEAK

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

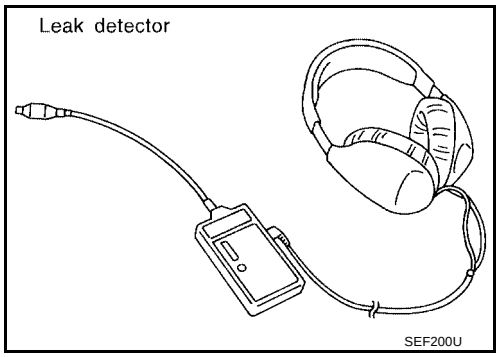
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 8.
NG >> Repair or replace.



8. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly. Refer to EC-1209, "Removal and Installation"
- EVAP canister vent control valve (Refer to EC-878, "Component Inspection"

OK or NG

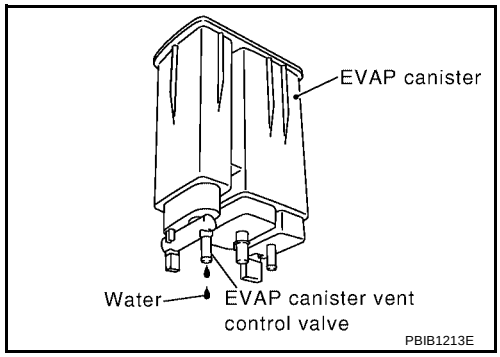
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XX %
THRTL POS SEN	X. XX V

PBIB0721E

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-615, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-872, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-813, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-885, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1212, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hose, tube or filler neck tube.

22. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1215, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

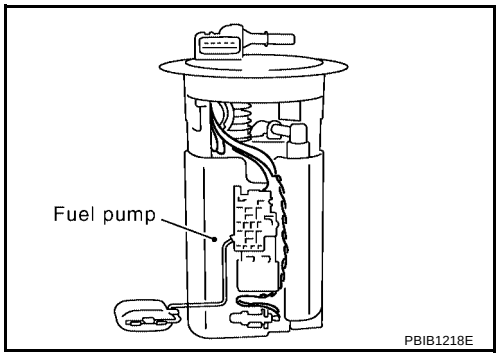
DTC P0460 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS001Y2

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM through CAN communication line.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnostic Logic

UBS001Y3

NOTE:
If DTC P0460 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to "DTC U1000, U1001 CAN COMMUNICATION LINE", EC-728 .
When the vehicle is parked, naturally the fuel level in the fuel tank is stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0460 0460	Fuel level sensor circuit noise	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor

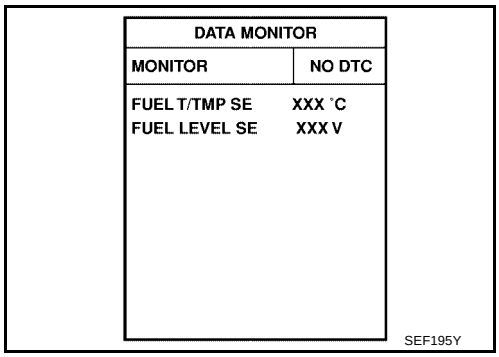
DTC Confirmation Procedure

UBS001Y5

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and wait maximum of 2 consecutive minutes.
4. If 1st trip DTC is detected, go to EC-911, "Diagnostic Procedure" .



WITH GST

Follow the procedure "WITH CONSULT-II" above.

Diagnostic Procedure

UBS001Y7

1. CHECK FUEL GAUGE OPERATION

Refer to FL-3 .

OK or NG

OK >> GO TO 2.
NG >> Follow the instruction of “METER AND GAUGES”. Refer to DI-3 .

2. CHECK FUEL LEVEL SENSOR AND CIRUIT

Refer to FL-3 .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning parts.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS006IZ

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

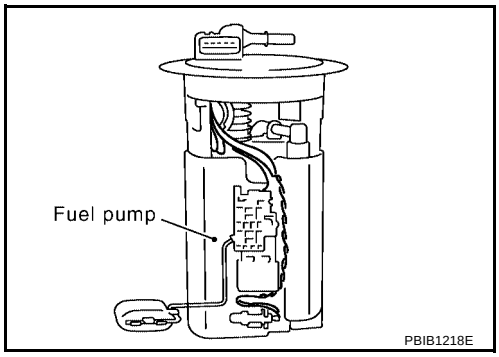
DTC P0461 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS001Y8

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM through CAN communication line.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnostic Logic

UBS001Y9

NOTE:
If DTC P0461 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to "DTC U1000, U1001 CAN COMMUNICATION LINE", EC-728 .
Driving long distances naturally affect fuel gauge level.
This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0461 0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor

Overall Function Check

UBS001YB

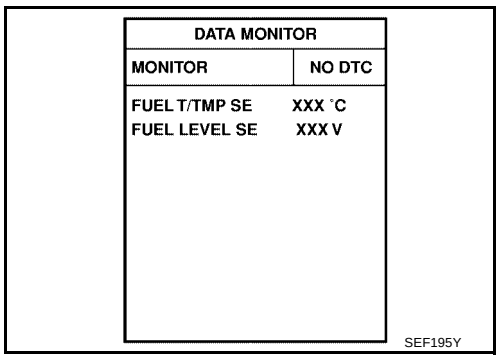
Use this procedure to check the overall function of the fuel level sensor function. During this check, a 1st trip DTC might not be confirmed.

WARNING:
When performing following procedure, be sure to observe the handling of the fuel. Refer to FL-2, "FUEL SYSTEM" .
TESTING CONDITION:
Before starting overall function check, preparation of draining fuel and refilling fuel is required.

WITH CONSULT-II

NOTE:
Start from step 11, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-637, "FUEL PRESSURE RELEASE" .
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch "OFF" and wait at least 10 seconds then turn "ON".
6. Select "FUEL LEVEL SE" in "DATA MONITOR" mode with CONSULT-II.



7. Check "FUEL LEVEL SE" output voltage and note it.
8. Select "FUEL PUMP" in "ACTIVE TEST" mode with CONSULT-II.
9. Touch "ON" and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
11. Check "FUEL LEVEL SE" output voltage and note it.

12. Check “FUEL LEVEL SE” output voltage and confirm whether the voltage changes more than 0.03V during step 7 to 11.
If NG, go to “Diagnostic Procedure” EC-913 .

WITH GST

NOTE:
Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-637, "FUEL PRESSURE RELEASE" .
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch “ON”.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.
10. If NG, go to “Diagnostic Procedure”, EC-913 .

Diagnostic Procedure

UBS006J0

1. CHECK FUEL GAUGE OPERATION

Refer to FL-3

OK or NG

OK >> GO TO 2.
NG >> Follow the instruction of DI-16 .

2. CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning parts.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS006J1

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

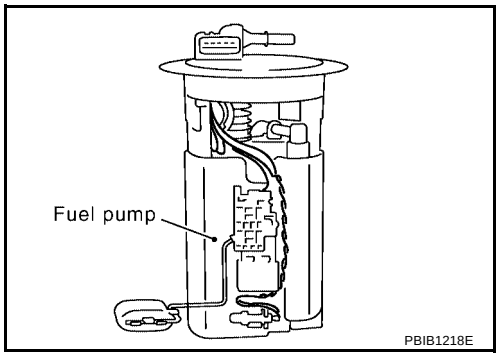
DTC P0462, P0463 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS001YC

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM through CAN communication.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnostic Logic

UBS001YD

NOTE:
If DTC P0462 or P0463 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to “DTC U1000, U1001 CAN COMMUNICATION LINE”, EC-728 .
ECM receives two signals from the fuel level sensor circuit.
One is fuel level sensor power supply circuit, and the other is fuel level sensor ground circuit.
This diagnosis indicates the former, to detect open or short circuit malfunction.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462 0462	Fuel level sensor circuit low input	An excessively low voltage is sent from the sensor to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor
P0463 0463	Fuel level sensor circuit high input	An excessively high voltage is sent from the sensor to ECM.	

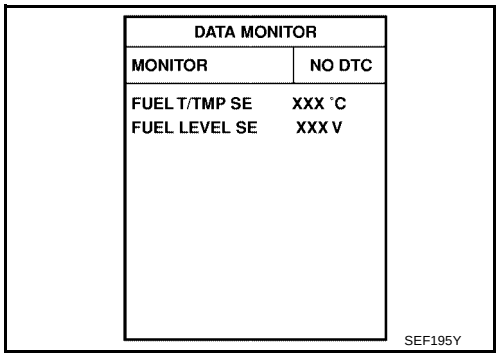
DTC Confirmation Procedure

UBS001YF

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-915, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS001YH

1. CHECK FUEL GAUGE OPERATION

Refer to DI-16, "Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode" .

OK or NG

OK >> GO TO 2.
NG >> Follow the instruction of “METER AND GAUGES”. Refer to DI-16, "Meter/Gauge Operation and Odo/Trip Meter Segment Check in Diagnosis Mode" .

2. CHECK FUEL LEVEL SENSOR AND CIRCUIT

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning parts.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS006J2

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

DTC P0500 VSS

PFP:32702

Component Description

UBS001YI

NOTE:
If DTC P0500 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-728, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the combination meter. The combination meter then sends a signal to the ECM through CAN communication line.

On Board Diagnosis Logic

UBS001YJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The CAN communication line is open or shorted) ● Harness or connectors (The vehicle speed signal circuit is open or shorted) ● Vehicle speed sensor ● Combination meter

DTC Confirmation Procedure

UBS001YK

CAUTION:
Always drive vehicle at a safe speed.

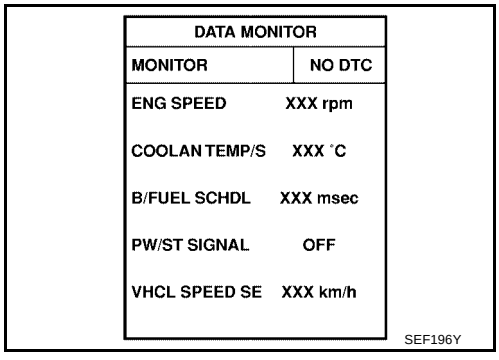
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine (TCS switch “OFF”).
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-917, "Diagnostic Procedure" .
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 50 consecutive seconds.

ENG SPEED	1,800 - 6,000 rpm (A/T) 2,000 - 6,000 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	More then 4.8 msec
Selector lever	Except “P” or “N” position
PW/ST SIGNAL	OFF



6. If 1st trip DTC is detected, go to EC-917, "Diagnostic Procedure" .

Overall Function Check

UBS001YL

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.

2. Start engine.
3. Read vehicle speed sensor signal in “MODE 1” with GST.
   The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-917, "Diagnostic Procedure" .

Diagnostic Procedure

UBS001YN

1. CHECK VEHICLE SPEED SENSOR CIRCUIT

Refer to DI-3, "METERS AND GAUGES" .

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-8, "Combination Meter" .

>> **INSPECTION END**

DTC P0506 ISC SYSTEM

PFP:23781

Description

UBS003OC

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.
The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

UBS003OE

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506 0506	Idle speed control system RPM lower than expected	The idle speed is less than the target idle speed by 100 rpm or more.	● Electric throttle control actuator ● Intake air leak

DTC Confirmation Procedure

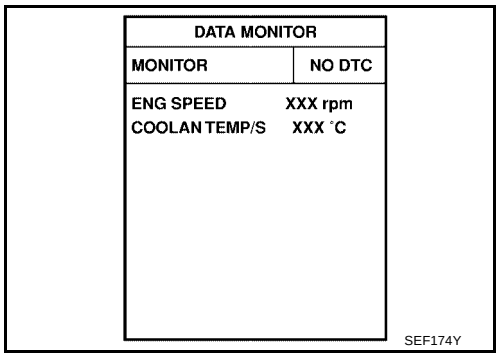
UBS003OF

NOTE:
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform “Idle Air Volume Learning”, EC-635 , before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the “Service Data and Specifications (SDS)”, EC-1222 .**

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

WITH CONSULT-II

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” again and select “DATA MONITOR” mode with CONSULT-II.
5. Start engine and run it for at least 1 minute at idle speed.
6. If 1st trip DTC is detected, go to EC-919 .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS003OH

1. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform EC-634, "Accelerator Pedal Released Position Learning" .
4. Perform EC-634, "Throttle Valve Closed Position Learning" .
5. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P0507 ISC SYSTEM

PFP:23781

Description

UBS003OJ

NOTE:
If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.
The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

UBS003OL

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507 0507	Idle speed control system RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	● Electric throttle control actuator ● Intake air leak ● PCV system

DTC Confirmation Procedure

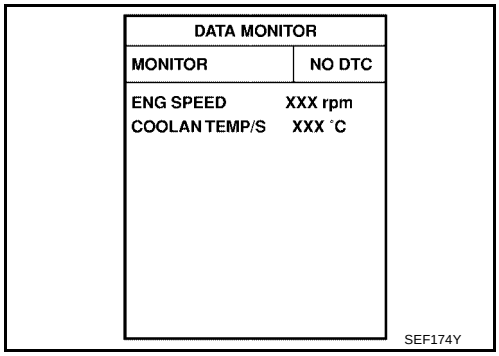
UBS003OM

NOTE:
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform “Idle Air Volume Learning”, EC-635 , before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the “Service Data and Specifications (SDS)”, EC-1222 .**

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

WITH CONSULT-II

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” again and select “DATA MONITOR” mode with CONSULT-II.
5. Start engine and run it for at least 1 minute at idle speed.
6. If 1st trip DTC is detected, go to EC-921, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS003OO

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Discover air leak location and repair.

3. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform EC-634, "Accelerator Pedal Released Position Learning" .
4. Perform EC-634, "Throttle Valve Closed Position Learning" .
5. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

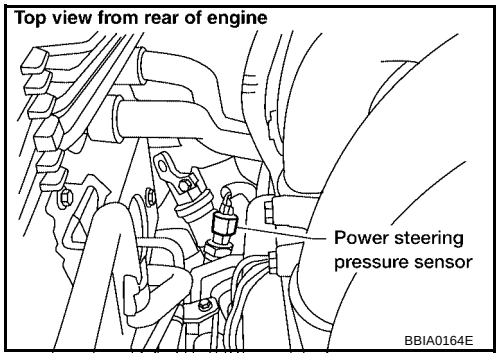
DTC P0550 PSP SENSOR

PFP:49763

Component Description

UBS003WV

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

UBS003WW

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

On Board Diagnosis Logic

UBS003WX

The MIL will not light up for this diagnosis.

NOTE:
If DTC P0550 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-1028.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Power steering pressure sensor

DTC Confirmation Procedure

UBS003WY

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-924, "Diagnostic Procedure" .

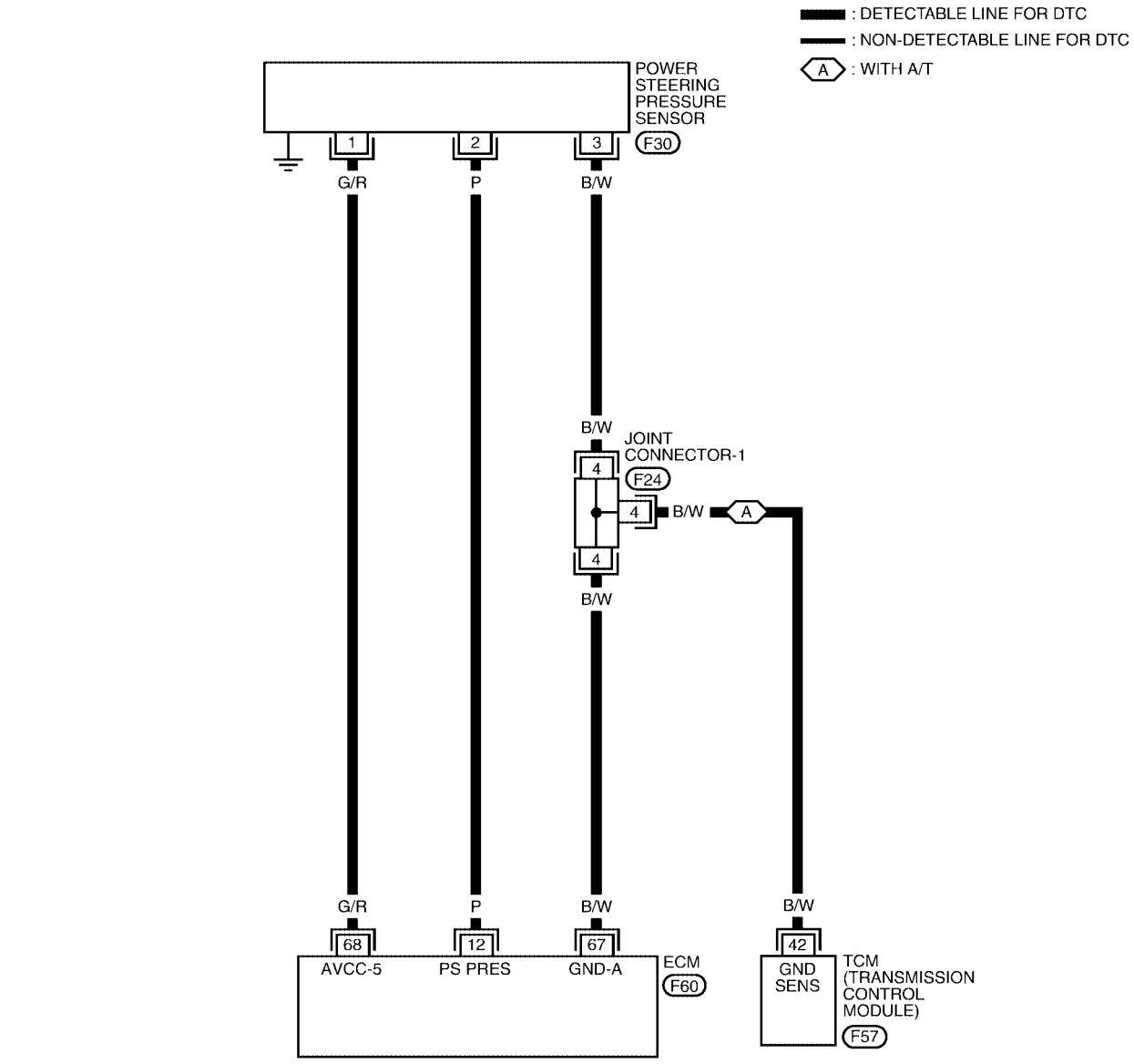
WITH GST

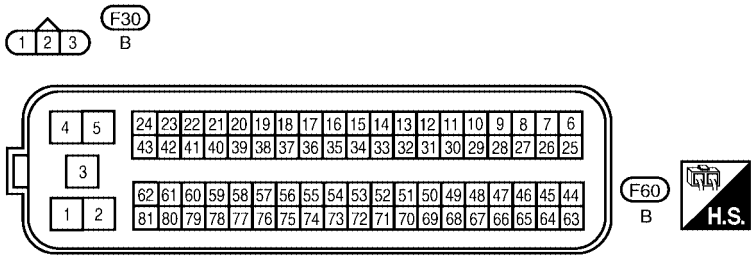
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003WZ

EC-PS/SEN-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

BBWA0787E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	P	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8V
67	B/W	Sensor ground (Power steering pressure sensor)	**[Engine is running]** ● Idle speed	Approximately 0V
68	G/R	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V

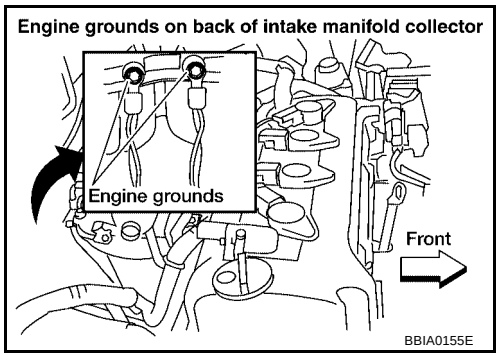
Diagnostic Procedure

UBS003X0

1. RETIGHTEN GROUND SCREWS

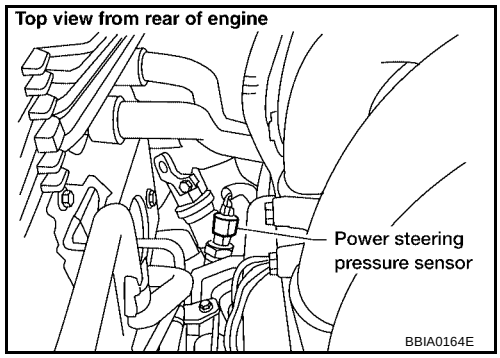
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



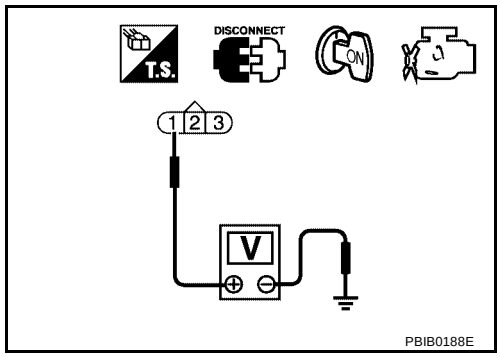
2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between PSP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between PSP sensor terminal 3 and engine ground.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between power steering pressure sensor and ECM
- Harness for open or short between power steering pressure sensor and TCM

>> Repair open circuit or short to power in harness or connectors.

5. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK PSP SENSOR

Refer to EC-926, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace PSP sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

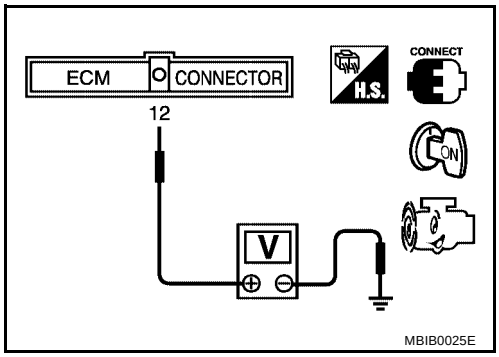
Component Inspection

UBS003X1

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned fully.	0.5 - 4.0V
Steering wheel is not being turned.	0.4 - 0.8V



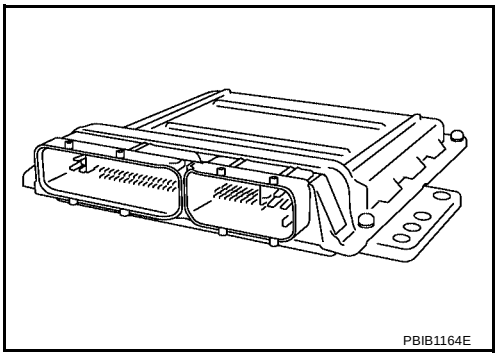
DTC P0605 ECM

PFP:23710

Component Description

UBS006FV

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


PBIB1164E

On Board Diagnosis Logic

UBS006FW

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters in fail-safe mode when the malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

UBS006FX

Perform “PROCEDURE FOR MALFUNCTION A” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no problem on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

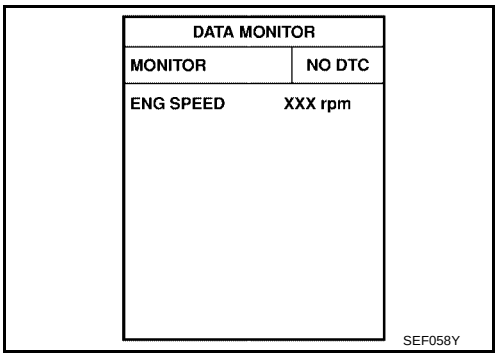
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-928, "Diagnostic Procedure" .



SEF058Y

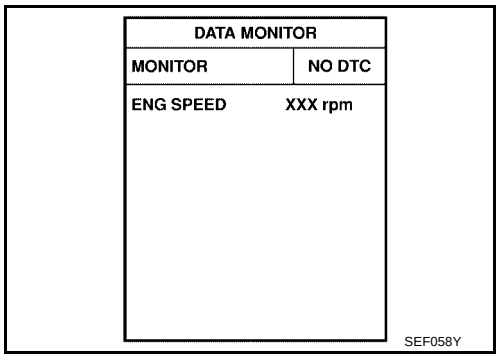
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-928, "Diagnostic Procedure" .



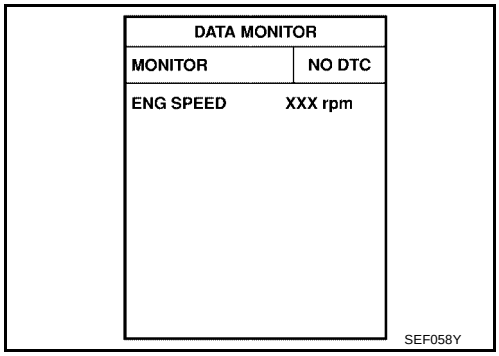
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 for, 32 times.
5. If 1st trip DTC is detected, go to EC-928, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS006FY

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-927 .
5. Is the 1st trip DTC P0605 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-927 .
5. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .
3. Perform EC-634, "Throttle Valve Closed Position Learning" .
4. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P1031, P1032 A/F SENSOR HEATER

PFP:22693

Description

UBS001ZB

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Air fuel ratio (A/F) sensor 1 heater control	Air fuel ratio (A/F) sensor 1 heater
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF duty control of the A/F sensor 1 heater corresponding to the engine operating condition to keep the temperature of A/F sensor 1 element at the specified range.

CONSULT-II Reference Value in Data Monitor Mode

UBS001ZC

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
A/F S1 HTR (B1)	● Engine: After warming up, idle the engine	0 - 100%

On Board Diagnosis Logic

UBS001ZD

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1031 1031 (Bank 1)	Air fuel ratio (A/F) sensor 1 heater control circuit low	The current amperage in the heated air fuel ratio (A/F) sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated air fuel ratio (A/F) sensor 1 heater.)	● Harness or connectors (The heated A/F sensor 1 heater circuit is open or shorted.) ● Heater A/F sensor 1 heater
P1032 1032 (Bank 1)	Air fuel ratio (A/F) sensor 1 heater control circuit high	The current amperage in the heated air fuel ratio (A/F) sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated air fuel ratio (A/F) sensor 1 heater.)	● Harness or connectors (The heated A/F sensor 1 heater circuit is shorted.) ● Heater A/F sensor 1 heater

DTC Confirmation Procedure

UBS001ZE

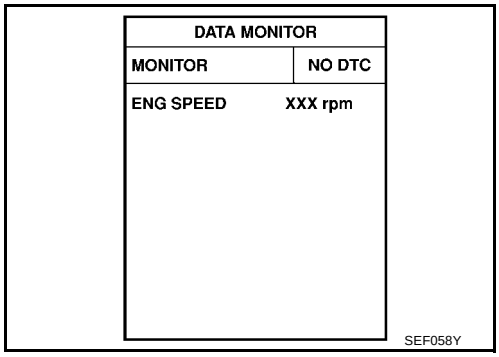
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

With CONSULT-II

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 10 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-933, "Diagnostic Procedure"
.



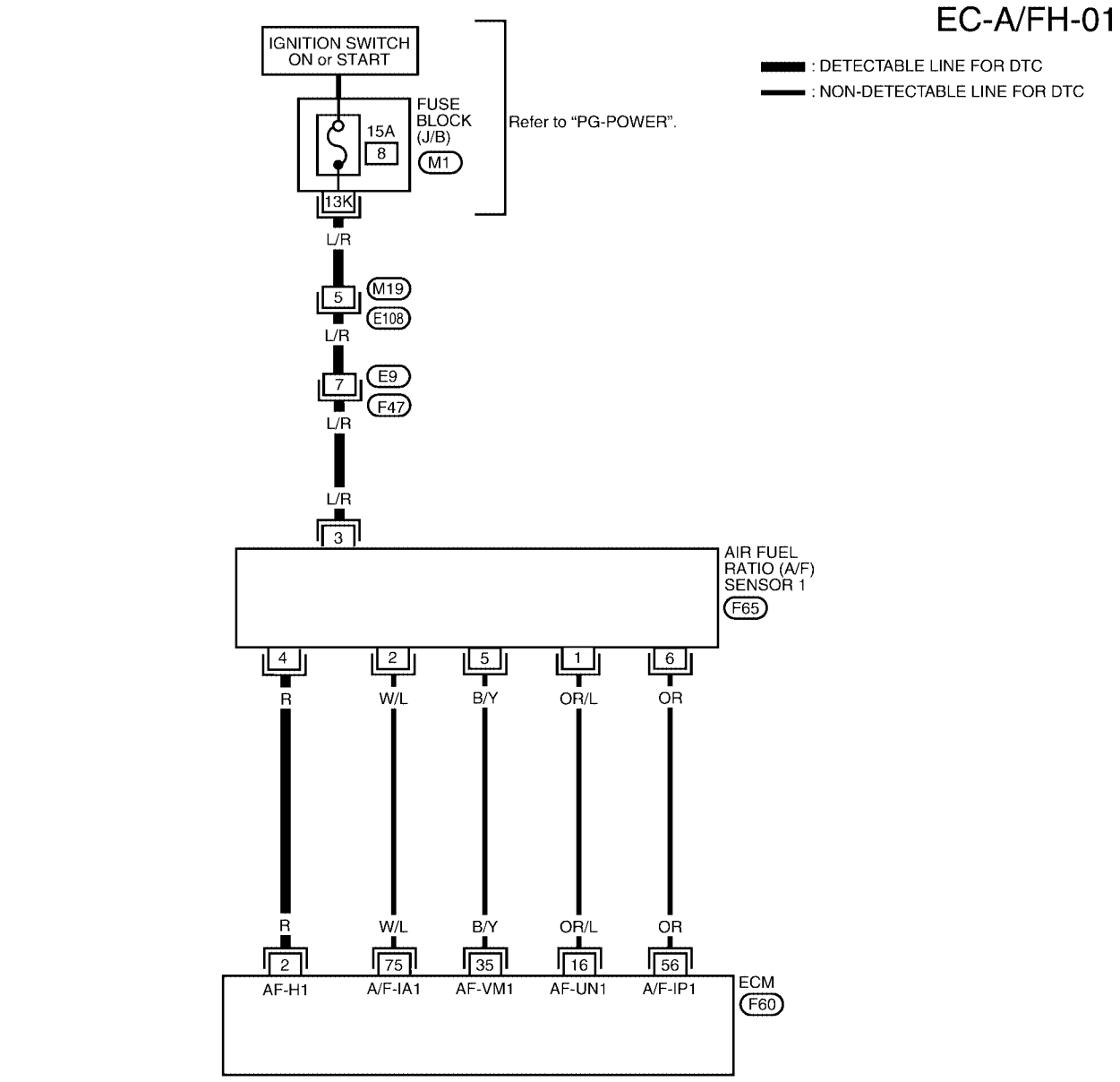
WITH GST

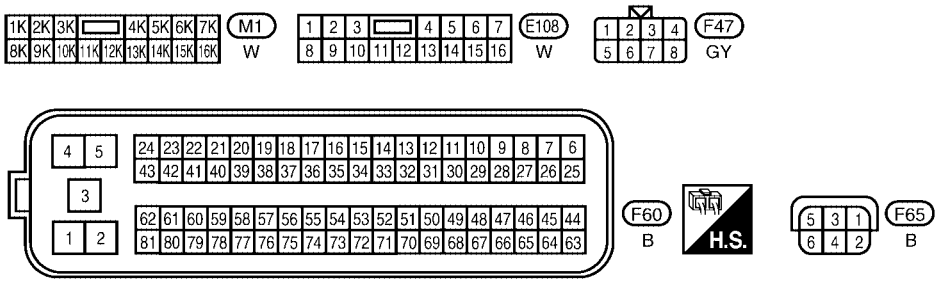
1. Start engine and run it for at least 10 seconds at idle speed.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and run it for at least 10 seconds at idle speed.
4. Select “MODE 3” with GST.
5. If DTC is detected, go to EC-933, "Diagnostic Procedure" .

- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS006H1





BBWA0802E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

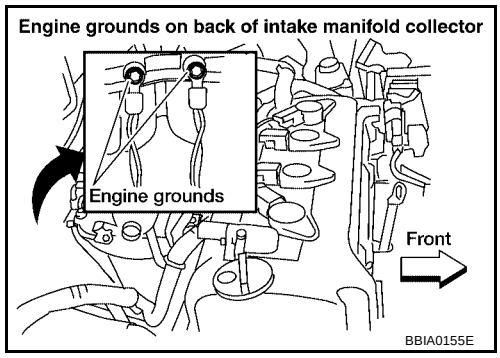
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R	A/F sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 5V

Diagnostic Procedure

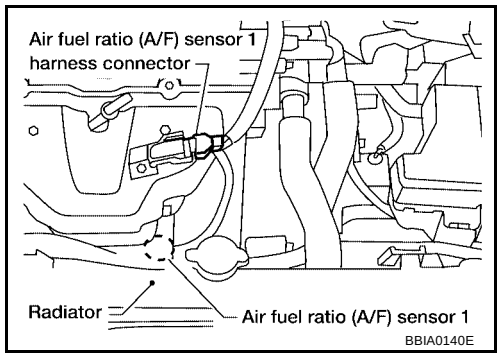
UBS001ZG

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.



3. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
4. Turn ignition switch “ON”.

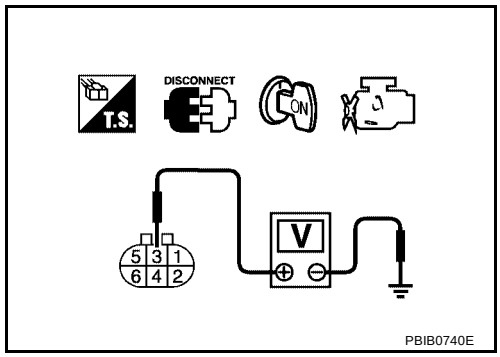


5. Check voltage between A/F sensor 1 terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E9, F47
- Fuse block (J/B) connector M1
- 15A fuse
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

3. CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and A/F sensor 1 terminal 4. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK A/F SENSOR 1 HEATER

Refer to EC-935, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace A/F sensor 1.

5. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace A/F sensor 1.
NG >> Repair or replace.

Component Inspection

UBS001ZH

AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Check resistance between terminals 3 and 4.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

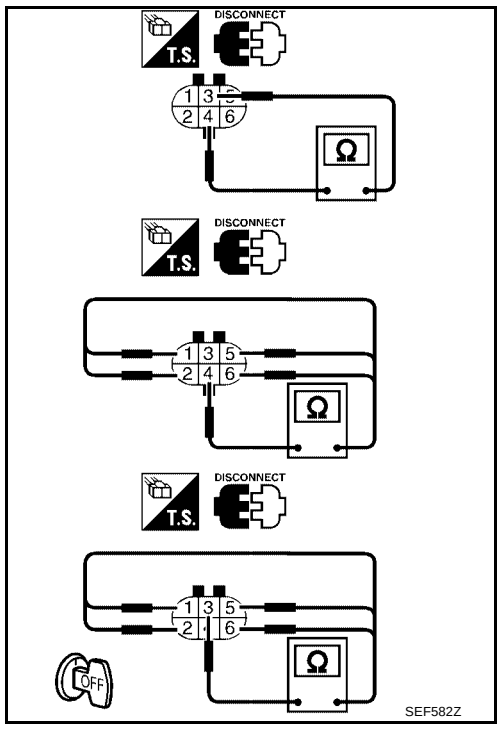
Check continuity between terminals 3 and 1, 2, 5, 6, terminals 4 and 1, 2, 5, 6.

Continuity should not exist.

If NG, replace the A/F sensor 1.

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

UBS001ZI

AIR FUEL RATIO SENSOR HEATER

Refer to EM-12, "Removal and Installation" .

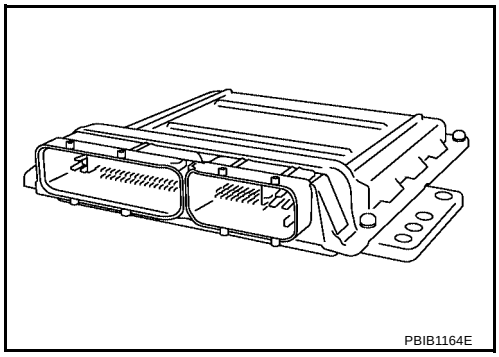
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

UBS003X2

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.


PBIB1164E

On Board Diagnosis Logic

UBS003X3

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back-up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

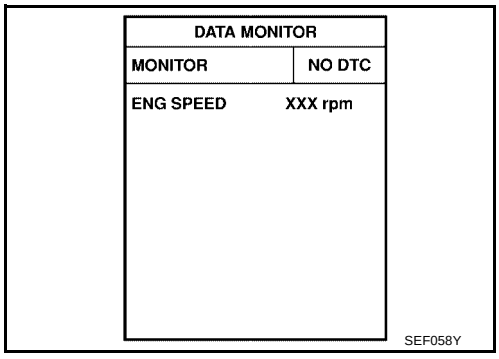
DTC Confirmation Procedure

UBS003X4

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-938, "Diagnostic Procedure"
.



SEF058Y

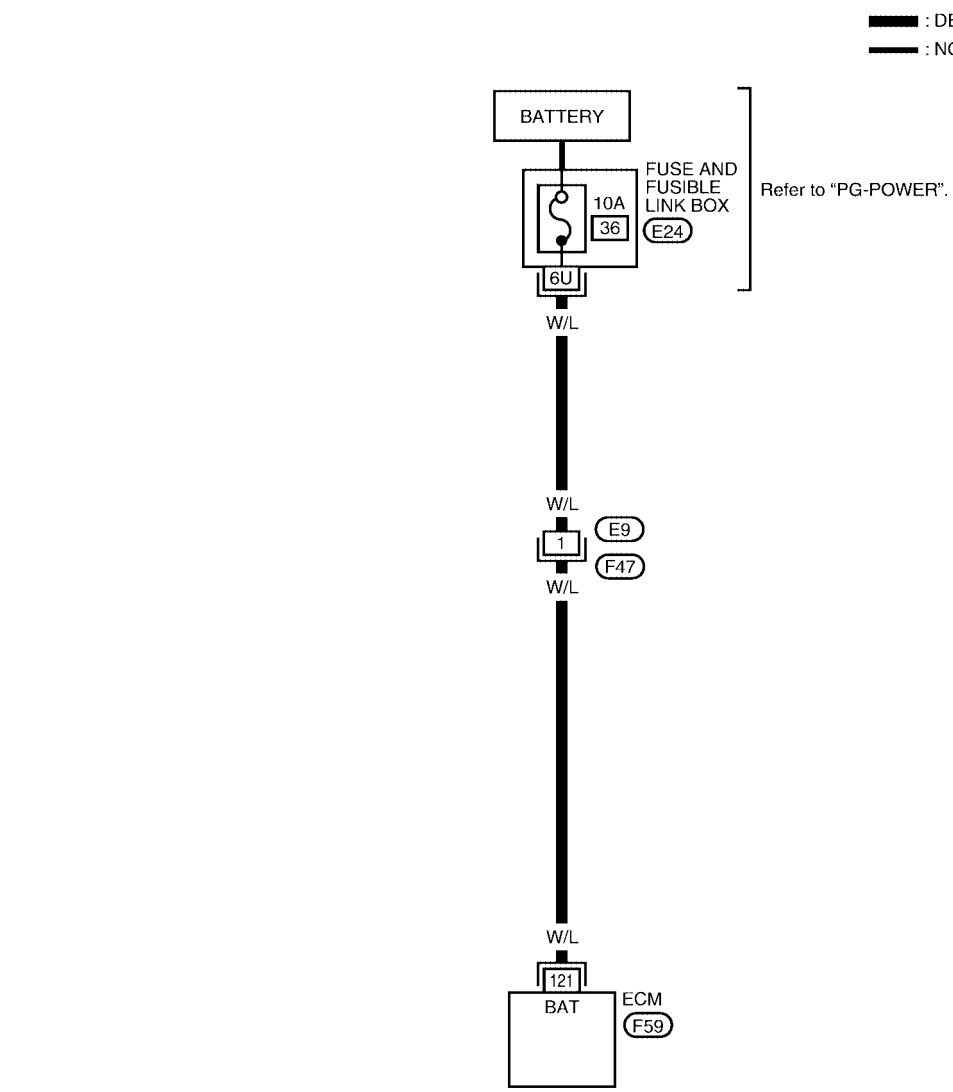
WITH GST

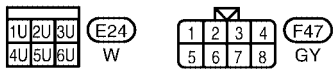
Follow the procedure “WITH CONSULT-II” above.

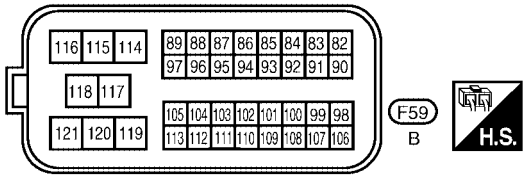
Wiring Diagram

UBS003X5

EC-ECM/PW-01







BBWA0294E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

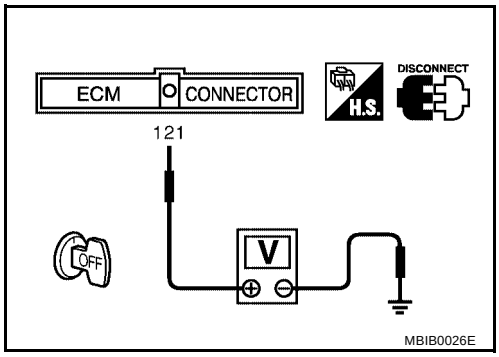
Diagnostic Procedure

UBS003X6

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 10A fuse
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit short to ground or short to power in harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-936 .
5. Is the 1st trip DTC P1065 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-936 .
5. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .
3. Perform EC-634, "Throttle Valve Closed Position Learning" .
4. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

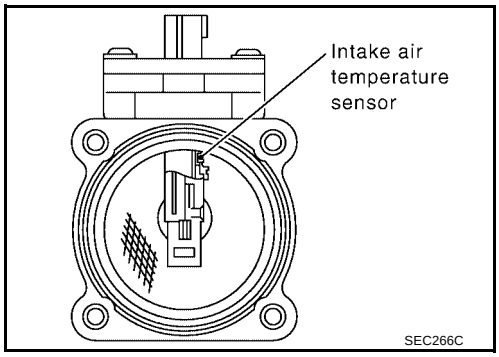
DTC P1102 MAF SENSOR

PFP:22680

Component Description

UBS006FZ

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS006G0

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.4V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	12.0 - 27.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.4 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS006G1

This self-diagnosis has the one trip detection logic.

NOTE:
If DTC P1102 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-1028.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1102 1102	Mass air flow sensor circuit range/performance problem	A voltage from the sensor is constantly approx.1.0V when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

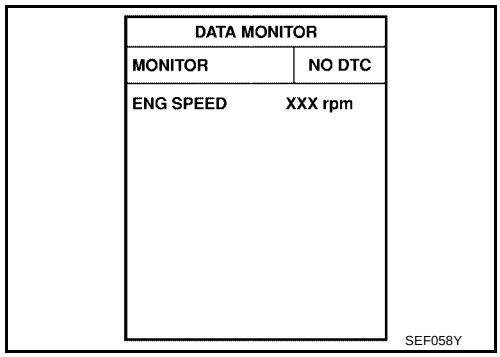
DTC Confirmation Procedure

UBS006G2

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-943, "Diagnostic Procedure" .



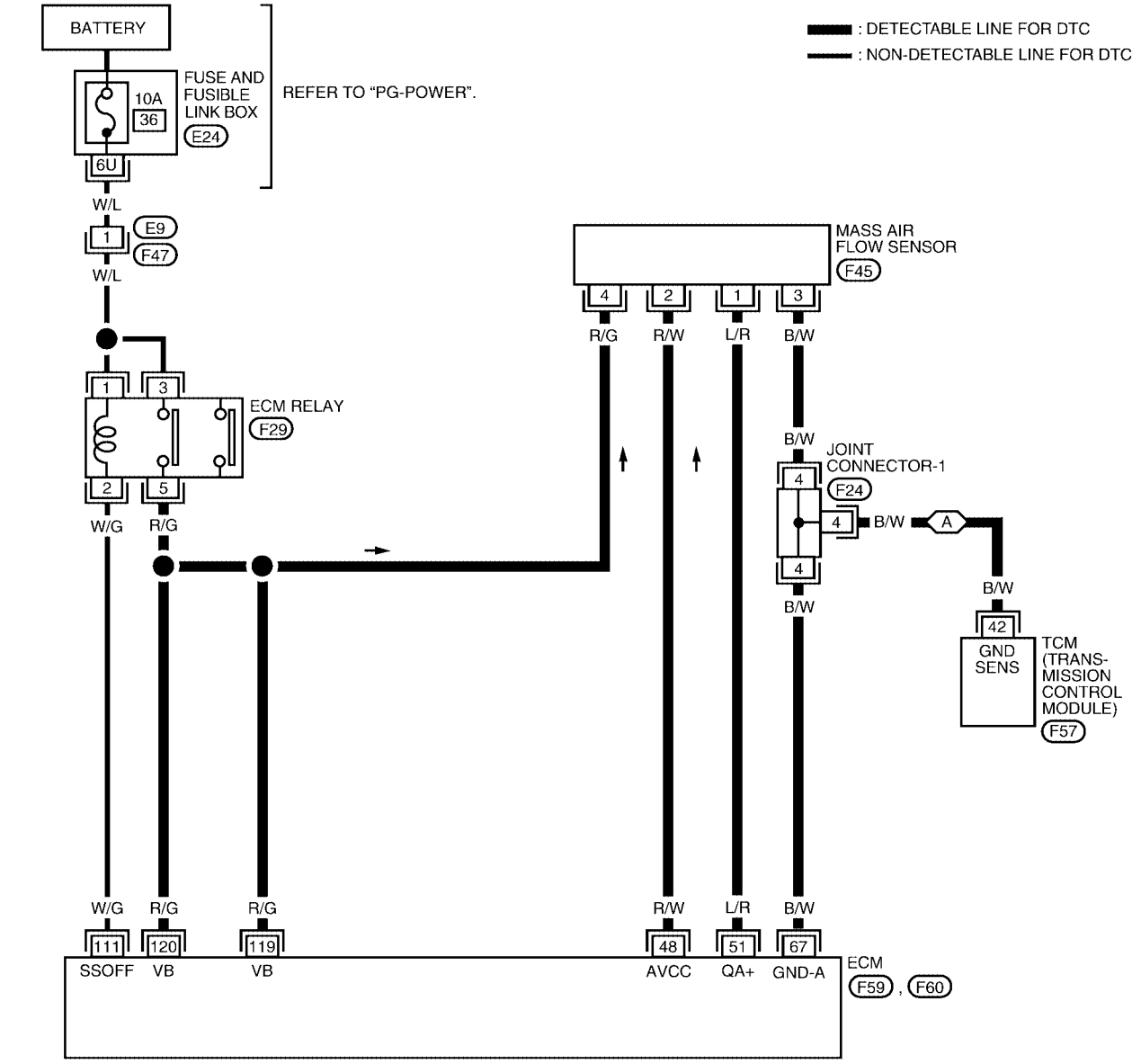
WITH GST

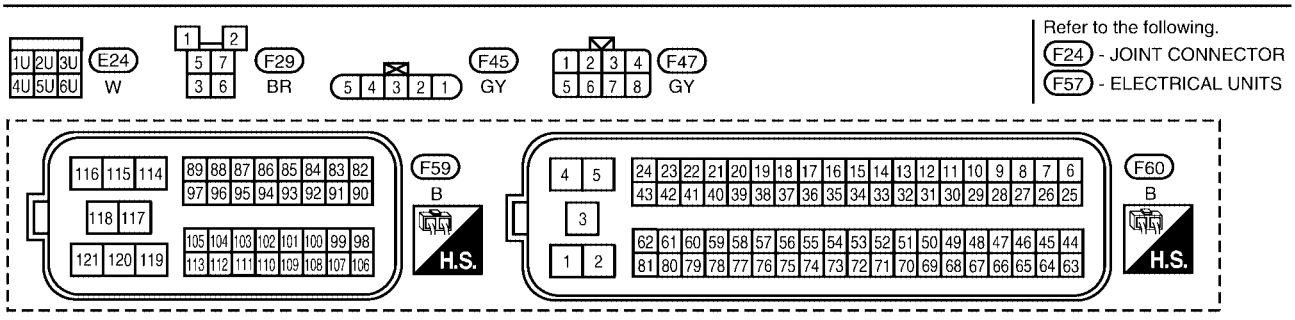
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003OV

EC-MAFS-01





BBWA0774E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	R/W	Sensors' power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
51	L/R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B/W	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

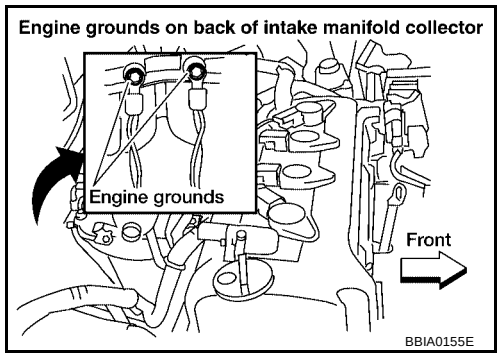
Diagnostic Procedure

UBS003OW

1. RETIGHTEN GROUND SCREWS

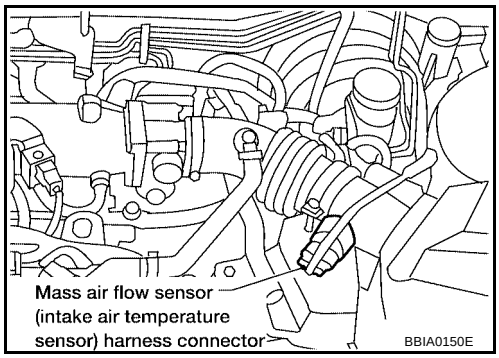
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



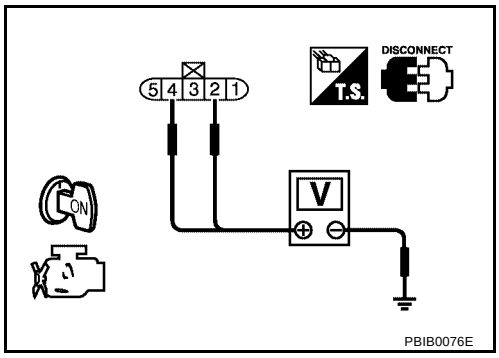
2. CHECK MASS AIR FLOW (MAF) SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and engine ground.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1.
- Harness for open or short between mass air flow sensor and ECM.
- Harness for open or short between mass air flow sensor and TCM.

>> Repair open circuit or short to power in harness or connectors.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 51.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MASS AIR FLOW SENSOR

Refer to EC-946, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace mass air flow sensor.

8. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

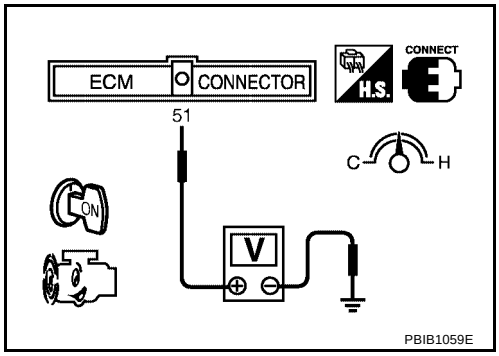
>> **INSPECTION END**

Component Inspection

UBS003OX

MASS AIR FLOW SENSOR

1. Turn ignition switch “ON”.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.



Conditions	Voltage V
Ignition switch “ON” (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.4
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

4. If the voltage is out of specification, proceed the following.
   - Turn ignition switch “OFF”.
   - Disconnect mass air flow sensor harness connector and reconnect it again.
   - Perform steps 2 and 3 again.
5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

DTC P1111 IVT CONTROL SOLENOID VALVE

PFP:23796

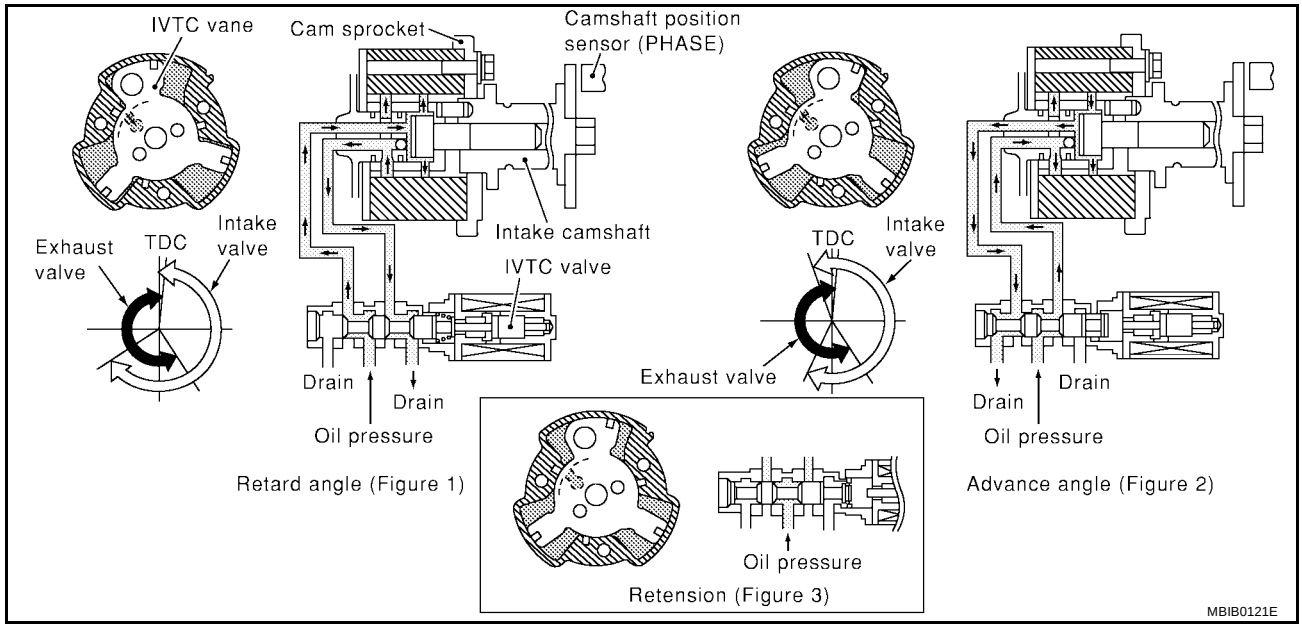
Description

UBS006G3

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

COMPONENT DESCRIPTION

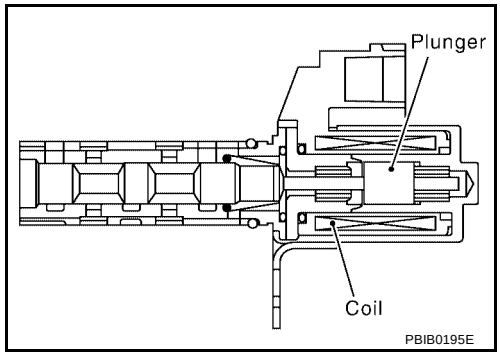
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

UBS006G4

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N (A/T), Neutral (M/T) ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 80%

On Board Diagnosis Logic

UBS006G5

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111 1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	● Harness or connectors (Solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

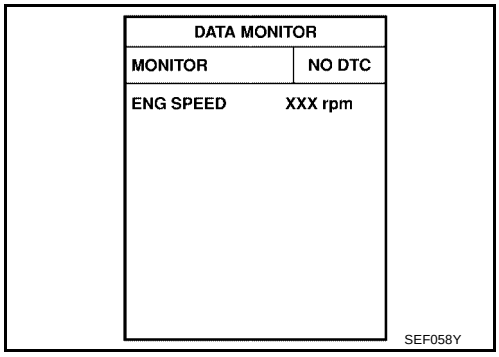
DTC Confirmation Procedure

UBS006G6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If 1st trip DTC is detected, go to EC-950, "Diagnostic Procedure" .



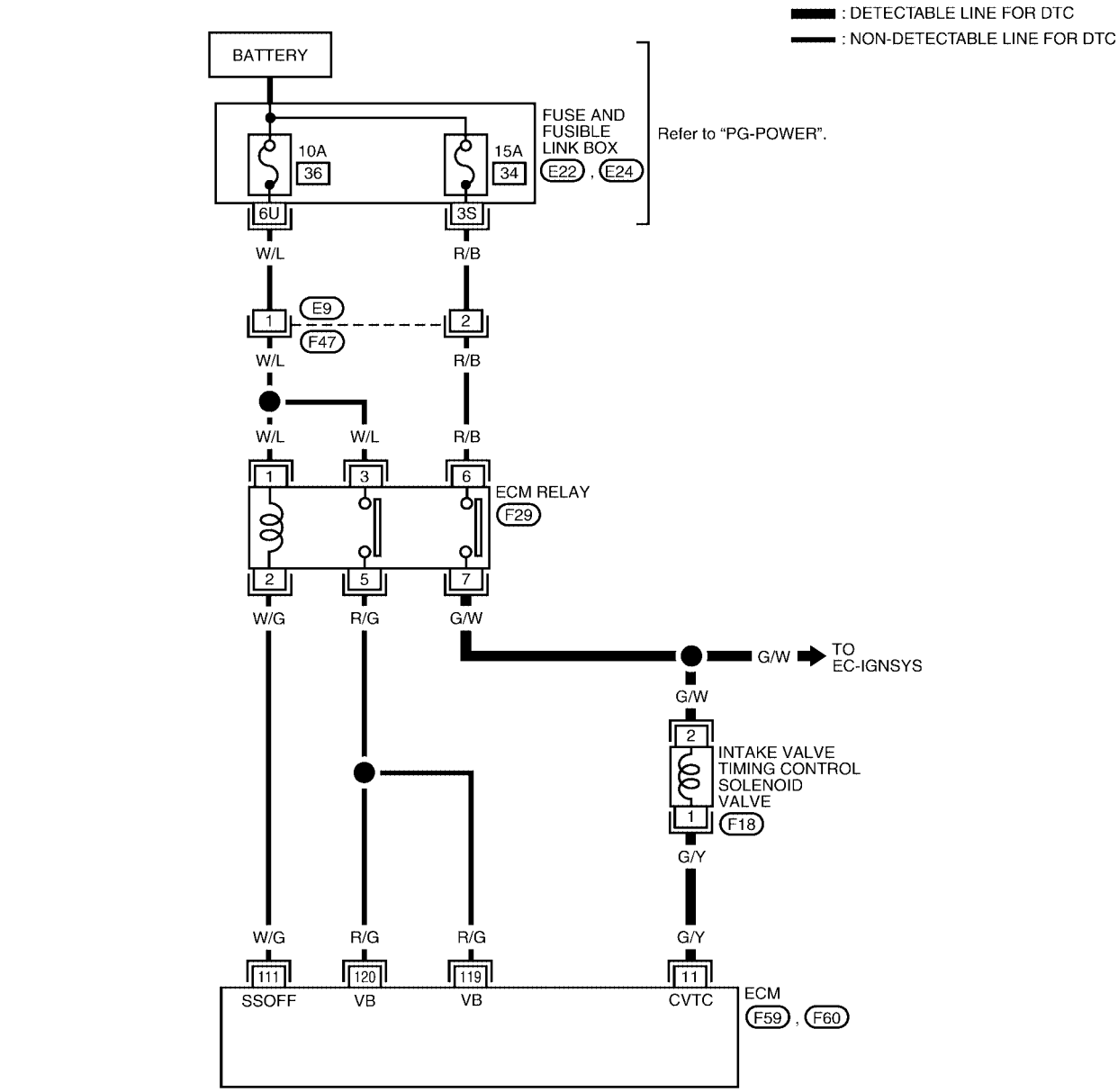
WITH GST

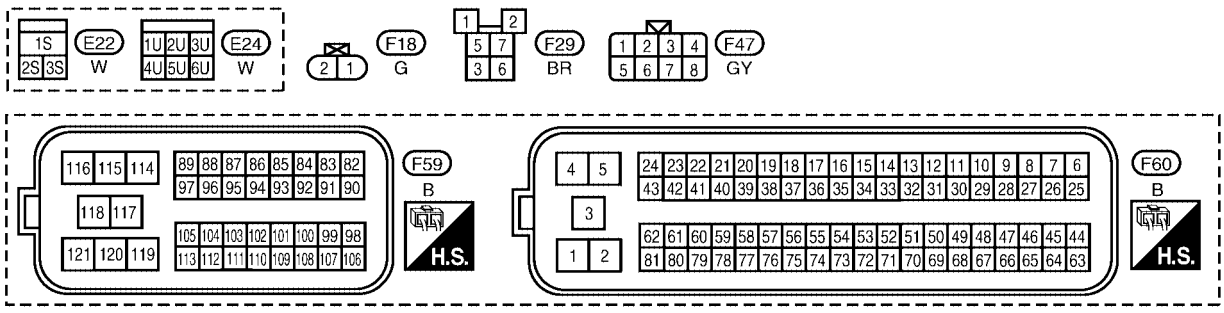
Following the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006G7

EC-IVC-01



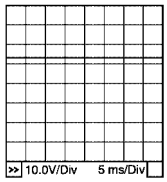
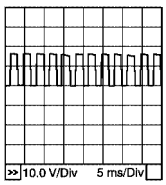


BBWA0788E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	G/Y	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	7 - 10V★  PBIB0532E

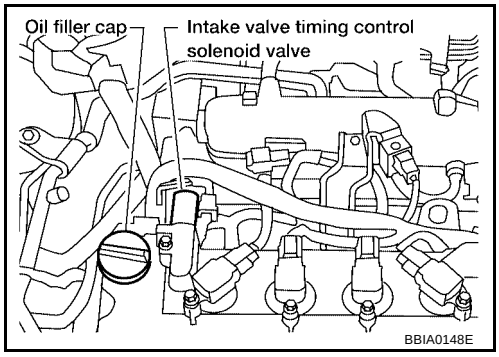
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS006G8

1. CHECK IVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



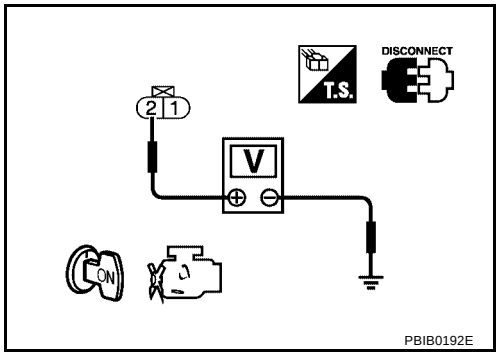
BBIA0148E

4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



PBIB0192E

2. CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 11 and intake valve timing control solenoid valve terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-951, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace intake valve timing control solenoid valve.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

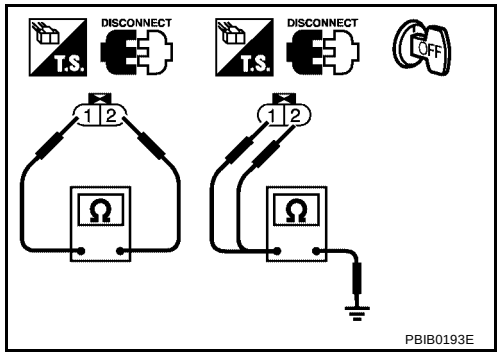
Component Inspection

UBS006G9

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2 under the following conditions.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

UBS006GA

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-39, "TIMING CHAIN" .

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

UBS003X7

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS003X8

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detects the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trip, the ECM enters fail-safe mode and the MIL lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle control actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

UBS003X9

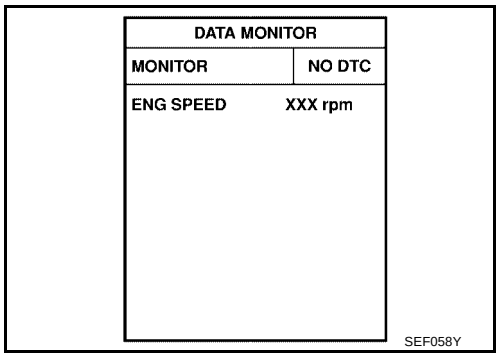
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-953, "Diagnostic Procedure" .



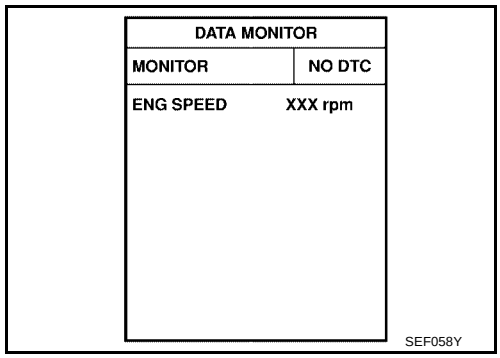
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-953, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

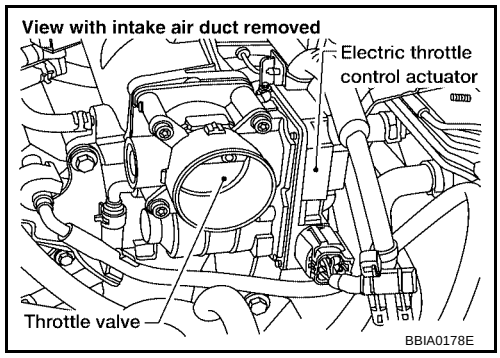
UBS003XA

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

UBS003XB

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-952 or EC-961 .

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS003XC

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted) ● Electric throttle control actuator

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

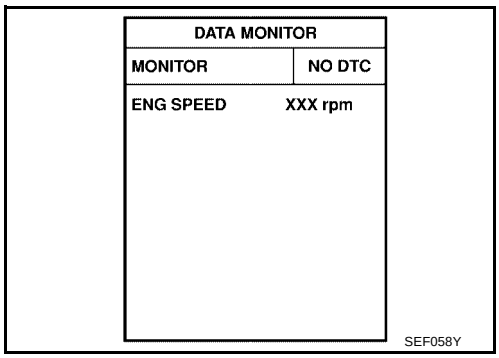
DTC Confirmation Procedure

UBS003XD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-956, "Diagnostic Procedure" .



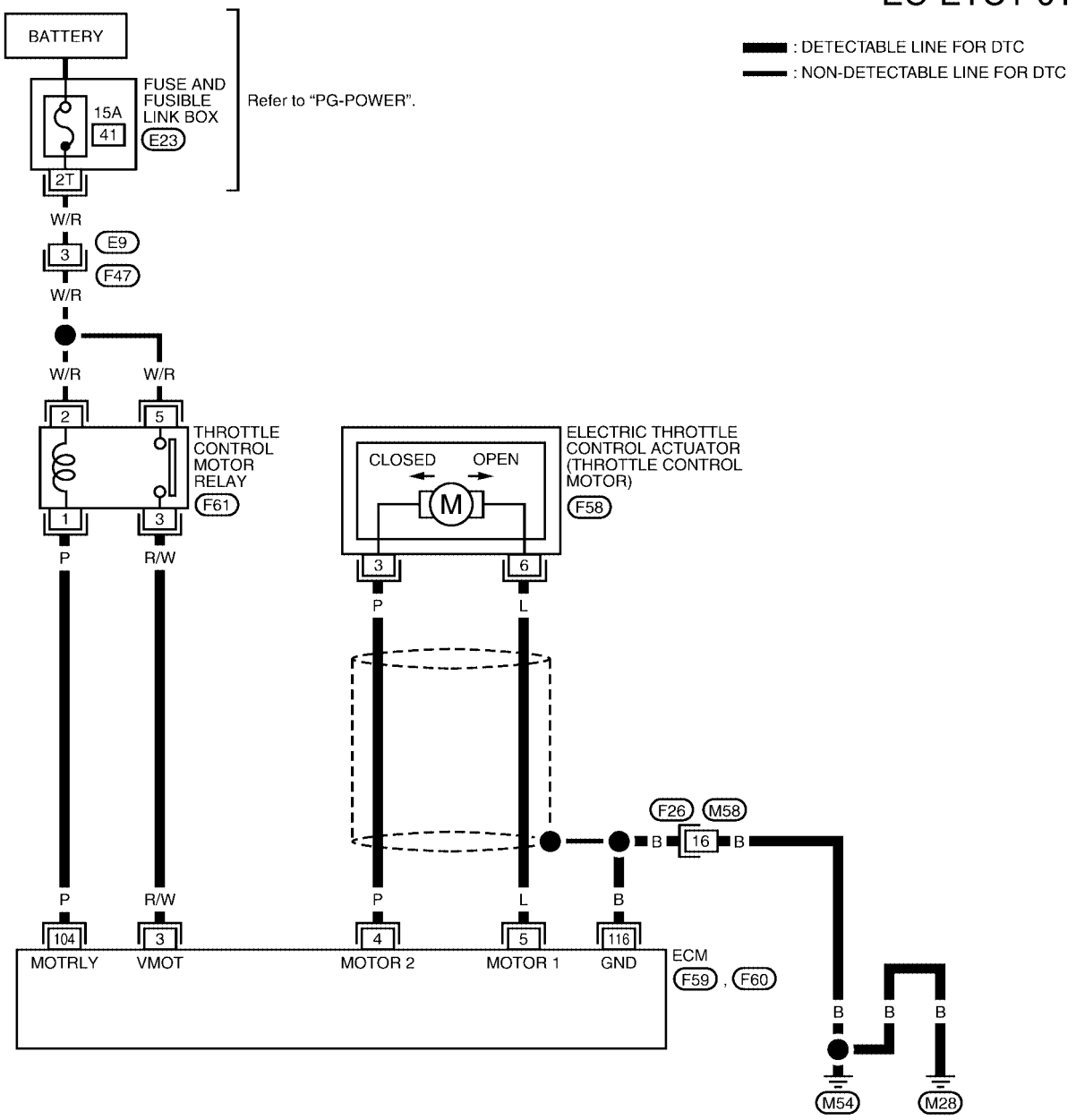
WITH GST

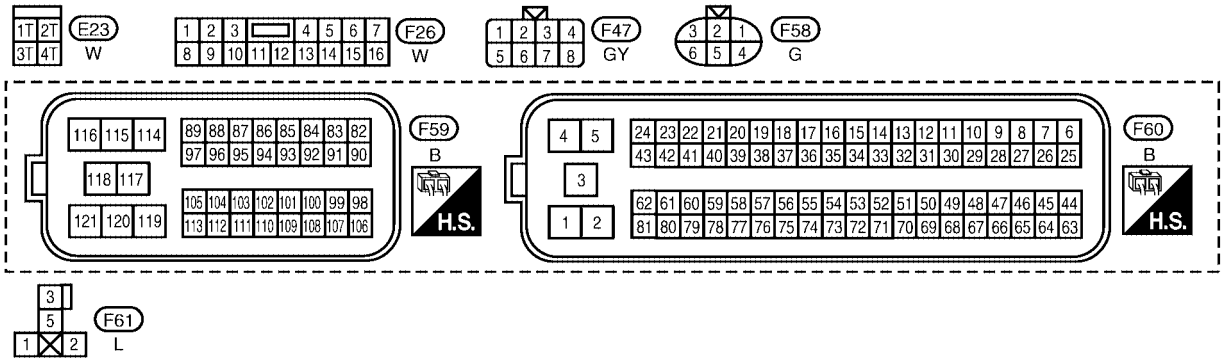
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003XE

EC-ETC1-01



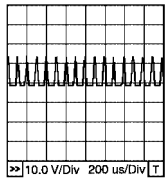
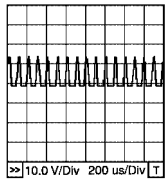


BBWA0789E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R/W	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
104	P	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

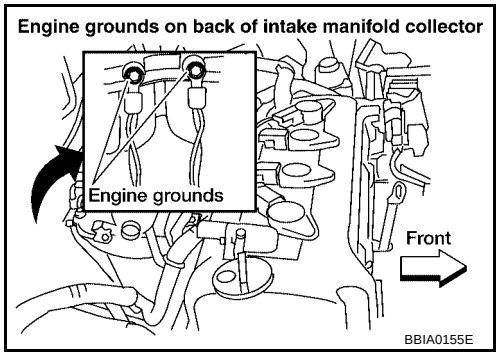
Diagnostic Procedure

UBS003XF

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF"
2. Loosen and retighten engine ground screws.

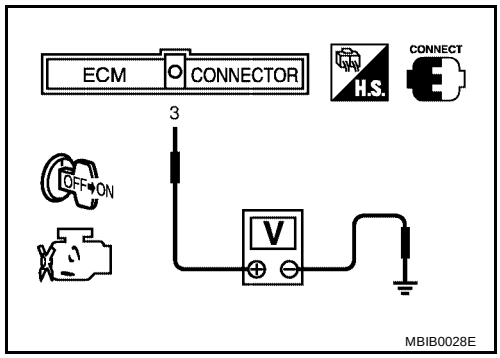
>> GO TO 2.



2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

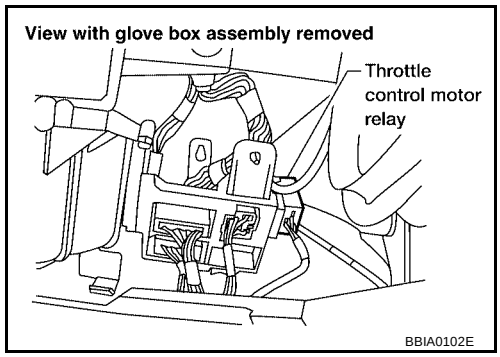


OK or NG

OK >> GO TO 8.
NG >> GO TO 3.

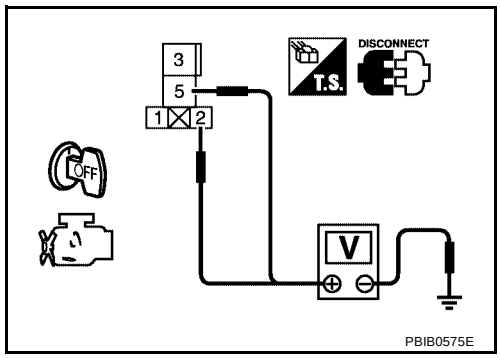
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-959, "Component Inspection" .

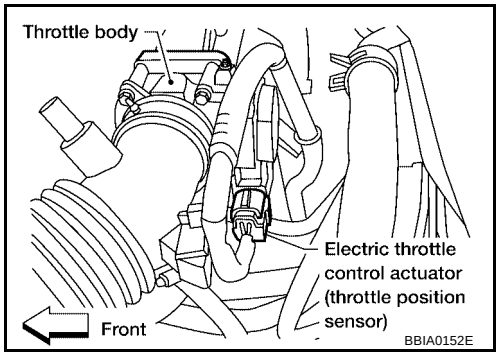
OK or NG

OK >> GO TO 11.
NG >> Replace throttle control motor relay.

8. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist



5. Also check harness for short to ground and short to power.

OK or NG

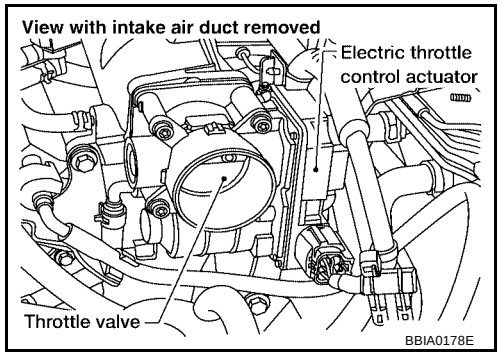
OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 10.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



10. CHECK THROTTLE CONTROL MOTOR

Refer to EC-959, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 12.

11. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 12.
NG >> Repair or replace harness or connectors.

12. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

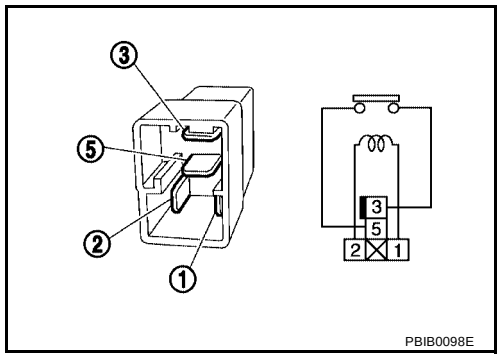
UBS006IL

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



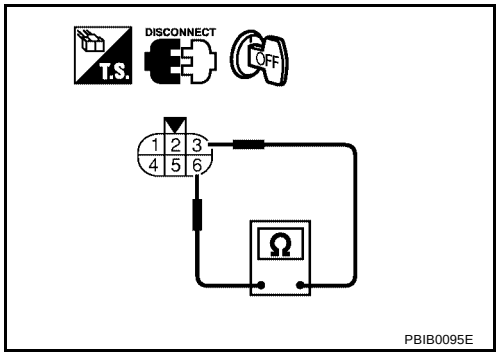
THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.

2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-634, "Throttle Valve Closed Position Learning" .
5. Perform EC-635, "Idle Air Volume Learning" .



Removal and Installation

UBS006IM

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

UBS003XI

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

UBS003XJ

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

UBS003XK

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detects the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	● Harness or connectors (Throttle control motor relay circuit is open) ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

UBS003XL

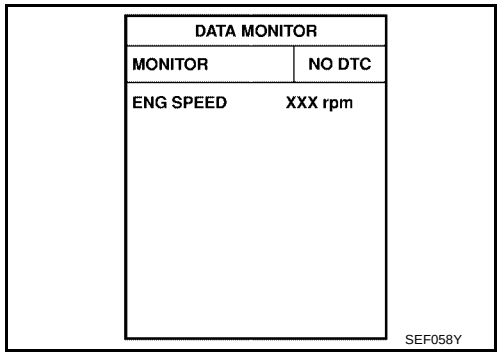
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-964, "Diagnostic Procedure" .



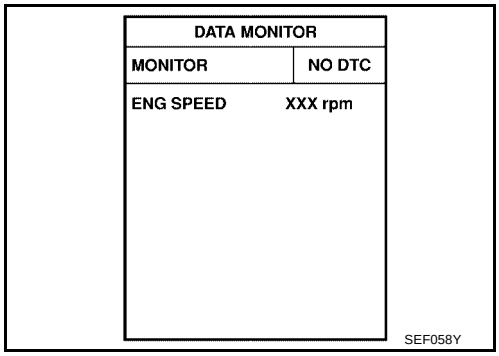
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR””mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-964, "Diagnostic Procedure" .

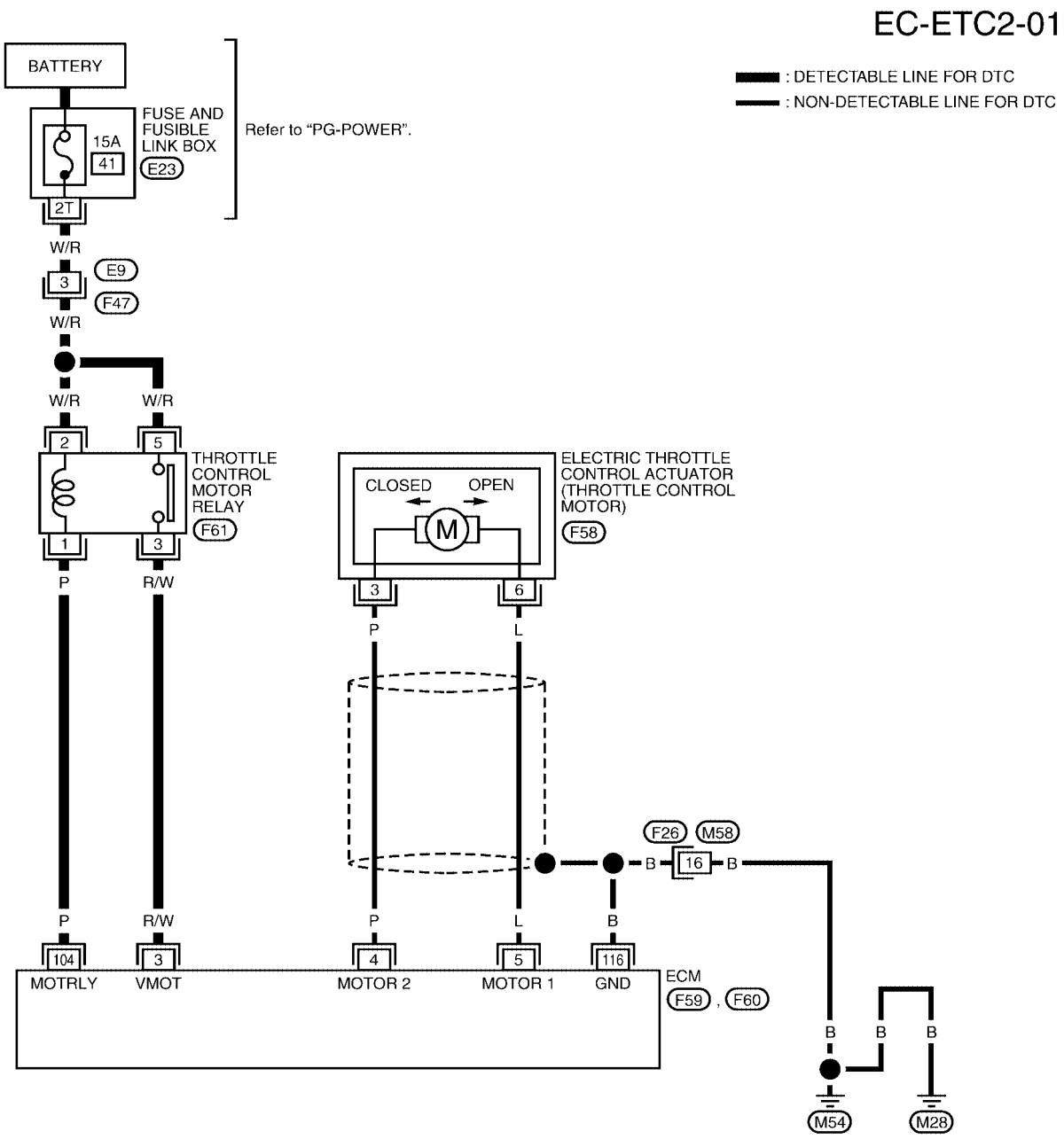


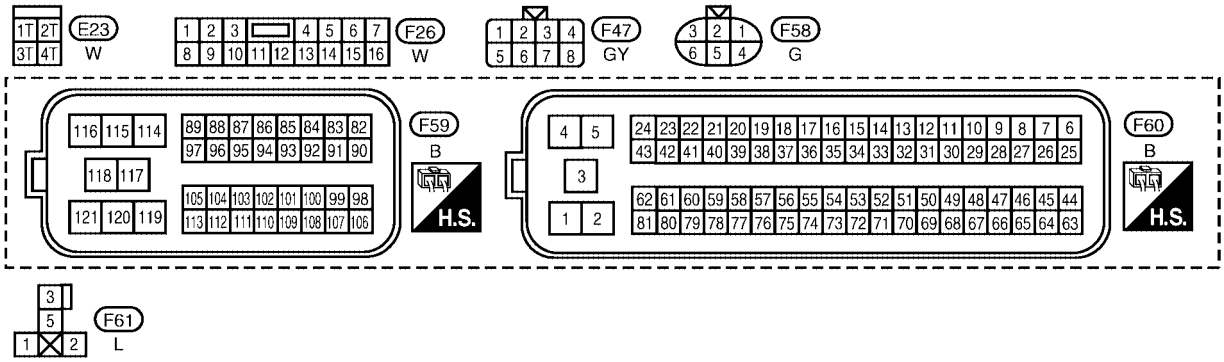
With GST

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS003XM





BBWA0790E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

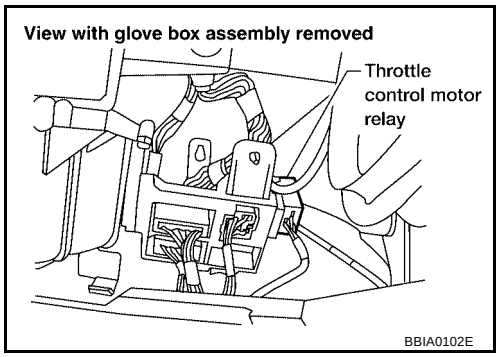
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R/W	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
104	P	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

Diagnostic Procedure

UBS003XN

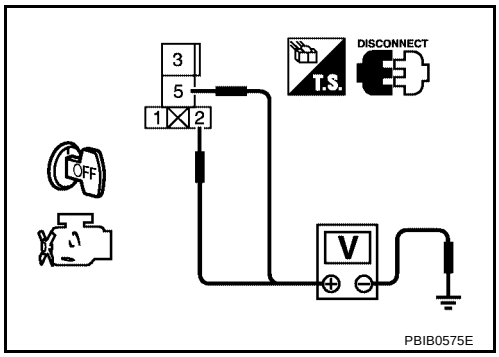
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay harness connector.



3. Check voltage between throttle control motor relay terminal 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse and fusible link connector E23
- 15A fuse
- Harness for open or short between throttle control motor relay and battery

>> Repair or replace harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-965, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace throttle control motor relay.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

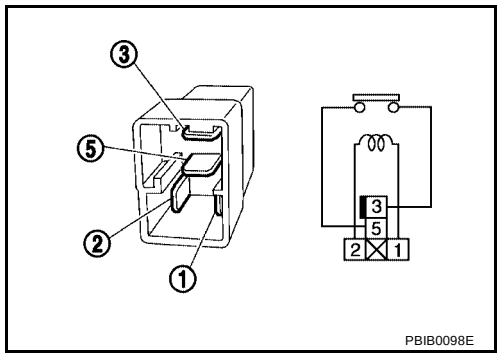
UBS006IA

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

UBS003XO

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS003XP

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

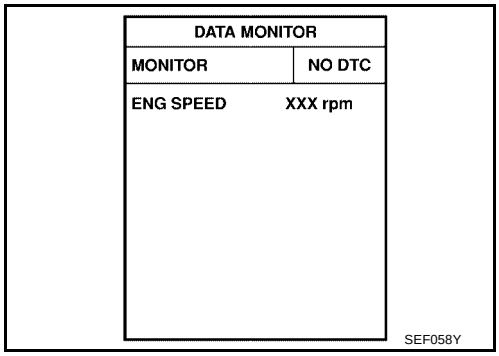
DTC Confirmation Procedure

UBS003XQ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-968, "Diagnostic Procedure" .

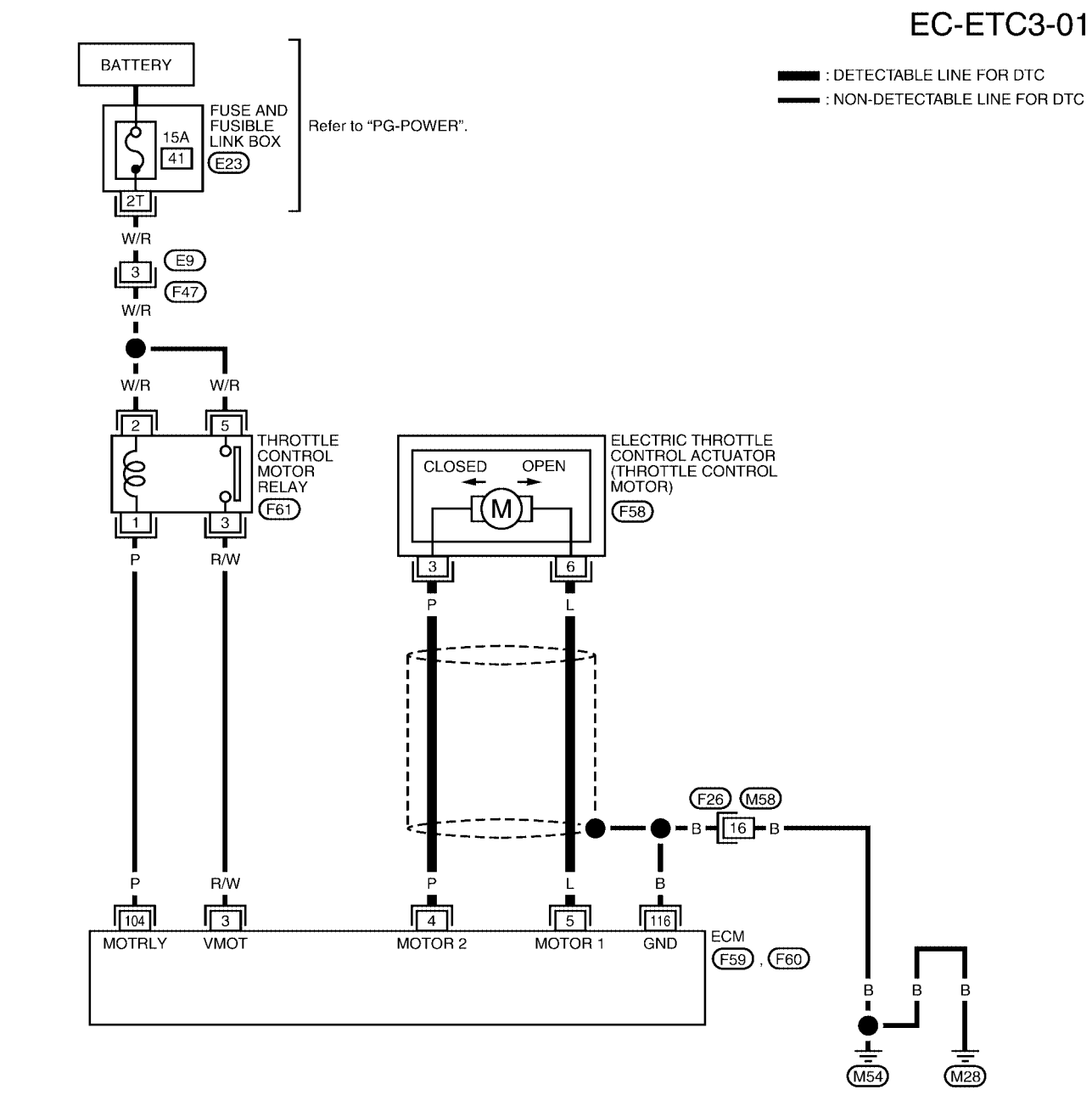


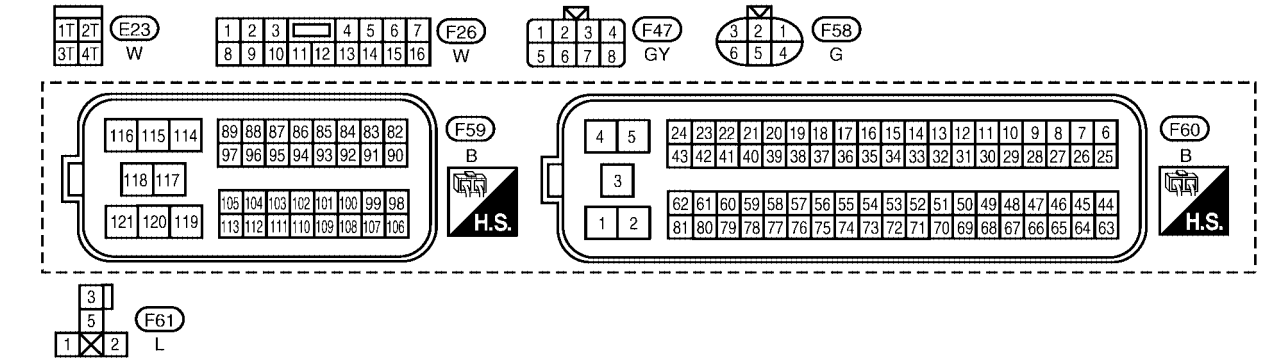
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003XR



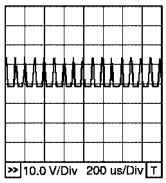
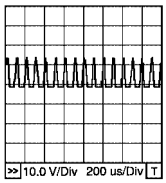


BBWA0791E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

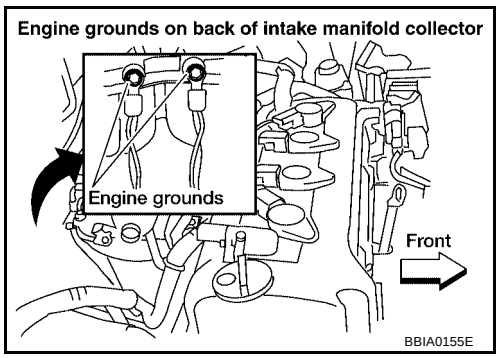
Diagnostic Procedure

UBS003XS

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

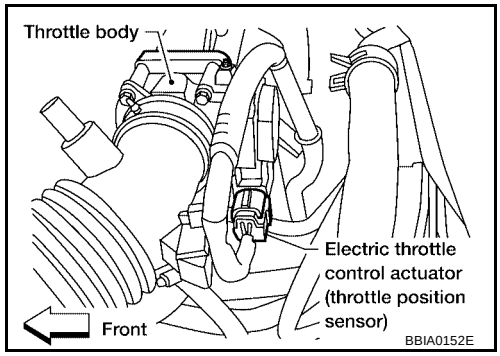
>> GO TO 2.



2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist



5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-969, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

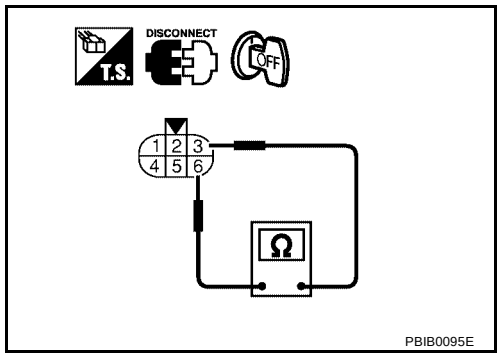
Component Inspection

UBS003XT

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-634, "Throttle Valve Closed Position Learning" .
5. Perform EC-635, "Idle Air Volume Learning" .

Removal and Installation

UBS003XU

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

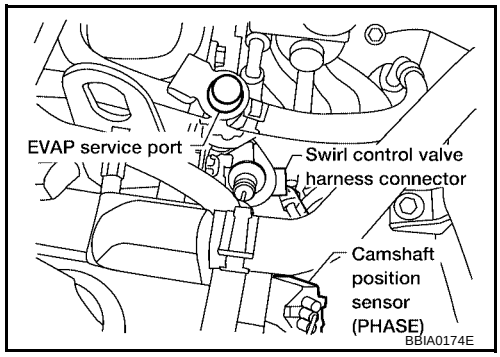
DTC P1132 SWIRL CONTROL VALVE

PFP:00000

Component Description

UBS00691

Swirl control valve consists of actuator and valve. The valve is installed in the intake manifold, and the actuator is connected to the rear end of the valve shaft.
The swirl control valve uses a step motor which has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes. When no change in the control position is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.



CONSULT-II Reference Value in Data Monitor Mode

UBS00692

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWL C/V (B1)	● Engine: Idle the engine	Engine coolant temperature is below 44°C (111°F)	0 - 5 step
		Engine coolant temperature is above 45°C (113°F)	115 - 120 step
SWL/C POSI SE	● Engine: Idle the engine	Engine coolant temperature is below 44°C (111°F)	Approx. 0 deg.
		Engine coolant temperature is above 45°C (113°F)	Approx. 80 deg.

On Board Diagnosis Logic

UBS00693

DTC No.	Trouble diagnosis name	DTC Detecting Condition	Possible Cause
P1132 1132	Swirl control valve circuit	An improper voltage signal is sent to ECM.	● Harness or connectors (The swirl control valve circuit is open or shorted.) ● Swirl control valve control solenoid valve

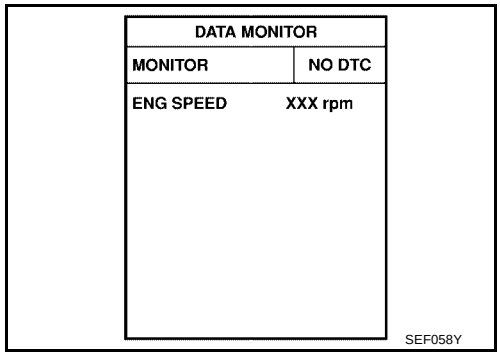
DTC Confirmation Procedure

UBS00695

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 10 seconds.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Turn ignition switch “ON” and wait at least 2 seconds.
6. Start engine and let it idle for at least 10 seconds.
7. Maintain engine speed at about 2,000 rpm for at least 10 seconds.
8. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
   If 1st trip DTC is detected, go to EC-974, "Diagnostic Procedure"
   .
   If 1st trip DTC is not detected, go to next step.
9. Perform step 5 through 8 three times.



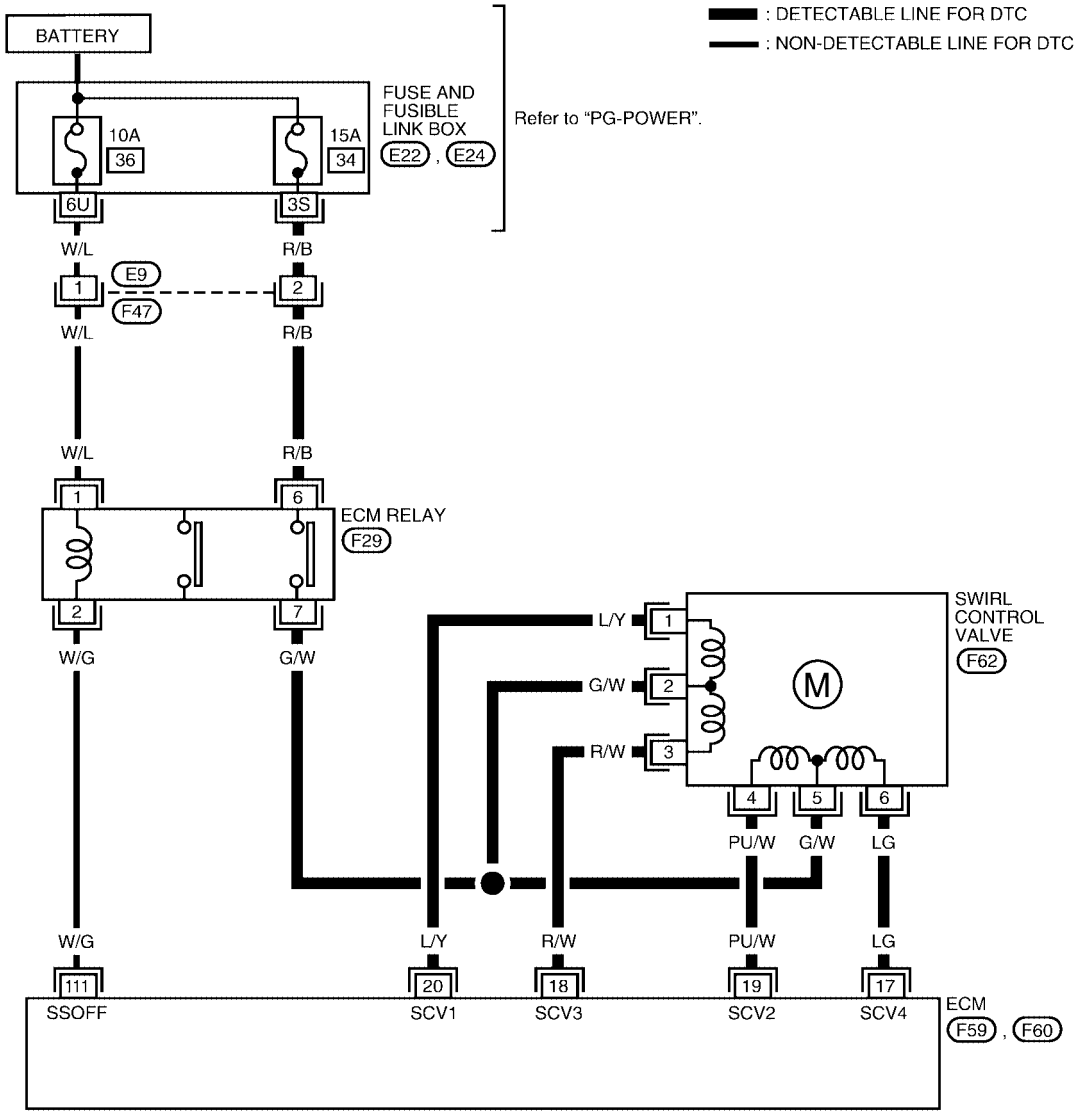
WITH GST

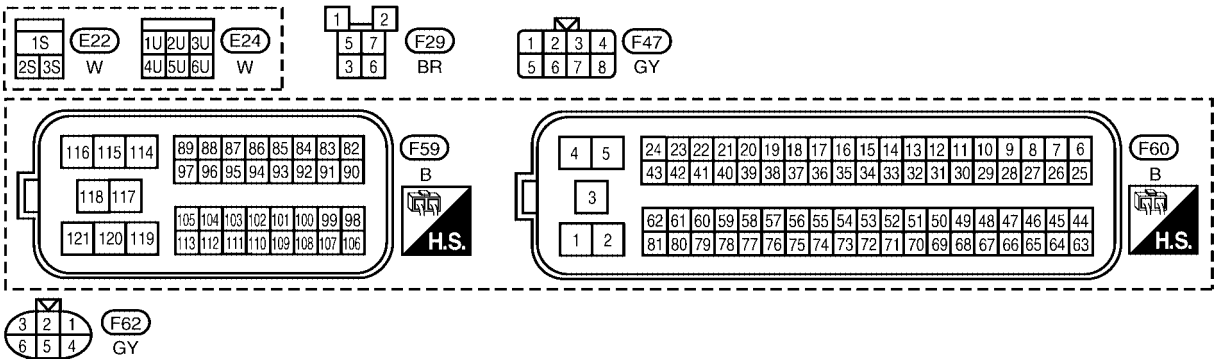
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS00696

EC-SWL/V-01





BBWA0800E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

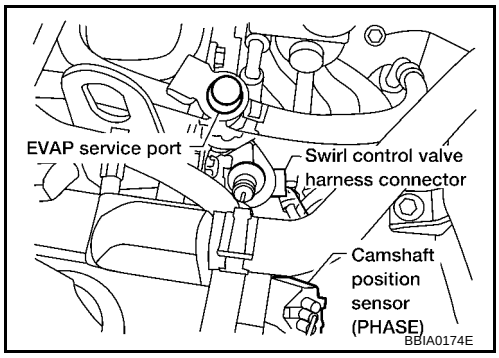
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17 18 19 20	LG R/W PU/W L/Y	Swirl control valve	**[Engine is running]** ● Idle speed	0.1 - 14V

Diagnostic Procedure

UBS00697

1. CHECK SWIRL CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect swirl control valve harness connector.
3. Turn ignition switch “ON”.

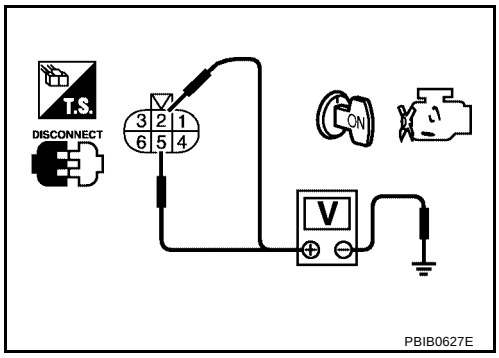


4. Check voltage between swirl control valve terminals 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



2. CHECK SWIRL CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and swirl control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	Swirl volume control valve
17	6
18	3
19	4
20	1

Continuity should exist.

4. Also check harness for short to ground and short to power.

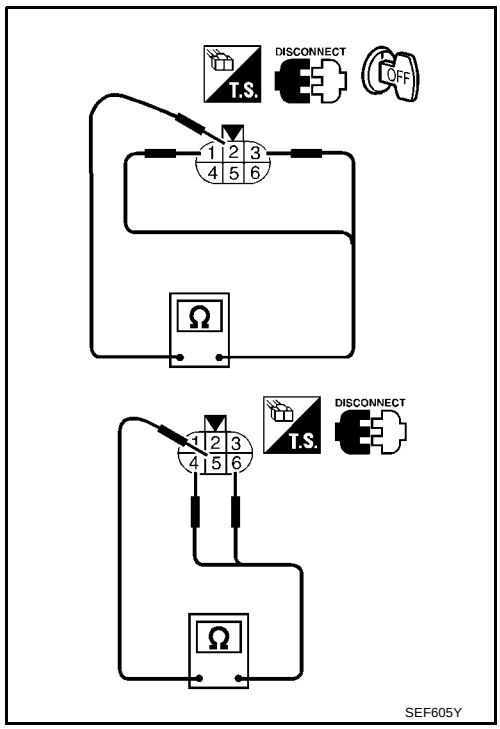
OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK SWIRL CONTROL VALVE

Check resistance between swirl control valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.

Resistance: 20.5 - 23.5Ω [At 20°C (68°F)]



OK or NG

OK >> GO TO 4.
NG >> Replace intake manifold assembly.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS00698

SWIRL CONTROL VALVE

Refer to EM-12, "Removal and Installation" .

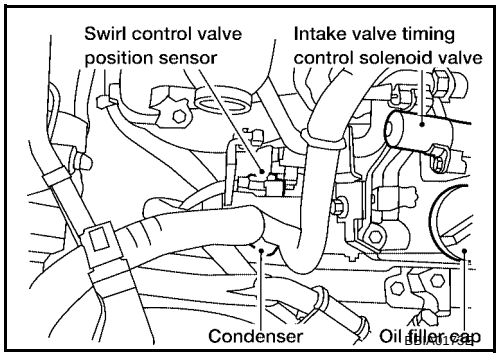
DTC P1137 SWIRL CONTROL VALVE CONTROL POSITION SENSOR

PFP:23731

Component Description

UBS00699

Swirl control valve position sensor is installed on the intake manifold. The sensor is connected to the front end of the valve shaft of the swirl control valve.
The sensor responds to the valve shaft movement. This sensor is a kind of potentiometer which transforms the swirl control valve position into output voltage, and emits the voltage signal to the ECM.



CONSULT-II Reference Value in Data Monitor Mode

UBS0069A

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWL C/V (B1)	● Engine speed: Idle	Engine coolant temperature is below 44°C (111°F).	0 - 5 step
		Engine coolant temperature is above 45°C (113°F).	115 - 120 step
SWL/C POSI SE	● Engine speed: Idle ● Engine coolant temperature is below 44°C (111°F).		Approximately 0 deg
	● Engine speed: Idle ● Engine coolant temperature is above 45°C (113°F).		Approximately 80 deg

On Board Diagnosis Logic

UBS0069B

DTC No.	Trouble diagnosis name	DTC Detecting Condition	Possible Cause
P1137 1137	Swirl control valve control position sensor circuit	An excessively low or high voltage from the sensor is ECM.	● Harness or connectors (Swirl control valve position sensor circuit is open or shorted.) ● Swirl control valve position sensor ● Harness or connectors (Swirl control valve circuit is open or shorted.) ● Swirl control valve

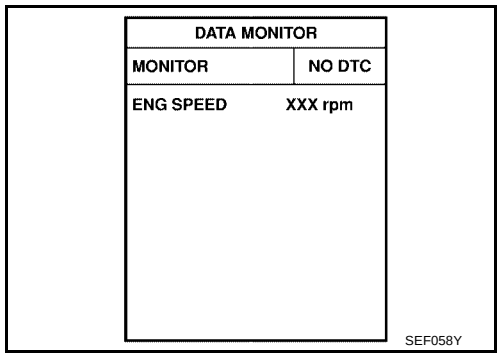
DTC Confirmation Procedure

UBS0069D

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “OFF” and wait at least 10 seconds.
2. Turn ignition switch “ON”.
3. Select “DATA MONITOR” mode with CONSULT-II and wait at least 5 seconds.
   If 1st trip DTC is detected, go to EC-980, "Diagnostic Procedure"
   .



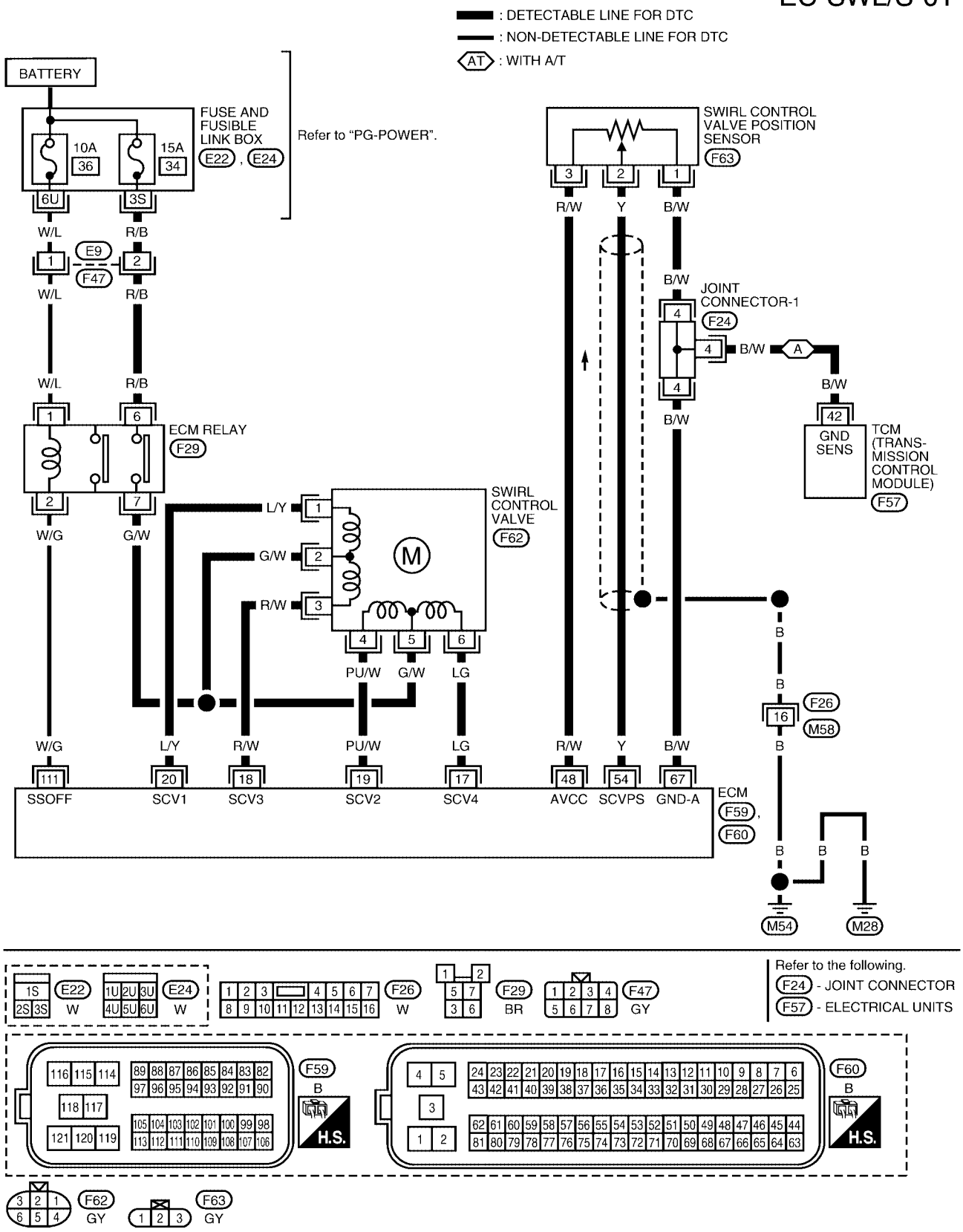
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0069E

EC-SWL/S-01



BBWA0801E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

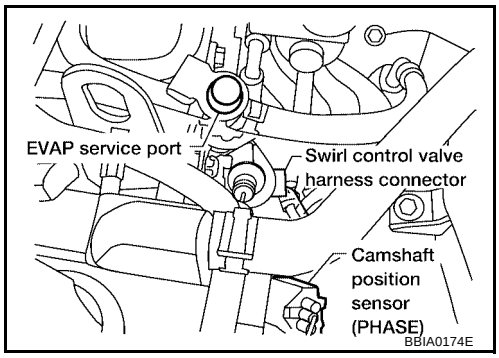
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17 18 19 20	LG R/W PU/W L/Y	Swirl control valve	**[Engine is running]** ● Idle speed	0.1 - 14V
54	Y	Swirl control valve position sensor	**[Engine is running]** ● Idle speed ● Engine coolant temperature is below 44°C (111°F).	Approximately 5V
			[Engine is running] ● **Warm-up condition** ● Idle speed ● Engine coolant temperature is above 45°C (113°F).	0 - 1.0V
67	B/W	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS0069F

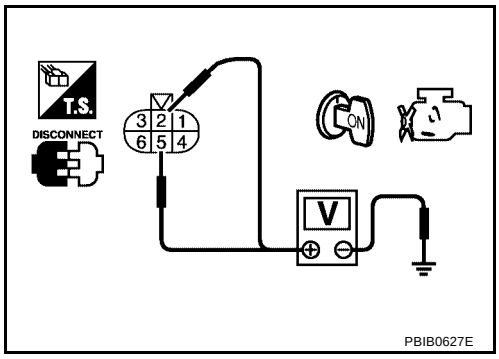
1. CHECK SWIRL CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect swirl control valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between swirl control valve terminals 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness connectors.

2. CHECK SWIRL CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and swirl control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	Swirl volume control valve
17	6
18	3
19	4
20	1

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

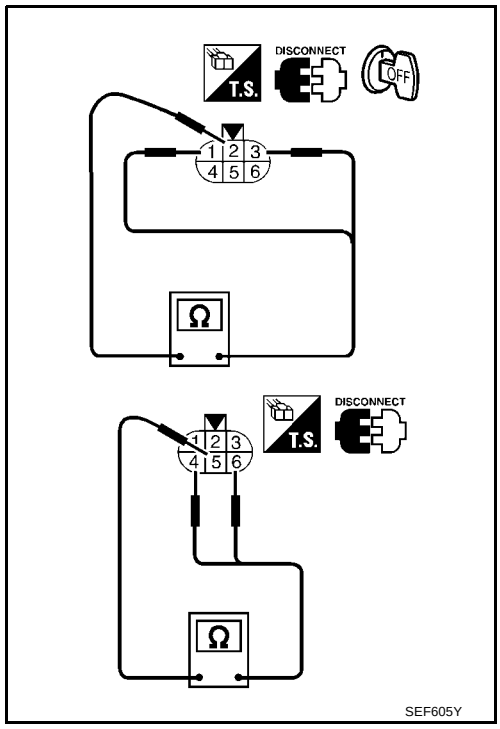
3. CHECK SWIRL CONTROL VALVE

Check resistance between swirl control valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.

Resistance: 20.5 - 23.5 Ω [at 20°C (68°F)]

OK or NG

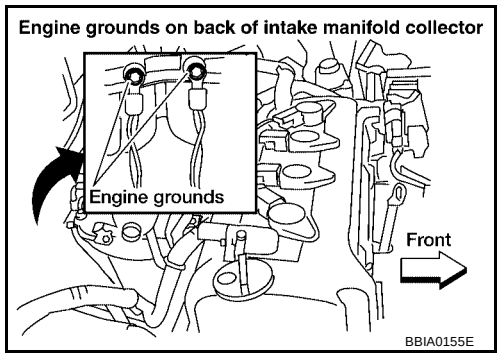
OK >> GO TO 4.
NG >> Replace intake manifold collector assembly.



4. RETIGHTEN GROUND SCREWS

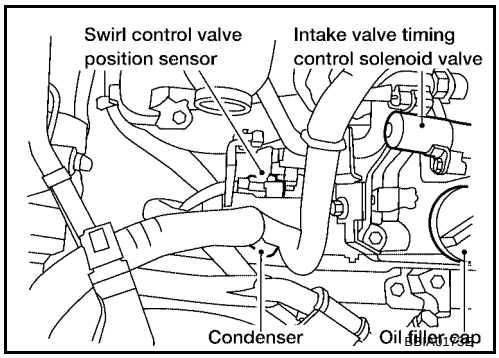
Loosen and retighten engine ground screws.

>> GO TO 5.



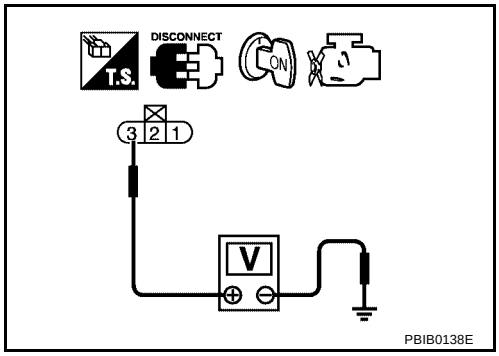
5. CHECK SWIRL CONTROL VALVE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect swirl control valve position sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between swirl control valve position sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness connectors.

6. CHECK SWIRL CONTROL VALVE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between swirl control valve position sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between swirl control valve position sensor and TCM
- Harness for open or short between swirl control valve position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK SWIRL CONTROL VALVE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 54 and swirl control valve position sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT-II)>>GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace intake manifold assembly.
NG >> Repair or replace.

Removal and Installation

UBS0069G

SWIRL CONTROL VALVE CONTROL POSITION SENSOR

Refer to EM-12, "Removal and Installation" .

DTC P1138 SWIRL CONTROL VALVE

PFP:00000

Description

UBS0069H

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position	Swirl control valve control	Swirl control valve
Battery	Battery voltage*		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Swirl control valve position sensor	Swirl control valve position		

*: The ECM determines the start signal status by the signal of engine speed and battery voltage.

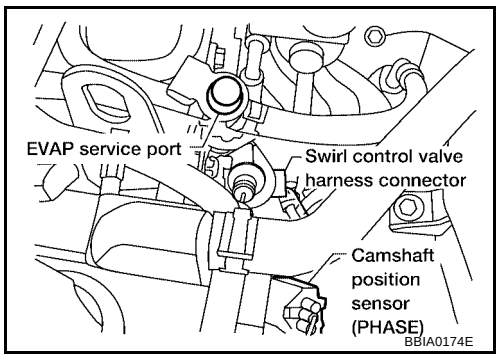
Swirl control valve has a valve portion in the intake passage of each cylinder.
While idling and during low engine coolant temperature, the swirl control valve closes, Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.
Also, except when idling and during low engine coolant temperature, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.
The swirl control valve is operated by the ECM.

Throttle position sensor (Idle position)	Engine coolant temperature	Swirl control valve
OFF	—	Open
ON	Above 45°C (113°F)	Open
	Below 44°C (111°F)	Close

COMPONENT DESCRIPTION

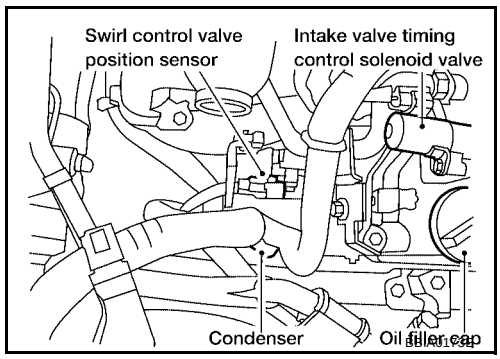
Swirl Control Valve

Swirl control valve consists of actuator and valve. The valve is installed in the intake manifold, and the actuator is connected to the rear end of the valve shaft.
The swirl control valve uses a step motor which has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes. When no change in the control position is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.



Swirl Control Valve Position Sensor

Swirl control valve position sensor is installed on the intake manifold. The sensor is connected to the front end of the valve shaft of the swirl control valve.
The sensor responds to the valve shaft movement. This sensor is a kind of potentiometer which transforms the swirl control valve position into output voltage, and emits the voltage signal to the ECM.



CONSULT-II Reference Value in Data Monitor Mode

UBS0069I

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWL C/V (B1)	● Engine speed: Idle	Engine coolant temperature is below 44°C (111°F).	0 - 5 step
		Engine coolant temperature is above 45°C (113°F).	115 - 120 step

On Board Diagnosis Logic

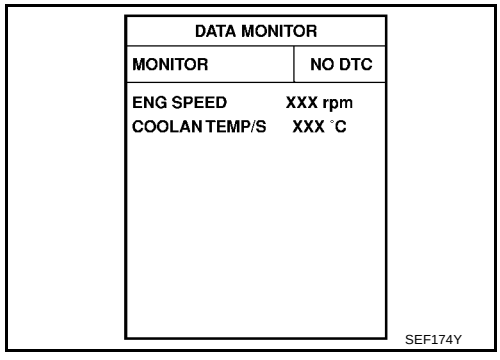
UBS0069J

DTC No.	Trouble diagnosis name	DTC Detecting Condition	Possible Cause
P1138 1138	Swirl control valve control system performance	The target opening angle of swirl control valve controlled by ECM and the input signal from swirl control valve position sensor is not in the normal rang.	● Harness or connectors (Swirl control valve position sensor circuit is open or shorted.) ● Swirl control valve position sensor ● Harness or connectors (Swirl control valve circuit is open or shorted.) ● Swirl control valve

DTC Confirmation Procedure

UBS0069L

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.



With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 10 seconds.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Turn ignition switch “ON” and wait at least 2 seconds.
6. Start engine and let it idle for at least 10 seconds.
7. Maintain engine speed at about 2,000 rpm for at least 10 seconds.
8. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
   If 1st trip DTC is detected, go to EC-988, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
9. Perform step 5 through 8 three times.

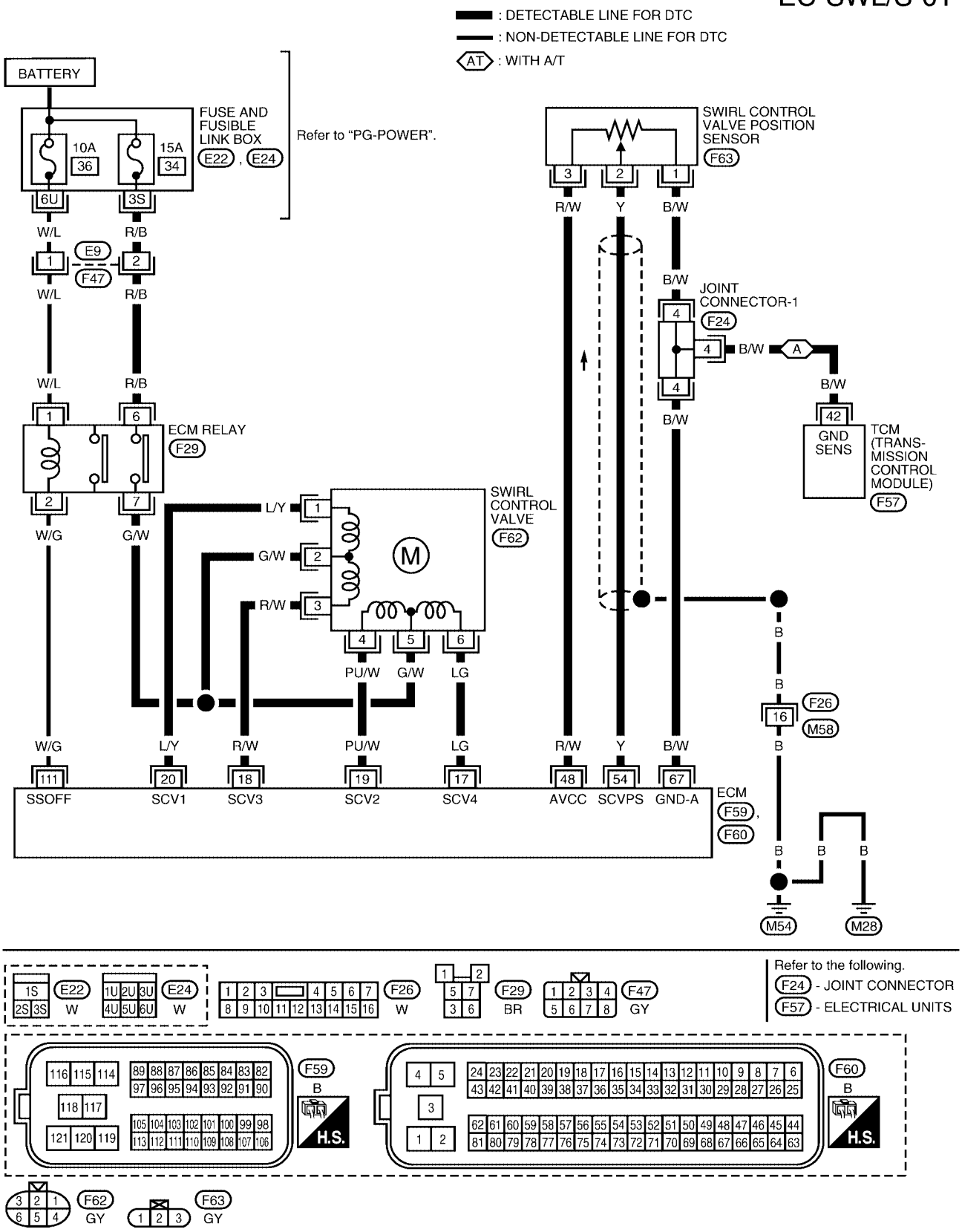
With GST

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS0069M

EC-SWL/S-01



BBWA0801E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

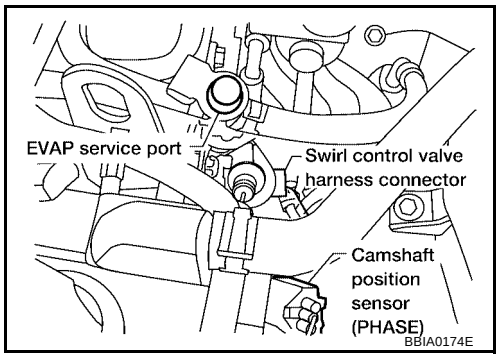
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17 18 19 20	LG R/W PU/W L/Y	Swirl control valve	**[Engine is running]** ● Idle speed	0.1 - 14V
54	Y	Swirl control valve position sensor	**[Engine is running]** ● Idle speed ● Engine coolant temperature is below 44°C (111°F).	Approximately 5V
			[Engine is running] ● **Warm-up condition** ● Idle speed ● Engine coolant temperature is above 45°C (113°F).	0 - 1.0V
67	B/W	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS0069N

1. CHECK SWIRL CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect swirl control valve harness connector.
3. Turn ignition switch “ON”.

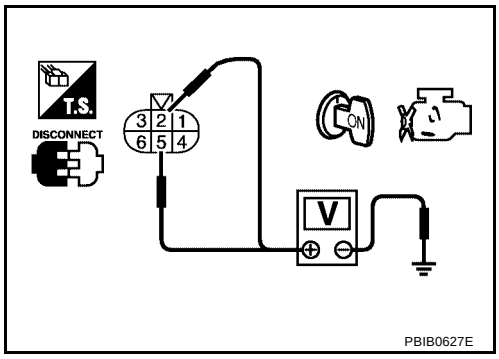


4. Check voltage between swirl control valve terminals 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness connectors.



2. CHECK SWIRL CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and swirl control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	Swirl volume control valve
17	6
18	3
19	4
20	1

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

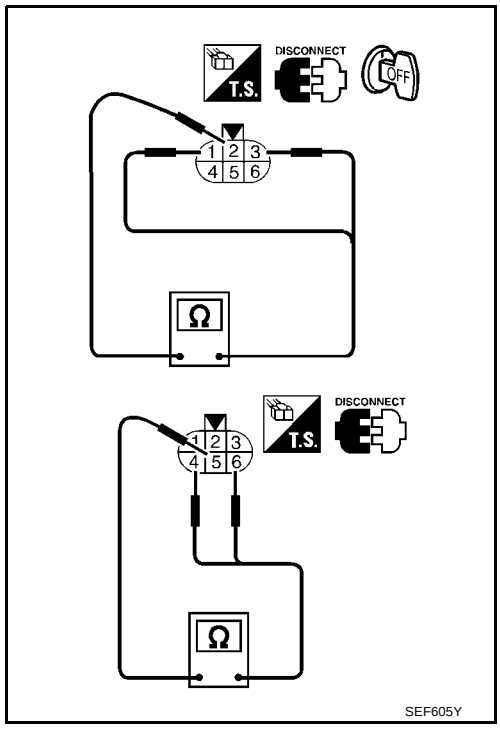
3. CHECK SWIRL CONTROL VALVE

Check resistance between swirl control valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.

Resistance: 20.5 - 23.5Ω [At 20°C (68°F)]

OK or NG

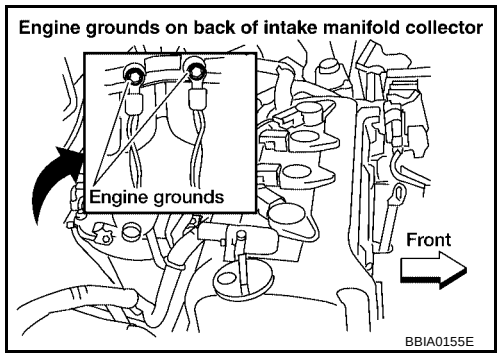
OK >> GO TO 4.
NG >> Replace intake manifold collector assembly.



4. RETIGHTEN GROUND SCREWS

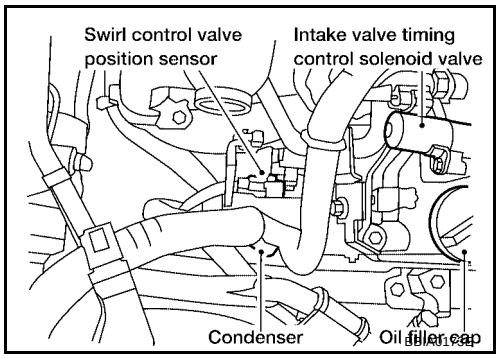
Loosen and retighten engine ground screws.

>> GO TO 5.



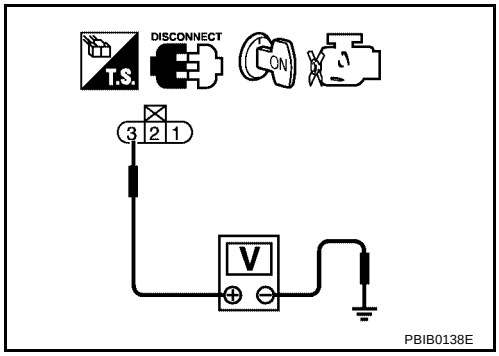
5. CHECK SWIRL CONTROL VALVE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect swirl control valve position sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between swirl control valve position sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness connectors.

6. CHECK SWIRL CONTROL VALVE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between swirl control valve position sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between swirl control valve position sensor and TCM
- Harness for open or short between swirl control valve position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK SWIRL CONTROL VALVE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 54 and swirl control valve position sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT-II)>>GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace intake manifold assembly.
NG >> Repair or replace.

Removal and Installation

UBS0069O

SWIRL CONTROL VALVE

Refer to EM-12, "Removal and Installation" .

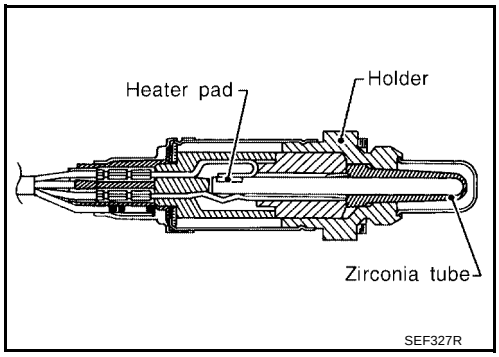
DTC P1146 HO2S2

PFP:226A0

Component Description

UBS0069P

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS0069Q

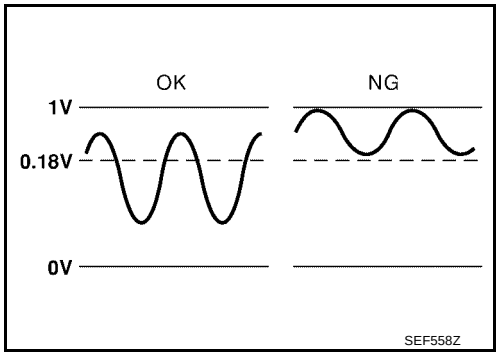
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH

On Board Diagnosis Logic

UBS0069R

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146 1146	Heated oxygen sensor 2 minimum voltage monitoring	The minimum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors

DTC Confirmation Procedure

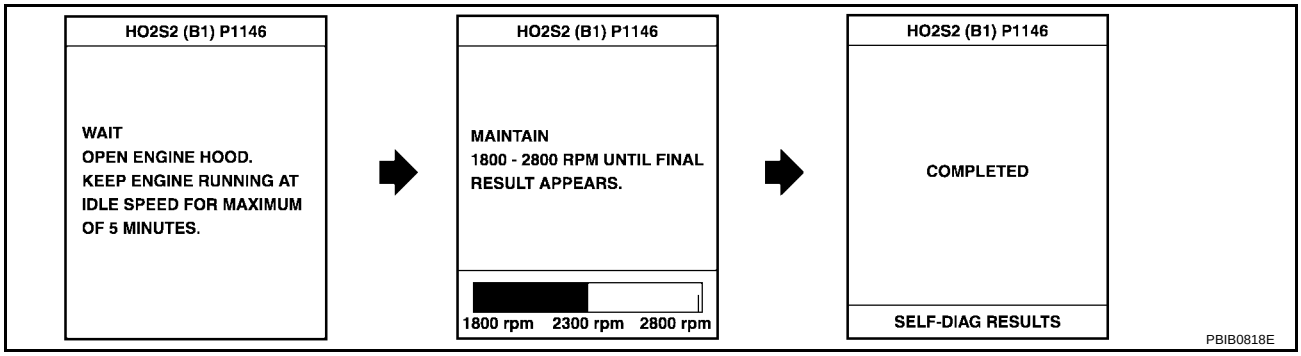
UBS0069S

NOTE:
If “DTC confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

TESTING CONDITION:
For the best results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “HO2S2 (B1) P1146” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that ″OK″ is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-996, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANEMP/S” indication on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 3.

Overall Function Check

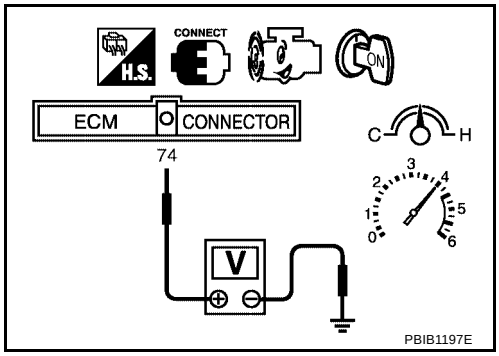
UBS0069T

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

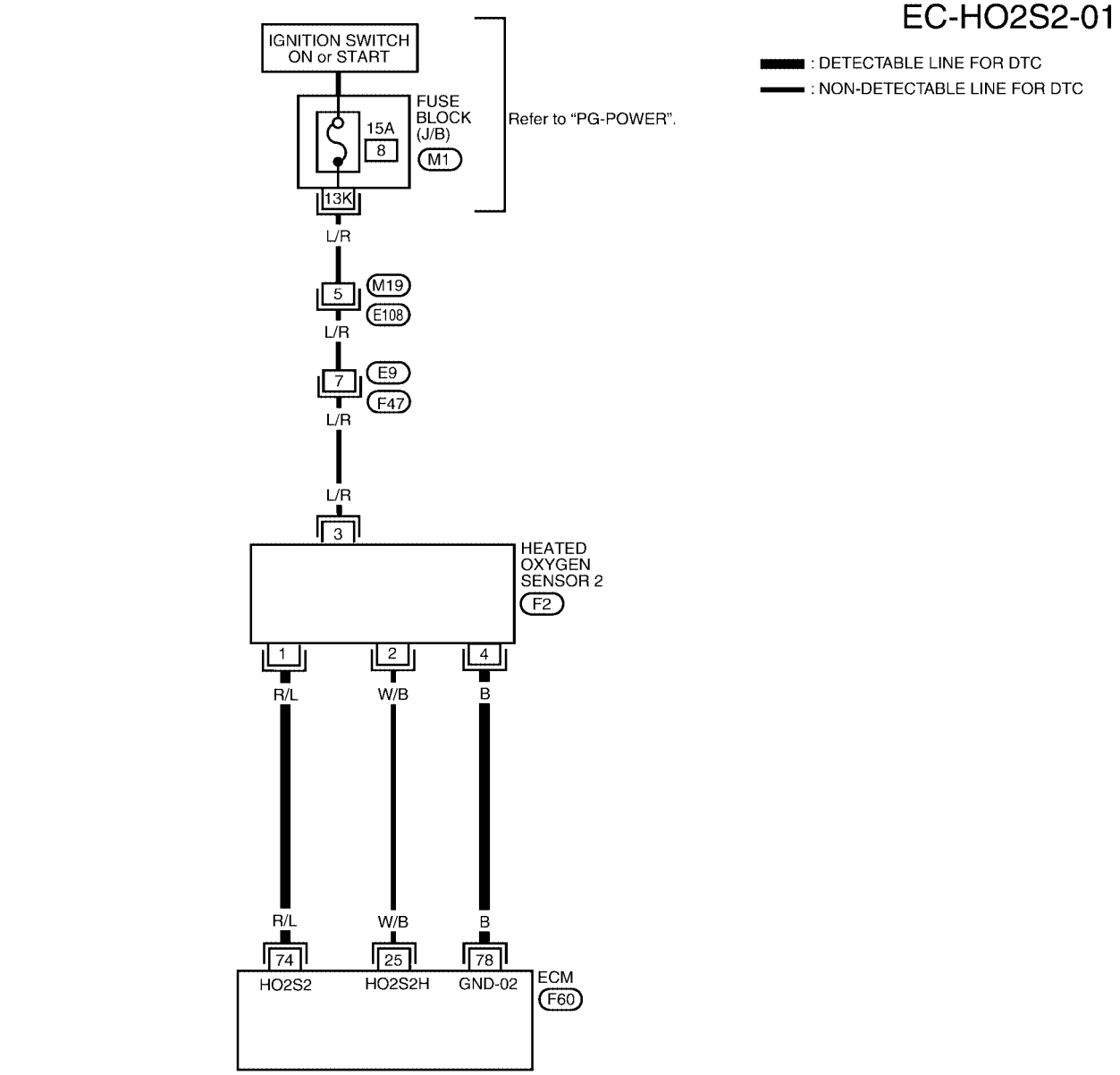
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.

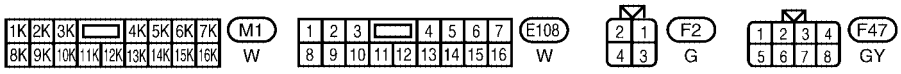
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.18V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T) “3rd” gear position (M/T).
   The voltage should be below 0.18V at least once during this procedure.
8. If NG, go to EC-996, "Diagnostic Procedure" .

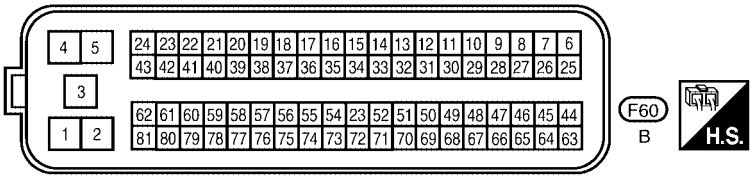


Wiring Diagram

UBS0069U







BBWA0283E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
78	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

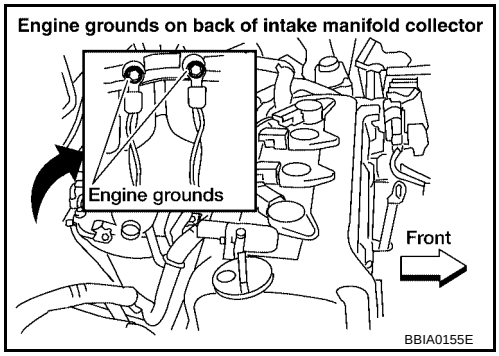
Diagnostic Procedure

UBS0069V

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

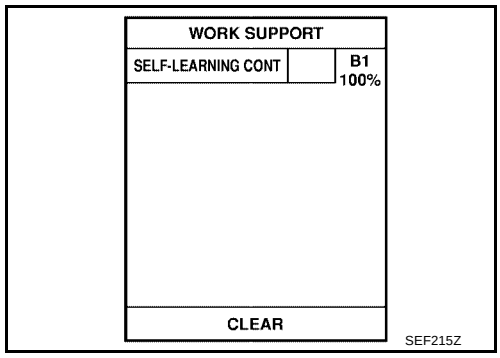
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

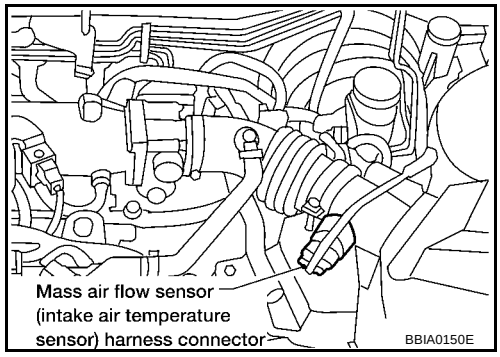
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-802 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

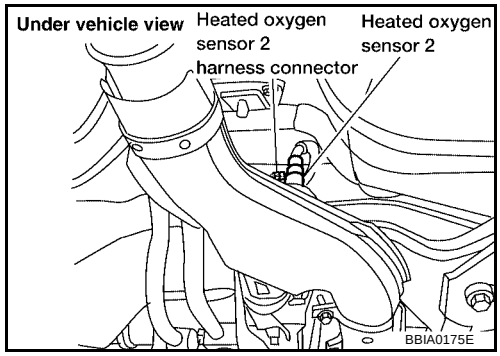
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 74 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 74 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer toEC-998, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS0069W

HEATED OXYGEN SENSOR 2

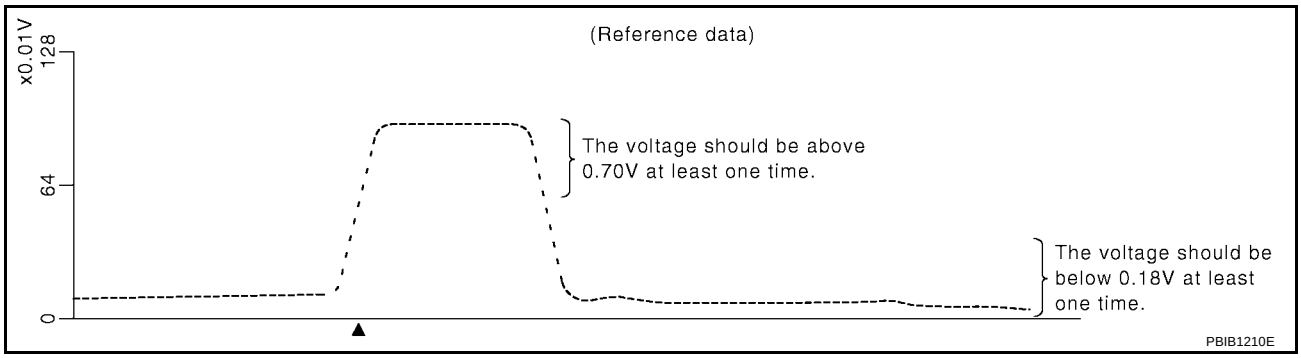
With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle and wait until 2 minutes have passed from starting the engine.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
A/F SEN1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S3 (B1)	XXX V

SEF519Z

6. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



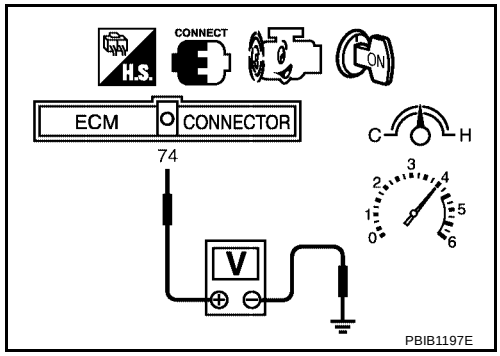
“HO2S2 (B1)” should be above 0.70V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.18V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch ″OFF″ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.70V at least once during this procedure.
   If the voltage is above 0.70V at step 6, step 7 is not necessary.



7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with“OD” OFF (A/T) “3rd” gear position.
   The voltage should be below 0.18V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS0069X

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

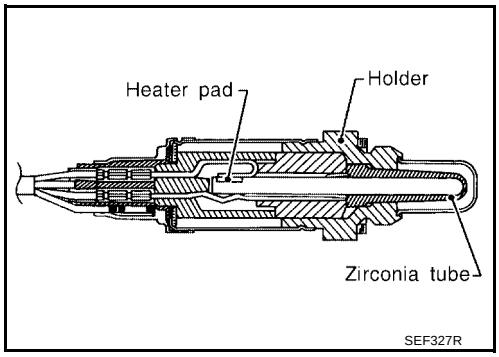
DTC P1147 HO2S2

PFP:226A0

Component Description

UBS0069Y

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS0069Z

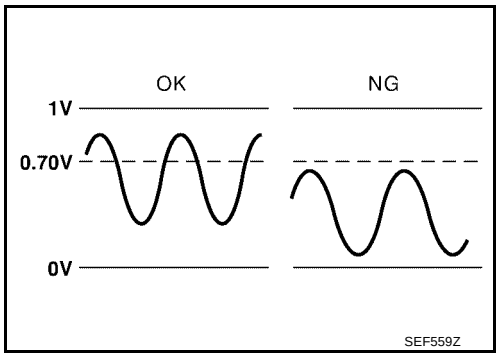
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load	Revving engine from idle to 3,000 rpm quickly	LEAN ←→ RICH

On Board Diagnosis Logic

UBS006A0

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147 1147	Heated oxygen sensor 2 maximum voltage monitoring	The maximum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

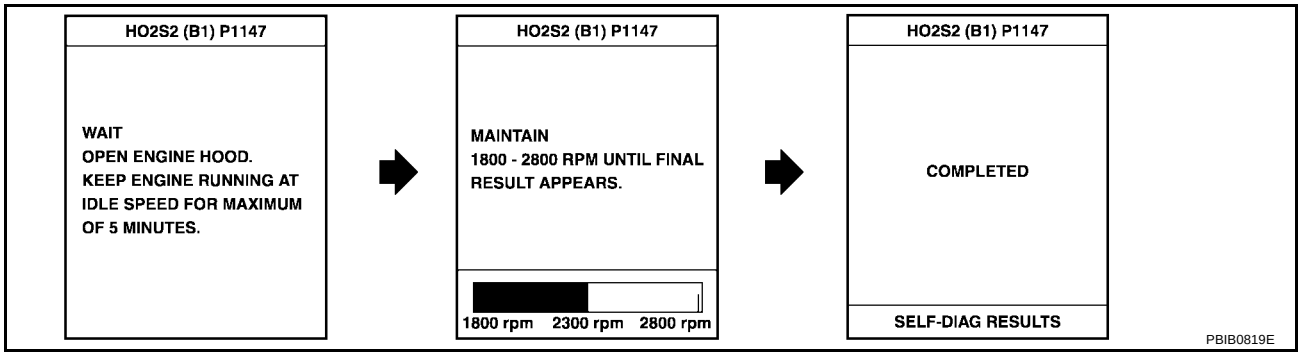
UBS006A1

NOTE:
If “DTC confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

TESTING CONDITION:
For the best results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “HO2S2 (B1) P1147” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-1004 .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANEMP/S” indication on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 3.

Overall Function Check

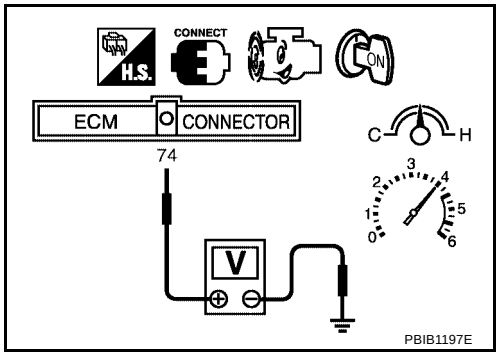
UBS006A2

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

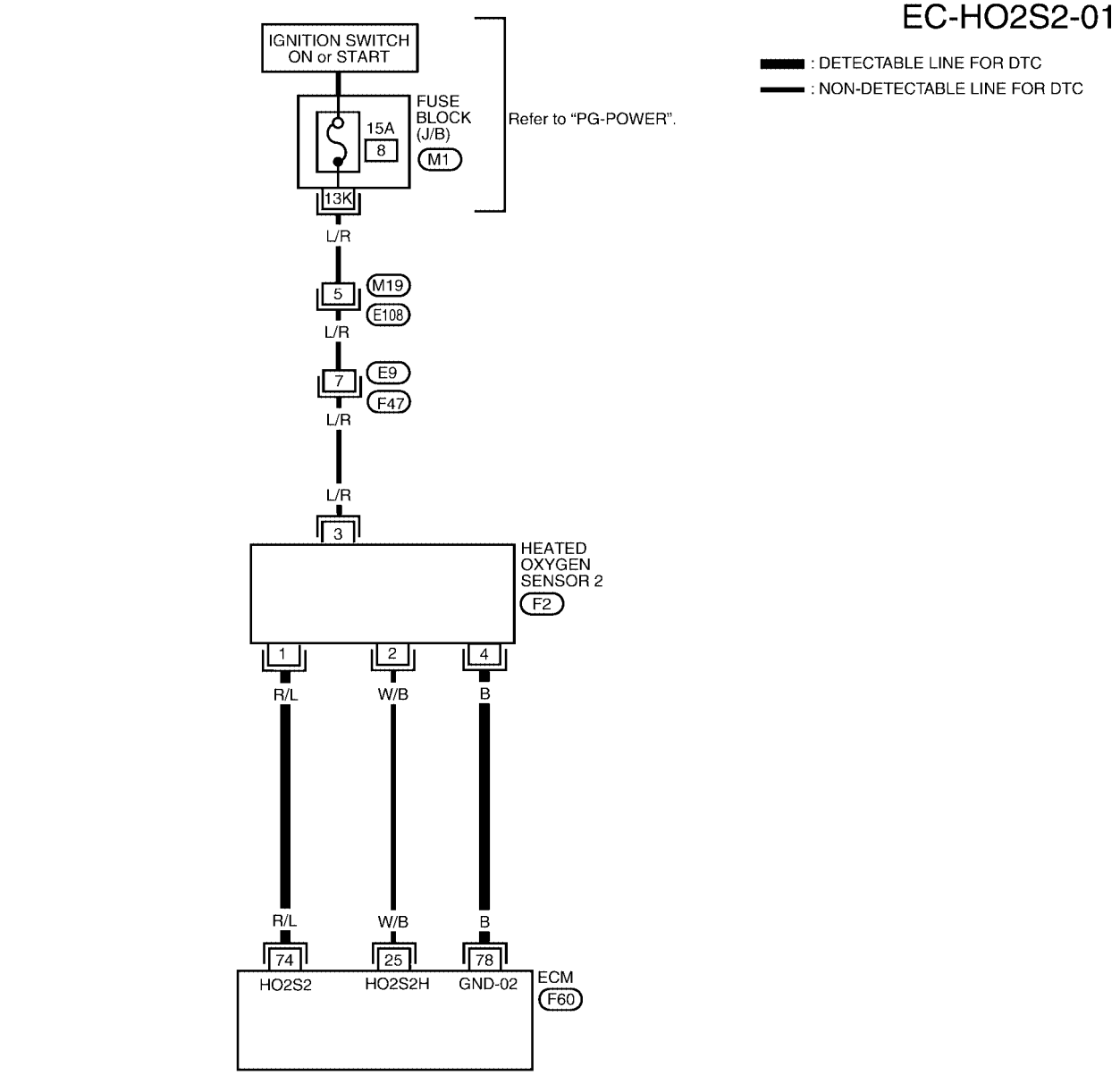
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.

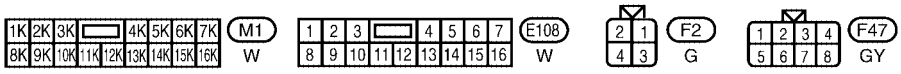
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.70V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T) “3rd” gear position (M/T).
   The voltage should be above 0.70V at least once during this procedure.
8. If NG, go to EC-1004, "Diagnostic Procedure" .

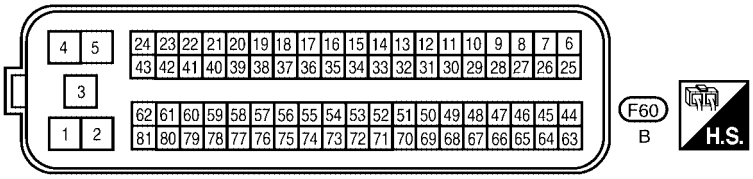


Wiring Diagram

UBS006A3







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Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	R/L	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - Approximately 1.0V
78	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

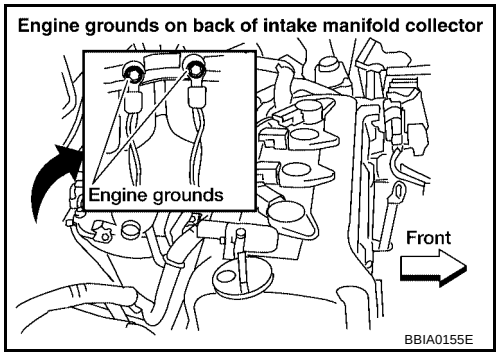
Diagnostic Procedure

UBS006A4

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

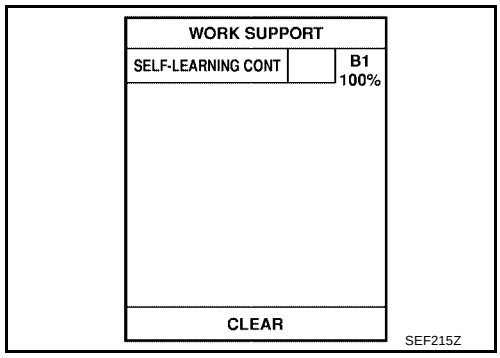
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

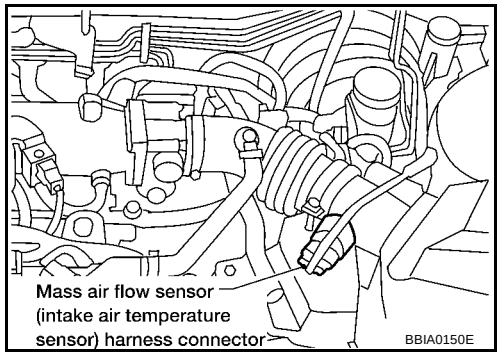
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-795 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

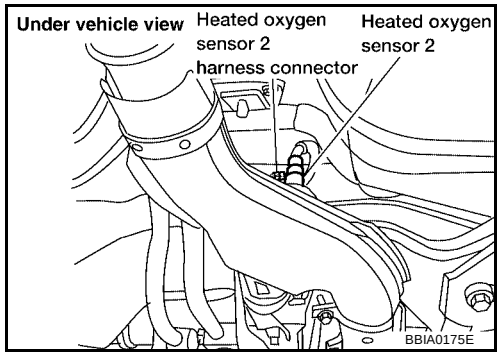
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 74 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 74 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1006, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS006A5

HEATED OXYGEN SENSOR 2

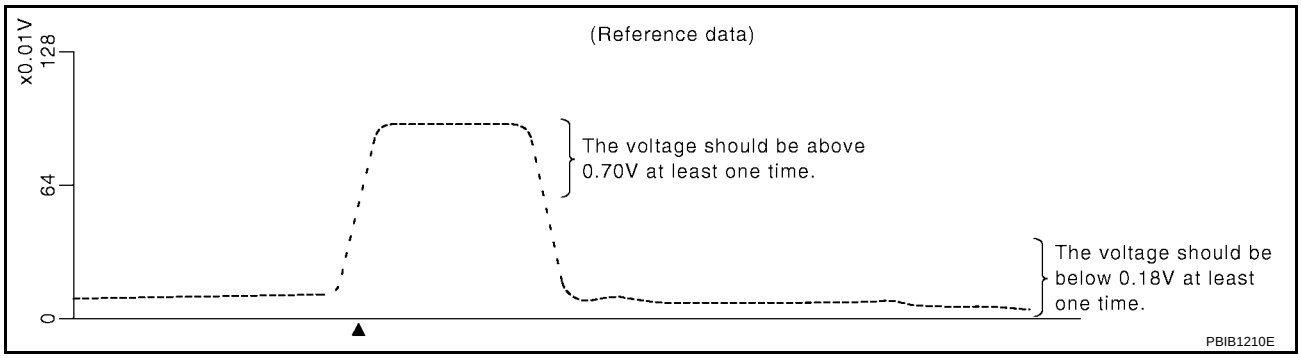
With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle one minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
A/F SEN1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S3 (B1)	XXX V

SEF519Z

6. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



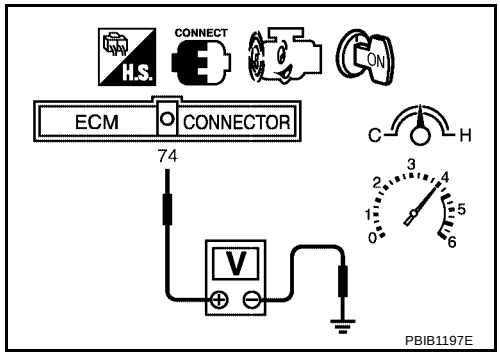
“HO2S2 (B1)” should be above 0.70V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.18V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 74 (HO2S2 signal) and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.70V at least once during this procedure.
   If the voltage is above 0.70V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T) “3rd gear” position.
   The voltage should be below 0.18V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS006A6

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P1148 CLOSED LOOP CONTROL

PFP:22690

On Board Diagnosis Logic

UBS006A7

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148	Closed loop control function	The closed loop control function for bank 1 does not operate even when vehicle is driving in the specified condition.	● The air fuel ratio (A/F) sensor 1 circuit is open or shorted. ● Air fuel ratio (A/F) sensor 1 ● Air fuel ratio (A/F) sensor 1 heater

DTC P1148 is displayed with another DTC for air fuel ratio (A/F) sensor 1. Perform the trouble diagnosis for the corresponding DTC.

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

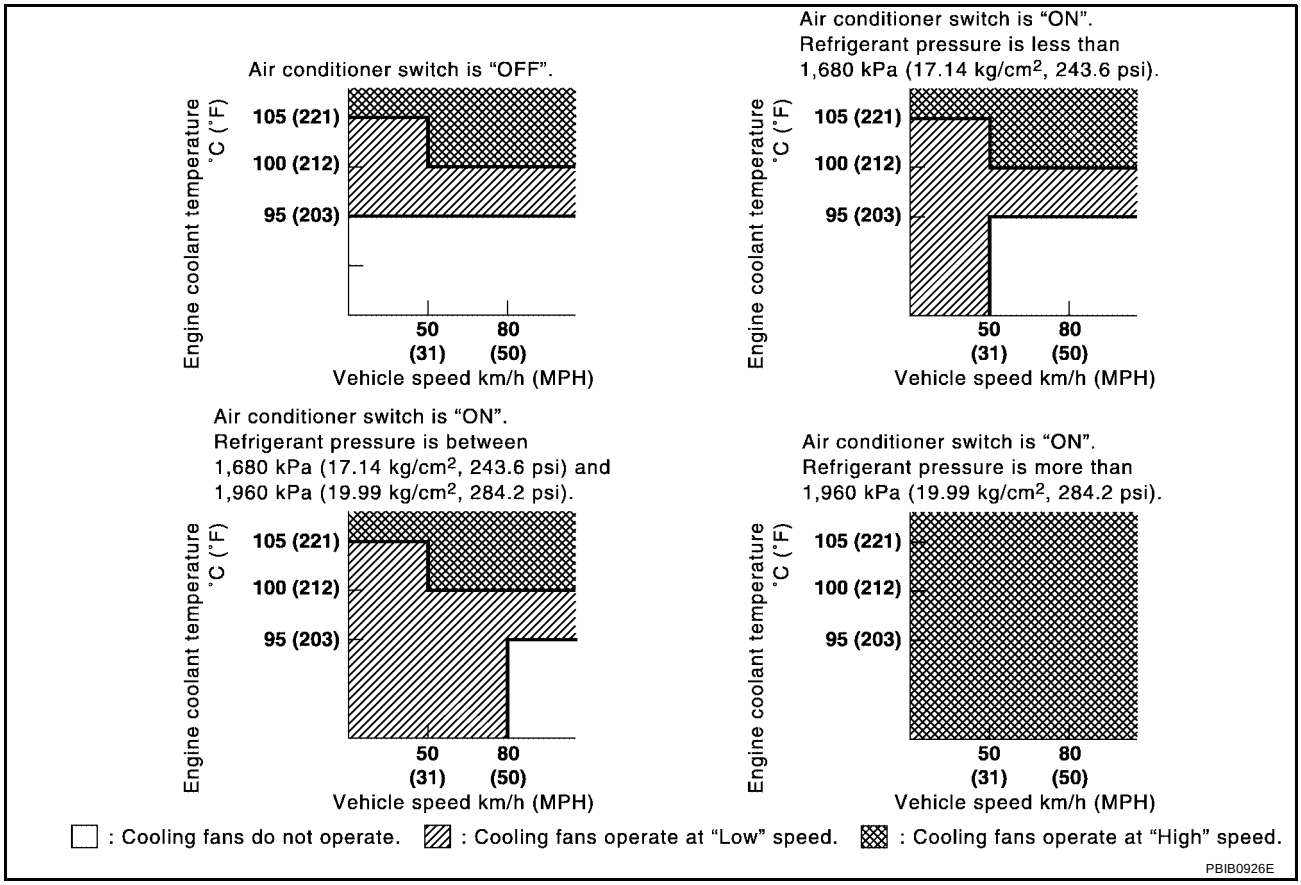
UBS0021S

COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

UBS0021T

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch “OFF”	OFF
		A/C switch: “ON” (Compressor operates)	ON

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

On Board Diagnosis Logic

UBS0021U

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-1021, "Main 12 Causes of Overheating" .

CAUTION:
When a malfunction is indicated, be sure to replace the coolant. Refer to MA-16, "Changing Engine Coolant" . Also, replace the engine oil. Refer to MA-20, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

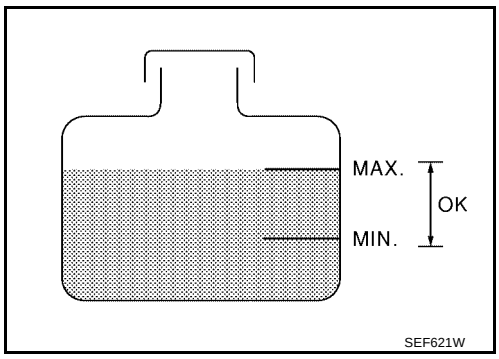
UBS0021V

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1013, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1013, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.



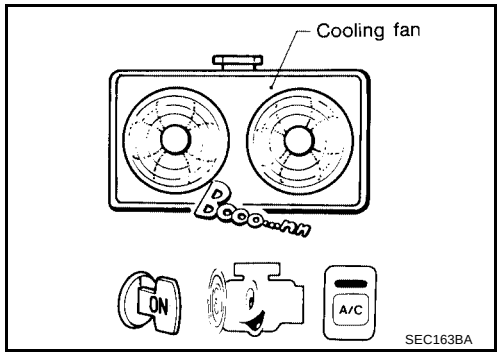
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-1013, "Diagnostic Procedure" .

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

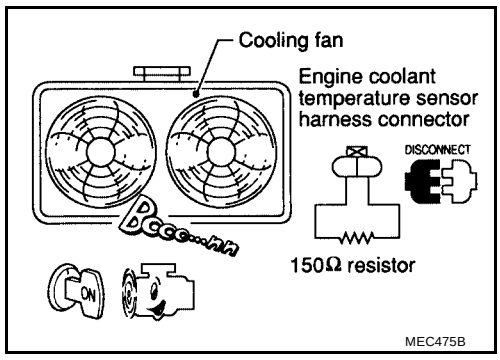
SEF646X

WITH GST

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1013, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1013, "Diagnostic Procedure" .
3. Start engine.
   Be careful not to overheat engine.
4. Set temperature control lever to full cold position.
5. Turn air conditioner switch “ON”.
6. Turn blower fan switch “ON”.
7. Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.
8. Make sure that cooling fan operates at low speed.
   If NG, go to EC-1013, "Diagnostic Procedure" .
   If OK, go to the following step.
9. Turn ignition switch “OFF”.
10. Turn air conditioner switch and blower fan switch “OFF”.
11. Disconnect engine coolant temperature sensor harness connector.
12. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
13. Restart engine and make sure that cooling fan operates at higher speed than low speed.
    Be careful not to overheat engine.
14. If NG, go to EC-1013, "Diagnostic Procedure" .



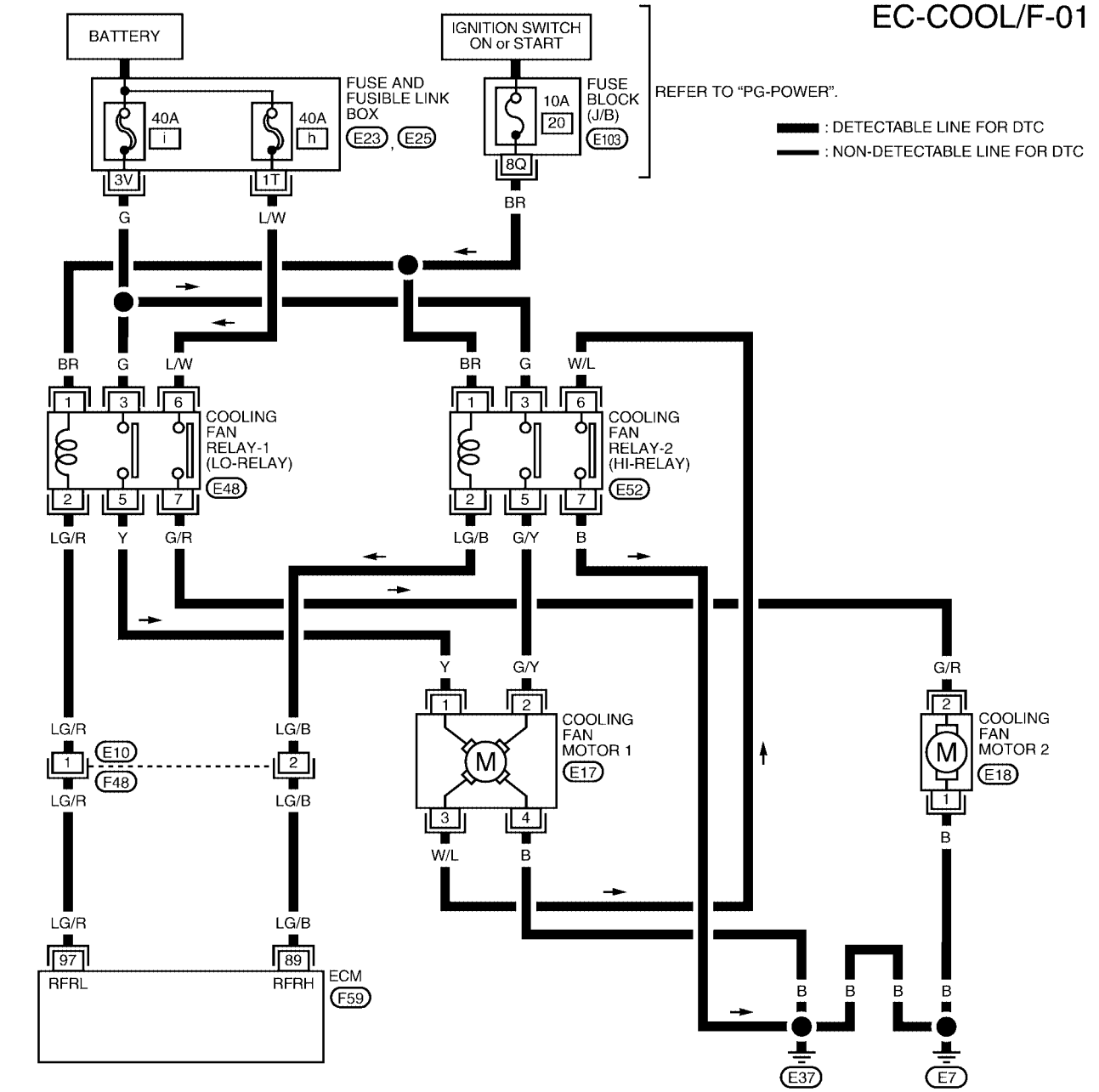
SEC163BA

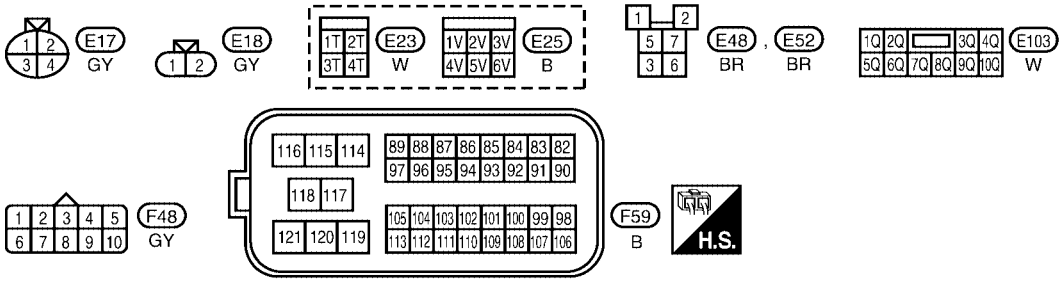


MEC475B

Wiring Diagram

UBS0021W





BBWA0300E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
89	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11-14V)
			[Engine is running] ● Cooling fan is high speed operating	0 - 1.0V
97	LG/R	Cooling fan relay (Low)	**[Ignition switch "ON"]** ● Cooling fan is not operating	BATTERY VOLTAGE (11-14V)
			[Ignition switch "ON"] ● Cooling fan is operating	0 - 1.0V

Diagnostic Procedure

UBS0021X

1. INSPECTION START

Do you have CONSULT-II?

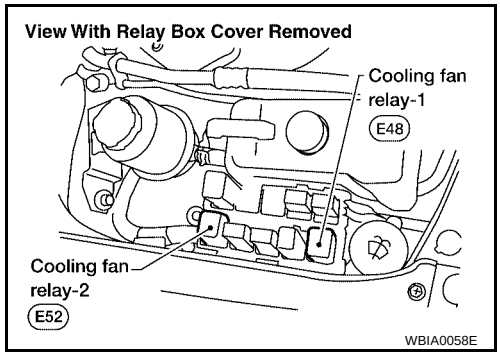
Yes or No

Yes >> GO TO 2.
No >> GO TO 4.

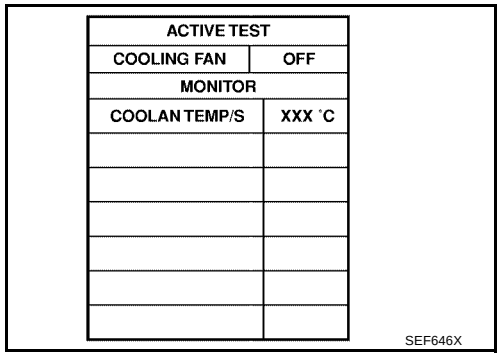
2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

1. Disconnect cooling fan relay-2.
2. Turn ignition switch "ON".



3. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT-II.
4. Make sure that cooling fans-1 and -2 operate at low speed.



OK or NG

OK >> GO TO 3.
NG >> Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-1017 .)

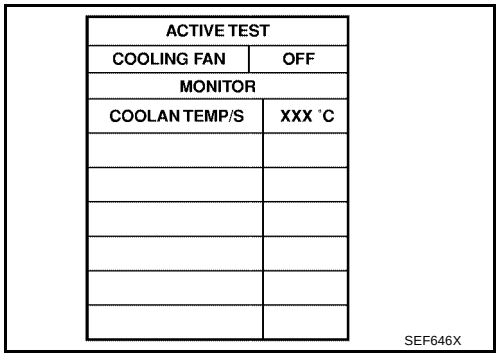
3. CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relay-2.
3. Turn ignition switch “ON”.
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. Make sure that cooling fan-1 operates at high speed.

OK or NG

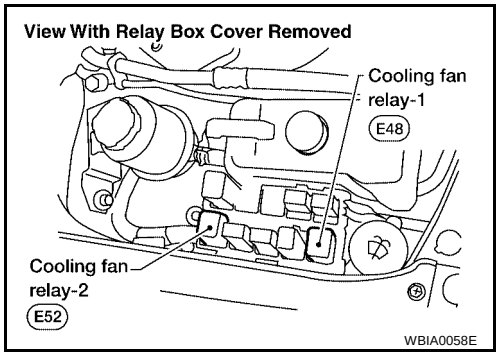
OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-1020 .)



4. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

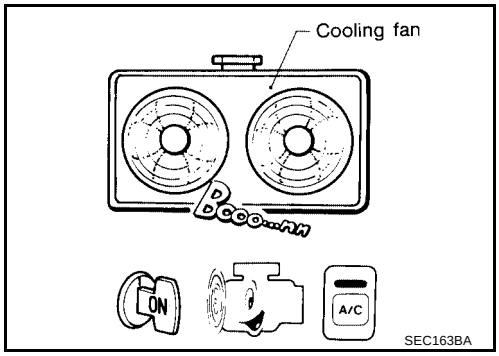
1. Disconnect cooling fan relays-2.
2. Start engine and let it idle.
3. Set temperature lever at full cold position.
4. Turn air conditioner switch “ON”.
5. Turn blower fan switch “ON”.



6. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

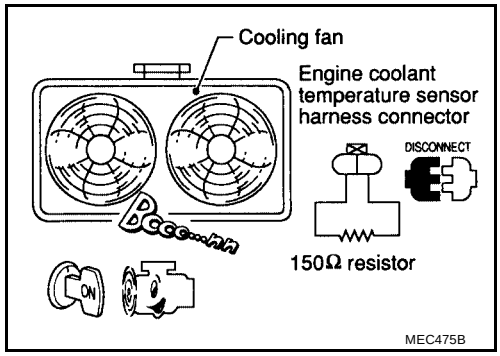
OK >> GO TO 5.
NG >> Check cooling fan low speed control circuit. (Go to PROCEDURE A, EC-1017 .)



5. CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relay-2.
3. Turn air conditioner switch and blower fan switch “OFF”.
4. Disconnect engine coolant temperature sensor harness connector.
5. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
6. Restart engine and make sure that cooling fan-1 operates at high speed.



OK or NG

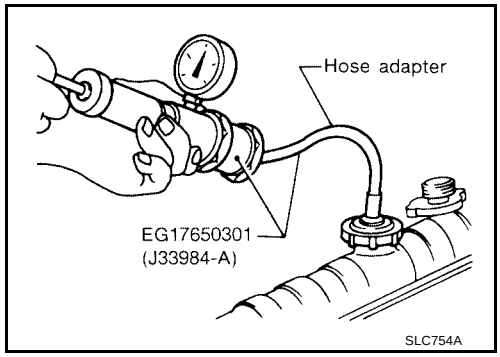
OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to PROCEDURE B, EC-1020 .)

6. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.6 kg/cm^2 , 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.
Pressure should not drop.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following for leak.

- Hose
- Radiator
- Water pump (Refer to CO-9, "WATER PUMP" .)

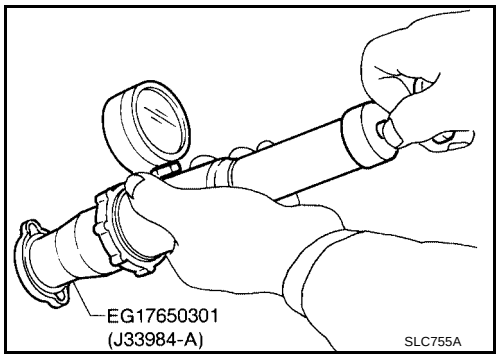
>> Repair or replace.

8. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure:

59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 9.
NG >> Replace radiator cap.

9. CHECK THERMOSTAT

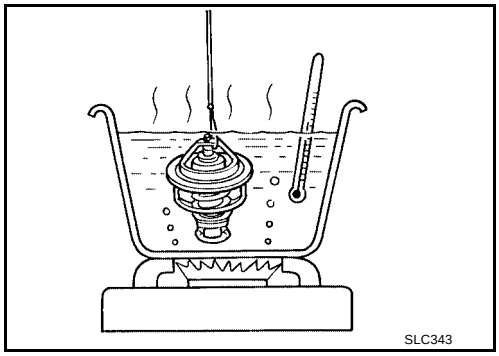
1. Check valve seating condition at normal room temperatures.
It should seat tightly.
2. Check valve opening temperature and valve lift.

Valve opening temperature:

76.5°C (170°F) [standard]

Valve lift:

More than 9 mm/90°C (0.35 in/194°F)



3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer toCO-11, "THERMOSTAT AND THERMOSTAT HOUSING" .

OK or NG

OK >> GO TO 10.
NG >> Replace thermostat.

10. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1022, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace engine coolant temperature sensor.

11. CHECK MAIN 12 CAUSES

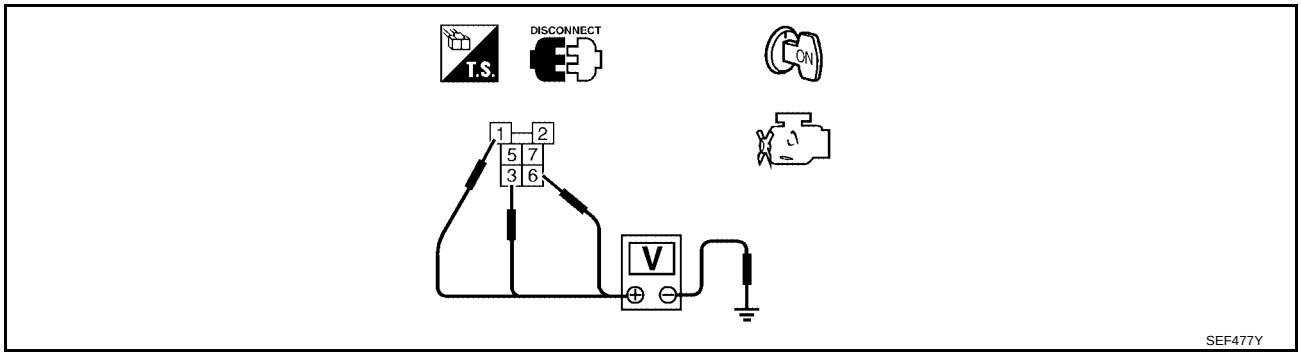
If the cause cannot be isolated, go to EC-1021, "Main 12 Causes of Overheating" .

>> **INSPECTION END**

PROCEDURE A

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- 40A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

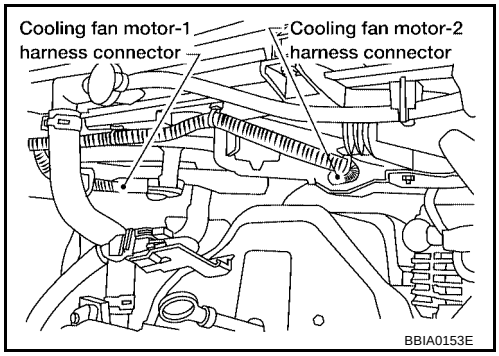
>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 4 and ground.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 2, cooling fan motor-2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should exist.
6. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 97 and cooling fan relay-1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relay-1 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-1022, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1022, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

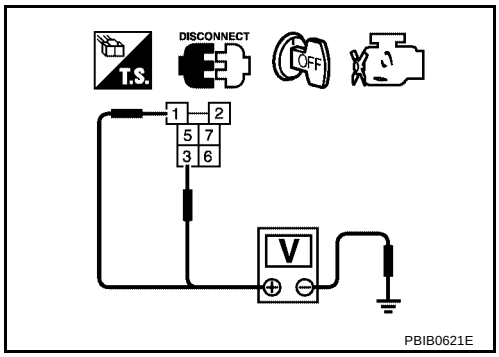
>> **INSPECTION END**

PROCEDURE B

1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-2.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relay-2 terminals 1, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse and fusible link box connector E25
- Fuse block (J/B) connector E103
- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relay-2 and fuse
- Harness for open or short between cooling fan relay-2 and fusible link

>> Repair harness or connectors.

3. CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-2 terminal 5 and cooling fan motor-1 terminal 2, cooling fan relay-2 terminal 6 and cooling fan motor-1 terminal 3, cooling fan relay-2 terminal 7 and ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 89 and cooling fan relay-2 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relay-2 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-2

Refer to EC-1022, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relays.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1022, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

UBS0021Y

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-16, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	SeeCO-7, "System Check" .

Engine	Step	Inspection item	Equipment	Standard	Reference page
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-7, "System Check" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-11, "THERMOSTAT AND THERMOSTAT HOUSING" and CO-13, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-1009).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-16, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See MA-16, "ENGINE MAINTENANCE (QG18DE ENGINE)" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-58, "Inspection after Disassembly" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-69, "Inspection" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (56 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-5, "OVERHEATING CAUSE ANALYSIS" .

Component Inspection

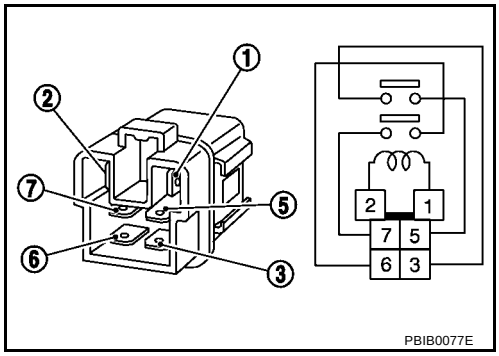
UBS0021Z

COOLING FAN RELAYS-1 AND -2

Check continuity between terminals 3 and 5, 6 and 7.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace relay.

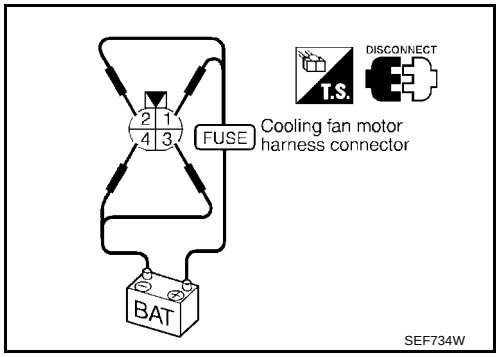


COOLING FAN MOTOR-1

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(+)	(–)
Cooling fan motor	Low	1	4
	High	1, 2	3, 4

Cooling fan motor should operate.
If NG, replace cooling fan motor.

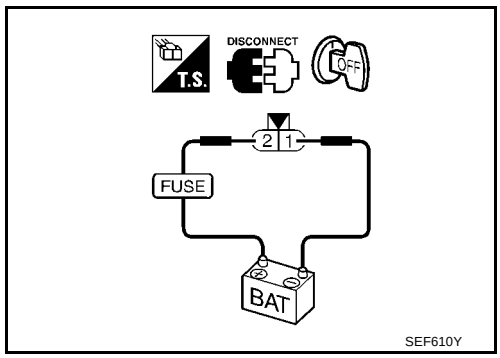


COOLING FAN MOTOR-2

1. Disconnect cooling fan motor harness connectors.

2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(–)
Cooling fan motor	2	1



Cooling fan motor should operate.
If NG, replace cooling fan motor.

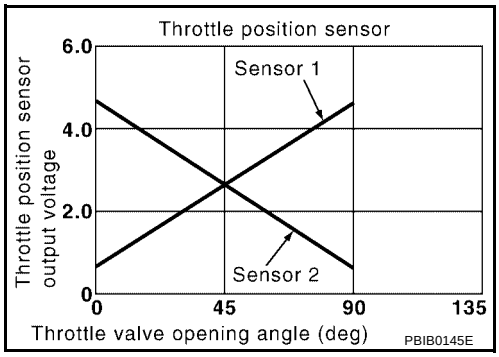
DTC P1225 TP SENSOR

PFP:16119

Component Description

UBS003Y7

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

UBS003Y8

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

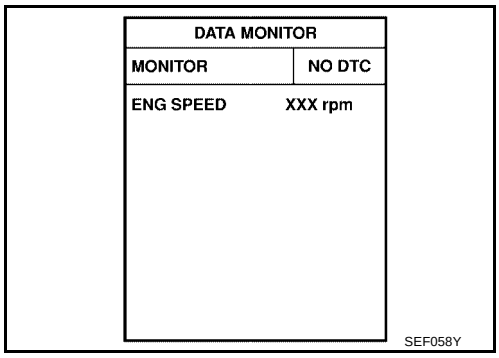
DTC Confirmation Procedure

UBS003Y9

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-1025, "Diagnostic Procedure" .



WITH GST

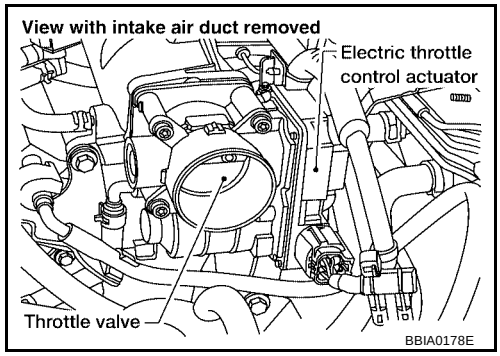
Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS003YA

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

UBS003YB

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

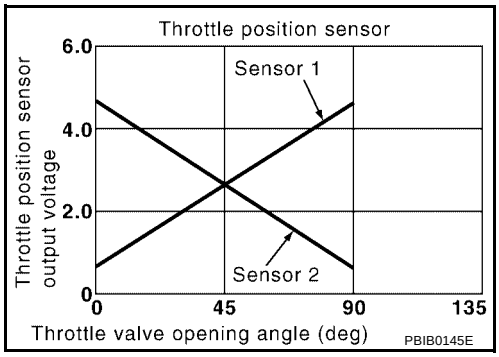
DTC P1226 TP SENSOR

PFP:16119

Component Description

UBS003YC

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

UBS003YD

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

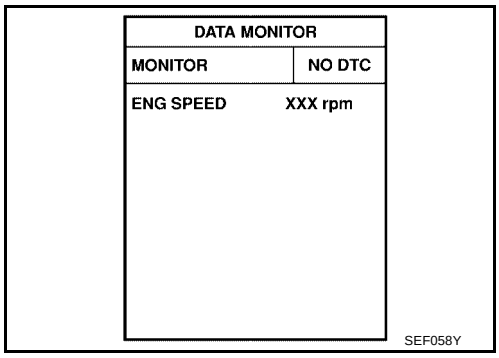
DTC Confirmation Procedure

UBS003YE

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-1027, "Diagnostic Procedure" .



WITH GST

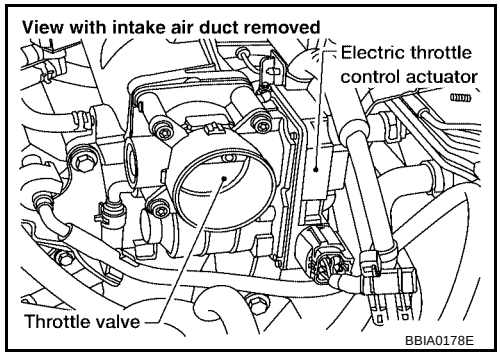
Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS003YF

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

UBS003YG

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

UBS006AB

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (APP sensor 1 circuit is shorted.) (Mass air flow sensor is shorted.) (PSP sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) ● Accelerator pedal position sensor (APP sensor 1) ● Power steering pressure sensor ● Mass air flow sensor ● Refrigerant pressure sensor ● EVAP control system pressure sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

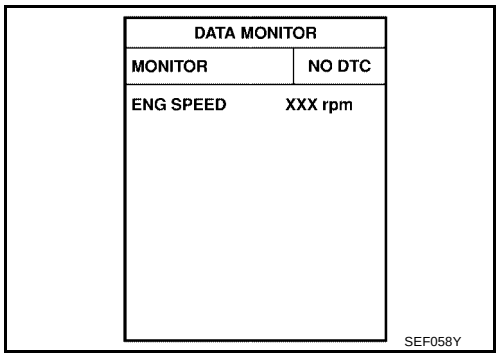
DTC Confirmation Procedure

UBS006AC

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1030, "Diagnostic Procedure" .



WITH GST

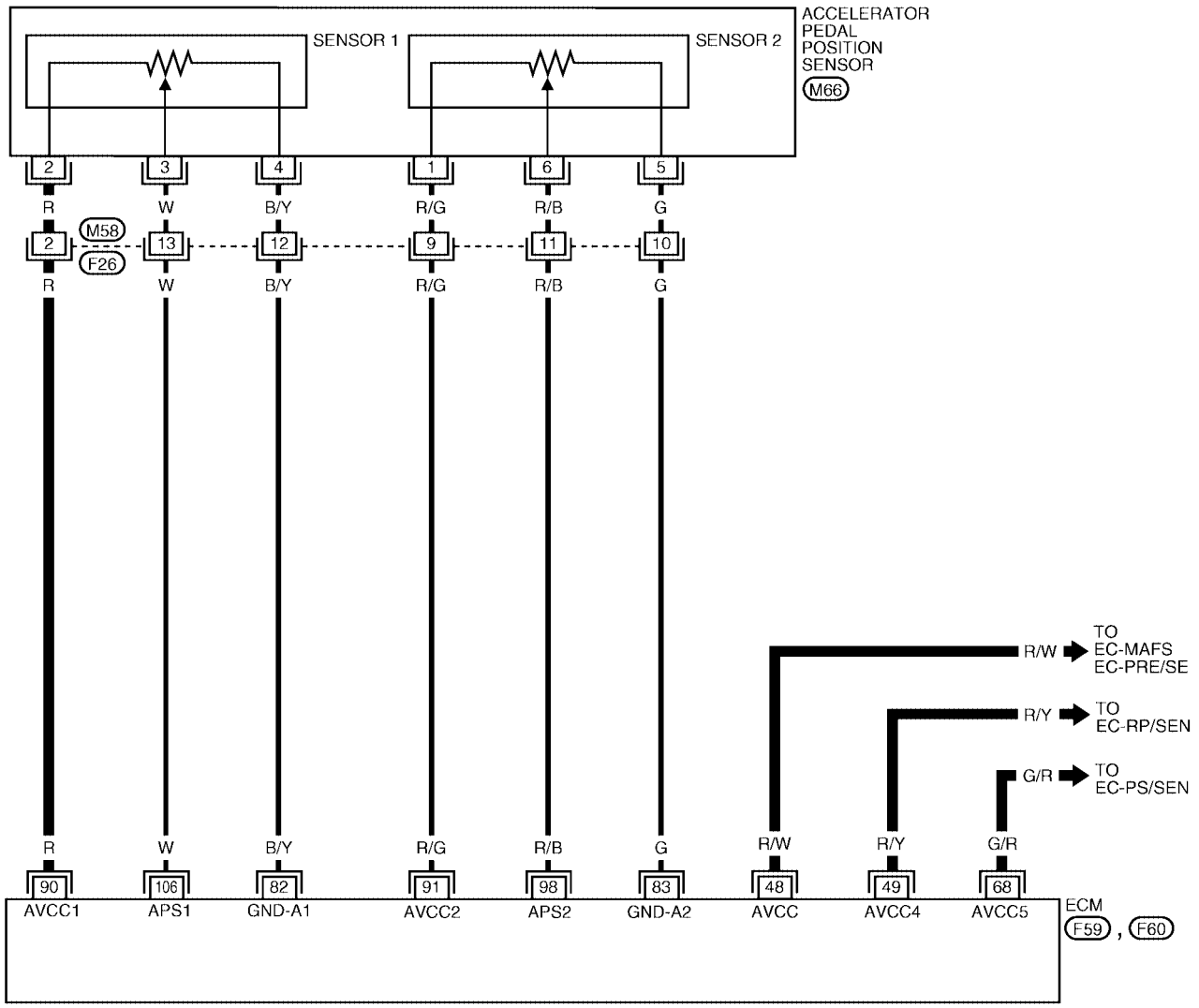
Follow the procedure “WITH CONSULT-II” above.

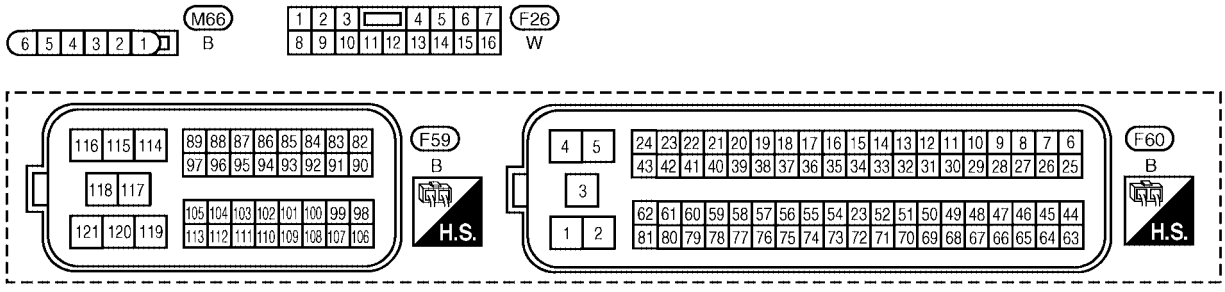
Wiring Diagram

UBS006AD

EC-APPS1-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA1385E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	R/W	Sensor power supply	**[Ignition switch “ON”]**	Approximately 5V
49	R/Y	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch “ON”]**	Approximately 5V
68	G/R	Sensor power supply (Power steering pressure sensor)	**[Ignition switch “ON”]**	Approximately 5V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch “ON”]**	Approximately 5V

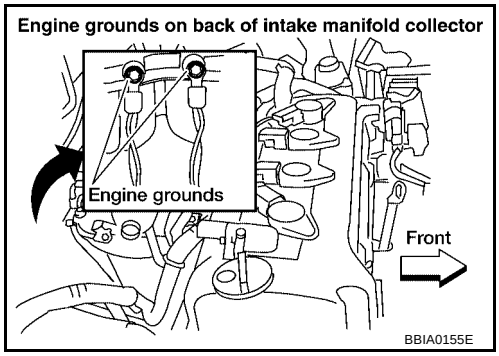
Diagnostic Procedure

UBS006AE

1. RETIGHTEN GROUND SCREWS

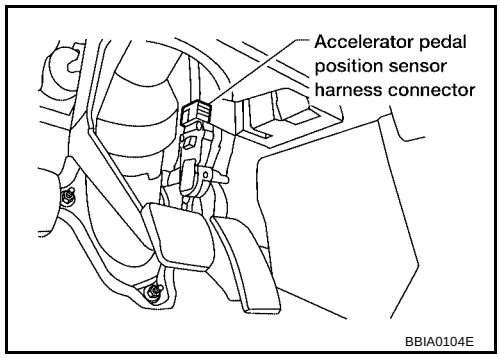
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



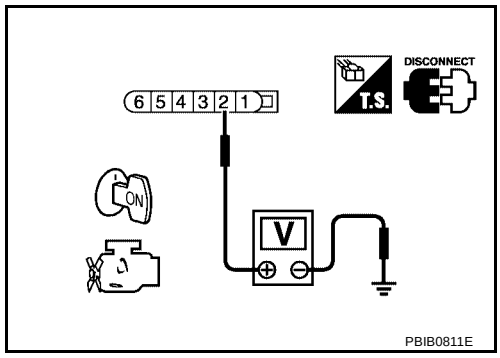
2. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 5.
NG >> GO TO 3.

3. CHECK SENSOR POWER SUPPLY CIRCUITS

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
90	APP sensor terminal 2	EC-1127
48	Mass air flow sensor terminal 2	EC-743
48	EVAP control system pressure sensor terminal 3	EC-882
49	Refrigerant pressure sensor terminal 1	EC-1181
68	PSP sensor terminal 1	EC-923

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Refrigerant pressure sensor (Refer to MTC-55, "Electrical Component Inspection" .)
- Power steering pressure sensor (Refer to EC-926, "Component Inspection" .)
- EVAP control system pressure sensor (Refer to EC-885, "Component Inspection" .)
- Mass air flow sensor (Refer to EC-747, "Component Inspection" .)

OK or NG

OK >> GO TO 7.
NG >> Replace malfunctioning component.

5. CHECK APP SENSOR

Refer to EC-1131, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1271 A/F SENSOR

PFP:22693

Component Description

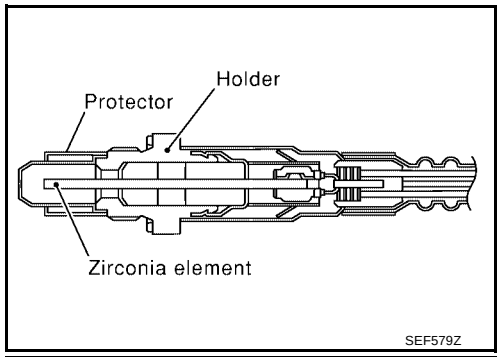
UBS00220

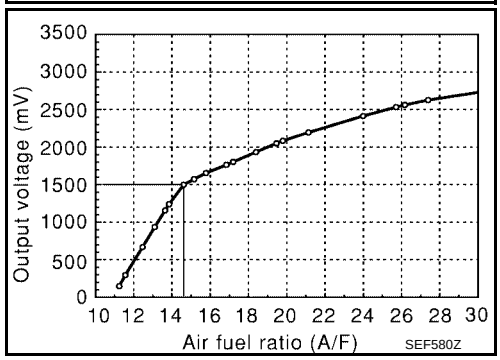
The A/F sensor is a planar dual-cell limit current sensor. The sensor element of the A/F sensor is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.

An electronic circuit controls the pump current through the oxygen-pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).





CONSULT-II Reference Value in Data Monitor Mode

UBS00221

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5V

On Board Diagnosis Logic

UBS00222

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal is not inordinately low.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P1271 1271	Air fuel ratio (A/F) sensor 1 circuit no activity detected	● The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Air fuel ratio (A/F) sensor 1

DTC Confirmation Procedure

UBS00223

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

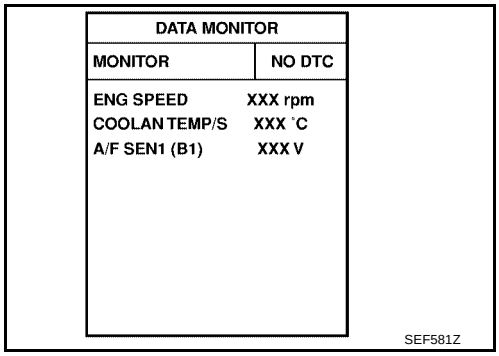
TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1)” in “DATA MONITOR” mode with CONSULT-II.

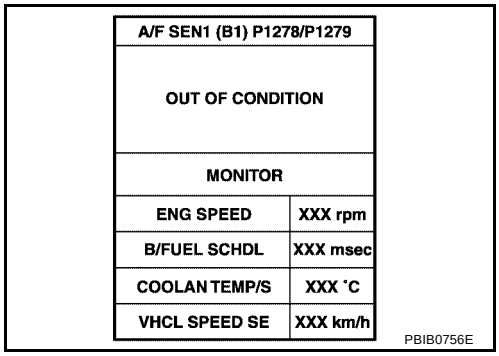
3. Check “A/F SEN1 (B1)” indication.
   If the indication is constantly approx. 0V, go to EC-1037, "Diagnostic Procedure" .
   If the indication is not constantly approx. 0V, go to next step.
4. Select “A/F SEN1 (B1) P1278/P1279” of “A/F SEN1” in “DTC WORK SUPPORT” mode.
5. Touch “START”.



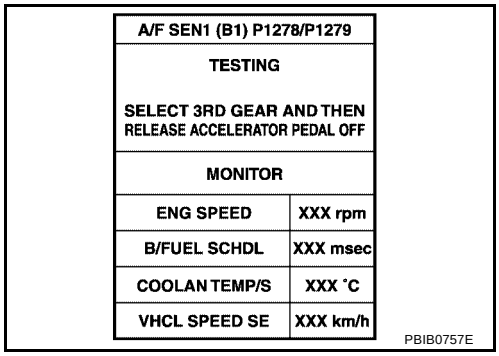
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen.

ENG SPEED	1,500 - 3,000 rpm
Vehicle speed	70 - 120 km/h (43 - 75 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	● “D” position with “OD” ON (A/T) ● “4th” position (M/T)

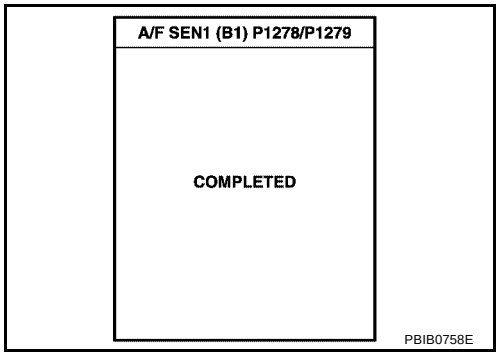
If “TESTING” is not displayed after 20 seconds, retry from step 2.



7. Following the instructions of CONSULT-II screen, set “D” position with “OD” OFF (A/T) or “3rd” position (M/T) and release accelerator pedal fully.



8. Make sure that “TESTING” changes to “COMPLETED”.
   If “TESTING” changed to “OUT OF CONDITION”, retry from step 6.
9. Touch “BACK” and “MODE”, then select “SELF-DIAG RESULT” mode.
   If P1271 is displayed, go to EC-1037, "Diagnostic Procedure" .
   If another DTC is displayed, go to the corresponding “Diagnostic Procedure”.



Overall Function Check

UBS00224

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or “3rd” position (M/T).

NOTE:
Keep the accelerator pedal as steady as possible during the cruising.

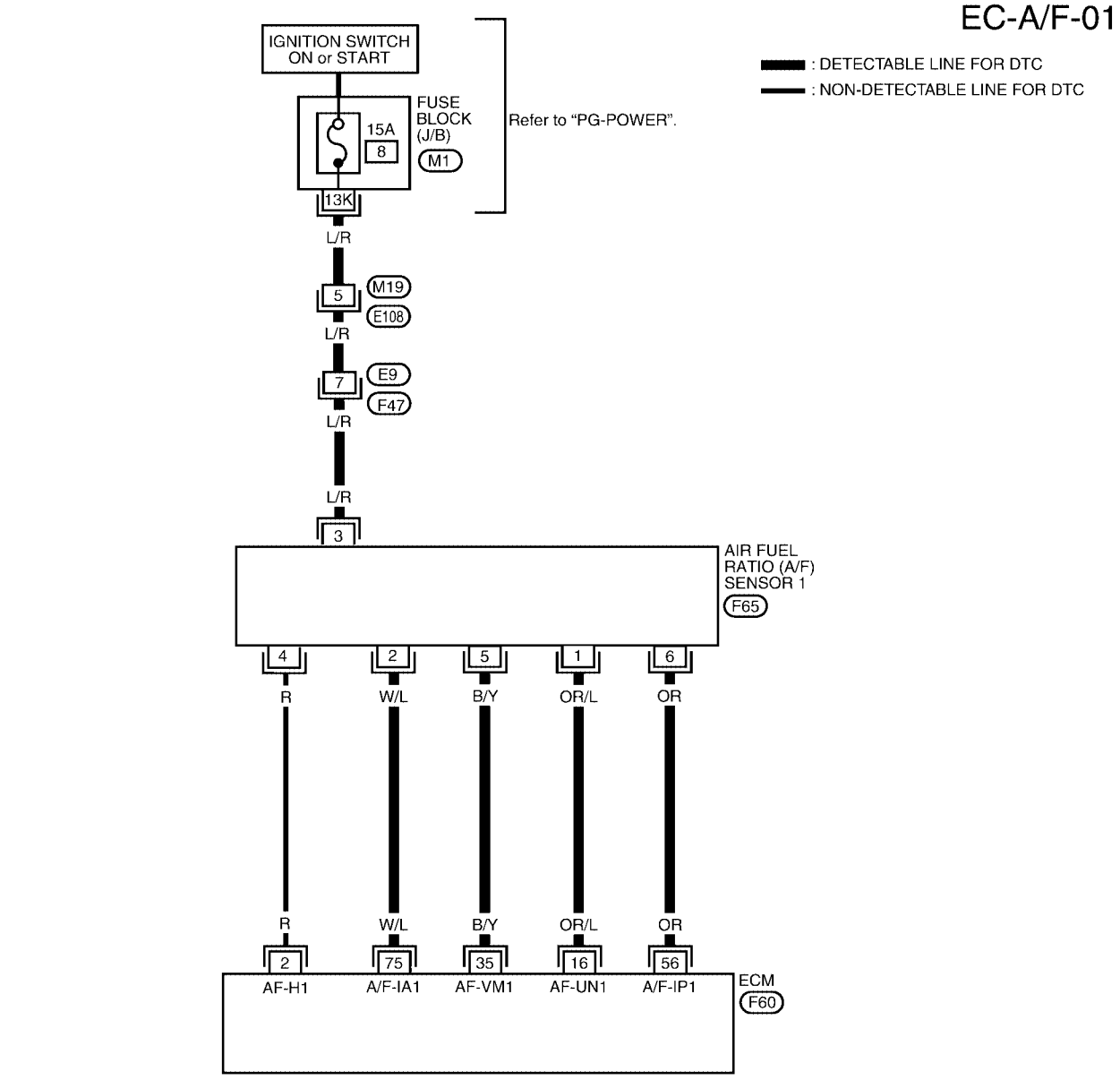
3. Set “D” position with “OD” ON (A/T) or “4rd” position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

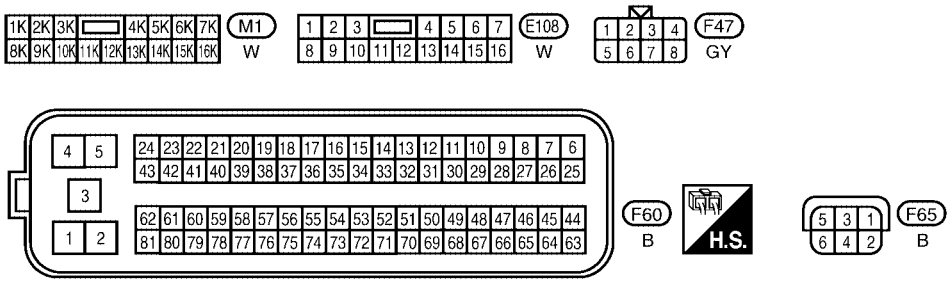
NOTE:
Never apply brake during releasing the accelerator pedal.

4. Repeat steps 2 to 3 five times.
5. Stop the vehicle and turn ignition switch “OFF”.
6. Wait at least 10 seconds and restart engine.
7. Repeat steps 2 to 3 five times.
8. Stop the vehicle and connect GST to the vehicle.
9. Make sure that no DTC is displayed.
If the DTC is displayed, go to EC-1037, "Diagnostic Procedure" .

Wiring Diagram

UBS00225





BBWA0803E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

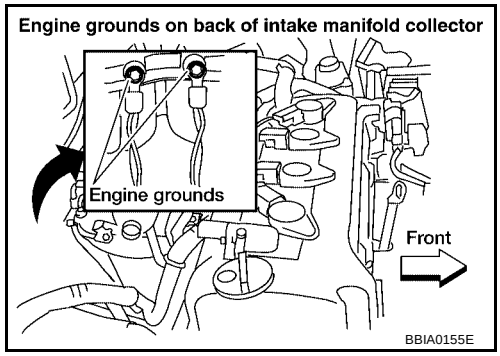
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	OR/L	A/F sensor 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.1V
35	B/Y			Approximately 2.6V
56	OR			2 - 3V
75	W/L			2 - 3V

Diagnostic Procedure

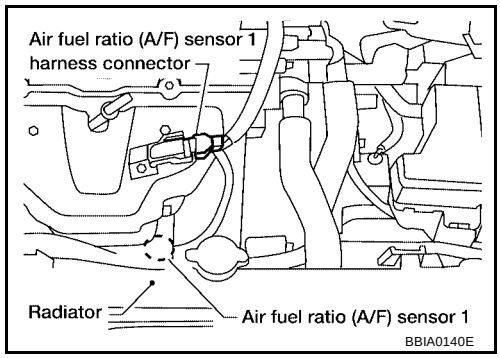
UBS00226

1. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.



3. Disconnect ECM harness connector and A/F sensor 1 harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



ECM terminal	A/F sensor terminal
16	1
35	5
56	6
75	2

Continuity should exist.

5. Check harness continuity between ECM terminals 16, 35, 56, 75 or A/F sensor 1 terminals 1, 2, 5, 6 and ground. Refer to Wiring Diagram.

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace A/F sensor 1.
NG >> Repair or replace.

Removal and Installation

UBS00227

AIR FUEL RATIO SENSOR

Refer to EM-12, "Removal and Installation" .

DTC P1272 A/F SENSOR

PFP:22693

Component Description

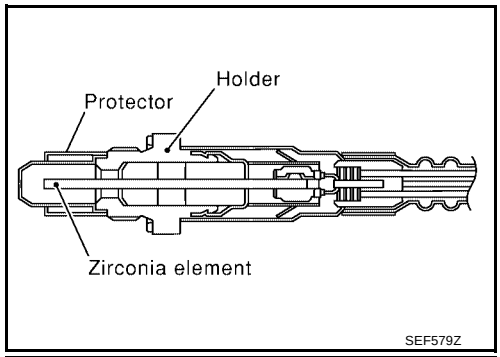
UBS00228

The A/F sensor is a planar dual-cell limit current sensor. The sensor element of the A/F sensor is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

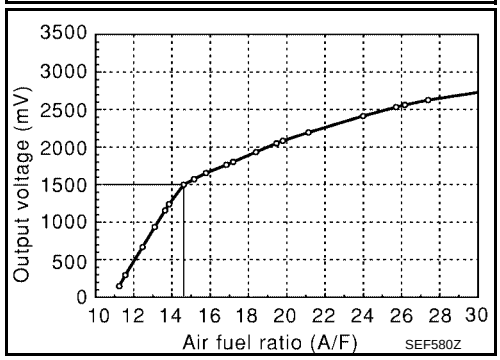
The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.

An electronic circuit controls the pump current through the oxygen-pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).



SEF579Z



SEF580Z

CONSULT-II Reference Value in Data Monitor Mode

UBS00229

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5V

On Board Diagnosis Logic

UBS0022A

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal is not inordinately high.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P1272 1272	Air fuel ratio (A/F) sensor 1 circuit no activity detected	● The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 4.5V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Air fuel ratio (A/F) sensor 1

DTC Confirmation Procedure

UBS0022B

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

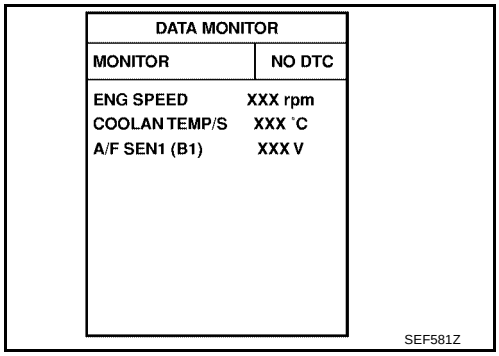
TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1)” in “DATA MONITOR” mode with CONSULT-II.

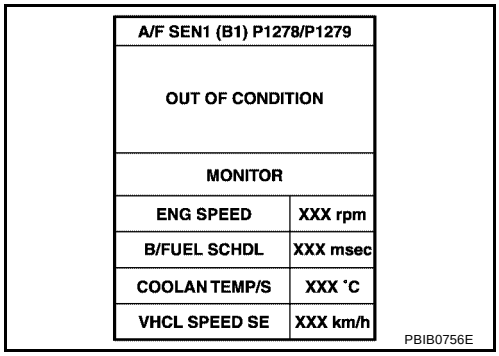
3. Check “A/F SEN1 (B1)” indication.
   If the indication is constantly approx. 4.5V, go to EC-1043, "Diagnostic Procedure" .
   If the indication is not constantly approx. 4.5V, go to next step.
4. Select “A/F SEN1 (B1) P1278/P1279” of “A/F SEN1” in “DTC WORK SUPPORT” mode.
5. Touch “START”.



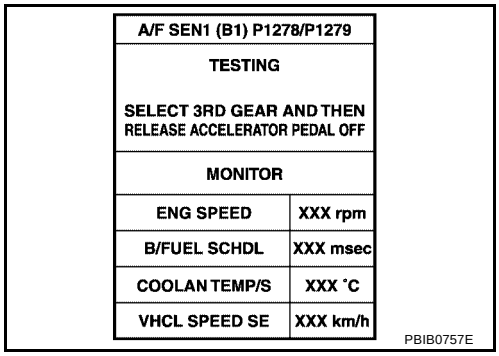
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen.

ENG SPEED	1,500 - 3,000 rpm
Vehicle speed	70 - 120 km/h (43 - 75 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	● “D” position with “OD” ON (A/T) ● “4th” position (M/T)

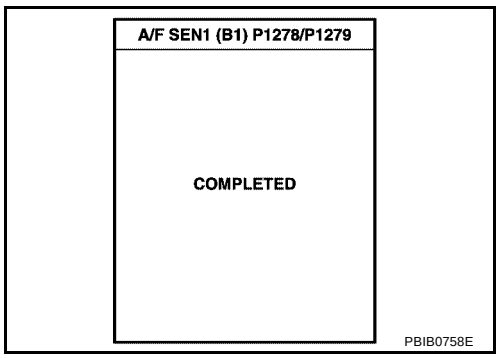
If “TESTING” is not displayed after 20 seconds, retry from step 2.



7. Following the instructions of CONSULT-II screen, set “D” position with “OD” OFF (A/T) or “3rd” position (M/T) and release accelerator pedal fully.



8. Make sure that “TESTING” changes to “COMPLETED”.
   If “TESTING” changed to “OUT OF CONDITION”, retry from step 6.
9. Touch “BACK” and “MODE”, then select “SELF-DIAG RESULT” mode.
   If P1272 is displayed, go to EC-1043, "Diagnostic Procedure" “.
   If another DTC is displayed, go to the corresponding “Diagnostic Procedure”.



Overall Function Check

UBS0022C

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or “3rd” position (M/T).

NOTE:
Keep the accelerator pedal as steady as possible during the cruising.

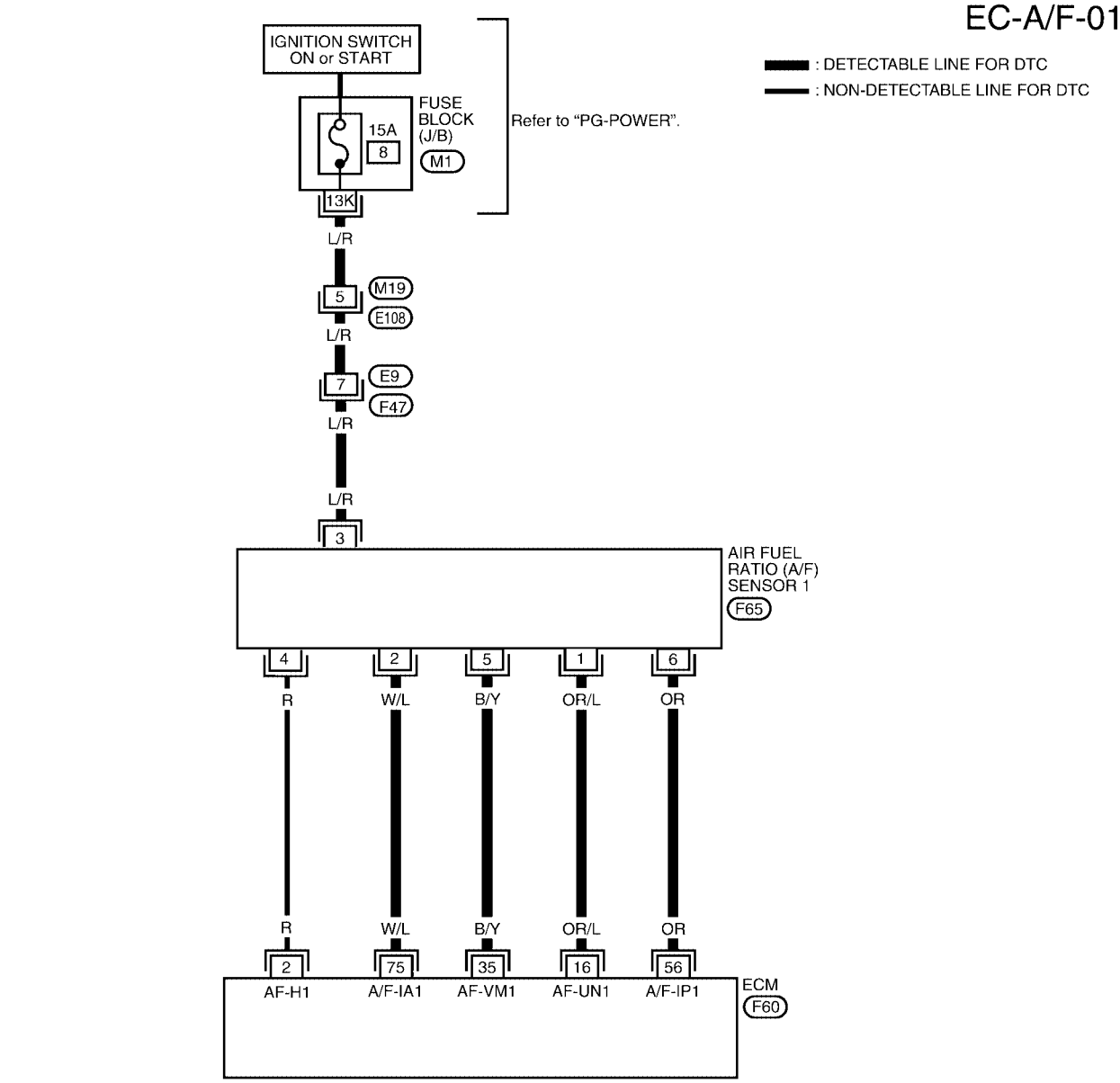
3. Set “D” position with “OD” ON (A/T) or “4th” position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

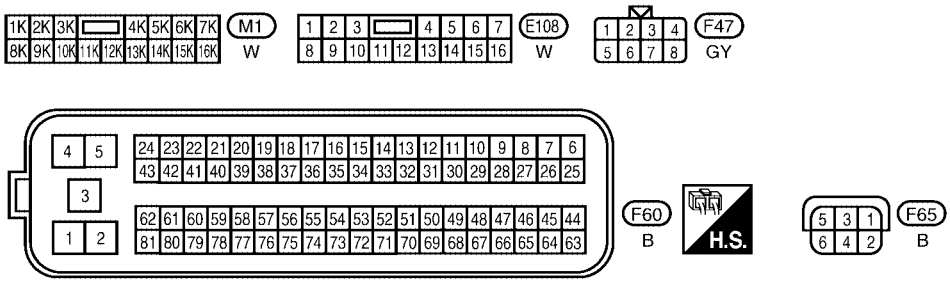
NOTE:
Never apply brake during releasing the accelerator pedal.

4. Repeat steps 2 to 3 five times.
5. Stop the vehicle and turn ignition switch “OFF”.
6. Wait at least 10 seconds and restart engine.
7. Repeat steps 2 to 3 five times.
8. Stop the vehicle and connect GST to the vehicle.
9. Make sure that no DTC is displayed.
   If the DTC is displayed, go to EC-1043, "Diagnostic Procedure" .

Wiring Diagram

UBS0022D





BBWA0803E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

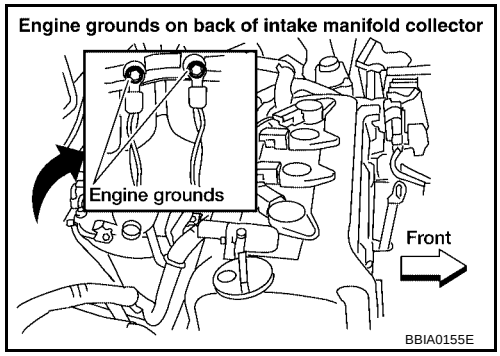
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	OR/L	A/F sensor 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.1V
35	B/Y			Approximately 2.6V
56	OR			2 - 3V
75	W/L			2 - 3V

Diagnostic Procedure

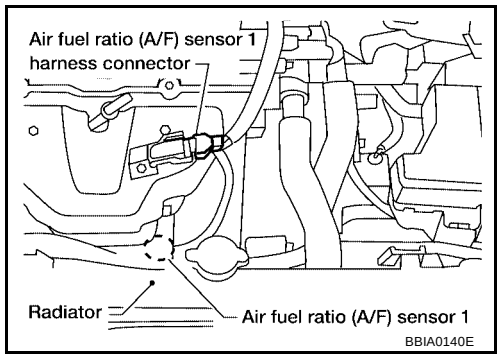
UBS0022E

1. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.



3. Disconnect ECM harness connector and A/F sensor 1 harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



ECM terminal	A/F sensor terminal
16	1
35	5
56	6
75	2

Continuity should exist.

5. Check harness continuity between ECM terminals 16, 35, 56, 75 or A/F sensor 1 terminals 1, 2, 5, 6 and ground. Refer to Wiring Diagram.

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace A/F sensor 1.
NG >> Repair or replace.

Removal and Installation

UBS0022F

AIR FUEL RATIO SENSOR

Refer to EM-12, "Removal and Installation" .

DTC P1273 A/F SENSOR

PFP:22693

Component Description

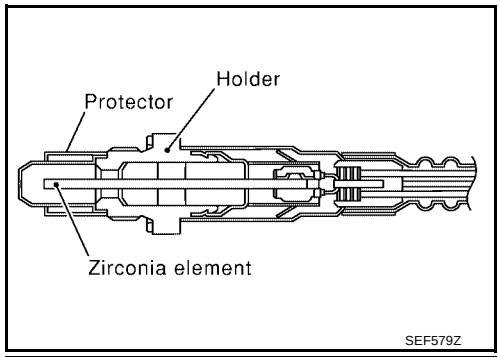
UBS0022G

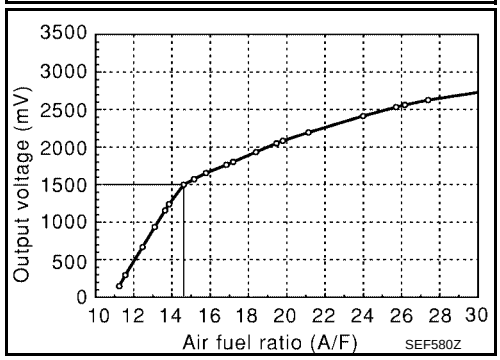
The A/F sensor is a planar dual-cell limit current sensor. The sensor element of the A/F sensor is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.

An electronic circuit controls the pump current through the oxygen-pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).





CONSULT-II Reference Value in Data Monitor Mode

UBS0022H

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5V

On Board Diagnosis Logic

UBS0022I

To judge the malfunction, the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal is monitored not to be shifted “lean” side or “rich” side. When the A/F signal is shifting to the lean side, the malfunction will be detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P1273 1273	Air fuel ratio (A/F) sensor 1 lean shift monitoring	● The output voltage computed by ECM from the A/F sensor 1 signal is shifted to the lean side for a specified period.	● Air fuel ratio (A/F) sensor 1 ● Air fuel ratio (A/F) sensor heater 1 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

UBS0022J

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

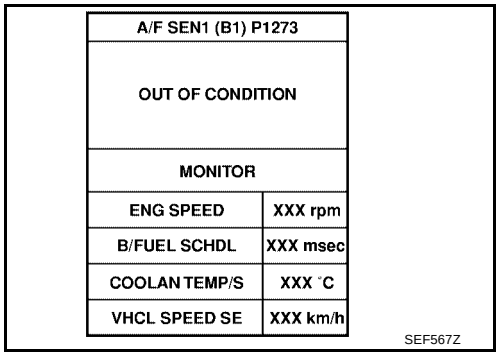
1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1) P1273” of “A/F SEN1” in “DTC WORK SUPPORT” mode.
3. Touch “START”.

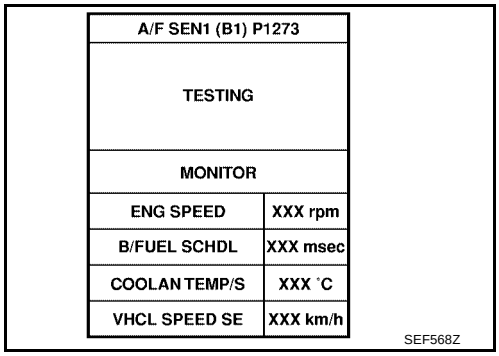
4. Maintain the following conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 400 to 800 seconds.)

   NOTE:
   Keep the accelerator pedal as steady as possible.

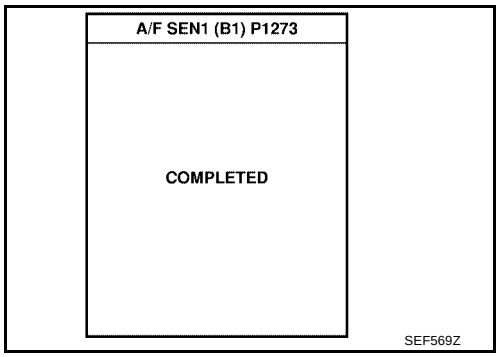
ENG SPEED	Below 3,000 rpm
B/FUEL SCHDL	Below 9.0 msec
Selector lever	“P” or “N” position

If “TESTING” is not displayed after 20 minutes, retry from step 2.





5. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, go to EC-1049, "Diagnostic Procedure" .



Overall Function Check

UBS0022K

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or “3rd” position (M/T).

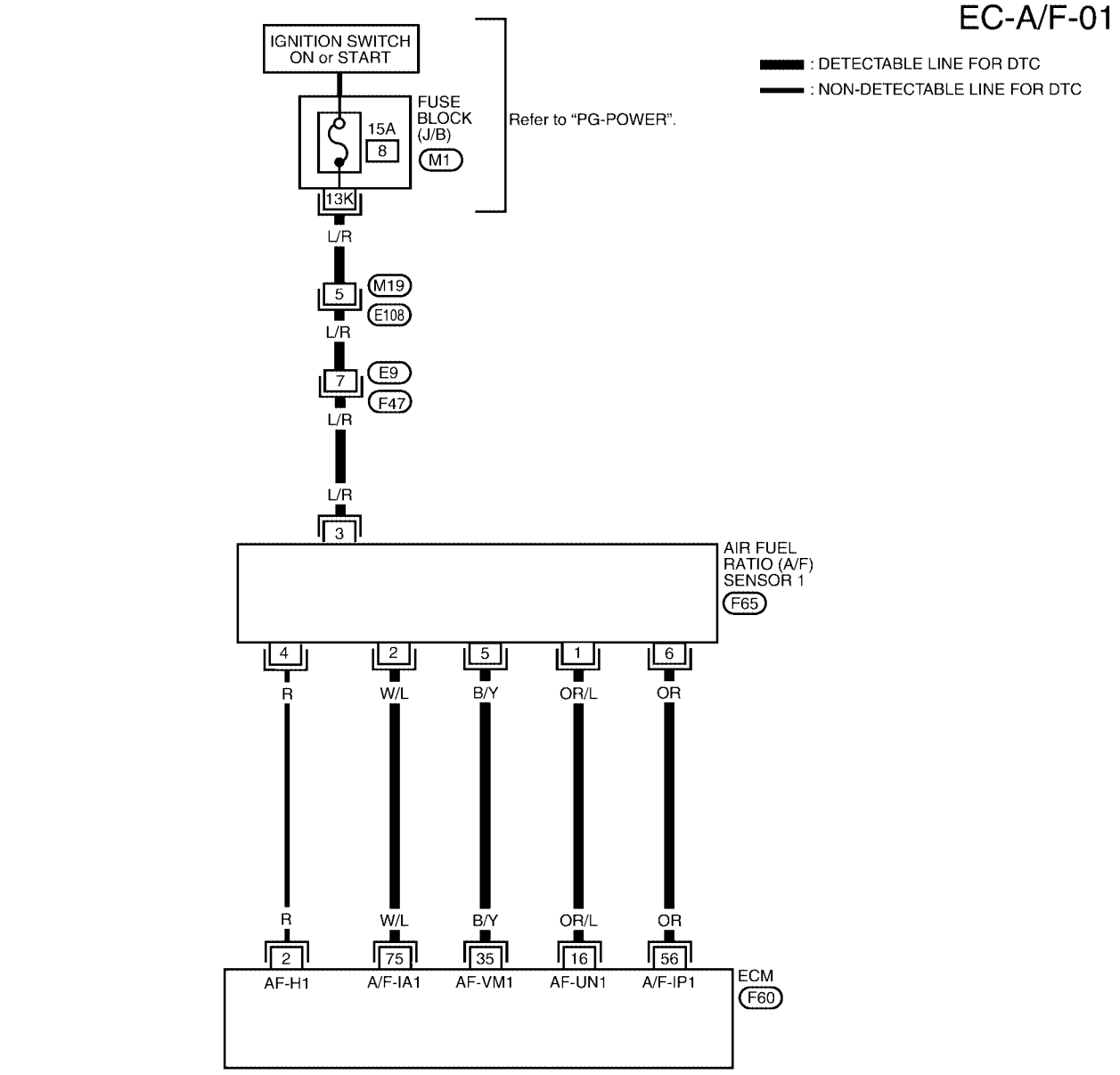
   NOTE:
   Keep accelerator pedal as steady as possible during the cruising.
3. Set “D” position with “OD” ON (A/T) or “4th” position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

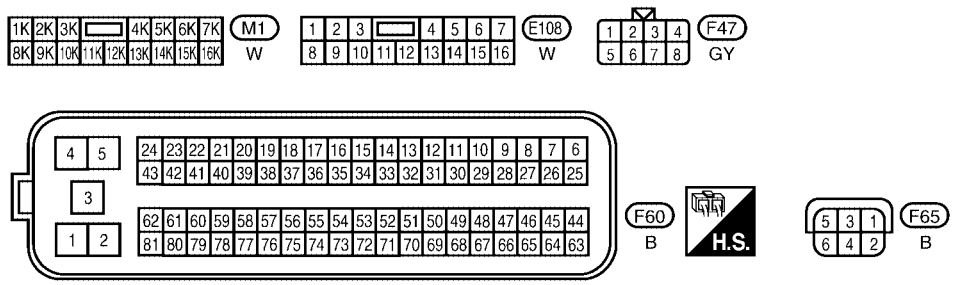
   NOTE:
   Never apply brake during releasing the accelerator pedal.
4. Repeat steps 2 to 3 five times.
5. Stop the vehicle and turn ignition switch “OFF”.
6. Wait at least 10 seconds and restart engine.
7. Repeat steps 2 to 3 five times.
8. Stop the vehicle and connect GST to the vehicle.
9. Make sure that no DTC is displayed.

If the DTC is displayed, go to EC-1049, "Diagnostic Procedure" .

Wiring Diagram

UBS0022L





BBWA0803E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	OR/L	A/F sensor 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.1V
35	B/Y			Approximately 2.6V
56	OR			2 - 3V
75	W/L			2 - 3V

Diagnostic Procedure

UBS0022M

1. RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten the air fuel ratio (A/F) sensor 1.

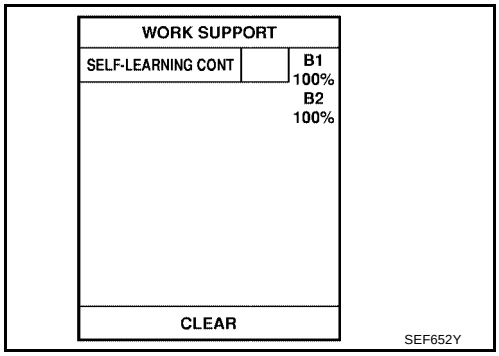
Tightening torque: 40 - 60 N-m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

>> GO TO 2.

2. CLEAR THE SELF-LEARNING DATA.

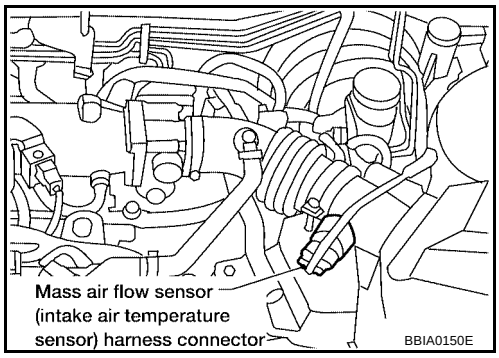
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected? Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected? Is it difficult to start engine?



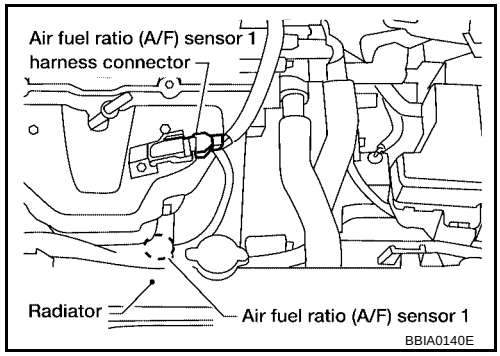
Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-795 .
No >> GO TO 3.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and A/F sensor 1 harness connector.
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM terminal	A/F sensor terminal
16	1
35	5
56	6
75	2



Continuity should exist.

4. Check harness continuity between ECM terminals 16, 35, 56, 75 or A/F sensor 1 terminals 1, 2, 5, 6 and ground. Refer to Wiring Diagram.

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK A/F SENSOR 1 HEATER

Refer to EC-935, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace A/F sensor 1.

5. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace A/F sensor 1.
NG >> Repair or replace.

Removal and Installation

UBS0022N

AIR FUEL RATIO SENSOR

Refer to EM-12, "Removal and Installation" .

DTC P1274 A/F SENSOR

PFP:22693

Component Description

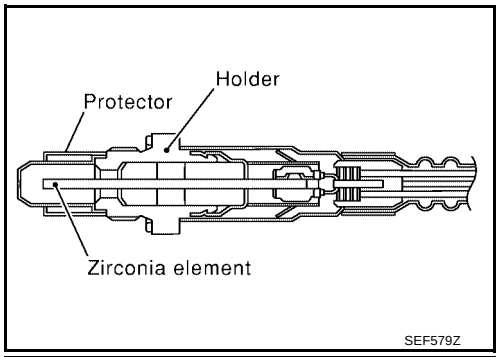
UBS0022O

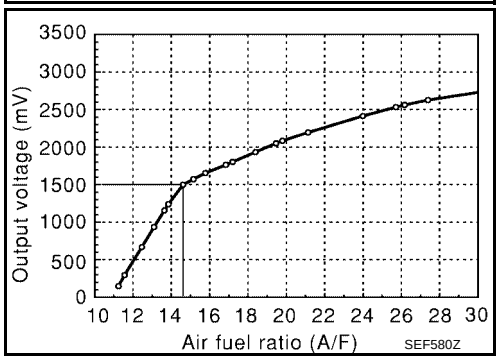
The A/F sensor is a planar dual-cell limit current sensor. The sensor element of the A/F sensor is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.

An electronic circuit controls the pump current through the oxygen-pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).





CONSULT-II Reference Value in Data Monitor Mode

UBS0022P

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5V

On Board Diagnosis Logic

UBS0022Q

To judge the malfunction, the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal is monitored not to be shifted to the “lean” side or “rich” side. When the A/F signal is shifting to the rich side, the malfunction will be detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P1274 1274	Air fuel ratio (A/F) sensor 1 rich shift monitoring	● The A/F signal computed by ECM from the A/F sensor 1 signal is shifted to the rich side for a specified period.	● Air fuel ratio (A/F) sensor 1 ● Air fuel ratio (A/F) sensor heater 1 ● Fuel pressure ● Injectors

DTC Confirmation Procedure

UBS0022R

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

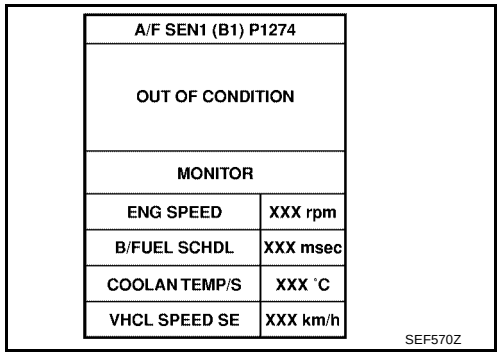
1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1) P1274” of “A/F SEN1” in “DTC WORK SUPPORT” mode.
3. Touch “START”.

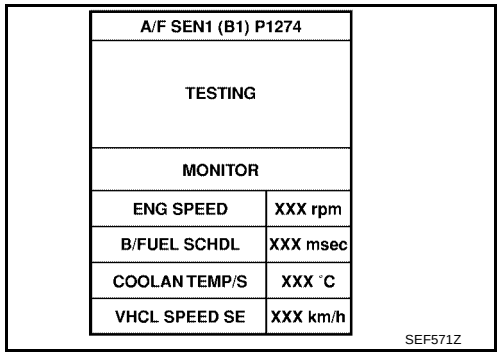
4. Maintain the following conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 400 to 800 seconds.)

   NOTE:
   Keep the accelerator pedal as steady as possible.

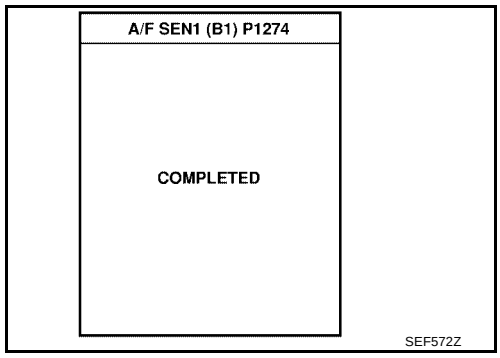
ENG SPEED	Below 3,000 rpm
B/FUEL SCHDL	Below 9.0 msec
Selector lever	“P” or “N” position

If “TESTING” is not displayed after 20 minutes, retry from step 2.





5. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, go to EC-1056, "Diagnostic Procedure" .



Overall Function Check

UBS0022S

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or “3rd” position (M/T).

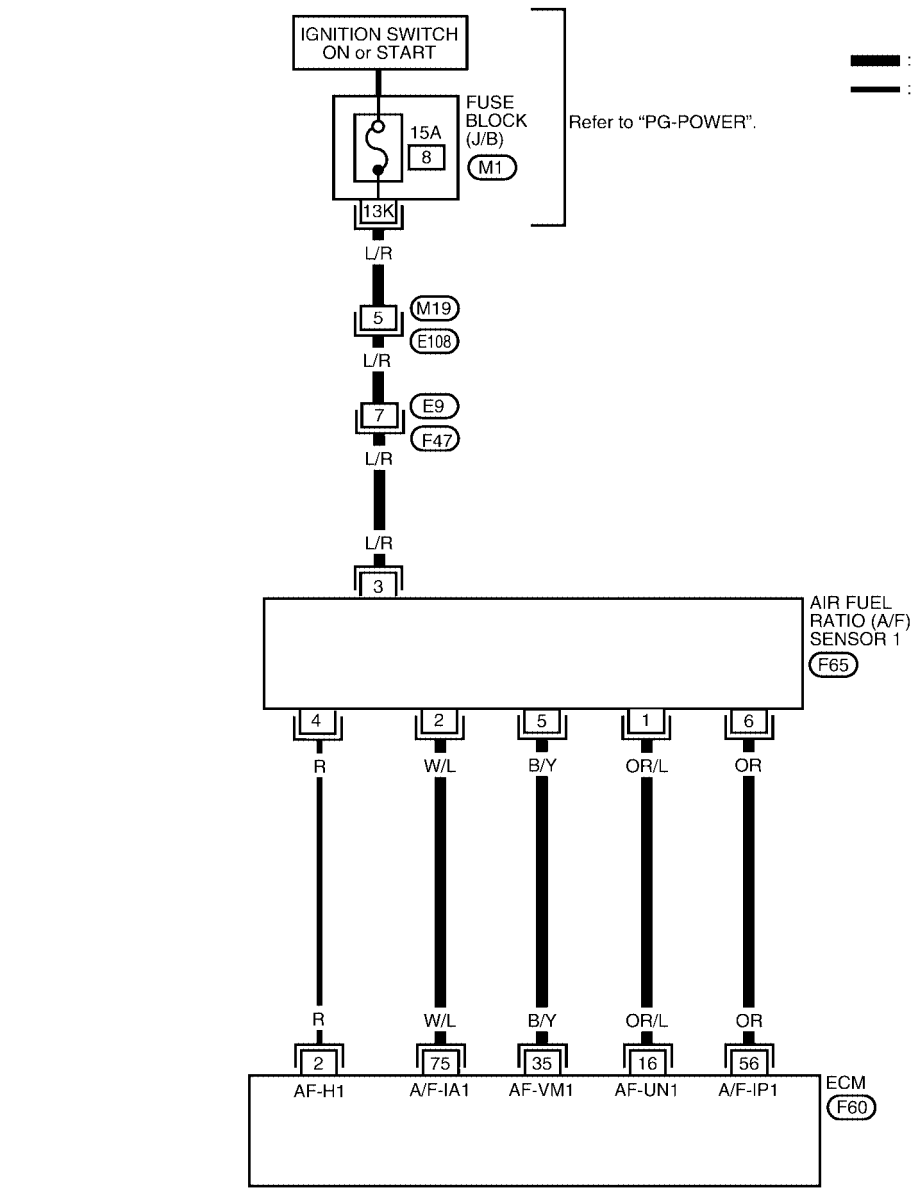
   NOTE:
   Keep accelerator pedal as steady as possible during the cruising.
3. Set “D” position with “OD” ON (A/T) or “4th” position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

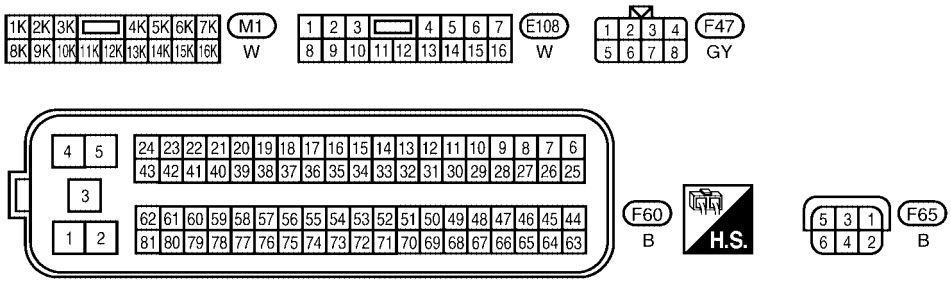
   NOTE:
   Never apply brake during releasing the accelerator pedal.
4. Repeat steps 2 to 3 five times.
5. Stop the vehicle and turn ignition switch “OFF”.
6. Wait at least 10 seconds and restart engine.
7. Repeat steps 2 to 3 five times.
8. Stop the vehicle and connect GST to the vehicle.
9. Make sure that no DTC is displayed.

If the DTC is displayed, go to EC-1056, "Diagnostic Procedure" .

Wiring Diagram

UBS0022T





BBWA0803E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	OR/L	A/F sensor 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.1V
35	B/Y			Approximately 2.6V
56	OR			2 - 3V
75	W/L			2 - 3V

Diagnostic Procedure

UBS0022U

1. RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten the air fuel ratio (A/F) sensor 1.

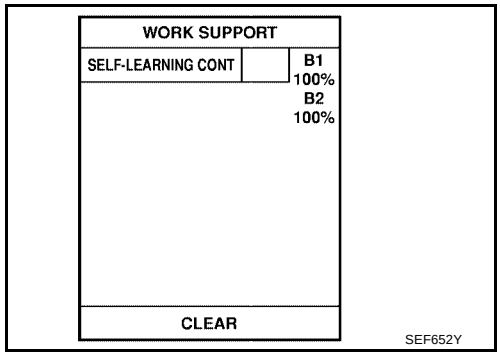
Tightening torque: 40 - 60 N-m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

>> GO TO 2.

2. CLEAR THE SELF-LEARNING DATA

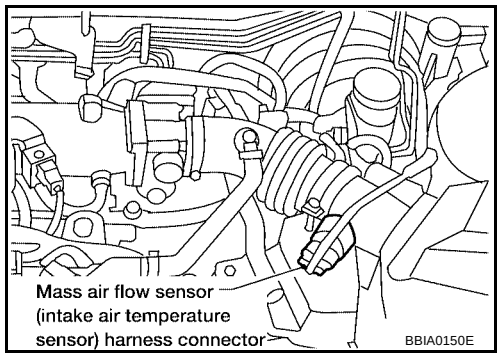
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected? Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected? Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-802 .
No >> GO TO 3.

3. CHECK HARNESS CONNECTOR

1. Turn ignition switch “OFF”.
2. Disconnect A/F sensor 1 harness connector.
3. Check harness connector for water.
   Water should not exit.

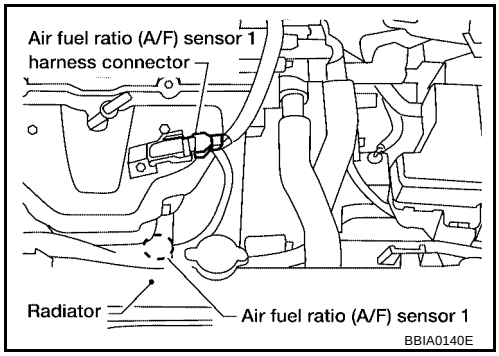
OK or NG

OK >> GO TO 4.
NG >> Repair or replace harness connector.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and A/F sensor 1 harness connector.
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM terminal	A/F sensor terminal
16	1
35	5
56	6
75	2



Continuity should exist.

4. Check harness continuity between ECM terminals 16, 35, 56, 75 or A/F sensor 1 terminals 1, 2, 5, 6 and ground. Refer to Wiring Diagram.

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK A/F SENSOR 1 HEATER

Refer to EC-935, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace A/F sensor 1.

6. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace A/F sensor 1.
NG >> Repair or replace.

Removal and Installation

UBS0022V

AIR FUEL RATIO SENSOR

Refer to EM-12, "Removal and Installation" .

DTC P1276 A/F SENSOR

PFP:22693

Component Description

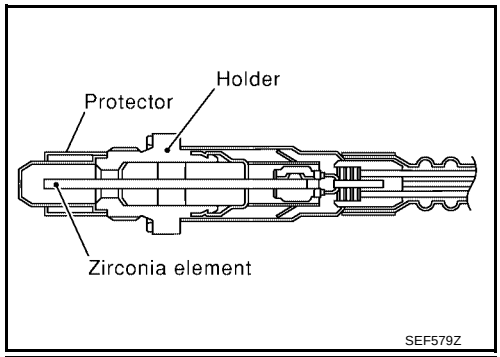
UBS0022W

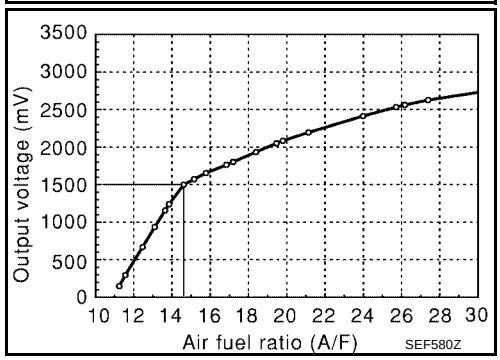
The A/F sensor is a planar dual-cell limit current sensor. The sensor element of the A/F sensor is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.

An electronic circuit controls the pump current through the oxygen-pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).





CONSULT-II Reference Value in Data Monitor Mode

UBS0022X

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5V

On Board Diagnosis Logic

UBS0022Y

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the air fuel ratio (A/F) sensor 1 signal fluctuates according to fuel feedback control.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P1276 1276	Air fuel ratio (A/F) sensor 1 circuit high voltage	● The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 1.5V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Air fuel ratio (A/F) sensor 1

DTC Confirmation Procedure

UBS0022Z

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

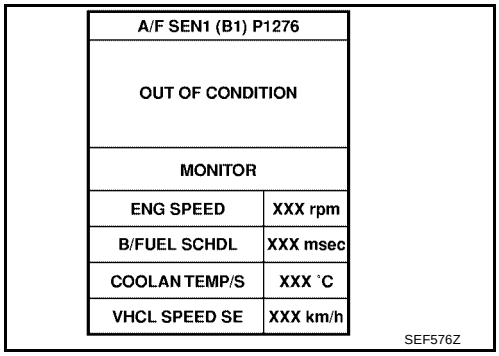
1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1)” of “DATA MONITOR” mode with CONSULT-II.
3. Check “A/F SEN1 (B1)” indication.
   If the indication is constantly approx. 1.5V and does not fluctuates, go to EC-1063, "Diagnostic Procedure"
   .

If the indication fluctuates around 1.5V, go to next step.

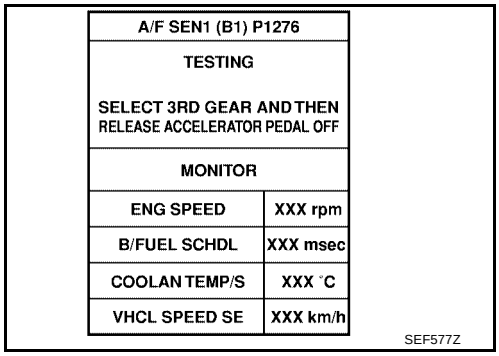
4. Select “A/F SEN1 (B1) P1276” of “A/F SEN1” in “DTC WORK SUPPORT” mode.
5. Touch “START”.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen.

ENG SPEED	1,500 - 3,000 rpm
Vehicle speed	70 - 120 km/h (43 - 75 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	● “D” position with “OD” ON (A/T) ● “4th” position (M/T)

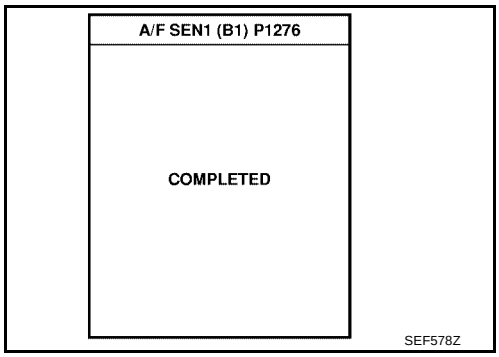
If “TESTING” is not displayed after 20 seconds, retry from step 2.



7. Following the instructions of CONSULT-II screen, set “D” position with “OD” OFF (A/T) or “3rd” position (M/T) and release accelerator pedal fully.



8. Make sure that “TESTING” changes to “COMPLETED”.
   If “TESTING” changed to “OUT OF CONDITION”, retry from step 6.
9. Make sure that “OK” is displayed after touching “SELF-DIAG RESULT”.
   If “NG” is displayed, go to EC-1063, "Diagnostic Procedure" .



Overall Function Check

UBS00230

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or “3rd” position (M/T).

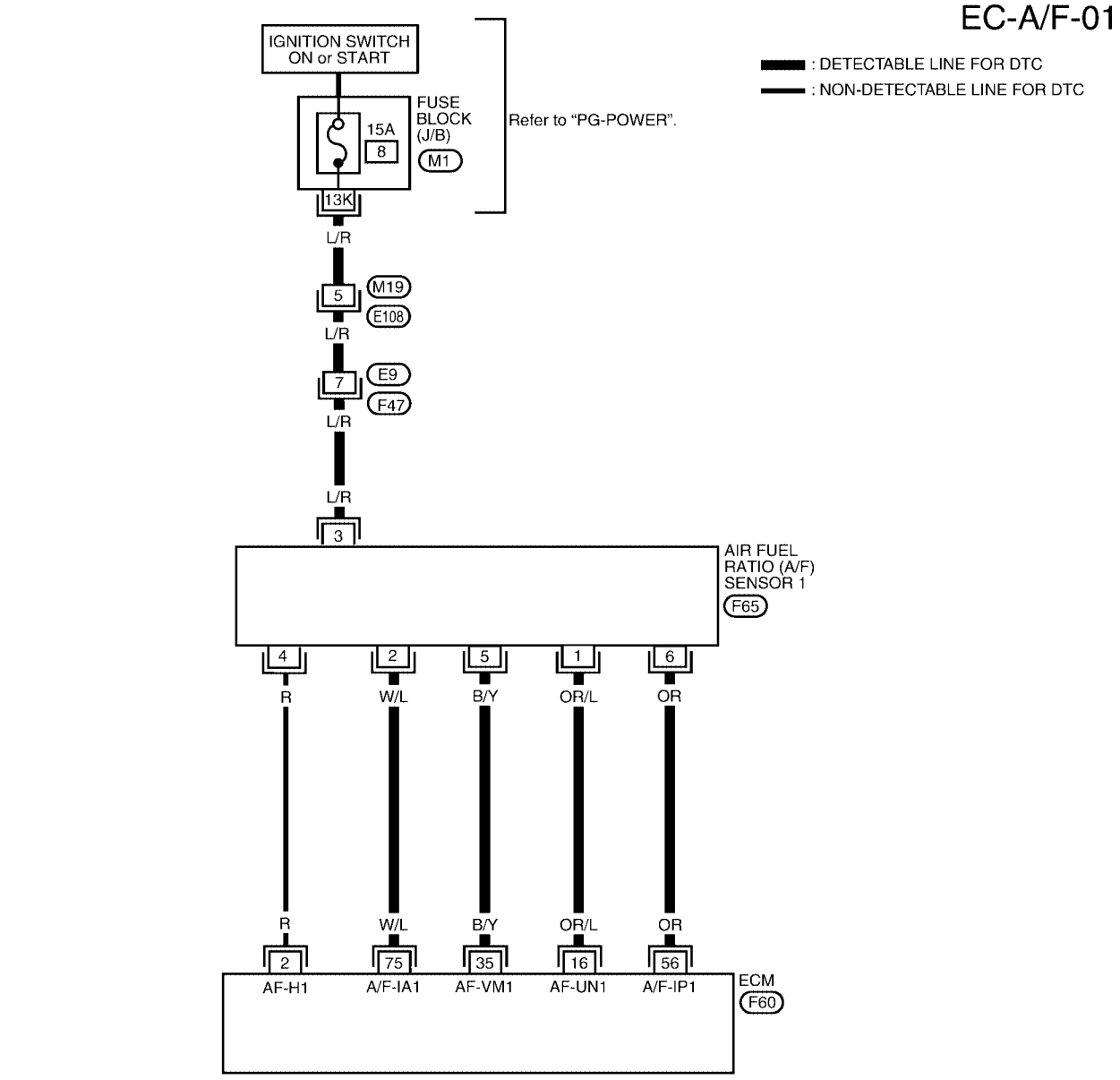
   NOTE:
   Keep the accelerator pedal as steady as possible during the cruising.
3. Set “D” position with “OD” ON (A/T) or “4th” position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

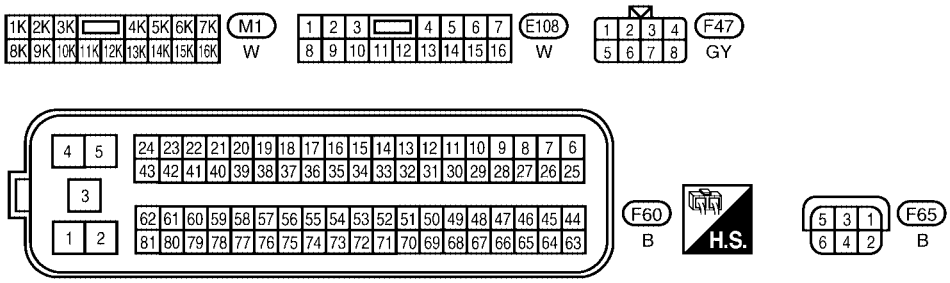
   NOTE:
   Never apply brake during releasing the accelerator pedal.
4. Repeat steps 2 to 3 five times.
5. Stop the vehicle and turn ignition switch “OFF”.
6. Wait at least 10 seconds and restart engine.

7. Repeat steps 2 to 3 five times.
8. Stop the vehicle and connect GST to the vehicle.
9. Make sure that no DTC is displayed.
   If the DTC is displayed, go to EC-1063, "Diagnostic Procedure" .

Wiring Diagram

UBS00231





BBWA0803E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

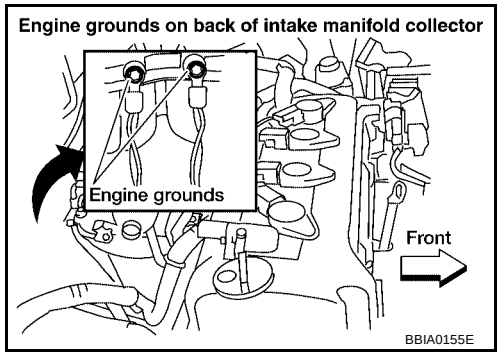
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	OR/L	A/F sensor 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.1V
35	B/Y			Approximately 2.6V
56	OR			2 - 3V
75	W/L			2 - 3V

Diagnostic Procedure

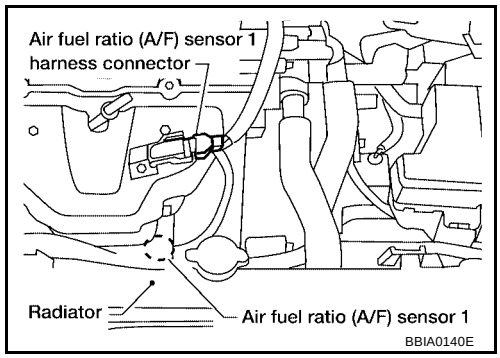
UBS00232

1. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.



3. Disconnect ECM harness connector and A/F sensor 1 harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



ECM terminal	A/F sensor terminal
16	1
35	5
56	6
75	2

Continuity should exist.

5. Check harness continuity between ECM terminals 16, 35, 56, 75 or A/F sensor 1 terminals 1, 2, 5, 6 and ground. Refer to Wiring Diagram.

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace A/F sensor 1.
NG >> Repair or replace.

Removal and Installation

UBS00233

AIR FUEL RATIO SENSOR

Refer to EM-12, "Removal and Installation" .

DTC P1278 A/F SENSOR

PFP:22693

Component Description

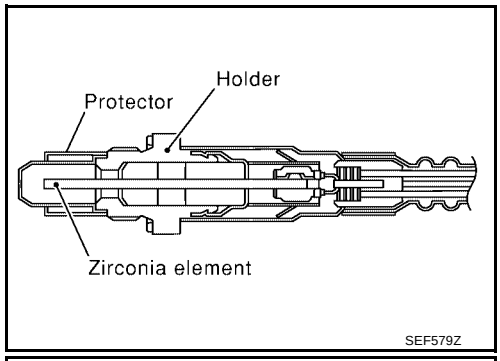
UBS003OZ

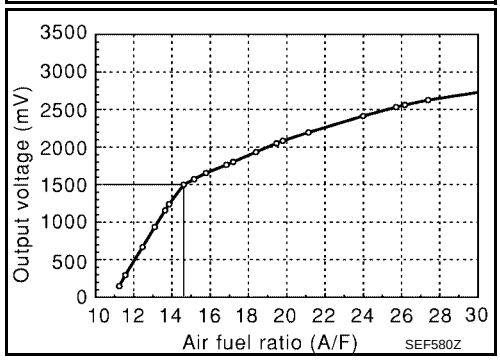
The A/F sensor is a planar dual-cell limit current sensor. The sensor element of the A/F sensor is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.

An electronic circuit controls the pump current through the oxygen-pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).





CONSULT-II Reference Value in Data Monitor Mode

UBS003P0

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5V

On Board Diagnosis Logic

UBS003P1

To judge the malfunction of air fuel ratio (A/F) sensor 1, this diagnosis measures response time of the A/F signal computed by ECM from the air fuel ration (A/F) sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the air fuel ration (A/F) sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P1278 1278	Air fuel ratio (A/F) sensor 1 circuit slow response	● The response (from RICH to LEAN) of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Air fuel ratio (A/F) sensor 1 ● Air fuel ratio (A/F) sensor heater 1 ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV ● Mass air flow sensor

DTC Confirmation Procedure

UBS003P2

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

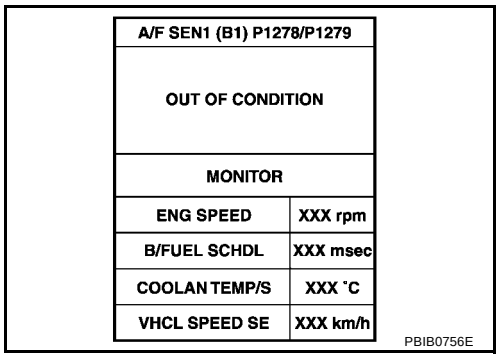
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

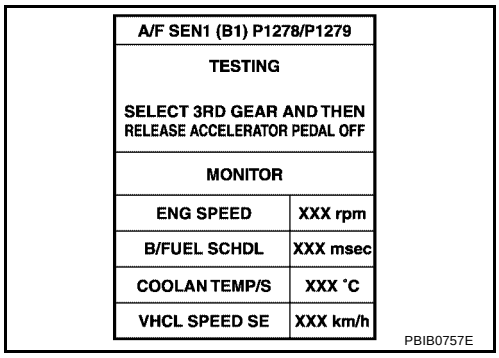
1. Perform EC-635, "Idle Air Volume Learning" . Make sure that “CMPLT” is displayed on CONSULT-II screen. If “INCMP” is displayed, follow the instruction for “Idle Air Volume Learning”.
2. Select “A/F SEN1 (B1) P1278/P1279” of “A/F SEN1” in “DTC WORK SUPPORT” mode.
3. Touch “START”.
4. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen.

ENG SPEED	1,500 - 3,000 rpm
Vehicle speed	70 - 120 km/h (43 - 75 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	● “D” position with “OD” ON (A/T) ● “4th” position (M/T)

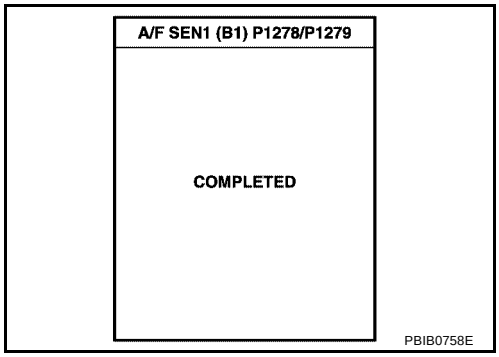
If “TESTING” is not displayed after 20 seconds, retry from step 2.



5. Following the instructions of CONSULT-II screen, set “D” position with “OD” OFF (A/T) or “3rd” position (M/T) and release accelerator pedal fully.



6. Make sure that “TESTING” changes to “COMPLETED”.
   If “TESTING” changed to “OUT OF CONDITION”, retry from step 6.
7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULT”.
   If “NG” is displayed, go to EC-1069, "Diagnostic Procedure" .



Overall Function Check

UBS003P3

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

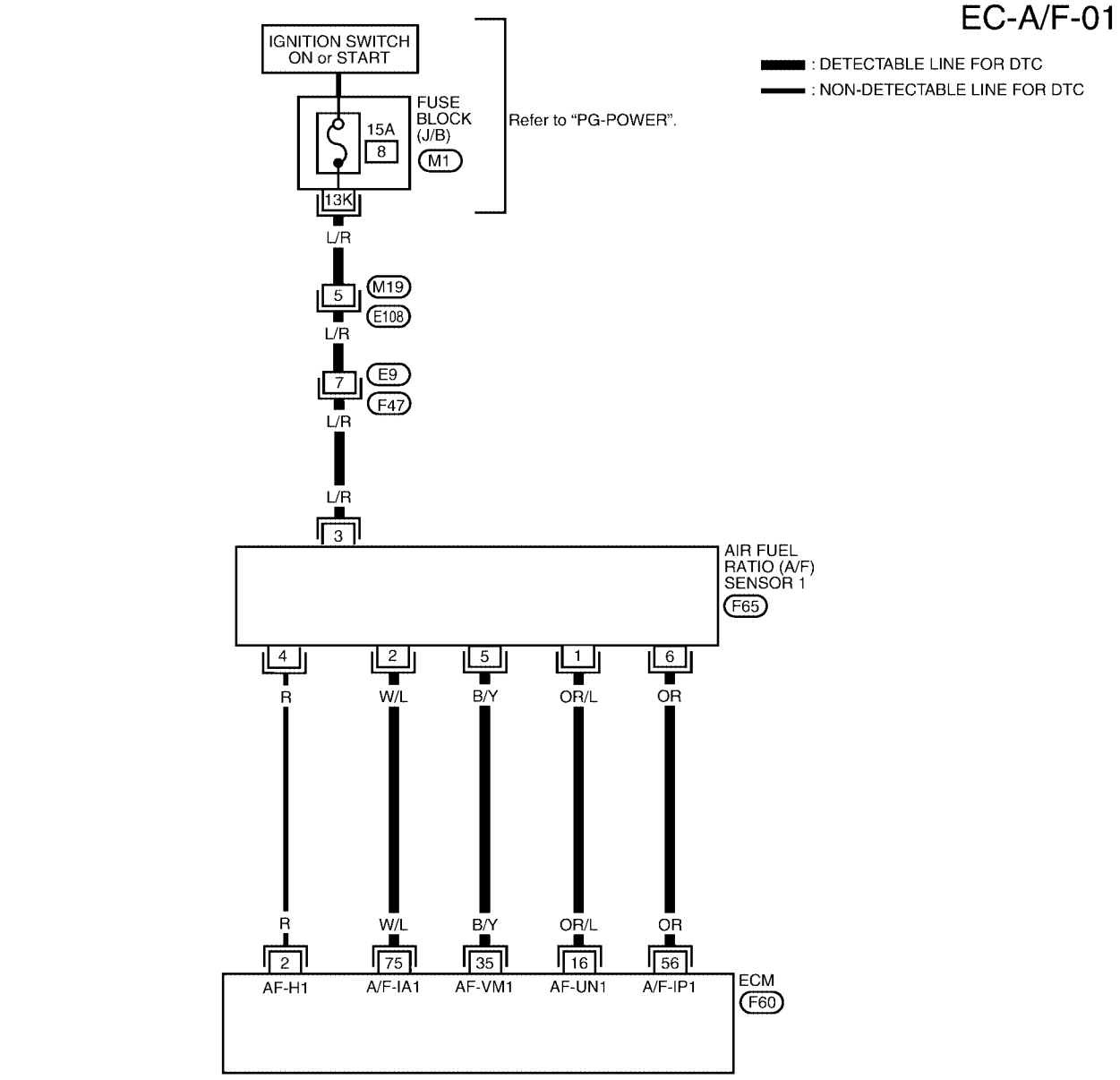
1. Perform EC-635, "Idle Air Volume Learning" . Make sure the result is OK. If NG, follow the instruction for “Idle Air Volume Learning”.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or “3rd” position (M/T).

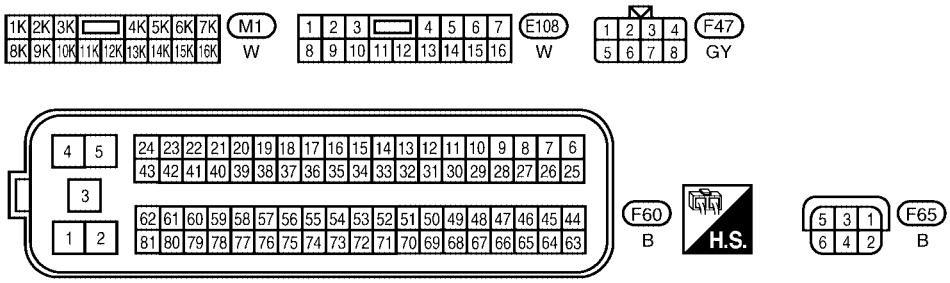
   NOTE:
   Keep the accelerator pedal as steady as possible during the cruising.
3. Set “D” position with “OD” ON (A/T) or “4th” position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

   NOTE:
   Never apply brake during releasing the accelerator pedal.
4. Repeat steps 2 to 3 five times.
5. Stop the vehicle and turn ignition switch “OFF”.
6. Wait at least 10 seconds and restart engine.
7. Repeat steps 2 to 3 five times.
8. Stop the vehicle and connect GST to the vehicle.
9. Make sure that no DTC is displayed.
   If the DTC is displayed, go to EC-1069, "Diagnostic Procedure" .

Wiring Diagram

UBS003P4





BBWA0803E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	OR/L	A/F sensor 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.1V
35	B/Y			Approximately 2.6V
56	OR			2 - 3V
75	W/L			2 - 3V

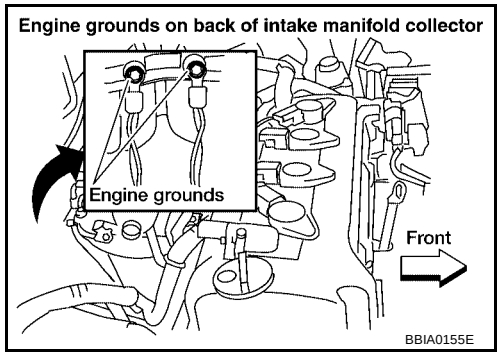
Diagnostic Procedure

UBS003P5

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

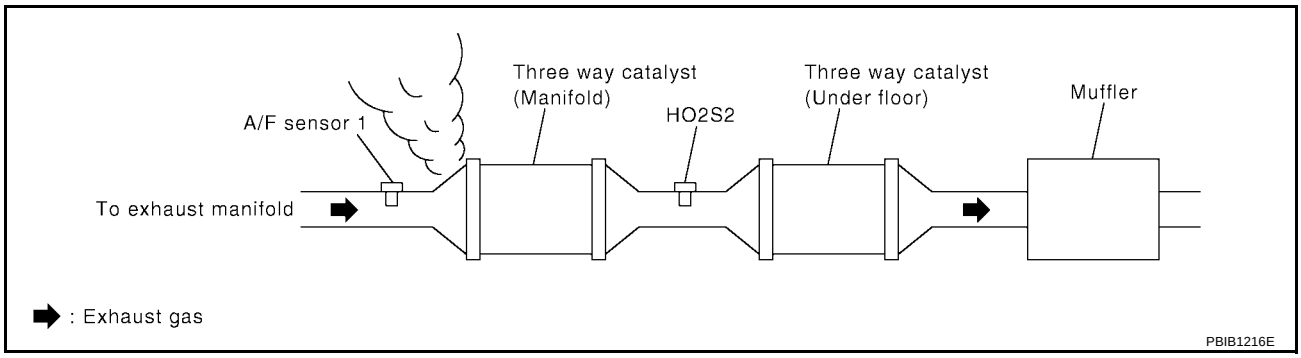
Loosen and retighten the air fuel ratio (A/F) sensor 1.

Tightening torque: 40 - 60 N-m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

>> GO TO 3.

3. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

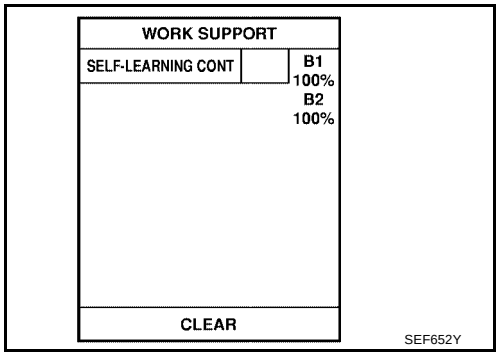
OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

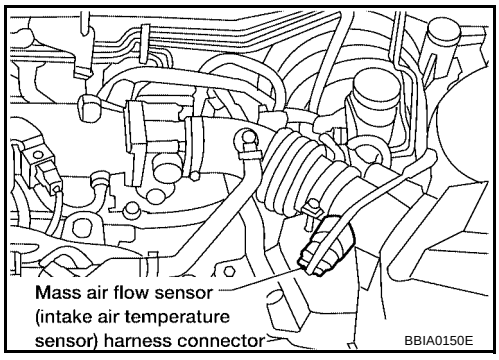
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR” or “START”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?



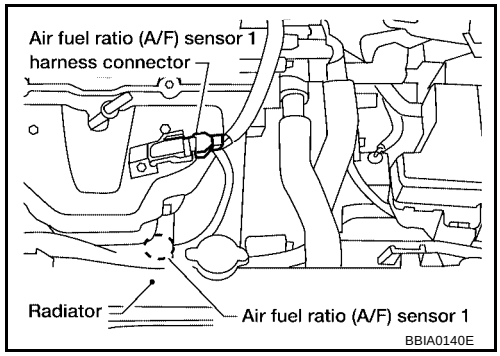
Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0172. Refer to EC-795 , EC-802 .
No >> GO TO 6.

6. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and A/F sensor 1 harness connector.
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM terminal	A/F sensor terminal
16	1
35	5
56	5
75	2



Continuity should exist.

4. Check harness continuity between ECM terminals 16, 35, 56, 75 or A/F sensor 1 terminals 1, 2, 5, 6 and ground. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to EC-935, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace A/F sensor 1.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-747, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK PCV VALVE

Refer to EC-1218, "POSITIVE CRANKCASE VENTILATION" .

OK or NG

OK >> GO TO 10.
NG >> Repair or replace PCV valve.

10. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace A/F sensor 1.
NG >> Repair or replace.

Removal and Installation

UBS003P6

AIR FUEL RATIO SENSOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

DTC P1279 A/F SENSOR

PFP:22693

Component Description

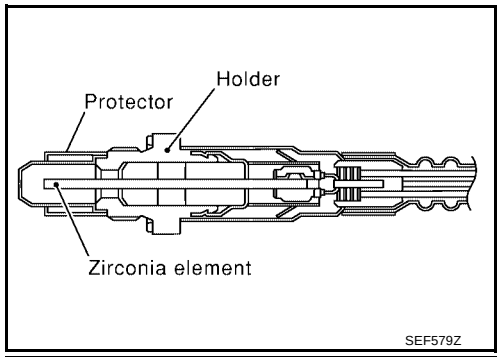
UBS003P7

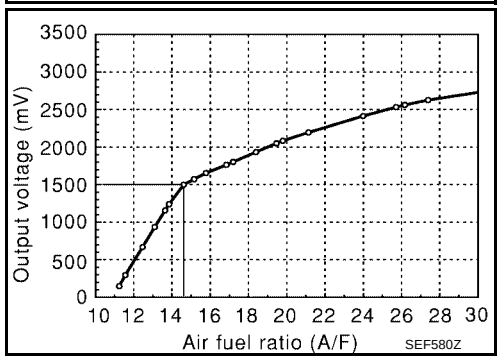
The A/F sensor is a planar dual-cell limit current sensor. The sensor element of the A/F sensor is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.

An electronic circuit controls the pump current through the oxygen-pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).





CONSULT-II Reference Value in Data Monitor Mode

UBS003P8

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5V

On Board Diagnosis Logic

UBS003P9

To judge the malfunction of air fuel ratio (A/F) sensor 1, this diagnosis measures response time of the A/F signal computed by ECM from the air fuel ration (A/F) sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the air fuel ration (A/F) sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P1279 1279	Air fuel ratio (A/F) sensor 1 circuit slow response	● The response (from LEAN to RICH) of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Air fuel ratio (A/F) sensor 1 ● Air fuel ratio (A/F) sensor heater 1 ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV ● Mass air flow sensor

DTC Confirmation Procedure

UBS003PA

CAUTION:

Always drive vehicle at a safe speed.

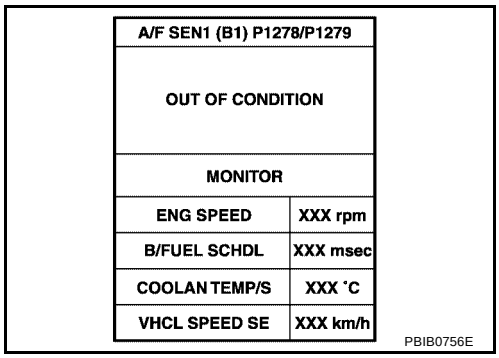
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

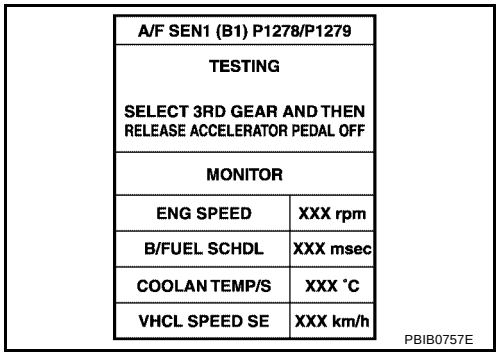
1. Perform EC-635, "Idle Air Volume Learning" . Make sure that “CMPLT” is displayed on CONSULT-II screen. If “INCMP” is displayed, follow the instruction for “Idle Air Volume Learning”.
2. Select “A/F SEN1 (B1) P1278/P1279” of “A/F SEN1” in “DTC WORK SUPPORT” mode.
3. Touch “START”.
4. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen.

ENG SPEED	1,500 - 3,000 rpm
Vehicle speed	70 - 120 km/h (43 - 75 MPH)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	● “D” position with “OD” ON (A/T) ● “4th” position (M/T)

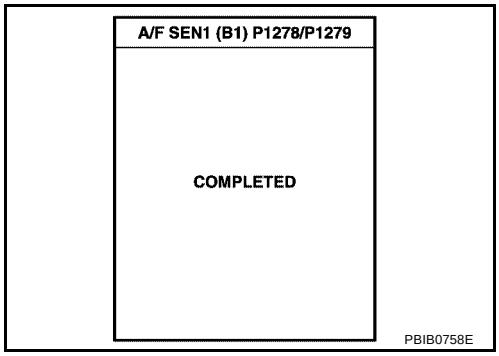
If “TESTING” is not displayed after 20 seconds, retry from step 2.



5. Following the instructions of CONSULT-II screen, set “D” position with “OD” OFF (A/T) or “3rd” position (M/T) and release accelerator pedal fully.



6. Make sure that “TESTING” changes to “COMPLETED”.
   If “TESTING” changed to “OUT OF CONDITION”, retry from step 6.
7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULT”.
   If “NG” is displayed, go to EC-1077, "Diagnostic Procedure" .



Overall Function Check

UBS003PB

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Perform EC-635, "Idle Air Volume Learning" . Make sure the result is OK. If NG, follow the instruction for “Idle Air Volume Learning”.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in “D” position with “OD” OFF (A/T) or “3rd” position (M/T).

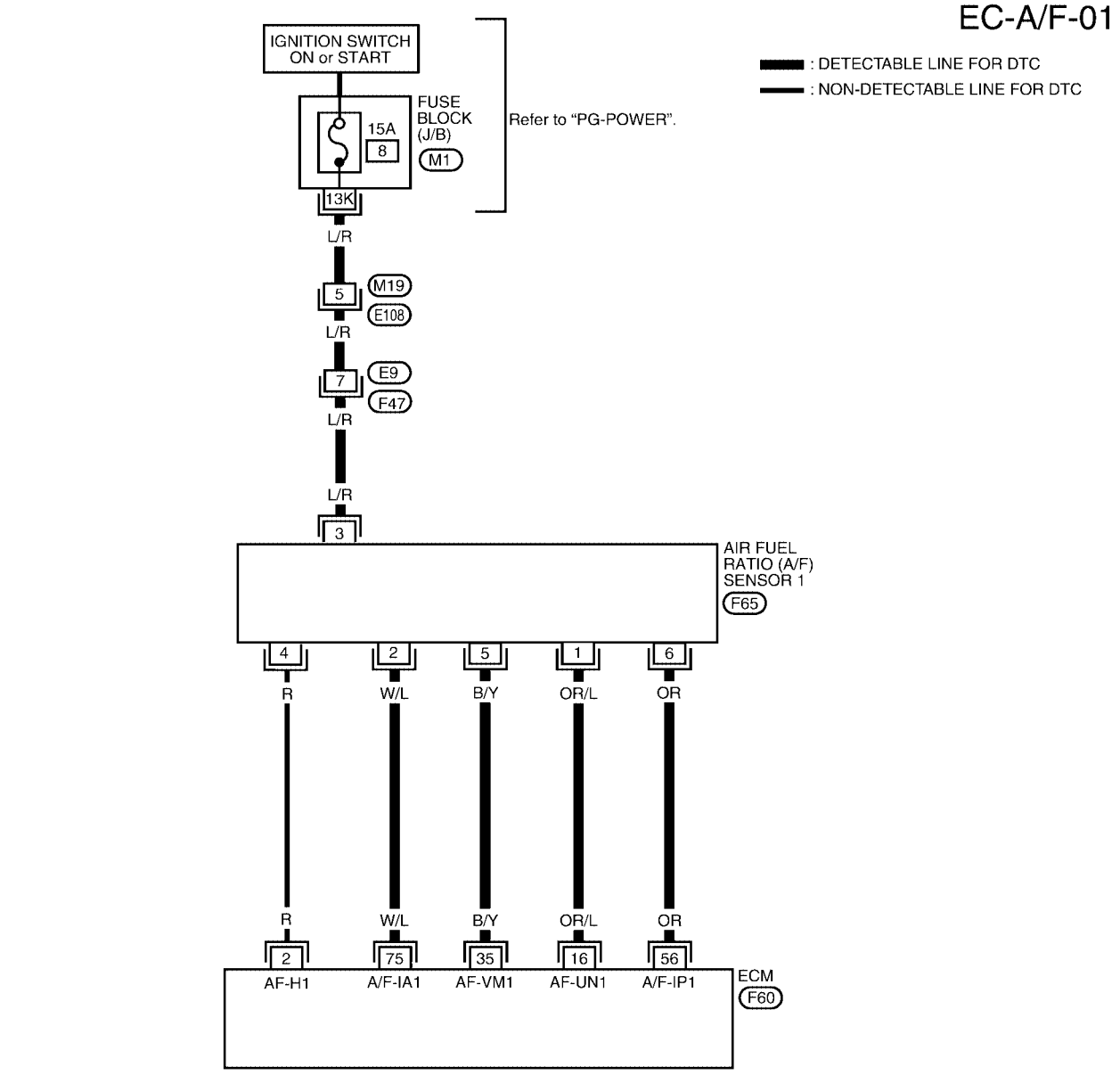
   NOTE:
   Keep the accelerator pedal as steady as possible during the cruising.

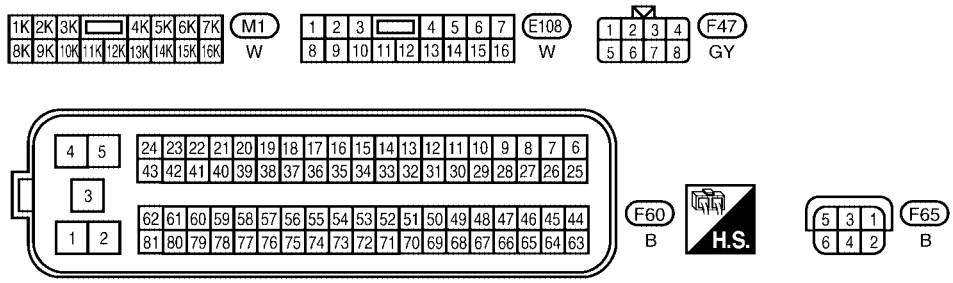
3. Set “D” position with “OD” ON (A/T) or “4th” position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

   NOTE:
   Never apply brake during releasing the accelerator pedal.
4. Repeat steps 2 to 3 five times.
5. Stop the vehicle and turn ignition switch “OFF”.
6. Wait at least 10 seconds and restart engine.
7. Repeat steps 2 to 3 five times.
8. Stop the vehicle and connect GST to the vehicle.
9. Make sure that no DTC is displayed.
   If the DTC is displayed, go to EC-1077, "Diagnostic Procedure" .

Wiring Diagram

UBS003PC





BBWA0803E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	OR/L	A/F sensor 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.1V
35	B/Y			Approximately 2.6V
56	OR			2 - 3V
75	W/L			2 - 3V

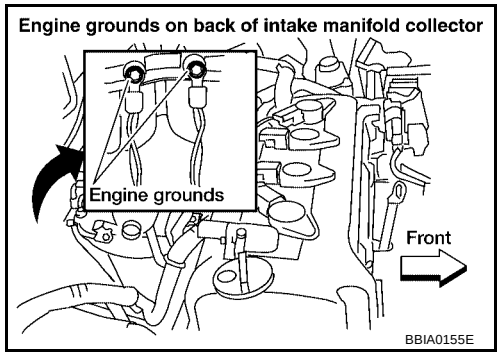
Diagnostic Procedure

UBS003PD

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

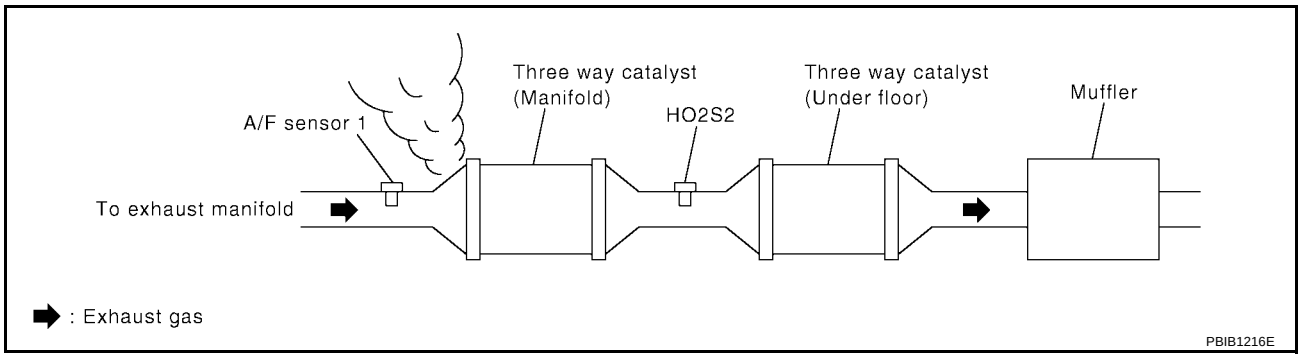
Loosen and retighten the air fuel ratio (A/F) sensor 1.

Tightening torque: 40 - 60 N-m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

>> GO TO 3.

3. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

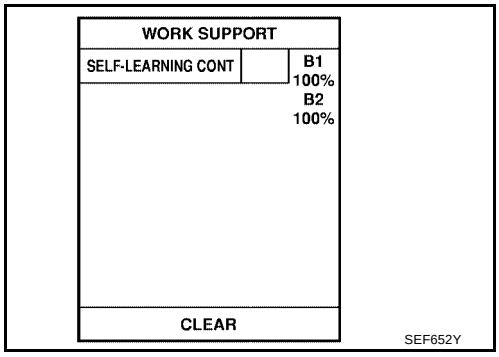
OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

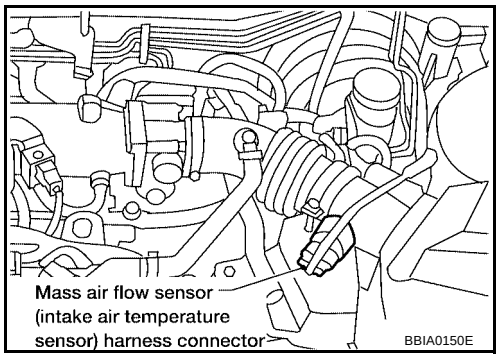
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR” or “START”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0102 is displayed.
6. Erase the 1st trip DTC memory. Refer to EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?



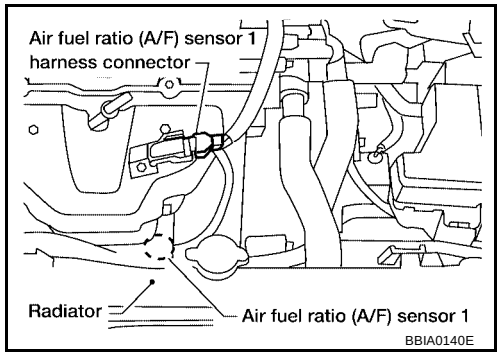
Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0172. Refer to EC-795 , EC-802 .
No >> GO TO 6.

6. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and A/F sensor 1 harness connector.
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM terminal	A/F sensor terminal
16	1
35	5
56	6
75	2



Continuity should exist.

4. Check harness continuity between ECM terminals 16, 35, 56, 75 or A/F sensor 1 terminals 1, 2, 5, 6 and ground. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to EC-935, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace A/F sensor 1.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-747, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK PCV VALVE

Refer to EC-1218, "POSITIVE CRANKCASE VENTILATION" .

OK or NG

OK >> GO TO 10.
NG >> Repair or replace PCV valve.

10. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace A/F sensor 1.
NG >> Repair or replace.

Removal and Installation

UBS003PE

AIR FUEL RATIO SENSOR

Refer to EM-12, "OUTER COMPONENT PARTS" .

DTC P1444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

UBS0023N

SYSTEM DESCRIPTION

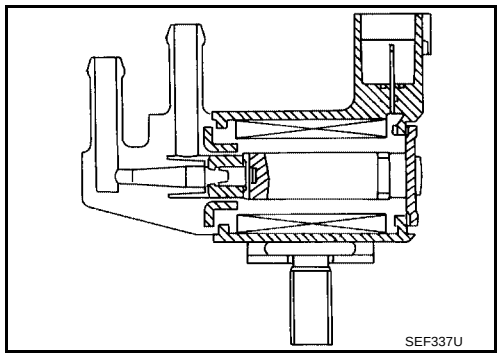
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed* and cylinder position	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Air fuel ratio (A/F) sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor	Vehicle speed		

*: ECM determines the start signal status by the signals of engine speed and battery voltage.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

UBS0023O

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	0%
		2,000 rpm	—

On Board Diagnosis Logic

UBS0023P

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1444 1444	EVAP canister purge volume control solenoid valve	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	● EVAP control system pressure sensor ● EVAP canister purge volume control solenoid valve (The valve is stuck open.) ● EVAP canister vent control valve ● EVAP canister ● Hoses (Hoses are connected incorrectly or clogged.)

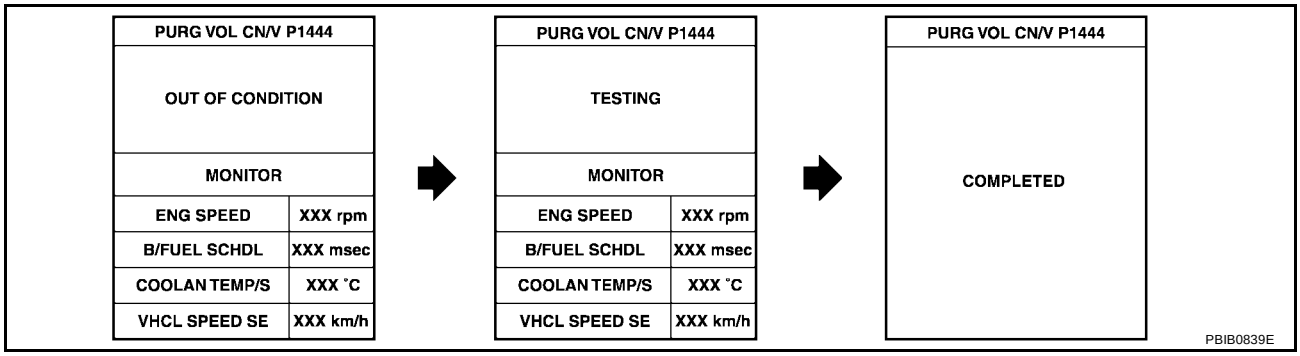
DTC Confirmation Procedure

UBS0023R

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 0°C (32°F) or more.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
5. Touch “START”.



6. Start engine and let it idle until “TESTING” on CONSULT-II changes to “COMPLETED”. (It will take approximately 10 seconds.)
   If “TESTING” is not displayed after 5 minutes, retry from step 2.
7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1085, "Diagnostic Procedure" .

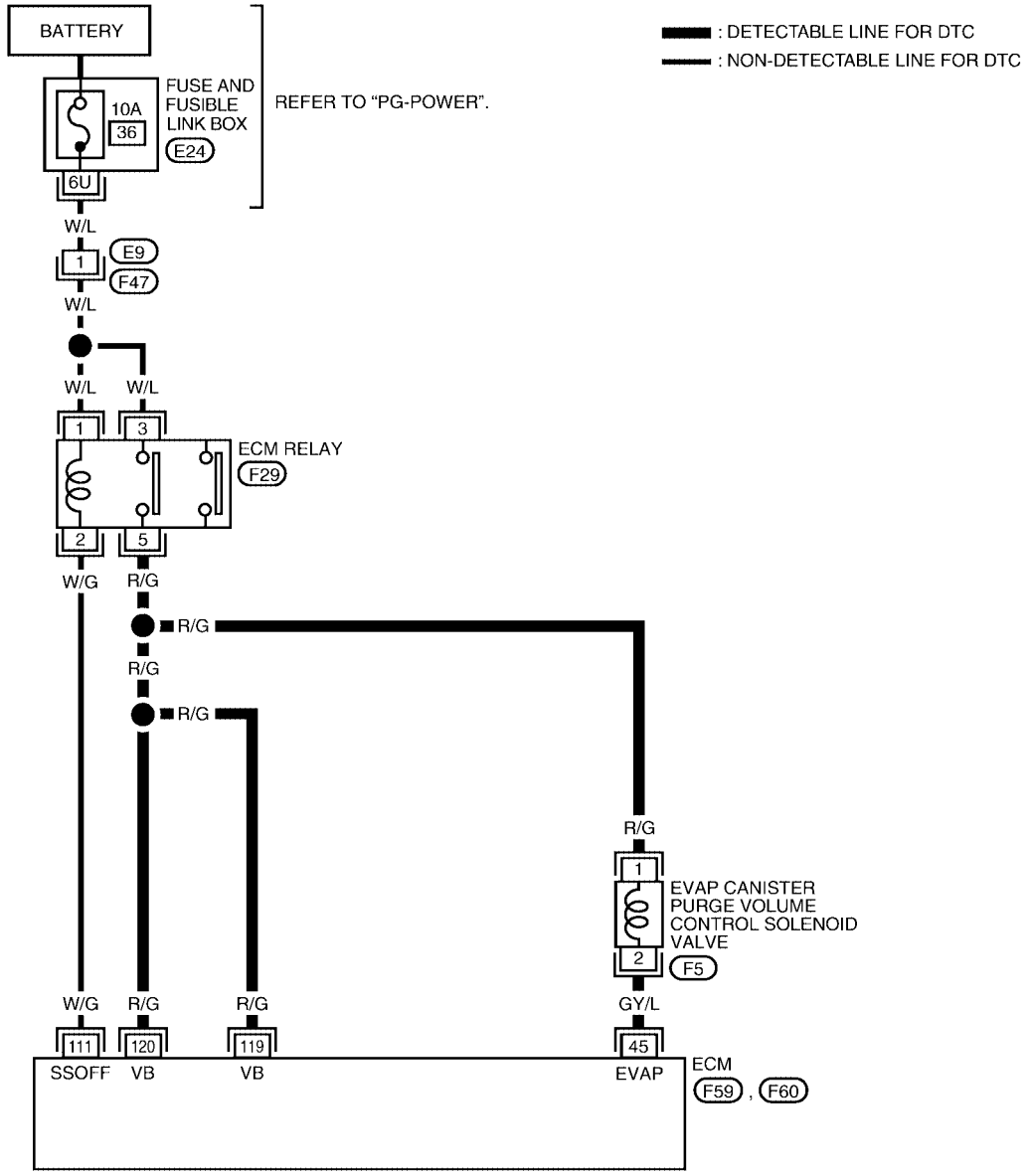
WITH GST

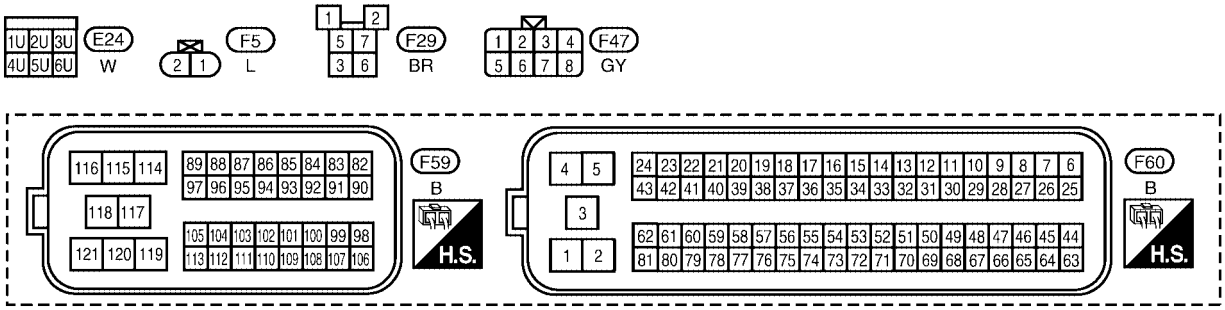
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and let it idle for at least 20 seconds.
4. Select “MODE 7” with GST.
5. If 1st trip DTC is detected, go to EC-1085, "Diagnostic Procedure" .

Wiring Diagram

UBS0023S

EC-PGC/V-01



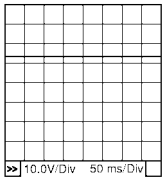
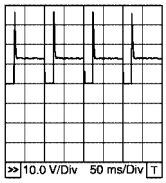


BBWA0785E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

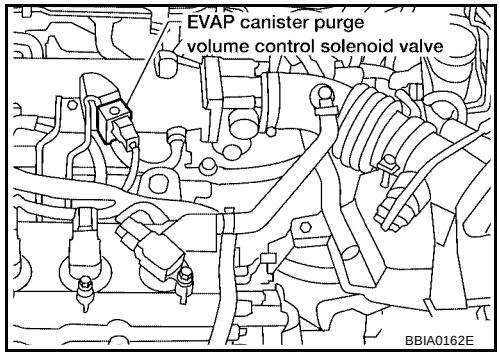
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS0023T

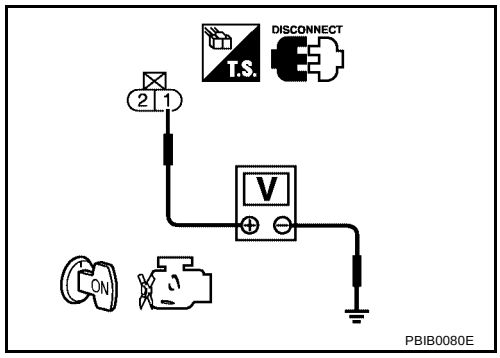
1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and engine ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Replace EVAP control system pressure sensor.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-885, "Component Inspection" .

OK or NG

OK (With CONSULT-II)>>GO TO 6.
OK (Without CONSULT-II)>>GO TO 7.
NG >> Replace EVAP control system pressure sensor.

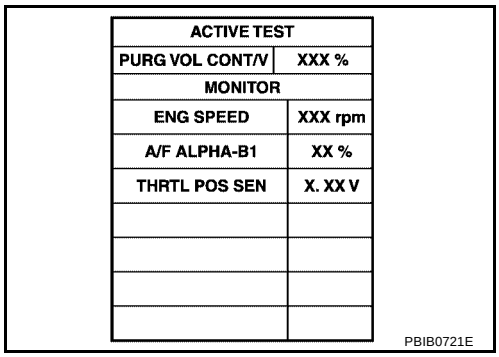
6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect harness connectors disconnected.
3. Start engine.
4. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.



7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-892, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 9.
NG >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE-II

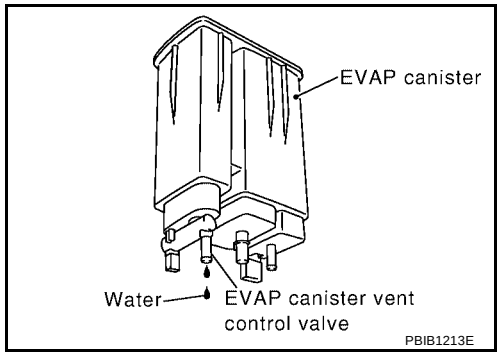
Refer to EC-878, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP canister vent control valve.

10. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



OK or NG

OK >> GO TO 11.
NG >> GO TO 13.

11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.

The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK >> GO TO 13.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-137, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

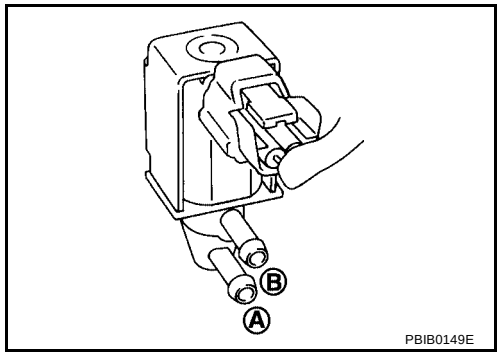
UBS006IB

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

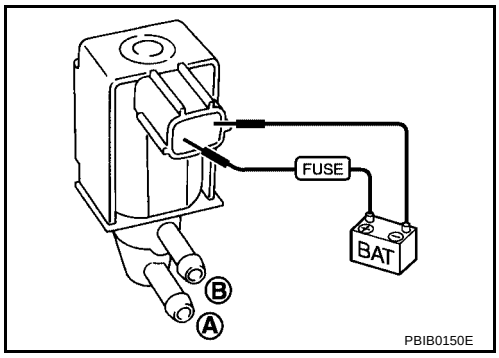
Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



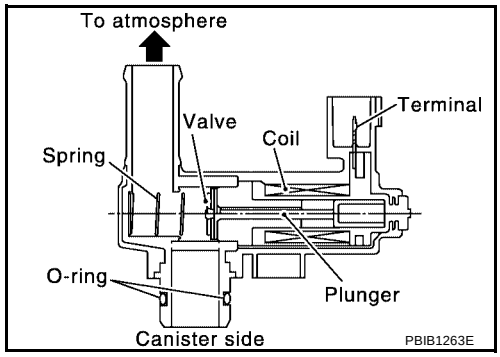
DTC P1446 EVAP CANISTER VENT CONTROL VALVE

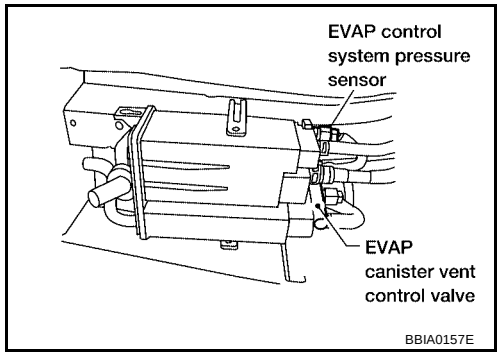
PFP:14935

Component Description

UBS0023U

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnoses.





CONSULT-II Reference Value in Data Monitor Mode

UBS0023V

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS0023W

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1446 1446	EVAP canister vent control valve close	EVAP canister vent control valve remains closed under specified driving conditions.	● EVAP canister vent control valve ● EVAP control system pressure sensor and the circuit ● Blocked rubber tube to EVAP canister vent control valve ● EVAP canister is saturated with water

DTC Confirmation Procedure

UBS0023Y

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 5 seconds.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and let it idle for at least 1 minute.
5. Repeat next procedures 3 times.

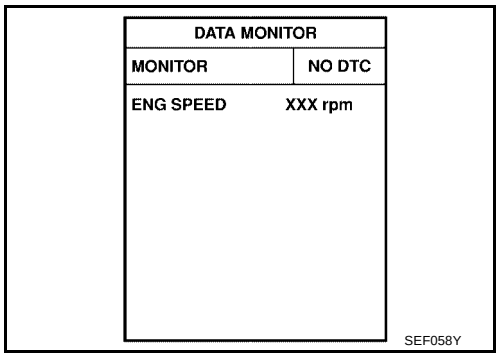
a. Increase the engine speed up to 3,000 to 3,500 rpm and keep it for 2 minutes and 50 seconds to 3 minutes.
Never exceed 3 minutes.

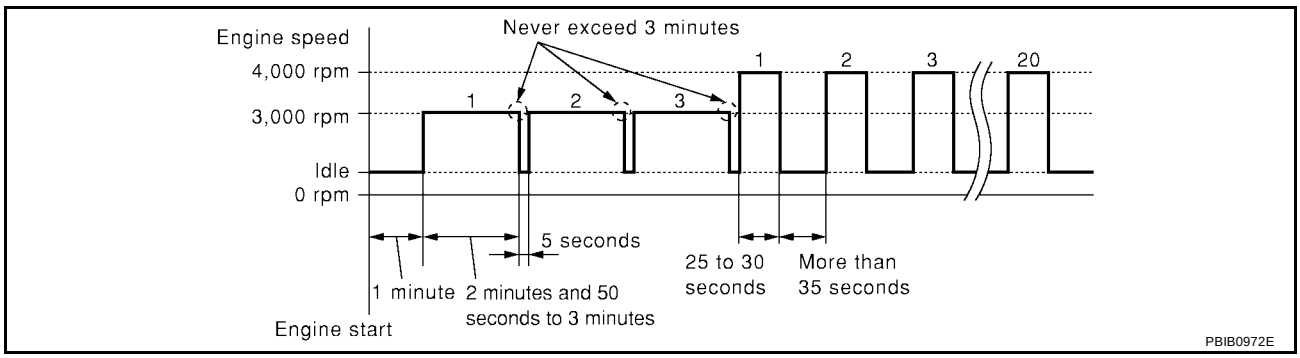
b. Fully released accelerator pedal and keep engine idle for about 5 seconds.

6. If 1st trip DTC is detected, go to EC-996, "Diagnostic Procedure" .
If 1st trip DTC is not detected, go to the next step.
7. Repeat next procedure 20 times.

a. Quickly increase the engine speed up to 4,000 to 4,500 rpm or more and keep it for 25 to 30 seconds.

b. Fully released accelerator pedal and keep engine idle for at least 35 seconds.





8. If 1st trip DTC is detected, go to EC-996, "Diagnostic Procedure" .

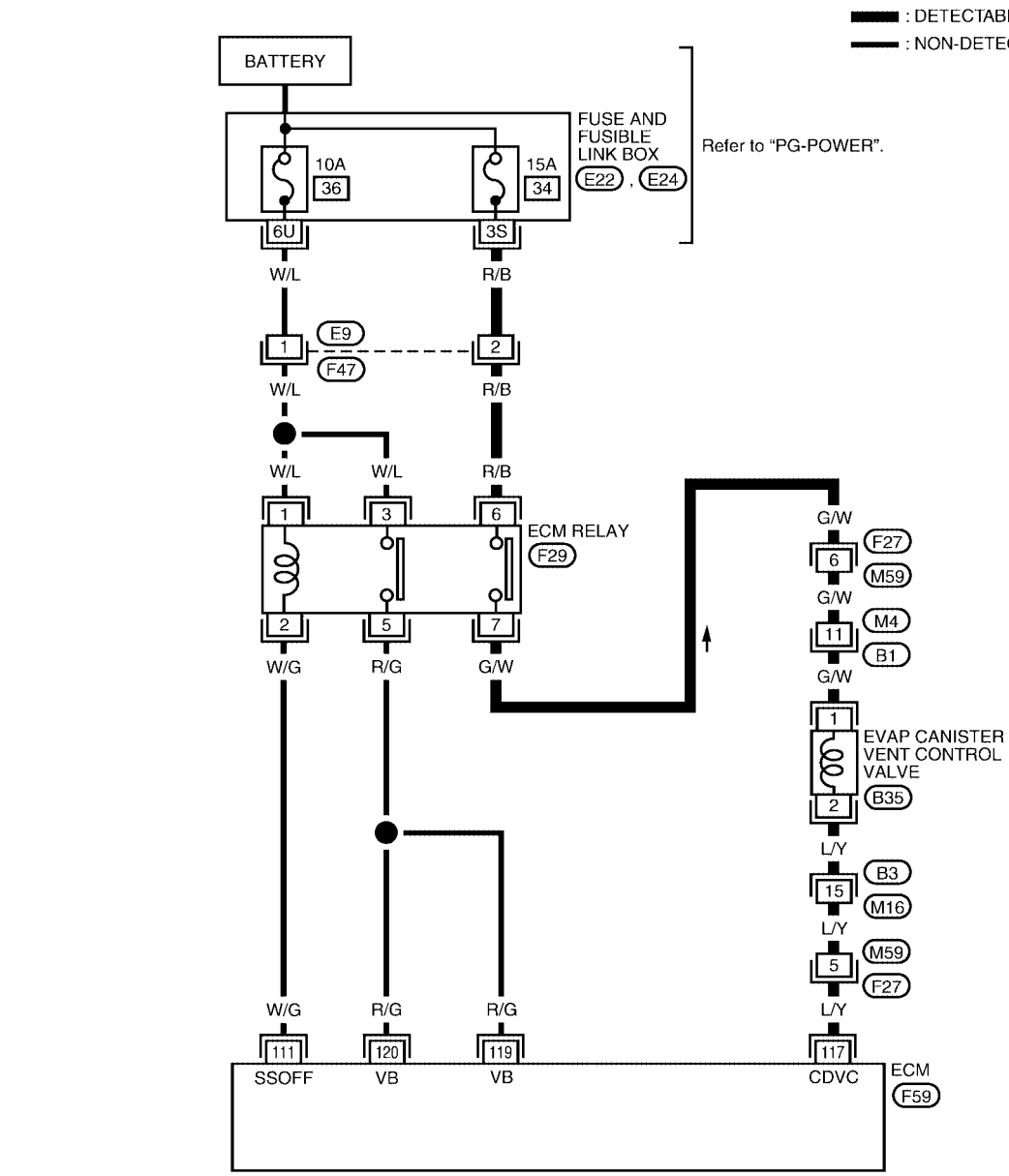
WITH GST

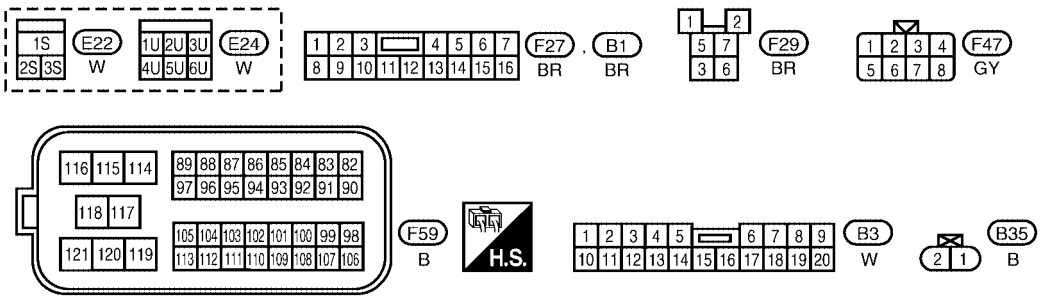
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0023Z

EC-VENT/V-01





BBWA0291E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
117	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

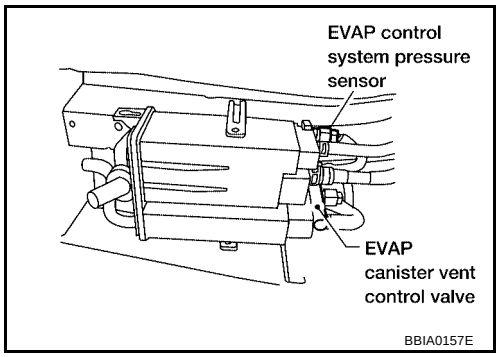
UBS00240

1. CHECK RUBBER TUBE

1. Turn ignition switch "OFF".
2. Disconnect rubber tube connected to EVAP canister vent control valve.
3. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 2.
NG >> Clean rubber tube using an air blower.



2. CHECK EVAP CANISTER VENT CONTROL VALVE-I

Refer to EC-998, "Component Inspection" .

OK or NG

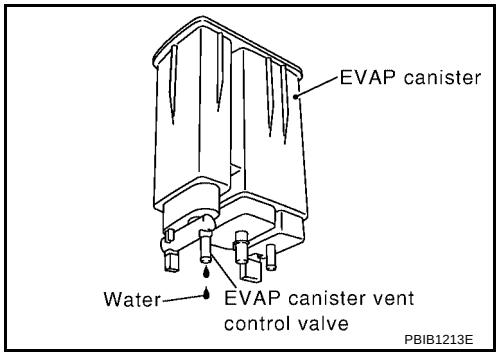
OK >> GO TO 3.
NG >> Replace EVAP canister vent control valve.

3. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.

Yes or No

Yes >> GO TO 4.
No >> GO TO 6.



4. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.9 kg (4.2 lb).

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

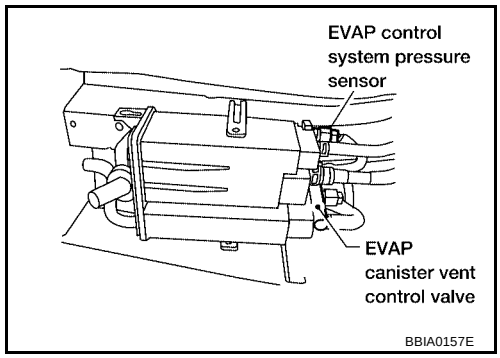
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.



OK or NG

OK >> GO TO 7.
NG >> Replace EVAP control system pressure sensor.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-892, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP control system pressure sensor.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

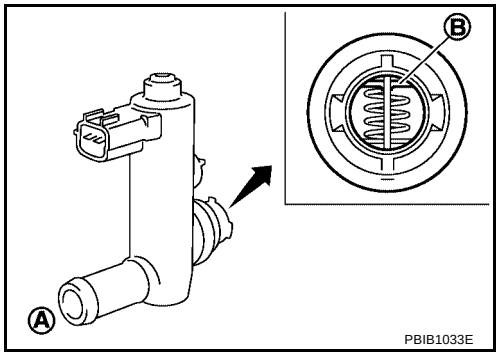
UBS006ID

EVAP CANISTER VENT CONTROL VALVE

With CONSULT-II

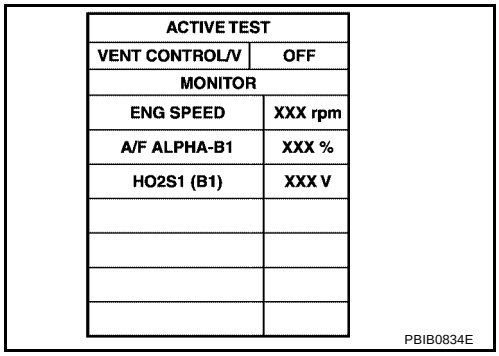
1. Remove EVAP canister vent control valve from EVAP canister.

2. Check portion **B** of EVAP canister vent control valve for being rusted.
   If NG, replace EVAP canister vent control valve.
   If OK, go to next step.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

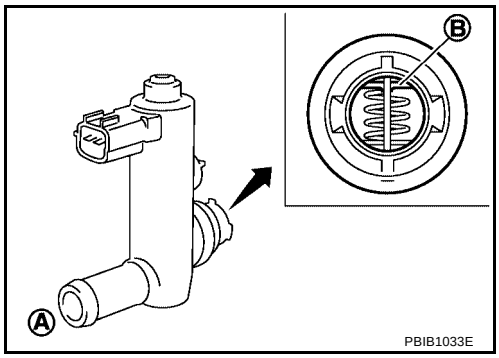


Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, replace EVAP canister vent control valve.
If OK, go to next step.

7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform step 5 again.

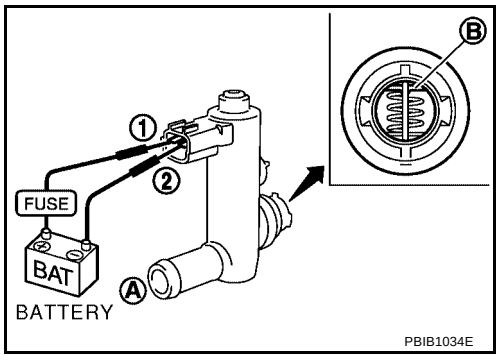
Without CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	No
OFF	Yes



Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, replace EVAP canister vent control valve.
If OK, go to next step.

4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.

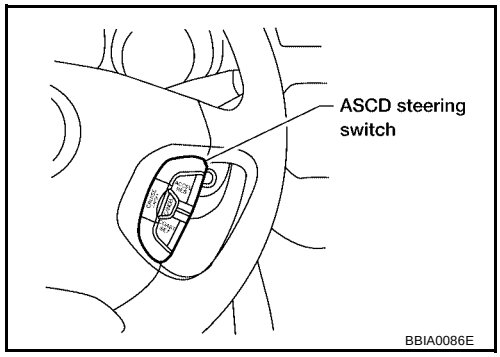
DTC P1564 ASCD STEERING SWITCH

PFP:25551

Component Description

UBS006AF

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to EC-1220, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS006AG

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAIN SW	● Ignition switch: ON	CRUISE switch: Depressed	ON
		CRUISE switch: Released	OFF
CANCEL SW	● Ignition switch: ON	CRUISE switch: Depressed	ON
		CRUISE switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	ACCEL/RES switch: Depressed	ON
		ACCEL/RES switch: Released	OFF
SET SW	● Ignition switch: ON	COAST/SET switch: Depressed	ON
		COAST/SET switch: Released	OFF

On Board Diagnosis Logic

UBS006AH

This self-diagnosis has the one trip detection logic.
The MIL will not light up for this diagnosis.

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-927.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1564 1564	ASCD steering switch	● An excessively high voltage signal from the ASCD steering switch is sent to ECM. ● ECM detects that input signal from the ASCD steering switch is out of the specified range. ● ECM detects that the ASCD steering switch is stuck ON.	● Harness or connectors (The switch circuit is open or shorted.) ● ASCD steering switch ● ECM

DTC Confirmation Procedure

UBS006AI

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 10 seconds.
4. Press “CRUISE” switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press “ACCEL/RES” switch for at least 10 seconds, then release it and wait at least 10 seconds.

6. Press “COAST/SET” switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Press “CANCEL” switch for at least 10 seconds, then release it and wait at least 10 seconds.
8. If trip DTC is detected, go to EC-1099, "Diagnostic Procedure" .

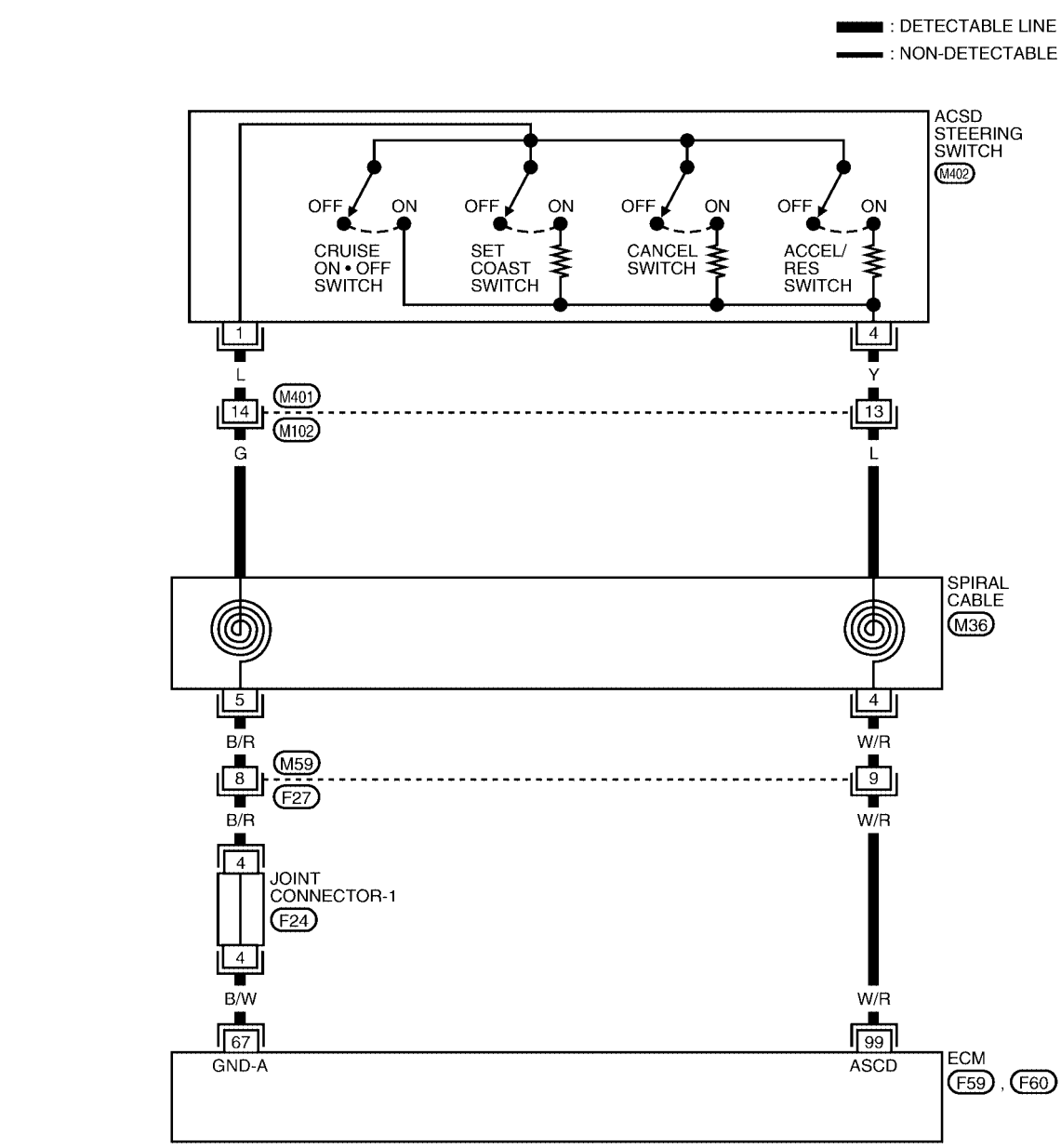
WITH GST

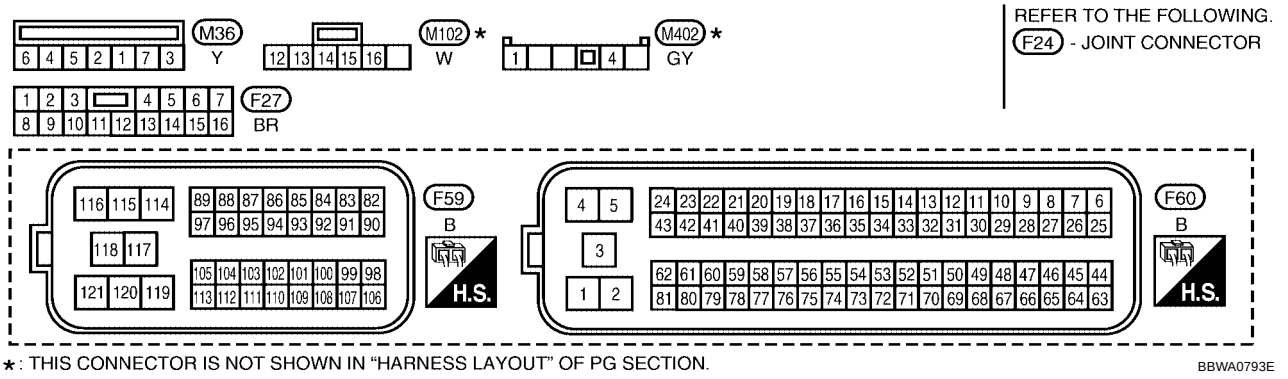
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006AJ

EC-ASC/SW-01





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" OF PG SECTION.

BBWA0793E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
67	B/W	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
99	W/R	ASCD steering switch	**[Ignition switch "ON"]** ● ASCD steering switch is "OFF".	Approximately 4V
			[Ignition switch "ON"] ● CRUISE switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1V
			[Ignition switch "ON"] ● COAST/SET switch is "ON".	Approximately 2V
			[Ignition switch "ON"] ● ACCEL/RESUME switch is "ON".	Approximately 3V

Diagnostic Procedure

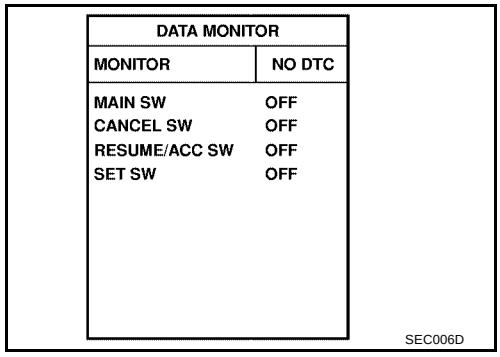
UBS006AK

1. CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “MAIN SW”, “RESUME/ACC SW”, “SET SW” and “CANCEL SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check each item indication under the following conditions.

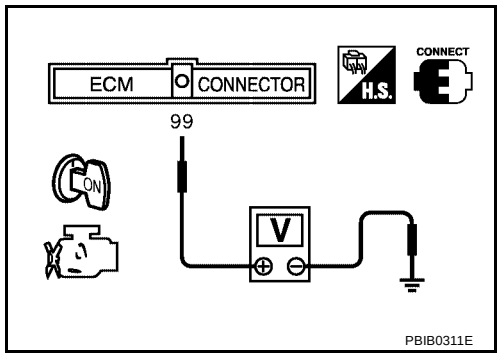
Switch	Monitor item	Condition	Indication
CRUISE	MAIN SW	Pressed	ON
		Released	OFF
COAST/SET	SET SW	Pressed	ON
		Released	OFF
ACCEL/RES	RESUME/ACC SW	Pressed	ON
		Released	OFF
CANCEL	CANCEL SW	Pressed	ON
		Released	OFF



Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 99 and ground with pressing each button.

Switch	Condition	Voltage [V]
CRUISE SW	Pressed	Approx. 0
	Released	Approx. 4
COAST/SET SW	Pressed	Approx. 2
	Released	Approx. 4
ACCEL/RES SW	Pressed	Approx. 3
	Released	Approx. 4
CANCEL SW	Pressed	Approx. 1
	Released	Approx. 4



OK or NG

OK >> GO TO 7.
NG >> GO TO 2.

2. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

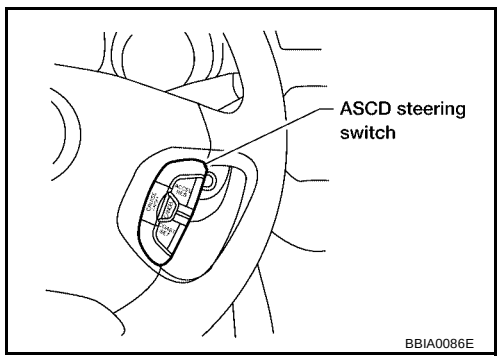
1. Turn ignition switch “OFF”.
2. Disconnect ASCD steering switch harness connector.
3. Check harness continuity between switch terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M401, M102
- Harness connectors M59, F27
- Joint connector-1
- Spiral cable
- Harness for open and short between ECM and ASCD steering switch

>> Repair open circuit or short to power in harness or connectors.

4. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 99 and ASCD steering switch terminal 4. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M401, M102
- Harness connectors M59, F27
- Spiral cable
- Harness for open and short between ECM and ASCD steering switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD STEERING SWITCH

Refer to EC-1101, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace ASCD steering switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

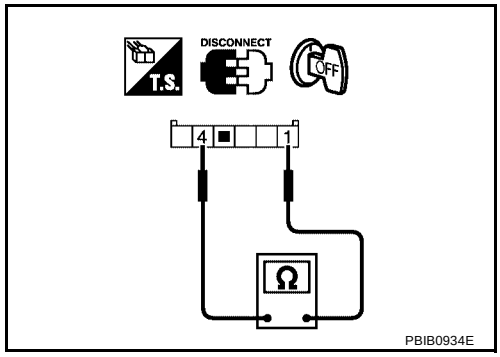
>> **INSPECTION END**

Component Inspection

UBS006AL

ASCD STEERING SWITCH

1. Disconnect ASCD steering switch.
2. Check continuity between ASCD steering switch terminals 1 and 4 with pushing each switch.



Switch	Condition	Resistance [Ω]
CRUISE SW	Pressed	Approx. 0
	Released	Approx. 4,000
COAST/SET SW	Pressed	Approx. 660
	Released	Approx. 4,000
ACCEL/RES SW	Pressed	Approx. 1,480
	Released	Approx. 4,000
CANCEL SW	Pressed	Approx. 250
	Released	Approx. 4,000

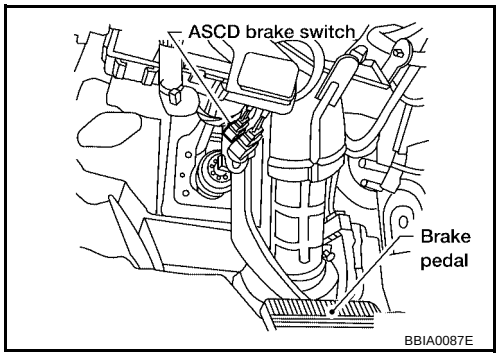
DTC P1572 ASCD BRAKE SWITCH

PFP:25320

Component Description

UBS006AM

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to for the ASCD function EC-1220, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" .



CONSULT-II Reference Value in Data Monitor Mode

UBS006AN

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1	● Ignition switch: ON	Clutch pedal (M/T) and brake pedal: Fully released	ON
		Clutch pedal (M/T) and brake pedal: Slightly depressed	OFF
BRAKE SW2	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

UBS006AO

This self-diagnosis has the one trip detection logic.
The MIL will not light up for this diagnosis.

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-927.**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfuntion A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition		Possible Cause
P1572 1572	ASCD brake switch	A)	● When the vehicle speed is above 30km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to ECM at the same time.	● Harness or connectors (The stop lamp switch circuit is shorted.) ● Harness or connectors (The ASCD brake switch circuit is shorted.) ● Harness or connectors (The ASCD clutch switch circuit is shorted.) (M/T models) ● Stop lamp switch ● ASCD brake switch ● ASCD clutch switch (M/T models) ● Incorrect stop lamp switch installation ● Incorrect ASCD brake switch installation ● Incorrect ASCD clutch switch installation (M/T models) ● ECM
		B)	● ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is driving	

DTC Confirmation Procedure

UBS006AP

CAUTION:
Always drive vehicle at a safe speed.

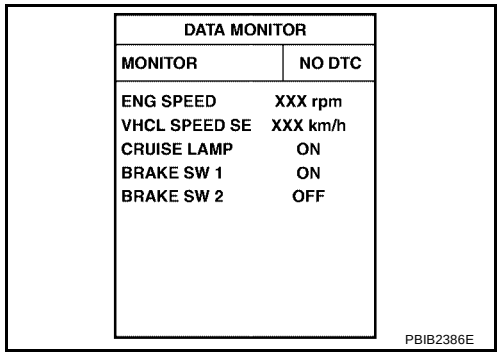
NOTE:
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
- Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.

TESTING CONDITION:
Steps 4 and 5 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine (TCS switch “OFF”).
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Press CRUISE switch and make sure that CRUISE indicator lights up.
4. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position



If 1st trip DTC is detected, go to EC-1106, "Diagnostic Procedure" .
If 1st trip DTC is not detected, go to the following step.

5. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned vehicle speed.

6. If 1st trip DTC is detected, go to EC-1106, "Diagnostic Procedure" .

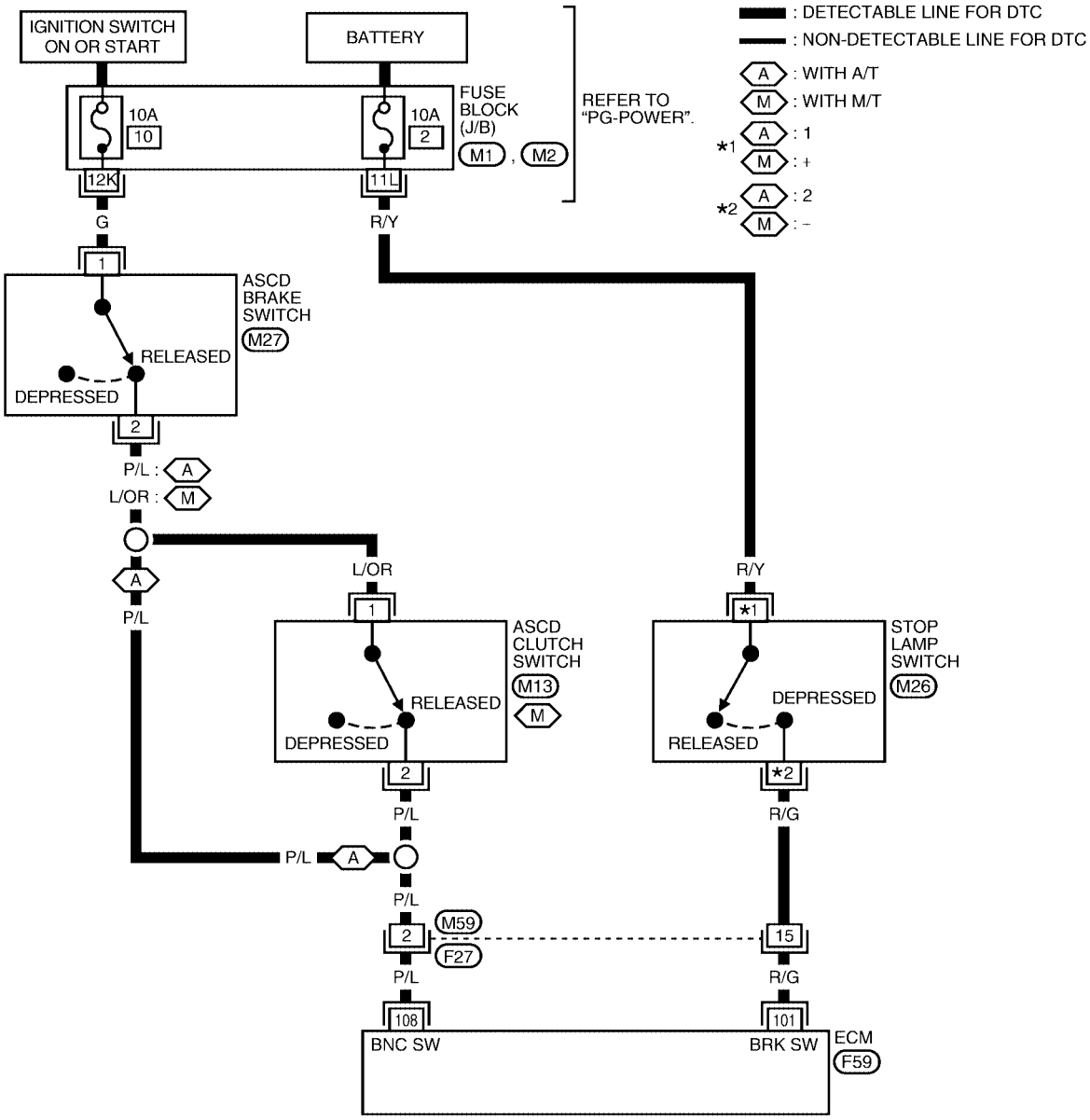
WITH GST

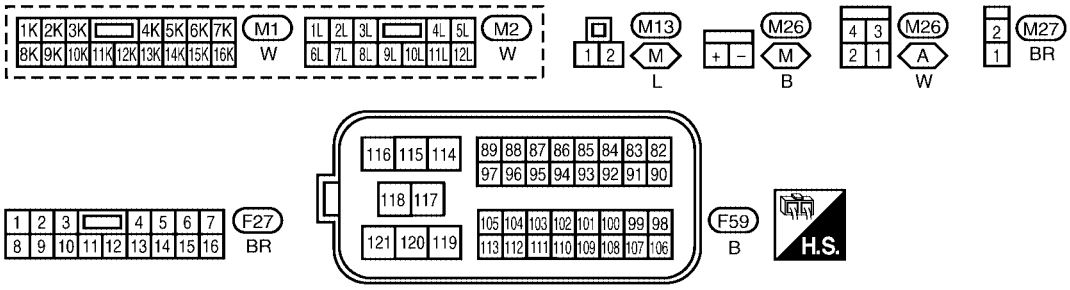
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006AQ

EC-ASC/BS-01





BBWA0303E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
108	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS006AR

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

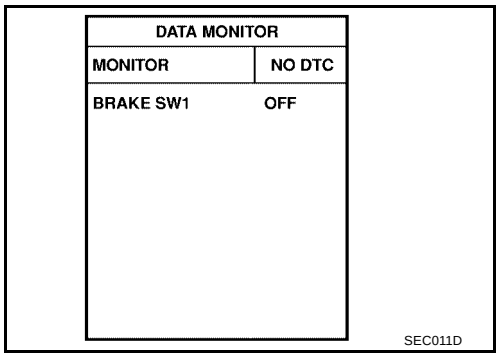
1. Turn ignition switch “ON”.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-II.
3. Check “BRAKE SW1” indication under the following conditions.

A/T models

CONDITION	INDICATION
When brake pedal is depress	OFF
When brake pedal is fully released	ON

M/T models

CONDITION	INDICATION
When clutch pedal and/or brake pedal is depressed	OFF
When clutch pedal and brake pedal are fully released	ON



Without CONSULT-II

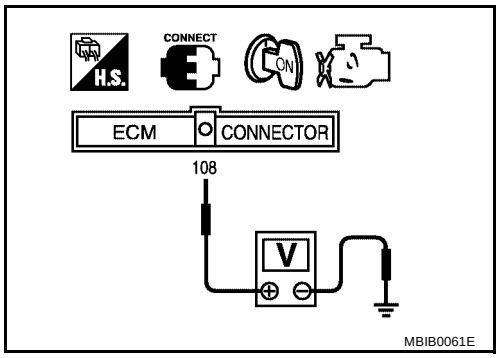
1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 108 and ground under the following conditions.

A/T models

CONDITION	VOLTAGE
When brake pedal is depress	Approximately 0V
When brake pedal is fully released	Battery voltage

M/T models

CONDITION	VOLTAGE
When clutch pedal and/or brake pedal is depressed	Approximately 0V
When clutch pedal and brake pedal are fully released	Battery voltage



OK or NG

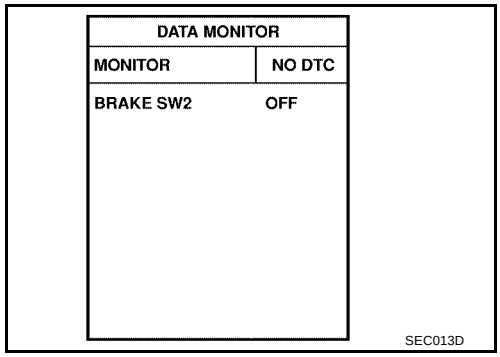
OK >> GO TO 2.
NG (M/T models) >>GO TO 3.
NG (A/T models) >>GO TO 4.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

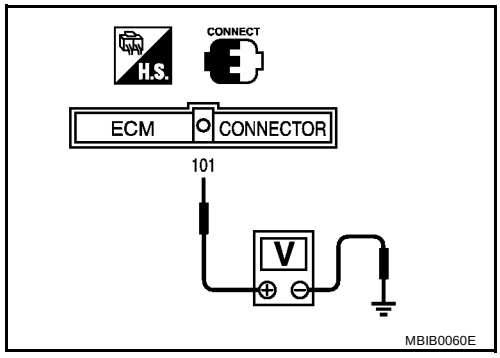
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

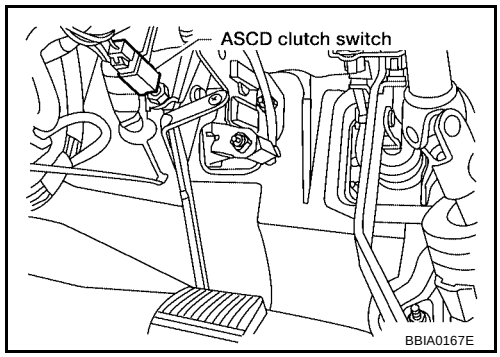


OK or NG

OK >> GO TO 18.
NG >> GO TO 13.

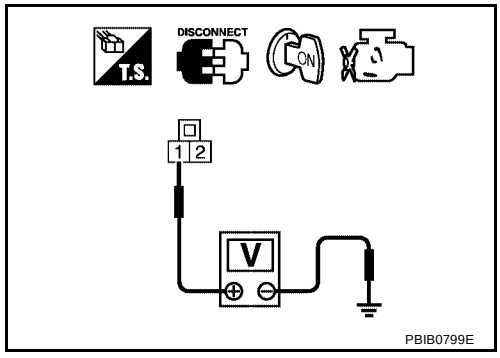
3. CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-II or tester.

CONDITION	VOLTAGE
When brake pedal is released	Battery voltage
When brake pedal is depressed	Approx. 0V

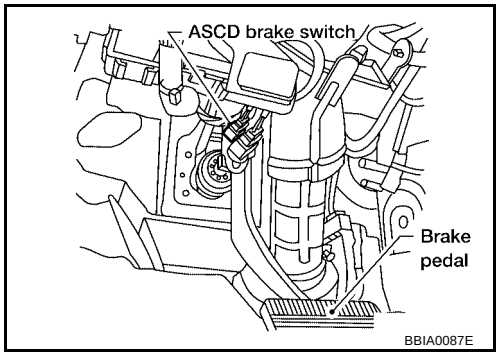


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

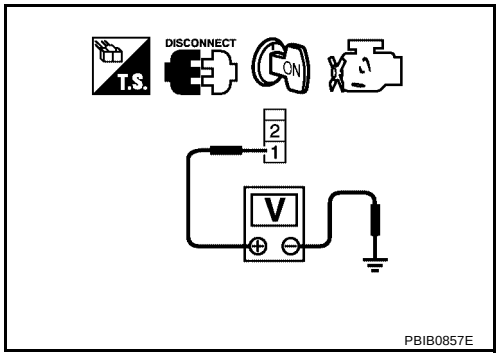
4. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK (M/T models)>>GO TO 6.
OK (A/T models)>>GO TO 7.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ASCD BRAKE SWITCH

Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD brake switch.

10. CHECK ASCD CLUTCH SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD clutch switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD clutch switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

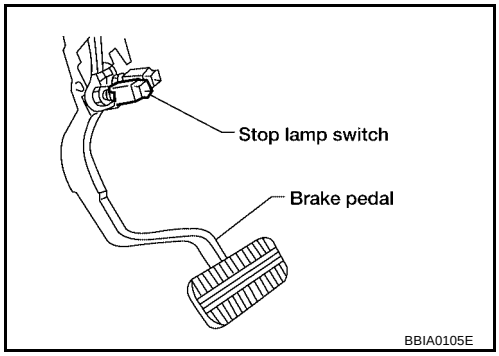
Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD clutch switch.

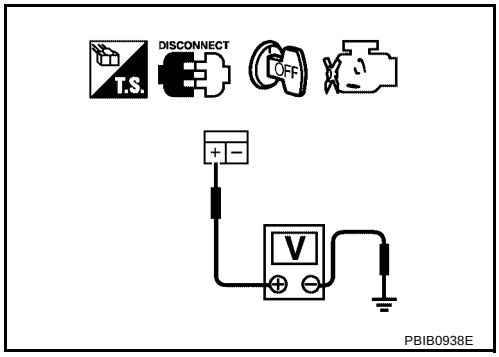
13. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

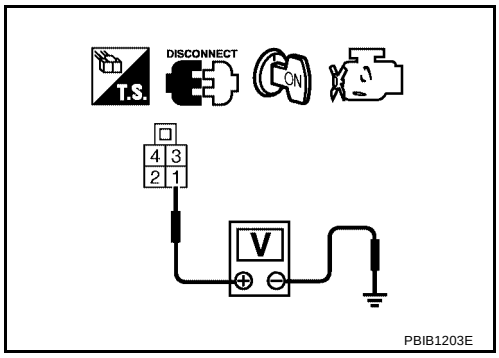
1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal **+** (M/T models) or 1 (A/T models) and ground with CONSULT-II or tester.

Voltage: Battery voltage





OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal – (M/T models) or 2 (A/T models).
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK STOP LAMP SWITCH

Refer to EC-1738, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace stop lamp switch.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

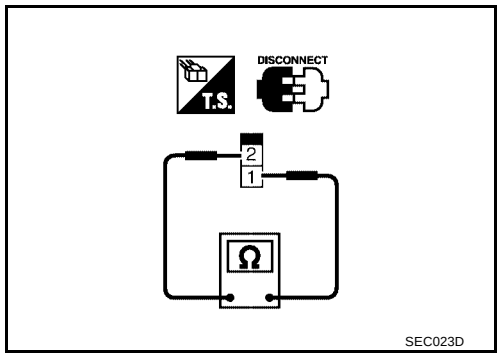
UBS006AS

ASCD BRAKE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Check harness continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should exist.
When brake pedal is depressed.	Should not exist.

If NG, adjust ASCD brake switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.

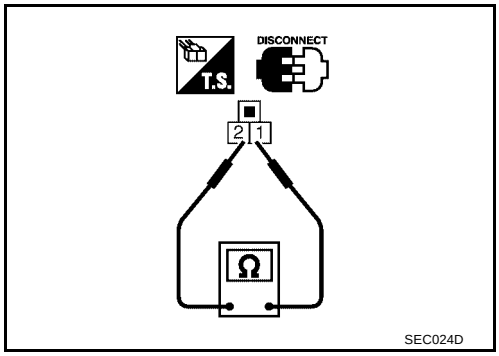


ASCD CLUTCH SWITCH (FOR M/T MODELS)

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Check harness continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When clutch pedal is fully released.	Should exist.
When clutch pedal is depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to CL-6, "CLUTCH SYSTEM" , and perform step 3 again.

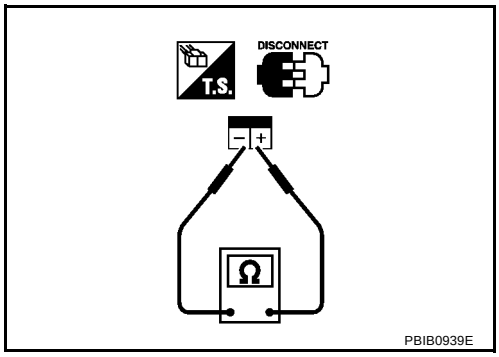


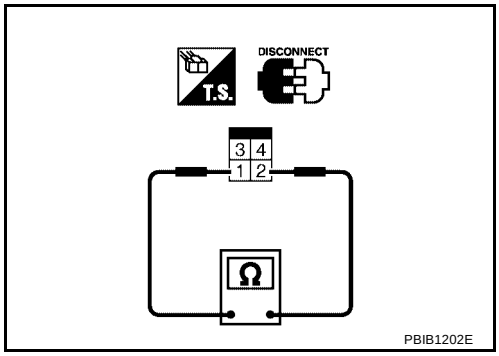
STOP LAMP SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals 1 and 2 (A/T models), + and – (M/T models) under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.





DTC P1574 ASCD VEHICLE SPEED SENSOR

PFP:31036

Component Description

UBS006AT

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to EC-1220, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for ASCD functions.

On Board Diagnosis Logic

UBS006AU

This self-diagnosis has the one trip detection logic.
The MIL will not light up for this diagnosis.

NOTE:

- **If DTC P1574 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-728, "DTC U1000, U1001 CAN COMMUNICATION LINE" .**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-916, "DTC P0500 VSS"**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-927, "DTC P0605 ECM"**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1574 1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	● Harness or connectors (The CAN communication line is open or shorted.) ● Combination meter ● Vehicle speed sensor ● TCM ● ECM

DTC Confirmation Procedure

UBS006AV

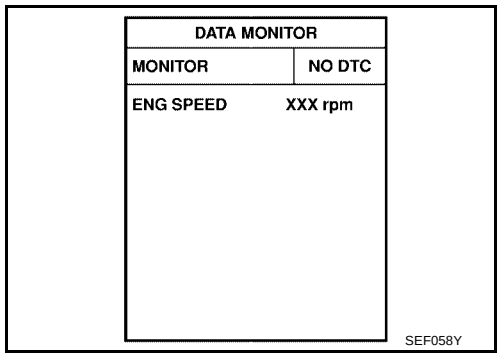
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Step 3 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine (TCS switch “OFF”).
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Drive the vehicle at more than 30 km/h (19 MPH).
4. If DTC is detected, go to EC-1114, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS006AW

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-38, "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" .

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-8, "Combination Meter" .

>> **INSPECTION END**

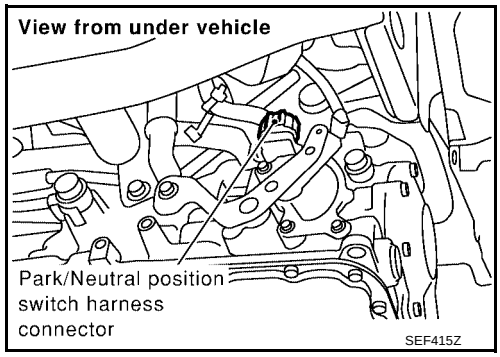
DTC P1706 PNP SWITCH

PFP:32006

Component Description

UBS0024Z

When the gear position is “P” or “N” (A/T models only), park/neutral position (PNP) switch is “ON”.
ECM detects the park/neutral position when continuity with ground exists.



CONSULT-II Reference Value in Data Monitor Mode

UBS00250

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: “P” or “N” (A/T models) Neutral (M/T models)	ON
		Except above	OFF

On Board Diagnosis Logic

UBS00251

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706 1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	● Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.] ● Park/neutral position (PNP) switch

DTC Confirmation Procedure

UBS00252

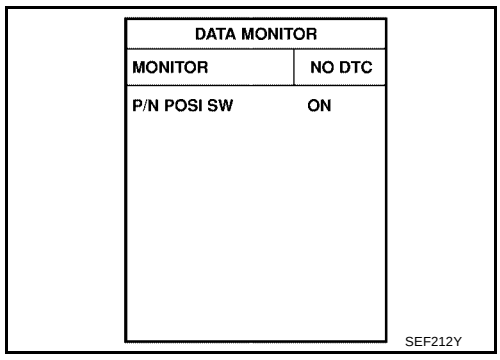
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II. Then check the “P/N POSI SW” signal under the following conditions.

Position (Selector lever)	Known good signal
“N” and “P” position	ON
Except the above position	OFF

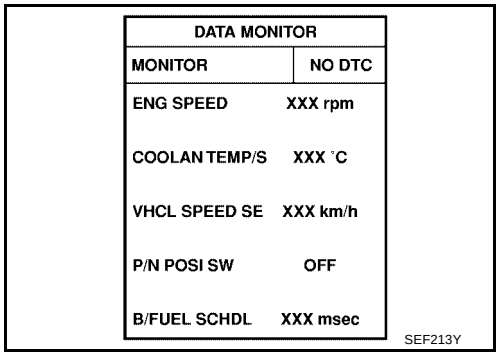


If NG, go to EC-1118, "Diagnostic Procedure" .
If OK, go to following step.

3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and warm it up to normal operating temperature.

5. Maintain the following conditions for at least 50 consecutive seconds.

ENG SPEED	1,550 - 6,375 rpm (A/T) 1,850 - 6,375 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.0 - 31.8 msec (A/T) 2.2 - 31.8 msec (M/T)
VHCL SPEED SE	More than 64 km/h (40 MPH)
Selector lever	Suitable position



6. If 1st trip DTC is detected, go to EC-1118, "Diagnostic Procedure" .

Overall Function Check

UBS00253

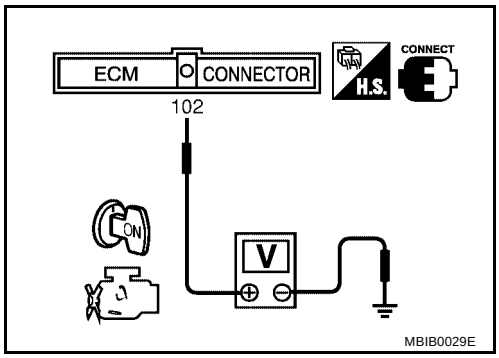
Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITHOUT CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 102 (PNP switch signal) and ground under the following conditions.

Condition (Gear position)	Voltage (V) (Known-good data)
“P” (A/T only) and “N” position	Approx. 0
Except the above position	A/T models: Battery voltage M/T models: Approximately 5V

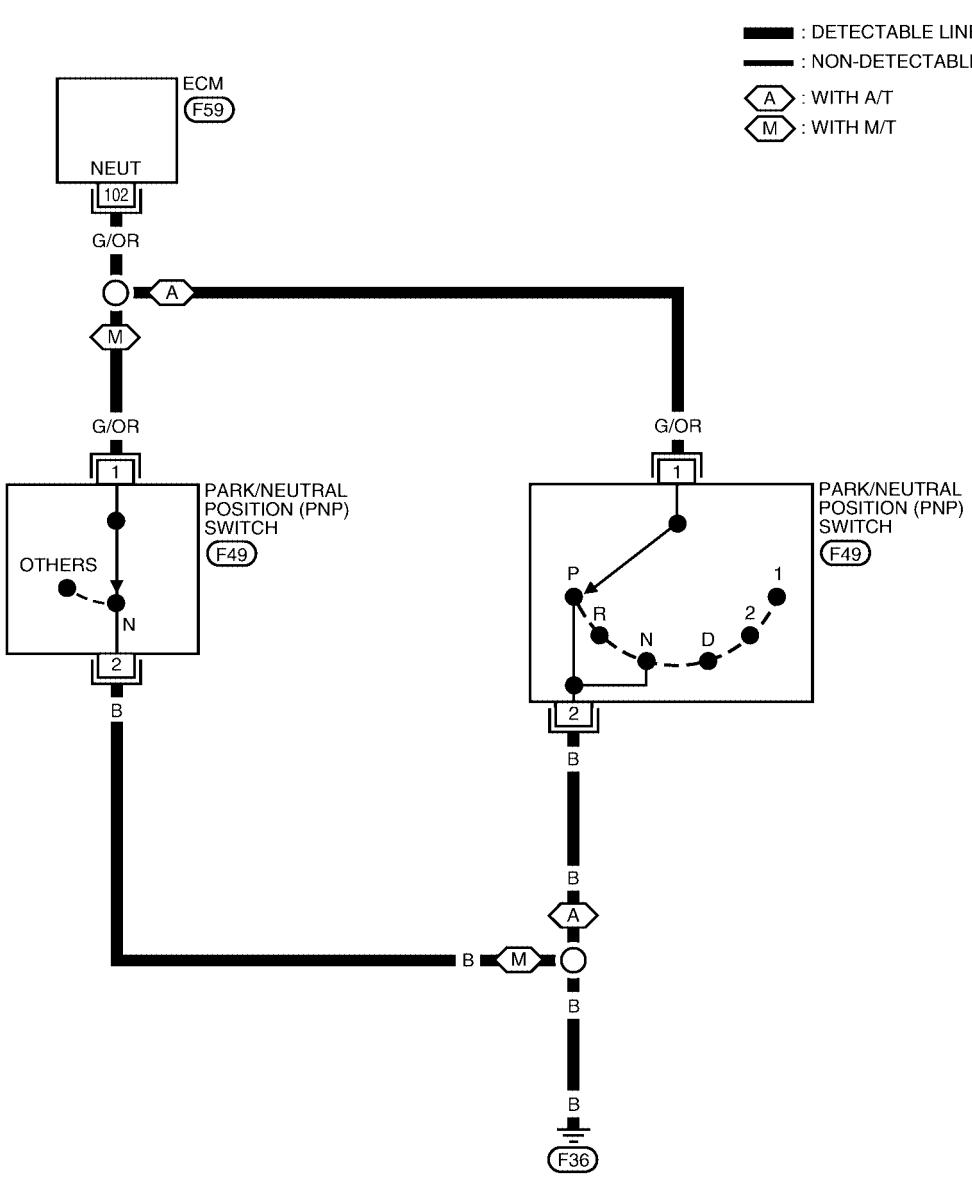
3. If NG, go to EC-1118, "Diagnostic Procedure" .

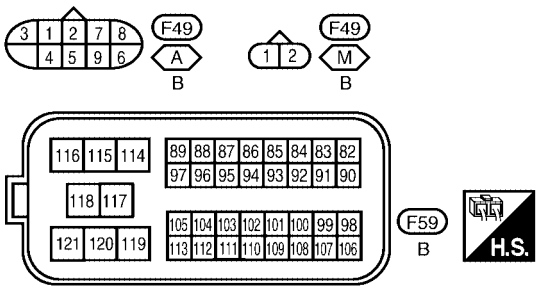


Wiring Diagram

UBS00254

EC-PNP/SW-01





BBWA0304E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	G/OR	PNP switch	**[Ignition switch "ON"]** ● Gear position is "P" or "N" (A/T models), "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

UBS00255

1. CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to power in harness or connectors.

2. CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and PNP switch terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK PNP SWITCH

Refer to AT-116, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" (A/T models) or MT-78, "POSITION SWITCH" (M/T models).

OK or NG

OK >> GO TO 4.
NG >> Replace PNP switch.

4. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

UBS003YH

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

UBS003YI

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

UBS003YJ

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

FALI-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

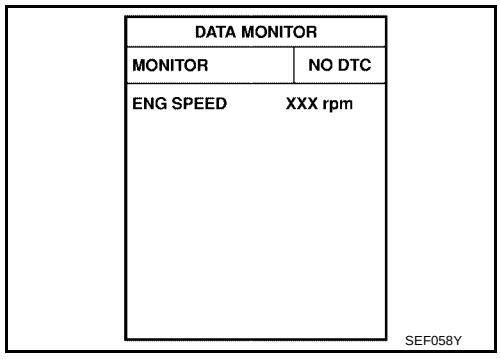
Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.	
	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

UBS003YK

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-1121, "Diagnostic Procedure" .



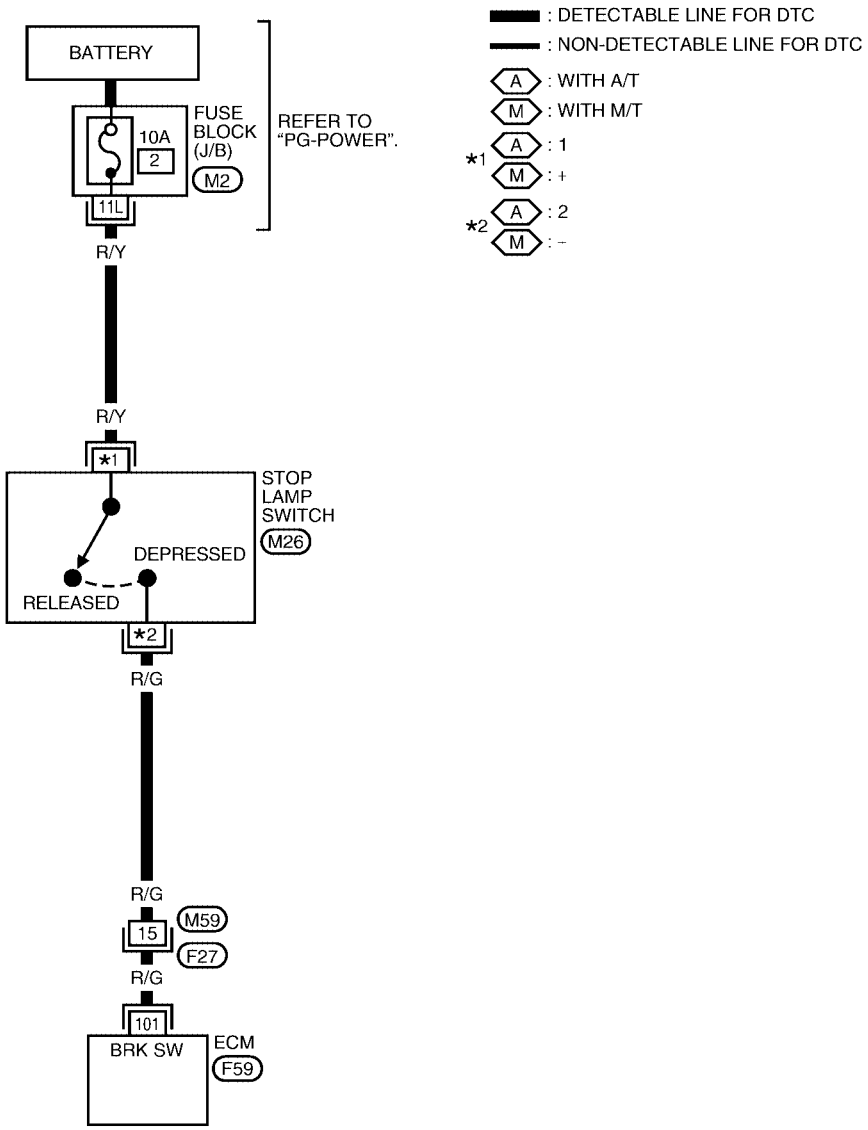
WITH GST

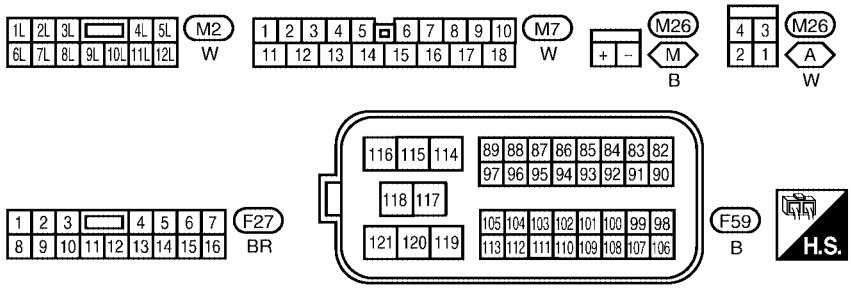
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS003YL

EC-BRK/SW-01





BBWA0305E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS003YM

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch "OFF".
2. Check the stop lamp when depressing and releasing the brake pedal.

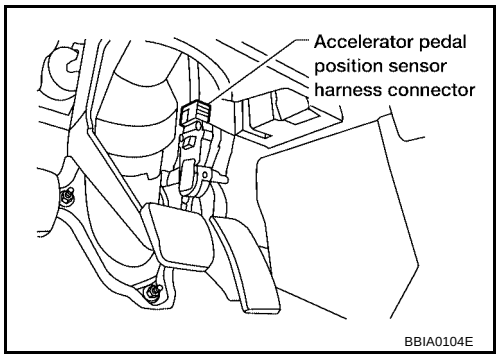
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

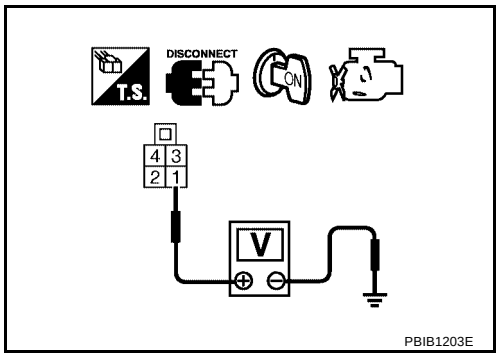
2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

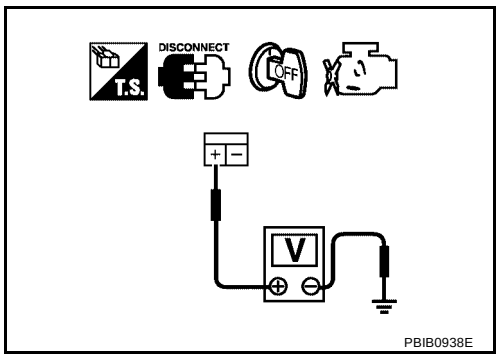
1. Disconnect stop lamp switch harness connector.



2. Check voltage between stop lamp switch terminal 1 (A/T models), + (M/T models) and ground with CONSULT-II or tester.

Voltage: Battery voltage





OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

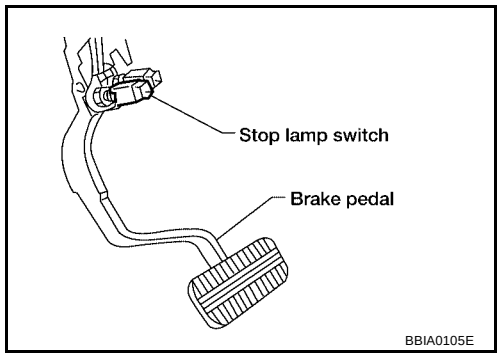
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.
4. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2 (A/T models), – (M/T models). Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-1123, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

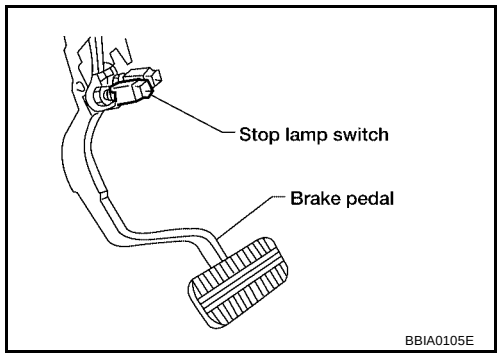
>> **INSPECTION END**

Component Inspection

UBS003YN

STOP LAMP SWITCH

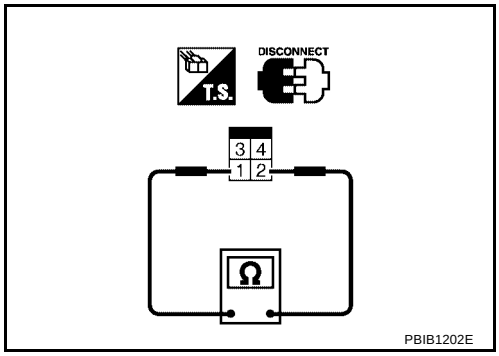
1. Disconnect stop lamp switch harness connector.

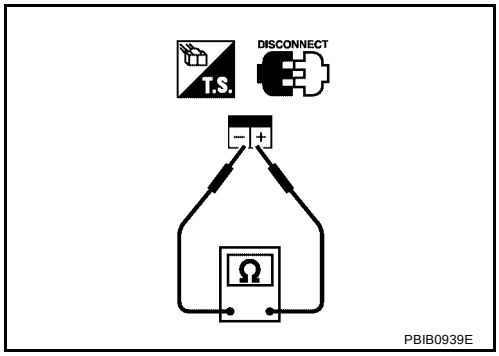


2. Check continuity between stop lamp switch terminals 1 and 2 (A/T models), + and – (M/T models) under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

If NG, adjust brake pedal installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 2 again.





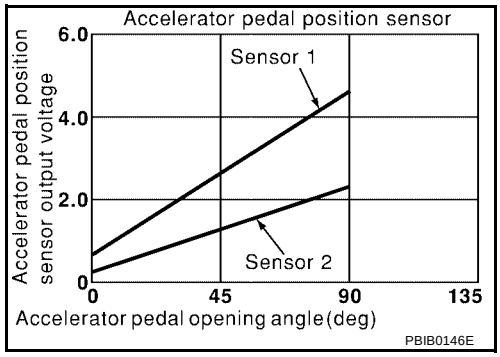
DTC P2122, P2123 APP SENSOR

PFP:18002

Component Description

UBS006AX

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS006AY

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87V
		Accelerator pedal: Fully depressed	More than 4.3V
ACCEL SEN2*	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96V
		Accelerator pedal: Fully depressed	More than 4.0V
CLSD THL POS	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

*: Accelerator pedal sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006AZ

These self-diagnoses have the one trip detection logic.

NOTE:
If DTC P2122 or P2123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-1028, "DTC P1229 SENSOR POWER SUPPLY" .

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122 2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P2123 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

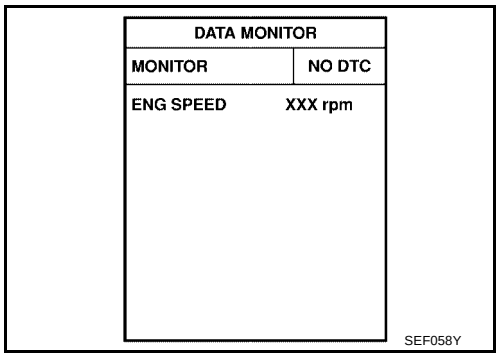
DTC Confirmation Procedure

UBS006B0

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1129, "Diagnostic Procedure" .

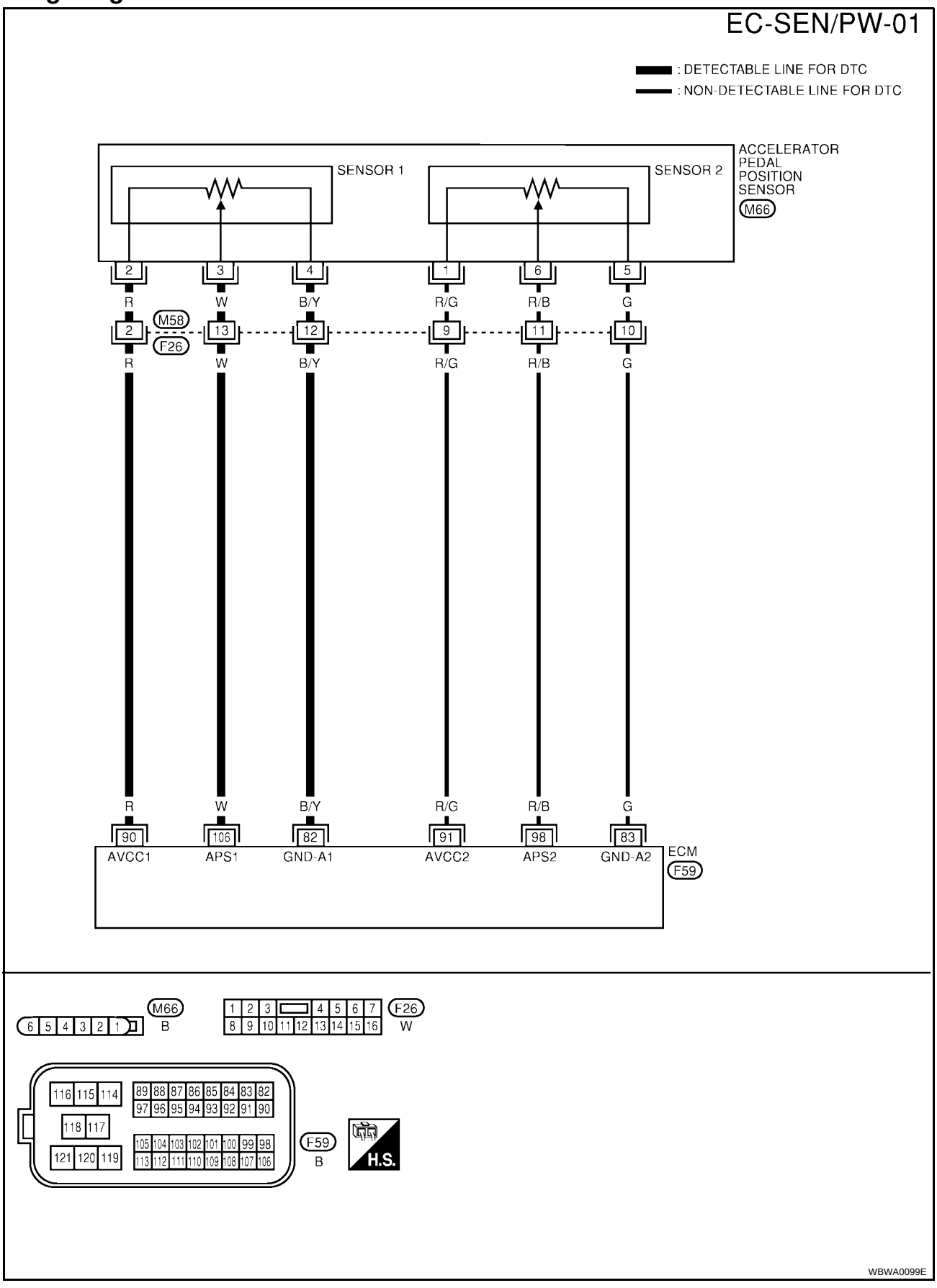


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006B1



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B/Y	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	G	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.28 - 0.48V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 2.0V
106	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.65 - 0.87V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 4.3V

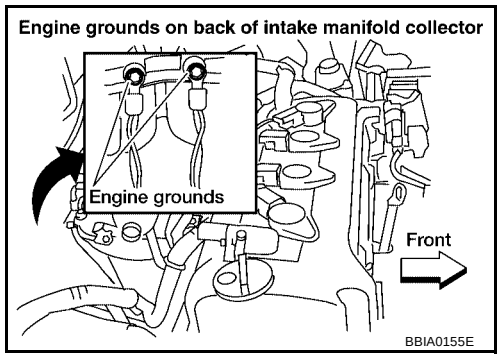
Diagnostic Procedure

UBS006B2

1. RETIGHTEN GROUND SCREWS

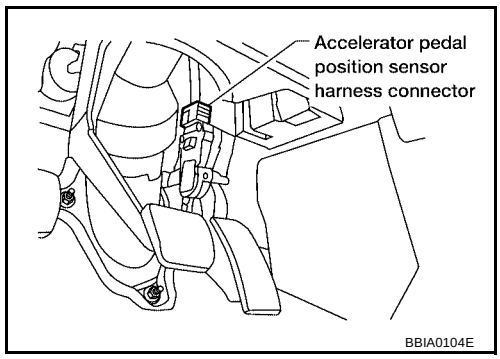
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



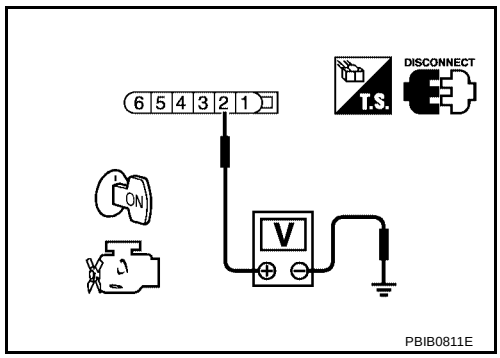
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 4 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 106 and APP sensor terminal 3.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1131, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .
3. Perform EC-634, "Throttle Valve Closed Position Learning" .
4. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

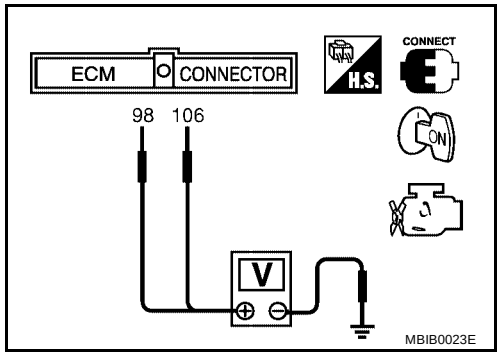
Component Inspection

UBS006B3

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-634, "Accelerator Pedal Released Position Learning" .
6. Perform EC-634, "Throttle Valve Closed Position Learning" .
7. Perform EC-635, "Idle Air Volume Learning" .

Removal and Installation

UBS006B4

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

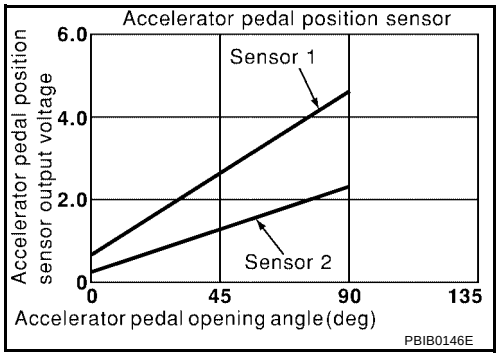
DTC P2127, P2128 APP SENSOR

PFP:18002

Component Description

UBS006H2

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

UBS006H3

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87V
		Accelerator pedal: Fully depressed	More than 4.3V
ACCEL SEN2*	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96V
		Accelerator pedal: Fully depressed	More than 4.0V
CLSD THL POS	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

*: Accelerator pedal sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006H4

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1227 1227	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) (TP sensor circuit is shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2) ● Electric throttle control actuator (TP sensor 1 and 2)
P1228 1228	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

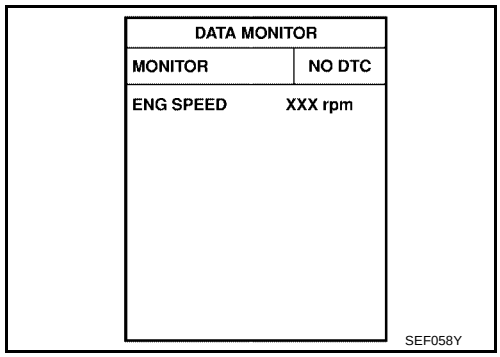
DTC Confirmation Procedure

UBS006H5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1136, "Diagnostic Procedure" .



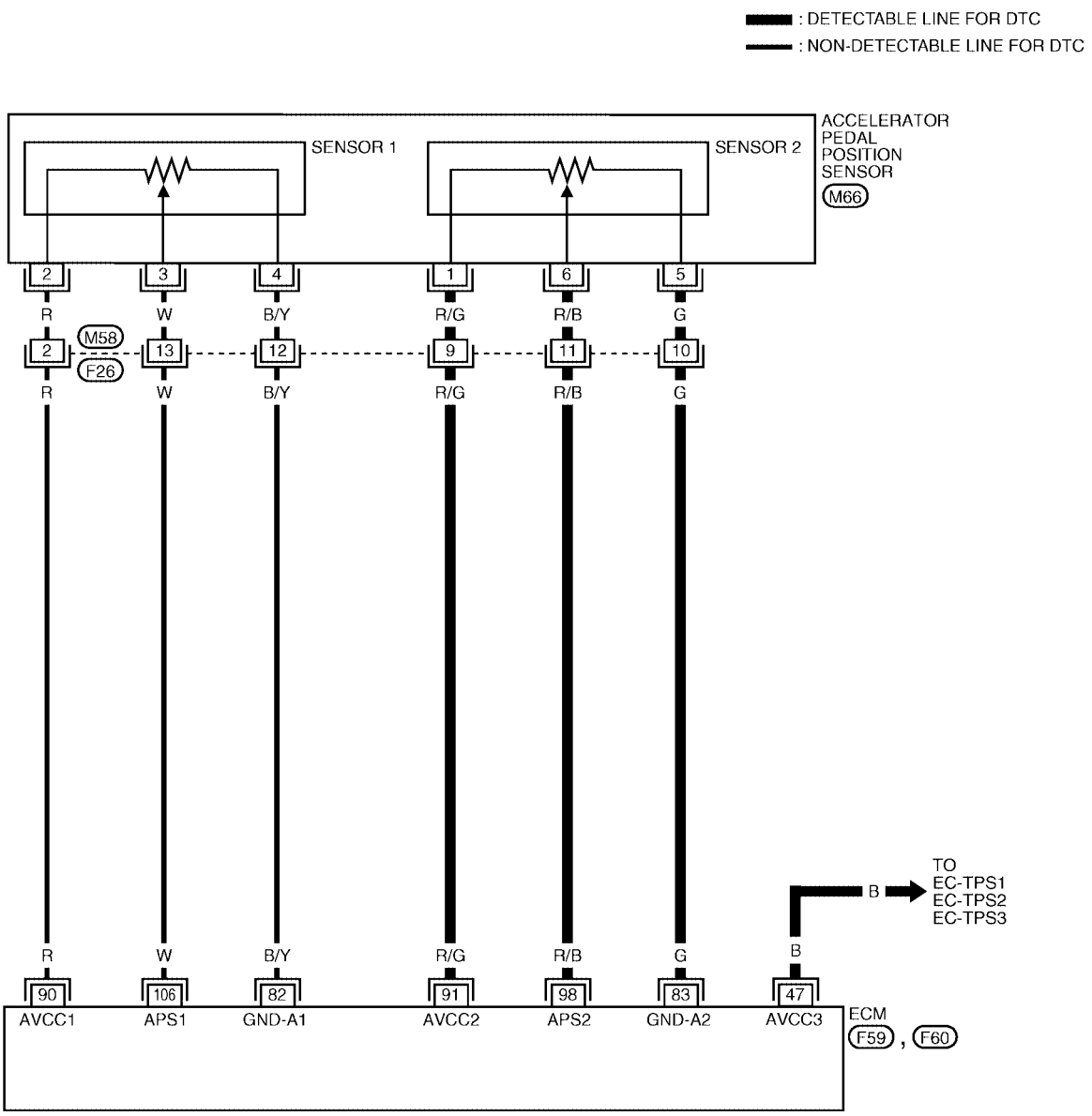
WITH GST

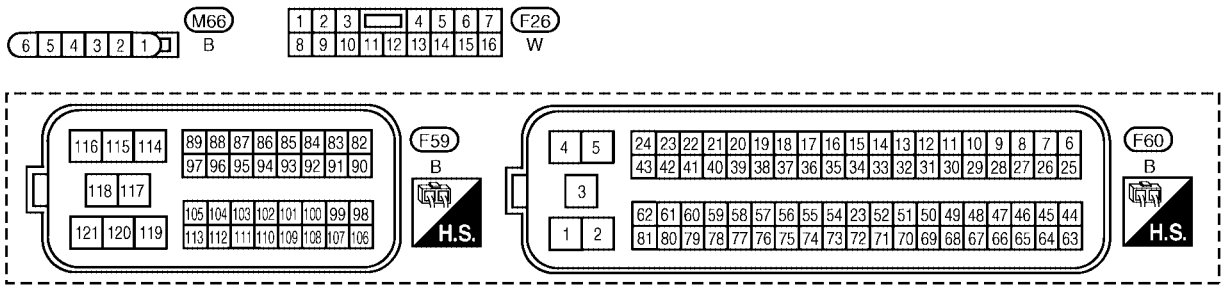
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS006H6

EC-APPS2-01





BBWA1382E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
82	B/Y	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	G	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.28 - 0.48V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 2.0V
106	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.65 - 0.87V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 4.3V

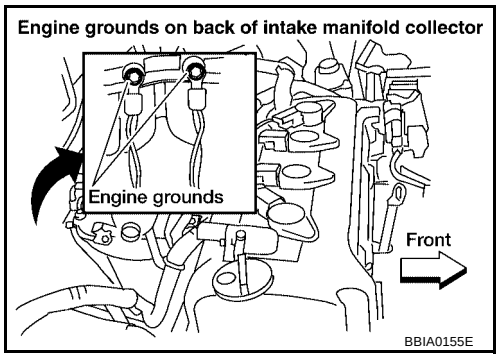
Diagnostic Procedure

UBS006H7

1. RETIGHTEN GROUND SCREWS

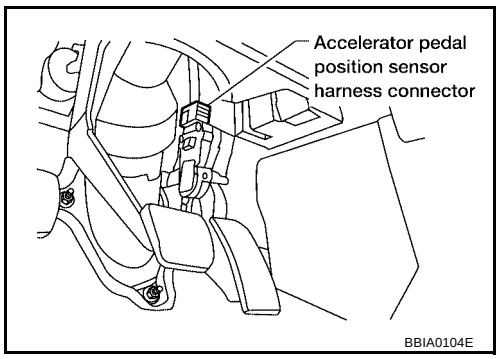
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



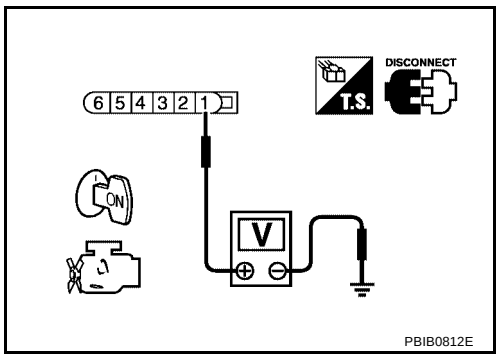
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 8.
NG >> GO TO 3.

3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 1 and ECM terminal 91. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open between ECM and accelerator pedal position sensor

>> Repair or replace open circuit.

5. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
91	APP sensor terminal 1	EC-1134
47	Electric throttle control actuator terminal 1	EC-767

OK or NG

OK >> GO TO 6.
NG >> Repair short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR

Refer to EC-771, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> GO TO 7.

7. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

8. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECM terminal 83 APP sensor terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 98 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK APP SENSOR

Refer to EC-1139, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .
3. Perform EC-634, "Throttle Valve Closed Position Learning" .
4. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

14. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

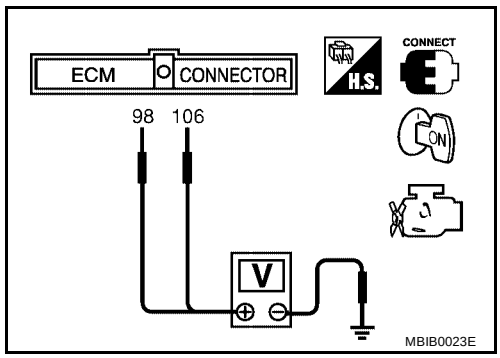
Component Inspection

UBS006H8

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V



4. If NG, replace accelerator pedal assembly.
5. Perform EC-634, "Accelerator Pedal Released Position Learning" .
6. Perform EC-634, "Accelerator Pedal Released Position Learning" .
7. Perform EC-635, "Idle Air Volume Learning" .

Removal and Installation

UBS006H9

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

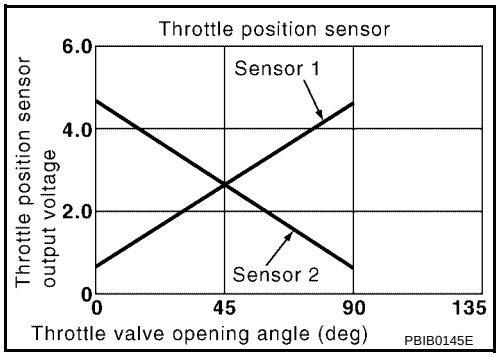
DTC P2135 TP SENSOR

PFP:16119

Component Description

UBS006BD

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS006BE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2*	● Ignition switch: ON (Engine stopped) ● Shift lever D: (A/T model) 1st: (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006BF

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135 2135	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) (APP sensor circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2) ● Accelerator pedal position sensor (APP sensor 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

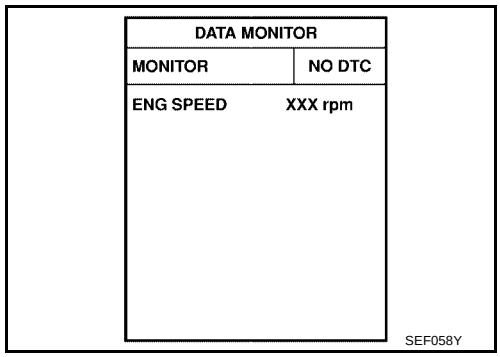
DTC Confirmation Procedure

UBS006BG

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1143, "Diagnostic Procedure" .



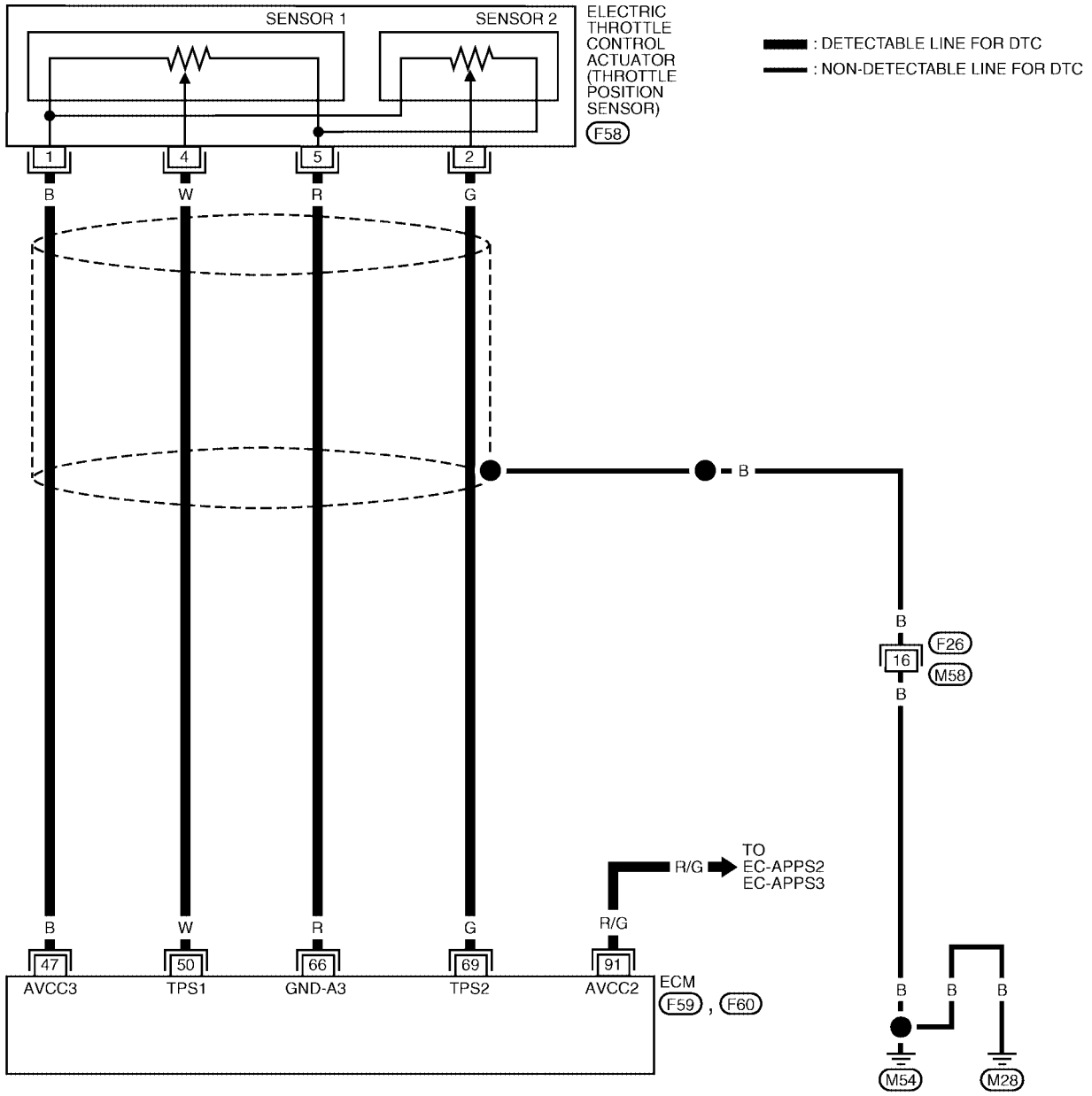
WITH GST

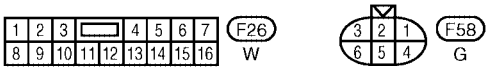
Follow the procedure “WITH CONSULT-II” above.

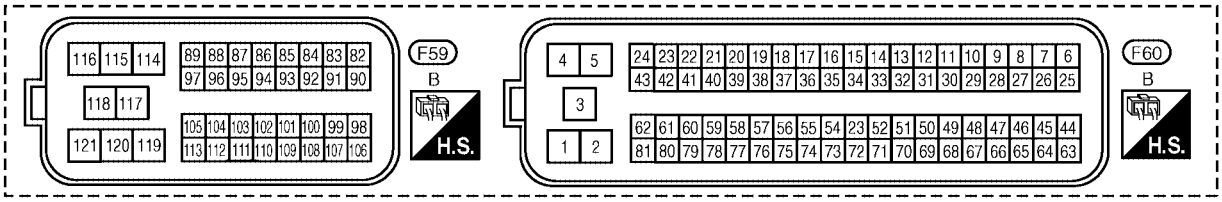
Wiring Diagram

UBS006BH

EC-TPS3-01







BBWA1383E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	R	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 0.36V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V

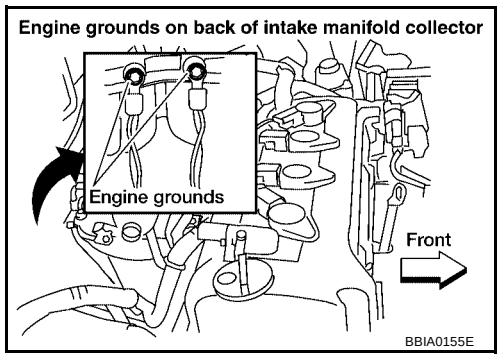
Diagnostic Procedure

UBS006BI

1. RETIGHTEN GROUND SCREWS

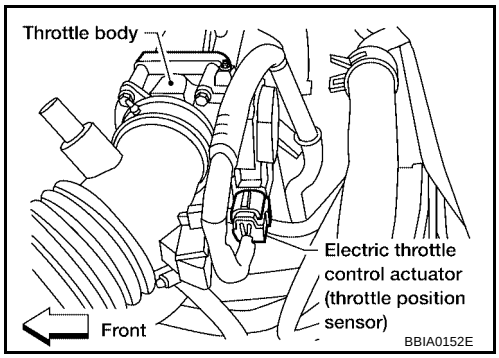
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



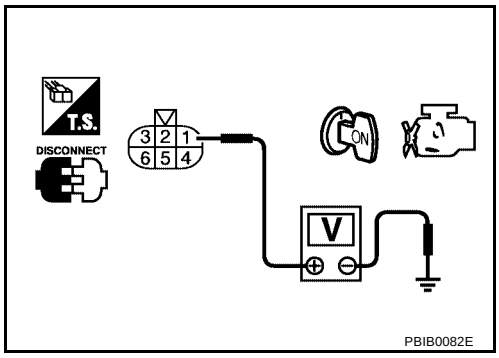
2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace open circuit.

4. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-1142
91	APP sensor terminal 1	EC-1134

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-1139 .

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .
3. Perform EC-634, "Throttle Valve Closed Position Learning" .
4. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 5 engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 4, ECM terminal 69 and electric throttle control actuator terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to EC-1146, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

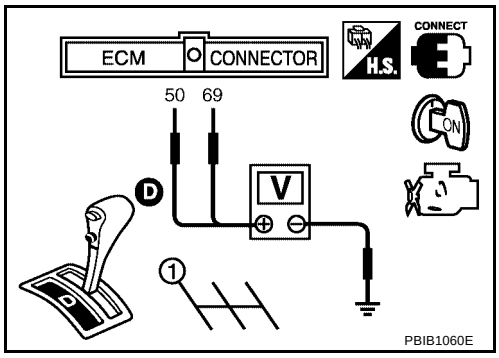
>> **INSPECTION END**

Component Inspection

UBS006BJ

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 50 (TP sensor 1 signal), 69 (TP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
69 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-634, "Throttle Valve Closed Position Learning" .
8. Perform EC-635, "Idle Air Volume Learning" .

Removal and Installation

UBS006BK

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-12, "Removal and Installation" .

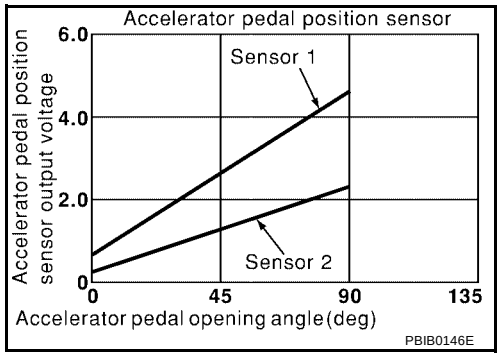
DTC P2138 APP SENSOR

PFP:18002

Component Description

UBS006BL

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS006BM

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.65 - 0.87V
		Accelerator pedal: Fully depressed	More than 4.3V
ACCEL SEN2*	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.56 - 0.96V
		Accelerator pedal: Fully depressed	More than 4.0V
CLSD THL POS	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

*: Accelerator pedal sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006BN

This self-diagnosis has the one trip detection logic.

NOTE:
If DTC P2138 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-1028

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138 2138	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) (TP sensor circuit is shorted) ● Accelerator pedal position sensor 1 and 2 ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

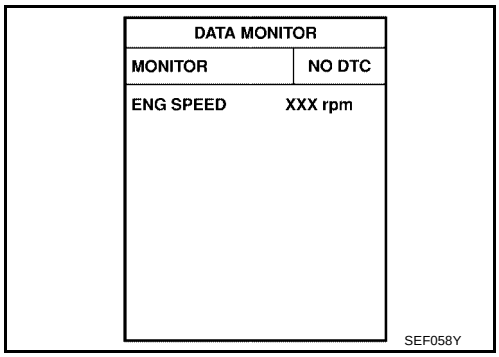
DTC Confirmation Procedure

UBS006BO

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1151, "Diagnostic Procedure" .



WITH GST

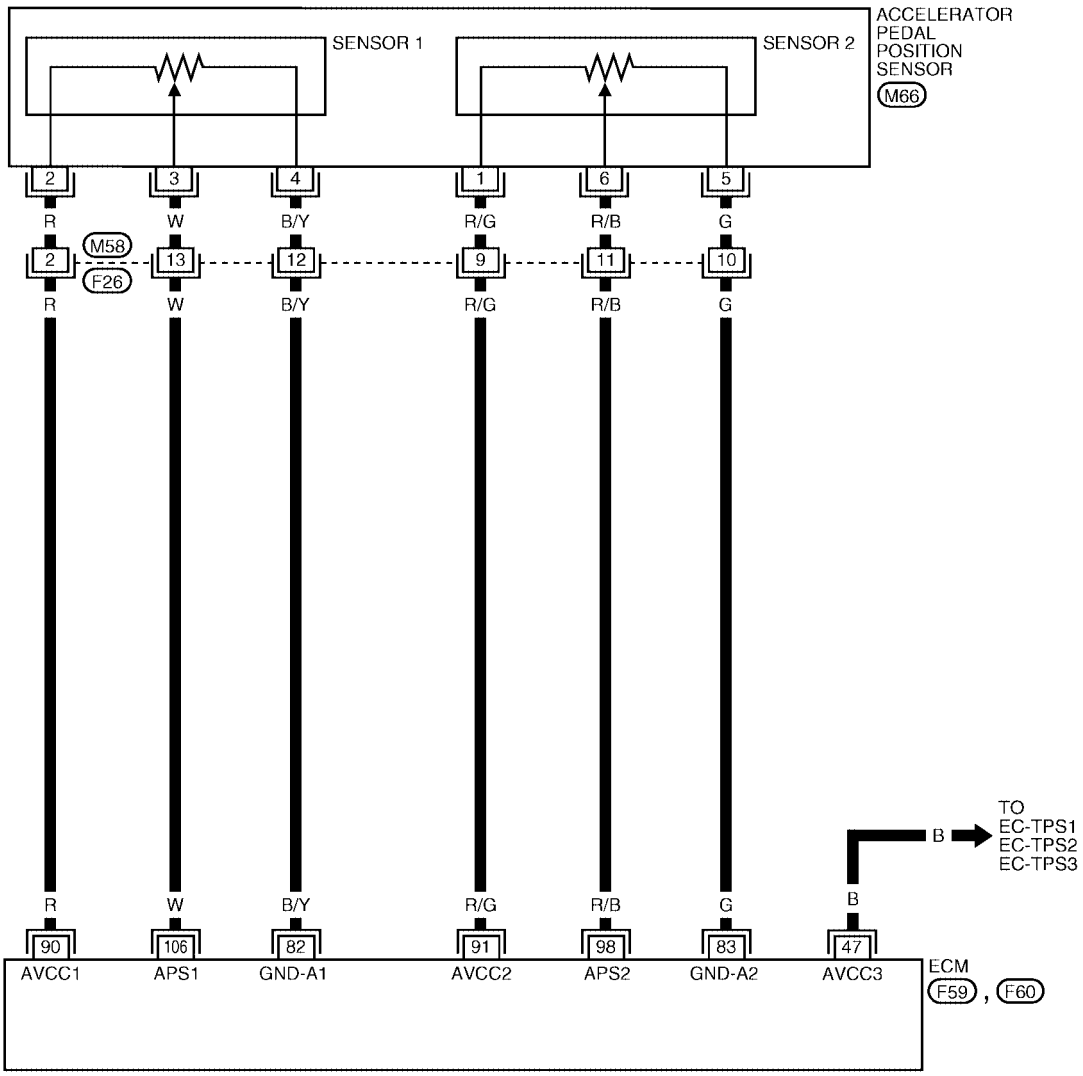
Follow the procedure “WITH CONSULT-II” above.

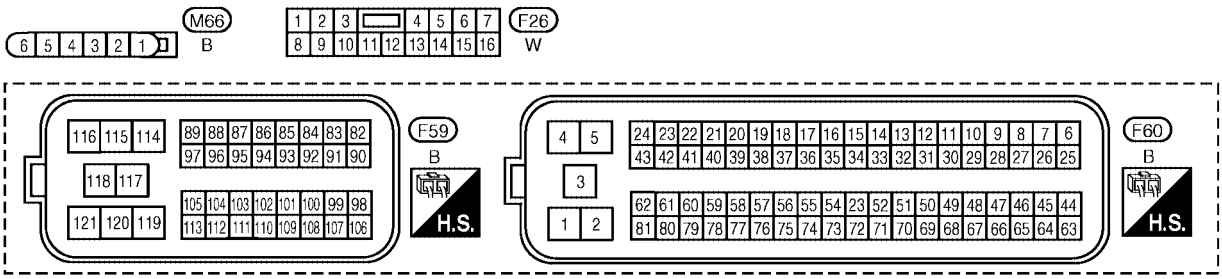
Wiring Diagram

UBS006BP

EC-APPS3-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





BBWA1384E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	B	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
82	B/Y	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	G	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	R/G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.28 - 0.48V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 2.0V
106	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.65 - 0.87V
			[Ignition switch "ON"] ● Engine stopped ● Gear position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 4.3V

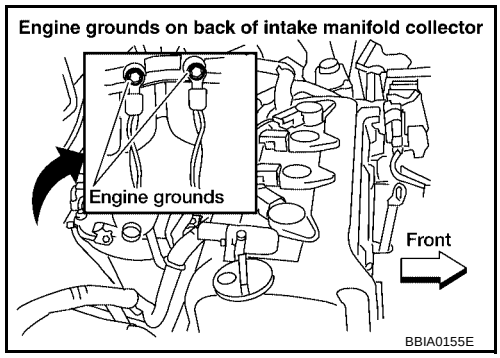
Diagnostic Procedure

UBS006BQ

1. RETIGHTEN GROUND SCREWS

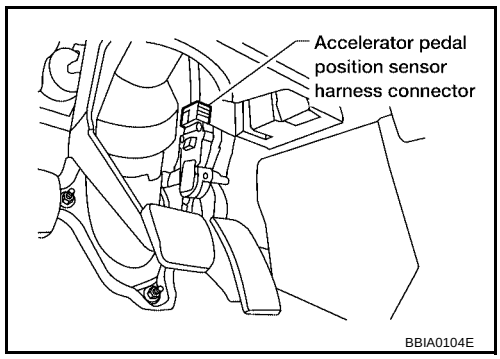
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



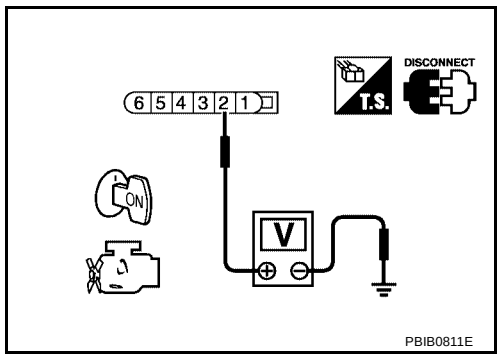
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch "ON".



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

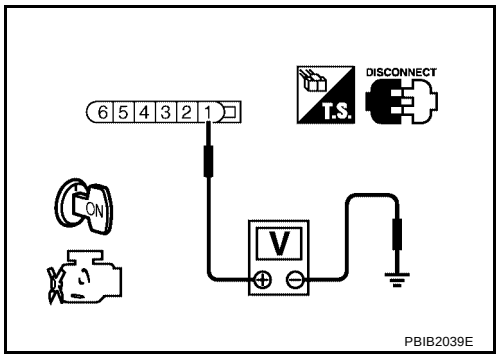
- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 10.
NG >> GO TO 5.

5. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 1 and ECM terminal 91. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open between ECM and accelerator pedal position sensor

>> Repair or replace open circuit.

7. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check the following.

- Harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
91	APP sensor terminal 1	EC-1134
47	Electric throttle control actuator terminal 1	EC-767

OK or NG

OK >> GO TO 8.
NG >> Repair short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR

Refer to EC-771, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> GO TO 9.

9. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-634, "Throttle Valve Closed Position Learning" .
3. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4, ECM terminal 83 and APP sensor terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK APP SENSOR

Refer to EC-1155, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-634, "Accelerator Pedal Released Position Learning" .
3. Perform EC-634, "Throttle Valve Closed Position Learning" .
4. Perform EC-635, "Idle Air Volume Learning" .

>> **INSPECTION END**

16. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

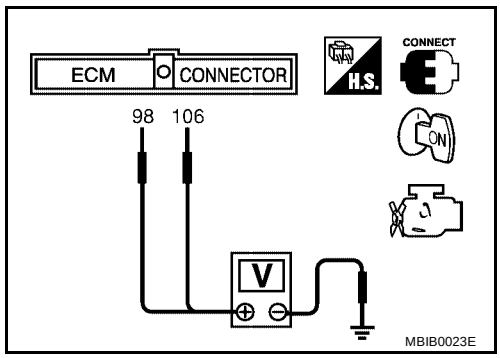
>> **INSPECTION END**

Component Inspection

UBS006BR

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.65 - 0.87V
	Fully depressed	More than 4.3V
98 (Accelerator pedal position sensor 2)	Fully released	0.28 - 0.48V
	Fully depressed	More than 2.0V

4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-634, "Accelerator Pedal Released Position Learning" .
6. Perform EC-634, "Throttle Valve Closed Position Learning" .
7. Perform EC-635, "Idle Air Volume Learning" .

Removal and Installation

UBS006BS

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

IGNITION SIGNAL

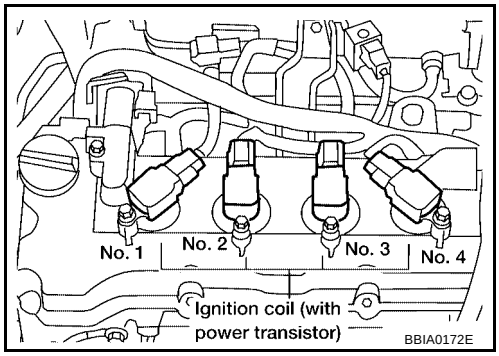
PFP:22448

Component Description

UBS006J5

IGNITION COIL & POWER TRANSISTOR

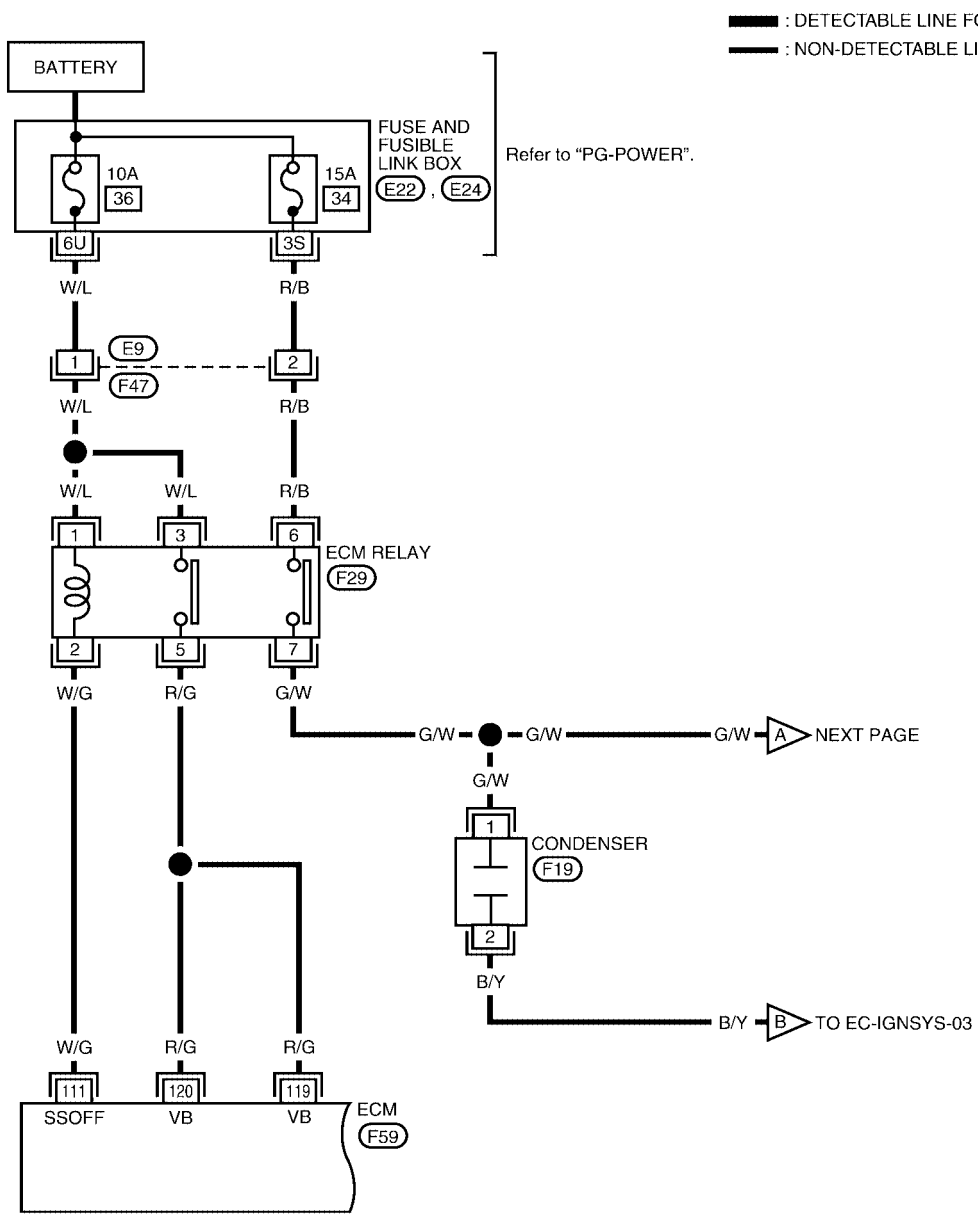
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

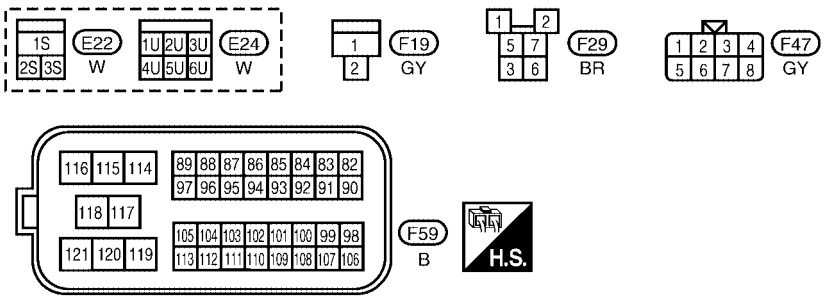


Wiring Diagram

UBS006J6

EC-IGNSYS-01





BBWA0310E

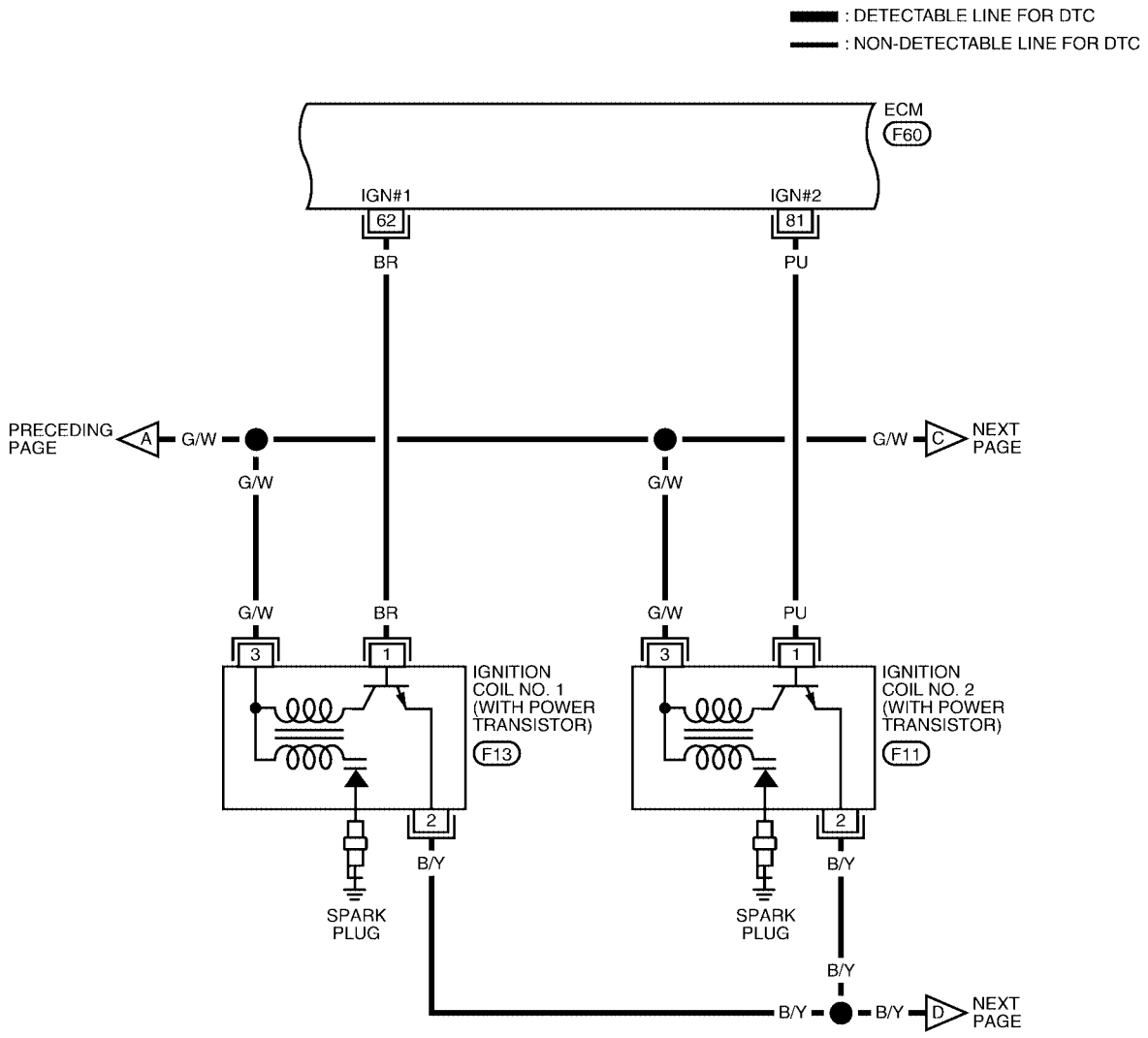
Specification data are reference values and are measured between each terminal and ground.

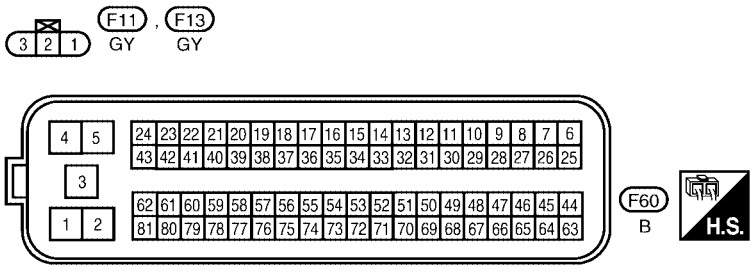
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02



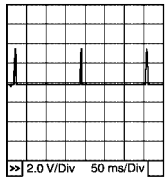
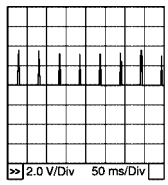


BBWA0795E

Specification data are reference values and are measured between each terminal and ground.

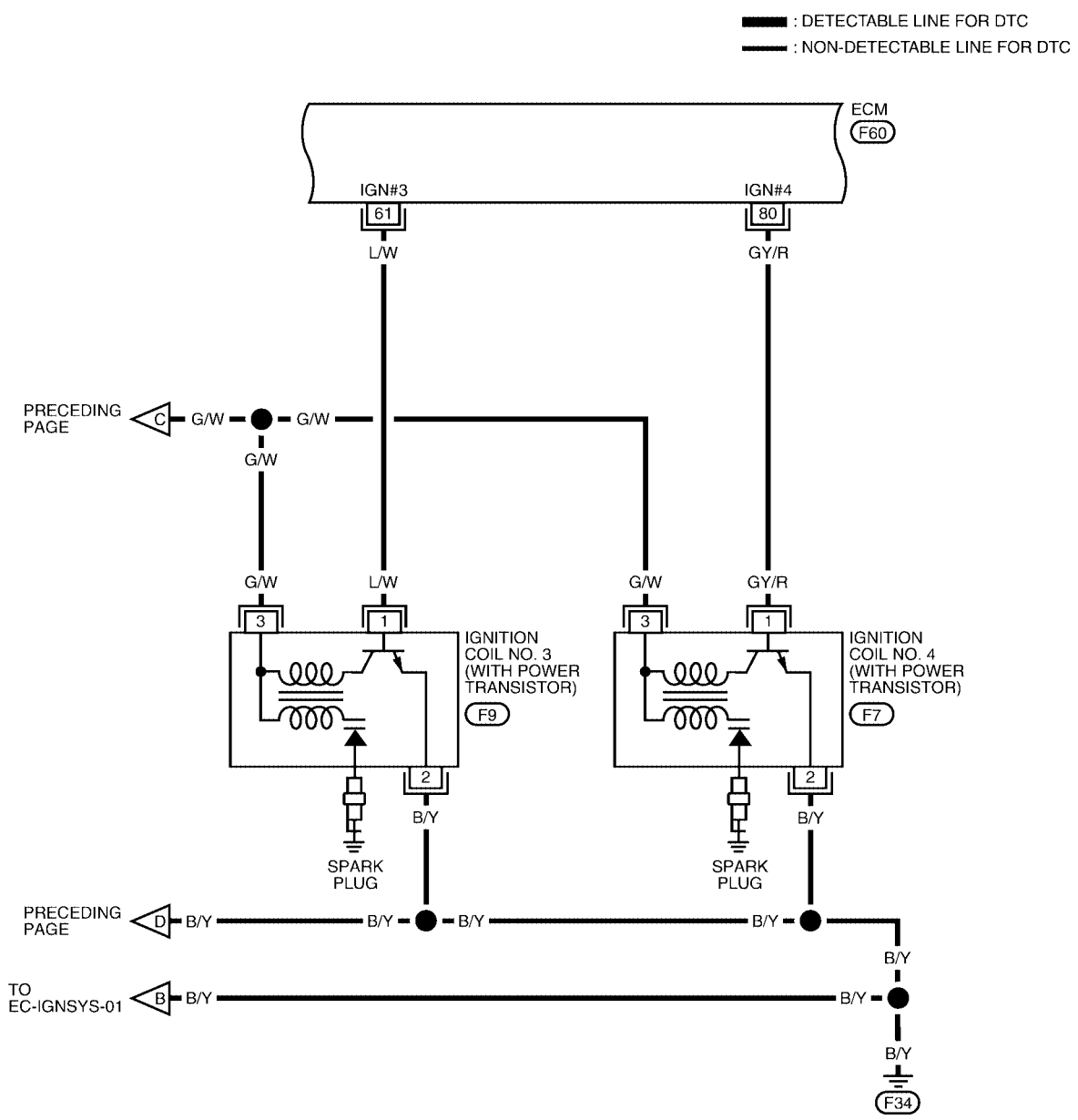
CAUTION:

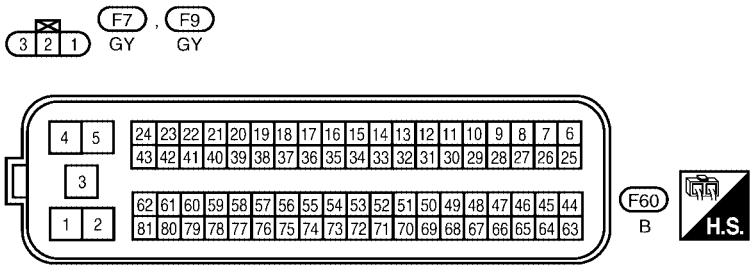
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62 81	BR PU	Ignition signal No. 1 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-IGNSYS-03



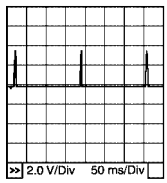
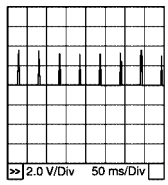


BBWA0796E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
61 80	L/W GY/R	Ignition signal No. 3 Ignition signal No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS006J7

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.
Is engine running?

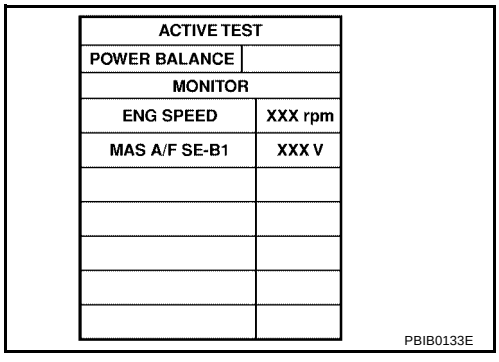
Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.



PBIB0133E

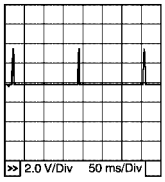
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

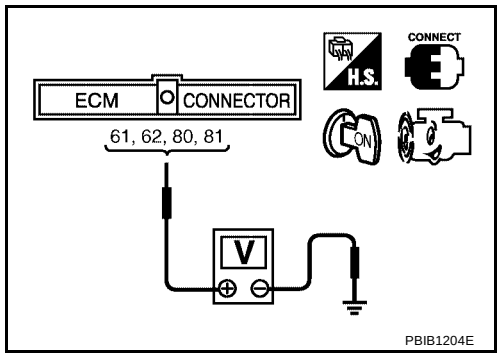
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 61, 62, 80, 81 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



PBIB1204E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

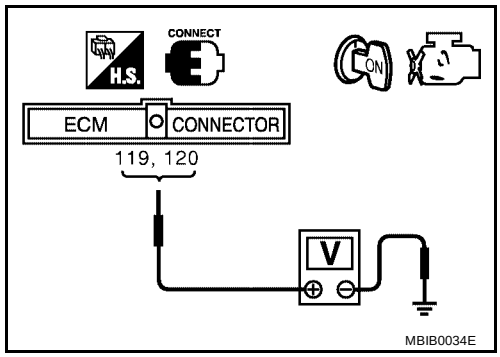
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-721, "POWER SUPPLY CIRCUIT FOR ECM"
.



MBIB0034E

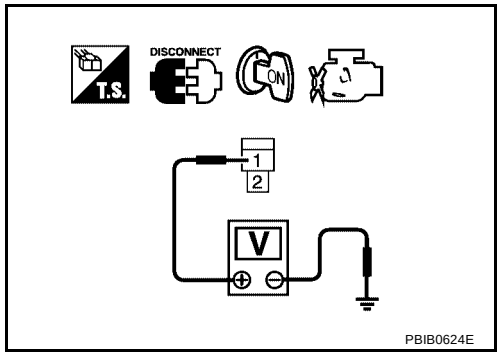
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 6.



PBIB0624E

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

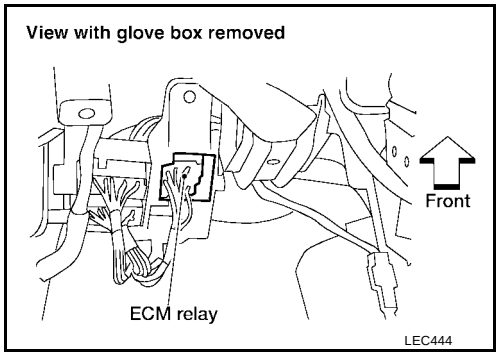
1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



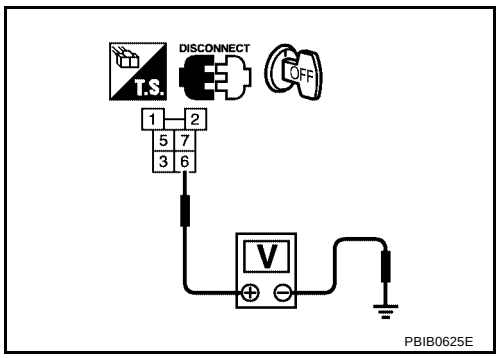
7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.



8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 15A fuse
- Harness for open or short between ECM relay and battery

>> Repair or replace harness or connectors.

9. CHECK ECM RELAY

Refer to EC-1166, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ECM relay.

10. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground.
   Refer to Wiring diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 11.
NG >> Repair open circuit or short to power in harness or connector.

11. CHECK CONDENSER

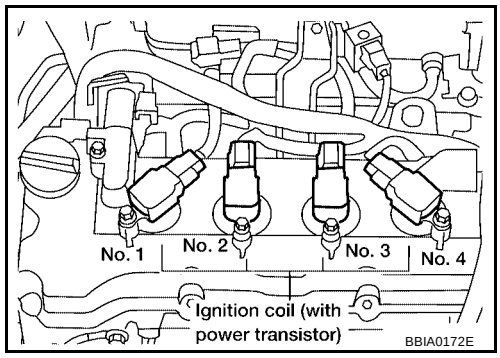
Refer to EC-1166, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace condenser.

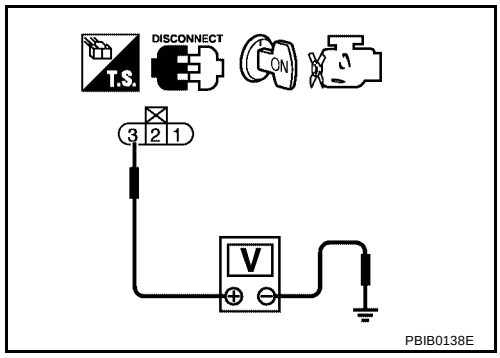
12. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between ignition coil terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ignition coil and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ignition coil terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 15.
NG >> Repair open circuit or short to power in harness or connectors.

15. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 61, 62, 80, 81 and ignition coil terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1166, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ignition coil with power transistor.

17. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

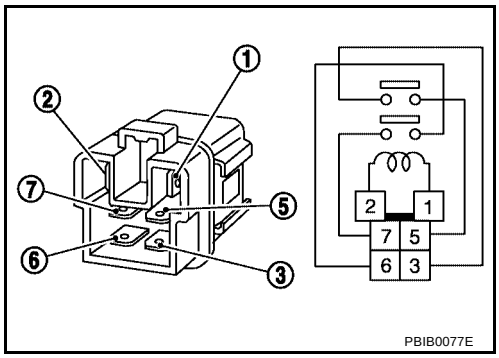
UBS006J8

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

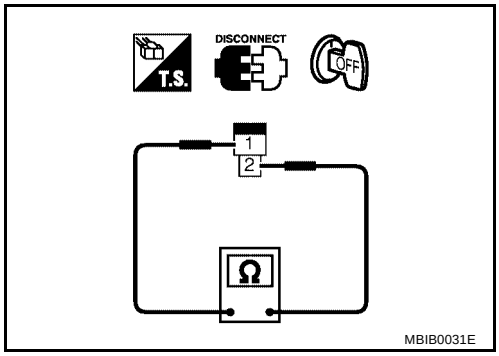
3. If NG, replace ECM relay.



CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals 1 and 2.

Resistance: Above 1 MΩ at 25°C (77°F)

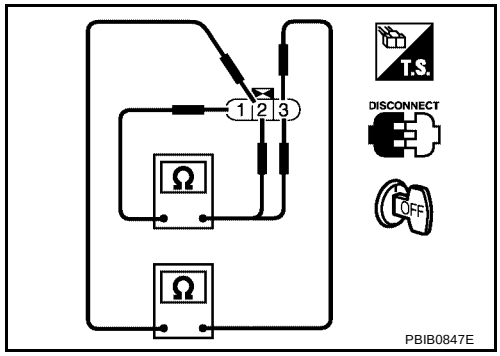


IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.

3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
3 and 1	Except 0 or ∞
3 and 2	Except 0
1 and 2	



UBS006J9

Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-12, "Removal and Installation" .

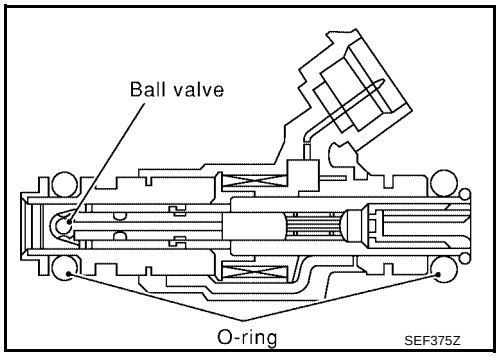
INJECTOR

PFP:16600

Component Description

UBS00256

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

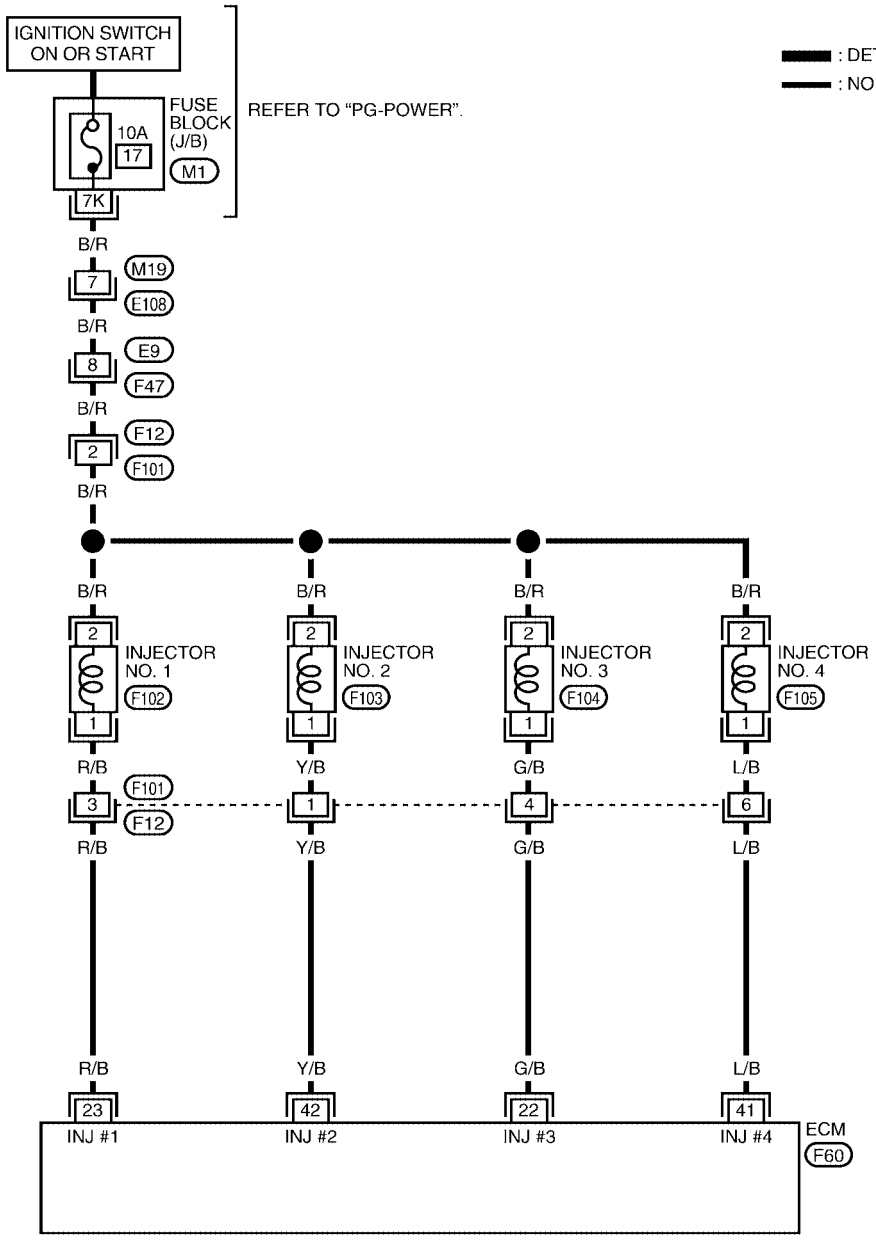
UBS00257

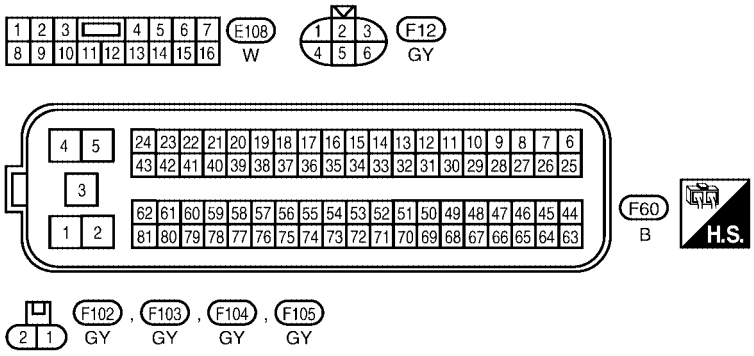
MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 3.2 msec
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: “N” (A/T), Neutral (M/T) ● No-load	Idle	1.0 - 1.6 msec
		2,000 rpm	0.7 - 1.3 msec

Wiring Diagram

UBS00258

EC-INJECT-01





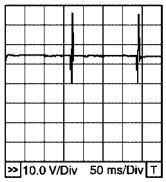
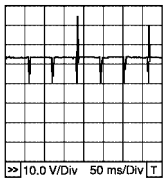
Refer to the following.
M1 - FUSE BLOCK - JUNCTION BOX (J/B)

BBWA0797E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS00259

1. INSPECTION START

Turn ignition switch to “START”.

Is any cylinder ignited?

Yes or No

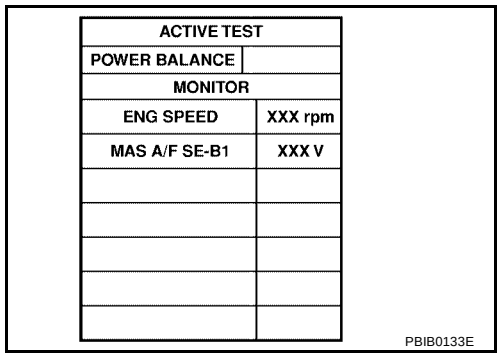
Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

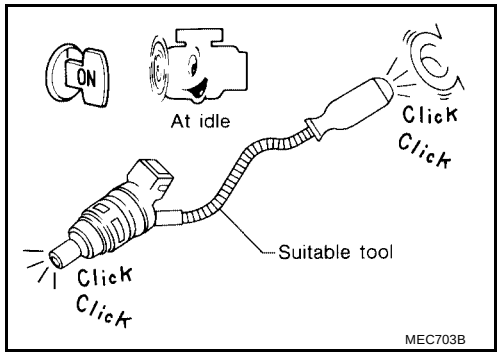
With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



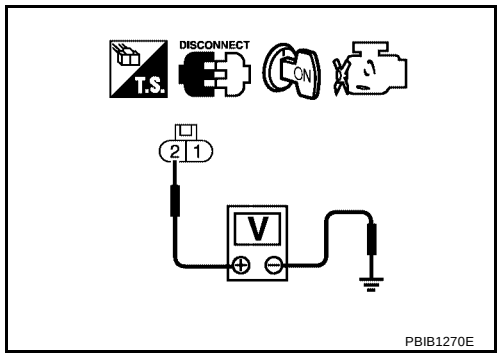
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. CHECK POWER SUPPLY CIRCUIT

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between injector terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse
- Harness connectors M19, E108
- Harness connectors E9, F47
- Harness connectors F12, F101
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

>> Repair harness or connectors.

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal 1 and ECM terminals 22, 23, 41, 42.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F12, F101
- Harness for open or short between injector and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INJECTOR

Refer to EC-1173, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace injector.

8. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

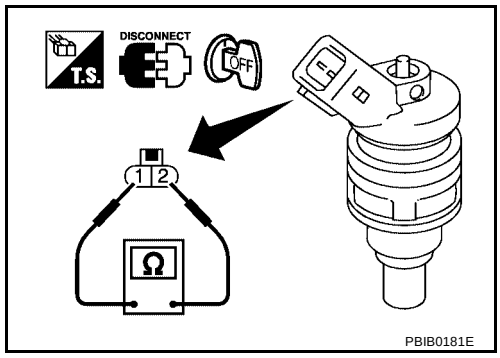
Component Inspection

UBS006IV

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 13.5 - 17.5Ω [at 20°C (68°F)]



Removal and Installation

UBS0025A

INJECTOR

Refer to EM-19, "Removal and Installation" .

FUEL PUMP

PFP:17042

System Description

UBS0025E

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

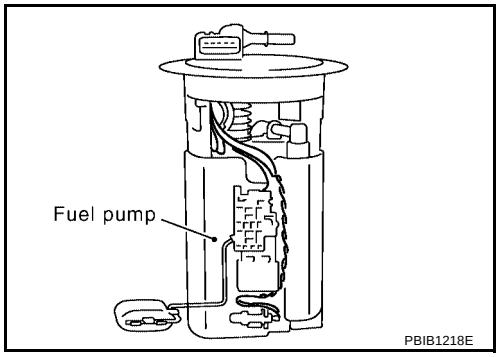
*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

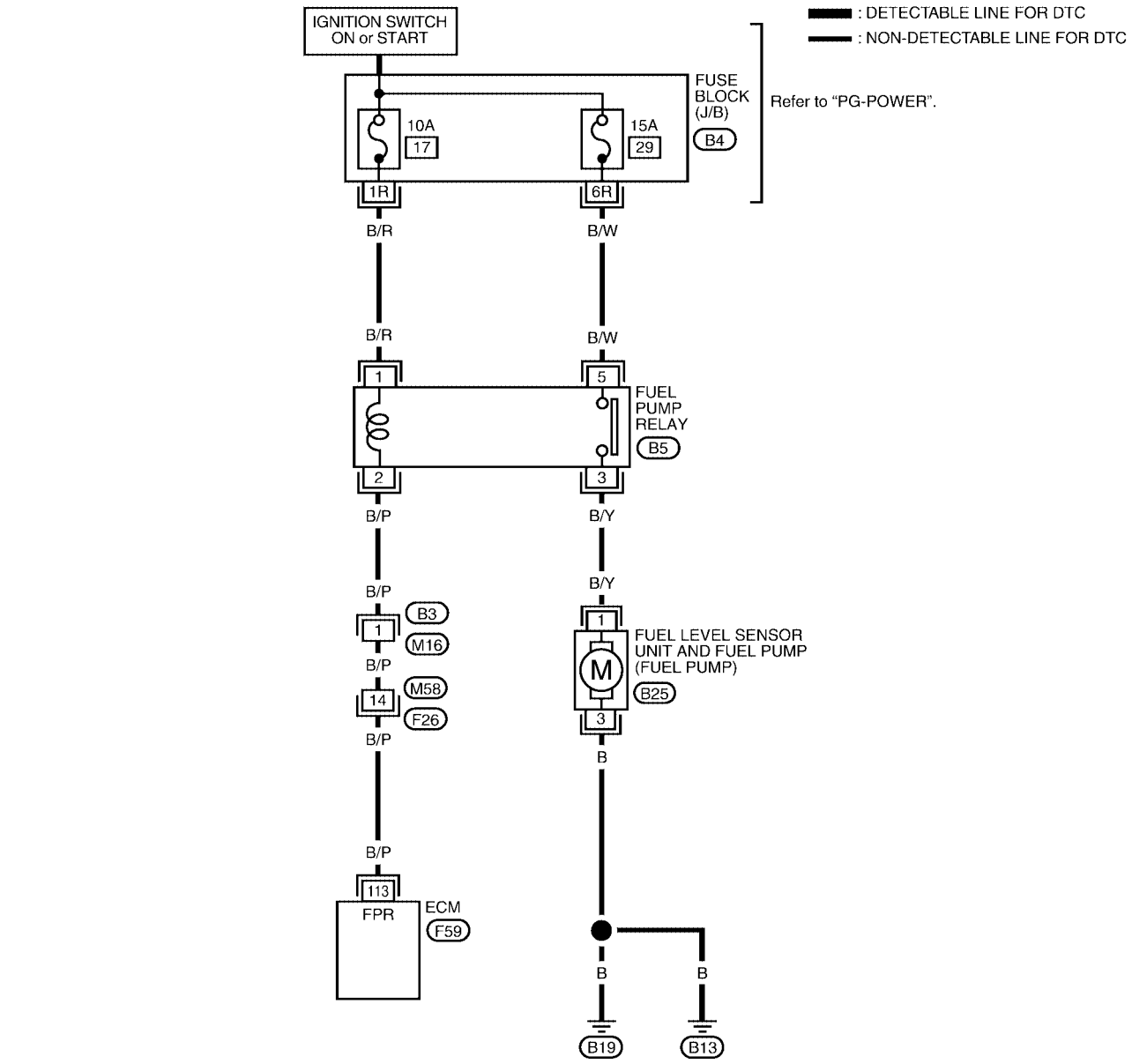
UBS0025G

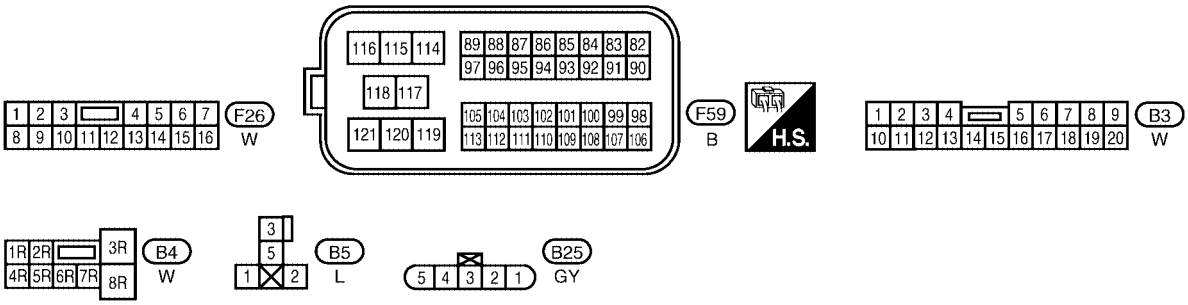
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (Stops in 1 seconds)	ON
	● Except as shown above	OFF

Wiring Diagram

UBS0025H

EC-F/PUMP-01





BBWA0314E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

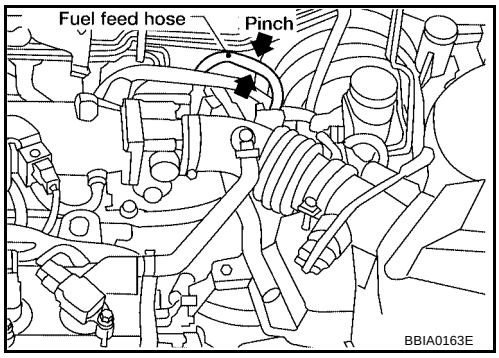
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS0025I

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.
   Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

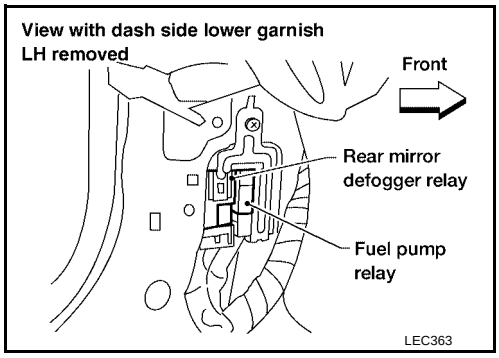


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

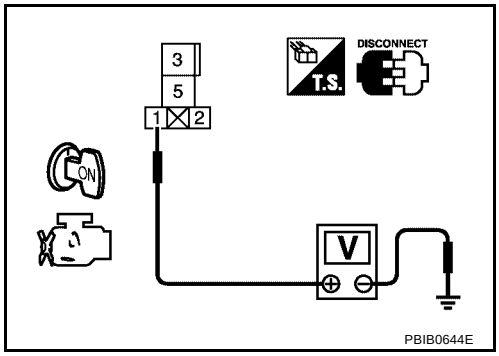
2. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-1

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

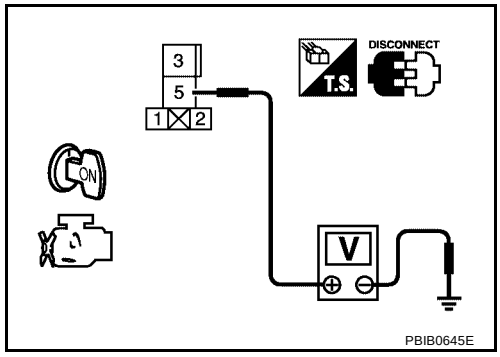
- 10A fuse
- Fuse block (J/B) connector B4
- Harness for open or short between fuse and fuel pump relay

>> Repair harness or connectors.

4. CHECK POWER SUPPLY-II

Check voltage between fuel pump relay terminal 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B4
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

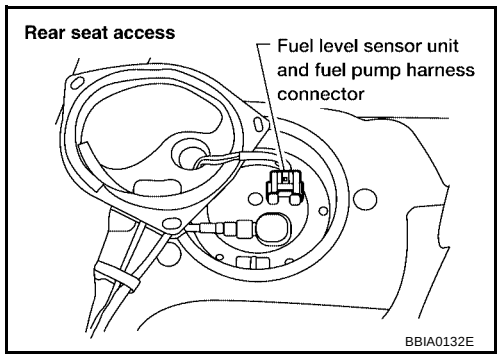
>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK POWER GROUND CIRCUIT AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel level sensor unit and fuel pump terminal 3 and body ground, fuel level sensor unit and fuel pump terminal 1 and fuel pump relay terminal 3. Refer to wiring diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between and fuel pump and body ground
- Harness for open or short between and fuel pump and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 113 and fuel pump relay connector terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connector M58, F26
- Harness for open or short between ECM and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK FUEL PUMP RELAY

Refer to EC-1179, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace fuel pump relay.

11. CHECK FUEL PUMP

Refer to EC-1179, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace fuel pump.

12. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

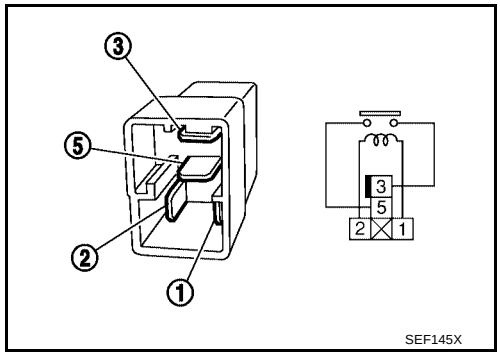
UBS0025J

FUEL PUMP RELAY

Check continuity between terminals 3 and 5.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace relay.



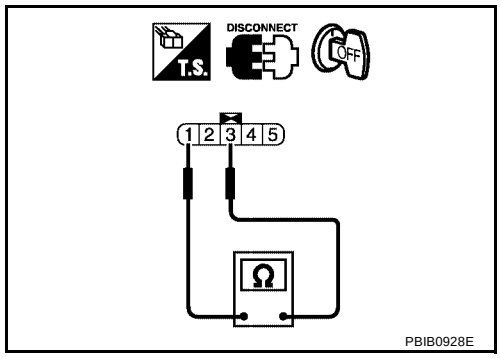
SEF145X

FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals 1 and 3.

Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]

If NG, replace fuel pump.



PBIB0928E

Removal and Installation

UBS0025K

FUEL PUMP

Refer to FL-3, "Removal and Installation" .

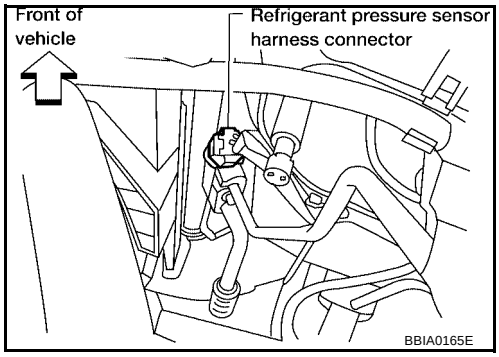
REFRIGERANT PRESSURE SENSOR

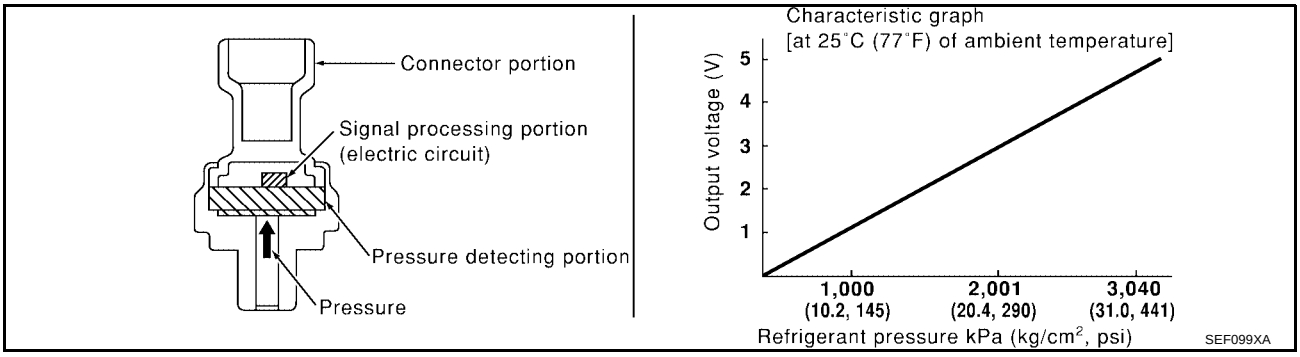
PFP:92136

Description

UBS0025R

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

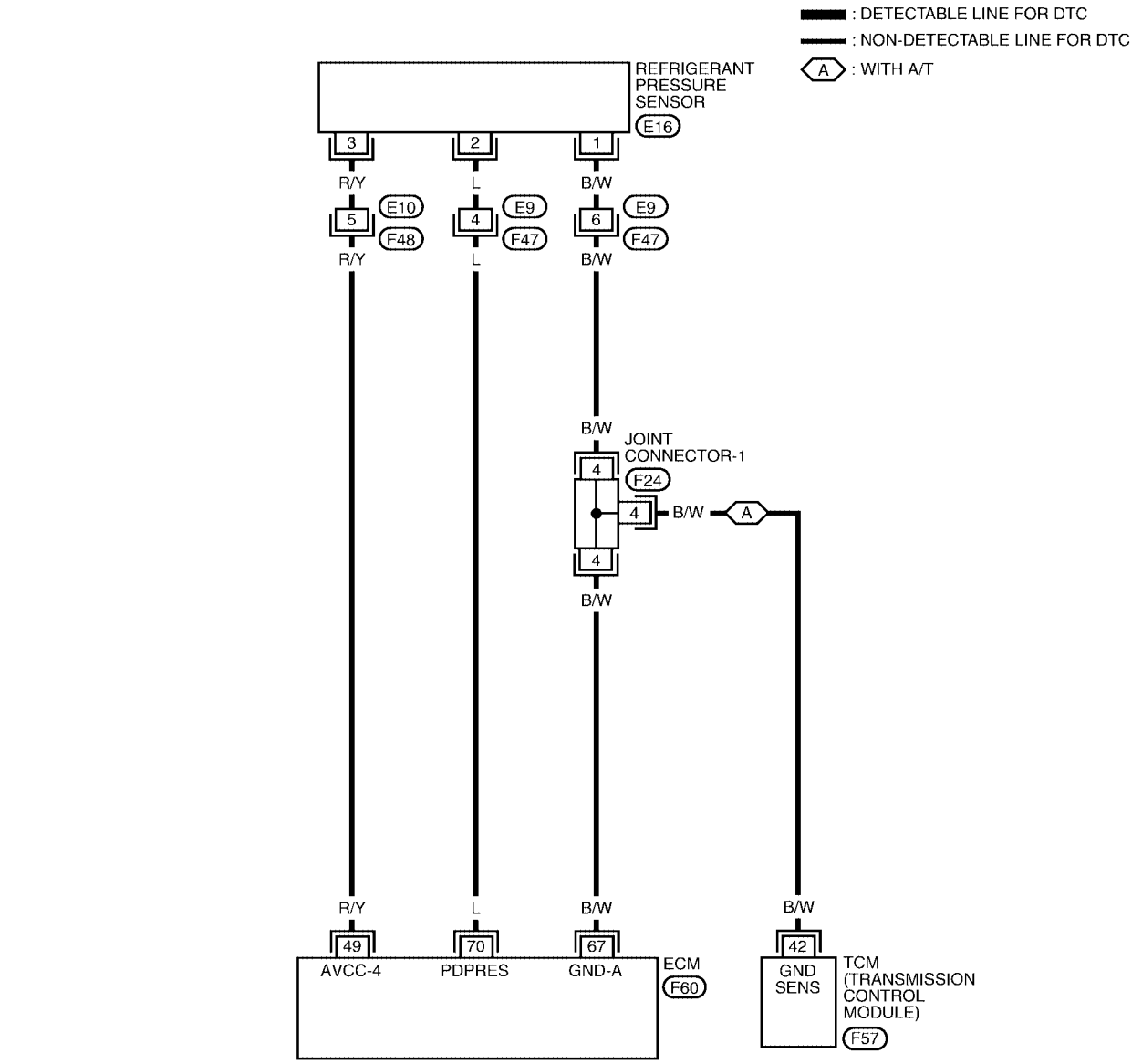


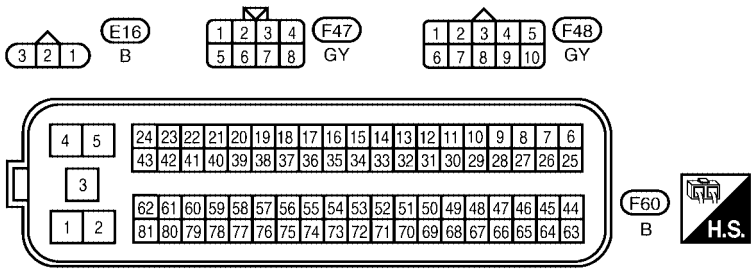


Wiring Diagram

UBS0025S

EC-RP/SEN-01





Refer to the following.
F24 - JOINT CONNECTOR
F57 - ELECTRICAL UNITS

BBWA0798E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	R/Y	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
67	B/W	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
70	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON" (Compressor operates.)	1.0 - 4.0V

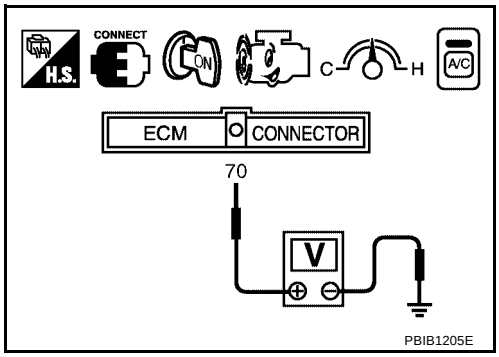
Diagnostic Procedure

UBS0025T

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and fan control switch "ON".
3. Check voltage between ECM terminal 70 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

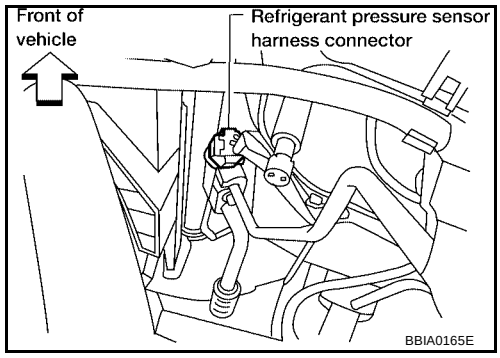


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

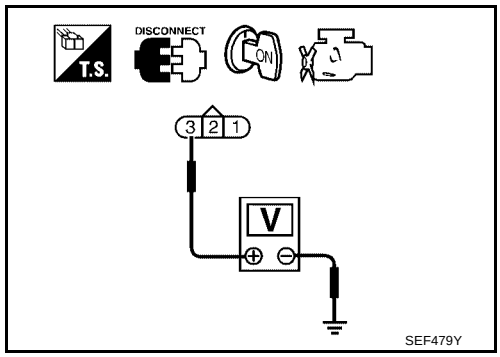
2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and fan control switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between refrigerant pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Joint connector-1
- Harness for open or short between TCM (transmission control module) and refrigerant pressure sensor
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to power in harness or connectors.

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 70 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK REFRIGERANT PRESSURE SENSOR

Refer to MTC-15, "Refrigerant Pressure Sensor" .

OK or NG

OK >> GO TO 9.
NG >> Replace refrigerant pressure sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS006I6

REFRIGERANT PRESSURE SENSOR

Refer to MTC-15, "REFRIGERATION SYSTEM" .

ELECTRICAL LOAD SIGNAL

PFP:25350

CONSULT-II Reference Value in Data Monitor Mode

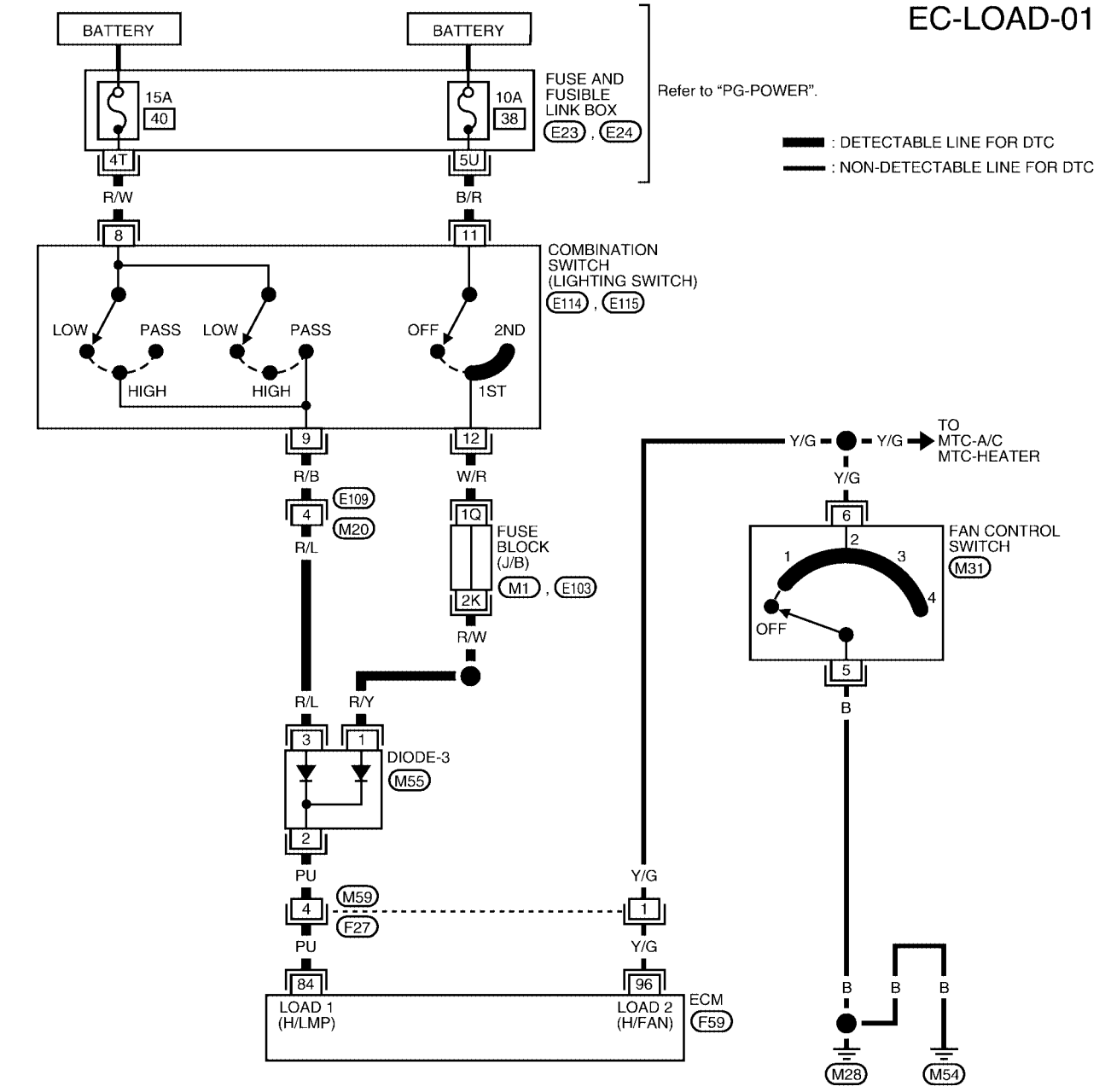
UBS0025U

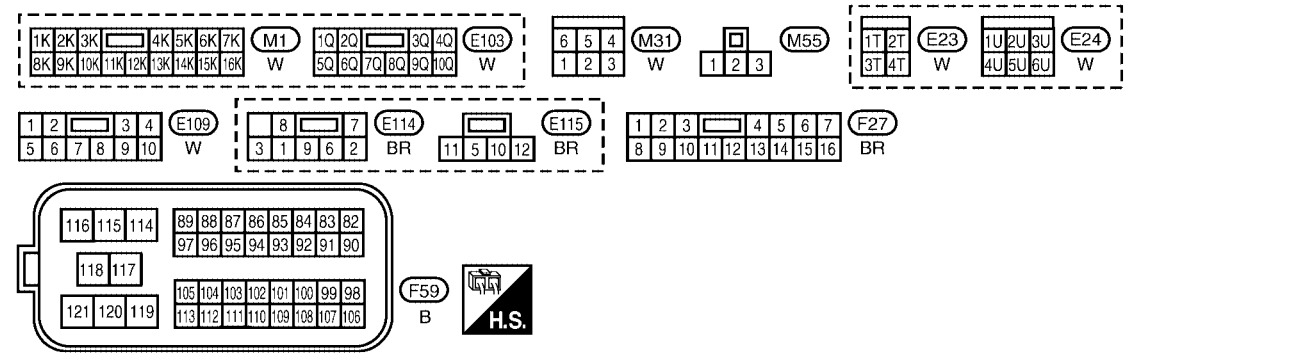
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch and/ or lighting switch is in 2nd	ON
		Rear window defogger switch is OFF and lighting switch is OFF	OFF

Wiring Diagram

UBS0025V





BBWA0401E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
84	PU	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V
96	Y/G	Electrical load signal (Heater fan signal)	**[Engine is running]** ● Heater fan switch "ON"	Approximately 0V
			[Engine is running] ● Heater fan switch "OFF"	Approximately 5V

Diagnostic Procedure

UBS0025W

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

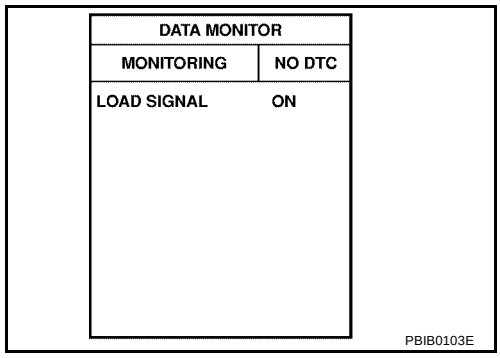
Yes >> GO TO 2.
No >> GO TO 4.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch "ON".
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Lighting switch "1ST" position	ON
Lighting switch "OFF"	OFF



OK or NG

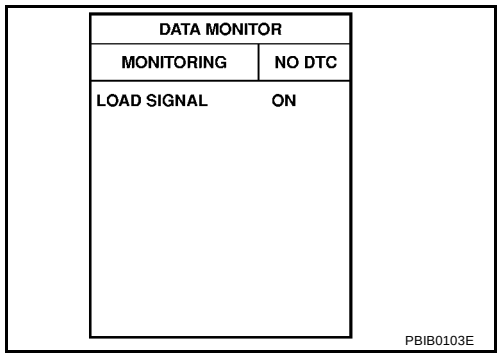
OK >> GO TO 3.
NG >> GO TO 7.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Lighting switch "2ND" and "HIGH" position	ON
Lighting switch "OFF"	OFF



OK or NG

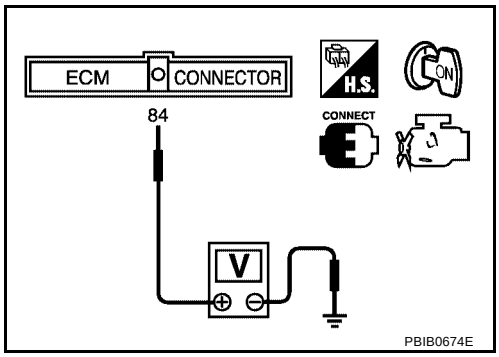
OK >> GO TO 6.
NG >> GO TO 11.

4. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch “1ST” position	BATTERY VOLTAGE
Lighting switch “OFF”	0V



OK or NG

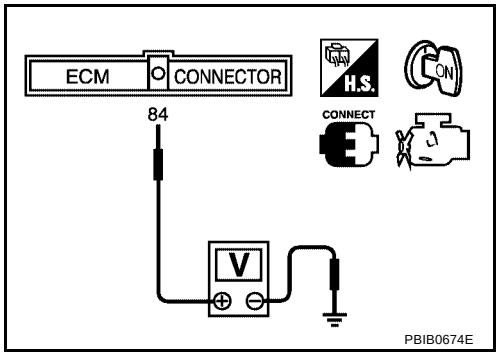
OK >> GO TO 5.
NG >> GO TO 7.

5. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch “2ND” and “HIGH” position	BATTERY VOLTAGE
Lighting switch “OFF”	0V



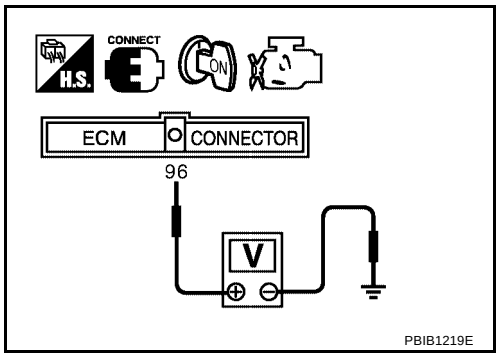
OK or NG

OK >> GO TO 6.
NG >> GO TO 11.

6. CHECK FAN CONTROL SWITCH CIRCUIT OVERALL FUNCTION

Check voltage between ECM terminal 96 and ground under the following conditions.

Condition	Voltage
Fan control switch “ON”	BATTERY VOLTAGE
Fan control switch “OFF”	0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 15.

7. CHECK LIGHTING SWITCH 1ST POSITION CIRCUIT

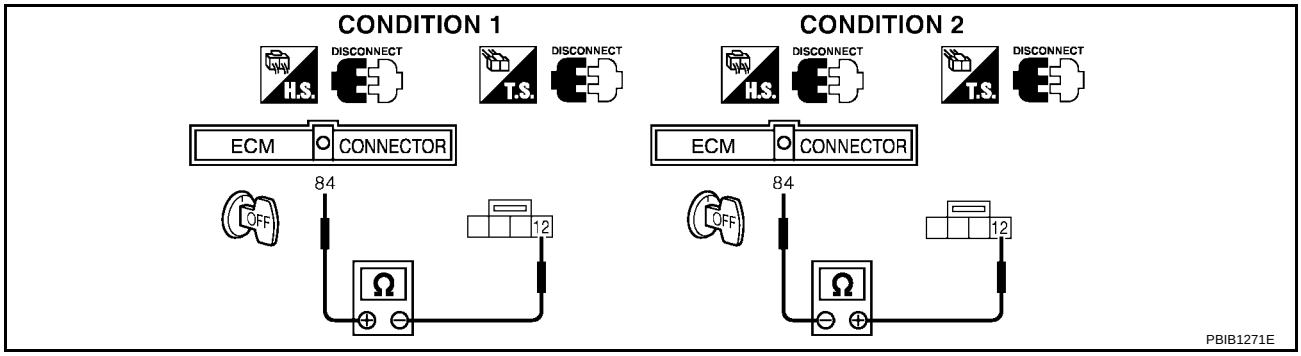
1. Turn the lighting switch “1ST” position.
2. Check that any illumination lamp is illuminated.

OK or NG

OK >> GO TO 8.
NG >> Refer to LT-32, "ILLUMINATION" .

8. CHECK LOAD SIGNAL INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connectors.
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 12 under the following conditions.



CONDITION	CONTINUITY
1	Should not exist.
2	Should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Fuse block (J/B) connectors M1, E103
- Diode-3
- Harness for open and short between ECM and lighting switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

11. CHECK HEADLAMP HIGH BEAM CIRCUIT

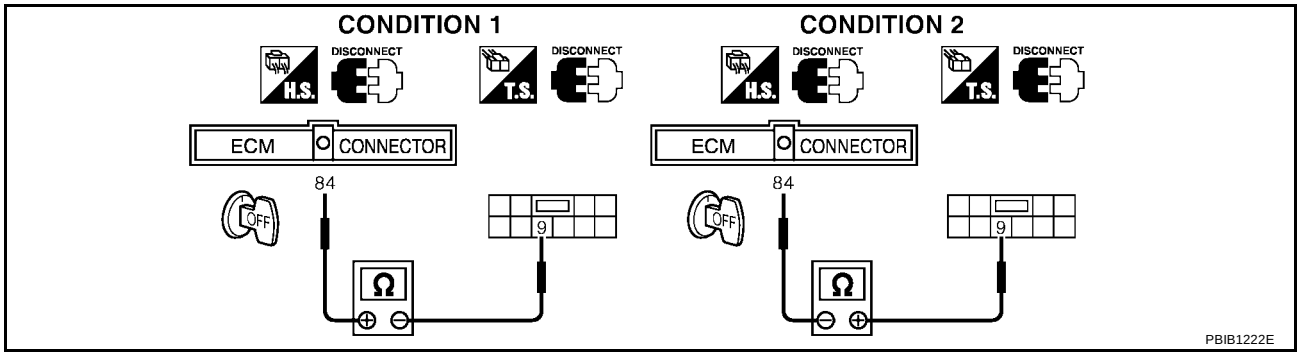
1. Start engine.
2. Turn the lighting switch “2ND” and “HIGH” position.
3. Check that headlamp high beams are illuminated.

OK or NG

OK >> GO TO 12.
NG >> Refer to LT-6, "HEADLAMP (FOR USA)" .

12. CHECK HEADLAMP HIGH BEAM INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connector.
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 9 under the following conditions.



CONDITION	CONTINUITY
1	Should not exist.
2	Should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors E109, M20
- Diode-3
- Harness for open and short between ECM and lighting switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

15. CHECK FAN CONTROL SWITCH CIRCUIT

1. Start engine.
2. Turn the fan control switch “ON”.
3. Check the blower fan motor. Is the blower fan motor operating?

Yes or No

Yes >> GO TO 16.
No >> Refer to MTC-19, "TROUBLE DIAGNOSIS" .

16. CHECK FAN CONTROL SWITCH INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect fan control switch harness connector.
4. Check harness continuity between ECM terminal 96 and fan control switch terminal 6. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 18.
NG >> GO TO 17.

17. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open and short between ECM and fan control switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

18. CHECK INTERMITTENT INCIDENT

Perform EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

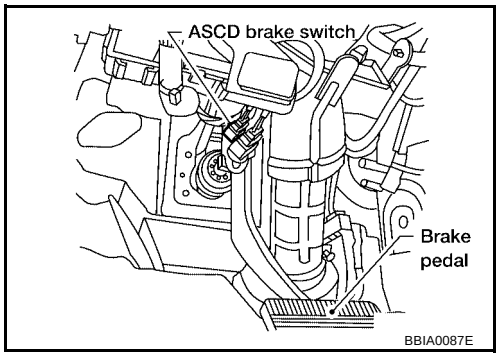
ASCD BRAKE SWITCH

PFP:25320

Component Description

UBS006JA

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal)
Refer to EC-1220, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS006JB

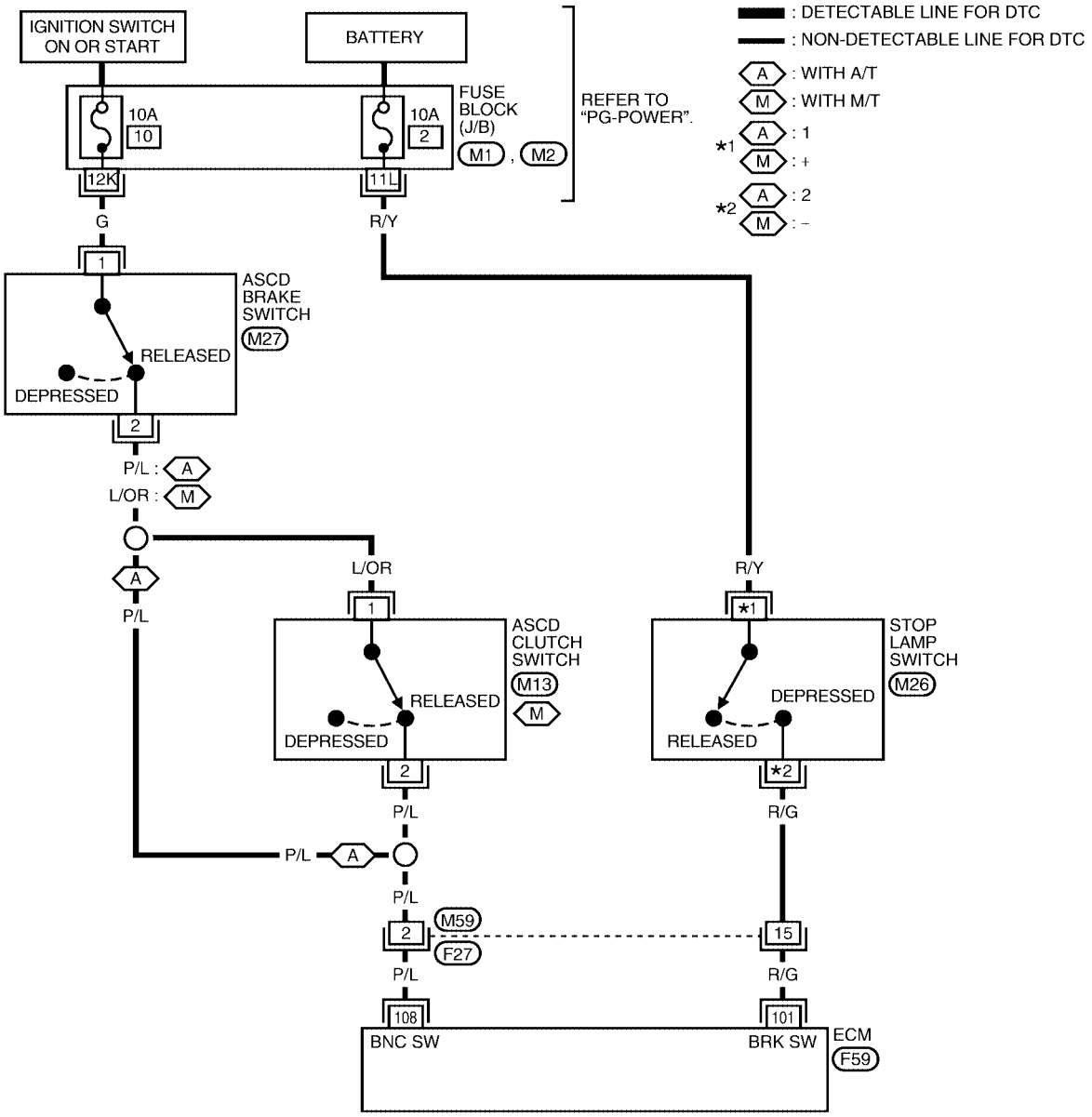
Specification data are reference values.

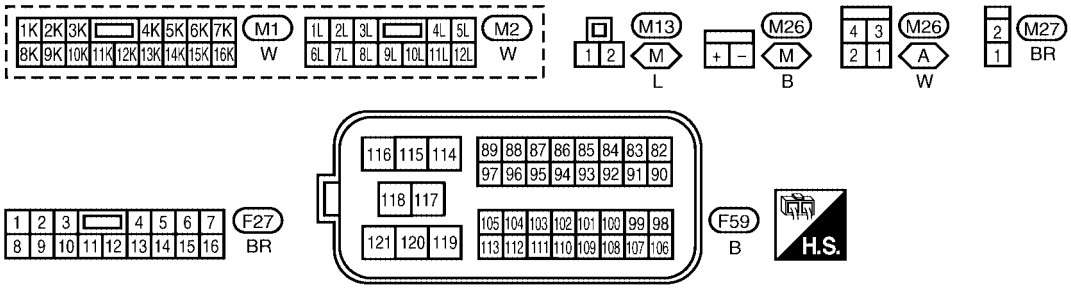
MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1	● Ignition switch: ON	Clutch pedal (M/T) and brake pedal: Slightly depressed	ON
		Clutch pedal (M/T) and brake pedal: Slightly depressed	OFF
BRAKE SW2	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

Wiring Diagram

UBS006JC

EC-ASCBOF-01





BBWA0316E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal is fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is depressed	BATTERY VOLTAGE (11 - 14V)
108	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS006JD

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

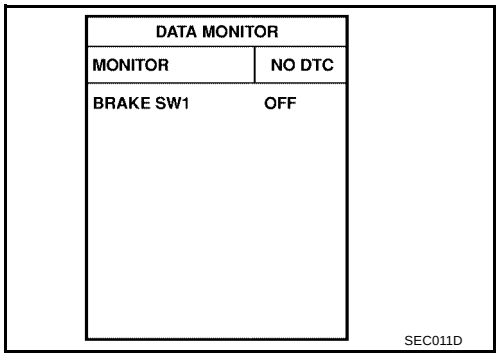
1. Turn ignition switch "ON".
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-II.
3. Check "BRAKE SW1" indication under the following conditions.

M/T models

CONDITION	INDICATION
When clutch pedal or brake pedal is depressed	OFF
When clutch pedal and brake pedal are fully released	ON

A/T models

CONDITION	INDICATION
When brake pedal is depressed	OFF
When brake pedal is fully released	ON



Without CONSULT-II

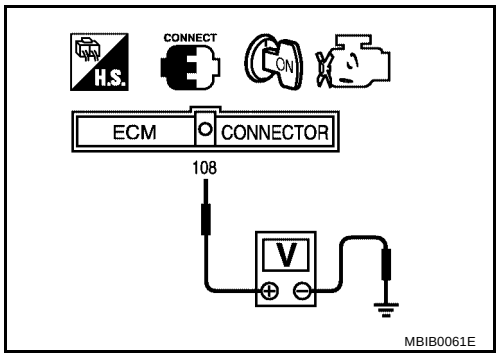
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 108 and ground under the following conditions.

M/T models

CONDITION	VOLTAGE
When clutch pedal or brake pedal is depressed	Approximately 0V
When clutch pedal and brake pedal are fully released	Battery voltage

A/T models

CONDITION	VOLTAGE
When brake pedal is depressed	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

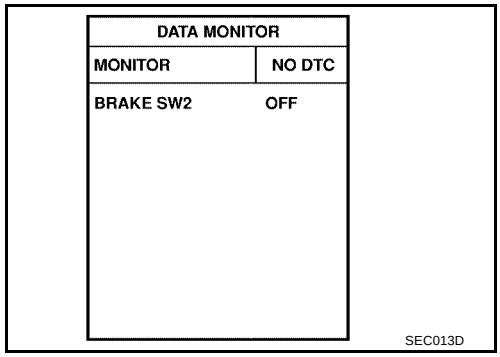
OK >> GO TO 2.
NG (M/T models) >>GO TO 3.
NG (A/T models) >>GO TO 4.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

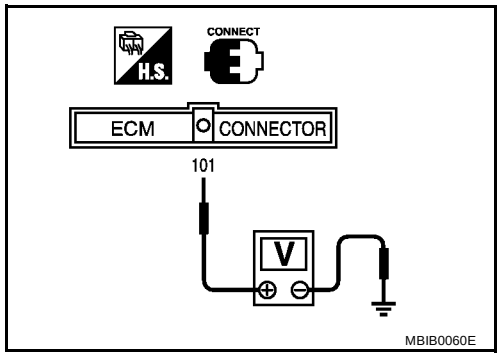
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

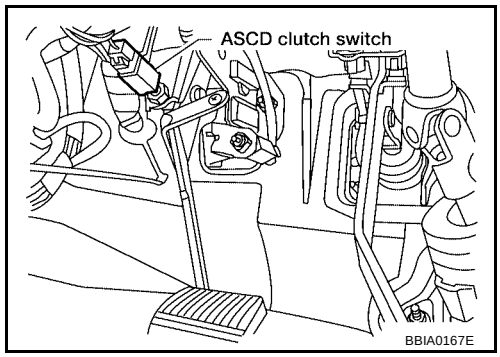


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 13.

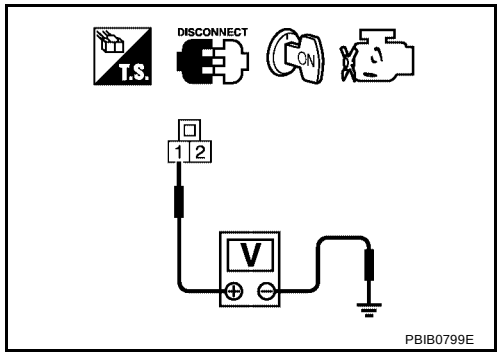
3. CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-II or tester.

CONDITION	VOLTAGE
When brake pedal is released	Battery voltage
When brake pedal is depressed	Approx. 0V

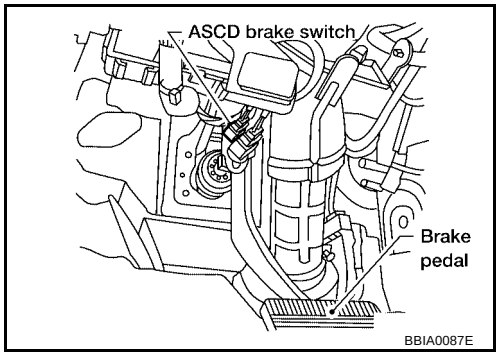


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

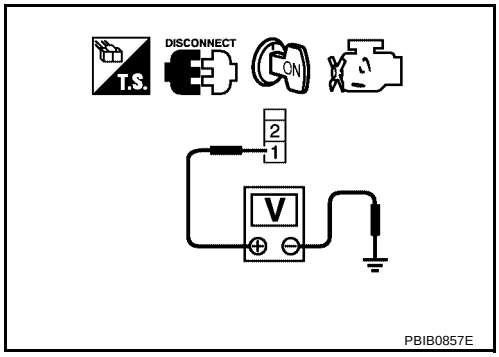
4. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK (M/T models)>>GO TO 6.
OK (A/T models)>>GO TO 7.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ASCD BRAKE SWITCH

Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD brake switch.

10. CHECK ASCD CLUTCH SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD clutch switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD clutch switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

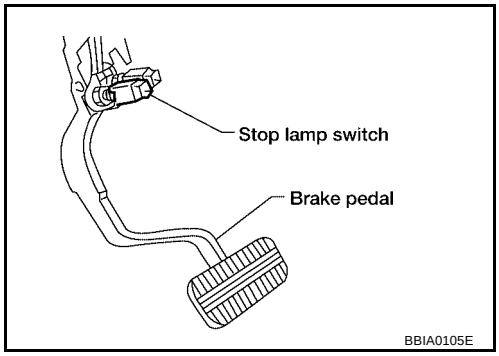
Refer to EC-1199, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD clutch switch.

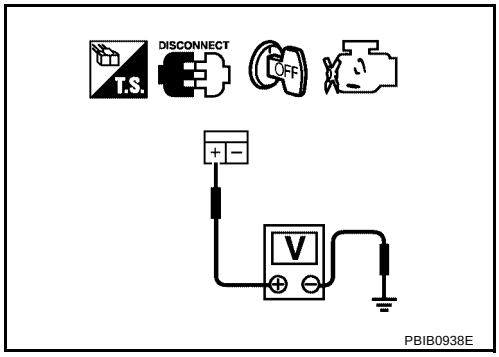
13. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

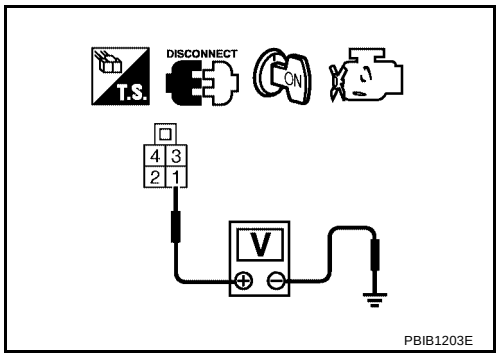
1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal **+** (M/T models) or 1 (A/T models) and ground with CONSULT -II or tester.

Voltage: Battery voltage





OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal – (M/T models) or 2 (A/T models).
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK STOP LAMP SWITCH

Refer to EC-1199, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace stop lamp switch.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

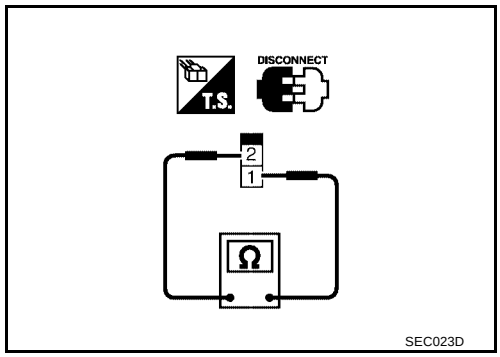
UBS006JE

ASCD BRAKE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Check harness continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should exist.
When brake pedal is depressed.	Should not exist.

If NG, adjust ASCD brake switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.



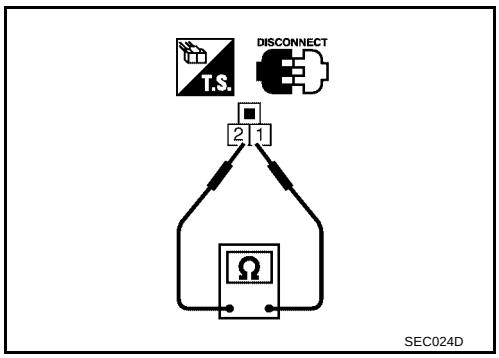
ASCD CLUTCH SWITCH (FOR M/T MODELS)

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.

3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When clutch pedal is fully released.	Should exist.
When clutch pedal is depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to CL-23, "CLUTCH SYSTEM" , and perform step 3 again.



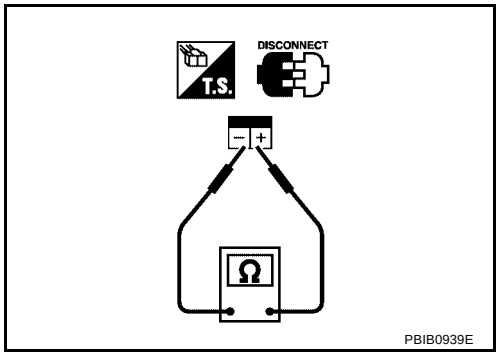
STOP LAMP SWITCH

With M/T Models

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals + and – under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.

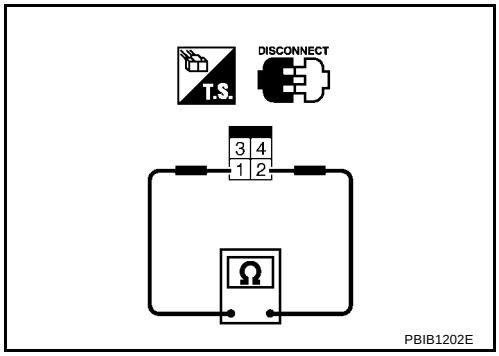


With A/T Models

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check harness continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.



ASCD INDICATOR

PFP:24814

Component Description

UBS006BX

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.
CRUISE indicator illuminates when CRUISE switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.
SET indicator illuminates when following conditions are met.

- CRUISE indicator is illuminated.
- SET switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET indicator remains lit during ASCD control.
Refer to EC-1220, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.

CONSULT-II Reference Value in Data Monitor Mode

UBS006BY

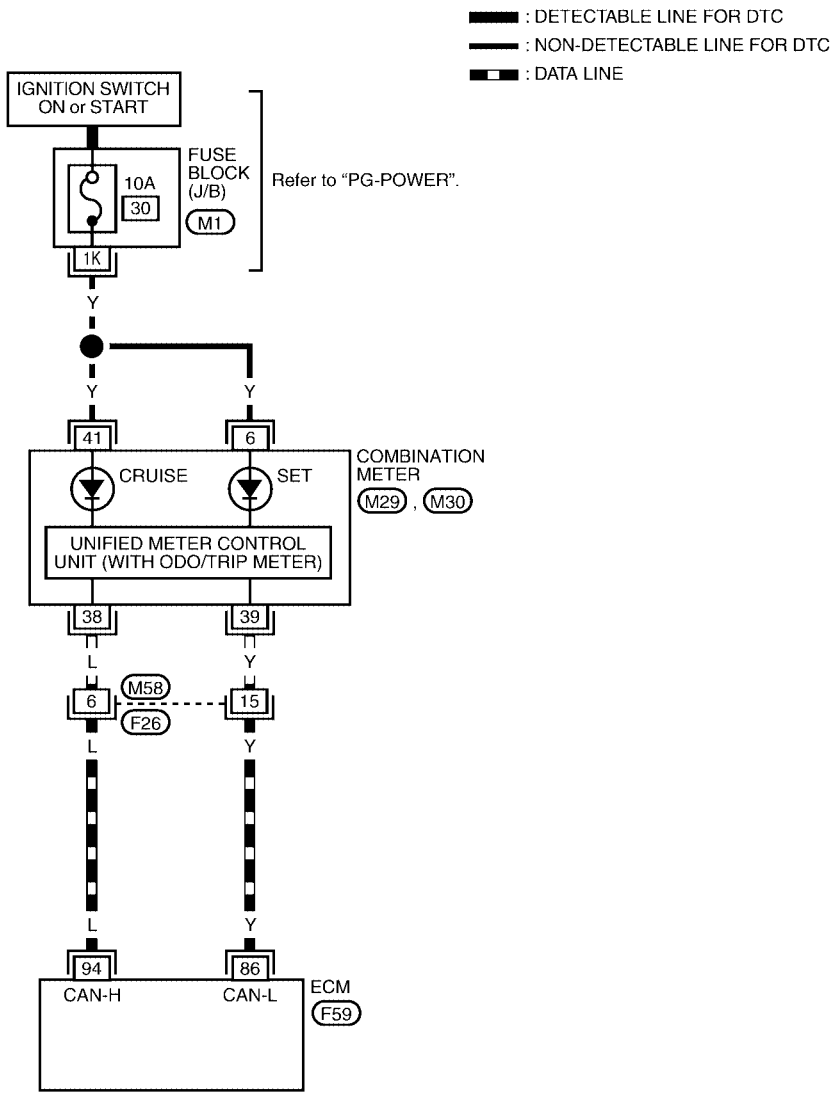
Specification data are reference value.

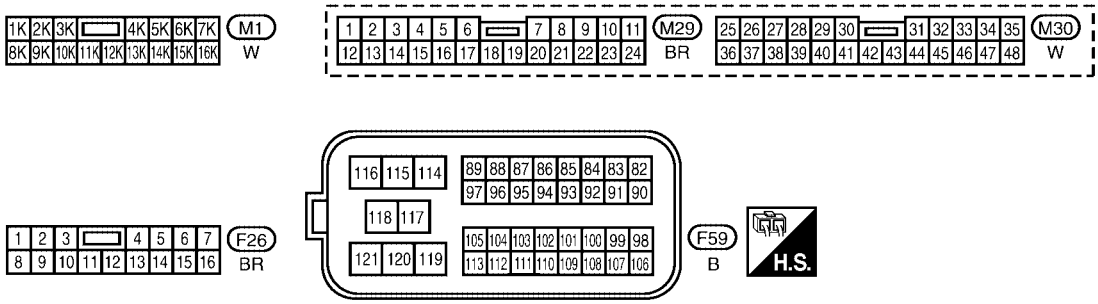
MONITOR ITEM	CONDITION		SPECIFICATION
CRUISE LAMP	● Ignition switch: ON	CRUISE Lamp: Illuminated	ON
		CRUISE Lamp: Not illuminated	OFF
SET LAMP	● Ignition switch: ON	SET Lamp: Illuminated	ON
		SET Lamp: Not illuminated	OFF

Wiring Diagram

UBS006BZ

EC-ASCIND-01





BBWA0433E

Diagnostic Procedure

UBS006C0

1. CHECK OVERALL FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	● Ignition switch: ON	CRUISE Lamp: Illuminated	ON
		CRUISE Lamp: Not illuminated	OFF
SET LAMP	● Ignition switch: ON	SET Lamp: Illuminated	ON
		SET Lamp: Not illuminated	OFF

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK DTC

Check that DTC U1000 or U1001 is not displayed.

Yes or No

Yes >> Perform trouble diagnoses for DTC U1000, U1001, refer to EC-728, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
No >> GO TO 3.

3. CHECK COMBINATION METER OPERATION

Does combination meter operate normally?

Yes or No

Yes >> GO TO 4.
No >> Check combination meter circuit. Refer to DI-8, "Combination Meter" .

4. CHECK INTERMITTENT INCIDENT

Refer to EC-720, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

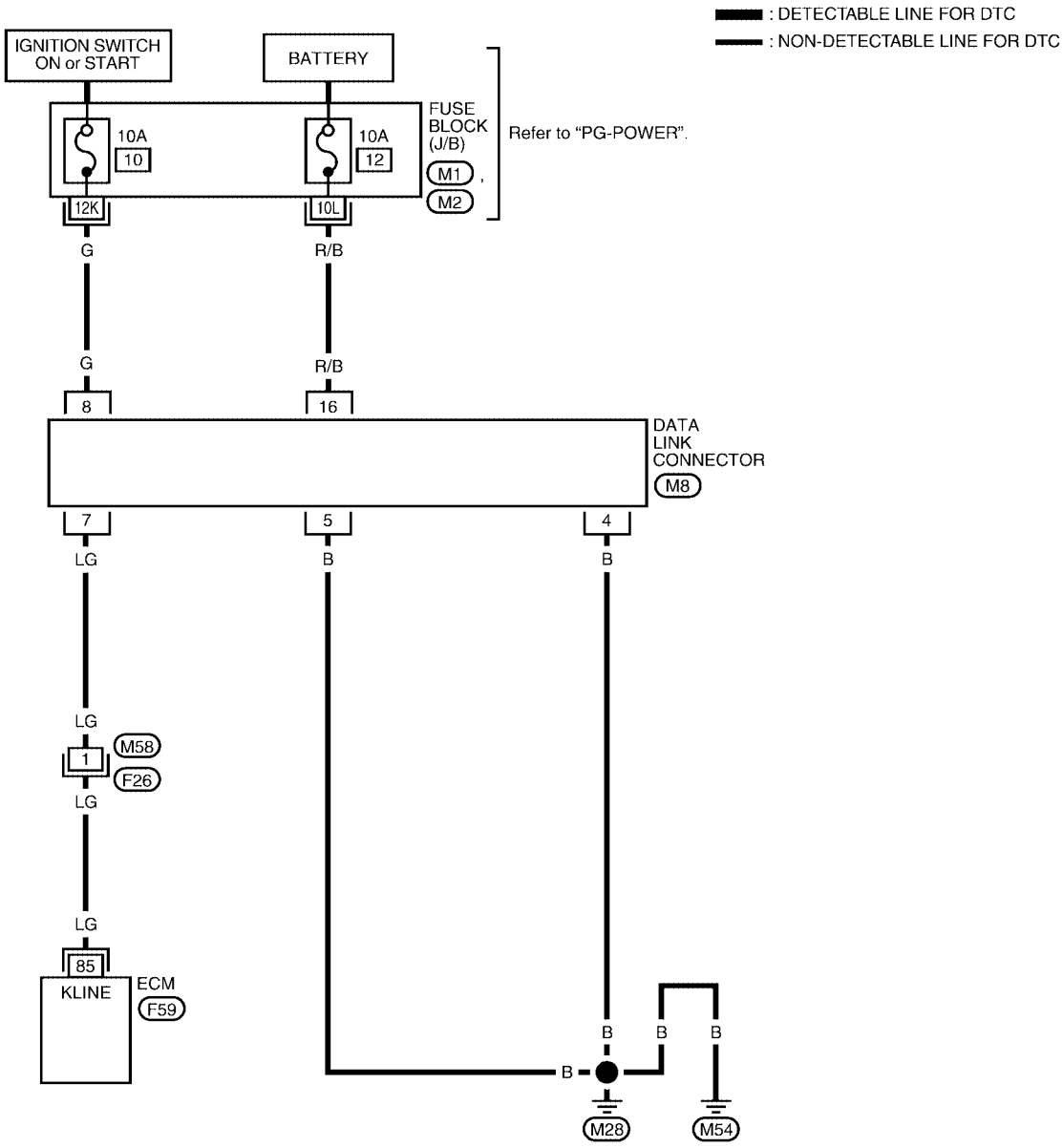
DATA LINK CONNECTOR

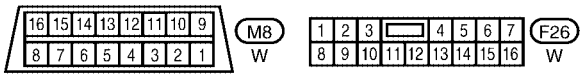
PFP:24814

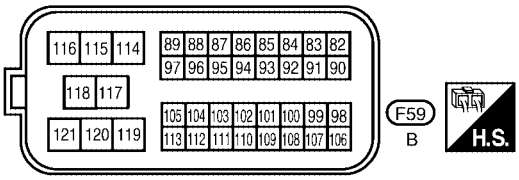
Wiring Diagram

EBS00KLG

EC-DLC-01







REFER TO THE FOLLOWING.
M1, M2 - FUSE BLOCK-JUNCTON BOX (J/B)

BBWA0318E

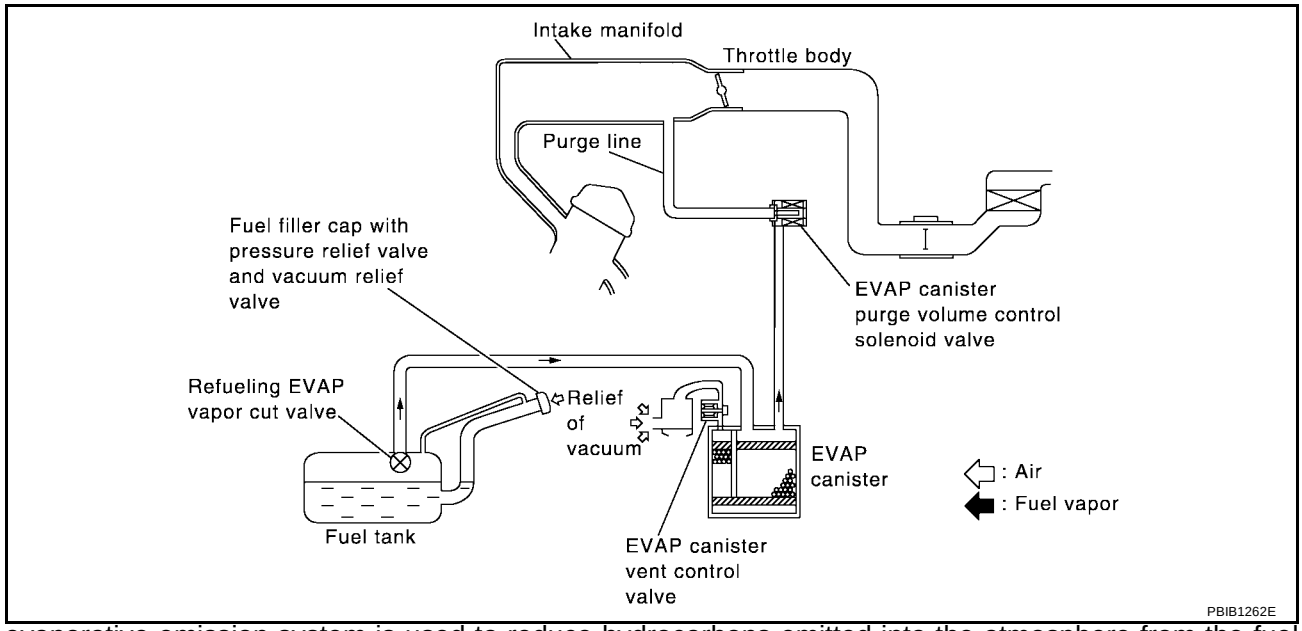
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

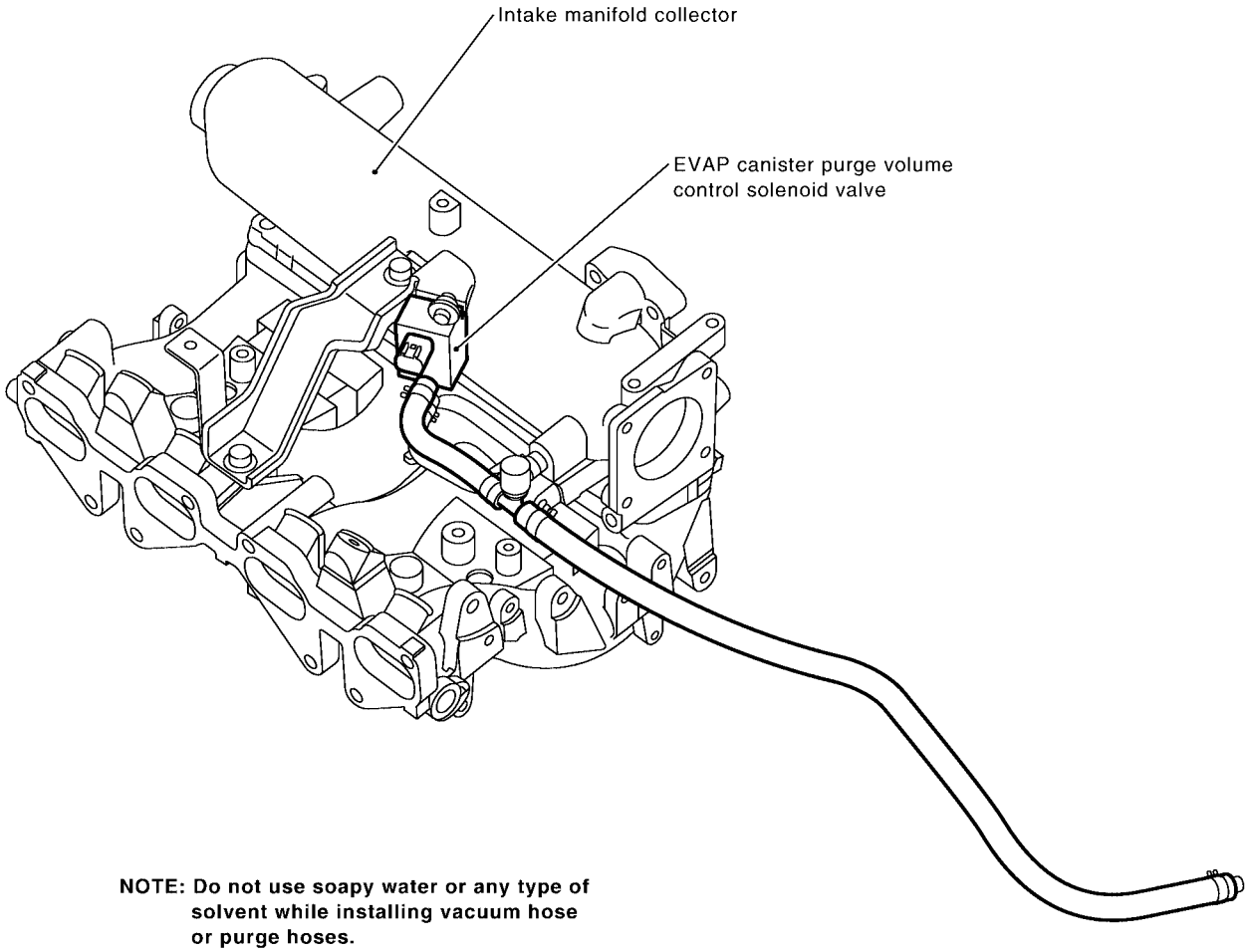
UBS0025Y

SYSTEM DESCRIPTION



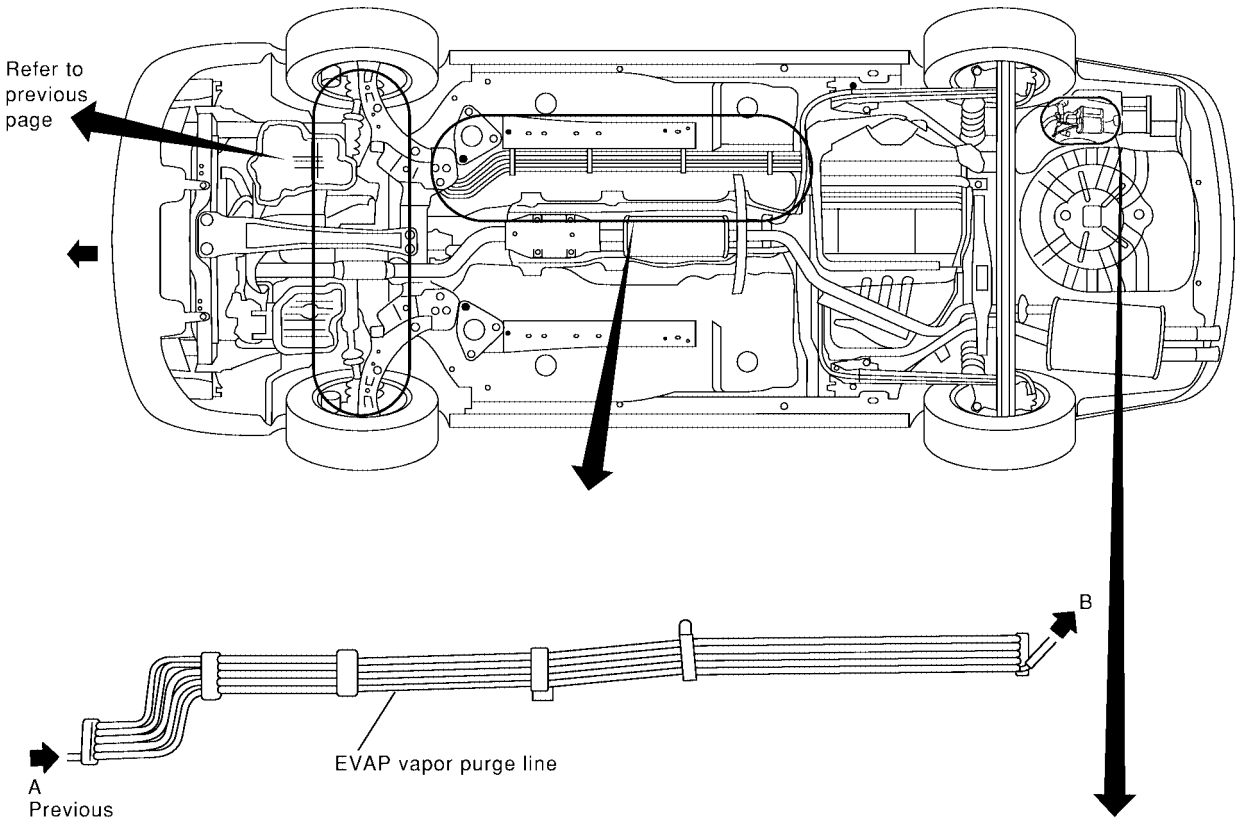
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

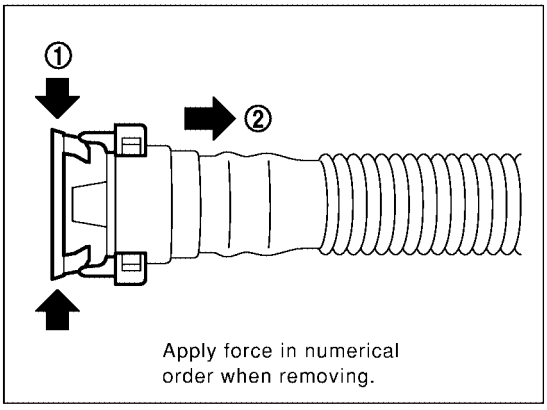
EVAPORATIVE EMISSION LINE DRAWING

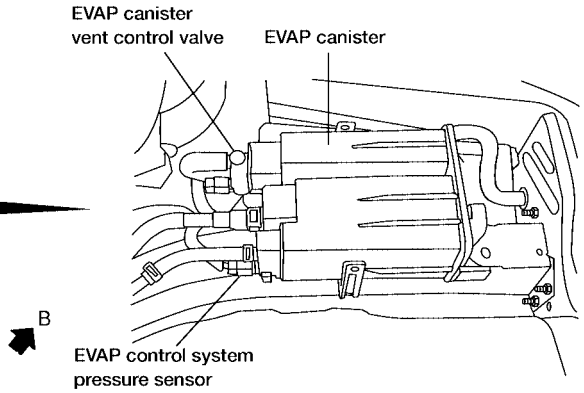


NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

PBIB1180E







INSTALLATION PRECAUTIONS:

- **This hose can be reused, but do not remove it unless necessary.**
- **Remove any foreign matter (dust, sand, etc.) from the hose connection before installing.**
- **Apply oil to the O-ring before installing.**
- **Replace the hose assembly if the O-ring is scratched or cracked.**

BBIA0177E

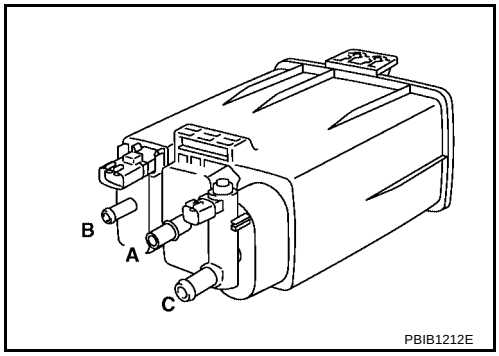
Component Inspection

UBS0025Z

EVAP CANISTER

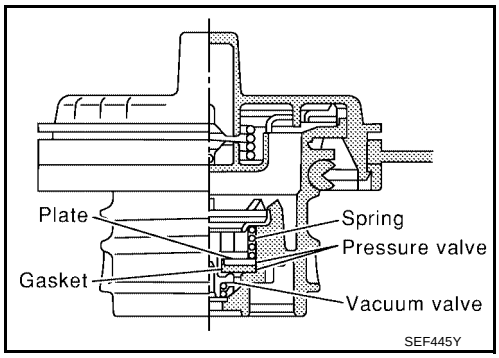
Check EVAP canister as follows:

1. Block port **B** .
2. Blow air into port **A** and check that it flows freely out of port **C** .
3. Release blocked port **B** .
4. Apply vacuum pressure to port **B** and check that vacuum pressure exists at the ports **A** and **C** .
5. Block port **A** and **B** .
6. Apply pressure to port **C** and check that there is no leakage.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.

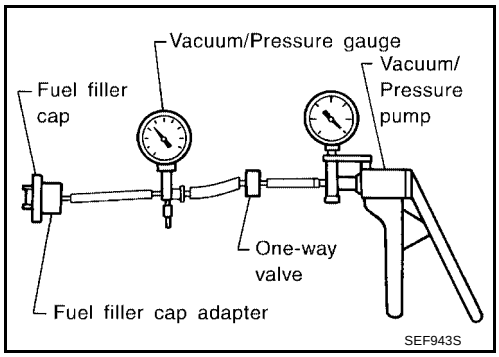


2. Check valve opening pressure and vacuum.

Pressure: **15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)**

Vacuum: **–6.0 to –3.3 kPa (–0.061 to –0.034 kg/cm^2 , –0.87 to –0.48 psi)**

3. If out of specification, replace fuel filler cap as an assembly.



CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-867, "DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE" .

FUEL TANK TEMPERATURE SENSOR

Refer to EC-809, "DTC P0181 FTT SENSOR" , EC-814, "DTC P0182, P0183 FTT SENSOR" .

EVAP CANISTER VENT CONTROL VALVE

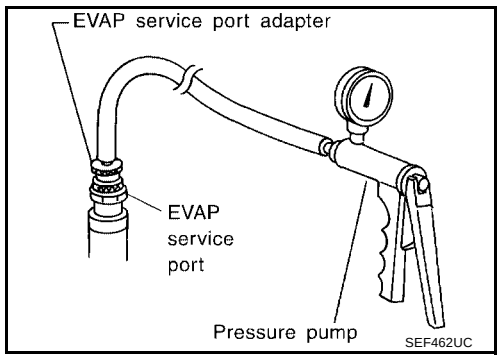
Refer to EC-873 .

EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-880 .

EVAP SERVICE PORT

Positive pressure is delivered to the EVAP system through the EVAP service port. If fuel vapor leakage in the EVAP system occurs, use a leak detector to locate the leak.

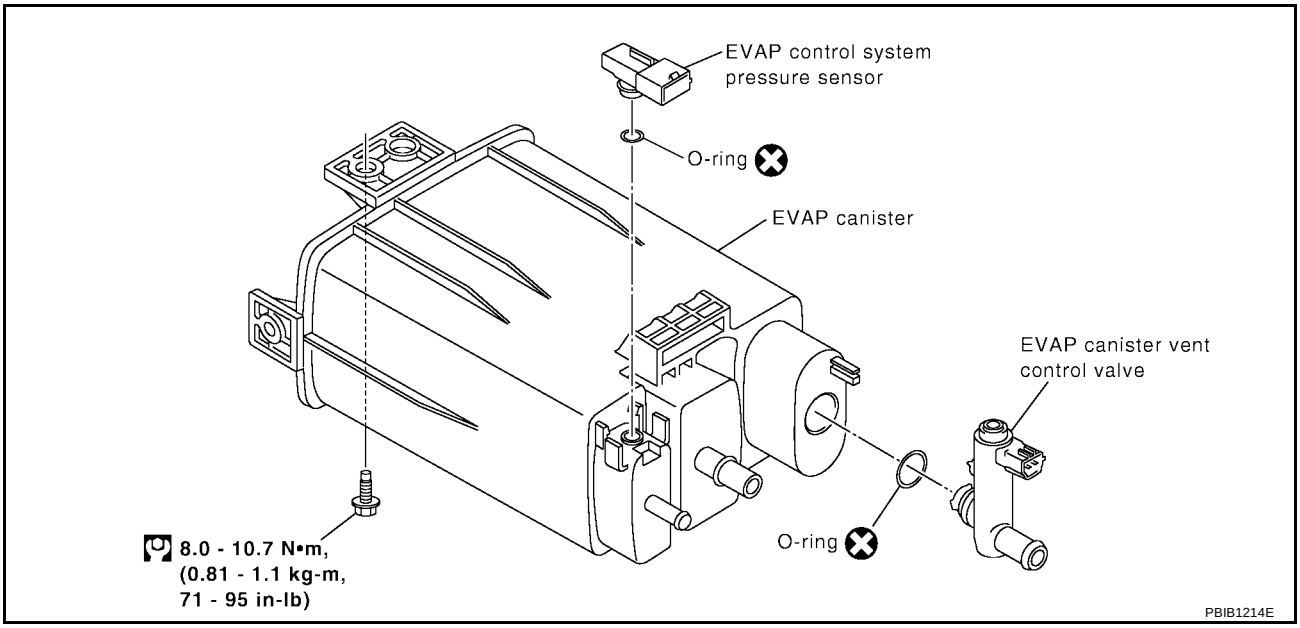


Removal and Installation

UBS006I7

EVAP CANISTER

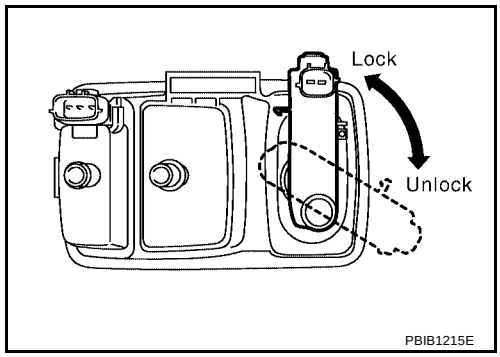
Tighten EVAP canister as shown in the figure.



EVAP CANISTER VENT CONTROL VALVE

1. Turn EVAP canister vent control valve counterclockwise.
2. Remove the EVAP canister vent control valve.

Do not reuse the O-ring, replace it with a new one.



How to Detect Fuel Vapor Leakage

UBS00260

CAUTION:

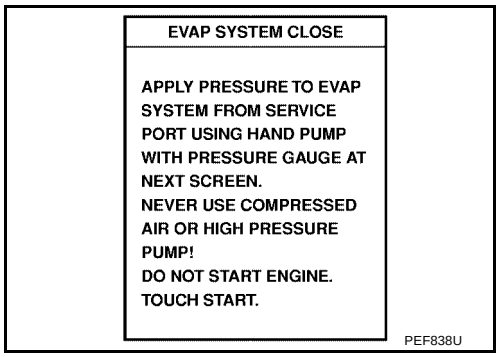
- **Never use compressed air or a high pressure pump.**
- **Do not start engine.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in EVAP system.**

NOTE:

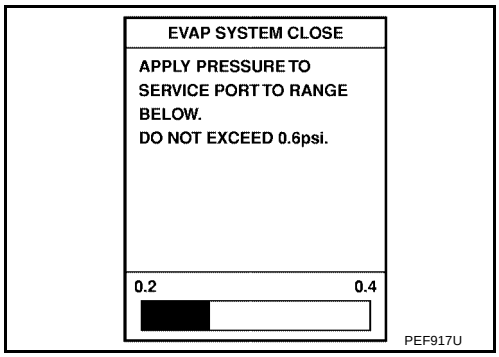
Improper installation of adapter to the service port may cause a leak.

WITH CONSULT-II

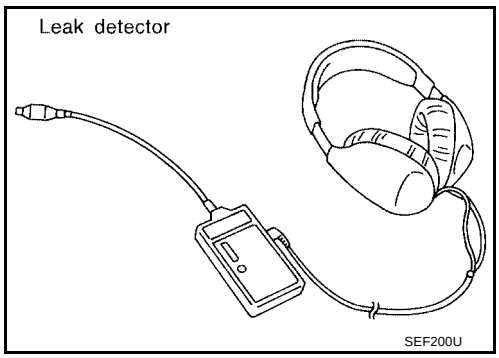
1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump and hose.
3. Turn ignition switch “ON”.
4. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
5. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.



6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7. Remove the EVAP service port adapter and hose with pressure pump.

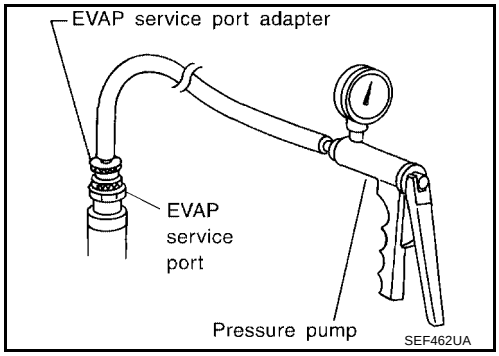


8. Locate the leak using a leak detector. Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

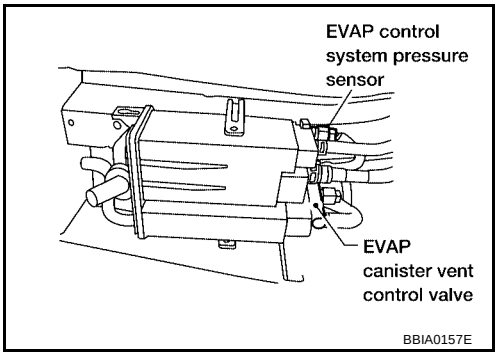


WITHOUT CONSULT-II

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump with pressure gauge to the EVAP service port adapter.



3. Apply battery voltage to between the terminals of EVAP canister vent control valve to make a closed EVAP system.
4. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2 , 0.2 to 0.4 psi).
5. Remove EVAP service port adapter and hose with pressure pump.
6. Locate the leak using a leak detector. Refer to EC-1206, "EVAPORATIVE EMISSION LINE DRAWING" .

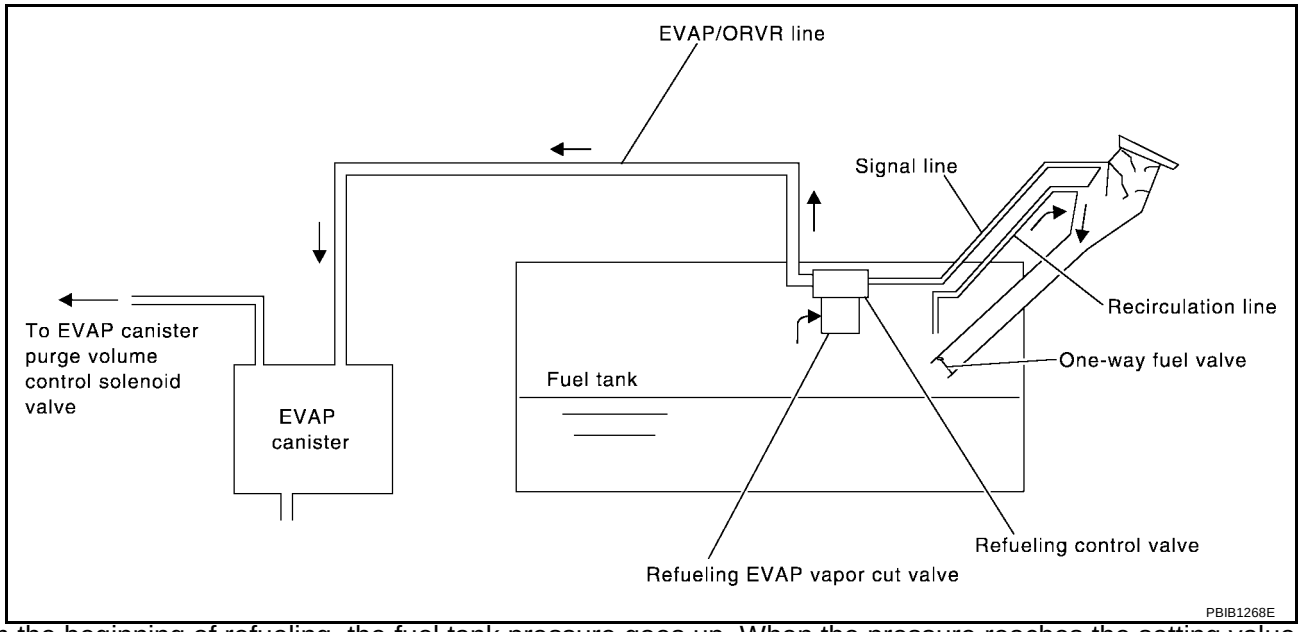


ON BOARD REFUELING VAPOR RECOVERY (ORVR)

PFP:00000

System Description

UBS00261



From the beginning of refueling, the fuel tank pressure goes up. When the pressure reaches the setting value of the refueling control valve (RCV) opening pressure, the RCV is opened. After RCV opens, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve, RCV and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.
When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.
The RCV is always closed during driving and the evaporative emission control system is operated the same as conventional system.

WARNING:

When conducting inspections below, be sure to observe the following:

- **Put a “CAUTION: FLAMMABLE” sign in workshop.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to furnish the workshop with a CO_2 fire extinguisher.**

CAUTION:

- **Before removing fuel line parts, carry out the following procedures:**
  - **Put drained fuel in an explosion-proof container and put lid on securely.**
  - **Release fuel pressure from fuel line. Refer to EC-637, "FUEL PRESSURE RELEASE" .**
  - **Disconnect battery ground cable.**
- **Always replace O-ring when the fuel gauge retainer is removed.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose and clamps excessively to avoid damaging hoses.**
- **After installation, run engine and check for fuel leaks at connection.**
- **Do not attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.**

Diagnostic Procedure

UBS00262

SYMPTOM: FUEL ODOR FROM EVAP CANISTER IS STRONG.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Weigh the EVAP canister with EVAP canister vent control valve attached.
   The weight should be less than 1.9 kg (4.2 lb).

OK or NG

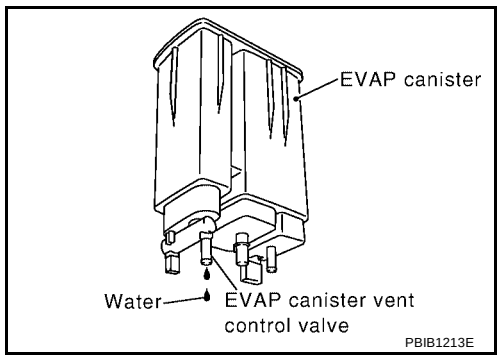
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.
No >> GO TO 5.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

5. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1215, "Component Inspection" .

OK or NG

OK >> **INSPECTION END**
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

SYMPTOM: CANNOT REFUEL/FUEL ODOR FROM THE FUEL FILLER OPENING IS STRONG WHILE REFUELING.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Weigh the EVAP canister with EVAP canister vent control valve attached.
   The weight should be less than 1.9 kg (4.2 lb).

OK or NG

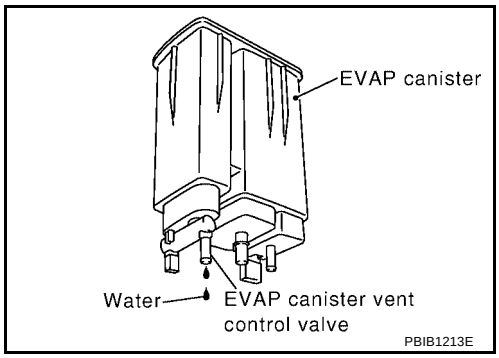
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.
No >> GO TO 5.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

5. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kink, looseness and improper connection.

OK or NG

OK >> GO TO 6.
NG >> Repair or replace hoses and tubes.

6. CHECK FILLER NECK TUBE

Check signal line and recirculation line for clogging, dents and cracks.

OK or NG

OK >> GO TO 7.
NG >> Replace filler neck tube.

7. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1215, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

8. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

OK or NG

OK >> GO TO 9.
NG >> Replace fuel filler tube.

9. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

OK or NG

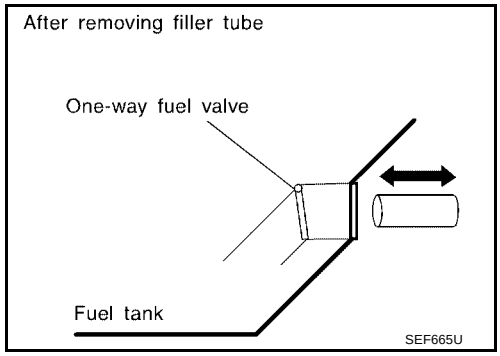
OK >> GO TO 10.
NG >> Repair or replace one-way fuel valve with fuel tank.

10. CHECK ONE-WAY FUEL VALVE-II

1. Make sure that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as follows.
   When a stick is inserted, the valve should open, when removing stick it should close.
   Do not drop any material into the tank.

OK or NG

OK >> **INSPECTION END**
NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.



Component Inspection

UBS006I8

REFUELING EVAP VAPOR CUT VALVE

With CONSULT-II

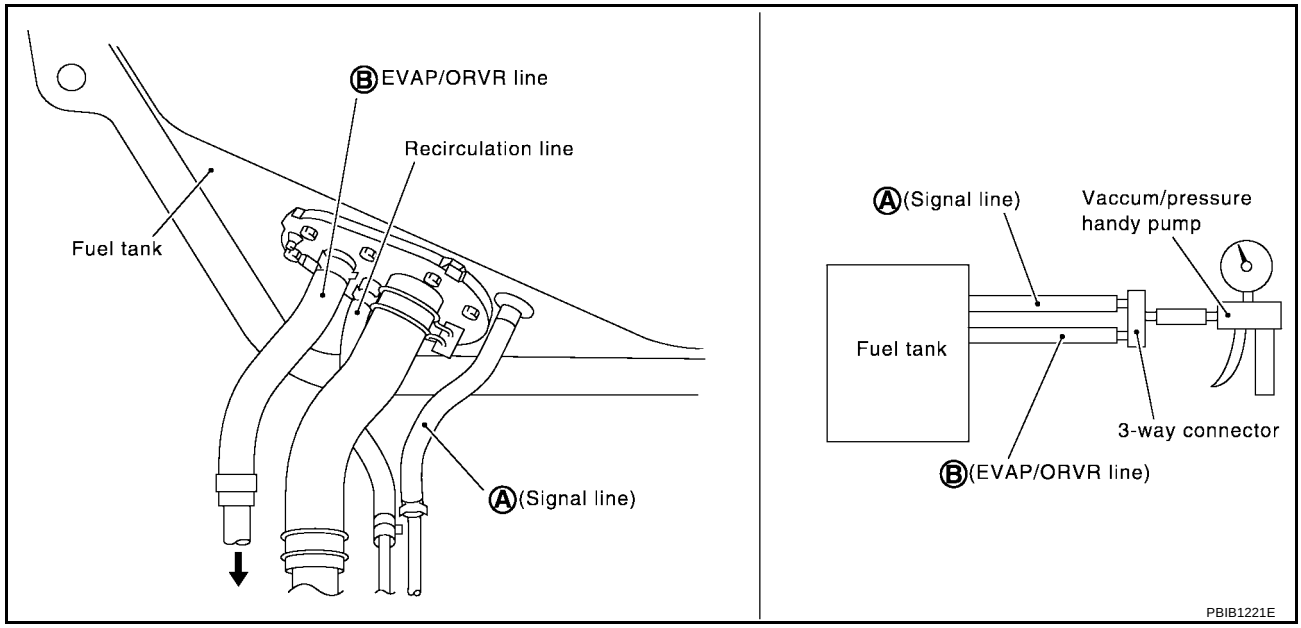
1. Remove fuel tank. Refer to FL-7, "Removal and Installation" .
2. Drain fuel from the tank as follows:

- Remove fuel feed hose located on the fuel level sensor unit retainer.
- Connect a spare fuel hose, one side to fuel level sensor unit retainer where the hose was removed and the other side to a fuel container.
- Drain fuel using “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT-II.

3. Check refueling EVAP vapor cut valve for being stuck closed as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end **B**), and check that the air flows freely into the tank.
4. Check EVAP vapor cut valve for being stuck open as follows.

- Connect vacuum pump to hose ends **A** and **B** using a suitable 3-way connector.
- Remove fuel level sensor unit retainer with fuel level sensor unit.
  Always replace O-ring with new one.
- Put fuel tank upside down.

- Apply vacuum pressure to both hose ends **A** and **B** [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel level sensor unit retainer remaining open and check that the pressure is applicable.



Without CONSULT-II

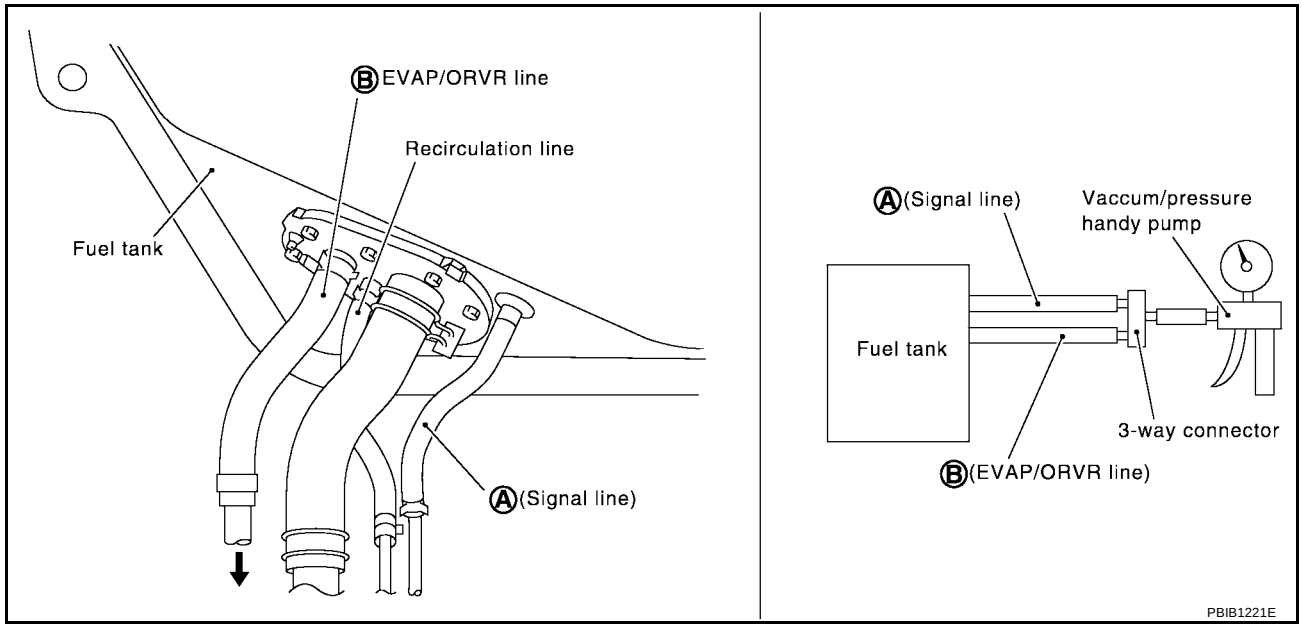
1. Remove fuel tank. Refer to FL-7, "Removal and Installation" .
2. Drain fuel from the tank as follows:

- Remove fuel level sensor unit retainer.
- Drain fuel from the tank using a handy pump into a fuel container.

3. Check refueling EVAP vapor cut valve for being stuck closed as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end **B**), and check that the air flows freely into the tank.
4. Check EVAP vapor cut valve for being stuck open as follows.

- Connect vacuum pump to hose ends **A** and **B** using a suitable 3-way connector.
- Remove fuel level sensor unit retainer with fuel level sensor unit.
  Always replace O-ring with new one.
- Put fuel tank upside down.

– Apply vacuum pressure to both hose ends **A** and **B** [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel level sensor unit retainer remaining open and check that the pressure is applicable.

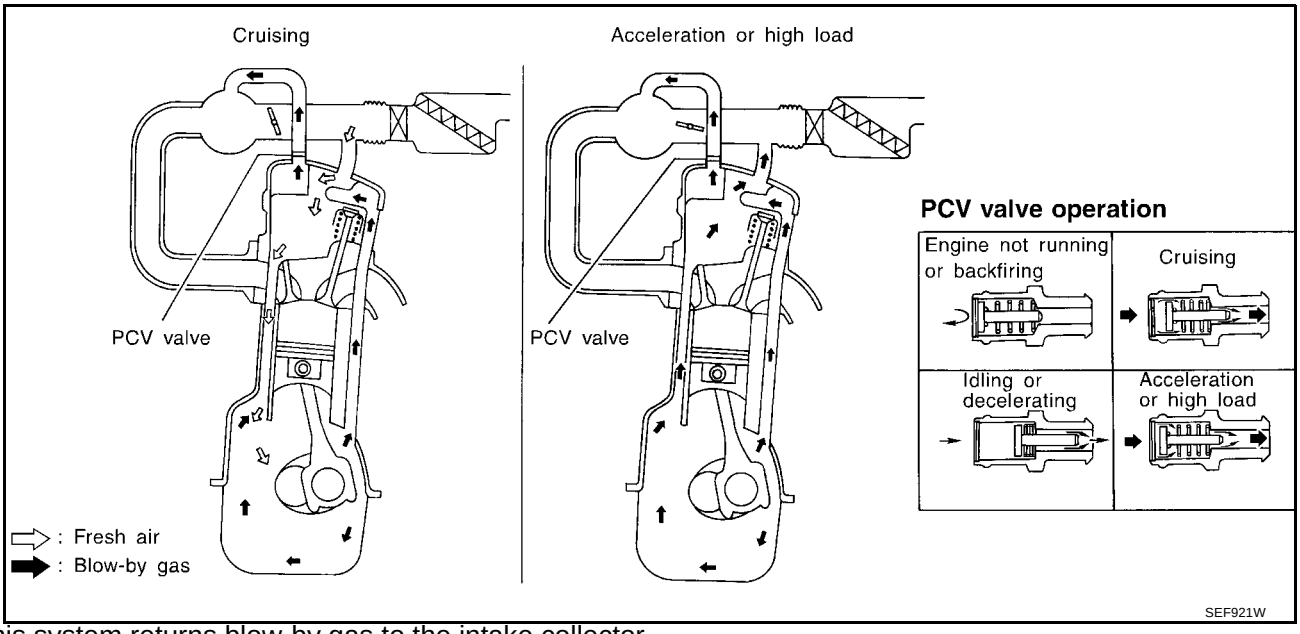


POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

UBS00263



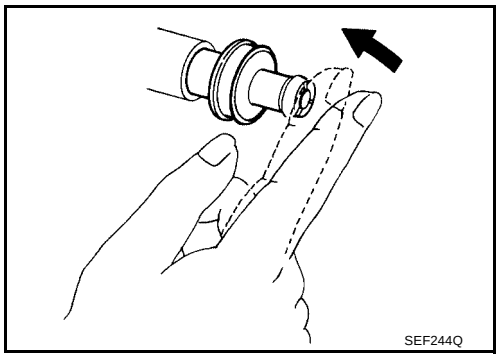
This system returns blow-by gas to the intake collector.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air duct into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the intake collector under all conditions.

Component Inspection

UBS00264

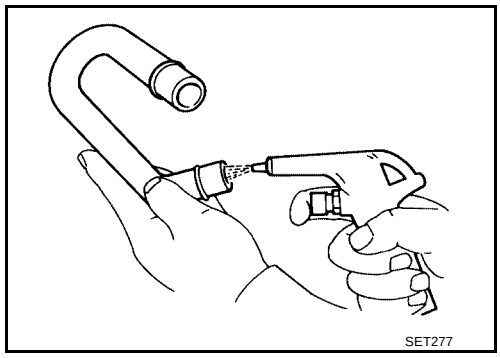
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



AUTOMATIC SPEED CONTROL DEVICE (ASCD)

PFP:18930

System Description

UBS006C1

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation	ASCD vehicle speed control	Electric throttle control actuator
Stop lamp switch	Brake pedal operation		
ASCD clutch switch (M/T models)	Clutch pedal operation		
ASCD steering switch	ASCD steering switch operation		
Park/Neutral position (PNP) switch (A/T models)	Gear position		
Combination meter	Vehicle speed		
TCM	Powertrain revolution		

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.
Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).
ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
Operation status of ASCD is indicated by CRUISE indicator and SET indicator in combination meter. If any malfunction occurs in ASCD system, it automatically deactivates control.

SET OPERATION

Press ASCD CRUISE switch (Main switch). (The CRUISE indicator in combination meter illuminates.)
When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press SET switch. (Then SET indicator in combination meter illuminates.)

ACCEL OPERATION

If the RESUME/ACCEL switch is depressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.
And then ASCD will keep the new set speed.

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is depressed
- More than 2 switches at ASCD steering switch are depressed at the same time (Set speed will be cleared.).
- Brake pedal is depressed
- Clutch pedal is depressed or gear position is changed to the neutral position (M/T models)
- Selector lever is changed to “N”, “P”, “R” position (A/T models).
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator lamp.

- Engine coolant temperature is slightly higher than the normal operating temperature: CRUISE lamp may blink slowly.
  When the engine coolant temperature decreases to the normal operating temperature, CRUISE lamp will stop blinking and the cruise operation will be able to work by depressing SET switch or RESUME switch.
- Malfunction for some self-diagnoses regarding ASCD control: SET lamp will blink quickly.

If MAIN switch is turned to OFF during ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

COAST OPERATION

When the SET/COAST switch is depressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will keep the new set speed.

RESUME OPERATION

When the RESUME/ACCEL switch is depressed after cancel operation other than depressing MAIN switch is performed, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- Brake pedal is released.
- Clutch pedal is released (M/T models)
- A/T selector lever is in other than P and N position (A/T models)
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

Component Description

UBS006C2

ASCD STEERING SWITCH

Refer to EC-1095 .

ASCD BRAKE SWITCH

Refer to EC-1119 , and EC-1123 .

ASCD CLUTCH SWITCH

Refer to EC-1102 and EC-1111 .

STOP LAMP SWITCH

Refer to EC-1102 , EC-1119 and EC-1192 .

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EC-952 , EC-954 , EC-961 and EC-966 .

ASCD INDICATOR

Refer to EC-1201 .

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

UBS00265

Fuel pressure at idling kPa (kg/cm^2 , psi)	Approximately 350 (3.57, 51)

Idle Speed and Ignition Timing

UBS00266

Target idle speed rpm (Engine is warmed up to normal operating temperature)	No-load*1	A/T: 800 ± 50 rpm (in “P” or “N” position) M/T: 650 ± 50 rpm
Air conditioner: ON rpm		850 or more
Ignition timing		A/T: 18° ± 5° BTDC M/T: 7° ± 5° BTDC
Throttle position sensor idle position V		0.15 - 0.85

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electrical load: OFF (Lights & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Mass Air Flow Sensor

UBS00267

Supply voltage V	Battery voltage (11 - 14)
Output voltage V	1.0 - 1.7
Mass air flow (Using CONSULT-II or GST) g·m/sec	1.4 - 4.0 at idle* 5.0 - 10.0 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and idling under no-load.

Engine Coolant Temperature Sensor

UBS00268

Temperature °C (°F)	Resistance kΩ
25 (77)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Fuel Pump

UBS0026A

Resistance [at 25°C (77°F)] Ω	0.2 - 5.0

Injector

UBS0026C

Resistance [at 20°C (68°F)] Ω	13.5 - 17.5

Resistor

UBS006IW

Resistance [at 25°C (77°F)] Ω	4 - 8

Throttle Control Motor

UBS006J4

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Air Fuel Ratio (A/F) Sensor 1 Heater

UBS0026F

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

Calculated Load Value

UBS0026G

	Calculated load value % (Using CONSULT-II or GST)
At idle	20.0 - 35.5
At 2,500 rpm	17.0 - 30.0

Intake Air Temperature Sensor

UBS0026H

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

Heated Oxygen Sensor 2 Heater

UBS0026J

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

Crankshaft Position Sensor (POS)

UBS0026K

Resistance [at 20°C (68°F)] Ω	166 - 204

Fuel Tank Temperature Sensor

UBS0026L

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

INDEX FOR DTC

PFP:00024

Alphabetical Index

UBS0026N

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1350, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

×: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
A/T 1ST GR FNCTN	P0731	0731	2	×	AT-512
A/T 2ND GR FNCTN	P0732	0732	2	×	AT-517
A/T 3RD GR FNCTN	P0733	0733	2	×	AT-522
A/T 4TH GR FNCTN	P0734	0734	2	×	AT-527
A/T TCC S/V FNCTN	P0744	0744	2	×	AT-539
APP SEN 1/CIRC	P2122	2122	1	×	EC-1751
APP SEN 1/CIRC	P2123	2123	1	×	EC-1751
APP SEN 2/CIRC	P2127	2127	1	×	EC-1757
APP SEN 2/CIRC	P2128	2128	1	×	EC-1757
APP SENSOR	P2138	2138	1	×	EC-1770
ASCD BRAKE SW	P1572	1572	1	—	EC-1730
ASCD SW	P1564	1564	1	—	EC-1723
ASCD VHL SPD SEN	P1574	1574	1	—	EC-1740
ATF TEMP SEN/CIRC	P0710	0710	2	×	AT-497
BRAKE SW/CIRCUIT	P1805	1805	2	—	EC-1746
CAN COMM CIRCUIT	U1000	1000*5	1	×	EC-1350
CAN COMM CIRCUIT	U1001	1001*5	2	—	EC-1350
CKP SEN/CIRCUIT	P0335	0335	2	×	EC-1490
CLOSED LOOP-B1	P1148	1148	1	×	EC-1649
CMP SEN/CIRC-B1	P0340	0340	2	×	EC-1496
CTP LEARNING	P1225	1225	2	—	EC-1664
CTP LEARNING	P1226	1226	2	—	EC-1666
CYL 1 MISFIRE	P0301	0301	2	×	EC-1481
CYL 2 MISFIRE	P0302	0302	2	×	EC-1481
CYL 3 MISFIRE	P0303	0303	2	×	EC-1481
CYL 4 MISFIRE	P0304	0304	2	×	EC-1481
ECM	P0605	0605	1 or 2	× or —	EC-1583
ECM BACK UP/CIRC	P1065	1065	2	×	EC-1590
ECT SEN/CIRCUIT	P0117	0117	1	×	EC-1386
ECT SEN/CIRCUIT	P0118	0118	1	×	EC-1386
ECT SENSOR	P0125	0125	1	×	EC-1398
ENG OVER TEMP	P0217	0217	1	×	EC-1461
ENG OVER TEMP	P1217	1217	1	×	EC-1651
ENGINE SPEED SIG	P0725	0725	2	×	AT-508
ETC ACTR	P1121	1121	1 or 2	×	EC-1604
ETC FUNCTION/CIRC	P1122	1122	1	×	EC-1606
ETC MOT	P1128	1128	1	×	EC-1618

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
ETC MOT PWR	P1124	1124	1	×	EC-1613
ETC MOT PWR	P1126	1126	1	×	EC-1613
EVAP GROSS LEAK	P0455	0455	2	×	EC-1547
EVAP PURG FLOW/MON	P0441	0441	2	×	EC-1507
EVAP SMALL LEAK	P0442	0442	2	×	EC-1513
EVAP SYS PRES SEN	P0452	0452	2	×	EC-1534
EVAP SYS PRES SEN	P0453	0453	2	×	EC-1540
EVAP VERY SML LEAK	P0456	0456	2	×	EC-1555
EVAP VERY SML LEAK	P1456	1456	2	×	EC-1695
FTT SEN/CIRCUIT	P0182	0182	2	×	EC-1457
FTT SEN/CIRCUIT	P0183	0183	2	×	EC-1457
FTT SENSOR	P0181	0181	2	×	EC-1455
FUEL LEV SEN SLOSH	P0460	0460	2	×	EC-1564
FUEL LEVEL SEN/CIRC	P1464	1464	2	×	EC-1704
FUEL LEVEL SENSOR	P0461	0461	2	×	EC-1569
FUEL LEVL SEN/CIRC	P0462	0462	2	×	EC-1571
FUEL LEVL SEN/CIRC	P0463	0463	2	×	EC-1571
FUEL SYS-LEAN-B1	P0171	0171	2	×	EC-1442
FUEL SYS-RICH-B1	P0172	0172	2	×	EC-1449
HO2S1 (B1)	P0132	0132	2	×	EC-1406
HO2S1 (B1)	P0133	0133	2	×	EC-1412
HO2S1 (B1)	P0134	0134	2	×	EC-1421
HO2S1 (B1)	P1143	1143	2	×	EC-1623
HO2S1 (B1)	P1144	1144	2	×	EC-1629
HO2S1 HTR (B1)	P0031	0031	2	×	EC-1356
HO2S1 HTR (B1)	P0032	0032	2	×	EC-1356
HO2S2 (B1)	P0138	0138	2	×	EC-1428
HO2S2 (B1)	P0139	0139	2	×	EC-1435
HO2S2 (B1)	P1146	1146	2	×	EC-1635
HO2S2 (B1)	P1147	1147	2	×	EC-1642
HO2S2 HTR (B1)	P0037	0037	2	×	EC-1362
HO2S2 HTR (B1)	P0038	0038	2	×	EC-1362
IAT SEN/CIRCUIT	P0112	0112	2	×	EC-1381
IAT SEN/CIRCUIT	P0113	0113	2	×	EC-1381
IAT SENSOR	P0127	0127	2	×	EC-1401
INT/V TIM CONT-B1	P0011	0011	2	×	EC-1353
INT/V TIM V/CIR-B1	P1111	1111	2	×	EC-1600
ISC SYSTEM	P0506	0506	2	×	EC-1579
ISC SYSTEM	P0507	0507	2	×	EC-1581
KNOCK SEN/CIRC-B1	P0327	0327	2	—	EC-1486
KNOCK SEN/CIRC-B1	P0328	0328	2	—	EC-1486
L/PRESS SOL/CIRC	P0745	0745	2	×	AT-547

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
MAF SEN/CIRCUIT	P0101	0101	1	×	EC-1368
MAF SEN/CIRCUIT	P0102	0102	1	×	EC-1375
MAF SEN/CIRCUIT	P0103	0103	1	×	EC-1375
MAF SENSOR	P1102	1102	1	×	EC-1594
MIL/CIRC	P0650	0650	2	—	EC-1586
MULTI CYL MISFIRE	P0300	0300	2	×	EC-1481
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	2	—	EC-1275
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	—	Flashing*4	EC-1276
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	**—**
O/R CLTCH SOL/CIRC	P1760	1760	2	×	AT-568
P-N POS SW/CIRCUIT	P1706	1706	2	×	EC-1742
PNP SW/CIRC	P0705	0705	2	×	AT-491
PURG VOLUME CONT/V	P0444	0444	2	×	EC-1521
PURG VOLUME CONT/V	P0445	0445	2	×	EC-1521
PURG VOLUME CONT/V	P1444	1444	2	×	EC-1672
SENSOR POWER/CIRC	P1229	1229	1	×	EC-1668
SFT SOL A/CIRC	P0750	0750	1	×	AT-553
SFT SOL B/CIRC	P0755	0755	1	×	AT-558
TCC SOLENOID/CIRC	P0740	0740	2	×	AT-534
THERMSTAT FNCTN	P0128	0128	2	×	EC-1404
TP SEN 1/CIRC	P0222	0222	1	×	EC-1475
TP SEN 1/CIRC	P0223	0223	1	×	EC-1475
TP SEN 2/CIRC	P0122	0122	1	×	EC-1391
TP SEN 2/CIRC	P0123	0123	1	×	EC-1391
TP SENSOR	P2135	2135	1	×	EC-1763
TPV SEN/CIRC A/T	P1705	1705	1	×	AT-563
TW CATALYST SYS-B1	P0420	0420	2	×	EC-1502
VC CUT/V BYPASS/V	P1491	1491	2	×	EC-1714
VC/V BYPASS/V	P1490	1490	2	×	EC-1707
VEH SPD SEN/CIR AT*6	P0720	0720	2	×	AT-503
VEH SPEED SEN/CIRC*6	P0500	0500	2	×	EC-1575
VENT CONTROL VALVE	P0447	0447	2	×	EC-1527
VENT CONTROL VALVE	P1446	1446	2	×	EC-1680
VENT CONTROL VALVE	P1448	1448	2	×	EC-1687

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

DTC No. Index

UBS0026O

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1350, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

×: Applicable —: Not applicable

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	—	Flashing*4	EC-1276
U1000	1000*5	CAN COMM CIRCUIT	1	×	EC-1350
U1001	1001*5	CAN COMM CIRCUIT	2	—	EC-1350
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	—
P0011	0011	INT/V TIM CONT-B1	2	×	EC-1353
P0031	0031	HO2S1 HTR (B1)	2	×	EC-1356
P0032	0032	HO2S1 HTR (B1)	2	×	EC-1356
P0037	0037	HO2S2 HTR (B1)	2	×	EC-1362
P0038	0038	HO2S2 HTR (B1)	2	×	EC-1362
P0101	0101	MAF SEN/CIRCUIT	1	×	EC-1368
P0102	0102	MAF SEN/CIRCUIT	1	×	EC-1375
P0103	0103	MAF SEN/CIRCUIT	1	×	EC-1375
P0112	0112	IAT SEN/CIRCUIT	2	×	EC-1381
P0113	0113	IAT SEN/CIRCUIT	2	×	EC-1381
P0117	0117	ECT SEN/CIRCUIT	1	×	EC-1386
P0118	0118	ECT SEN/CIRCUIT	1	×	EC-1386
P0122	0122	TP SEN 2/CIRC	1	×	EC-1391
P0123	0123	TP SEN 2/CIRC	1	×	EC-1391
P0125	0125	ECT SENSOR	1	×	EC-1398
P0127	0127	IAT SENSOR	2	×	EC-1401
P0128	0128	THERMSTAT FNCTN	2	×	EC-1404
P0132	0132	HO2S1 (B1)	2	×	EC-1406
P0133	0133	HO2S1 (B1)	2	×	EC-1412
P0134	0134	HO2S1 (B1)	2	×	EC-1421
P0138	0138	HO2S2 (B1)	2	×	EC-1428
P0139	0139	HO2S2 (B1)	2	×	EC-1435
P0171	0171	FUEL SYS-LEAN-B1	2	×	EC-1442
P0172	0172	FUEL SYS-RICH-B1	2	×	EC-1449
P0181	0181	FTT SENSOR	2	×	EC-1455
P0182	0182	FTT SEN/CIRCUIT	2	×	EC-1457
P0183	0183	FTT SEN/CIRCUIT	2	×	EC-1457
P0217	0217	ENG OVER TEMP	1	×	EC-1461
P0222	0222	TP SEN 1/CIRC	1	×	EC-1475
P0223	0223	TP SEN 1/CIRC	1	×	EC-1475
P0300	0300	MULTI CYL MISFIRE	2	×	EC-1481

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P0301	0301	CYL 1 MISFIRE	2	×	EC-1481
P0302	0302	CYL 2 MISFIRE	2	×	EC-1481
P0303	0303	CYL 3 MISFIRE	2	×	EC-1481
P0304	0304	CYL 4 MISFIRE	2	×	EC-1481
P0327	0327	KNOCK SEN/CIRC-B1	2	—	EC-1486
P0328	0328	KNOCK SEN/CIRC-B1	2	—	EC-1486
P0335	0335	CKP SEN/CIRCUIT	2	×	EC-1490
P0340	0340	CMP SEN/CIRC-B1	2	×	EC-1496
P0420	0420	TW CATALYST SYS-B1	2	×	EC-1502
P0441	0441	EVAP PURG FLOW/MON	2	×	EC-1507
P0442	0442	EVAP SMALL LEAK	2	×	EC-1513
P0444	0444	PURG VOLUME CONT/V	2	×	EC-1521
P0445	0445	PURG VOLUME CONT/V	2	×	EC-1521
P0447	0447	VENT CONTROL VALVE	2	×	EC-1527
P0452	0452	EVAP SYS PRES SEN	2	×	EC-1534
P0453	0453	EVAP SYS PRES SEN	2	×	EC-1540
P0455	0455	EVAP GROSS LEAK	2	×	EC-1547
P0456	0456	EVAP VERY SML LEAK	2	×	EC-1555
P0460	0460	FUEL LEV SEN SLOSH	2	×	EC-1564
P0461	0461	FUEL LEVEL SENSOR	2	×	EC-1569
P0462	0462	FUEL LEVL SEN/CIRC	2	×	EC-1571
P0463	0463	FUEL LEVL SEN/CIRC	2	×	EC-1571
P0500	0500	VEH SPEED SEN/CIRC*6	2	×	EC-1575
P0506	0506	ISC SYSTEM	2	×	EC-1579
P0507	0507	ISC SYSTEM	2	×	EC-1581
P0605	0605	ECM	1 or 2	× or —	EC-1583
P0650	0650	MIL/CIRC	2	—	EC-1586
P0705	0705	PNP SW/CIRC	2	×	AT-491
P0710	0710	ATF TEMP SEN/CIRC	2	×	AT-497
P0720	0720	VEH SPD SEN/CIR AT*6	2	×	AT-503
P0725	0725	ENGINE SPEED SIG	2	×	AT-508
P0731	0731	A/T 1ST GR FNCTN	2	×	AT-512
P0732	0732	A/T 2ND GR FNCTN	2	×	AT-517
P0733	0733	A/T 3RD GR FNCTN	2	×	AT-522
P0734	0734	A/T 4TH GR FNCTN	2	×	AT-527
P0740	0740	TCC SOLENOID/CIRC	2	×	AT-534
P0744	0744	A/T TCC S/V FNCTN	2	×	AT-539
P0745	0745	L/PRESS SOL/CIRC	2	×	AT-547
P0750	0750	SFT SOL A/CIRC	1	×	AT-553
P0755	0755	SFT SOL B/CIRC	1	×	AT-558
P1065	1065	ECM BACK UP/CIRC	2	×	EC-1590
P1102	1102	MAF SENSOR	1	×	EC-1594

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P1111	1111	INT/V TIM V/CIR-B1	2	×	EC-1600
P1121	1121	ETC ACTR	1 or 2	×	EC-1604
P1122	1122	ETC FUNCTION/CIRC	1	×	EC-1606
P1124	1124	ETC MOT PWR	1	×	EC-1613
P1126	1126	ETC MOT PWR	1	×	EC-1613
P1128	1128	ETC MOT	1	×	EC-1618
P1143	1143	HO2S1 (B1)	2	×	EC-1623
P1144	1144	HO2S1 (B1)	2	×	EC-1629
P1146	1146	HO2S2 (B1)	2	×	EC-1635
P1147	1147	HO2S2 (B1)	2	×	EC-1642
P1148	1148	CLOSED LOOP-B1	1	×	EC-1649
P1217	1217	ENG OVER TEMP	1	×	EC-1651
P1225	1225	CTP LEARNING	2	—	EC-1664
P1226	1226	CTP LEARNING	2	—	EC-1666
P1229	1229	SENSOR POWER/CIRC	1	×	EC-1668
P1444	1444	PURG VOLUME CONT/V	2	×	EC-1672
P1446	1446	VENT CONTROL VALVE	2	×	EC-1680
P1448	1448	VENT CONTROL VALVE	2	×	EC-1687
P1456	1456	EVAP VERY SML LEAK	2	×	EC-1695
P1464	1464	FUEL LEVEL SEN/CIRC	2	×	EC-1704
P1490	1490	VC/V BYPASS/V	2	×	EC-1707
P1491	1491	VC CUT/V BYPASS/V	2	×	EC-1714
P1564	1564	ASCD SW	1	—	EC-1723
P1572	1572	ASCD BRAKE SW	1	—	EC-1730
P1574	1574	ASCD VHL SPD SEN	1	—	EC-1740
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	2	—	EC-1275
P1705	1705	TPV SEN/CIRC A/T	1	×	AT-563
P1706	1706	P-N POS SW/CIRCUIT	2	×	EC-1742
P1760	1760	O/R CLTCH SOL/CIRC	2	×	AT-568
P1805	1805	BRAKE SW/CIRCUIT	2	—	EC-1746
P2122	2122	APP SEN 1/CIRC	1	×	EC-1751
P2123	2123	APP SEN 1/CIRC	1	×	EC-1751
P2127	2127	APP SEN 2/CIRC	1	×	EC-1757
P2128	2128	APP SEN 2/CIRC	1	×	EC-1757
P2135	2135	TP SENSOR	1	×	EC-1763
P2138	2138	APP SENSOR	1	×	EC-1770

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

UBS0026P

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

On Board Diagnostic (OBD) System of Engine and A/T

UBS0026Q

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MIL) to warn the driver of a malfunction causing emission deterioration.

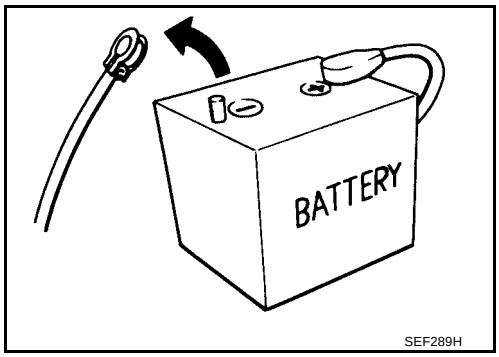
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-46, "HARNESS CONNECTOR" .**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

Precaution

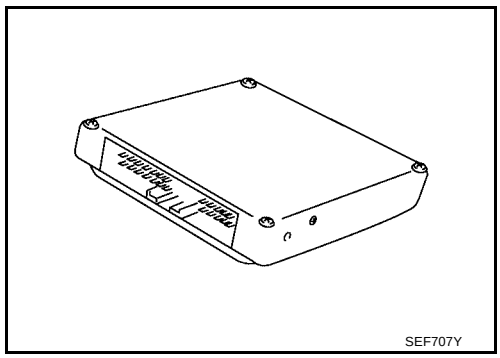
UBS0026R

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**

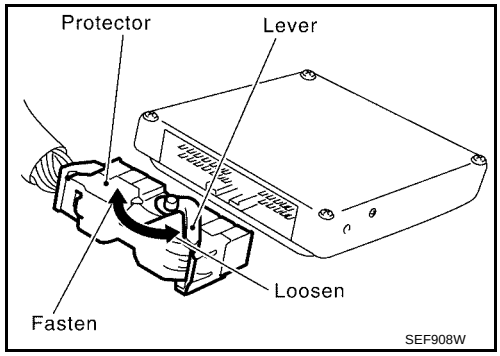


SEF289H

- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

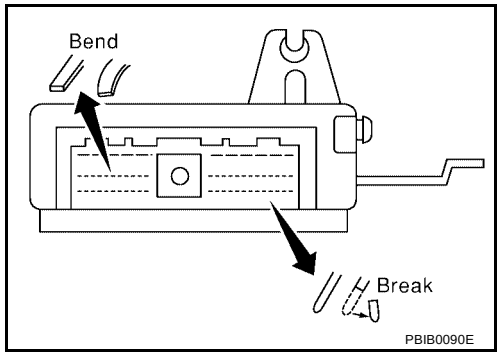

SEF707Y

- **When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown at right.**



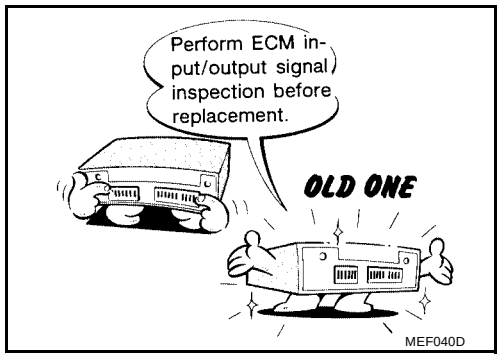
SEF908W

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



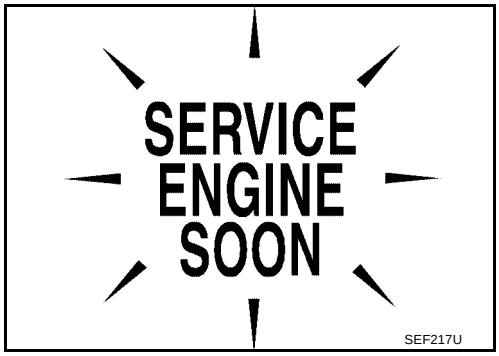
PBIB0090E

- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-1307 .**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

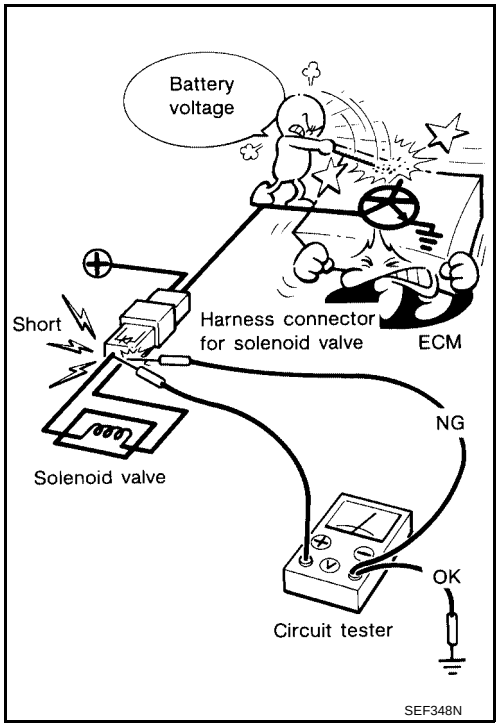


MEF040D

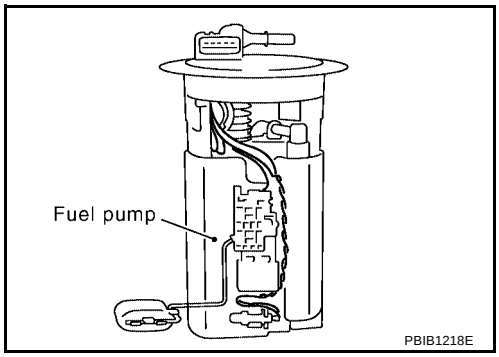
- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



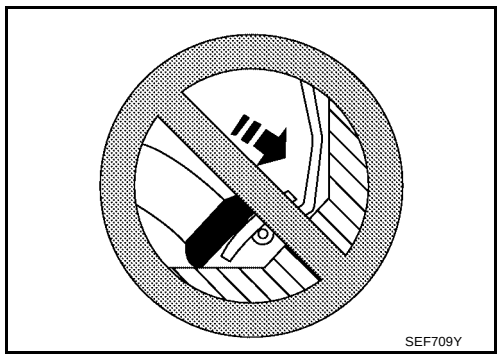
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**



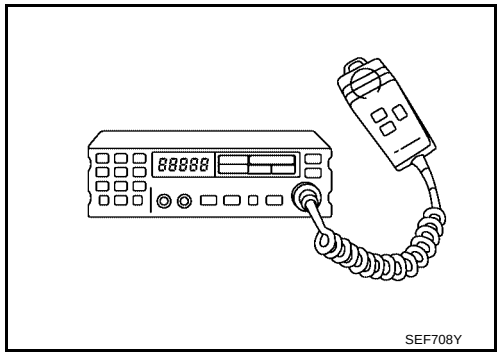
- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**


SEF708Y

Wiring Diagrams and Trouble Diagnosis

UBS0026S

When you read wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams"
- PG-2, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"

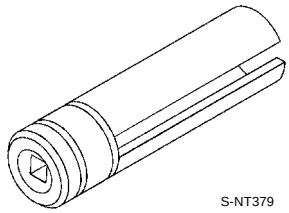
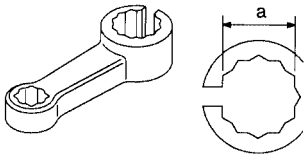
PREPARATION

PFP:00002

Special Service Tools

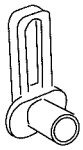
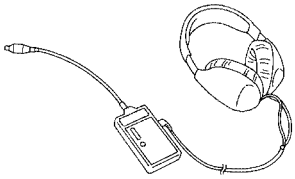
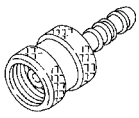
UBS0026T

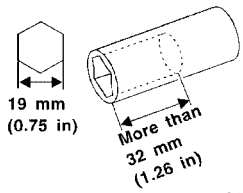
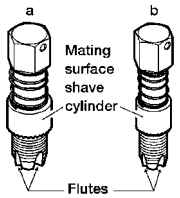
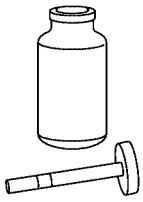
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number Tool name (Kent-Moore No.)	Description	
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensors **a: 22 mm (0.87 in)**
Fuel filler cap adapter (J-45356)	 S-NT815	Checking fuel tank vacuum relief valve opening pressure

Commercial Service Tools

UBS0026U

Tool name (Kent-Moore No.)	Description	
Quick connector release	 PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
Leak detector ie: (J41416)	 S-NT703	Locating the EVAP leak
EVAP service port adapter ie: (J41413-OBD)	 S-NT704	Applying positive pressure through EVAP service port

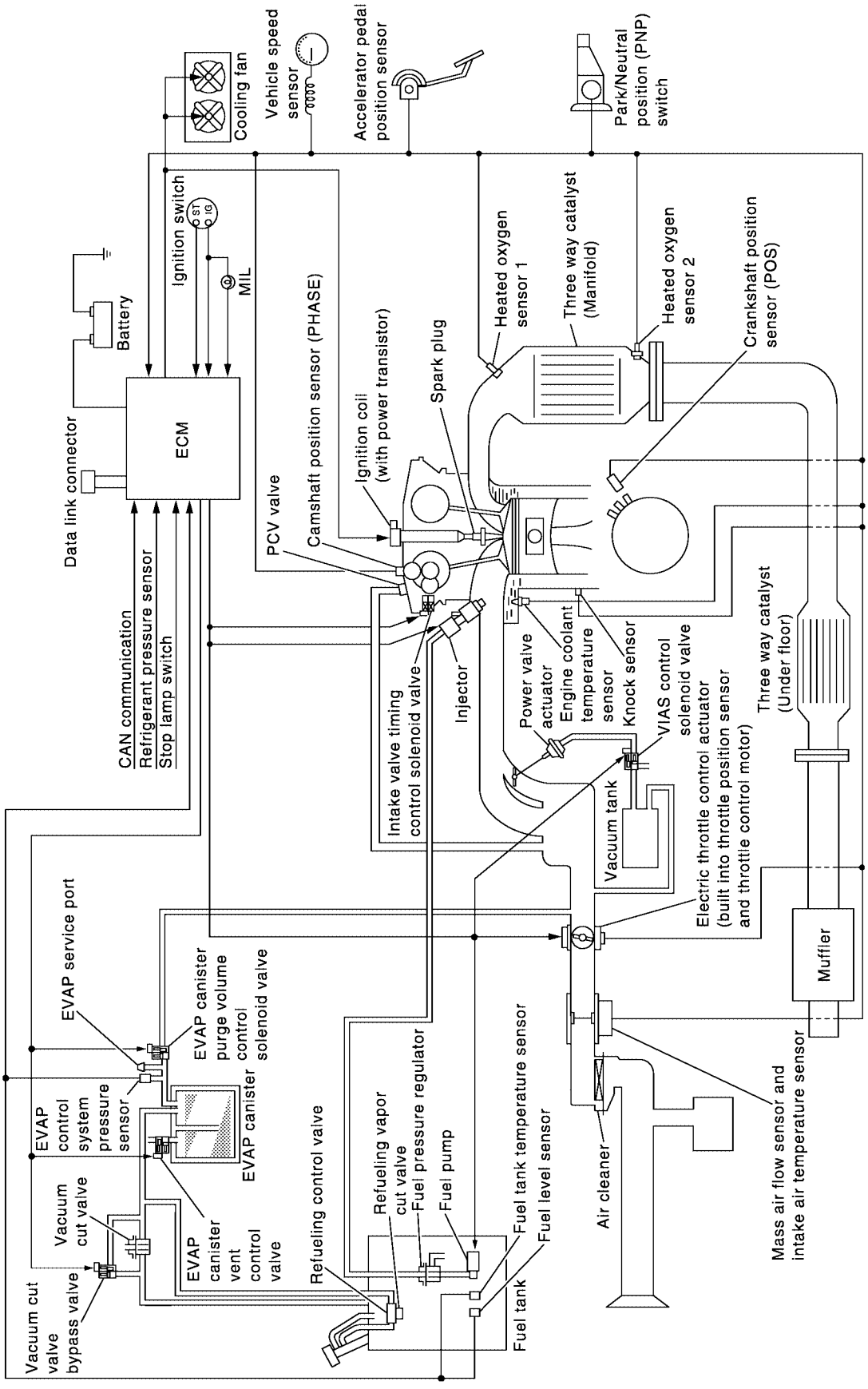
Tool name (Kent-Moore No.)	Description	
Socket wrench	 S-NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner ie: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant ie: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

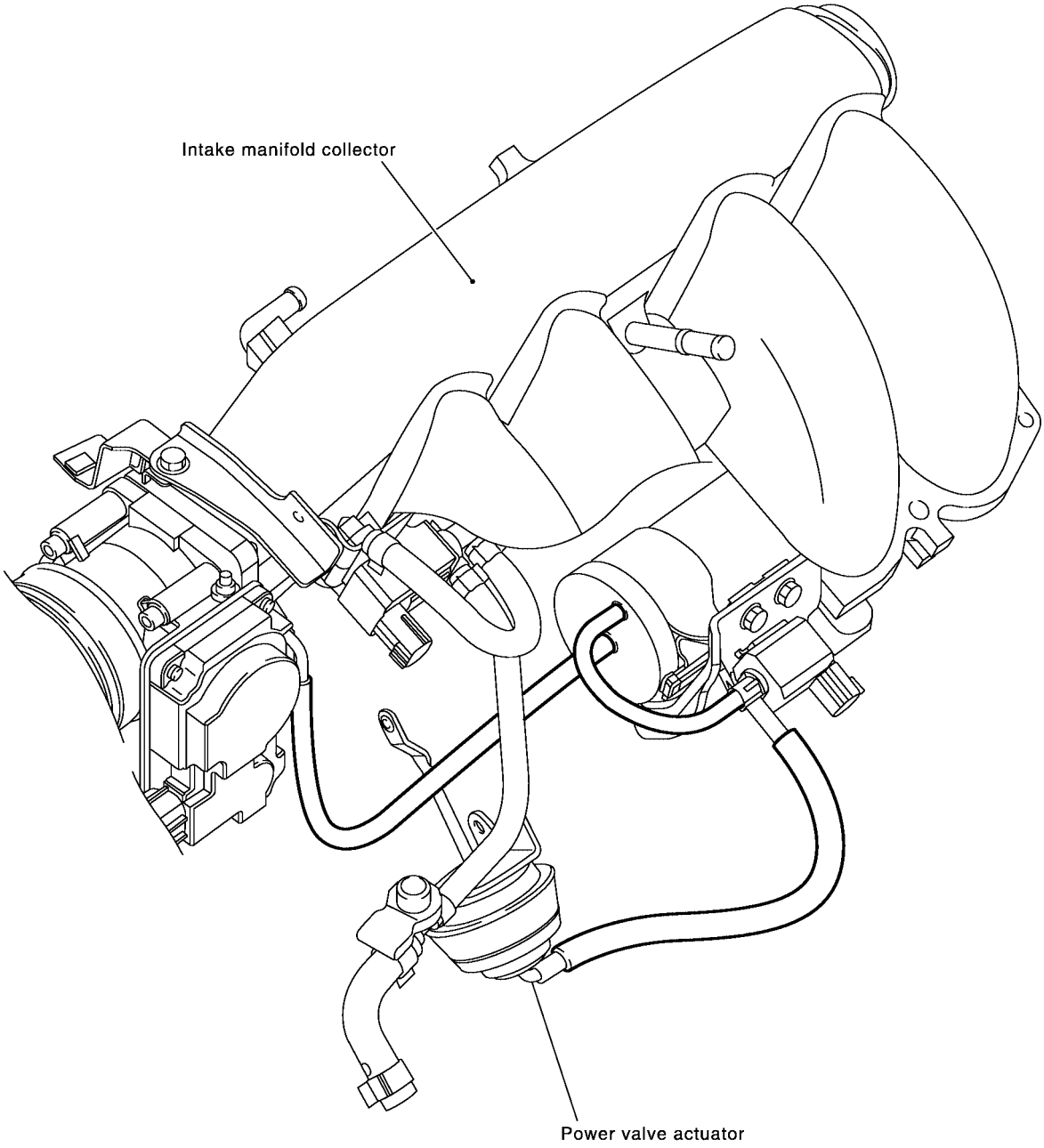
UBS0026V



PBIB1261E

Vacuum Hose Drawing

UBS0026W



PBIB1265E

Refer to EC-1236, "System Diagram" for Vacuum Control System.

System Chart

UBS0026X

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering oil pressure switch ● Ignition switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● Stop lamp switch ● ASCD steering switch ● ASCD brake switch ● ASCD clutch switch ● Fuel level sensor*1 ● EVAP control system pressure sensor ● Fuel tank temperature sensor*1 ● Heated oxygen sensor 2 *2 ● TCM (Transmission control module) *3 ● Air conditioner switch ● Vehicle speed sensor ● Electrical load signal	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	ASCD vehicle speed control	Electric throttle control actuator
	On board diagnostic system	MIL (On the instrument panel)
	Power valve control	VIAS control solenoid valve
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay
	Cooling fan control	Cooling fan relays
	ON BOARD DIAGNOSIS for EVAP system	● EVAP canister vent control valve ● Vacuum cut valve bypass valve

*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.
*2: This sensor is not used to control the engine system under normal conditions.
*3: The signal is sent to the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

UBS0026Y

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Fuel injection & mixture ratio control	Fuel injectors
Camshaft position sensor (PHASE)	Engine speed and piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Ignition switch	Start signal		
Knock sensor	Engine knocking condition		
Battery	Battery voltage		
Power steering oil pressure switch	Power steering operation		
Heated oxygen sensor 2 *	Density of oxygen in exhaust gas		
Vehicle speed sensor	Vehicle speed		
Air conditioner switch	Air conditioner operation		

*: Under normal conditions, this sensor is not for engine control operation.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the crankshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

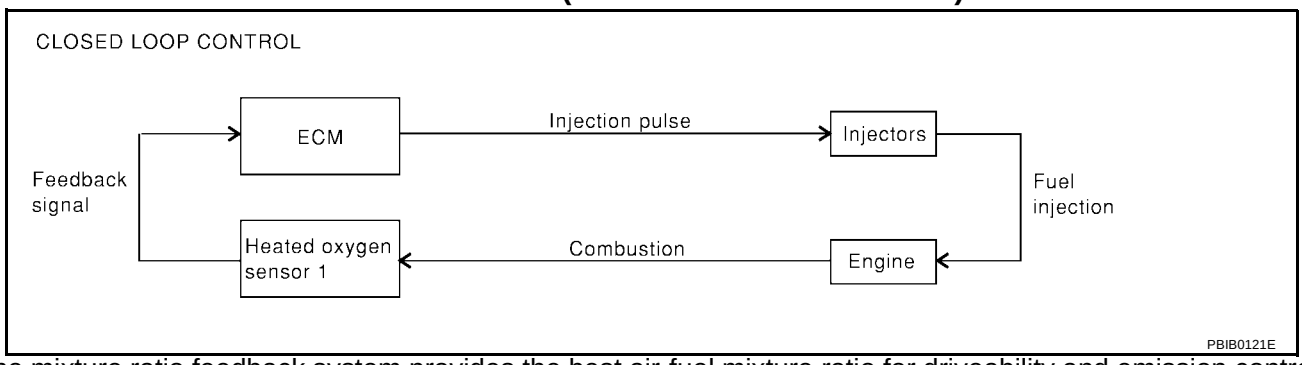
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (A/T models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-1406 . This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

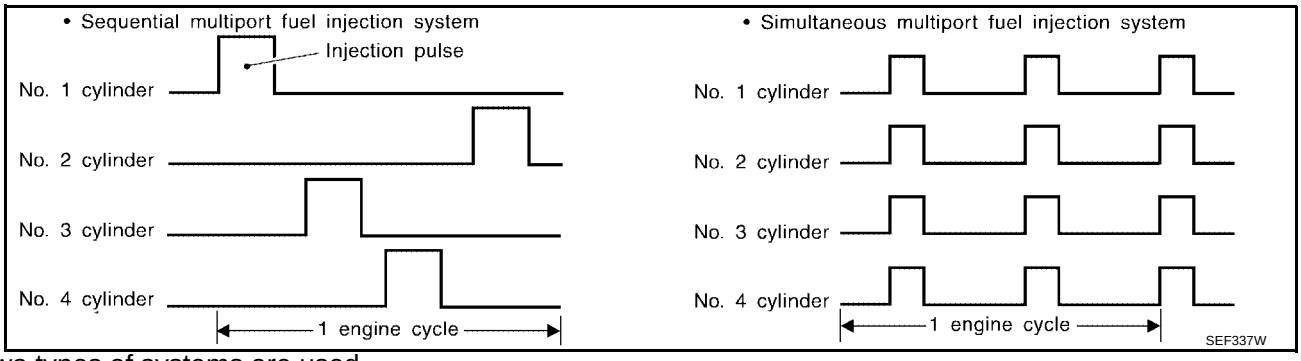
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (A/T models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

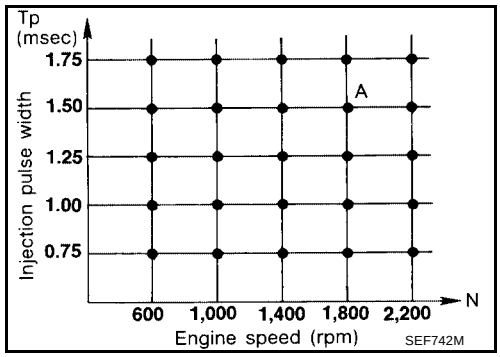
UBS0026Z

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Ignition timing control	Power transistor
Camshaft position sensor (PHASE)	Engine speed and piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Ignition switch	Start signal		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed		

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.



- At starting
- During warm-up
- At idle

- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

UBS00270

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle position		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering oil pressure switch	Power steering operation		
Vehicle speed sensor	Vehicle speed		

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Fuel Cut Control (at No Load and High Engine Speed)

UBS00271

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed sensor	Vehicle speed		

SYSTEM DESCRIPTION

If the engine speed is above 1,800 rpm with no load (for example, in neutral and engine speed over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

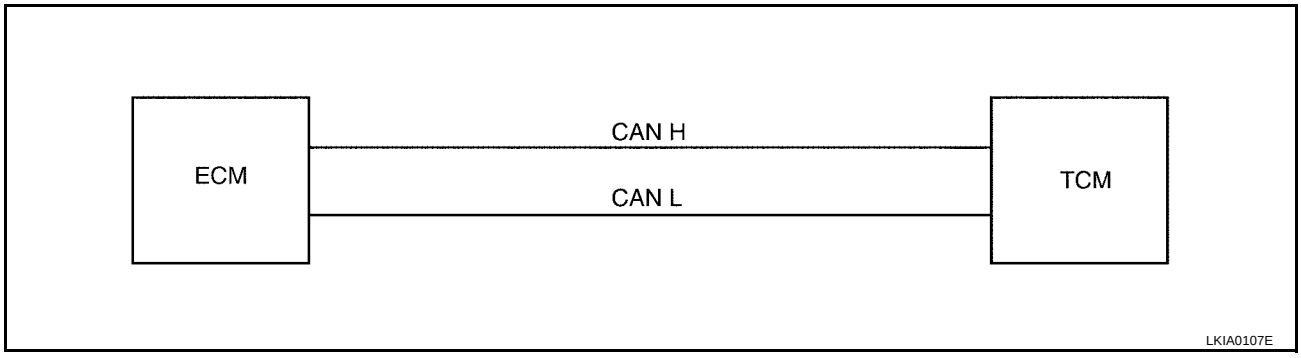
NOTE:
This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-1239 .

CAN communication

UBS00272

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	TCM
Accelerator pedal position signal	T	R
Output shaft revolution signal	R	T
A/T self-diagnosis signal	R	T
Wide open throttle position signal	T	R
Overdrive cancel signal	T	R

BASIC SERVICE PROCEDURE

PFP:00018

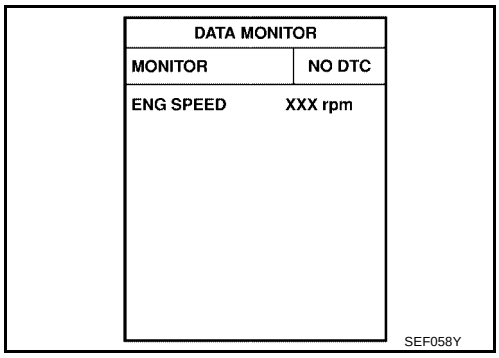
Idle Speed and Ignition Timing Check

UBS00273

IDLE SPEED

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.



With GST

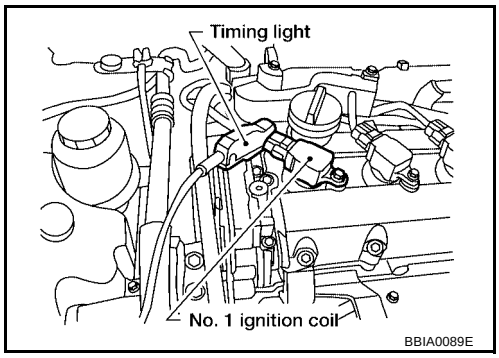
Check idle speed in “MODE 1” with GST.

IGNITION TIMING

Any of following two methods may be used.

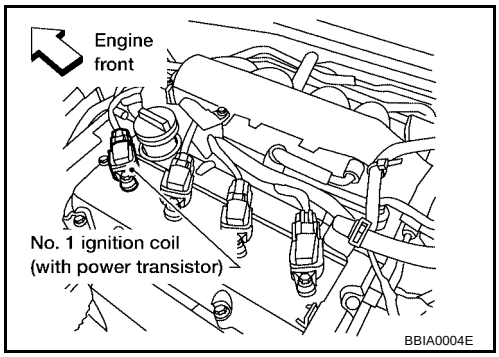
Method A

1. Slide the harness protector off ignition coil No. 1 to clear the wires.
2. Attach timing light to the wires as shown in the figure.
3. Check ignition timing.

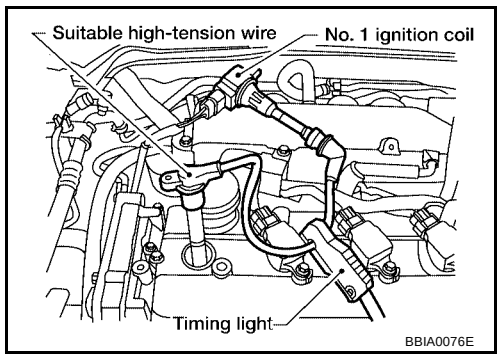


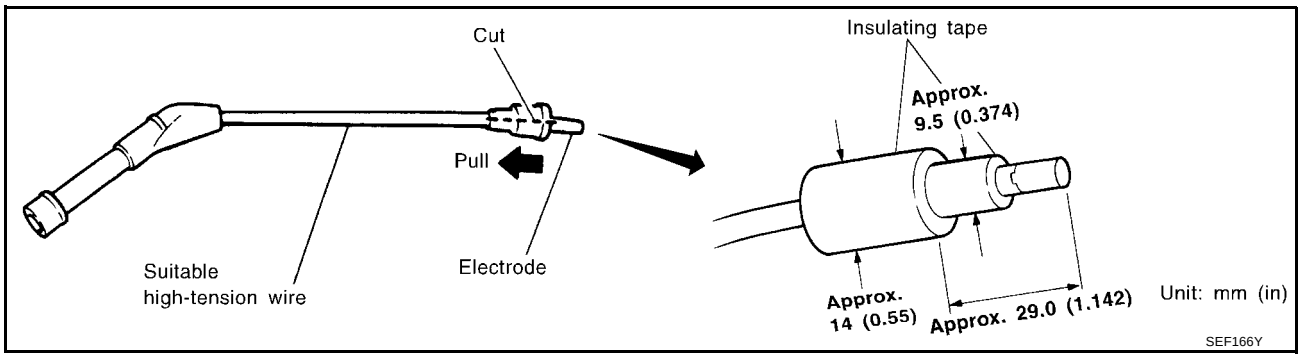
Method B

1. Remove No. 1 ignition coil.

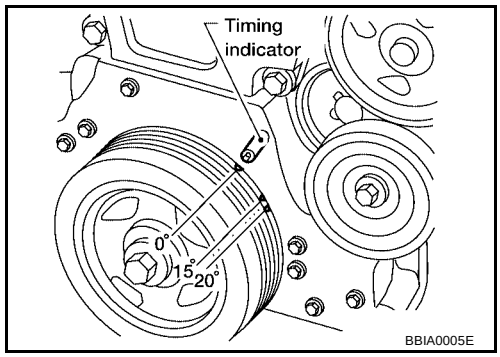


2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.



Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

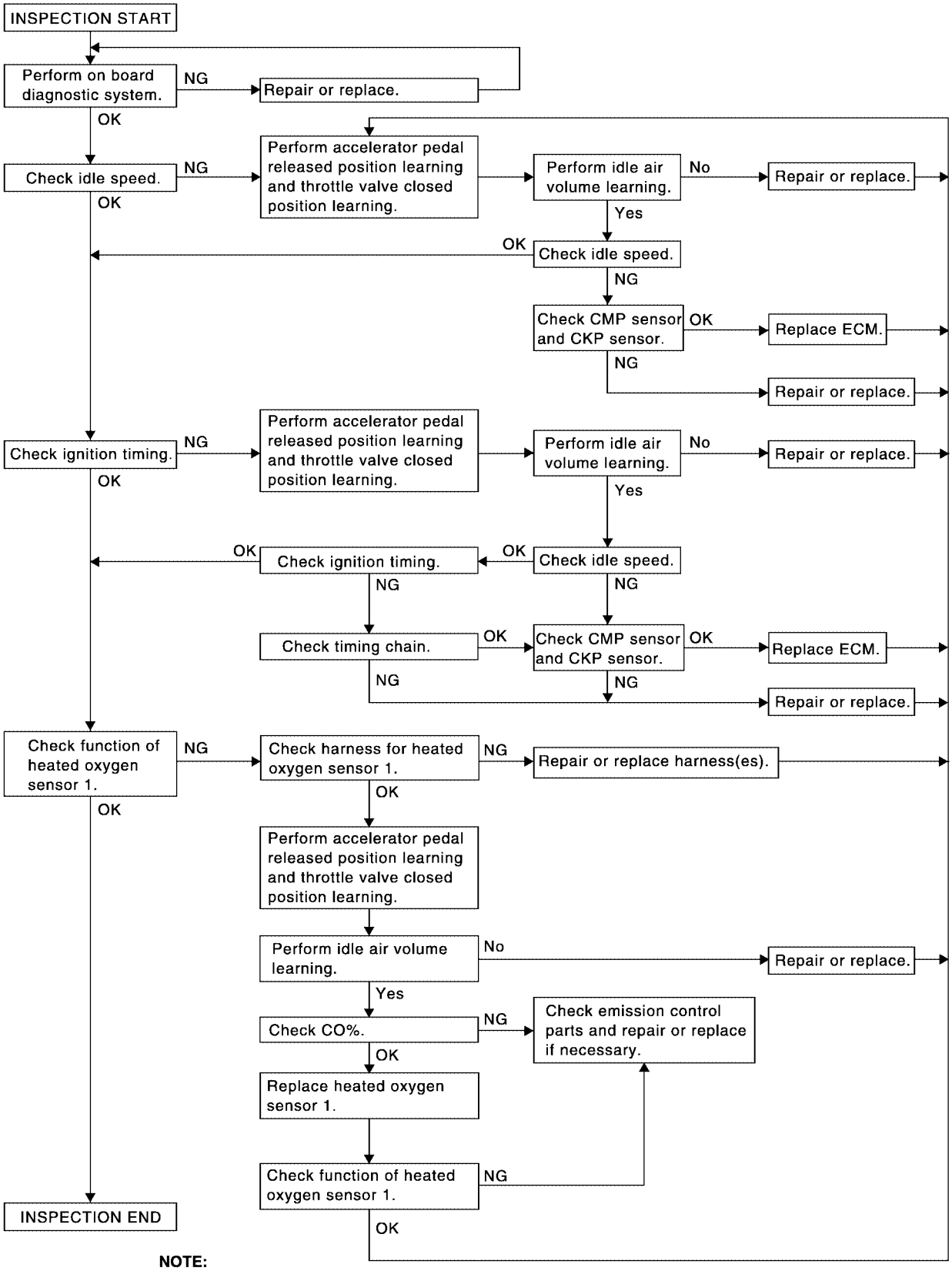
UBS00274

PREPARATION

1. Make sure that the following parts are in good order.
   - Battery
   - Ignition system
   - Engine oil and coolant levels
   - Fuses
   - ECM harness connector
   - Vacuum hoses
   - Air intake system
     (Oil filler cap, oil level gauge, etc.)
   - Fuel pressure
   - Engine compression
   - Throttle valve
   - Evaporative emission system
2. On air conditioner equipped models, checks should be carried out while the air conditioner is “OFF”.
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in “N” position.
4. When measuring “CO” percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear window defogger.

6. Keep front wheels pointed straight ahead.

OVERALL INSPECTION SEQUENCE



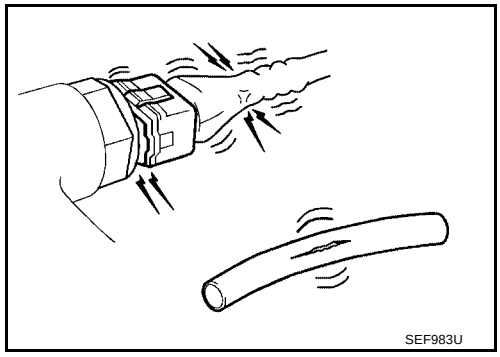
NOTE:
If a vehicle contains a part which is operating outside of design specifications with no MIL illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system cannot reasonably be expected to detect the resulting malfunction.

PBIB1054E

INSPECTION PROCEDURE

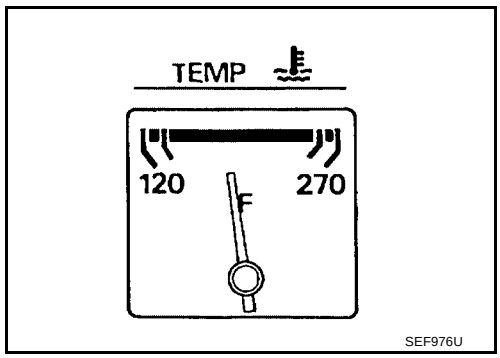
1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket


SEF983U

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.

4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.

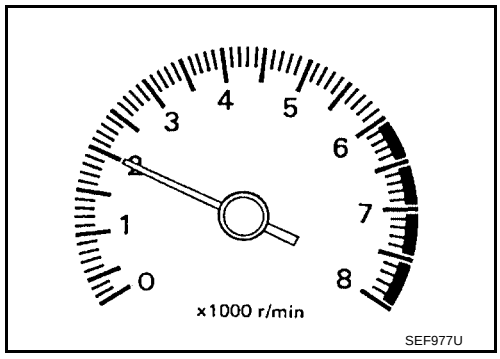


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

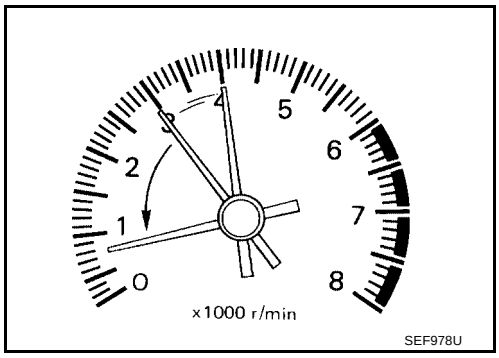
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

With CONSULT-II

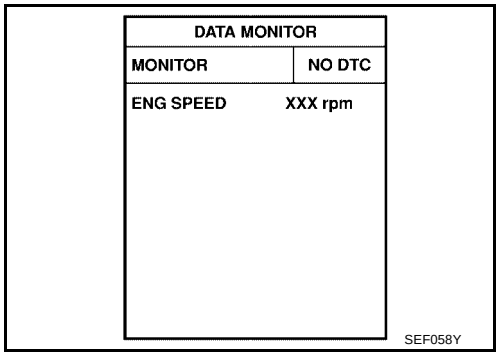
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm

A/T: 700 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 700 ± 50 rpm

A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-1255, "Idle Air Volume Learning" .
Is the ″Idle Air Volume Learning″ carried out successfully?
Yes or No

Yes >> GO TO 7.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1496 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1490 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 15 ± 5° BTDC

A/T: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK (With CONSULT-II)>>GO TO 19.
OK (Without CONSULT-II)>>GO TO 20.
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-1255, "Idle Air Volume Learning" .
Is the ″Idle Air Volume Learning″ carried out successfully?

Yes or No

Yes >> GO TO 14.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm

A/T: 700 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm

A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 15 ± 5° BTDC
A/T: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK (With CONSULT-II)>>GO TO 19.
OK (Without CONSULT-II)>>GO TO 20.
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-134, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1496 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1490 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

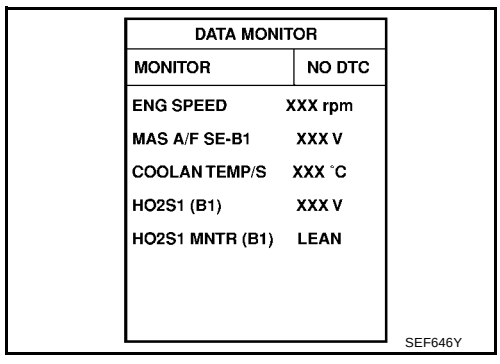
>> GO TO 4.

19. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.

1 time: RICH → LEAN → RICH
2 times: RICH → LEAN → RICH → LEAN → RICH



OK or NG

OK >> **INSPECTION END**
NG (Monitor does not fluctuate.)>>GO TO 21.
NG (Monitor fluctuates less than 5 times.)>>GO TO 28.

20. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

Without CONSULT-II

1. Stop engine and set ECM to Self-diagnostic mode II (Heated oxygen sensor 1 monitor). Refer to EC-1276, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
2. Start engine and run it at about 2,000 rpm for about 2 minutes under no-load.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the MIL comes on more than 5 times during 10 seconds.

OK or NG

OK >> **INDPECTION END**
NG (MIL does not come on)>>GO TO 21.
NG (MIL comes on less than 5 times)>>GO TO 28.

21. CHECK HEATED OXYGEN SENSOR 1 HARNESS

1. Turn ignition switch “OFF” and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect heated oxygen sensor 1 harness connector.
4. Check harness continuity between ECM terminal 92 and heated oxygen sensor 1 terminal 1. Refer to EC-1408, "Wiring Diagram" .

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 22.
NG >> 1. Repair or replace harness between ECM and heated oxygen sensor 1.
2. GO TO 4.

22. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Reconnect ECM harness connector.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 23.

23. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 24.

24. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1255, "Idle Air Volume Learning" .
Is the ″Idle Air Volume Learning″ carried out successfully?

Yes or No

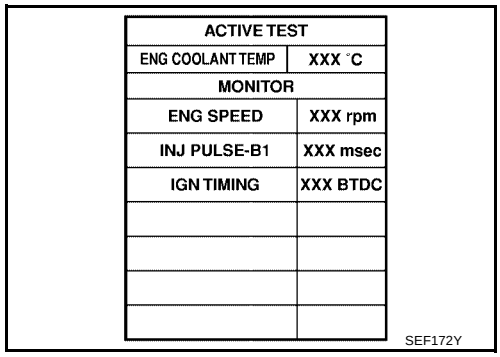
Yes (With CONSULT-II)>>GO TO 25.
Yes (Without CONSULT-II)>>GO TO 26.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

25. CHECK “CO”%

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Select “ENG COOLANT TEMP” in “ACTIVE TEST” mode.
4. Set “ENG COOLANT TEMP” to 5°C (41°F) by touching “DWN” and “Qd”.
5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
6. Check “CO”%.

Idle CO: 0.3 – 9.5% and engine runs smoothly.



OK or NG

OK >> GO TO 28.
NG >> GO TO 27.

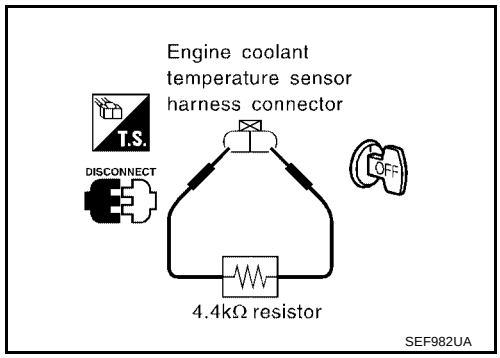
26. CHECK “CO”%

Without CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
2. Turn ignition switch “OFF”.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.
5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
6. Check “CO”%.

Idle CO: 0.3 – 9.5% and engine runs smoothly.

7. After checking “CO”%, turn ignition switch “OFF”, disconnect the resistor from the terminals of engine coolant temperature sensor harness connector, and then connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.



OK or NG

OK >> GO TO 28.
NG >> GO TO 27.

27. RECONNECT HEATED OXYGEN SENSOR 1 HARNESS CONNECTOR

1. Turn ignition switch “OFF”.
2. Reconnect heated oxygen sensor 1 harness connector.

>> GO TO 31.

28. REPLACE HEATED OXYGEN SENSOR 1

1. Stop engine.
2. Replace heated oxygen sensor 1.

With CONSULT-II>>GO TO 29.
Without CONSULT-II>>GO TO 30.

29. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
2. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.

1 time: RICH → LEAN → RICH

2 times: RICH → LEAN → RICH → LEAN → RICH

OK or NG

OK >> GO TO 4.
NG >> GO TO 31.

30. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

Without CONSULT-II

1. Set ECM to Self-diagnostic mode II (Heated oxygen sensor 1 monitor). Refer to EC-1277, "How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)" .
2. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the MIL comes on more than 5 times during 10 seconds.

OK or NG

OK >> GO TO 4.
NG >> GO TO 31.

31. DETECT MALFUNCTIONING PART

Check the following.

- Check fuel pressure regulator and repair or replace if necessary. Refer to EC-1257, "Fuel Pressure Check" .
- Check mass air flow sensor and its circuit, and repair or replace if necessary. Refer to EC-1368 , EC-1375 and EC-1594 .
- Check injector and its circuit, and repair or replace if necessary. Refer to EC-1796 .
- Check engine coolant temperature sensor and its circuit, and repair or replace if necessary. Refer to EC-1386 and EC-1398 .

OK or NG

OK >> GO TO 33.
NG >> 1. Repair or replace.
2. GO TO 32.

32. ERASE UNNECESSARY DTC

After this inspection, unnecessary DTC might be displayed.
Erase the stored memory in ECM and TCM. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 4.

33. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

>> GO TO 4.

Accelerator Pedal Released Position Learning

UBS00275

DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

Throttle Valve Closed Position Learning

UBS00276

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

UBS00277

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

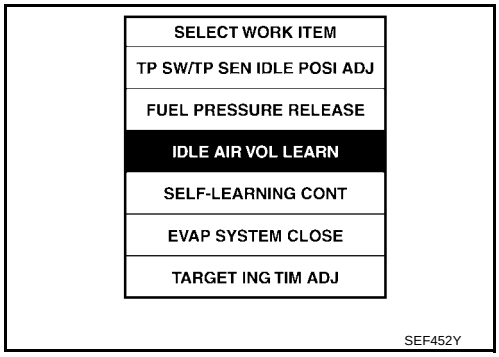
Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For A/T models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
  For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

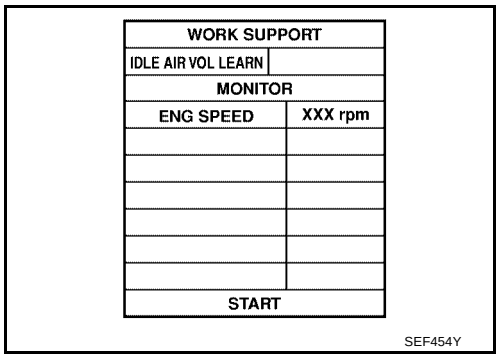
OPERATION PROCEDURE

With CONSULT-II

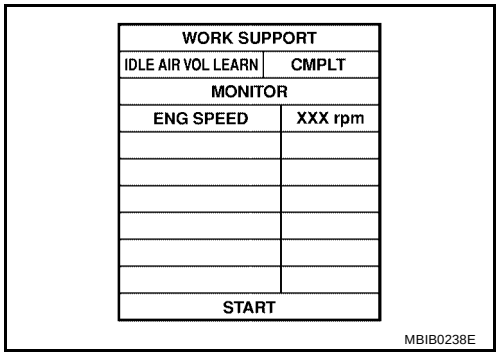
1. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.



6. Touch “START” and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “CMPLT” is not displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 700±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 15±5° BTDC A/T: 15±5° BTDC (in “P” or “N” position)

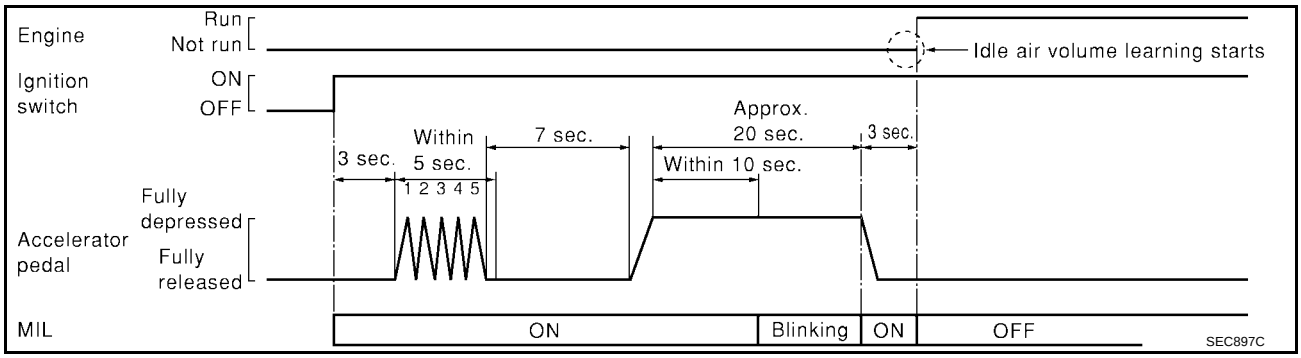
Without CONSULT-II

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.
8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MIL goes off.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 700±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 15±5° BTDC A/T: 15±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.**
   It is useful to perform EC-1337, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform “Idle air volume learning” all over again:**

- **Engine stalls.**
- **Erroneous idle.**

Fuel Pressure Check

UBS00278

FUEL PRESSURE RELEASE

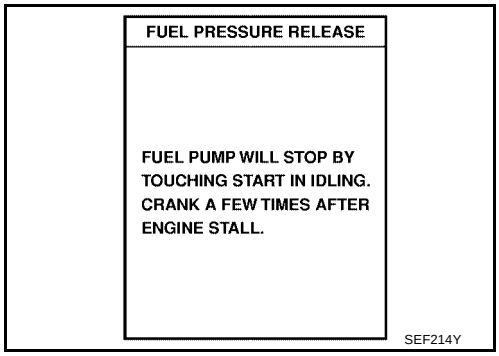
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because B15 models do not have fuel return system.

With CONSULT-II

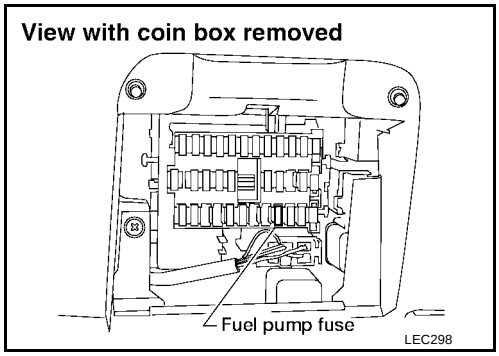
1. Turn ignition switch “ON”.

2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch “OFF”.



Without CONSULT-II

1. Remove fuel pump fuse.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch “OFF”.
5. Reinstall fuel pump fuse after servicing fuel system.

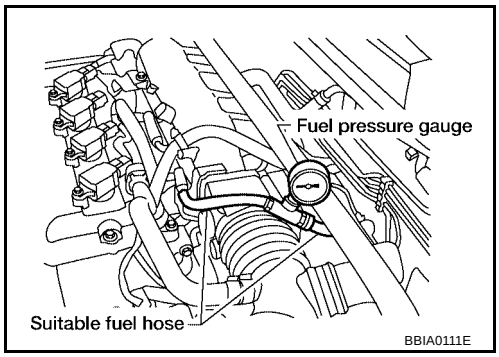


FUEL PRESSURE CHECK

CAUTION:

- **The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.**
- **Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains saleability with O-rings inside.**
- **Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C switch, etc.). Fuel pressure gauge may indicate false readings due to varying engine loads and changes in manifold vacuum.**

1. Release fuel pressure to zero. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Prepare fuel hose and fuel hose clamp for fuel pressure check, and connect fuel pressure gauge.
   - Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
   - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
   - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
   - Use fuel pressure gauge to check fuel pressure.
3. Remove fuel hose. Refer to EM-105, "INTAKE MANIFOLD" .
   - Do not twist or kink fuel hose because it is plastic hose.
   - Do not remove fuel hose from quick connector.
   - Keep the original fuel hose to be free from intrusion of dust or foreign substances with a suitable cover.
4. Install the fuel pressure gauge as shown in the figure.
   - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
   - Apply proper amount of gasoline between top of the fuel tube and No.1 spool.
   - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
   - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
   - When reconnecting fuel line, always use new clamps.
   - When reconnecting fuel hose, check the original fuel hose for damage and abnormality.

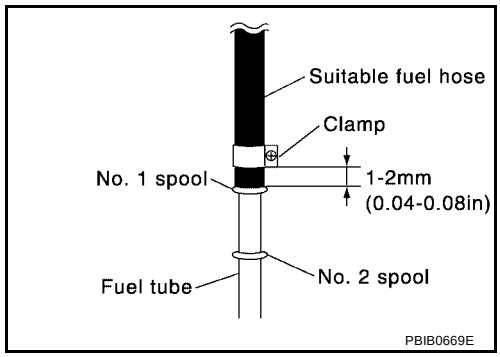


- Use a torque driver to tighten clamps.
- Install hose clamp to the position within 1 - 2 mm (0.04 - 0.08 in).

Tightening torque:

1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb.)

- Make sure that clamp screw does not contact adjacent parts.



5. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb.) to confirm fuel tube does not come off.
6. Turn ignition switch “ON”, and check for fuel leakage.
7. Start engine and check for fuel leakage.
8. Read the indication of fuel pressure gauge.
   - Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
   - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.

   At idling: Approximately 350 CPA (3.57 kg/cm^2 , 51 psi)
9. If result is unsatisfactory, go to next step.
10. Check the following.
    - Fuel hoses and fuel tubes for clogging
    - Fuel filter for clogging
    - Fuel pump
    - Fuel pressure regulator for clogging

    If OK, replace fuel pressure regulator.
    If NG, repair or replace.

ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

UBS00279

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information	SAE Mode
Diagnostic Trouble Code (DTC)	Mode 3 of SAE J1979
Freeze Frame data	Mode 2 of SAE J1979
System Readiness Test (SRT) code	Mode 1 of SAE J1979
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of SAE J1979
1st Trip Freeze Frame data	
Test values and Test limits	Mode 6 of SAE J1979
Calibration ID	Mode 9 of SAE J1979

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	×	×	×	×	×	—
GST	×	×*1	×	—	×	×
ECM	×	×*2	—	—	—	—

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.
*2: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-1290.)

Two Trip Detection Logic

UBS0027A

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up	Blinking	Lighting up				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnosis (refer to EC-1224, "INDEX FOR DTC")	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

Emission-related Diagnostic Information

UBS0027B

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
CAN COMM CIRCUIT	U1000	1000*5	—	—	—	EC-1350
CAN COMM CIRCUIT	U1001	1001*5	—	—	×	EC-1350
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	—	—
INT/V TIM CONT-B1	P0011	0011	—	—	×	EC-1353
HO2S1 HTR (B1)	P0031	0031	×	×	×*4	EC-1356
HO2S1 HTR (B1)	P0032	0032	×	×	×*4	EC-1356
HO2S2 HTR (B1)	P0037	0037	×	×	×*4	EC-1362
HO2S2 HTR (B1)	P0038	0038	×	×	×*4	EC-1362
MAF SEN/CIRCUIT	P0101	0101	—	—	×	EC-1368
MAF SEN/CIRCUIT	P0102	0102	—	—	—	EC-1375
MAF SEN/CIRCUIT	P0103	0103	—	—	—	EC-1375
IAT SEN/CIRCUIT	P0112	0112	—	—	×	EC-1381
IAT SEN/CIRCUIT	P0113	0113	—	—	×	EC-1381
ECT SEN/CIRCUIT	P0117	0117	—	—	—	EC-1386
ECT SEN/CIRCUIT	P0118	0118	—	—	—	EC-1386
TP SEN 2/CIRC	P0122	0122	—	—	—	EC-1391
TP SEN 2/CIRC	P0123	0123	—	—	—	EC-1391
ECT SENSOR	P0125	0125	—	—	—	EC-1398
IAT SENSOR	P0127	0127	—	—	×	EC-1401
THERMSTAT FNCTN	P0128	0128	—	—	×	EC-1404
HO2S1 (B1)	P0132	0132	×	×	×*4	EC-1406
HO2S1 (B1)	P0133	0133	×	×	×*4	EC-1412
HO2S1 (B1)	P0134	0134	×	×	×*4	EC-1421
HO2S2 (B1)	P0138	0138	×	×	×*4	EC-1428
HO2S2 (B1)	P0139	0139	×	×	×*4	EC-1435
FUEL SYS-LEAN-B1	P0171	0171	—	—	×	EC-1442
FUEL SYS-RICH-B1	P0172	0172	—	—	×	EC-1449
FTT SENSOR	P0181	0181	—	—	×	EC-1455
FTT SEN/CIRCUIT	P0182	0182	—	—	×	EC-1457
FTT SEN/CIRCUIT	P0183	0183	—	—	×	EC-1457
ENG OVER TEMP	P0217	0217	—	—	—	EC-1461
TP SEN 1/CIRC	P0222	0222	—	—	—	EC-1475
TP SEN 1/CIRC	P0223	0223	—	—	—	EC-1475
MULTI CYL MISFIRE	P0300	0300	—	—	×	EC-1481
CYL 1 MISFIRE	P0301	0301	—	—	×	EC-1481
CYL 2 MISFIRE	P0302	0302	—	—	×	EC-1481
CYL 3 MISFIRE	P0303	0303	—	—	×	EC-1481
CYL 4 MISFIRE	P0304	0304	—	—	×	EC-1481

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
KNOCK SEN/CIRC-B1	P0327	0327	—	—	×	EC-1486
KNOCK SEN/CIRC-B1	P0328	0328	—	—	×	EC-1486
CKP SEN/CIRCUIT	P0335	0335	—	—	×	EC-1490
CMP SEN/CIRC-B1	P0340	0340	—	—	×	EC-1496
TW CATALYST SYS-B1	P0420	0420	×	×	×*4	EC-1502
EVAP PURG FLOW/MON	P0441	0441	×	×	×*4	EC-1507
EVAP SMALL LEAK	P0442	0442	×	×	×*4	EC-1513
PURG VOLUME CONT/V	P0444	0444	—	—	×	EC-1521
PURG VOLUME CONT/V	P0445	0445	—	—	×	EC-1521
VENT CONTROL VALVE	P0447	0447	—	—	×	EC-1527
EVAP SYS PRES SEN	P0452	0452	—	—	×	EC-1534
EVAP SYS PRES SEN	P0453	0453	—	—	×	EC-1540
EVAP GROSS LEAK	P0455	0455	—	×	×*4	EC-1547
EVAP VERY SML LEAK	P0456	0456	×*3	×	×*4	EC-1555
FUEL LEV SEN SLOSH	P0460	0460	—	—	×	EC-1564
FUEL LEVEL SENSOR	P0461	0461	—	—	×	EC-1569
FUEL LEVL SEN/CIRC	P0462	0462	—	—	×	EC-1571
FUEL LEVL SEN/CIRC	P0463	0463	—	—	×	EC-1571
VEH SPEED SEN/CIRC*6	P0500	0500	—	—	×	EC-1575
ISC SYSTEM	P0506	0506	—	—	×	EC-1579
ISC SYSTEM	P0507	0507	—	—	×	EC-1581
ECM	P0605	0605	—	—	×	EC-1583
MIL/CIRC	P0650	0650	—	—	×	EC-1586
PNP SW/CIRC	P0705	0705	—	—	×	AT-491
ATF TEMP SEN/CIRC	P0710	0710	—	—	×	AT-497
VEH SPD SEN/CIR AT*6	P0720	0720	—	—	×	AT-503
ENGINE SPEED SIG	P0725	0725	—	—	×	AT-508
A/T 1ST GR FNCTN	P0731	0731	—	—	×	AT-512
A/T 2ND GR FNCTN	P0732	0732	—	—	×	AT-517
A/T 3RD GR FNCTN	P0733	0733	—	—	×	AT-522
A/T 4TH GR FNCTN	P0734	0734	—	—	×	AT-527
TCC SOLENOID/CIRC	P0740	0740	—	—	×	AT-534
A/T TCC S/V FNCTN	P0744	0744	—	—	×	AT-539
L/PRESS SOL/CIRC	P0745	0745	—	—	×	AT-547
SFT SOL A/CIRC	P0750	0750	—	—	—	AT-553
SFT SOL B/CIRC	P0755	0755	—	—	—	AT-558
ECM BACK UP/CIRC	P1065	1065	—	—	×	EC-1590
MAF SENSOR	P1102	1102	—	—	—	EC-1594
INT/V TIM V/CIR-B1	P1111	1111	—	—	×	EC-1600
ETC ACTR	P1121	1121	—	—	— or ×	EC-1604
ETC FUNCTION/CIRC	P1122	1122	—	—	—	EC-1606

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
ETC MOT PWR	P1124	1124	—	—	—	EC-1613
ETC MOT PWR	P1126	1126	—	—	—	EC-1613
ETC MOT	P1128	1128	—	—	—	EC-1618
HO2S1 (B1)	P1143	1143	×	×	×*4	EC-1623
HO2S1 (B1)	P1144	1144	×	×	×*4	EC-1629
HO2S2 (B1)	P1146	1146	×	×	×*4	EC-1635
HO2S2 (B1)	P1147	1147	×	×	×*4	EC-1642
CLOSED LOOP-B1	P1148	1148	—	—	—	EC-1649
ENG OVER TEMP	P1217	1217	—	—	—	EC-1651
CTP LEARNING	P1225	1225	—	—	×	EC-1664
CTP LEARNING	P1226	1226	—	—	×	EC-1666
SENSOR POWER/CIRC	P1229	1229	—	—	—	EC-1668
PURG VOLUME CONT/V	P1444	1444	—	—	×	EC-1672
VENT CONTROL VALVE	P1446	1446	—	—	×	EC-1680
VENT CONTROL VALVE	P1448	1448	—	—	×	EC-1687
EVAP VERY SML LEAK	P1456	1456	×*3	×	×*4	EC-1695
FUEL LEVEL SEN/CIRC	P1464	1464	—	—	×	EC-1704
VC/V BYPASS/V	P1490	1490	—	—	×	EC-1707
VC CUT/V BYPASS/V	P1491	1491	—	—	×	EC-1714
ASCD SW	P1564	1564	—	—	—	EC-1723
ASCD BRAKE SW	P1572	1572	—	—	—	EC-1730
ASCD VHL SPD SEN	P1574	1574	—	—	—	EC-1740
TPV SEN/CIRC A/T	P1705	1705	—	—	—	AT-563
P-N POS SW/CIRCUIT	P1706	1706	—	—	×	EC-1742
O/R CLTCH SOL/CIRC	P1760	1760	—	—	×	AT-568
BRAKE SW/CIRCUIT	P1805	1805	—	—	×	EC-1746
APP SEN 1/CIRC	P2122	2122	—	—	—	EC-1751
APP SEN 1/CIRC	P2123	2123	—	—	—	EC-1751
APP SEN 2/CIRC	P2127	2127	—	—	—	EC-1757
APP SEN 2/CIRC	P2128	2128	—	—	—	EC-1757
TP SENSOR	P2135	2135	—	—	—	EC-1763
APP SENSOR	P2138	2138	—	—	—	EC-1770

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: SRT code will not be set if the self-diagnostic result is NG.
*4: These are not displayed with GST.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur at the same time, the MIL illuminates.

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required

driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
For malfunctions in which 1st trip DTCs are displayed, refer to EC-1261, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" . These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-II.
1st trip DTC is specified in Mode 7 of SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-1285, "WORK FLOW" . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

WITH CONSULT-II

WITH GST

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P1148, P1706, etc.
These DTCs are prescribed by SAE J2012.
(CONSULT-II also displays the malfunctioning component or system.)

NO TOOLS

The number of blinks of the MIL in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0340, 1148, 1706, etc.
These DTCs are controlled by NISSAN.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST or the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

PBIB0911E

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-1320, "Freeze Frame Data and 1st Trip Freeze Frame Data" .

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-1261, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" .

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:

The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If MIL is “ON” during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”) and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item (CONSULT-II indication)	Perfor-mance Priority*1	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
EVAP SYSTEM	1	EVAP control system	P0442
	2	EVAP control system	P0456, P1456
	2	EVAP control system purge flow monitoring	P0441
HO2S	2	Heated oxygen sensor 1	P0132
		Heated oxygen sensor 1	P0133
		Heated oxygen sensor 1	P0134
		Heated oxygen sensor 1	P1143
		Heated oxygen sensor 1	P1144
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139
		Heated oxygen sensor 2	P1146
		Heated oxygen sensor 2	P1147
HO2S HTR	2	Heated oxygen sensor 1 heater	P0031, P0032
		Heated oxygen sensor 2 heater	P0037, P0038

*1: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT-II.

SRT Set Timing

SRT is set as “CMPLT” after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON →	OFF ← ON →	OFF ← ON →	OFF ← ON →
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MIL “ON”)
		SRT of EGR	“INCMP”	“INCMP”	“INCMP”	“CMPLT”

OK: Self-diagnosis is carried out and the result is OK.
NG: Self-diagnosis is carried out and the result is NG.
—: Self-diagnosis is not carried out.

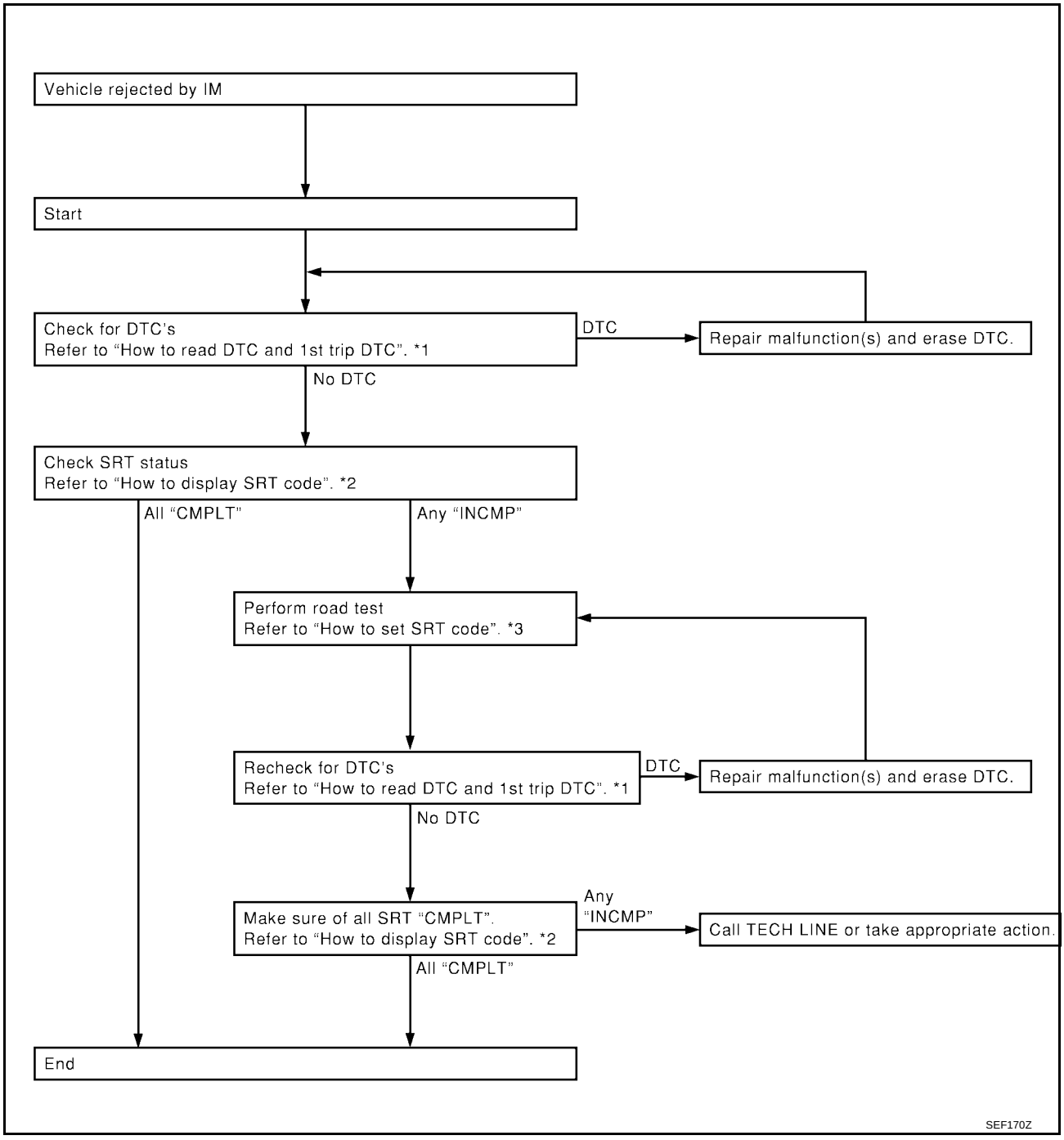
When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above
When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above
If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above
The table above shows that the minimum number of cycles for setting SRT as “INCMP” is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to “CMPLT” of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:
SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

SRT Service Procedure

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating “INCMP”, review the flowchart diagnostic sequence on the next page.



*1 EC-1264 *2 EC-1268 *3 EC-1269

How to Display SRT Code

WITH CONSULT-II

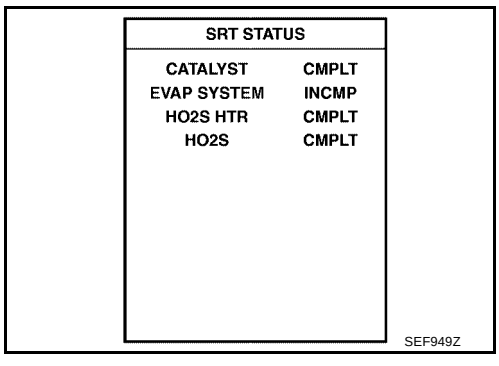
Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.

For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.

A sample of CONSULT-II display for SRT code is shown at right.

"INCMP" means the self-diagnosis is incomplete and SRT is not set.

"CMPLT" means the self-diagnosis is complete and SRT is set.



WITH GST

Selecting Mode 1 with GST (Generic Scan Tool)

How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

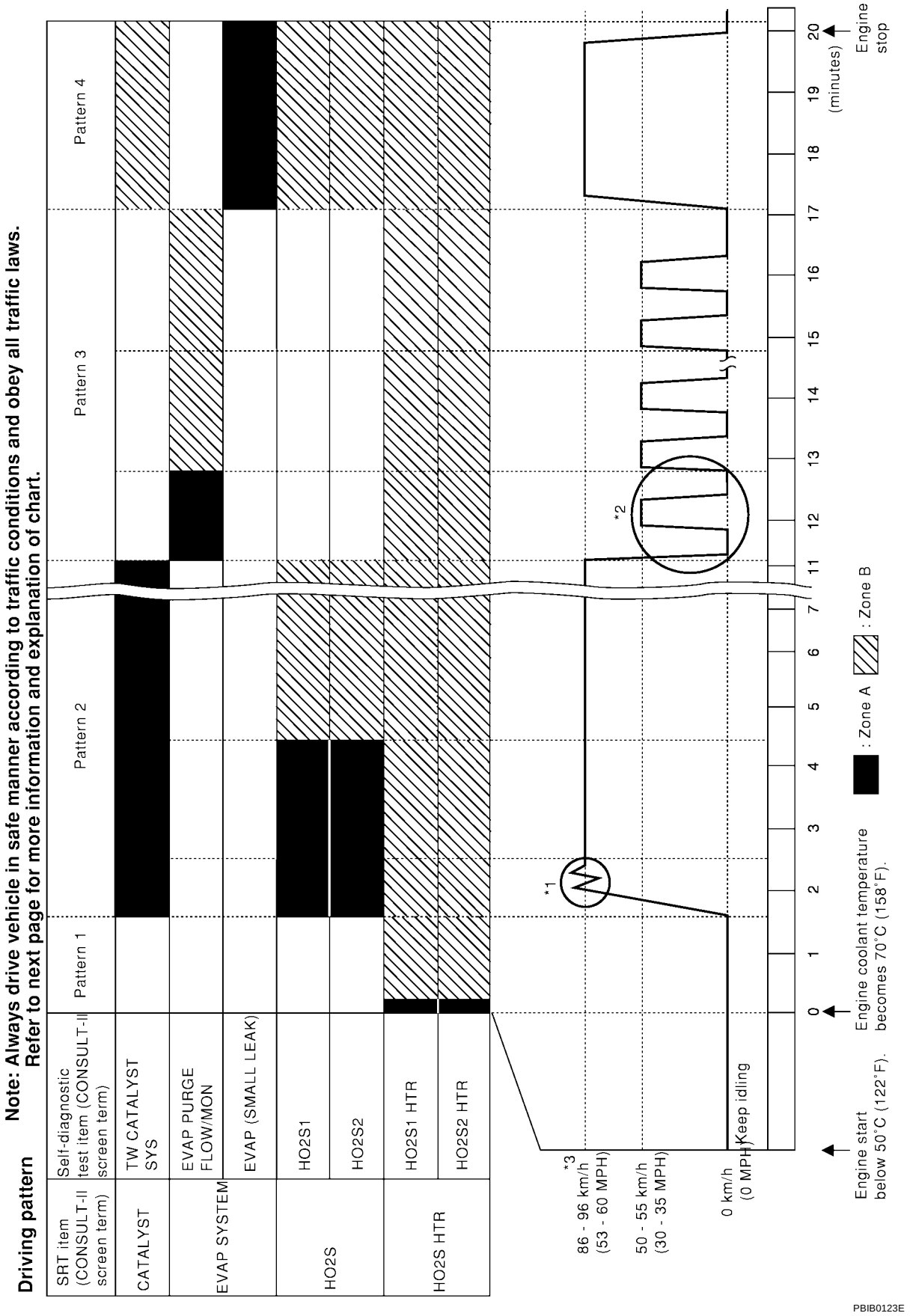
WITH CONSULT-II

Perform corresponding DTC Confirmation Procedure one by one based on “Performance Priority” in the table on EC-1266, "SRT Item" .

WITHOUT CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern



- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 93 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 93 and ground is lower than 1.4V).**
- **The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 70 and ground is less than 4.1V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

Pattern 3:

- The driving pattern outlined in *2 must be repeated at least 3 times.

Pattern 4:

- Tests are performed after the engine has been operated for at least 17 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.

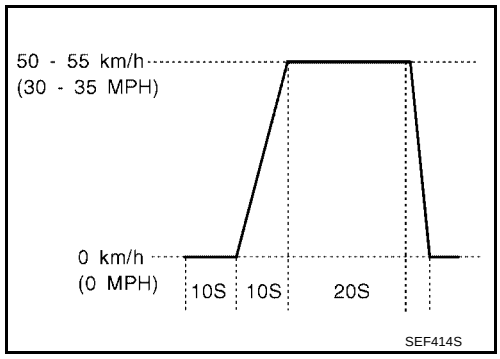
*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Operate the vehicle in the following driving pattern.

1. Decelerate vehicle to 0 km/h (0 MPH) and let engine idle.
2. Repeat driving pattern shown at right at least 10 times.

– **During acceleration, hold the accelerator pedal as steady as possible.**

*3: Checking the vehicle speed with GST is advised.



Suggested Transmission Gear Position for A/T Models

Set the selector lever in the “D” position with the overdrive switch turned ON.

Suggested Upshift Speeds for M/T Models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

Model with 5-speed

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:		For normal acceleration in high altitude areas [over 1,219 m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)	km/h (MPH)
1st to 2nd	24 (15)	24 (15)	24 (15)
2nd to 3rd	40 (25)	29 (18)	40 (25)
3rd to 4th	58 (36)	48 (30)	64 (40)
4th to 5th	64 (40)	62 (39)	72 (45)

Model with 6-speed

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:		For normal acceleration in high altitude areas [over 1,219 m (4,000 ft)]:	
Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)
1st to 2nd	26 (16)	16 (10)	26 (16)	24 (15)
2nd to 3rd	42 (26)	23 (14)	42 (26)	40 (25)
3rd to 4th	55 (34)	40 (25)	64 (40)	64 (40)
4th to 5th	66 (41)	60 (37)	72 (45)	72 (45)
5th to 6th	72 (45)	72 (45)	80 (50)	80 (50)

Suggested Maximum Speed in Each Gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.
Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted sped limits and drive according to the road conditions to ensure sage operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

Model with 5-speed

Gear	km/h (MPH)
1st	55 (35)
2nd	95 (60)
3rd	135 (85)
4th	—
5th	—

Model with 6-speed

Gear	km/h (MPH)
1st	45 (25)
2nd	80 (50)
3rd	130 (80)
4th	—
5th	—
6th	

TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-II)

The following is the information specified in Mode 6 of SAE J1979.
The test value is a parameter used to determine whether a system/circuit diagnostic test is “OK” or “NG” while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items (18 test items).

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

×: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function	01H	01H	Max.	×
		02H	81H	Min.	×
EVAP SYSTEM	EVAP control system (Small leak)	05H	03H	Max.	×
	EVAP control system purge flow monitoring	06H	83H	Min.	×
	EVAP control system (Very small leak)	07H	03H	Max.	×
HO2S	Heated oxygen sensor 1	09H	04H	Max.	×
		0AH	84H	Min.	×
		0BH	04H	Max.	×
		0CH	04H	Max.	×
		0DH	04H	Max.	×
	Heated oxygen sensor 2	19H	86H	Min.	×
		1AH	86H	Min.	×
		1BH	06H	Max.	×
		1CH	06H	Max.	×
HO2S HTR	Heated oxygen sensor 1 heater	29H	08H	Max.	×
		2AH	88H	Min.	×
	Heated oxygen sensor 2 heater	2DH	0AH	Max.	×
		2EH	8AH	Min.	×

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC (With CONSULT-II)

The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.
If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

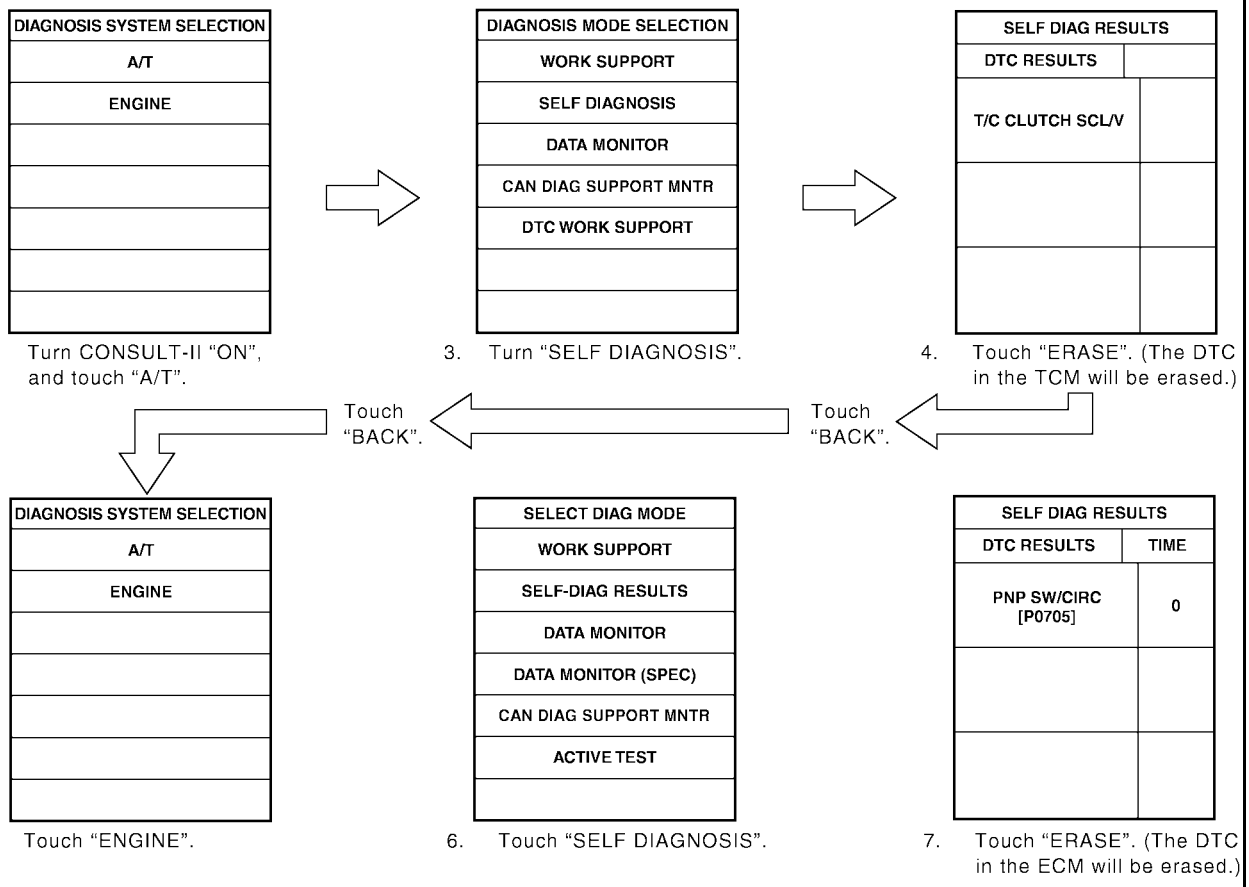
NOTE:
If the DTC is not for A/T related items (see EC-1224), skip steps 2 through 4.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “A/T”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. [The DTC in the TCM (Transmission control module) will be erased.] Then touch “BACK” twice.
5. Touch “ENGINE”.
6. Touch “SELF-DIAG RESULTS”.

7. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.



How to Erase DTC (With GST)

The emission related diagnostic information in the ECM can be erased by selecting Mode 4 with GST.

NOTE:
If the DTC is not for A/T related items (see EC-1224), skip step 2.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Perform “SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)” in AT section titled “TROUBLE DIAGNOSIS”, “Self-diagnosis”. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

How to Erase DTC (No Tools)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once.
2. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-1276, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

– Diagnostic trouble codes
– 1st trip diagnostic trouble codes
– Freeze frame data
– 1st trip freeze frame data

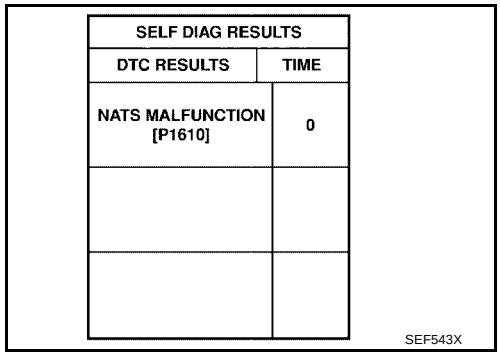
- System readiness test (SRT) codes
- Test values
- Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

NVIS (Nissan Vehicle Immobilizer System — NATS)

UBS0027C

- **If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to BL-95, "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)" .**
- **Confirm no self-diagnostic results of NVIS (NATS) is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NVIS (NATS) initialization and NVIS (NATS) ignition key ID registration, refer to CONSULT-II operation manual, IVIS/NVIS.



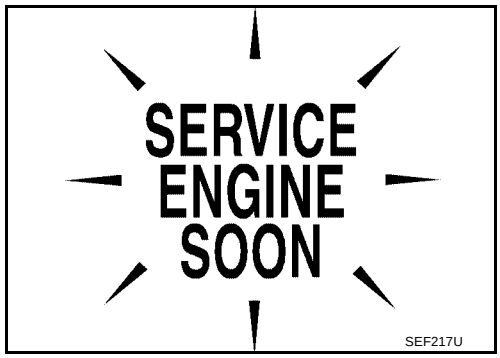
Malfunction Indicator Lamp (MIL)

UBS0027D

DESCRIPTION

The MIL is located on the instrument panel.

1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not light up, refer to DI-27, "WARNING LAMPS" , or see EC-1586 .
2. When the engine is started, the MIL should go off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.



ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position Engine stopped	BULB CHECK	This function checks the MIL bulb for damage (blown, open circuit, etc.). If the MIL does not come on, check MIL circuit.
	Engine running	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip. ● “Misfire (Possible three way catalyst damage)” ● One trip detection diagnosis
Mode II	Ignition switch in “ON” position Engine stopped	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

MIL Flashing Without DTC

If the ECM is in Diagnostic Test Mode II, MIL may flash when engine is running. In this case, check ECM diagnostic test mode. EC-1276, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later.EC-1276, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned “OFF”.**

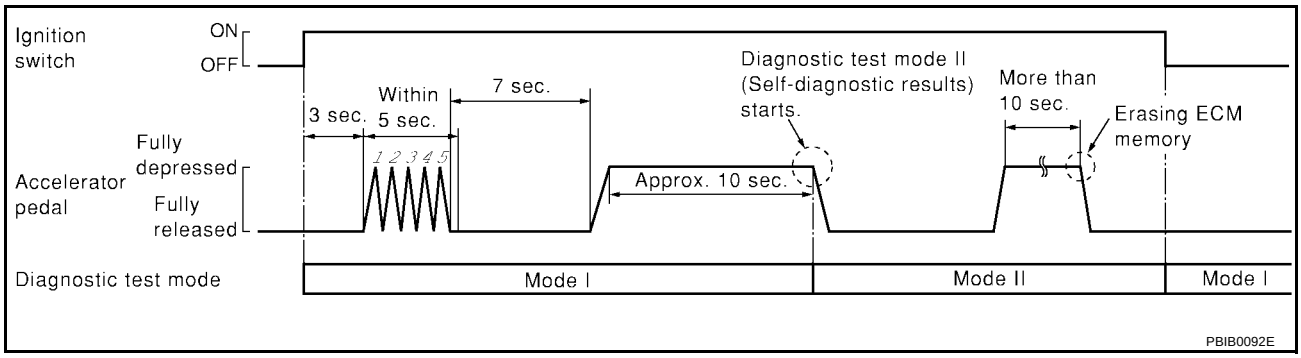
How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MIL starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-1277, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-1277, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-27, "WARNING LAMPS" or see EC-1586 .

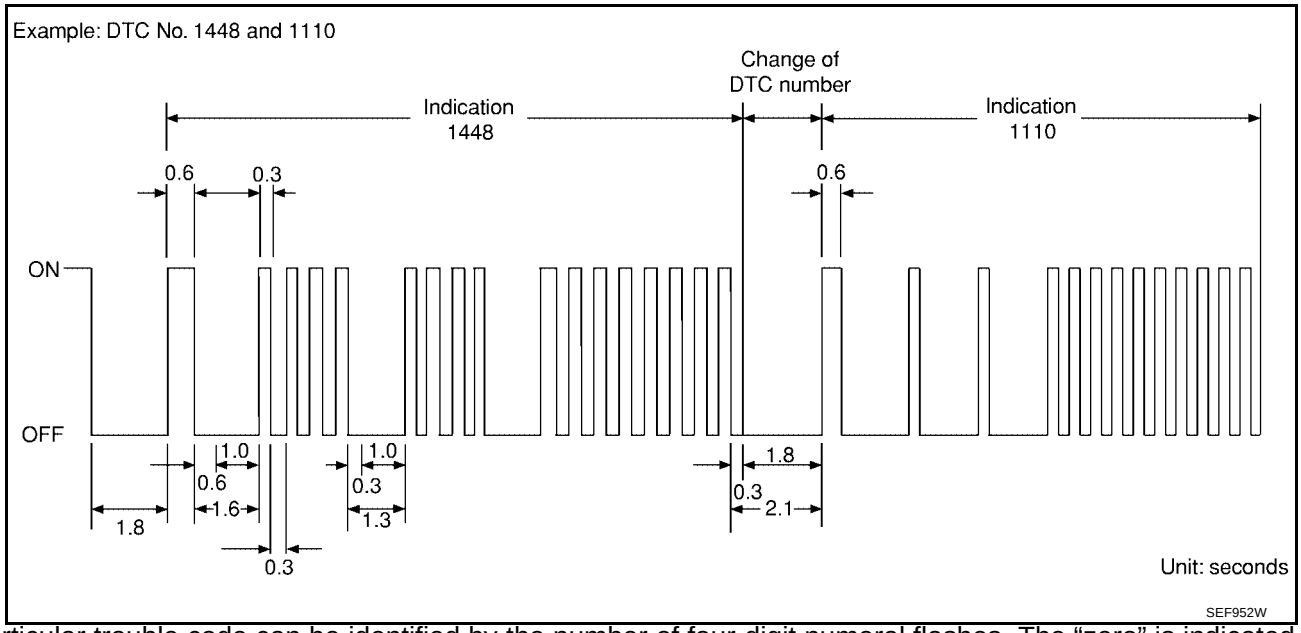
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MIL	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below.
The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-II or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-1224, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-1277, "How to Erase Diagnostic Test Mode II (Self-diagnostic Results)" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MIL displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MIL	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MIL comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

OBD System Operation Chart

UBS0027E

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to EC-1260, "Two Trip Detection Logic" .

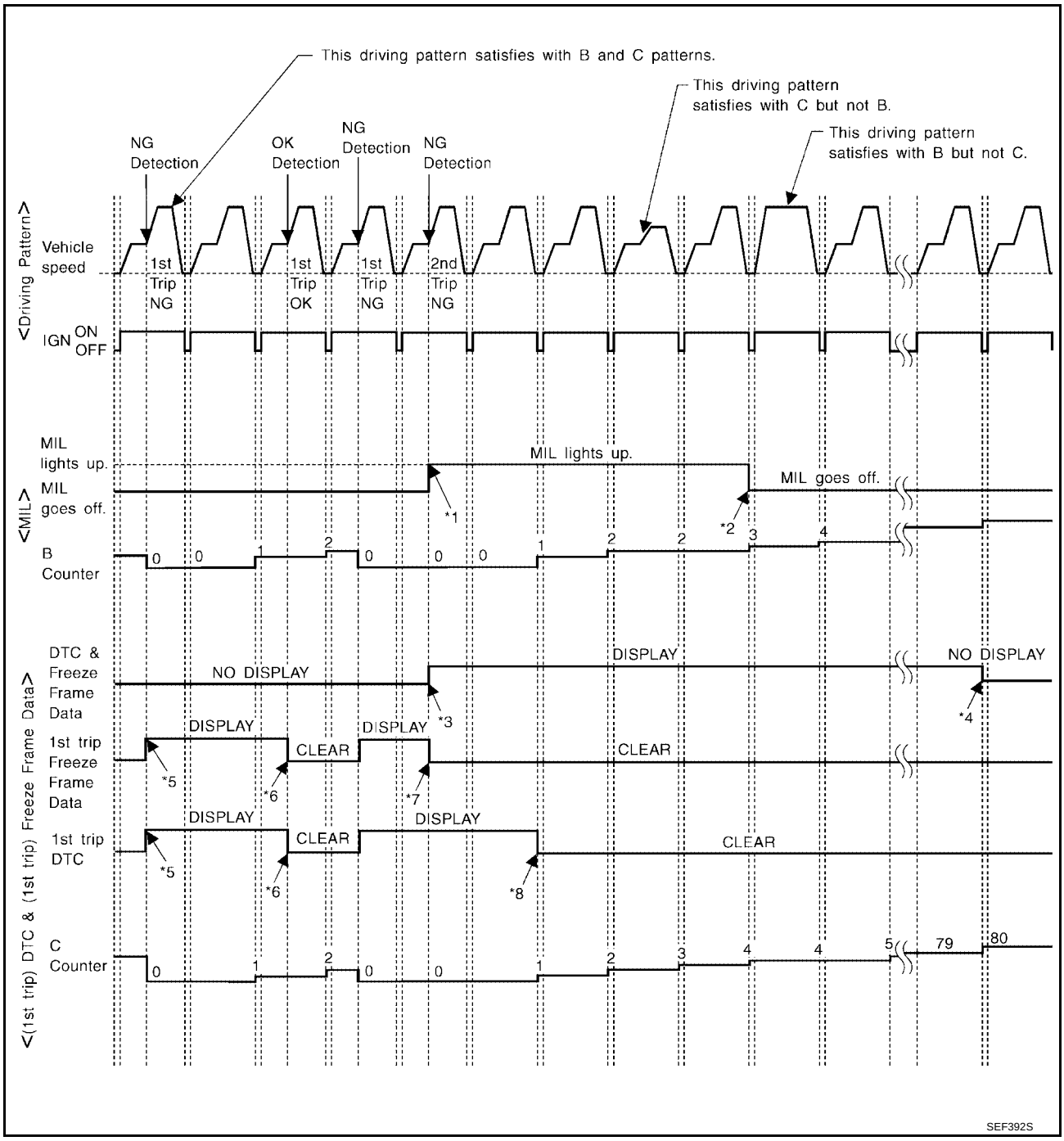
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in “OK” for the 2nd trip.

SUMMARY CHART

Items	Fuel Injection System	Misfire	Other
MIL (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

For details about patterns “B” and “C” under “Fuel Injection System” and “Misfire”, see EC-1281 .
For details about patterns “A” and “B” under “Other”, see EC-1283 .
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will go off when the B counter reaches 3. (*2 in “OBD SYSTEM OPERATION CHART”)

<Driving Pattern C>

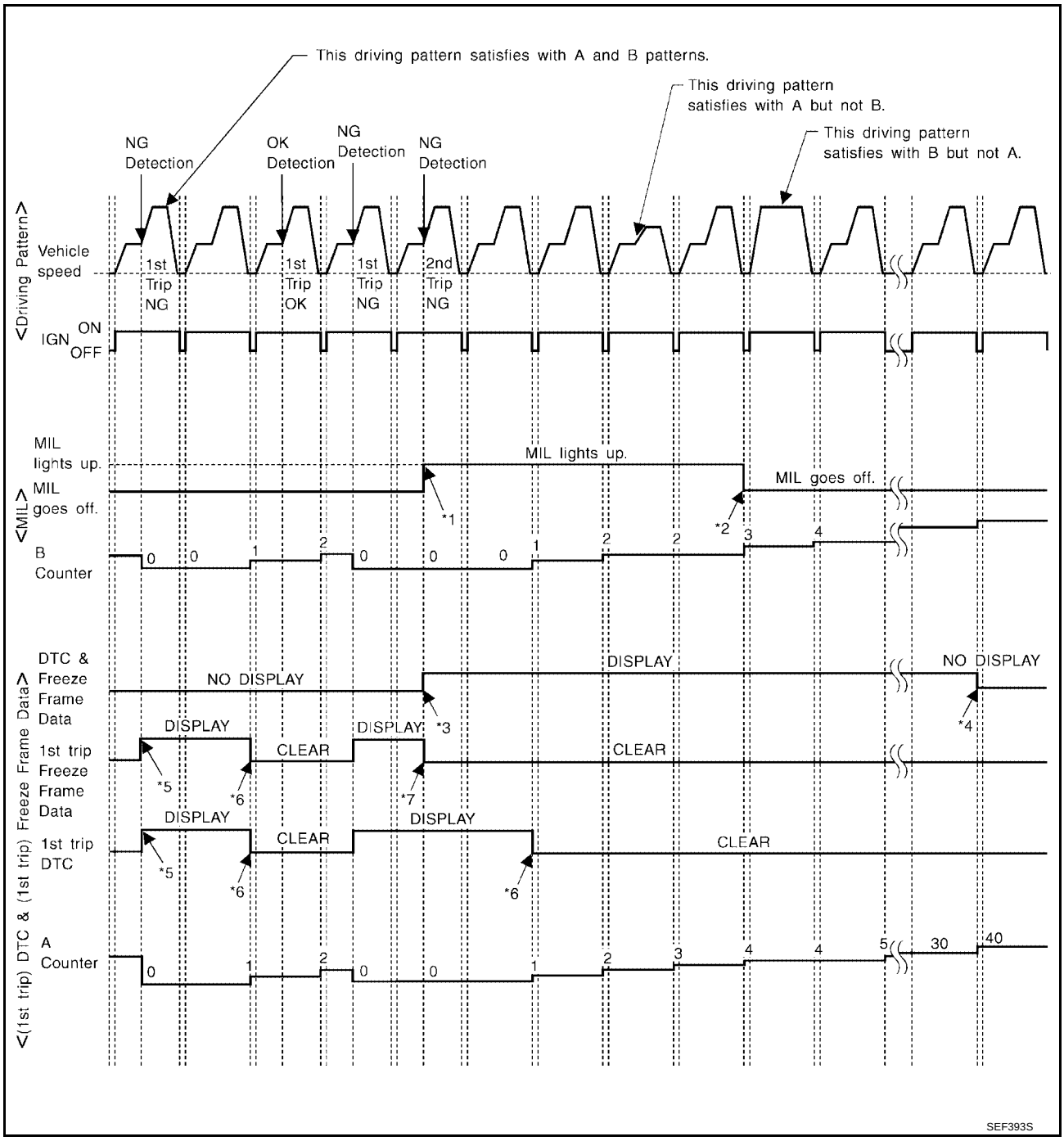
Driving pattern C means the vehicle operation as follows:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), “T” should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), “T” should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of the vehicle conditions described above.
- The C counter will be counted up when the vehicle conditions described above is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

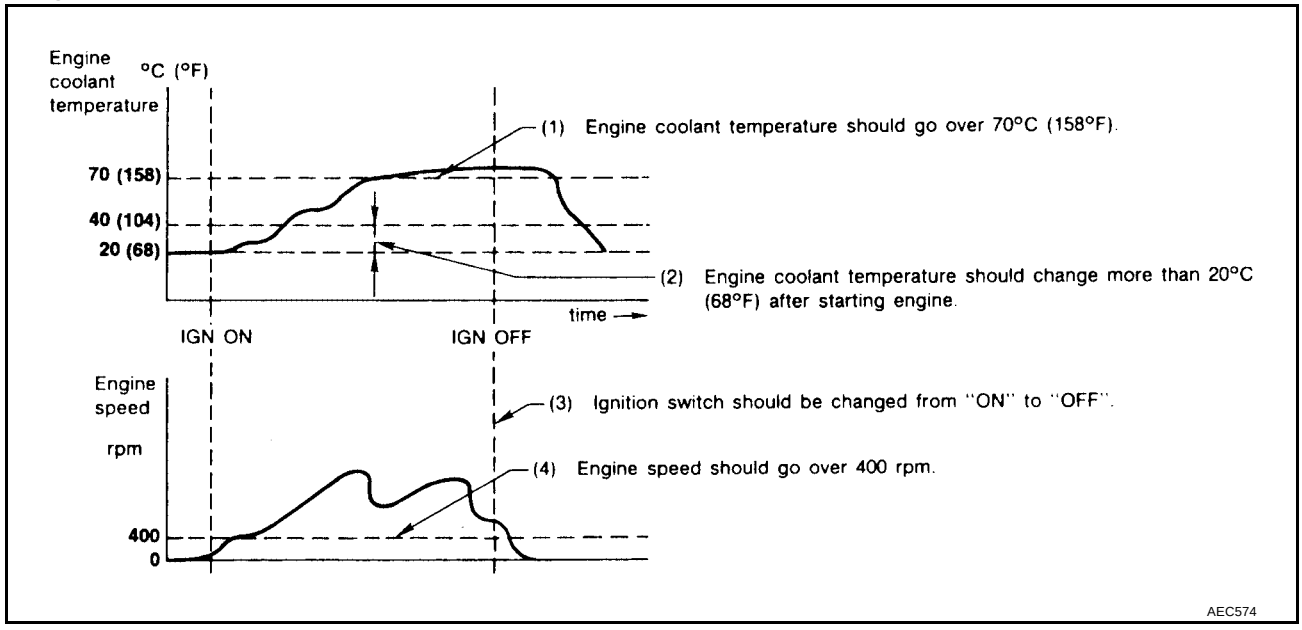
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").

TROUBLE DIAGNOSIS

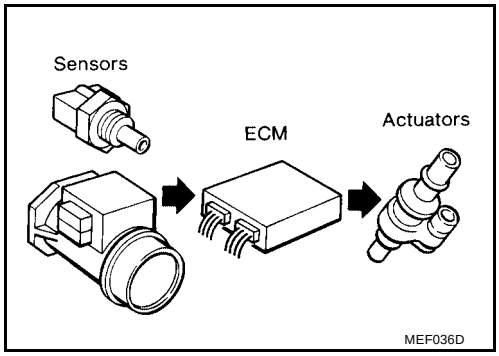
PFP:00004

Trouble Diagnosis Introduction

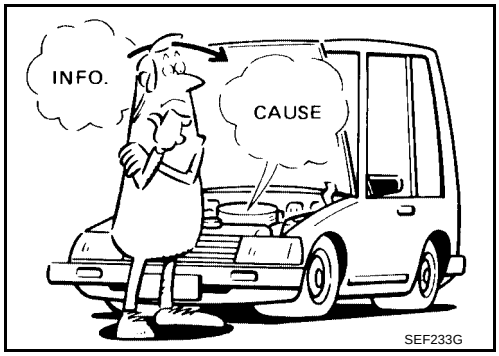
UBS0027F

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.



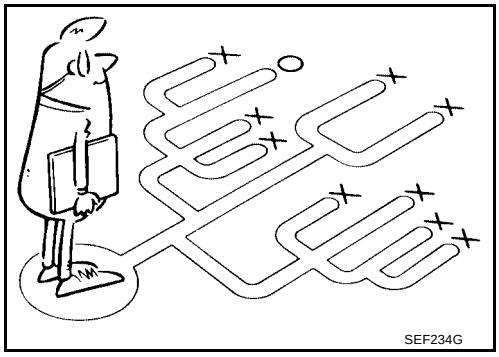
It is much more difficult to diagnose a incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



A visual check only may not find the cause of the incidents. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-1285 .

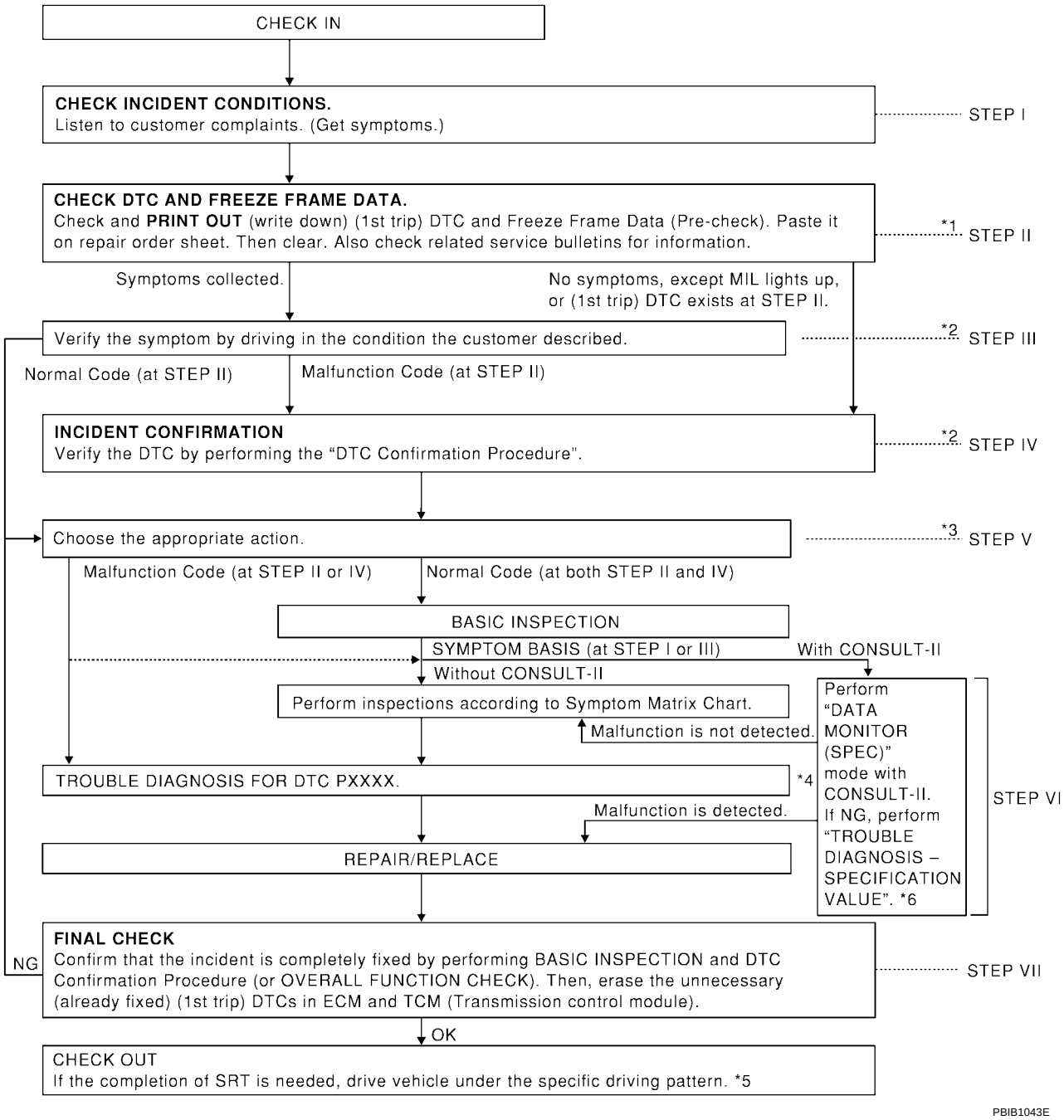
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-1288 should be used.

Start your diagnosis by looking for “conventional” incidents first. This will help troubleshoot driveability incidents on an electronically controlled engine vehicle.



WORK FLOW

Flow Chart



PBIB1043E

*1 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2 If the incident cannot be verified, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-1342, "POWER SUPPLY CIRCUIT FOR ECM" .

*4 If malfunctioning part cannot be detected, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5 EC-1270

*6 EC-1337

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-1287 .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or GST) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-1273 .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-1295 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-1291 .) If CONSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TROUBLE DIAGNOSIS – SPECIFICATION VALUE”. (Refer to EC-1337 .) (If malfunction is detected, proceed to “REPAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-1295 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-1307 , EC-1331 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to “Circuit Inspection” in GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" . Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and AT-430, "HOW TO ERASE DTC" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.
Some conditions may cause the MIL to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

UBS0027G

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-1350 .

Priority	Detected items (DTC)
1	● U1000 U1001 CAN communication line ● P0101 P0102 P0103 P1102 Mass air flow sensor ● P0112 P0113 P0127 Intake air temperature sensor ● P0117 P0118 P0125 Engine coolant temperature sensor ● P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor ● P0128 Thermostat function ● P0181 P0182 P0183 Fuel tank temperature sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0460 P0461 P0462 P0463 P1464 Fuel level sensor ● P0500 Vehicle speed sensor ● P0605 ECM ● P1229 Sensor power supply ● P1610-P1615 NATS ● P1706 Park/Neutral position (PNP) switch ● P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
2	● P0031 P0032 Heated oxygen sensor 1 heater ● P0037 P0038 Heated oxygen sensor 2 heater ● P0132 P0133 P0134 P1143 P1144 Heated oxygen sensor 1 ● P0138 P0139 P1146 P1147 Heated oxygen sensor 2 ● P0217 Coolant overtemperature enrichment protection ● P0441 EVAP control system purge flow monitoring ● P0444 P0445 P1444 EVAP canister purge volume control solenoid valve ● P0447 P1446 P1448 EVAP canister vent control valve ● P0452 P0453 EVAP control system pressure sensor ● P0506 P0507 Idle speed control system ● P0650 MIL ● P0705-P0725, P0740-P0755, P1705 P1760 A/T related sensors and solenoid valves ● P1065 ECM power supply ● P1111 Intake valve timing control solenoid valve ● P1122 Electric throttle control function ● P1124 P1126 Throttle control motor relay ● P1128 Electric throttle control actuator ● P1490 P1491 Vacuum cut valve bypass valve ● P1805 Brake switch
3	● P0011 Intake valve timing control ● P0171 P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0420 Three way catalyst function ● P0442 P0456 P1456 EVAP control system (SMALL LEAK, VERY SMALL LEAK) ● P0455 EVAP control system (GROSS LEAK) ● P0731 - P0734 A/T function ● P1121 Electric throttle control actuator ● P1148 Closed loop control ● P1217 Engine over temperature (OVERHEAT) ● P1564 ASCD steering switch ● P1572 ASCD brake switch ● P1574 ASCD vehicle speed sensor

Fail-safe Chart

UBS0027H

The ECM enters fail-safe mode, if any of the following malfunctions is detected. When the ECM enters the fail-safe mode, the MIL illuminates.

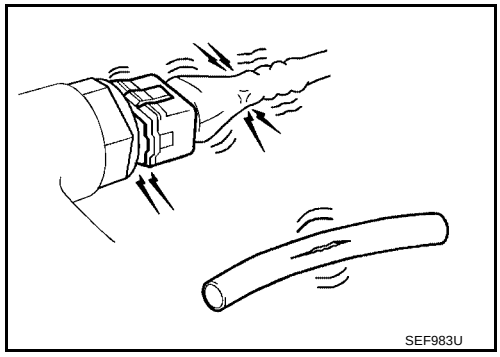
<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0102
P0103
P1102</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0122
P0123
P0222
P0223
P2135</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal operation.
So, the acceleration will be poor.</td></tr>
<tr><td>P1121</td><td>Electric throttle control actuator
(ECM detects the throttle valve is stuck open.)</td><td colspan="2">While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1122</td><td>Electric throttle control function</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1124
P1126</td><td>Throttle control motor relay</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1128</td><td>Throttle control motor</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1229</td><td>Sensor power supply</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P2122
P2123
P2127
P2128
P2138</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal operation.
So, the acceleration will be poor.</td></tr>
</table>

Basic Inspection

UBS0027I

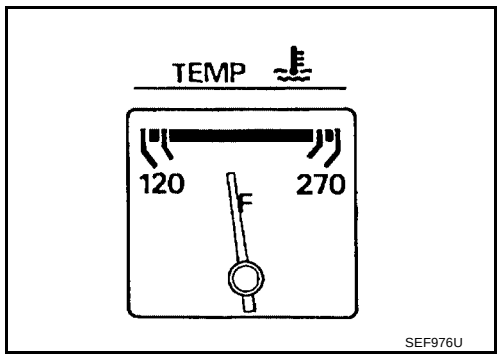
1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket


SEF983U

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.

4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.



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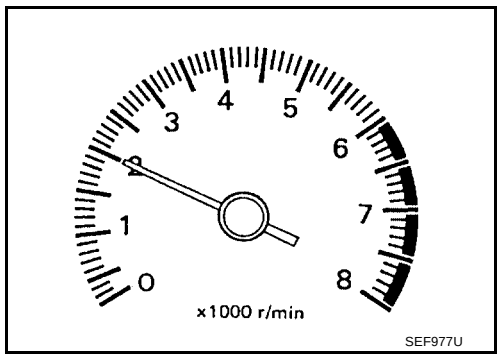
5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



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2. REPAIR OR REPLACE

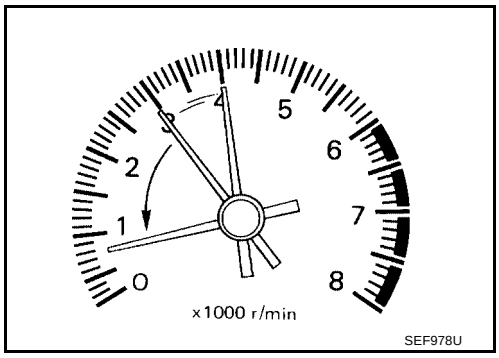
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

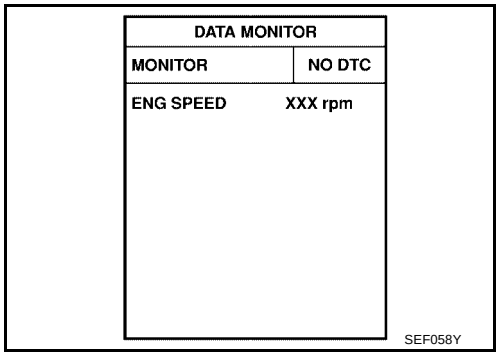
With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1255, "Idle Air Volume Learning" .
Is the Air Volume Learning carried out successfully?
Yes or No
Yes >> GO TO 7.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG
OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1496 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1490 .

OK or NG
OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 15 ± 5° BTDC
A/T: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG
OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1255, "Idle Air Volume Learning" .
Is the ″Idle Air Volume Learning″ carried out successfully?
Yes or No

Yes >> GO TO 14.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 15 ± 5° BTDC
A/T: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-134, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1496 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1490 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

>> GO TO 4.

Symptom Matrix Chart

UBS0027J

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-1806
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-1257
	Injector circuit	1	1	2	3	2		2	2			2			EC-1796
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-1846

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-1858
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-1291
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-1604, EC-1606 , EC-1613 , EC-1618
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-1291
	Ignition circuit	1	1	2	2	2		2	2			2			EC-1777
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-1342
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-1368, EC-1375 , EC-1594
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-1386, EC-1398
Throttle position sensor circuit			1	2		2	2	2	2	2		2			EC-1391, EC-1475 , EC-1664 , EC-1666 , EC-1668 , EC-1763
Accelerator pedal position sensor circuit				3	2	1	2			2					EC-1751, EC-1757 , EC-1770
Heated oxygen sensor 1 circuit			1	2	3	2		2	2			2			EC-1406, EC-1412 , EC-1421 , EC-1623 , EC-1629
Knock sensor circuit				2	2							3			EC-1486
Crankshaft position sensor (POS) circuit		2	2												EC-1490
Camshaft position sensor (PHASE) circuit		2	2												EC-1496
Vehicle speed signal circuit			2	3		3						3			EC-1575
Power steering oil pressure switch circuit			2				3	3	3	3					EC-1811
ECM		2	2	3	3	3	3	3	3	3	3	3			EC-1583, EC-1590
Intake valve timing control solenoid valve circuit		3	3	2		1	3	2	2	3		3			EC-1600

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
VIAS control solenoid valve circuit					1									EC-1788
PNP switch circuit			3		3	3	3	3	3		3			EC-1742
Start signal circuit	2													EC-1802
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-1816
Electrical load signal circuit						3	3	3	3					EC-1821
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	MTC-19

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-7
	Fuel piping			5	5	5		5	5			5			EM-118, FL-2
	Vapor lock		5												—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—

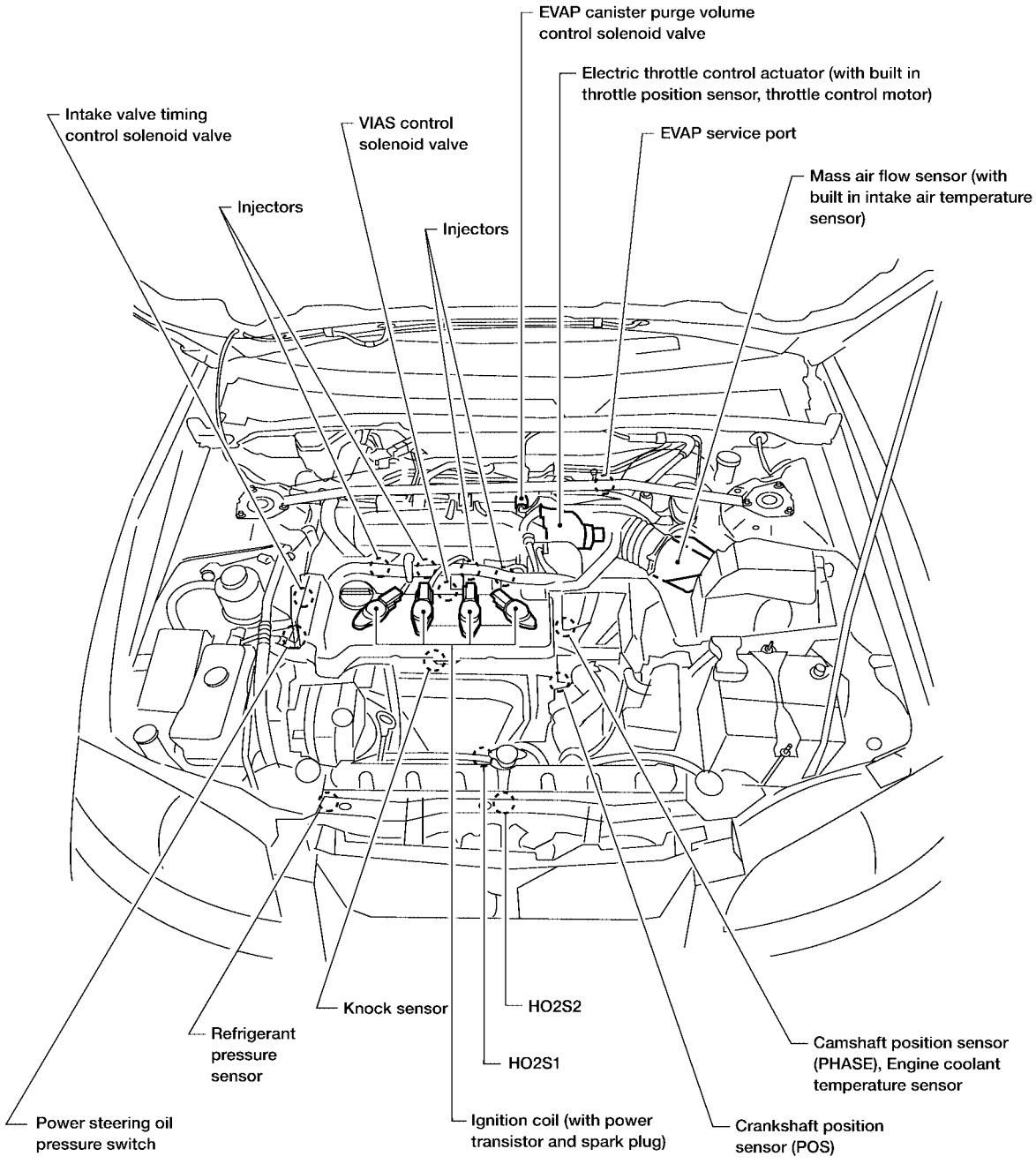
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Air duct		5	5		5		5	5			5			EM-103
	Air cleaner														EM-103
	Air leakage from air duct (Mass air flow sensor —electric throttle control actuator)	5			5		5			5					EM-103
	Electric throttle control actuator														EM-105
	Air leakage from intake manifold/ Collector/Gasket														EM-105
Cranking	Battery	1	1	1		1		1	1			1		1	SC-4
	Alternator circuit														SC-22
	Starter circuit	3													SC-9
	Signal plate/Flywheel/Drive plate	6													EM-160
	PNP switch	4													MT-78, MT-139 or AT-491
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-145
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-160
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-134
	Camshaft														EM-123
	Intake valve timing control														EM-134
	Intake valve												3		EM-145
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-110, EX-3
	Three way catalyst														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5	2		EM-112, LU-19 , LU-18
	Oil level (Low)/Filthy oil														LU-16
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		2	5			CO-30
	Thermostat									5					CO-28
	Water pump														CO-26
	Water gallery														CO-23
	Cooling fan									5					CO-36
	Coolant level (low)/Contaminated coolant														CO-24
NVIS (NISSAN Vehicle Immobilizer System — NATS)		1	1												EC-1275 or BL-95

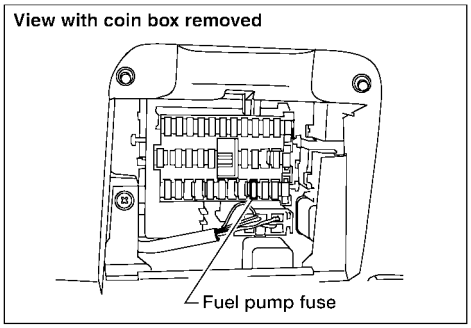
1 - 6: The numbers refer to the order of inspection.

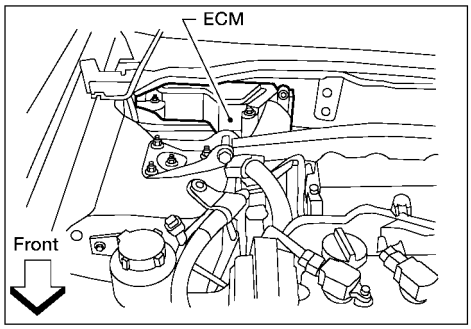
Engine Control Component Parts Location

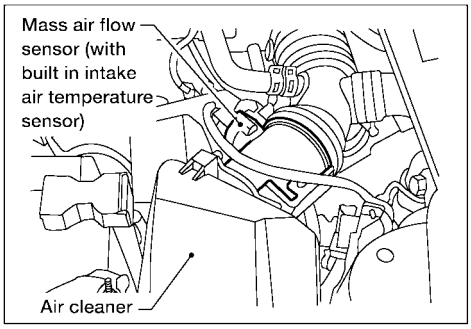
UBS0027K

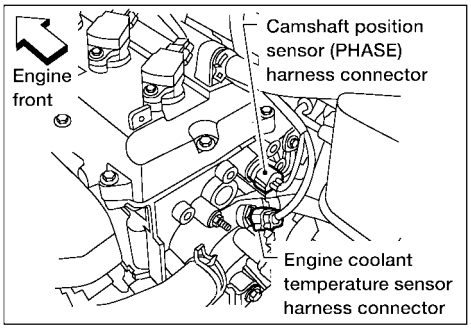


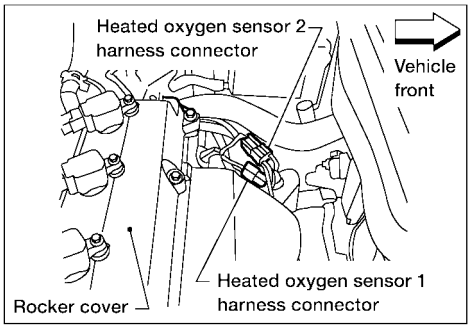
BBIA0126E

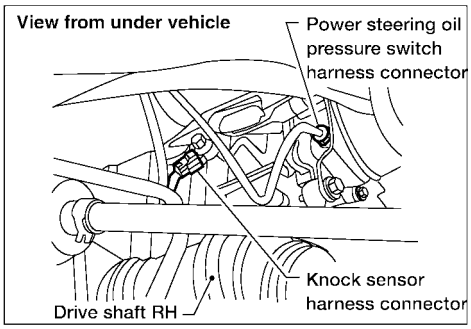

View with coin box removed
Fuel pump fuse

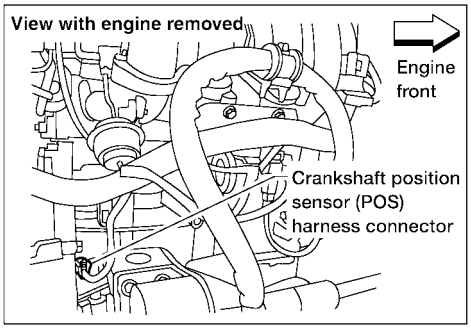

ECM
Front

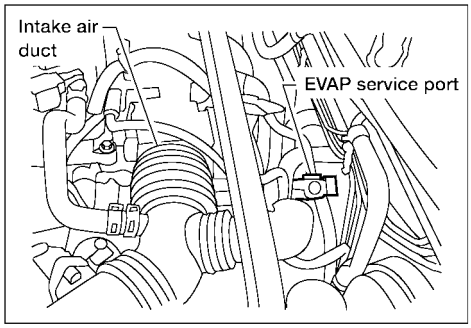

Mass air flow sensor (with built in intake air temperature sensor)
Air cleaner


Engine front
Camshaft position sensor (PHASE) harness connector
Engine coolant temperature sensor harness connector

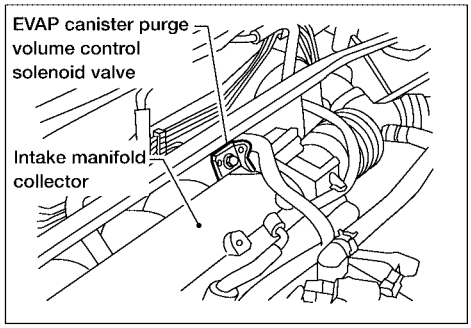

Heated oxygen sensor 2 harness connector
Vehicle front
Heated oxygen sensor 1 harness connector
Rocker cover

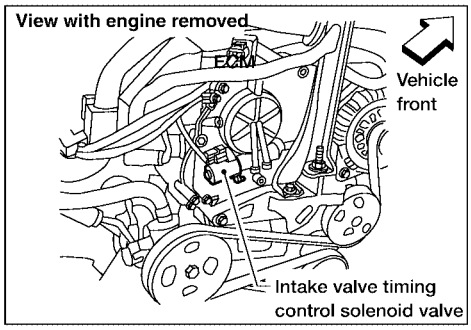

View from under vehicle
Power steering oil pressure switch harness connector
Knock sensor harness connector
Drive shaft RH

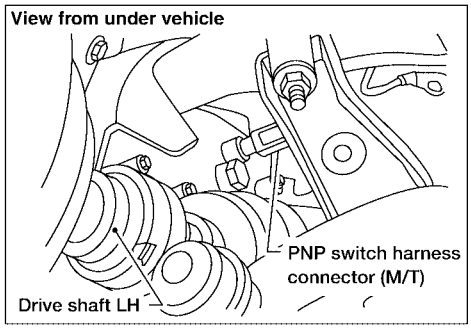

View with engine removed
Engine front
Crankshaft position sensor (POS) harness connector

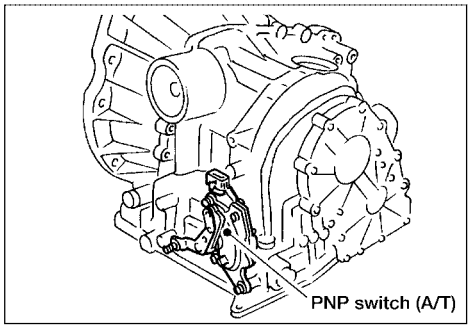

Intake air duct
EVAP service port

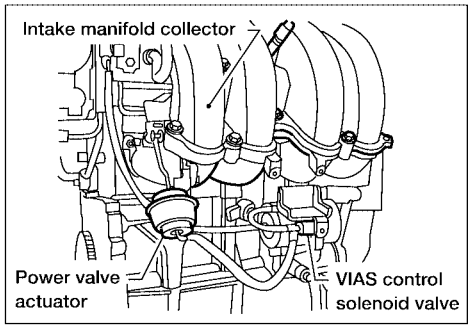
BBIA0127E

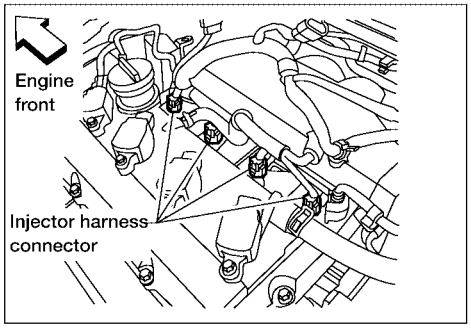

EVAP canister purge volume control solenoid valve
Intake manifold collector

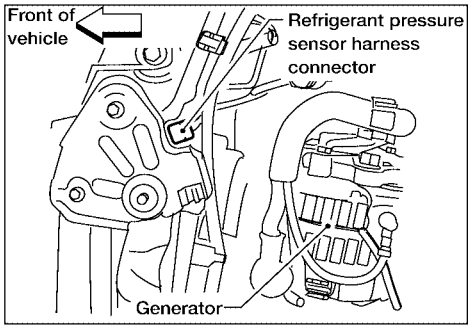

View with engine removed
ECM
Vehicle front
Intake valve timing control solenoid valve

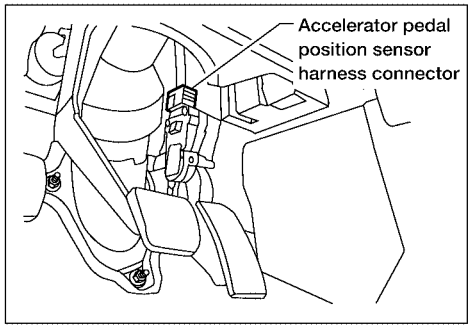

View from under vehicle
PNP switch harness connector (M/T)
Drive shaft LH


PNP switch (A/T)

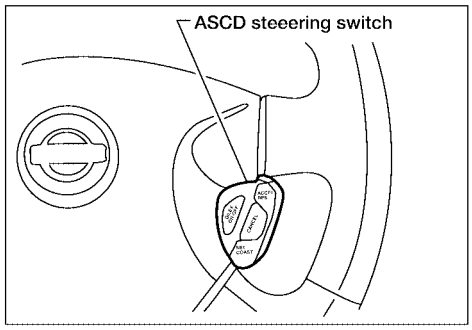

Intake manifold collector
Power valve actuator
VIAS control solenoid valve

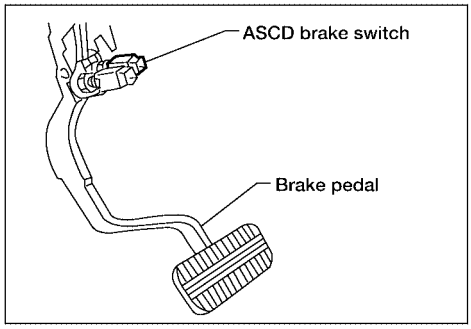

Engine front
Injector harness connector

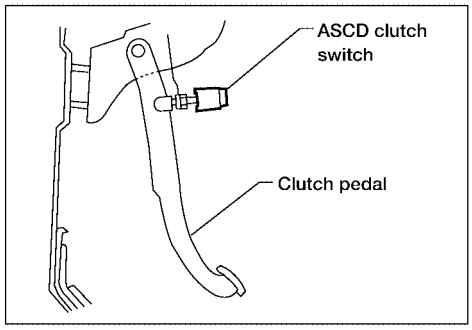

Front of vehicle
Refrigerant pressure sensor harness connector
Generator

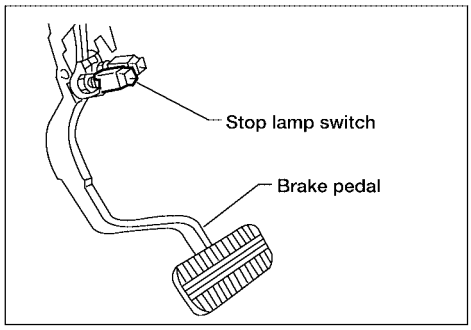

Accelerator pedal position sensor harness connector

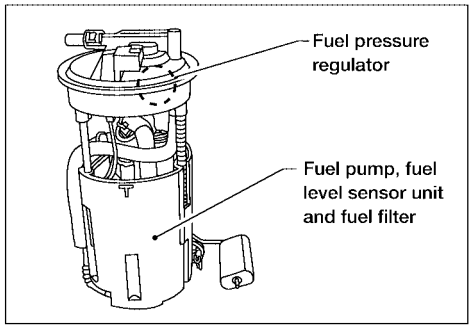
BBIA0128E

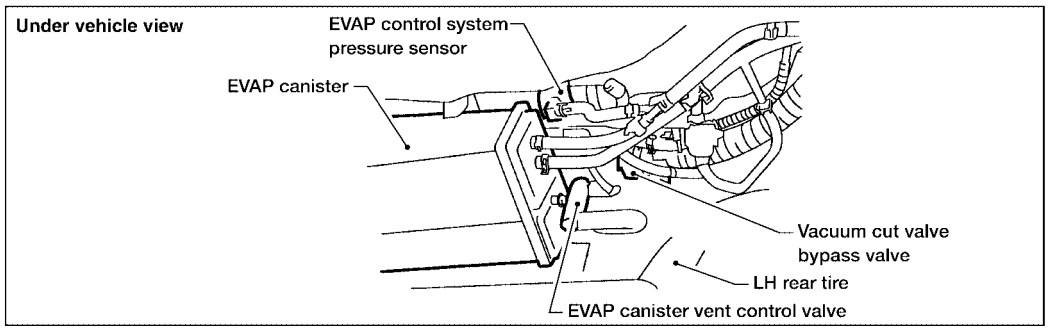

ASCD steeering switch


ASCD brake switch
Brake pedal

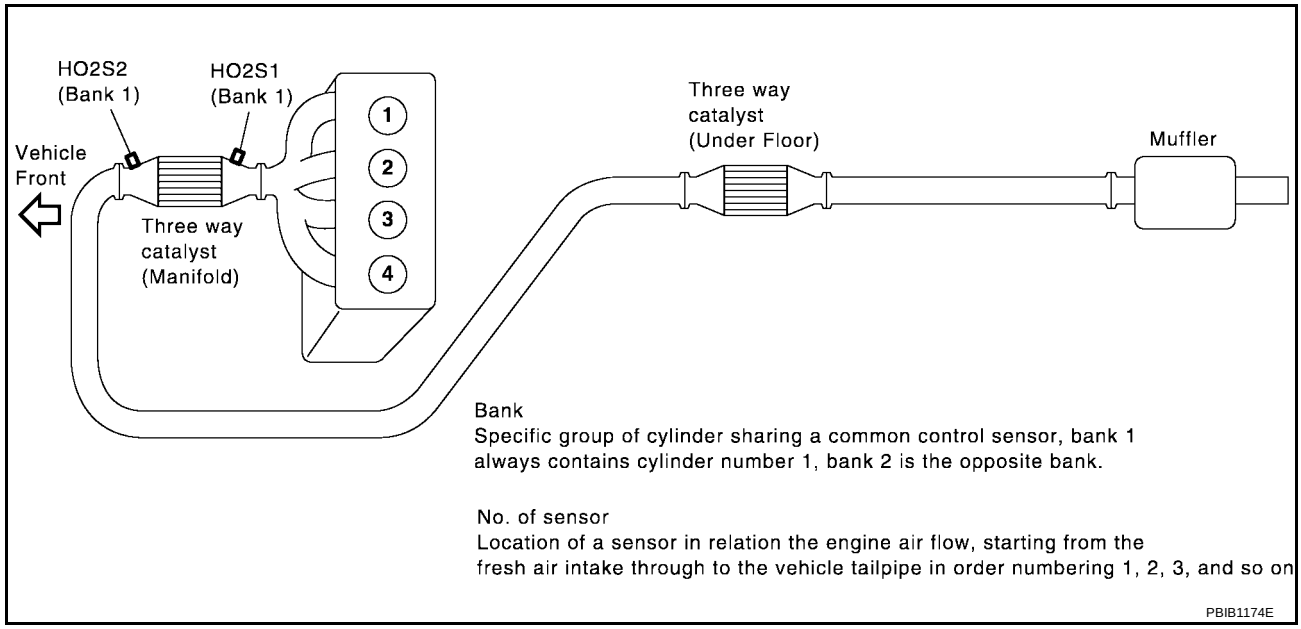

ASCD clutch switch
Clutch pedal

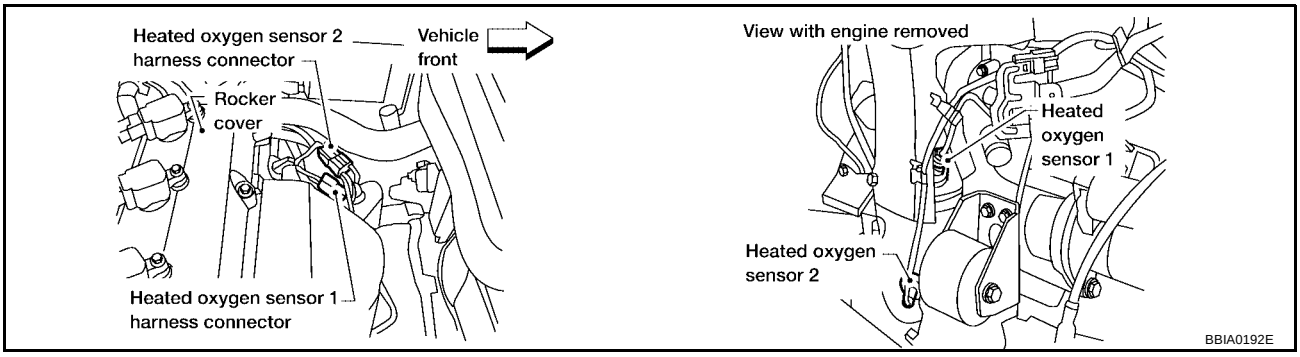

Stop lamp switch
Brake pedal


Fuel pressure regulator
Fuel pump, fuel level sensor unit and fuel filter


Under vehicle view
EVAP control system pressure sensor
EVAP canister
Vacuum cut valve bypass valve
LH rear tire
EVAP canister vent control valve

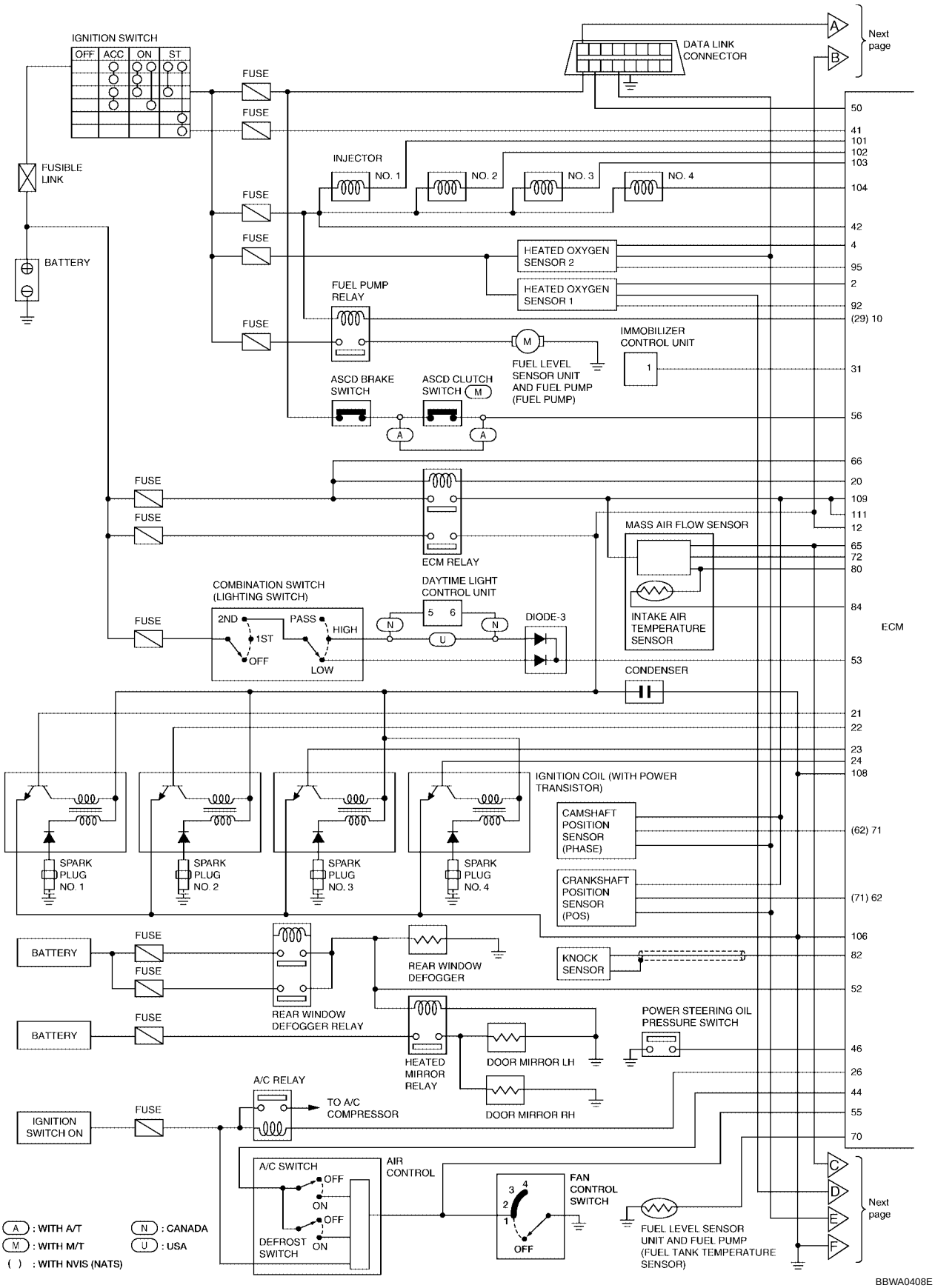
BBIA0123E

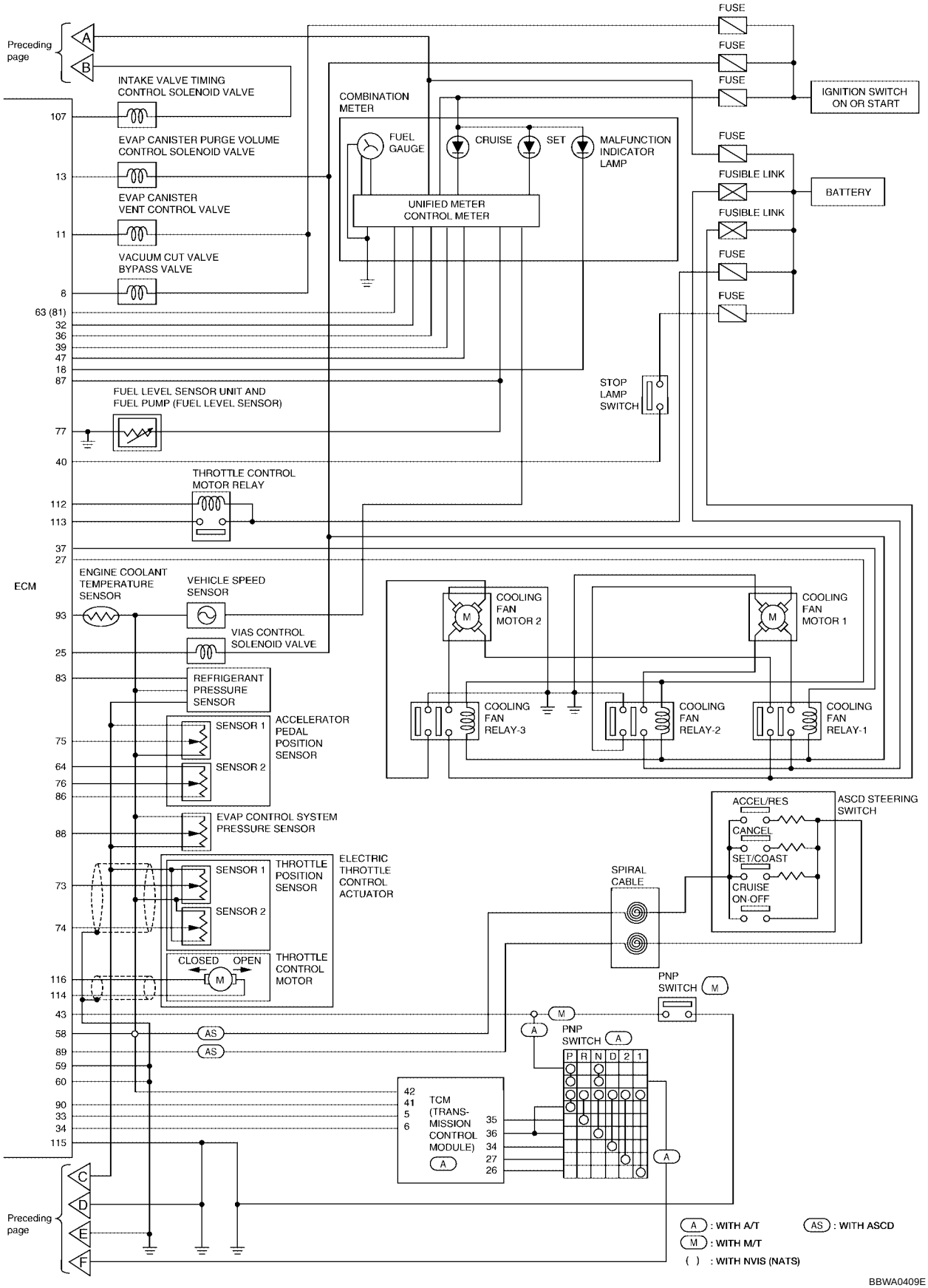

HO2S2
(Bank 1)
HO2S1
(Bank 1)
Vehicle
Front
Three way
catalyst
(Manifold)
1
2
3
4
Three way
catalyst
(Under Floor)
Muffler
Bank
Specific group of cylinder sharing a common control sensor, bank 1
always contains cylinder number 1, bank 2 is the opposite bank.
No. of sensor
Location of a sensor in relation the engine air flow, starting from the
fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on
PBIB1174E


Heated oxygen sensor 2
harness connector
Vehicle
front
Rocker
cover
Heated oxygen sensor 1
harness connector
View with engine removed
Heated
oxygen
sensor 1
Heated oxygen
sensor 2
BBIA0192E

Circuit Diagram

UBS0027L

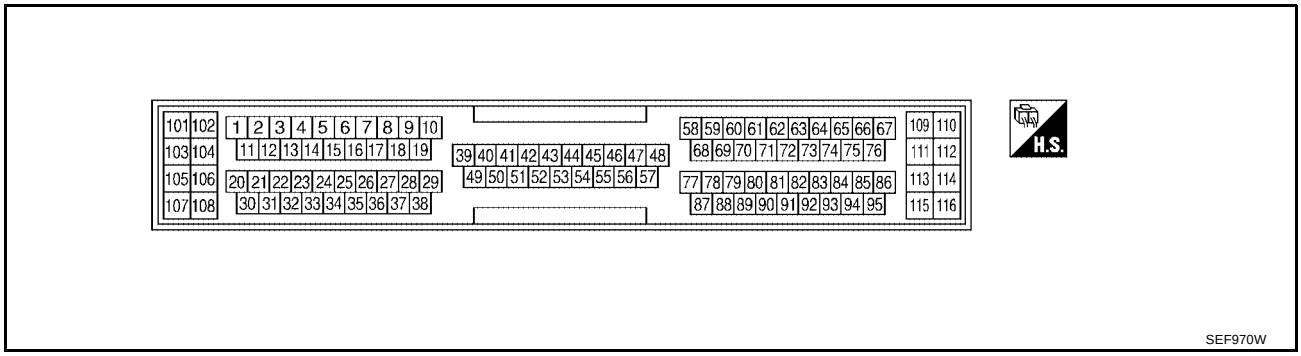



Preceding page
A
B
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
107
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
13
EVAP CANISTER VENT CONTROL VALVE
11
VACUUM CUT VALVE BYPASS VALVE
8
63 (81)
32
36
39
47
18
87
FUEL LEVEL SENSOR UNIT AND FUEL PUMP (FUEL LEVEL SENSOR)
77
40
THROTTLE CONTROL MOTOR RELAY
112
113
37
27
ECM
ENGINE COOLANT TEMPERATURE SENSOR
93
VEHICLE SPEED SENSOR
VIAS CONTROL SOLENOID VALVE
25
83
REFRIGERANT PRESSURE SENSOR
ACCELERATOR PEDAL POSITION SENSOR
SENSOR 1
SENSOR 2
75
64
76
86
EVAP CONTROL SYSTEM PRESSURE SENSOR
88
ELECTRIC THROTTLE CONTROL ACTUATOR
THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
73
74
THROTTLE CONTROL MOTOR
CLOSED
OPEN
116
114
43
58
89
59
60
90
33
34
115
AS
TCM (TRANS-MISSION CONTROL MODULE)
42
41
5
6
35
36
34
27
26
COMBINATION METER
FUEL GAUGE
CRUISE
SET
MALFUNCTION INDICATOR LAMP
UNIFIED METER CONTROL METER
FUSE
FUSIBLE LINK
IGNITION SWITCH ON OR START
BATTERY
STOP LAMP SWITCH
COOLING FAN MOTOR 2
COOLING FAN MOTOR 1
COOLING FAN RELAY-3
COOLING FAN RELAY-2
COOLING FAN RELAY-1
ACCEL/RES
CANCEL
SET/COAST
CRUISE ON-OFF
ASCD STEERING SWITCH
SPIRAL CABLE
PNP SWITCH
M
A
P R N D 2 1
C
D
E
F
Preceding page
A : WITH A/T
M : WITH M/T
( ) : WITH NVIS (NATS)
AS : WITH ASCD

BBWA0409E

ECM Harness Connector Terminal Layout

UBS0027M

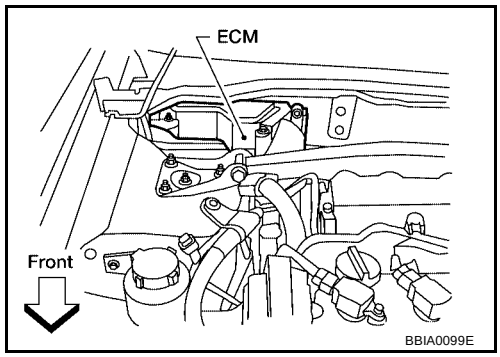


ECM Terminals and Reference Value

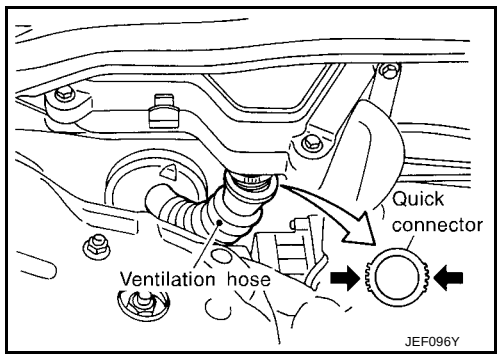
UBS0027N

PREPARATION

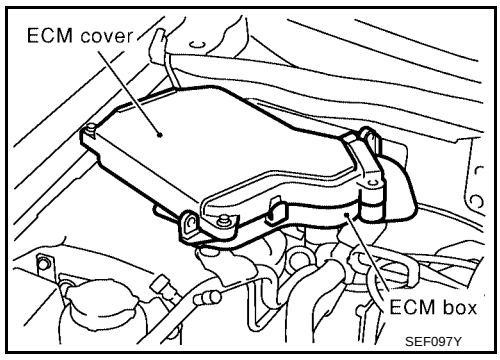
1. ECM is located in the right side of the cowl top (behind the strut tower).
   For this inspection:
   - Remove front strut tower bar. Refer to FSU-5, "FRONT SUSPENSION ASSEMBLY" .
   - Remove engine control harness bracket on the strut tower.



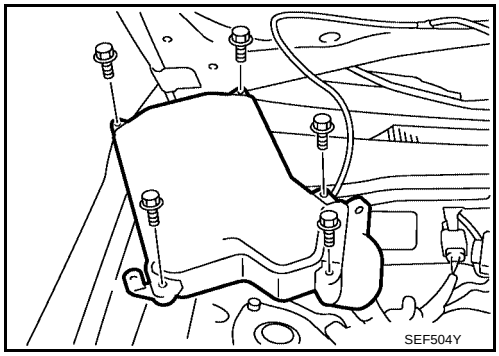
   - Remove quick connector on the ventilation hose.



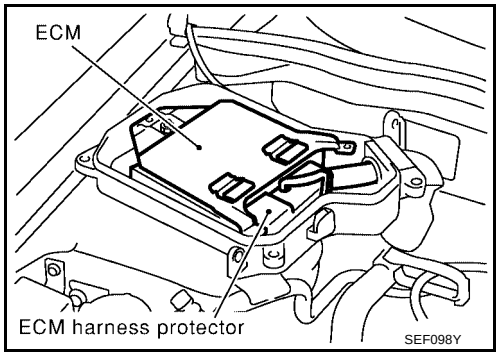
   - Remove ECM fixing bolts and pull it out all the way.



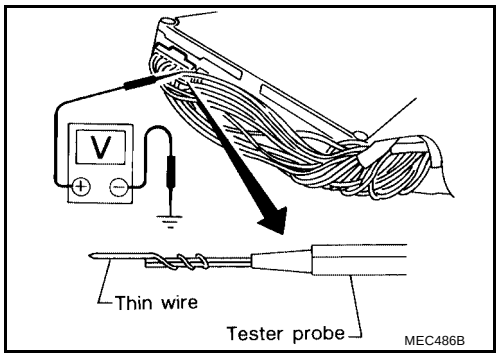
- Remove ECM cover fixing bolts.



- Remove ECM fixing bolts.
- Remove ECM with the harness from the cover.



2. Remove ECM harness protector.
3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
   - Open harness securing clip to make testing easier.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.

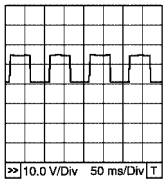


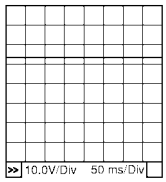
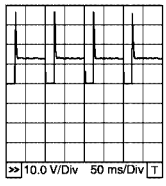
ECM INSPECTION TABLE

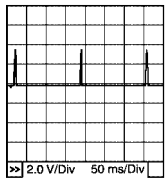
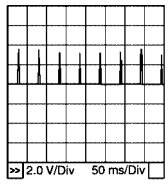
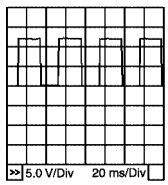
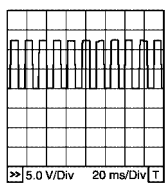
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

CAUTION:

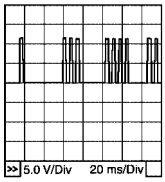
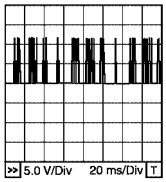
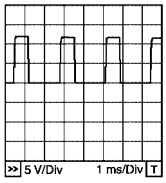
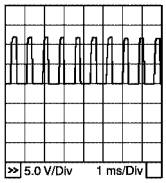
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

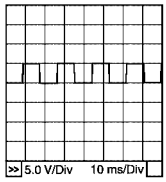
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/L	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	P/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - 1.0V
			[Ignition switch “ON”] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
8	L/B	Vacuum cut valve bypass valve	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
10 (Without NVIS) 29 (With NVIS)	B/P	Fuel pump relay	**[Ignition switch “ON”]** ● For 1 seconds after turning ignition switch “ON” **[Engine is running]**	0 - 1.0V
			[Ignition switch “ON”] ● More than 1 seconds after turning ignition switch “ON”.	BATTERY VOLTAGE (11 - 14V)
11	L/Y	EVAP canister vent control valve	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
12	R	Counter current return	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
13	PU/W	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E
18	OR/L	MIL	**[Ignition switch “ON”]**	0 - 1.0V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
20	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch “OFF”]** ● For 5 seconds after turning ignition switch “OFF”	0 - 1.0V
			[Ignition switch “OFF”] ● 5 seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)

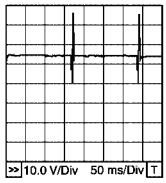
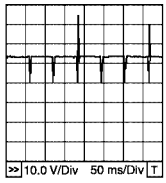
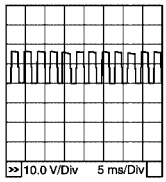
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22 23 24	BR PU L/R GY/R	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 3 Ignition signal No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E
25	Y/G	VIAS control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is above 5,000 rpm	0 - 1.0V
26	L/W	Air conditioner relay	**[Engine is running]** ● Both A/C switch and blower switch are “ON” (Compressor operates)	0 - 0.6V
			[Engine is running] ● A/C switch is “OFF”	BATTERY VOLTAGE (11 - 14V)
27	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is high speed operating	0 - 1.0V
33	L	CAN communication line	**[Ignition switch “ON”]**	Approximately 2.6 - 3.2V Output voltage varies with the communication status.
34	Y	CAN communication line	**[Ignition switch “ON”]**	Approximately 1.7 - 2.3V Output voltage varies with the communication status.
36	L/OR	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	6 - 7V★  PBIB0523E
			[Engine is running] ● Engine speed is 2,500 rpm	6 - 7V★  PBIB0524E

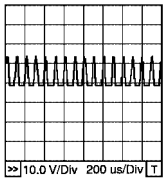
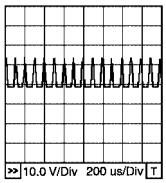
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
37	LG/R	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating.	0 - 1.0V
39	P/B	ASCD CRUISE lamp	**[Ignition switch "ON"]** ● CRUISE switch is depressed at first time → second time	Approximately 0V ↓ BATTERY VOLTAGE (11 - 14V)
40	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 14V
42	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
43	G/OR	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models), "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V
44	L/R	Air conditioner switch	**[Engine is running]** ● Both A/C switch and blower switch are "ON"	Approximately 0V
			[Engine is running] ● A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
46	G	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned	Approximately 0V
			[Engine is running] ● Steering wheel is not being turned	Approximately 5V
47	Y/B	ASCD SET lamp	**[Engine is running]** ● SET switch is "ON". ● ASCD control is operating.	Approximately 0V
			[Engine is running] ● ASCD control is not operating.	BATTERY VOLTAGE (11 - 14V)
50	L/G	Data link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	Approximately 5V
52	L/W	Electrical load signal (Rear window defogger signal)	**[Ignition switch "ON"]** ● Rear window defogger switch is "ON"	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Rear window defogger switch is "OFF"	Approximately 0V
53	R/W	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
55	LG/B	Heater fan switch	**[Engine is running]** ● Heater fan switch “ON”	Approximately 0V
			[Engine is running] ● Heater fan switch “OFF”	Approximately 5V
56	P/L	ASCD brake switch	**[Ignition switch “ON”]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch “ON”] ● Brake pedal is fully released ● Clutch pedal is fully released (M/T models)	BATTERY VOLTAGE (11 - 14V)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
59 60 106 108	B/R B B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
62 (With NVIS) 71 (Without NVIS)	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
62 (Without NVIS) 71 (With NVIS)	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63 (Without NVIS) 81 (With NVIS)	R/W	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● Vehicle speed is 40 km/h (25MPH)	Approximately 2.3V★  PBIB0531E
64	R/G	Accelerator pedal position sensor 2 power supply	**[Ignition switch “ON”]**	Approximately 2.5V
65	R	Sensor's power supply	**[Ignition switch “ON”]**	Approximately 5V
66	W/L	Power supply for ECM (Buck-up)	**[Ignition switch “OFF”]**	BATTERY VOLTAGE (11 - 14V)
70	G/OR	Fuel tank temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature.
72	OR/L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
73	W	Throttle position sensor 1	**[Ignition switch “ON”]** ● **Engine stopped** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch “ON”] ● **Engine stopped** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
74	G	Throttle position sensor 2	**[Ignition switch “ON”]** ● **Engine stopped** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch “ON”] ● **Engine stopped** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
75	W	Accelerator pedal position sensor 1	**[Ignition switch “ON”]** ● **Engine stopped** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch “ON”] ● **Engine stopped** ● Accelerator pedal fully depressed	More than 4.2V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
76	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● **Engine stopped** ● Accelerator pedal fully released	0.21 - 0.36V
			[Ignition switch "ON"] ● **Engine stopped** ● Accelerator pedal fully depressed	More than 2.1V
77	B/W	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V
80	W/L	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
83	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V
84	Y/G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
86	G	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V
87	G/R	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.
88	B/R	EVAP control system pressure sensor	**[Ignition switch "ON"]**	1.8 -4.8V
89	G	ASCD steering switch	**[Ignition switch "ON"]** ● ASCD steering switch is "OFF".	Approximately 4.0V
			[Ignition switch "ON"] ● CRUISE switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1.0V
			[Ignition switch "ON"] ● SET/COAST switch is "ON".	Approximately 2.0V
			[Ignition switch "ON"] ● ACCEL/RES switch is "ON".	Approximately 3.0V
90	W	Accelerator pedal position sensor signal output	**[Ignition switch "ON"]** ● **Engine stopped** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch "ON"] ● **Engine stopped** ● Accelerator pedal fully depressed	More than 4.2V
92	W/G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
93	Y	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600 rpm after the following conditions are met. – Engine: after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V
101 102 103 104	R/B R/W R/Y R/L	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
107	G	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 9V★  PBIB0532E
109 111	R/G R/G	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
112	OR	Throttle control motor relay	**[Ignition switch “OFF”]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch “ON”]	0 - 1.0V
113	R	Throttle control motor relay power supply	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
114	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
115	B	Throttle control motor ground	**[Engine is running]** ● Idle speed	Approximately 0V
116	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

CONSULT-II Function

UBS0027O

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
CAN diagnostic support monitor	The results of transmit/receive diagnosis of CAN communication can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECM part number	ECM part number can be read.

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	×			
		Camshaft position sensor (PHASE)		×		×	×			
		Mass air flow sensor		×		×	×			
		Engine coolant temperature sensor		×	×	×	×	×		
		Heated oxygen sensor 1		×		×	×		×	×
		Heated oxygen sensor 2		×		×	×		×	×
		Vehicle speed sensor		×	×	×	×			
		Accelerator pedal position sensor		×		×	×			
		Throttle position sensor		×		×	×			
		Fuel tank temperature sensor		×		×	×	×		
		EVAP control system pressure sensor		×		×	×			
		Intake air temperature sensor		×		×	×			
		Knock sensor		×						
		Refrigerant pressure sensor				×	×			
		Ignition switch (start signal)				×	×			
		Closed throttle position switch (accelerator pedal position sensor signal)				×	×			
		Air conditioner switch				×	×			
		Park/neutral position (PNP) switch		×		×	×			
		Stop lamp switch		×		×	×			
		Power steering oil pressure switch				×	×			
		Battery voltage				×	×			
		Load signal				×	×			
		Fuel level sensor		×		×	×			
		ASCD steering switch		×		×	×			
		ASCD brake switch		×		×	×			

Item			DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				×	×	×		
		Power transistor (Ignition timing)				×	×	×		
		Throttle control motor relay		×		×	×			
		Throttle control motor		×						
		EVAP canister purge volume control solenoid valve		×		×	×	×		×
		Air conditioner relay				×	×			
		Fuel pump relay	×			×	×	×		
		Cooling fan relay		×		×	×	×		
		Heated oxygen sensor 1 heater		×		×	×		×	
		Heated oxygen sensor 2 heater		×		×	×		×	
		EVAP canister vent control valve		×		×	×	×		
		Vacuum cut valve bypass valve		×		×	×	×		×
		Intake valve timing control solenoid valve		×		×	×	×		
		VIAS control solenoid valve				×	×	×		
		Calculated load value			×	×	×			

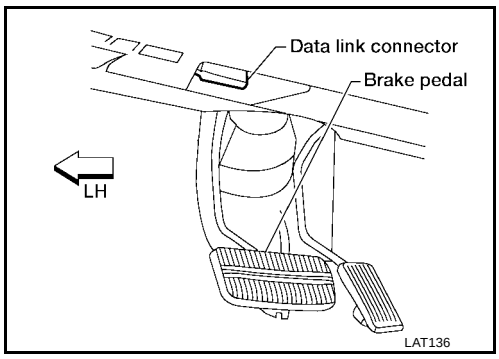
X: Applicable

*1: This item includes 1st trip DTCs.

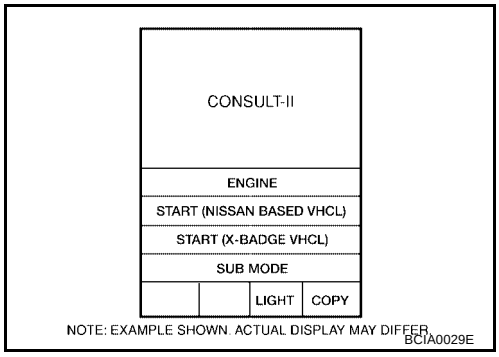
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-1264 .

CONSULT-II INSPECTION PROCEDURE

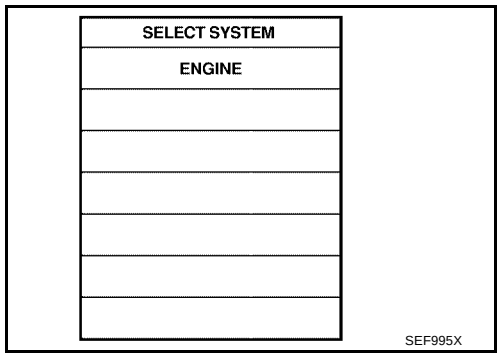
1. Turn ignition switch OFF.
2. Connect “CONSULT-II” and “CONSULT-II CONVERTER“ to data link connector, which is located under LH dash panel.
3. Turn ignition switch ON.



4. Touch “START (NISSAN BASED VHCL)”.

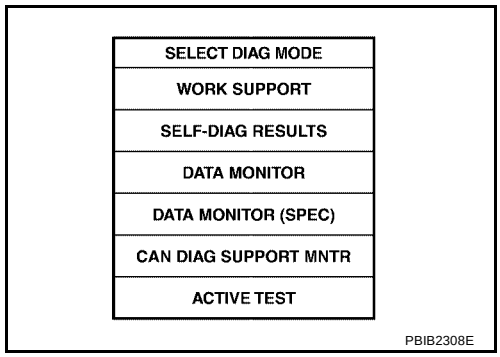


5. Touch “ENGINE”.
If “ENGINE“ is not indicated, go to EC-582, "DATA LINK CONNECTOR" .



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
EVAP SYSTEM CLOSE	OPEN THE VACUUM CUT VALVE BYPASS VALVE AND CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. ● IGN SW “ON” ● ENGINE NOT RUNNING ● AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). ● NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM ● FUEL TANK TEMP. IS MORE THAN 0°C (32°F). ● WITHIN 10 MINUTES AFTER STARTING “EVAP SYSTEM CLOSE” ● WHEN TRYING TO EXECUTE “EVAP SYSTEM CLOSE” UNDER THE CONDITION EXCEPT ABOVE, CONSULT-II WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. **NOTE:** **WHEN STARTING ENGINE, CONSULT-II MAY DISPLAY “BATTERY VOLTAGE IS LOW. CHARGE BATTERY”, EVEN IN USING CHARGED BATTERY.**	When detecting EVAP vapor leak point of EVAP system

WORK ITEM	CONDITION	USAGE
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to EC-1224, "INDEX FOR DTC" .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to EC-1224, "INDEX FOR DTC" .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE
Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×	● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	×	×	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×	● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1) [V]	×	×	● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	×	×	● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	×		● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	×	×	● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×	● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	×	×	● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×			
THRTL SEN 1 [V]	×	×	● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×			

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
FUEL T/TEMP SE [°C] or [°F]	×		● The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
INT/A TEMP SE [°C] or [°F]	×	×	● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
EVAP SYS PRES [V]	×		● The signal voltage of EVAP control system pressure sensor is displayed.	
ABSOL PRES/SE [V]	×		● The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE [V]	×		● The signal voltage of the fuel level sensor is displayed.	
START SIGNAL [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×	● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×	● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×	×	● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×		● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×		● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		×	● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]			● “Calculated load value” indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
PURG VOL C/V [%]			● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]			● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]			● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
VIAS S/V [ON/OFF]			● The control condition of the VIAS control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... VIAS control solenoid valve is operating. OFF ... VIAS control solenoid valve is not operating.	
AIR COND RLY [ON/OFF]		×	● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×	● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
VC/V BYPASS/V [ON/OFF]			● The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signals) is indicated. ON ... Open OFF ... Closed	
VENT CONT/V [ON/OFF]			● The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON ... Closed OFF ... Open	
THRTL RELAY [ON/OFF]			● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]			● Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI ... High speed operation LOW ... Low speed operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
IDL A/V LEARN [YET/CMPLT]			● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully.	
TRVL AFTER MIL [km] or [mile]			● Distance traveled while MIL is activated.	
O2SEN HTR DTY [%]			● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals.	
AC PRESS SEN [V]			● The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE [km/h] or [mph]			● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
SET VHCL SPD [km/h] or [mph]			● The preset vehicle speed is displayed.	
MAIN SW [ON/OFF]			● Indicates [ON/OFF] condition from CRUISE switch signal.	
CANCEL SW [ON/OFF]			● Indicates [ON/OFF] condition from CAN-CEL switch signal.	
RESUME/ACC SW [ON/OFF]			● Indicates [ON/OFF] condition from ACCEL/RES switch signal.	
SET SW [ON/OFF]			● Indicates [ON/OFF] condition from COAST/SET switch signal.	
BRAKE SW1 SW [ON/OFF]			● Indicates [ON/OFF] condition from ASCD brake switch signal, and ASCD clutch switch signal (M/T models).	
BRAKE SW2 SW [ON/OFF]			● Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT [NON/CUT]			● Indicates the vehicle cruise condition. NON ... Vehicle speed is maintained at the ASCD set speed. CUT ...Vehicle speed increased to excessively high compared with the ASCD set speed, and ASCD operation is cut off.	
LO SPEED CUT [NON/CUT]			● Indicates the vehicle cruise condition. NON ... Vehicle speed is maintained at the ASCD set speed. CUT ...Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off.	
AT OD MONITOR [ON/OFF]			● Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM.	
AT OD CANCEL [ON/OFF]			● Indicates [ON/OFF] condition of A/T O/D cancel signal sent from the TCM.	
CRUISE LAMP [ON/OFF]			● Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
SET LAMP [ON/OFF]			● Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.	
Voltage [V]			● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]				
DUTY-HI				
DUTY-LOW				
PLS WIDTH-HI				
PLS WIDTH-LOW				

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE
Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×		● Indicates the engine speed computed from the signal of the crankshaft position sensor (POS).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]			● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE
Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform "Idle Air Volume Learning".

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever “N” ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
VIAS SOL VALVE	● Ignition switch: ON ● Turn solenoid valve “ON” and “OFF” with CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connectors ● Solenoid valve
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
FUEL/T TEMP SEN	● Change the fuel tank temperature using CONSULT-II.		
VENT CONTROL/V	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve “ON” and “OFF” with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connectors ● Solenoid valve
VC/V BYPASS/V	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve “ON” and “OFF” with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to EC-1265, "SYSTEM READINESS TEST (SRT) CODE" .

SRT Work Support Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

DTC Work Support Mode

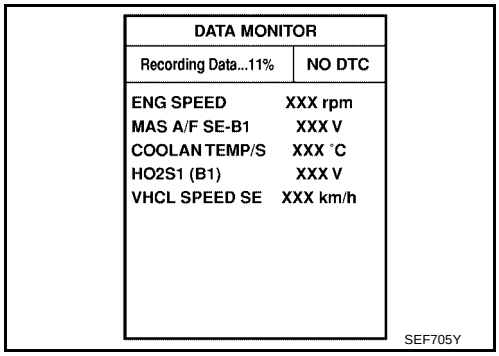
Test mode	Test item	Condition	Reference page
EVAP SYSTEM	PURGE FLOW P0441	Refer to corresponding trouble diagnosis for DTC.	EC-1507
	EVAP SML LEAK P0442/P1442		EC-1513
	EVAP V/S SML LEAK P0456/P1456		EC-1555, EC-1695
	PURG VOL CN/V P1444		EC-1672
	VC CUT/V BP/V P1491		EC-1714
HO2S1	HO2S1 (B1) P0133		EC-1412
	HO2S1 (B1) P0134		EC-1421
	HO2S1 (B1) P1143		EC-1623
	HO2S1 (B1) P1144		EC-1629
H02S2	HO2S2 (B1) P0139		EC-1435
	HO2S2 (B1) P1146		EC-1635
	HO2S2 (B1) P1147		EC-1642

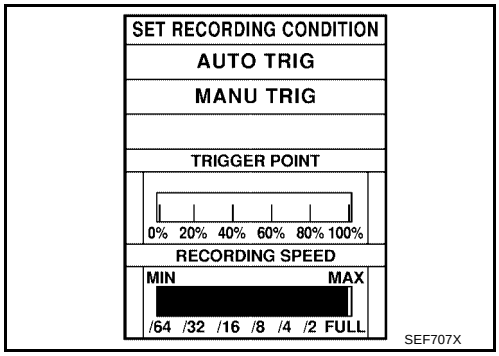
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

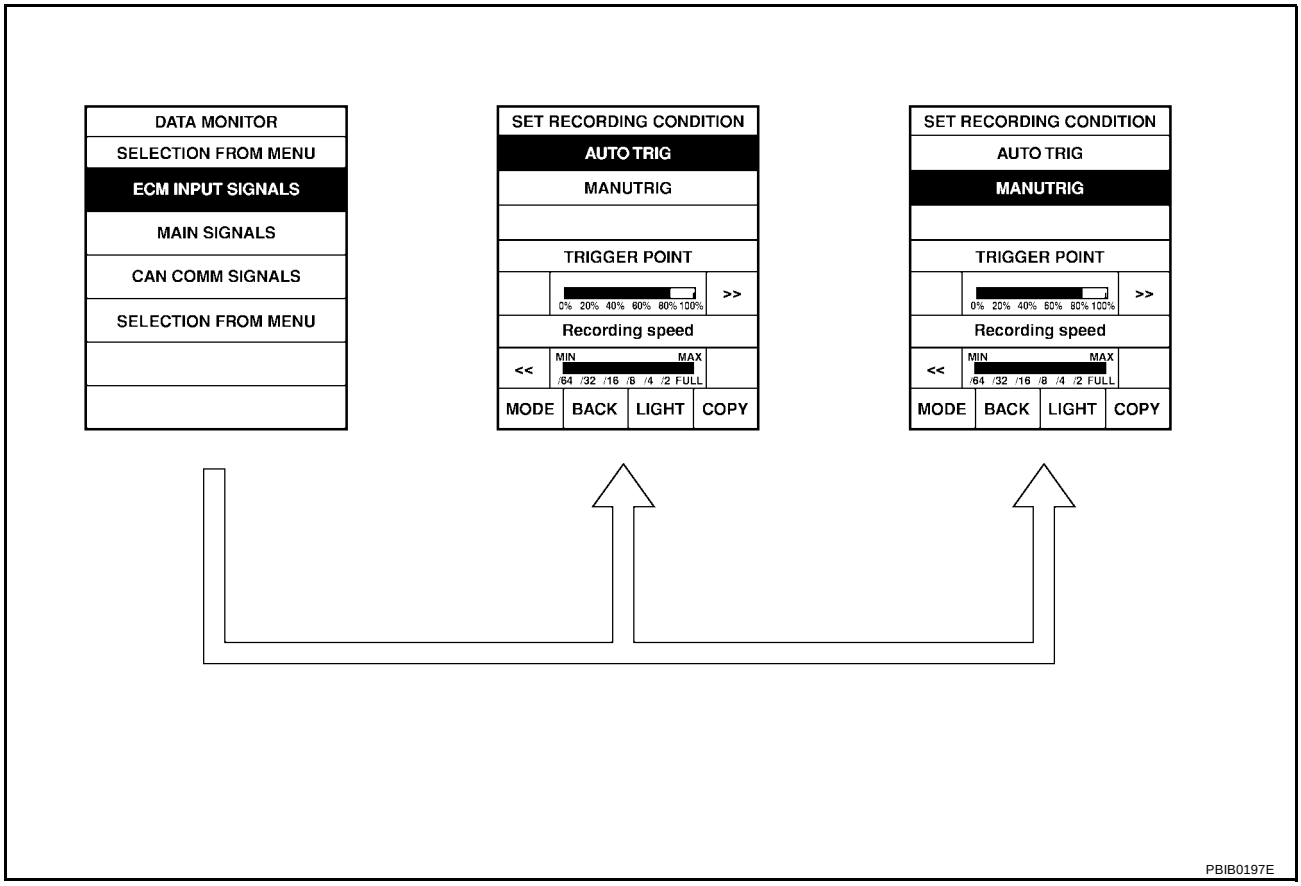
1. “AUTO TRIG” (Automatic trigger):
   - The malfunction will be identified on the CONSULT-II screen in real time.
     In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
     At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
     The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.
2. “MANU TRIG” (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.





Operation

1. “AUTO TRIG”
   - While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" .)
2. “MANU TRIG”
   - If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

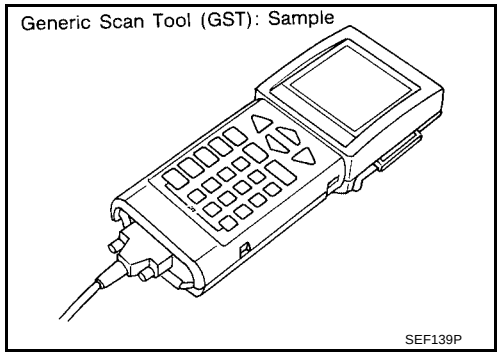


Generic Scan Tool (GST) Function

UBS0027P

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained below.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



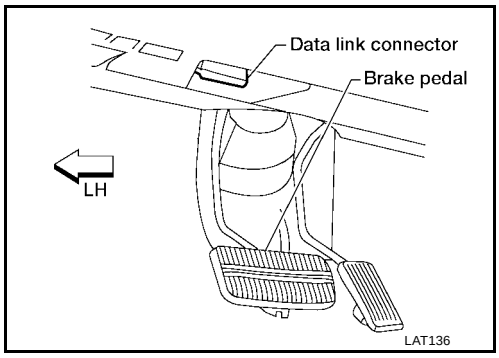
FUNCTION

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-1264, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.

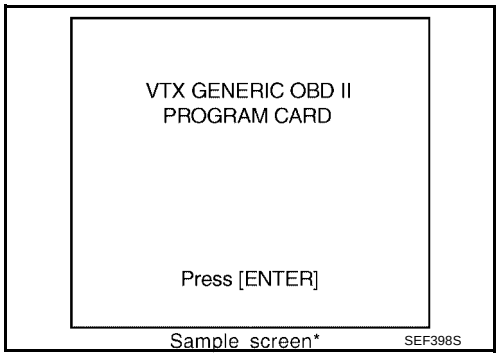
Diagnostic test mode		Function
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode can close EVAP system in ignition switch “ON” position (Engine stopped). When this mode is performed, the following parts can be opened or closed. ● EVAP canister vent control valve open ● Vacuum cut valve bypass valve closed In the following conditions, this mode cannot function. ● Low ambient temperature ● Low battery voltage ● Engine running ● Ignition switch “OFF” ● Low fuel temperature ● Too much pressure is applied to EVAP system
MODE 9	(CALIBRATION ID)	This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

GST INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect “GST” to data link connector, which is located under LH dash panel near the fuse box cover.
3. Turn ignition switch ON.

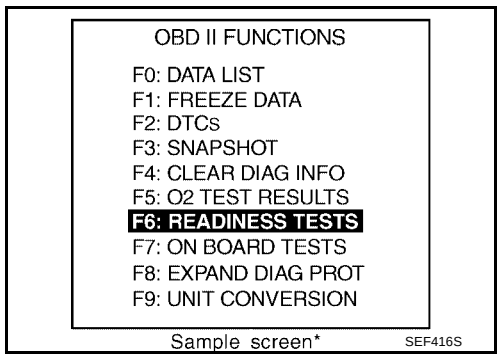


4. Enter the program according to instruction on the screen or in the operation manual.
   (*: Regarding GST screens in this section, sample screens are shown.)



5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.



CONSULT-II Reference Value in Data Monitor Mode

UBS0027Q

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.5 - 3.5 msec
		2,000 rpm	2.5 - 3.5 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	54% - 155%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 (B1)	● Warm-up condition ● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1)	● Engine: After warming up ● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1 ACCEL SEN2★	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2★	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
EVAP SYS PRES	● Ignition switch: ON		1.8 - 4.8V
ABSOL PRES/SE	● Ignition switch: ON		1.8 - 4.8V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10° - 20° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		2,000 rpm	Approx. 0° - 20°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 25% - 60%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
VIAS S/V	● Engine: After warming up	Idle	OFF
		More than 5,000 rpm	ON
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
VC/V BYPAS S/V	● Ignition switch: ON		OFF
VENT CONT/V	● Ignition switch: ON		OFF
THRTL RELAY	● Ignition switch: ON		ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm		ON
	● Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1)	● Engine speed: Below 3,600 rpm after the following conditions are met ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.		ON
	● Engine speed: Above 3,600 rpm		OFF
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MIL has turned ON.	0 - 65,535 km (0 - 40,723 mile)
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80°C (176°F) ● Engine speed: Below 3,600 rpm		Approx. 50%
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
SET VHCL SPD	● Engine: Running	ASCD: Operating	The preset vehicle speed is displayed.
MAIN SW	● Ignition switch: ON	CRUISE switch: Depressed	ON
		CRUISE switch: Released	OFF

MONITOR ITEM	CONDITION		SPECIFICATION
CANCEL SW	● Ignition switch: ON	CANCEL switch: Depressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	ACCEL/RES switch: Depressed	ON
		ACCEL/RES switch: Released	OFF
SET SW	● Ignition switch: ON	COAST/SET switch: Depressed	ON
		COAST/SET switch: Released	OFF
BRAKE SW1 (ASCD brake switch)	● Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2 (STOP lamp switch)	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
CRUISE LAMP	● Ignition switch: ON	CRUISE switch is depressed at first time → second time	ON → OFF
SET LAMP	● CRUISE switch: ON	SET switch pressed	ON
	● When vehicle is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD control is canceled.	OFF

★: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

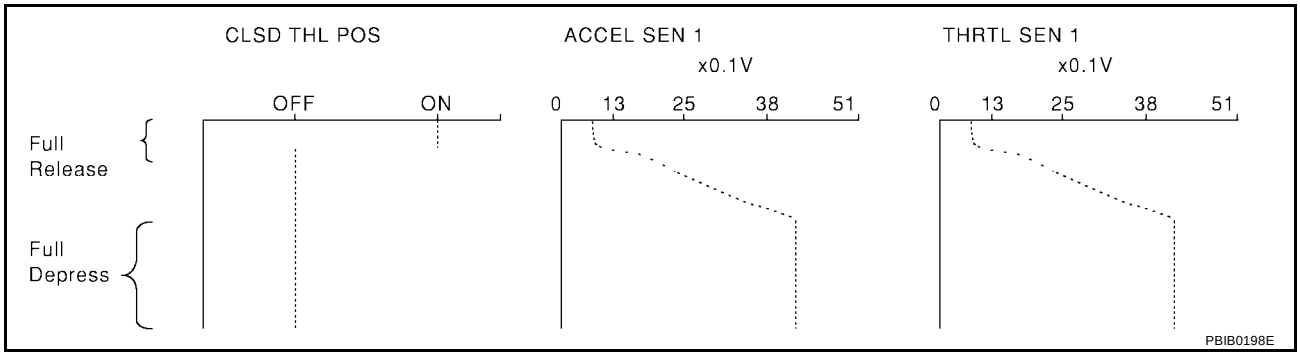
Major Sensor Reference Graph in Data Monitor Mode

UBS0027R

The following are the major sensor reference graphs in “DATA MONITOR” mode.

CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

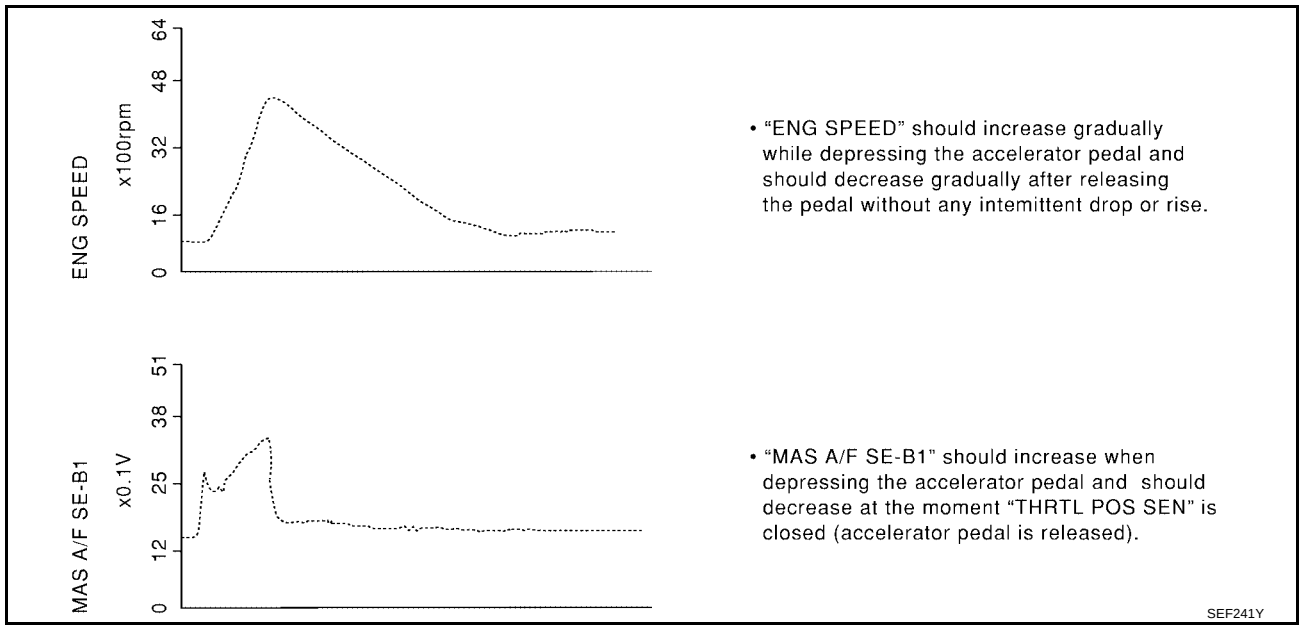
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position (A/T models) or with shift lever in “1st” position (M/T models).
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.

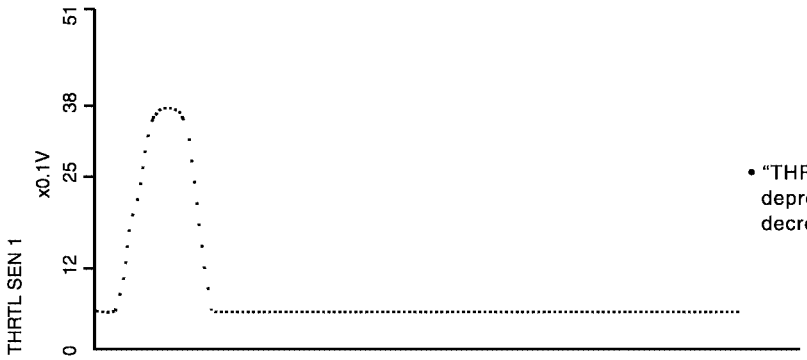


ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

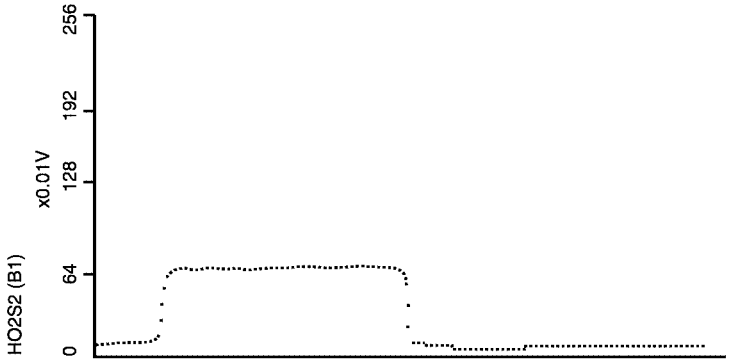
Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

Each value is for reference, the exact value may vary.

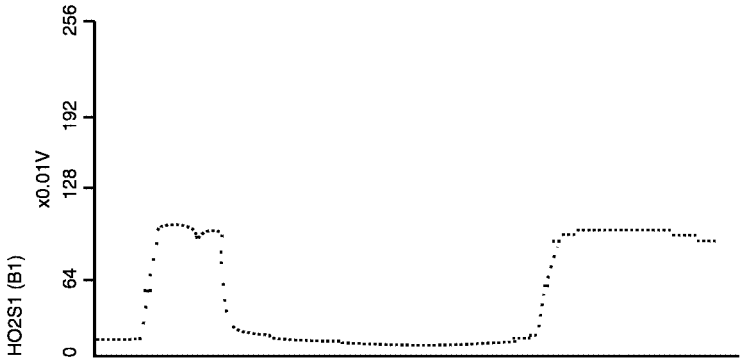




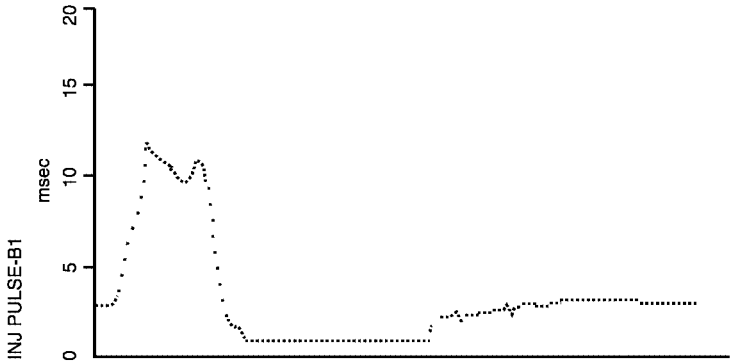
• "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

UBS0027S

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

UBS0027T

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

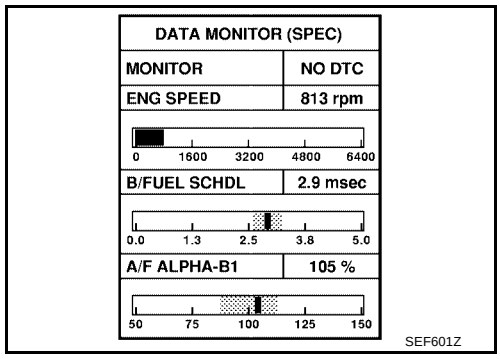
*1: For A/T models, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
For M/T models, after the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

Inspection Procedure

UBS0027U

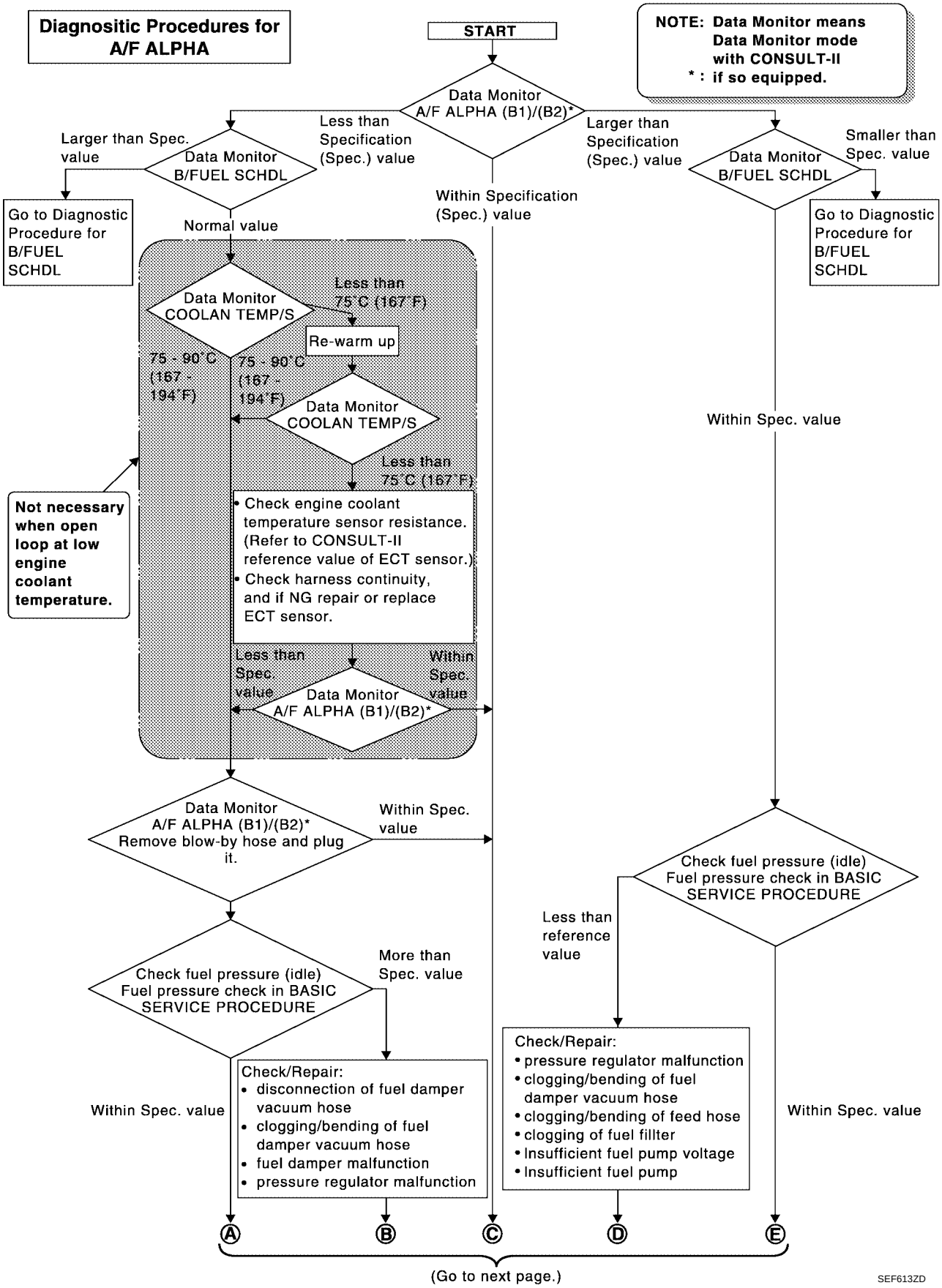
NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

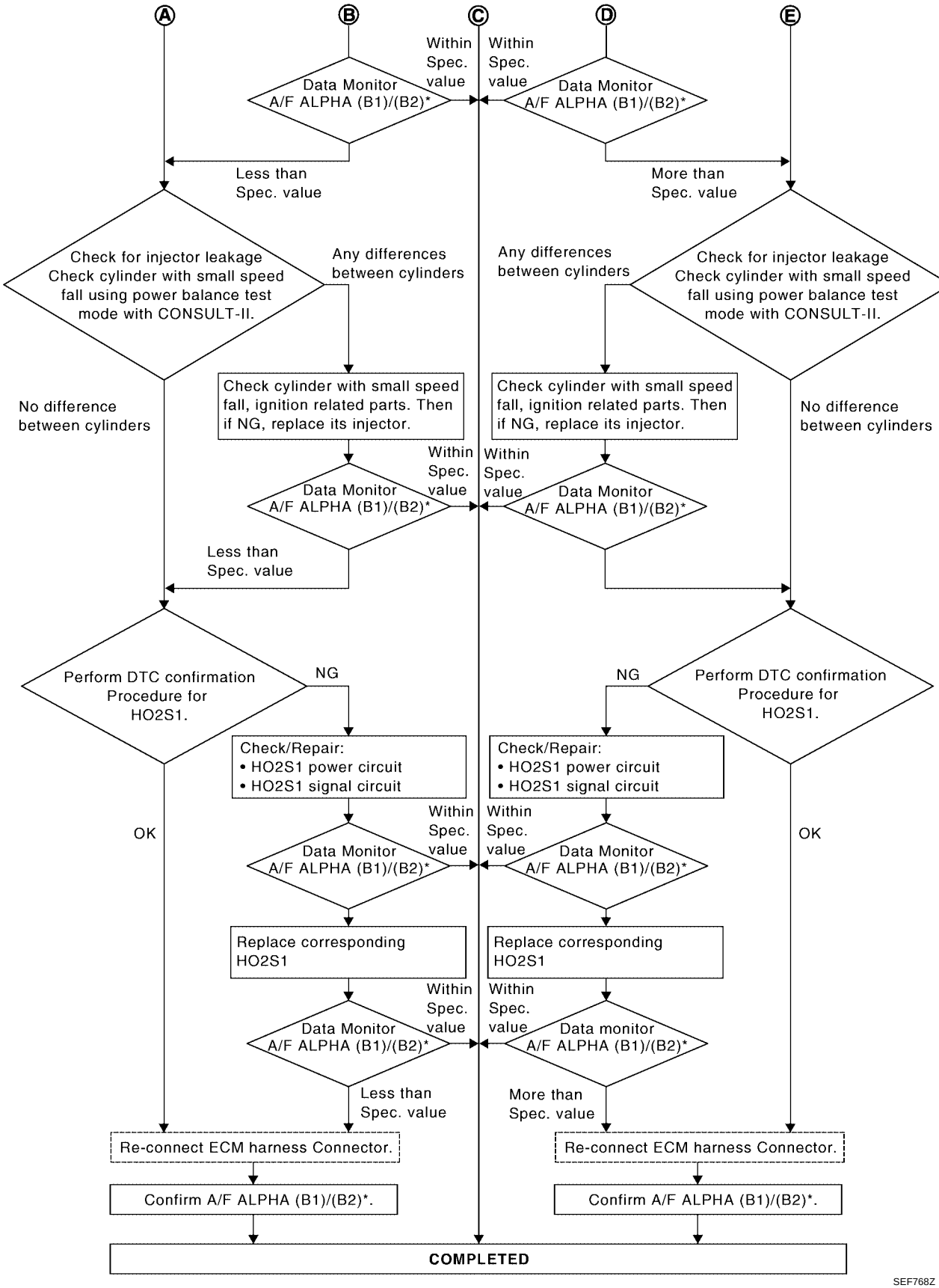
1. Perform EC-1291, "Basic Inspection" .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-1338, "Diagnostic Procedure" .

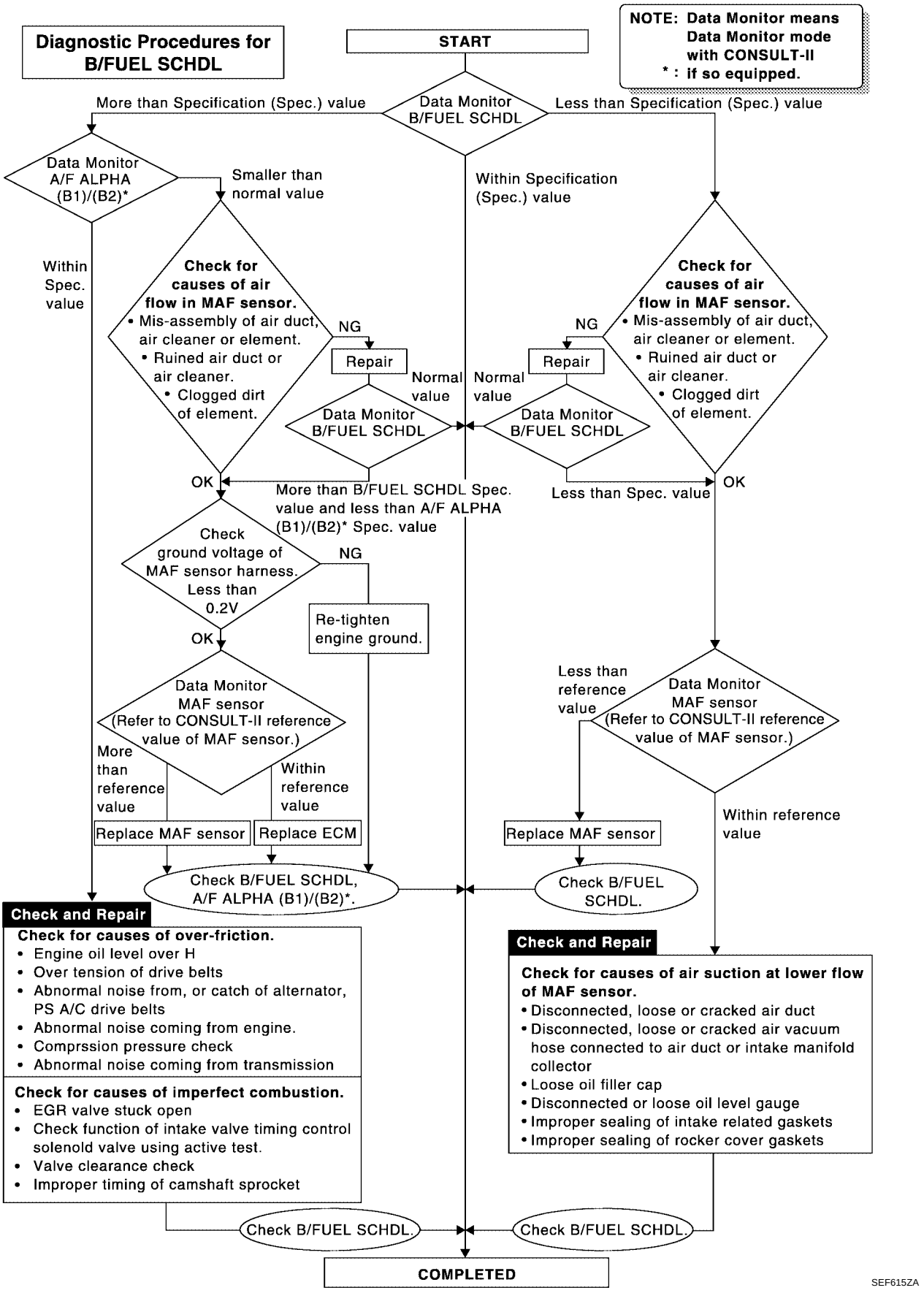


Diagnostic Procedure

UBS0027V




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair: • HO2S1 power circuit • HO2S1 signal circuit
Check/Repair: • HO2S1 power circuit • HO2S1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED
SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
Re-tighten engine ground.
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Less than reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check B/FUEL SCHDL.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

UBS0027W

Intermittent incidents (I/I) may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “[1t]”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the malfunctioning area.

Diagnostic Procedure

UBS0027X

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK CONNECTOR TERMINALS

Refer to GI-23, "How to Check Terminal" , “HOW TO PROBE CONNECTORS”, “How to Check Enlarged Contact Spring of Terminal”.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace connector.

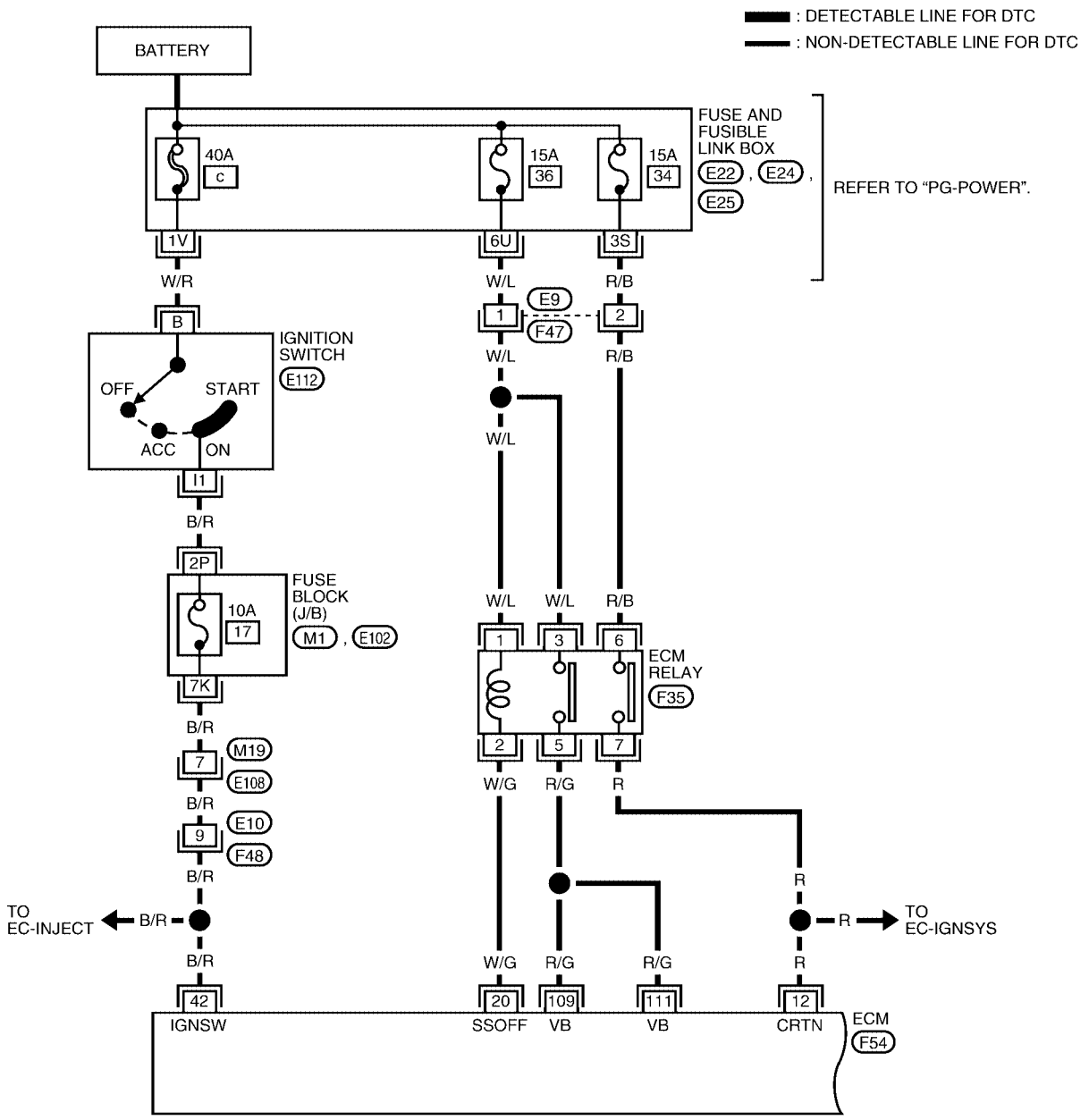
POWER SUPPLY CIRCUIT FOR ECM

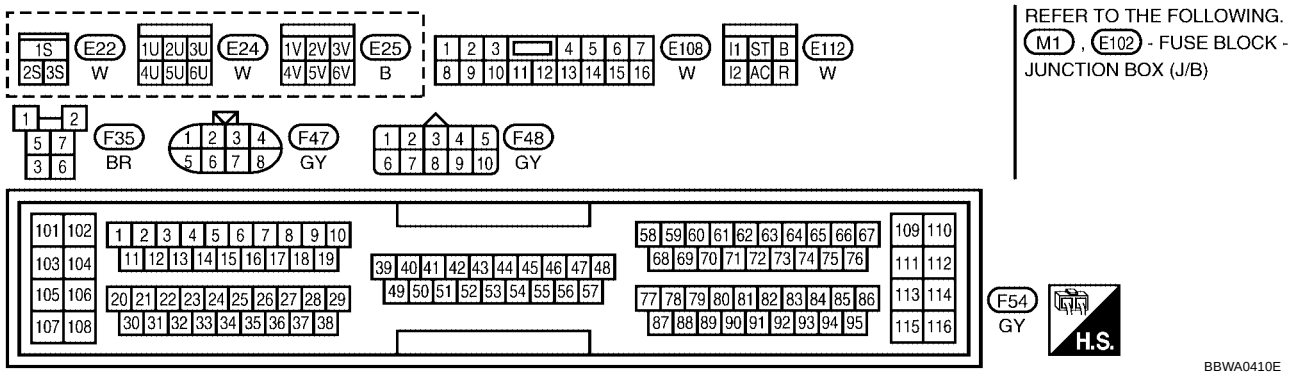
PFP:24110

Wiring Diagram

UBS0027Y

EC-MAIN-01





Specification data are reference values and are measured between each terminal and ground.

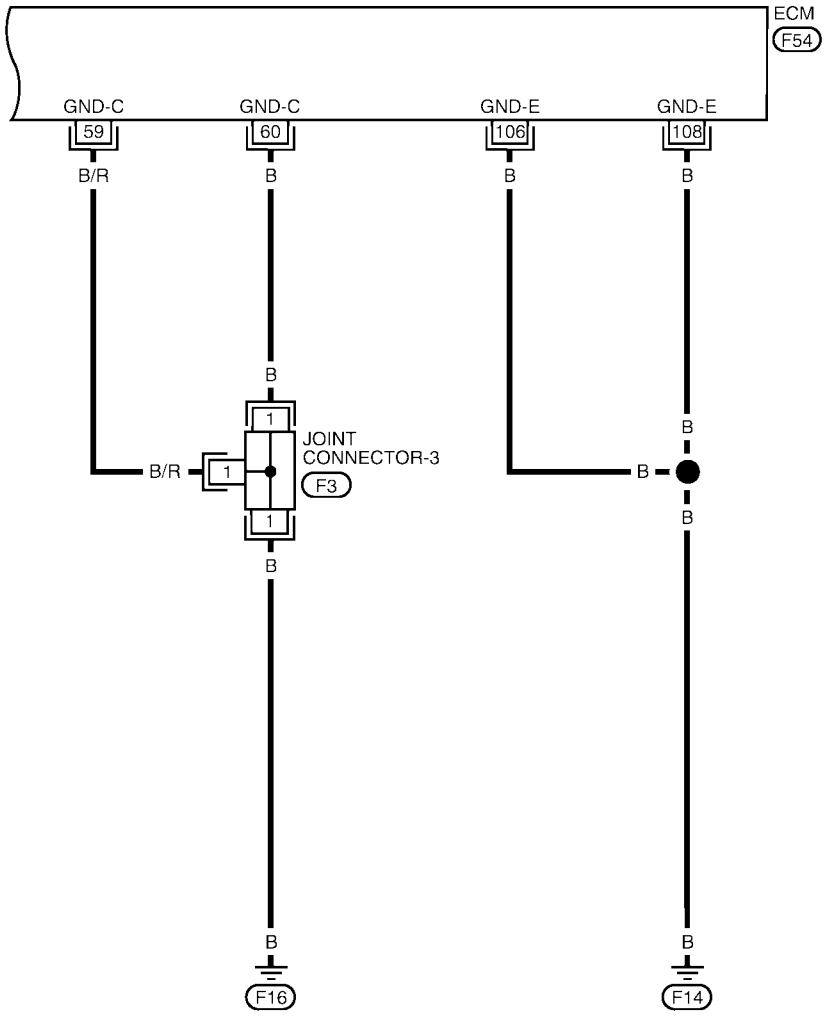
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

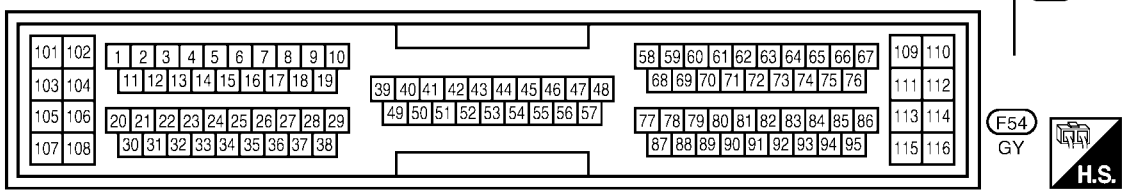
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	R	Counter current return	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
20	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● More than 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
42	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
109 111	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-MAIN-02

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC



REFER TO THE FOLLOWING.
F3 -JOINT CONNECTOR



BBWA0211E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
59 60 106 108	B/R B B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

Diagnostic Procedure

UBS0027Z

1. INSPECTION START

Start engine.

Is engine running?

Yes or No

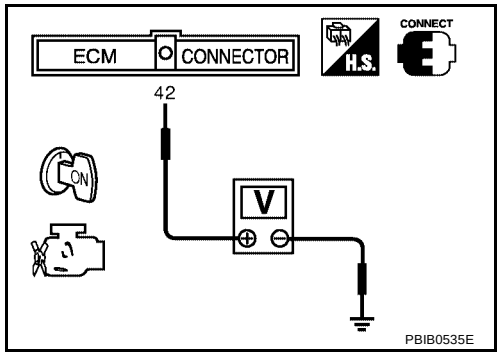
Yes >> GO TO 9.

No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “OFF” and then “ON”.
2. Check voltage between ECM terminal 42 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E10, F48
- Fuse block (J/B) connectors E102, M1
- 10A fuse
- Harness for open or short between ECM and fuse

>> Repair harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 59, 60, 106, 108 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

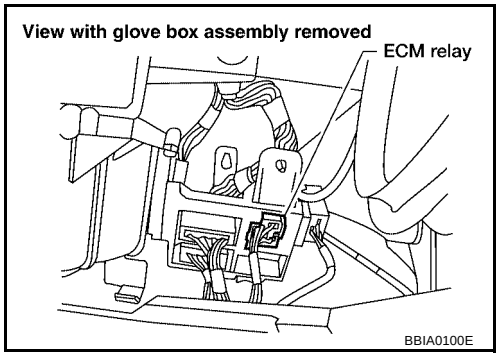
Check the following.

- Joint connector-3
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

6. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.

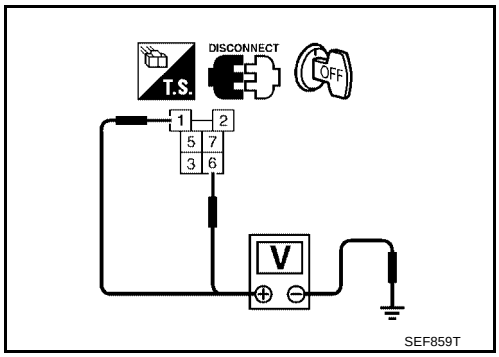


2. Check voltage between ECM relay terminals 1, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.



7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 15A fuses
- Fuse and fusible link box connectors E22, E24
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 20 and ECM relay terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

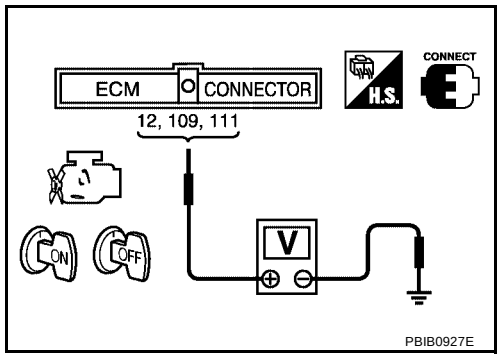
OK or NG

OK >> Go to EC-1777, "IGNITION SIGNAL" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Stop engine.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 12, 109, 111 and ground with CONSULT-II or tester.

Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

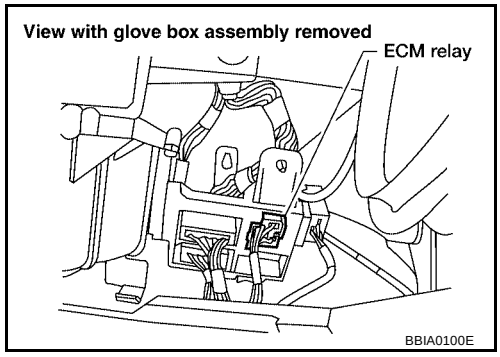


OK or NG

OK >> GO TO 14.
NG (Battery voltage does not exist.)>>GO TO 10.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 13.

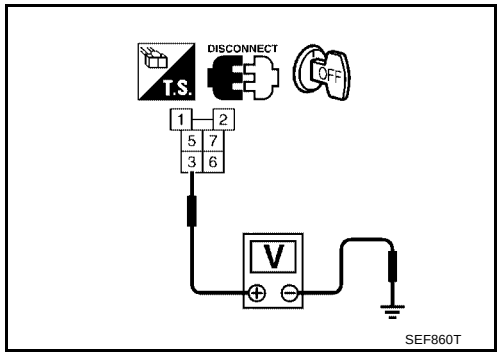
10. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness or connectors E9, F47
- Harness for open or short between ECM relay and 15A fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals and ECM relay terminals as follows. Refer to Wiring Diagram.

ECM terminal	ECM relay terminal
12	7
109, 111	5

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 13.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

13. CHECK ECM RELAY

Refer to EC-1349, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> Replace ECM relay.

14. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 59, 60, 106, 108 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

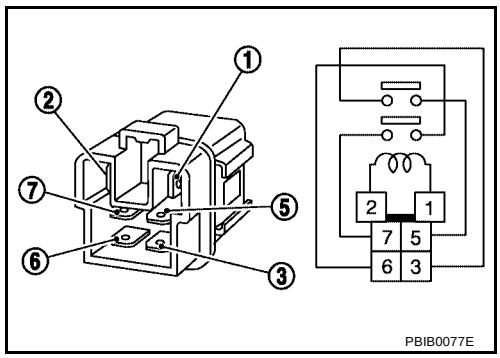
UBS00280

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

UBS00281

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

UBS00282

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000*1 1000	CAN communication line	● ECM cannot communicate to other control units. ● ECM cannot communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted)
U1001*2 1001			

***1:This self-diagnosis has the one trip detection.**
***2:The MIL will not light up for this diagnosis.**

DTC Confirmation Procedure

UBS00283

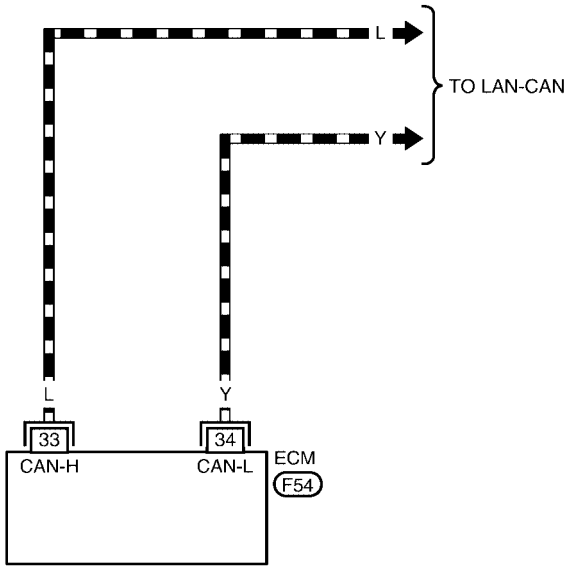
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1352, "Diagnostic Procedure" .

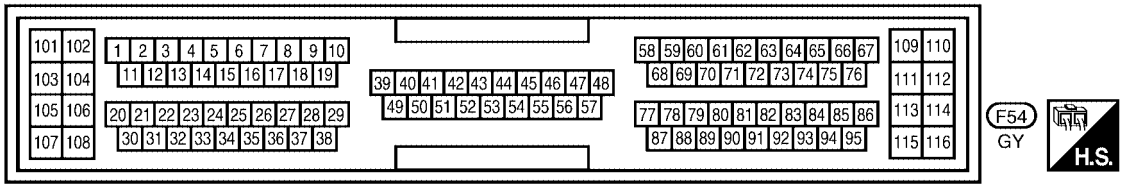
Wiring Diagram

UBS00284

EC-CAN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
: DATA LINE





BBWA0212E

Diagnostic Procedure

UBS00285

Go to LAN-23, "CAN SYSTEM (TYPE 3)"

DTC P0011 IVT CONTROL

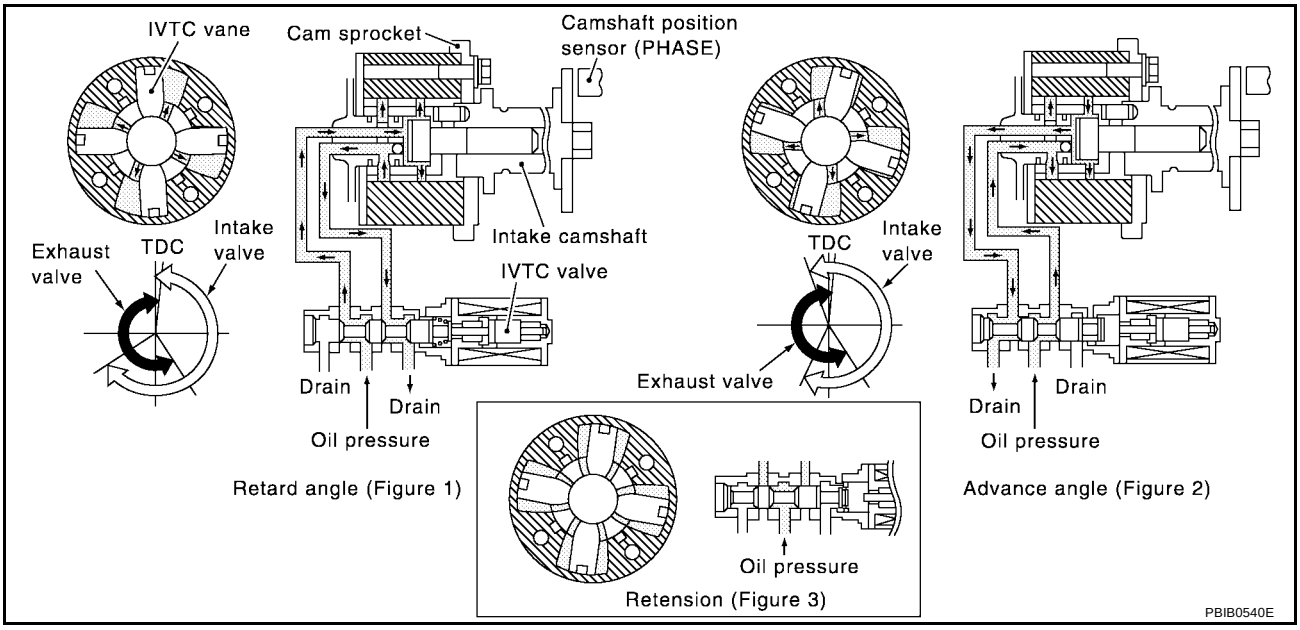
PFP:23796

Description

UBS00286

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed sensor	Vehicle speed		



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

CONSULT-II Reference Value in Data Monitor Mode

UBS00287

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		2,000 rpm	Approx. 0° - 20°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 25% - 60%

On Board Diagnosis Logic

UBS00288

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	● Crankshaft position sensor (POS) ● Camshaft position sensor (PHASE) ● Accumulation of debris to the signal pick-up portion of the camshaft

FAIL-SAFE MODE

ECM enters in fail-safe mode when the malfunction is detected.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

UBS00289

CAUTION:
Always drive at a safe speed.

NOTE:

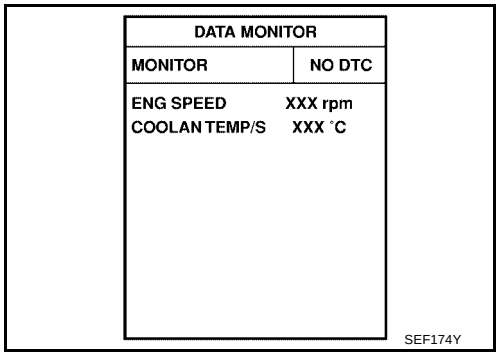
- **If DTC P0011 is displayed with DTC P1111, first perform trouble diagnosis for "DTC P1111". See EC-1600 .**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLANT TEMPS	70 - 105°C (158 - 221°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)



4. If 1st trip DTC is detected, go to EC-1354, "Diagnostic Procedure" .

WITH GST

Follow the procedure "WITH CONSULT-II" above.

Diagnostic Procedure

UBS0028A

1. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1494, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace crankshaft position sensor (POS).

2. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1500, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace camshaft position sensor (PHASE).

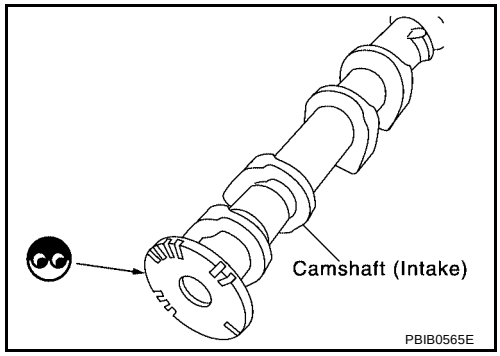
3. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 4.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For wiring diagram refer to CKP sensor (POS) EC-1491 and CMP sensor (PHASE) EC-1497 .

>> **INSPECTION END**

DTC P0031, P0032 HO2S1 HEATER

PFP:22690

Description

UBS0028B

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

UBS0028C

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80°C (176°F) ● Engine speed: Below 3,600 rpm	Approx. 50%

On Board Diagnosis Logic

UBS0028D

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heater oxygen sensor 1 heater
P0032 0032	Heated oxygen sensor 1 heater control circuit high	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heater oxygen sensor 1 heater

DTC Confirmation Procedure

UBS0028E

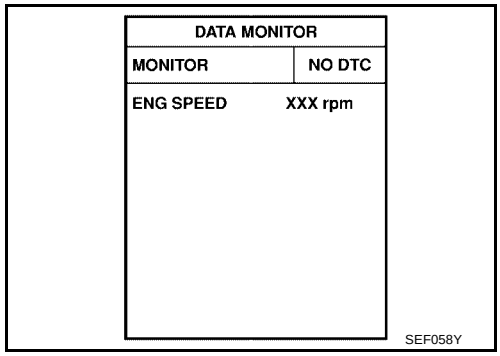
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and run it for at least 6 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-1359, "Diagnostic Procedure" .



WITH GST

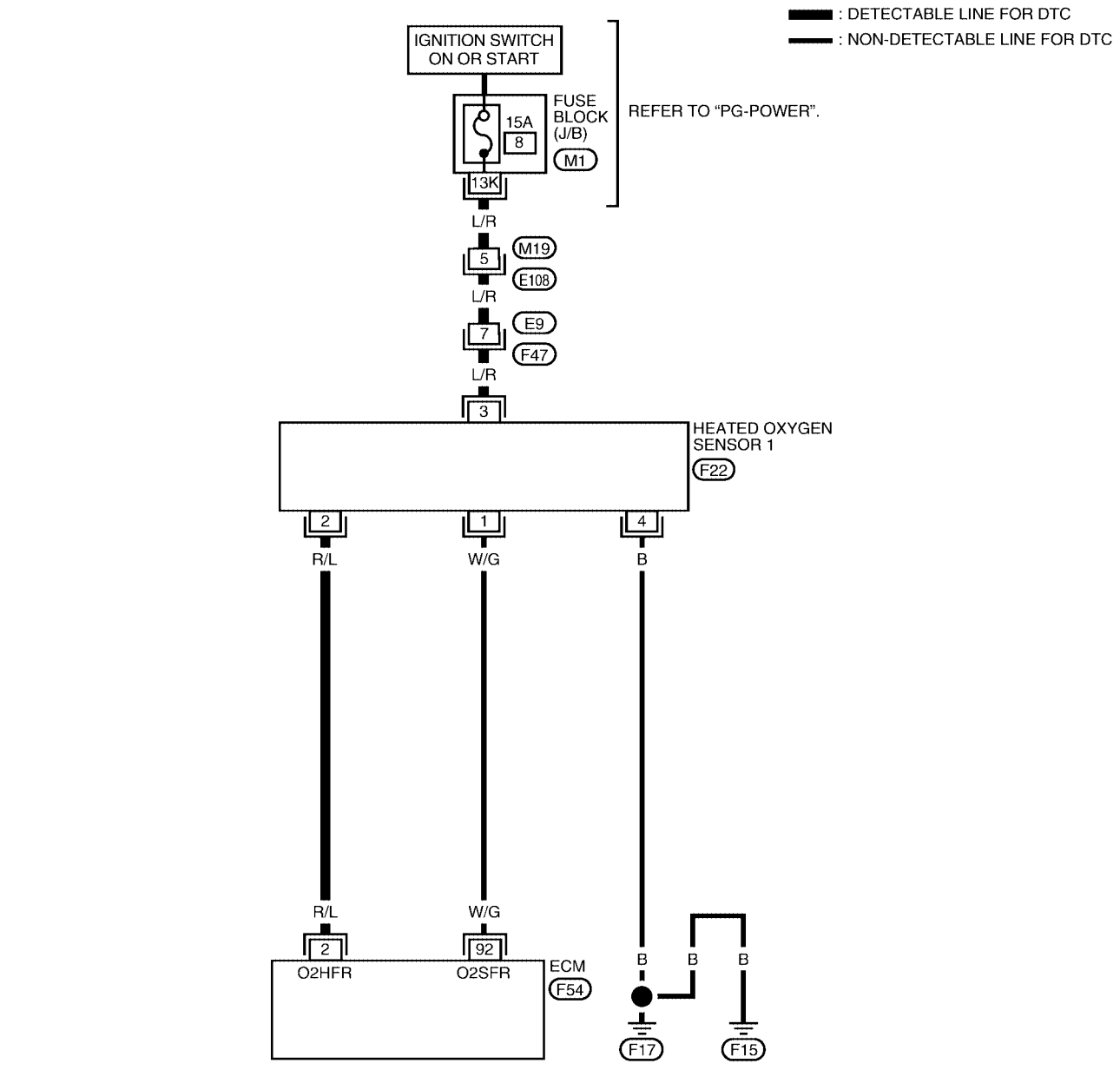
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and run it for at least 6 seconds at idle speed.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine and run it for at least 6 seconds at idle speed.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-1359, "Diagnostic Procedure" .

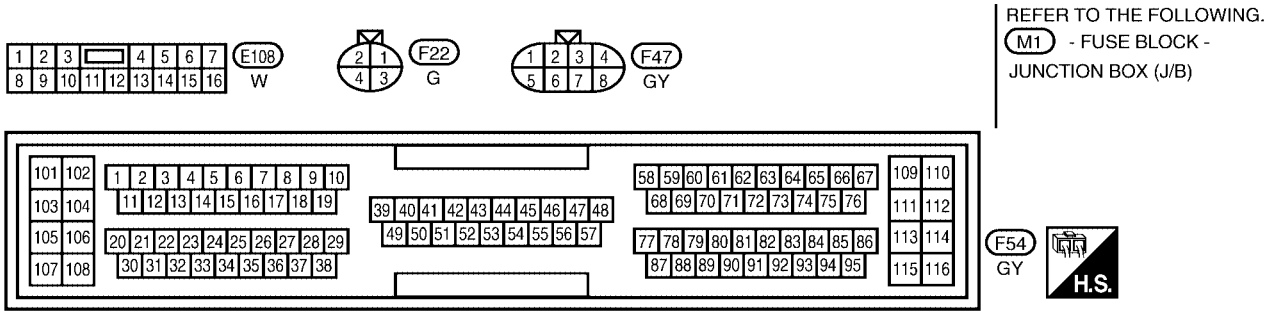
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS0028F

EC-HO2S1H-01



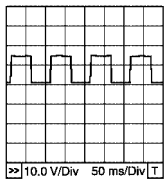


BBWA0411E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/L	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

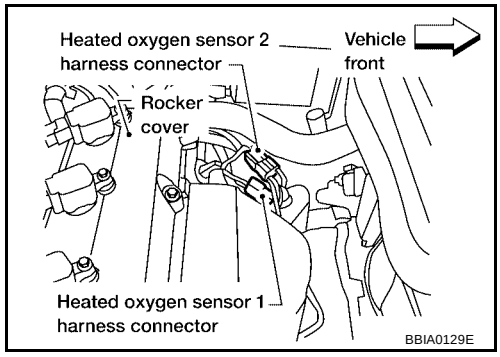
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS0028G

1. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch “ON”.

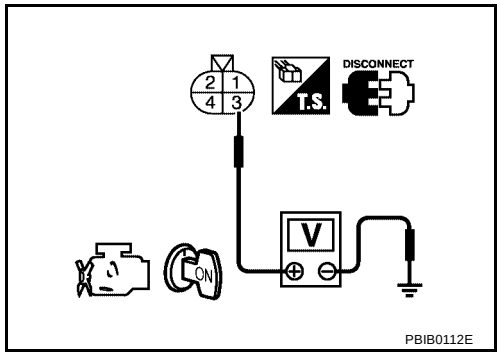


4. Check voltage between HO2S1 terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E9, F47
- Fuse block (J/B) connector M1
- 15A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair harness or connectors.

3. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1361, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS0028H

HEATED OXYGEN SENSOR 1 HEATER

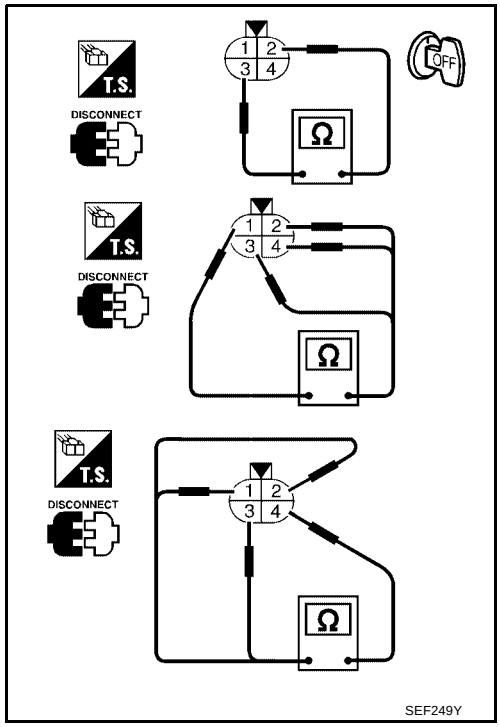
1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
2 and 3	3.3 - 4.0 Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

UBS0028I

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

DTC P0037, P0038 HO2S2 HEATER

PFP:226A0

Description

UBS0028J

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
Below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	ON

CONSULT-II Reference Value in Data Monitor Mode

UBS0028K

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	ON
	● Engine speed: Above 3,600 rpm	OFF

On Board Diagnosis Logic

UBS0028L

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) ● Heated oxygen sensor 2 heater
P0038 0038	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) ● Heated oxygen sensor 2 heater

DTC Confirmation Procedure

UBS0028M

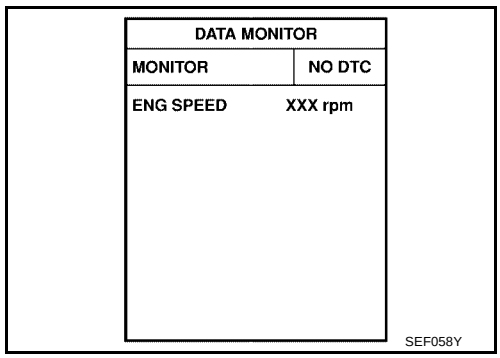
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.

4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minute.
6. If 1st trip DTC is detected, go to EC-1365, "Diagnostic Procedure" .



WITH GST

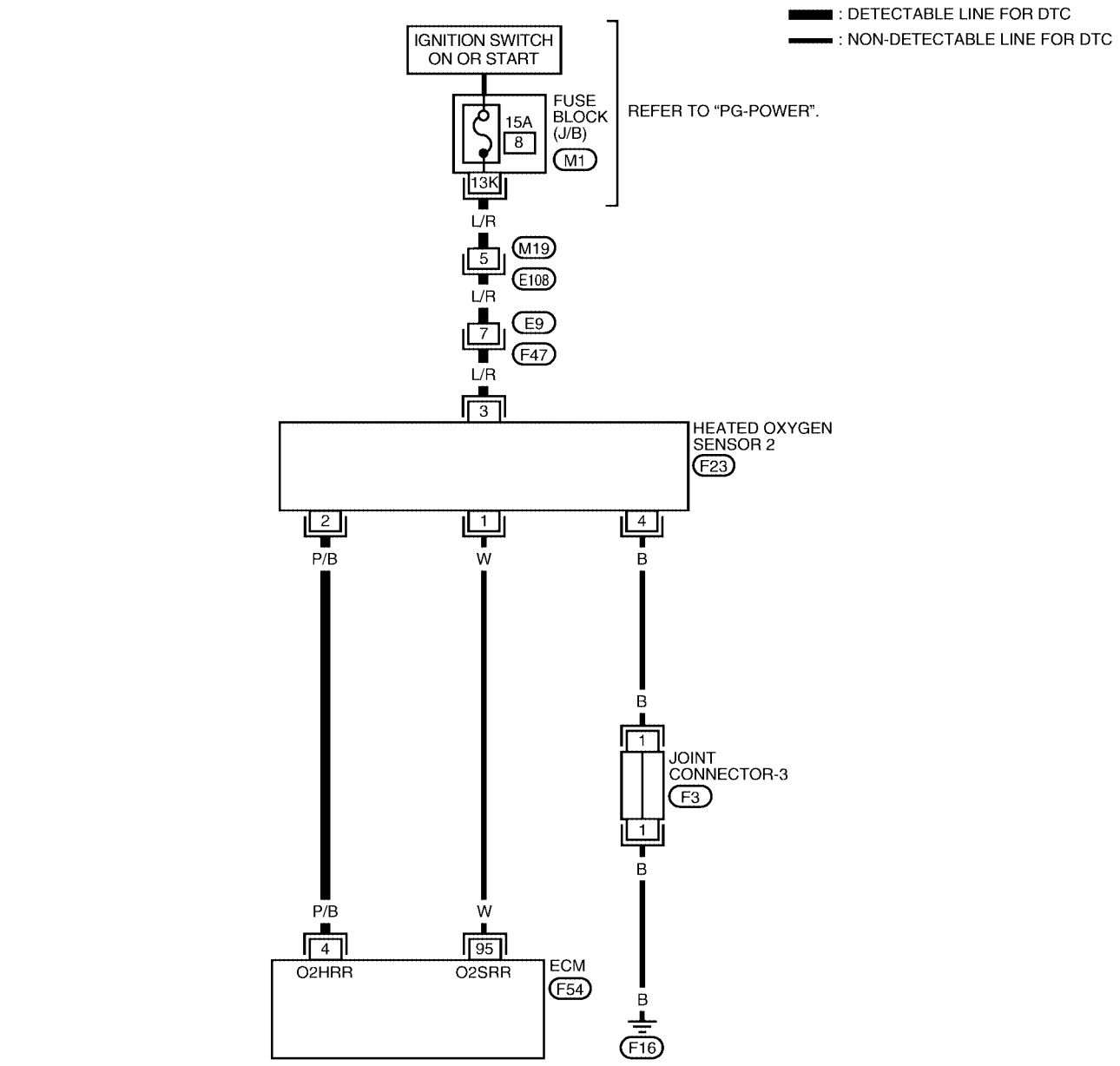
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for one minute.
8. Select “MODE 3” with GST.
9. If DTC is detected, go to EC-1365, "Diagnostic Procedure" .

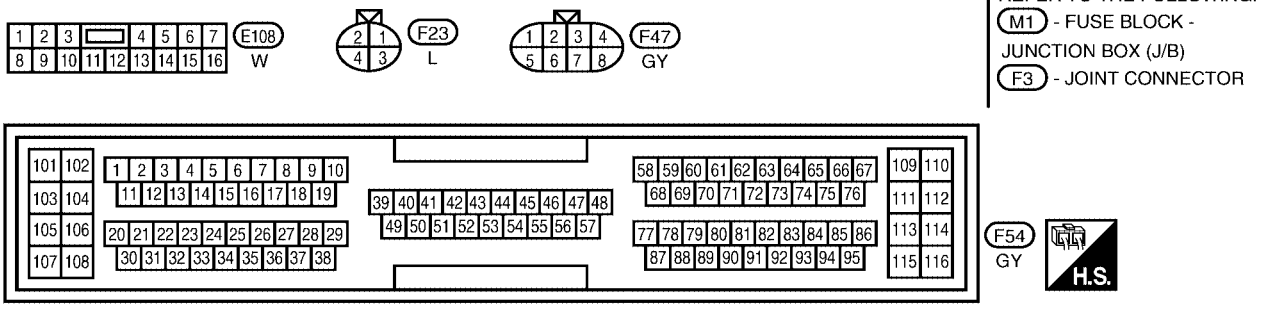
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS0028N

EC-HO2S2H-01





BBWA0412E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

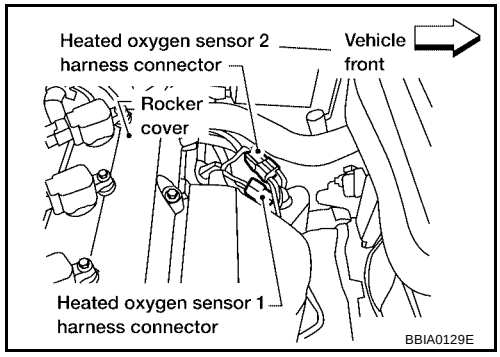
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	P/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS0028O

1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch "ON".

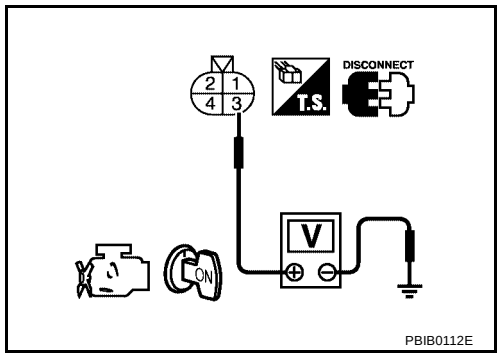


4. Check voltage between HO2S2 terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E9, F47
- Fuse block (J/B) connector M1
- 15A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 4 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-1367, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS0028P

HEATED OXYGEN SENSOR 2 HEATER

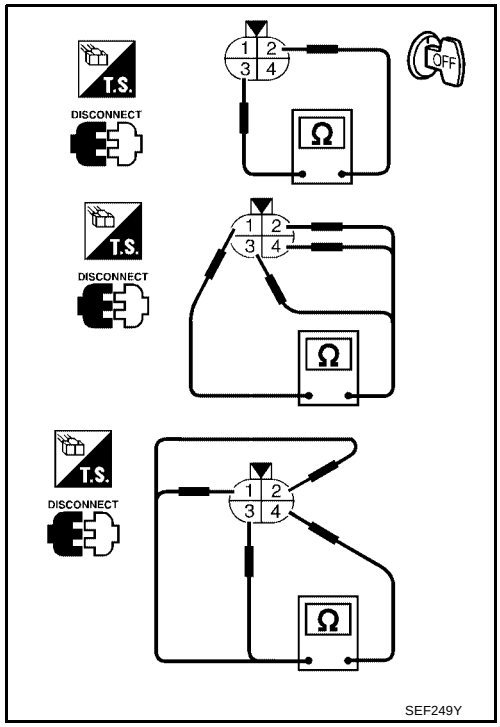
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
2 and 3	3.3 - 4.0 Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

2. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

UBS0028Q

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

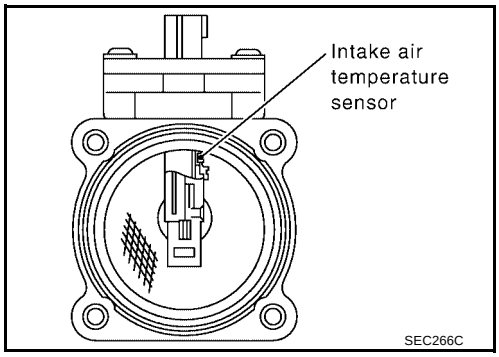
DTC P0101 MAF SENSOR

PFP:22680

Component Description

UBS0028R

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS0028S

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS0028T

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0101 0101	Mass air flow sensor circuit range/performance problem	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor
		B)	A low voltage from the sensor is sent to ECM under heavy load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor

DTC Confirmation Procedure

UBS0028U

Perform “PROCEDURE FOR MALFUNCTION A” first.
If the DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”.

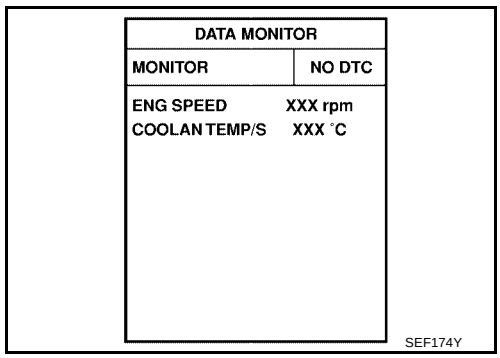
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

NOTE:
If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch “ON”) instead of running engine at idle speed.

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and warm it up to normal operating temperature.
4. Run engine for at least 10 seconds at idle speed.
5. If DTC is detected, go to EC-1372, "Diagnostic Procedure" .



With GST

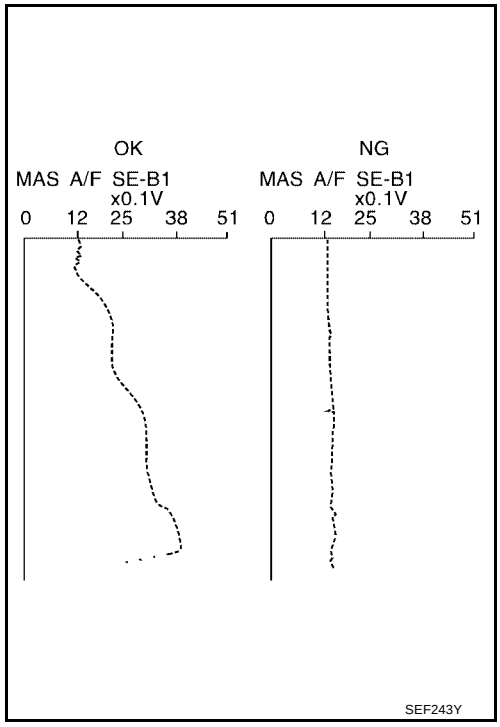
Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

CAUTION:
Always drive vehicle at a safe speed.

With CONSULT-II

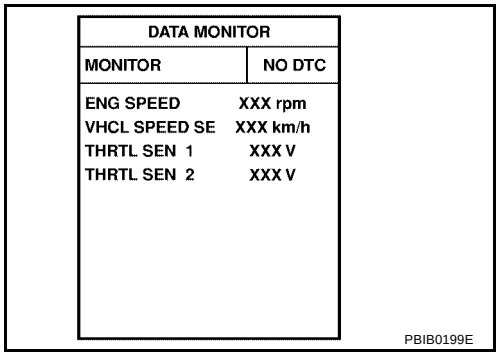
1. Turn ignition switch “ON”.
2. Start engine and warm it up to normal operating temperature.
   If engine cannot be started, go to EC-1372, "Diagnostic Procedure" .
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Check the voltage of “MAS A/F SE-B1” with “DATA MONITOR”.
5. Increases engine speed to about 4,000 rpm.
6. Monitor the linear voltage rise in response to engine speed increases.
   If NG, go to EC-1372, "Diagnostic Procedure" .
   If OK, go to following step.



7. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
THRTL SEN 1	More than 3V
THRTL SEN 2	More than 3V
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

8. If DTC is detected, go to EC-1372, "Diagnostic Procedure" .



Overall Function Check

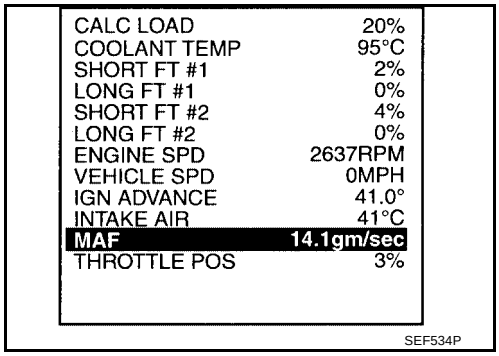
UBS0028V

PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a DTC might not be confirmed.

With GST

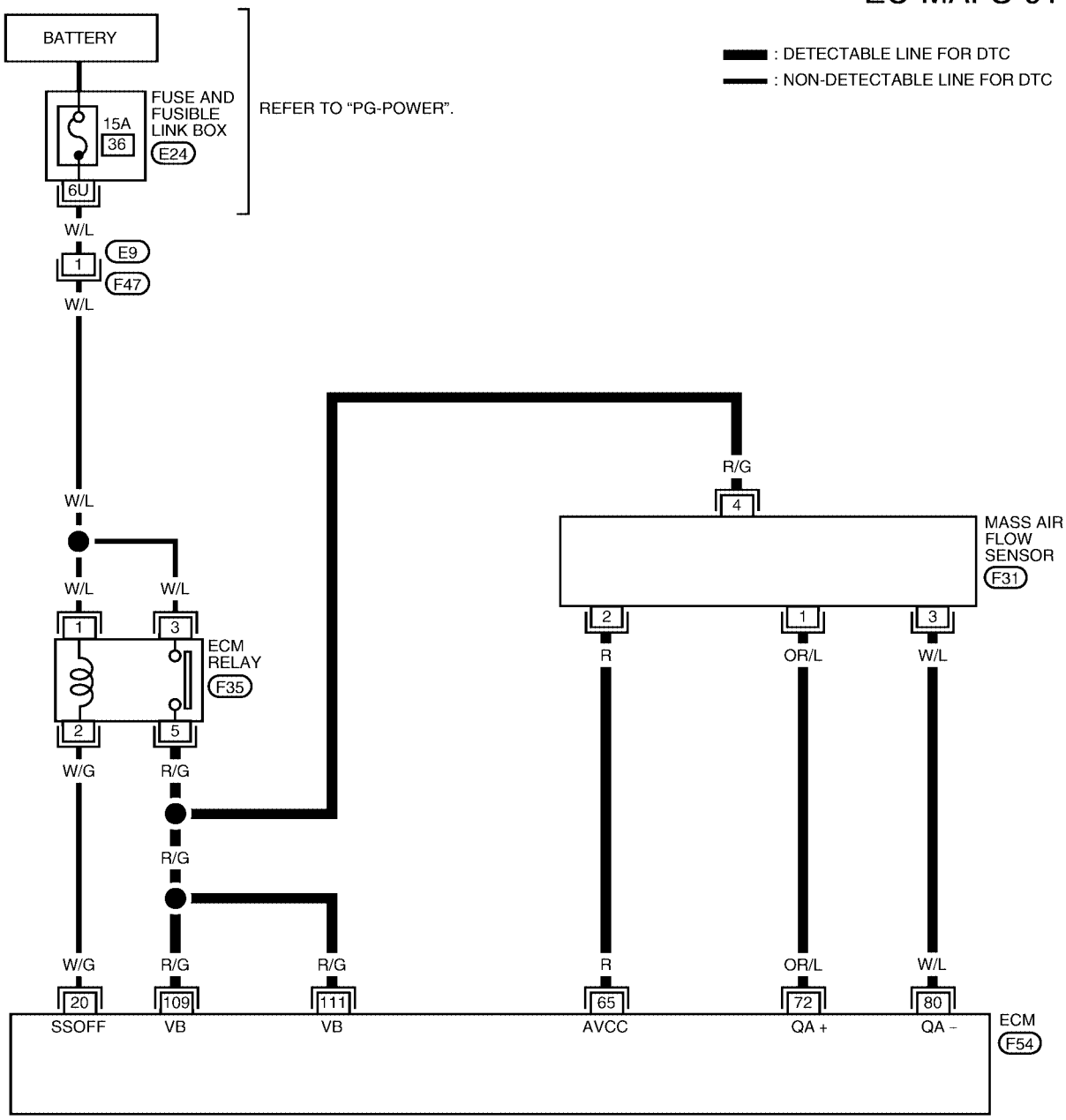
1. Start engine and warm it up to normal operating temperature.
2. Select “MODE 1” with GST.
3. Check the mass air flow sensor signal with “MODE 1”.
4. Check for linear mass air flow sensor signal value rise in response to increases to about 4,000 rpm in engine speed.
5. If NG, go to EC-1372, "Diagnostic Procedure" .

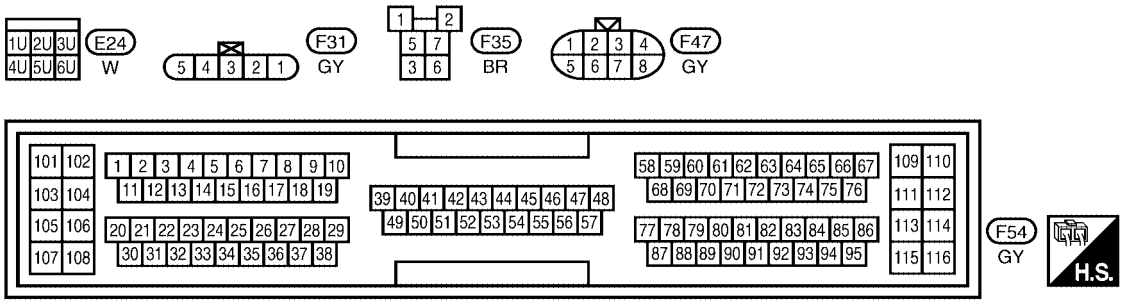


Wiring Diagram

UBS0028W

EC-MAFS-01





BBWA0213E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
72	OR/L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
80	W/L	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

UBS0028X

1. INSPECTION START

Which malfunction (A or B) is duplicated?

A or B

A >> GO TO 3.
B >> GO TO 2.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

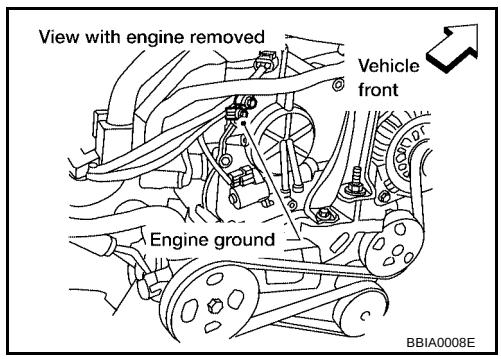
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

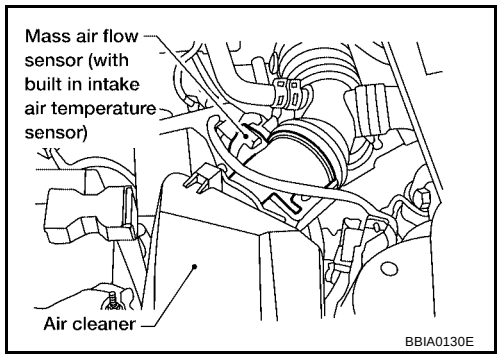
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



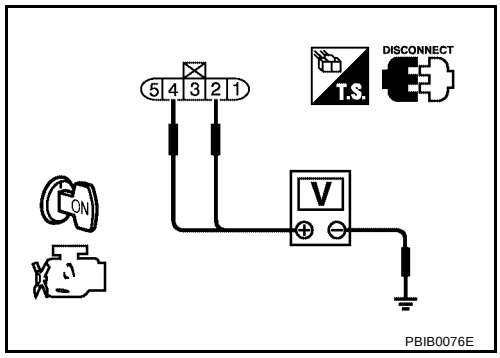
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 80. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 72. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-1374, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

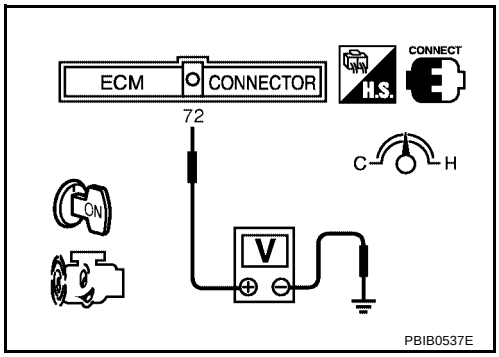
>> **INSPECTION END**

Component Inspection

UBS0028Y

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 72 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.5
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.

4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

UBS0028Z

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

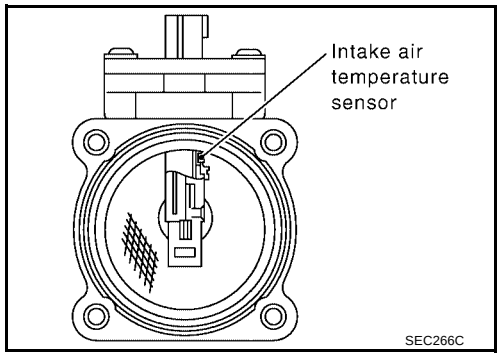
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

UBS00290

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS00291

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS00292

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

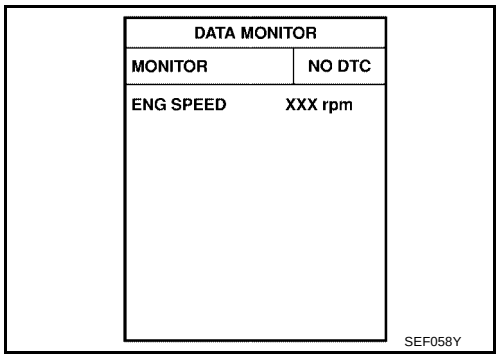
UBS00293

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-1378, "Diagnostic Procedure" .



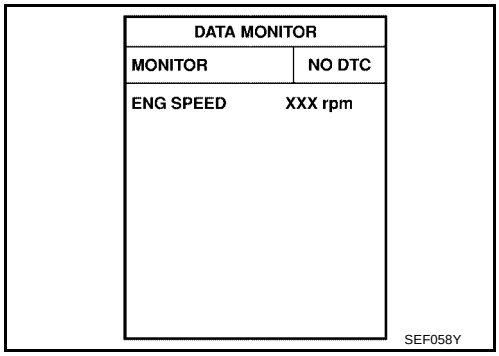
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1378, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-1378, "Diagnostic Procedure" .



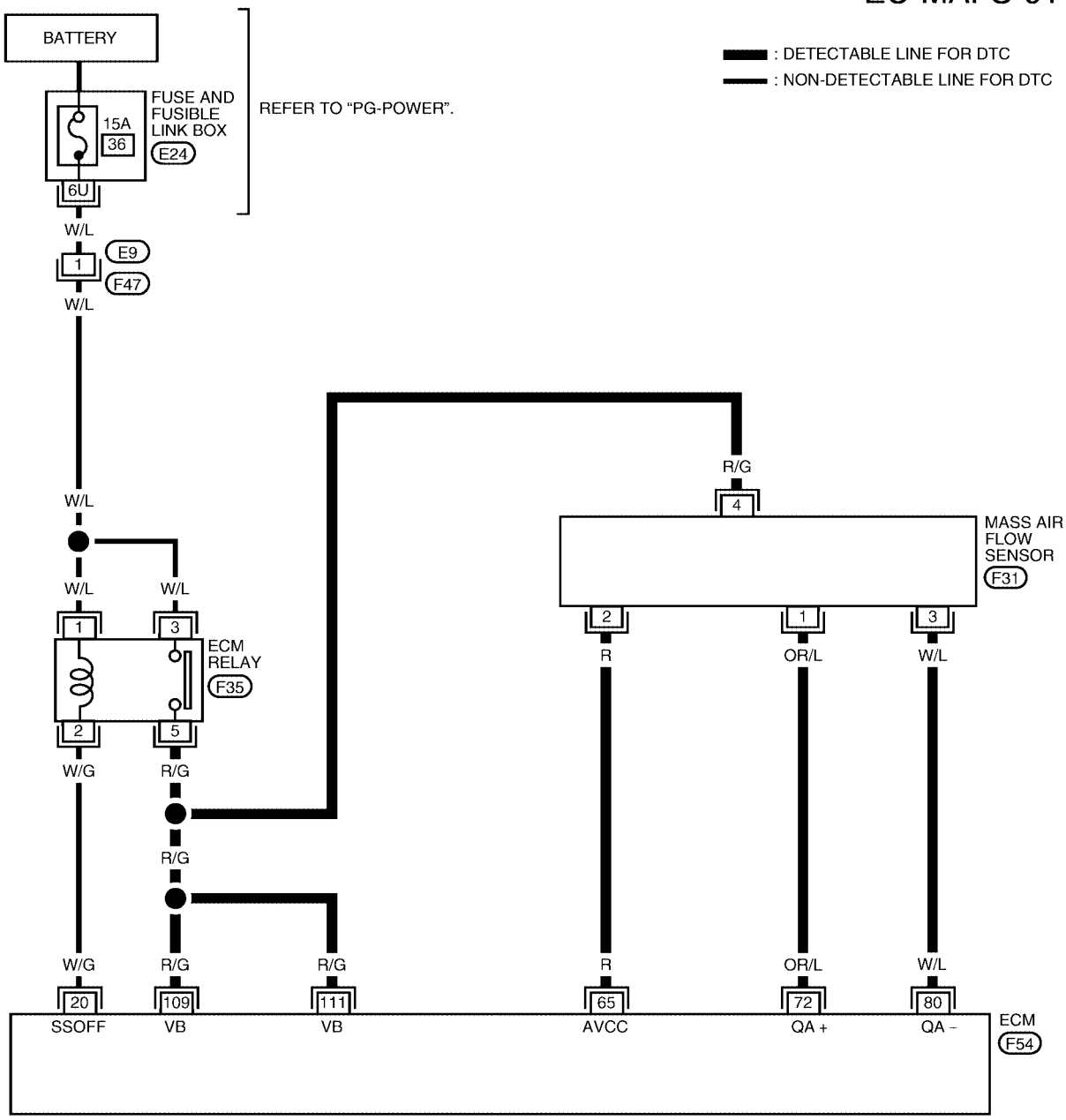
With GST

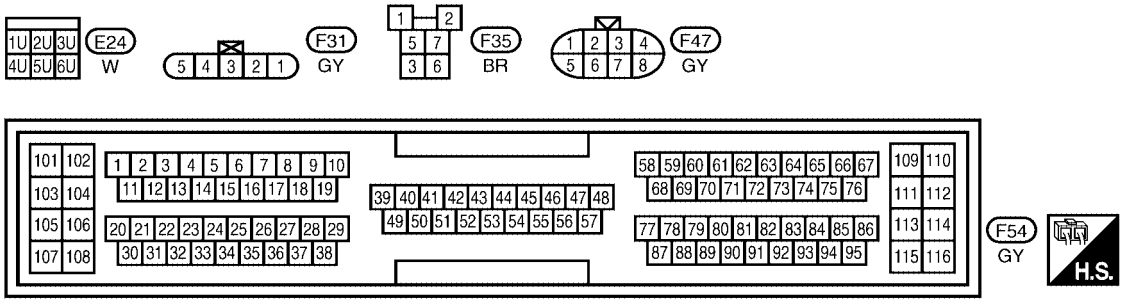
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS00294

EC-MAFS-01





BBWA0213E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
72	OR/L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
80	W/L	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

UBS00295

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

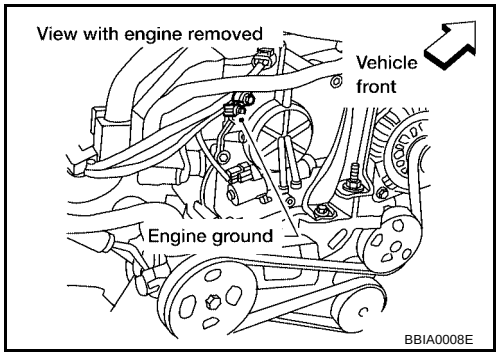
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

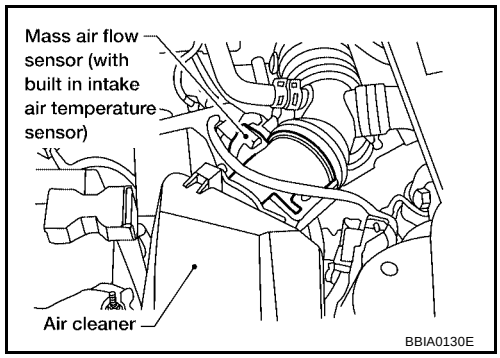
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



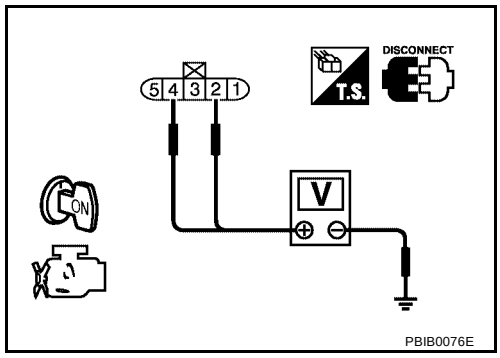
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 80. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 72. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-1380, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

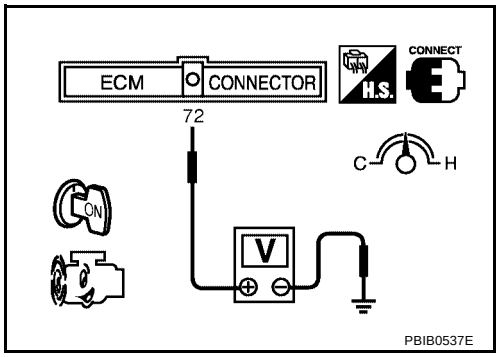
>> **INSPECTION END**

Component Inspection

UBS00296

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 72 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.5
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.

4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

UBS00297

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

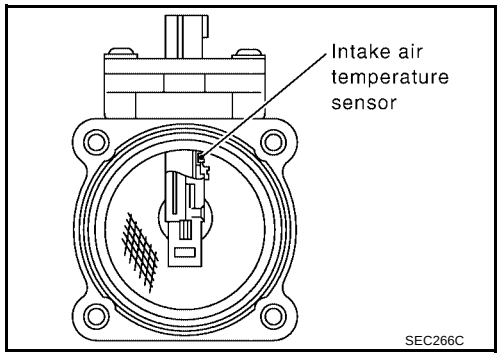
DTC P0112, P0113 IAT SENSOR

PFP:22630

Component Description

UBS00298

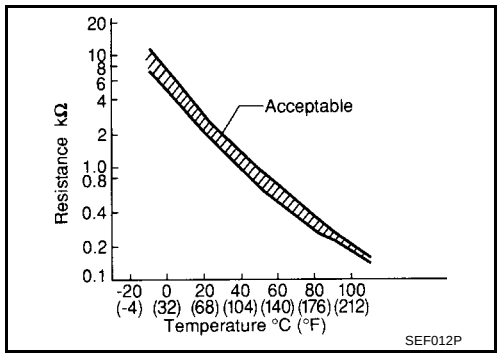
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 84 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS00299

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

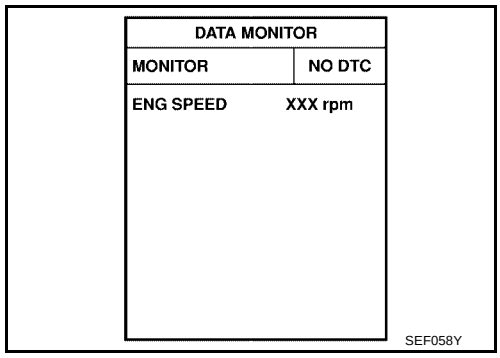
DTC Confirmation Procedure

UBS0029A

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1384, "Diagnostic Procedure" .



WITH GST

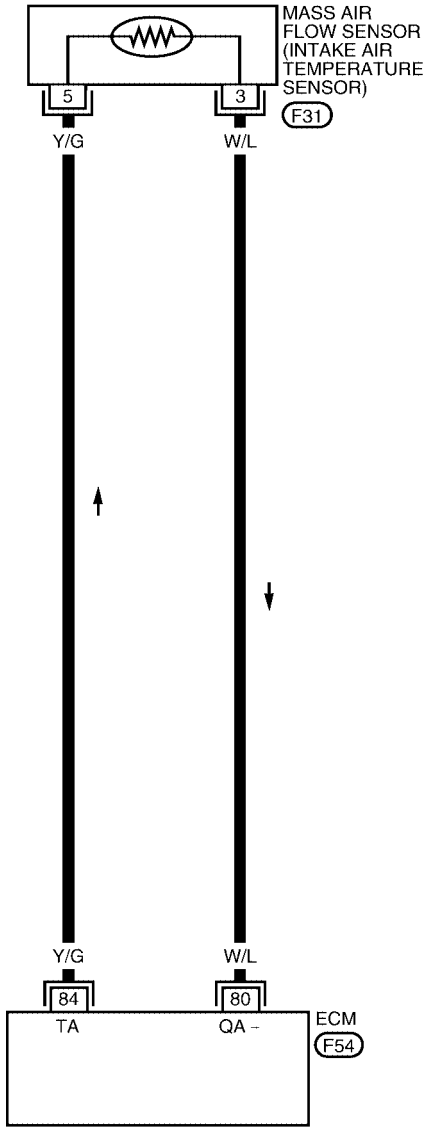
Follow the procedure “With CONSULT-II” above.

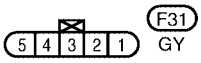
Wiring Diagram

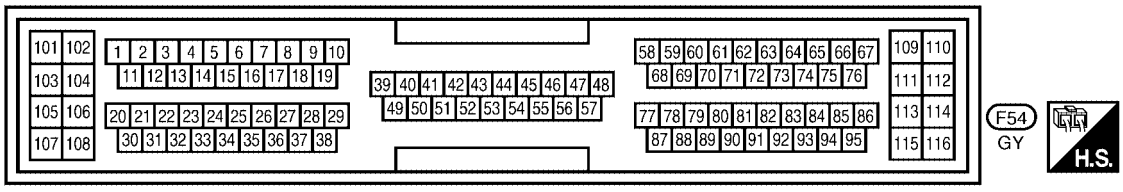
UBS0029B

EC-IATS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC







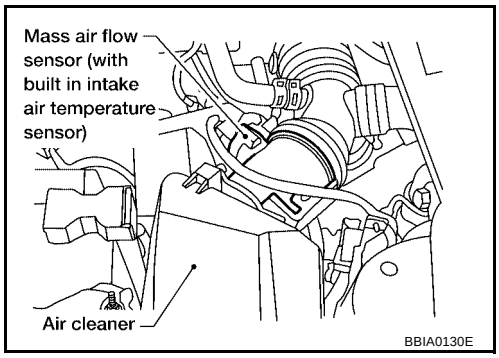
BBWA0214E

Diagnostic Procedure

UBS0029C

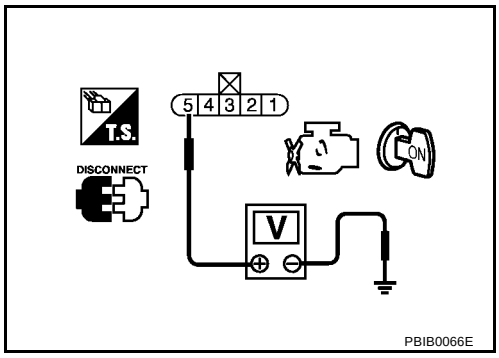
1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair harness or connectors.

2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between MAF sensor terminal 3 and ECM terminal 80. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair harness or connectors.

3. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1385, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

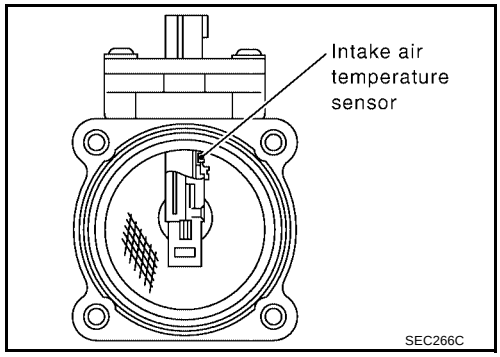
UBS0029D

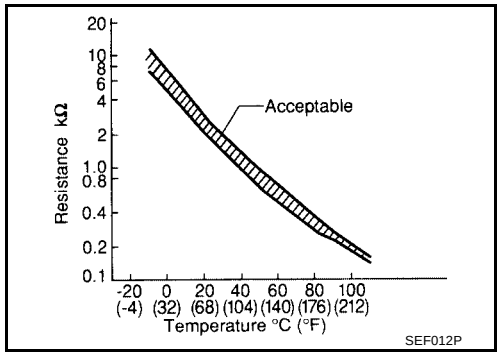
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

UBS0029E

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

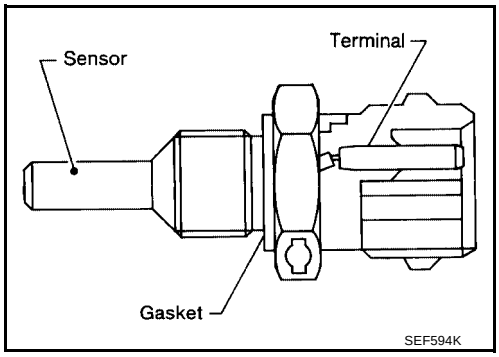
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

UBS0029F

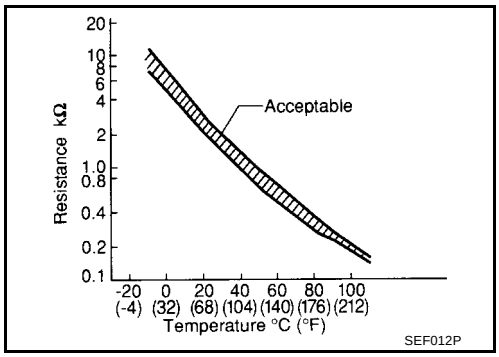
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS0029G

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

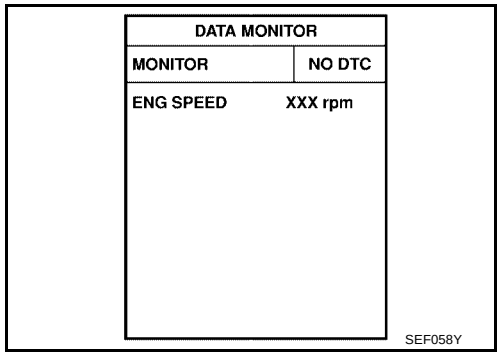
DTC Confirmation Procedure

UBS0029H

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1389, "Diagnostic Procedure" .



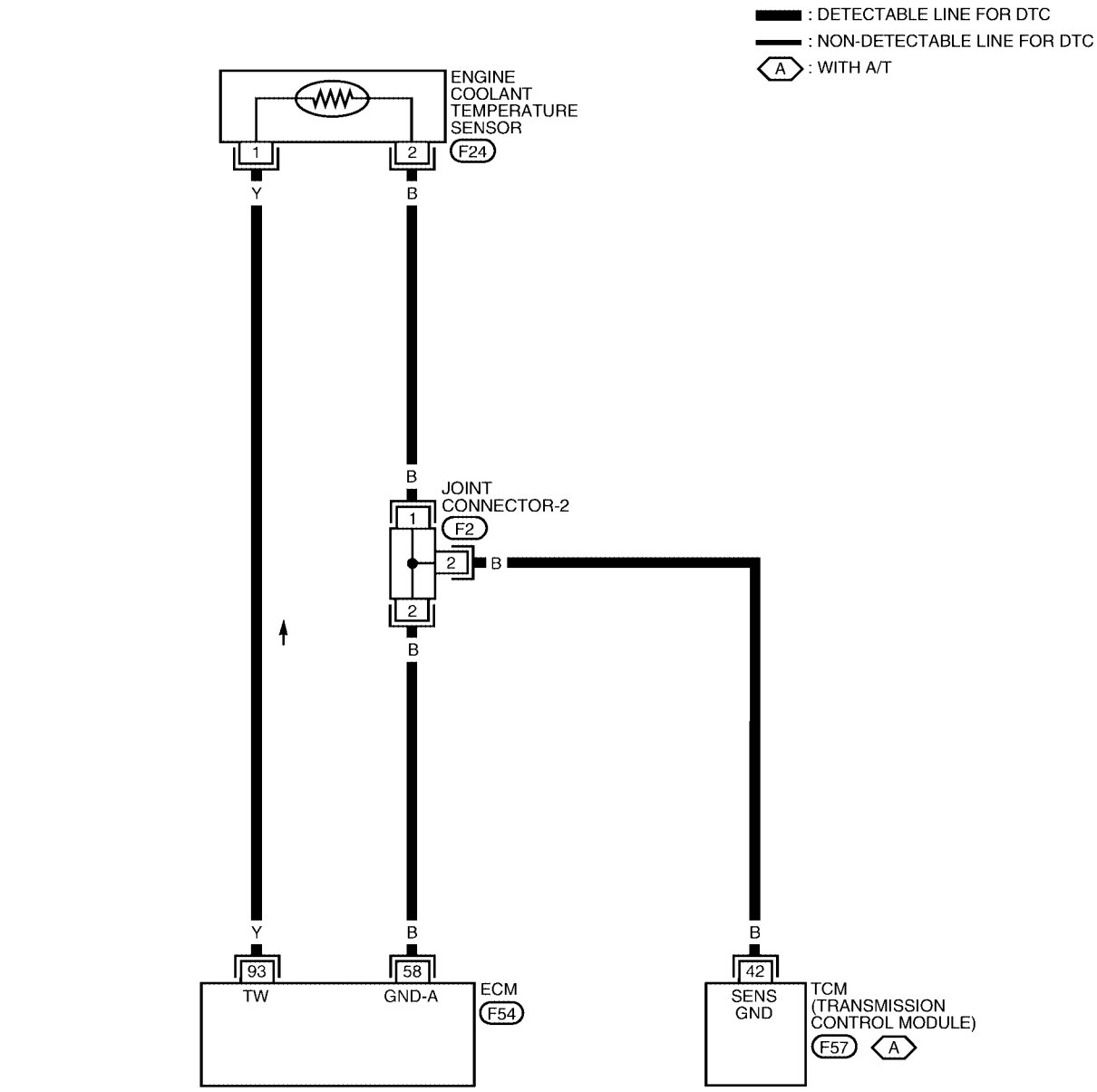
WITH GST

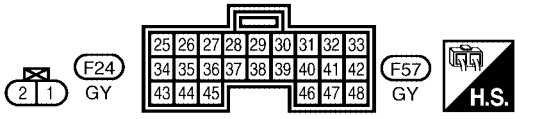
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

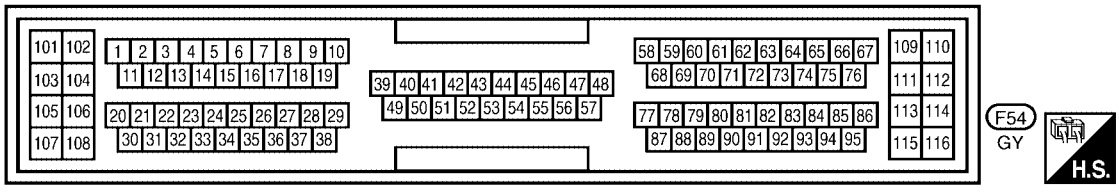
UBS0029I

EC-ECTS-01





REFER TO THE FOLLOWING.
F2 -JOINT CONNECTOR



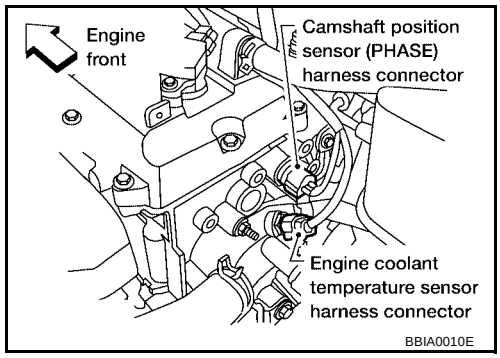
BBWA0413E

Diagnostic Procedure

UBS0029J

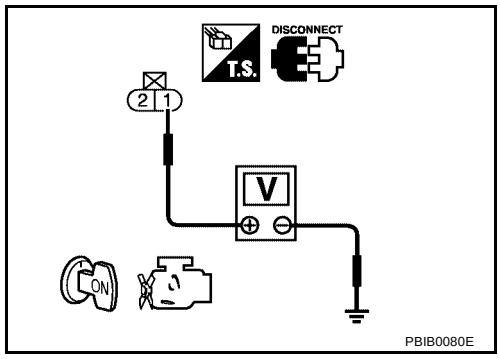
1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-2
- Harness for open or short between engine coolant temperature sensor and ECM
- Harness for open or short between engine coolant temperature sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1390, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

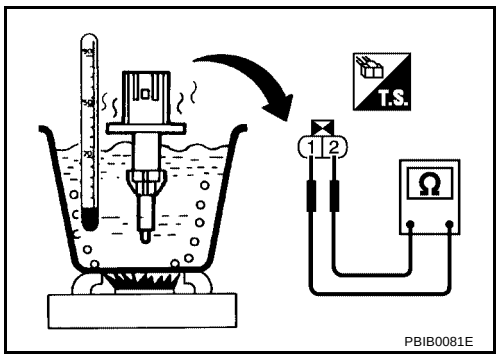
>> **INSPECTION END**

Component Inspection

UBS0029K

ENGINE COOLANT TEMPERATURE SENSOR

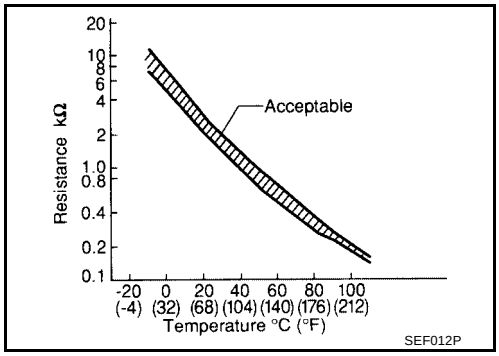
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS0029L

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .

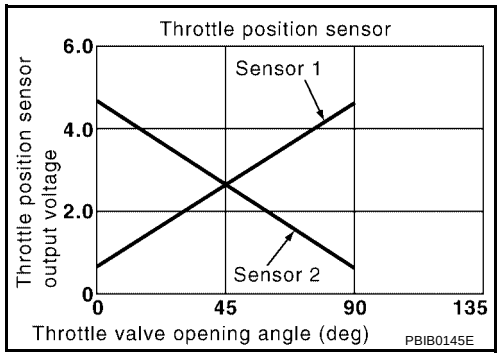
DTC P0122, P0123 TP SENSOR

PFP:16119

Component Description

UBS00571

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS00572

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2★	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st(M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

★: Throttle position sensor2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS00573

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122 0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 2)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

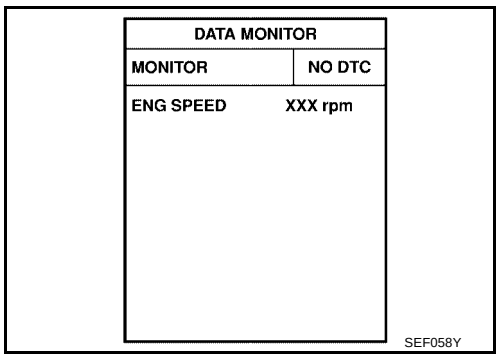
DTC Confirmation Procedure

UBS00574

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1394, "Diagnostic Procedure" .

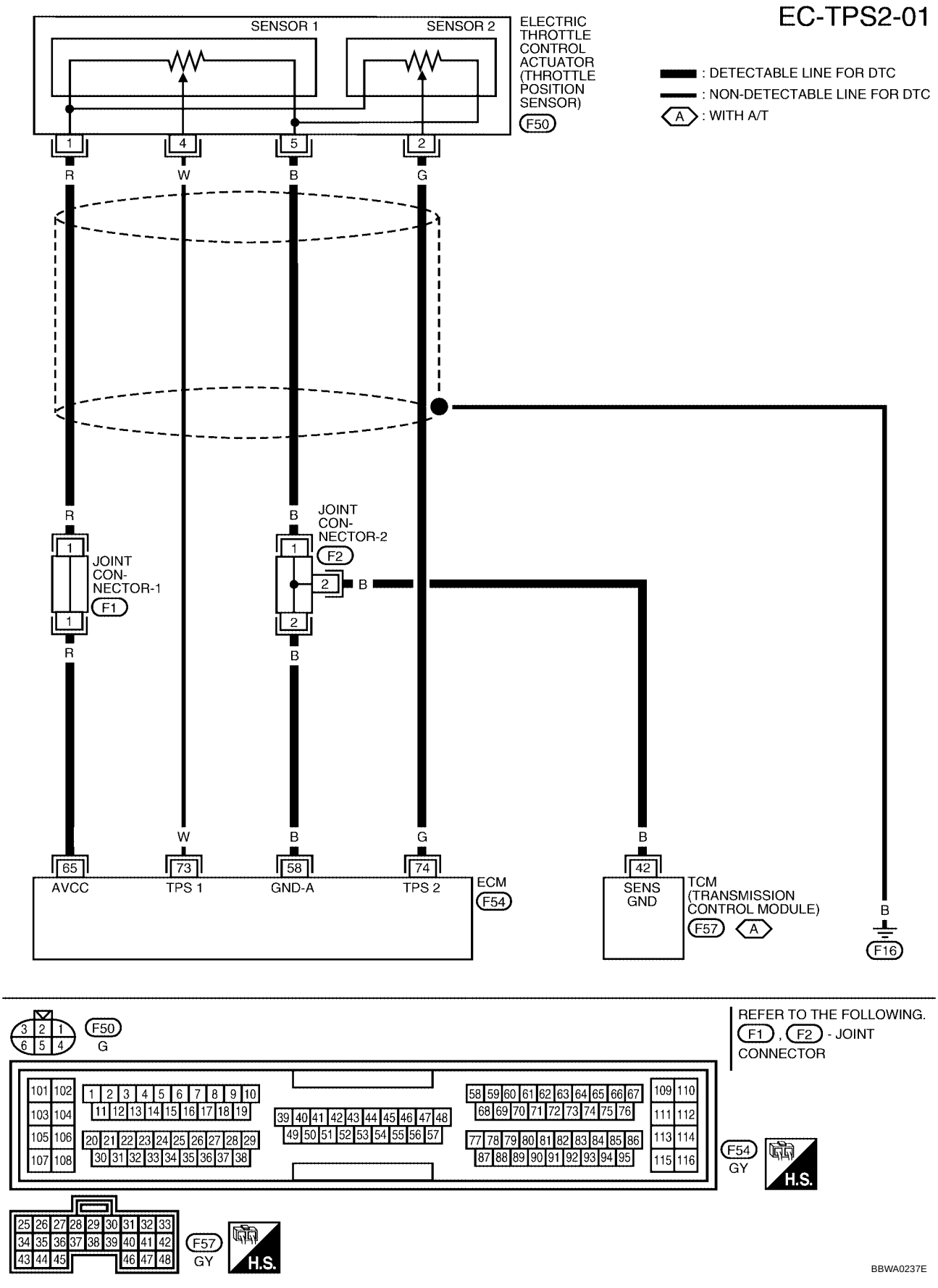


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS00575



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
73	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
74	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

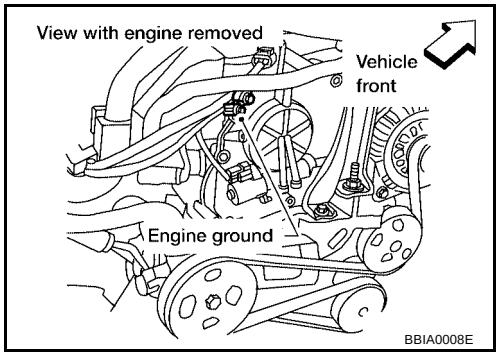
Diagnostic Procedure

UBS00576

1. RETIGHTEN GROUND SCREWS

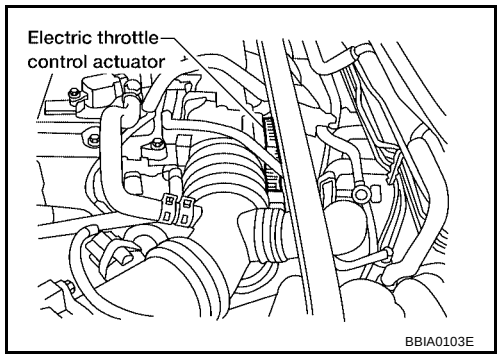
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

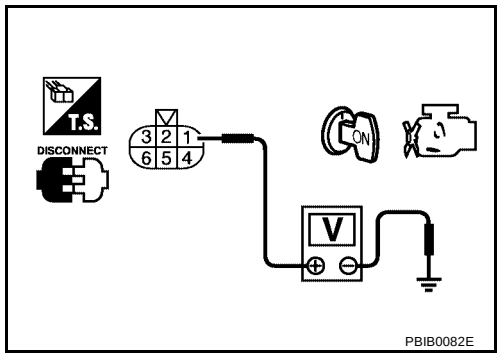


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between electric throttle control actuator and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electric throttle control actuator terminal 5 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-2
- Harness for open or short between electric throttle control actuator and ECM
- Harness for open or short between electric throttle control actuator and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 74 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE POSITION SENSOR

Refer to EC-1396, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

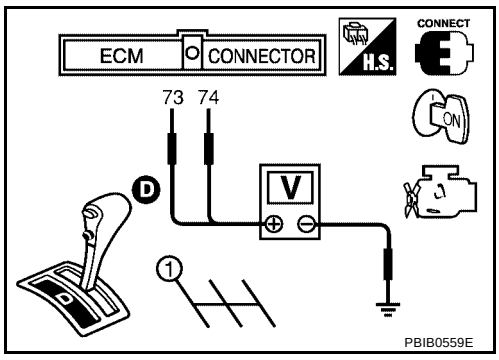
Component Inspection

UBS00577

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 73 (TP sensor 1signal), 74 (TP sensor 2signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
73 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
74 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1255, "Throttle Valve Closed Position Learning" .
8. Perform EC-1255, "Idle Air Volume Learning" .

Removal and Installation

UBS00578

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

DTC P0125 ECT SENSOR

PFP:22630

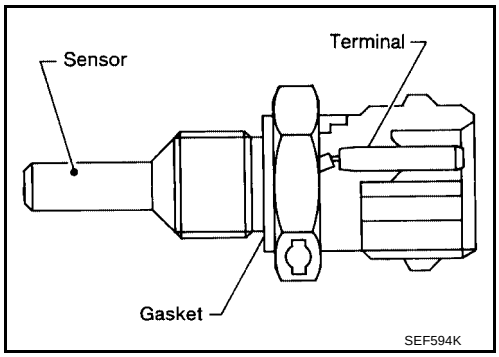
Description

UBS0029M

NOTE:
If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to EC-1386 .

COMPONENT DESCRIPTION

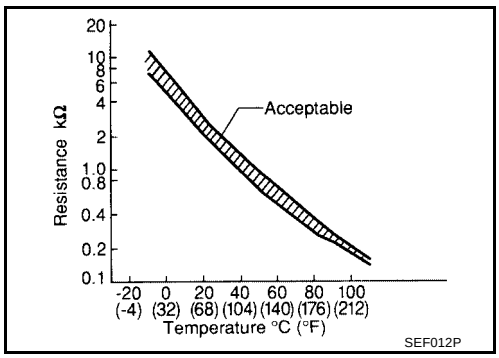
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS0029N

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	Insufficient engine coolant temperature for closed loop fuel control	● Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. ● Engine coolant temperature is insufficient for closed loop fuel control.	● Harness or connectors (High resistance in the circuit) ● Engine coolant temperature sensor ● Thermostat

DTC Confirmation Procedure

UBS0029O

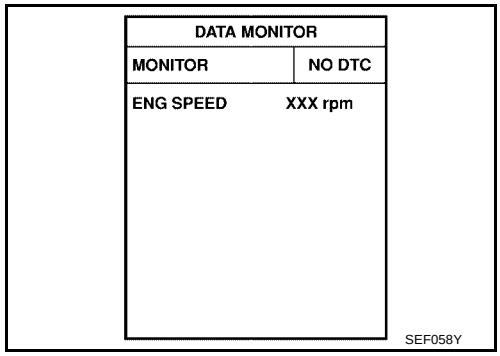
CAUTION:
Be careful not to overheat engine.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Check that “COOLAN TEMP/S” is above 10°C (50°F).
   If it is above 10°C (50°F), the test result will be OK.
   If it is below 10°C (50°F), go to following step.
4. Start engine and run it for 65 minutes at idle speed.
   If “COOLAN TEMP/S” increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.
5. If DTC is detected, go to EC-1399, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS0029P

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1399, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace engine coolant temperature sensor.

2. CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm the engine coolant does not flow.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace thermostat. Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .

3. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

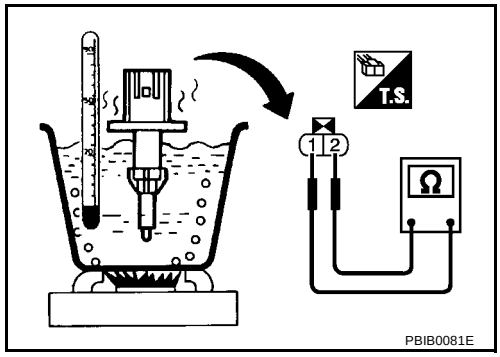
>> **INSPECTION END**

Component Inspection

UBS0029Q

ENGINE COOLANT TEMPERATURE SENSOR

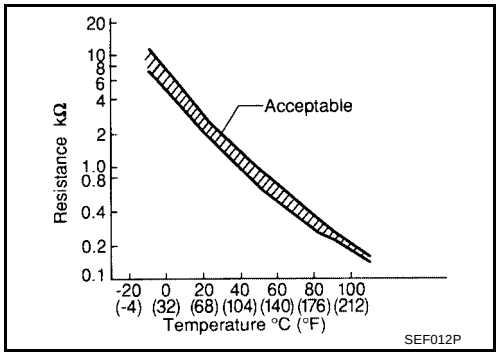
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS0029R

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .

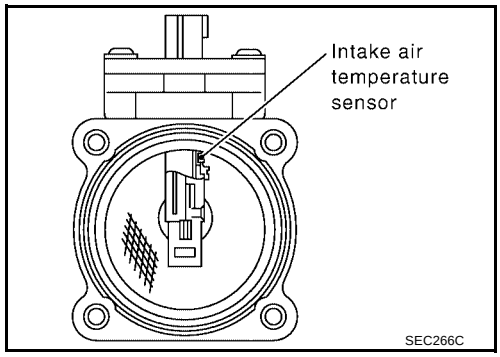
DTC P0127 IAT SENSOR

PFP:22630

Component Description

UBS0029S

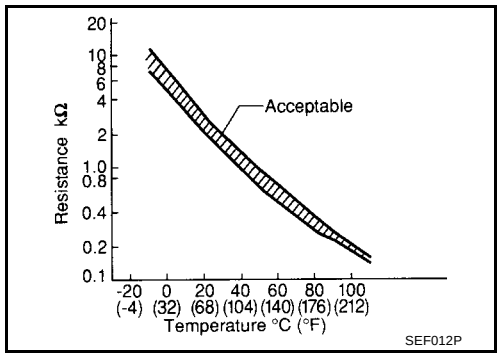
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 84 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS0029T

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127 0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Intake air temperature sensor

DTC Confirmation Procedure

UBS0029U

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

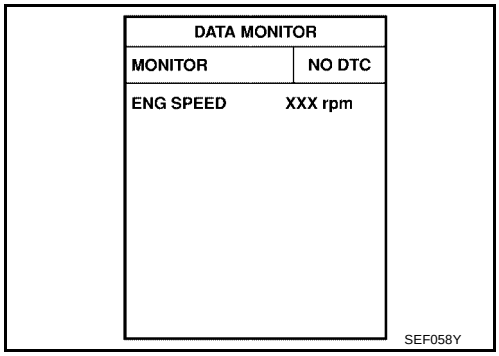
TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Wait until engine coolant temperature is less than 90°C (194°F)

a. Turn ignition switch “ON”.

b. Select “DATA MONITOR” mode with CONSULT-II.
c. Check the engine coolant temperature.
d. If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch “OFF” and cool down engine.
   - Perform the following steps before engine coolant temperature is above 90°C (194°F).
2. Turn ignition switch “ON”.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6. If 1st trip DTC is detected, go to EC-1402, "Diagnostic Procedure" .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS0029V

1. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1402, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

2. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
Refer to EC-1383, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

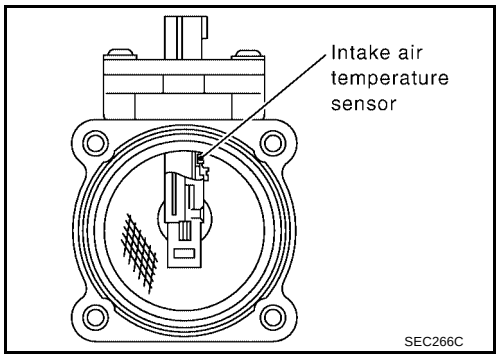
UBS0029W

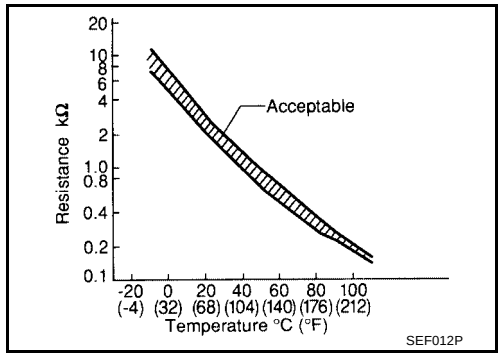
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

UBS0029X

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

DTC P0128 THERMOSTAT FUNCTION

PFP:21200

On Board Diagnosis Logic

UBS0029Y

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.
This is due to a leak in the seal or the thermostat stuck open.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128 0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	● Thermostat ● Leakage from sealing portion of thermostat ● Engine coolant temperature sensor

DTC Confirmation Procedure

UBS0029Z

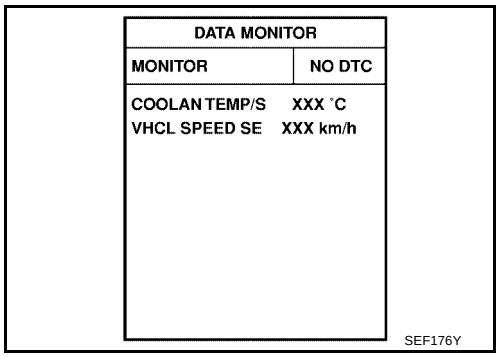
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:

- **For best results, perform at ambient temperature of –10°C (14°F) or higher.**
- **For best results, perform at engine coolant temperature of –10°C (14°F) to 68°C (154°F).**

WITH CONSULT-II

1. Replace thermostat with new one. Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" . Use only a genuine NISSAN thermostat as a replacement. If an incorrect thermostat is used, the MIL may come on.
2. Turn ignition switch “ON”.
3. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
4. Check that the “COOLAN TEMP/S” is above 68°C (154°F).
   If it is below 68°C (154°F), go to following step.
   If it is above 68°C (154°F), stop engine and cool down the engine to less than 68°C (154°F), then retry from step 2.
5. Drive vehicle for 10 consecutive minutes under the following conditions.

VHCL SPEED SE	80 - 120 km/h (50 - 75 MPH)



If 1st trip DTC is detected, go to EC-1404, "Diagnostic Procedure" .

WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002A0

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1405, "Component Inspection" .

OK or NG

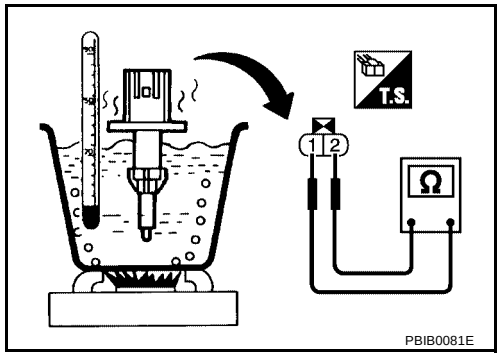
OK >> **INSPECTION END**
NG >> Replace engine coolant temperature sensor.

Component Inspection

UBS002A1

ENGINE COOLANT TEMPERATURE SENSOR

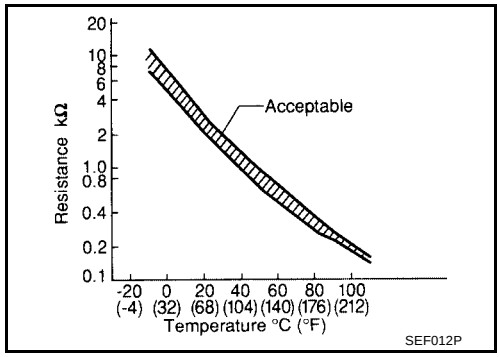
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS002A2

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .

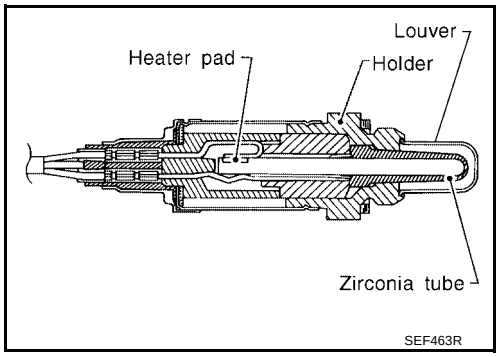
DTC P0132 HO2S1

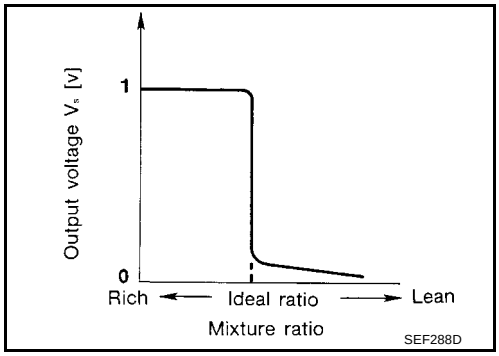
PFP:22690

Component Description

UBS002A3

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002A4

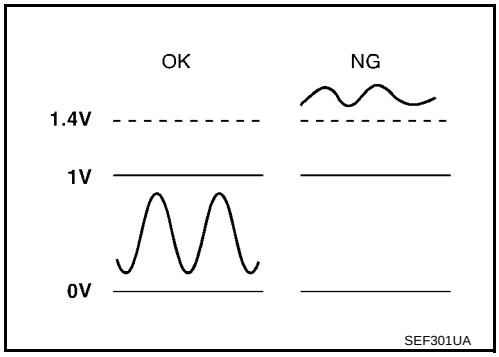
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002A5

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1

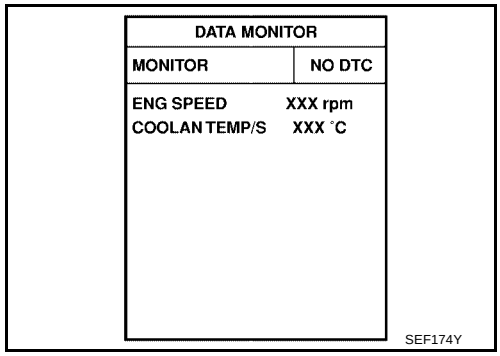
DTC Confirmation Procedure

UBS002A6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-1409, "Diagnostic Procedure" .



WITH GST

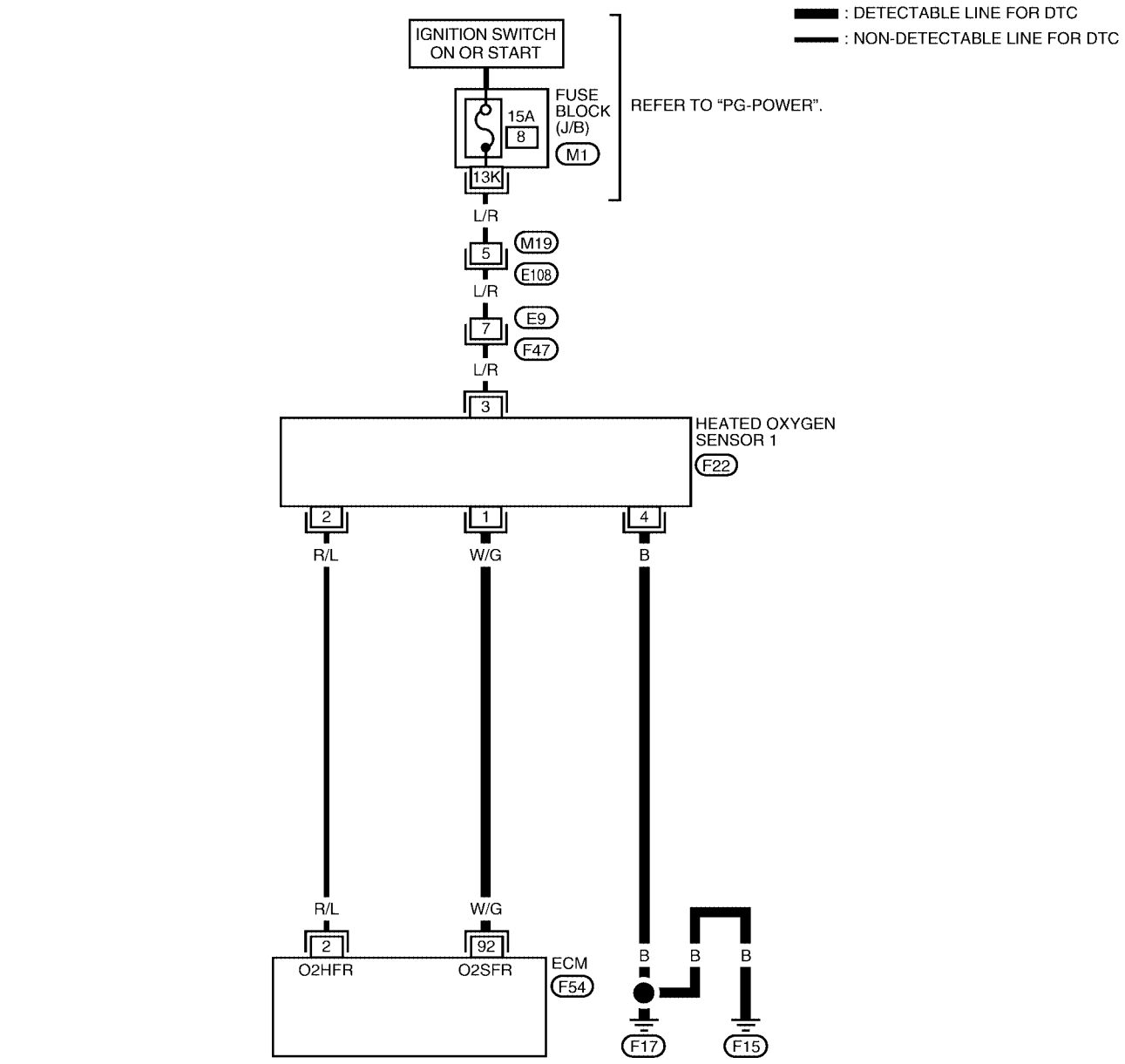
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Restart engine and let it idle for 2 minutes.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-1409, "Diagnostic Procedure" .

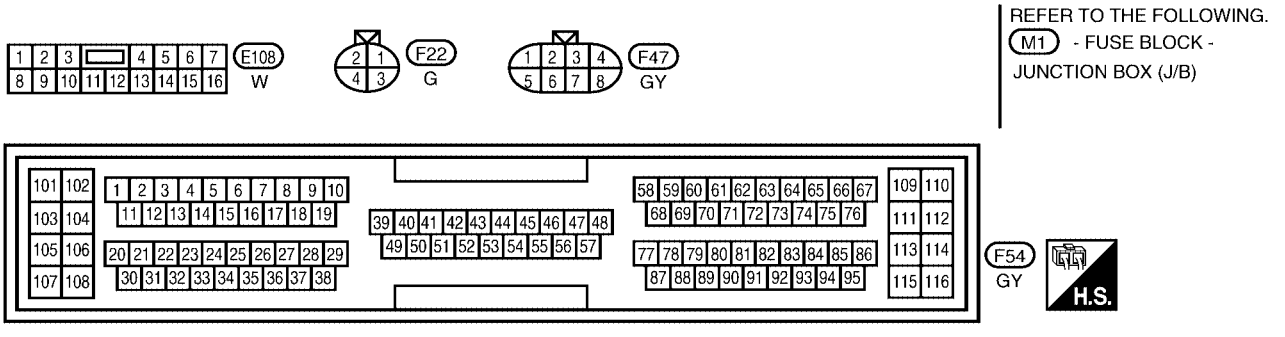
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS002A7

EC-HO2S1-01





BBWA0414E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
92	W/G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

Diagnostic Procedure

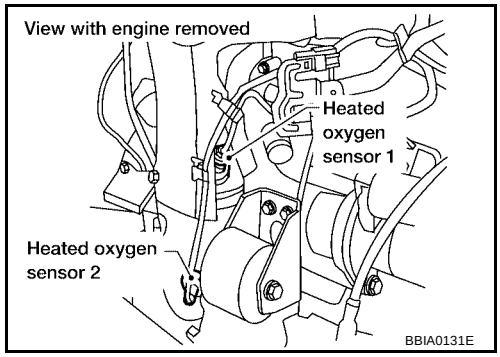
UBS002A8

1. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check harness continuity between HO2S1 terminal 4 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

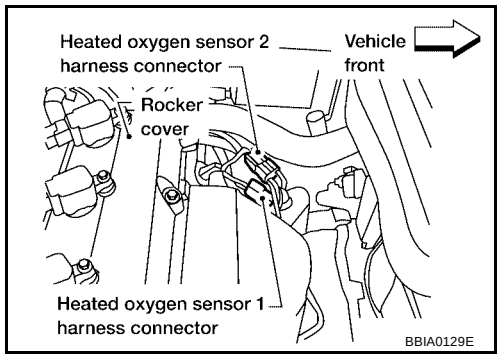
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

4. Also check harness for short to power.



OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 CONNECTOR FOR WATER

1. Disconnect heated oxygen sensor 1 harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1410, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

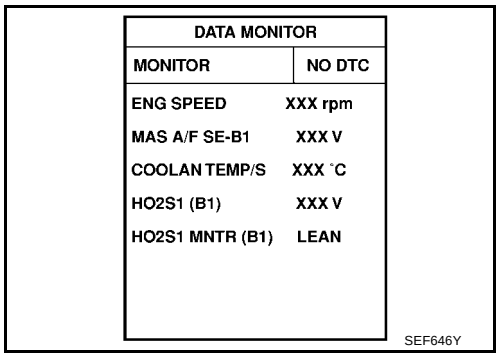
Component Inspection

UBS002A9

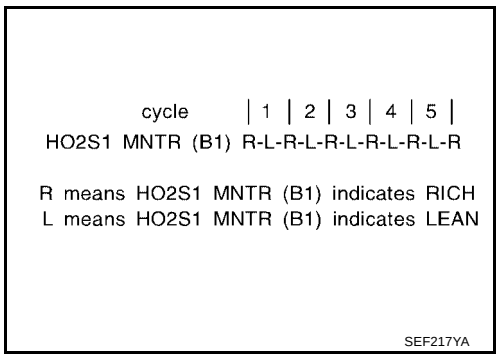
HEATED OXYGEN SENSOR 1

With CONSULT-II

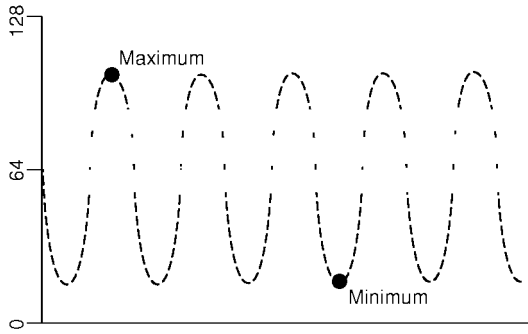
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



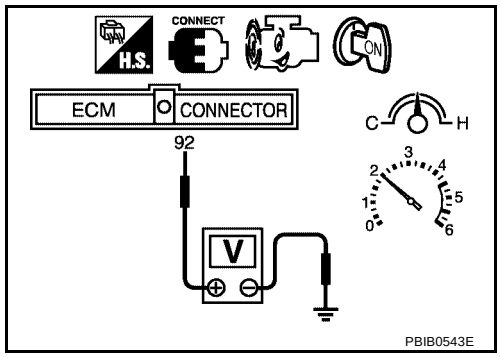
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002AA

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

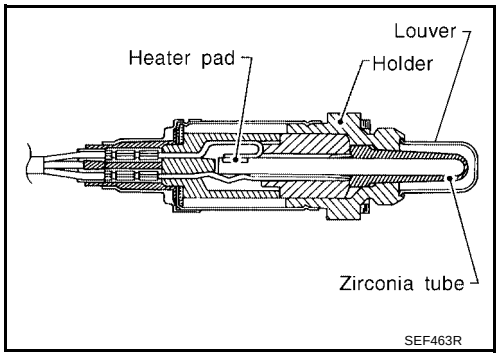
DTC P0133 HO2S1

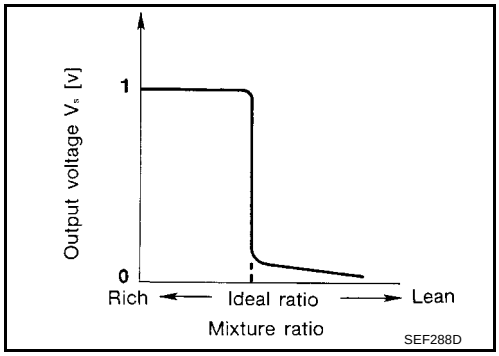
PFP:22690

Component Description

UBS002AB

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002AC

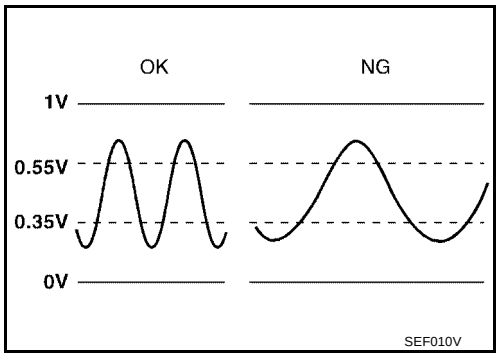
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002AD

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133	Heated oxygen sensor 1 circuit slow response	The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV valve ● Mass air flow sensor

DTC Confirmation Procedure

UBS002AE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

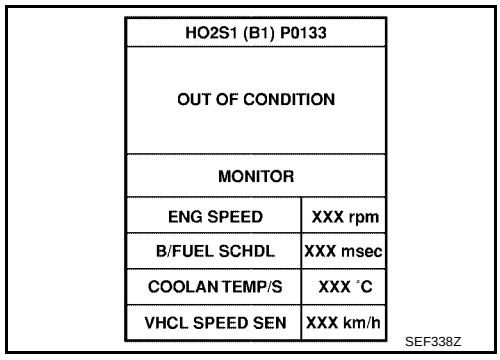
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:

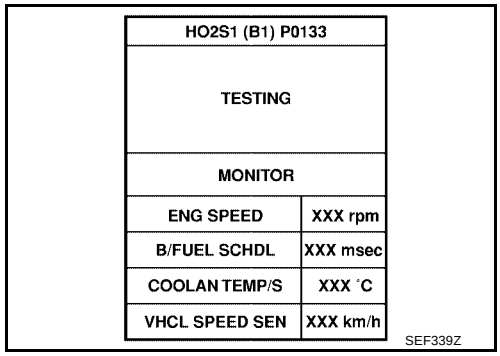
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



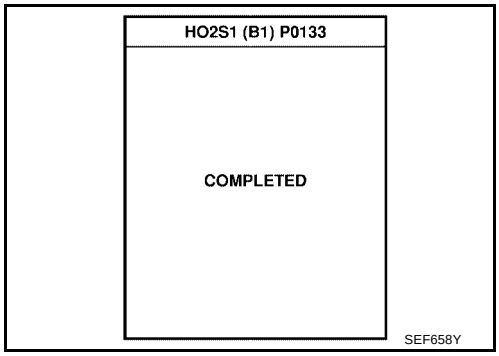
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 20 to 50 seconds.)

ENG SPEED	1,200 - 3,200 rpm
Vehicle speed	More than 80 km/h (50 MPH)
B/FUEL SCHDL	1.9 - 13.0 msec
Selector lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.



7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1416, "Diagnostic Procedure" .



Overall Function Check

UBS002AF

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

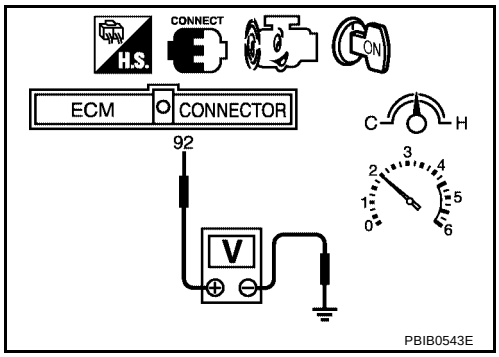
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1(B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.

1 time:	**0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**
2 times:	**0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**

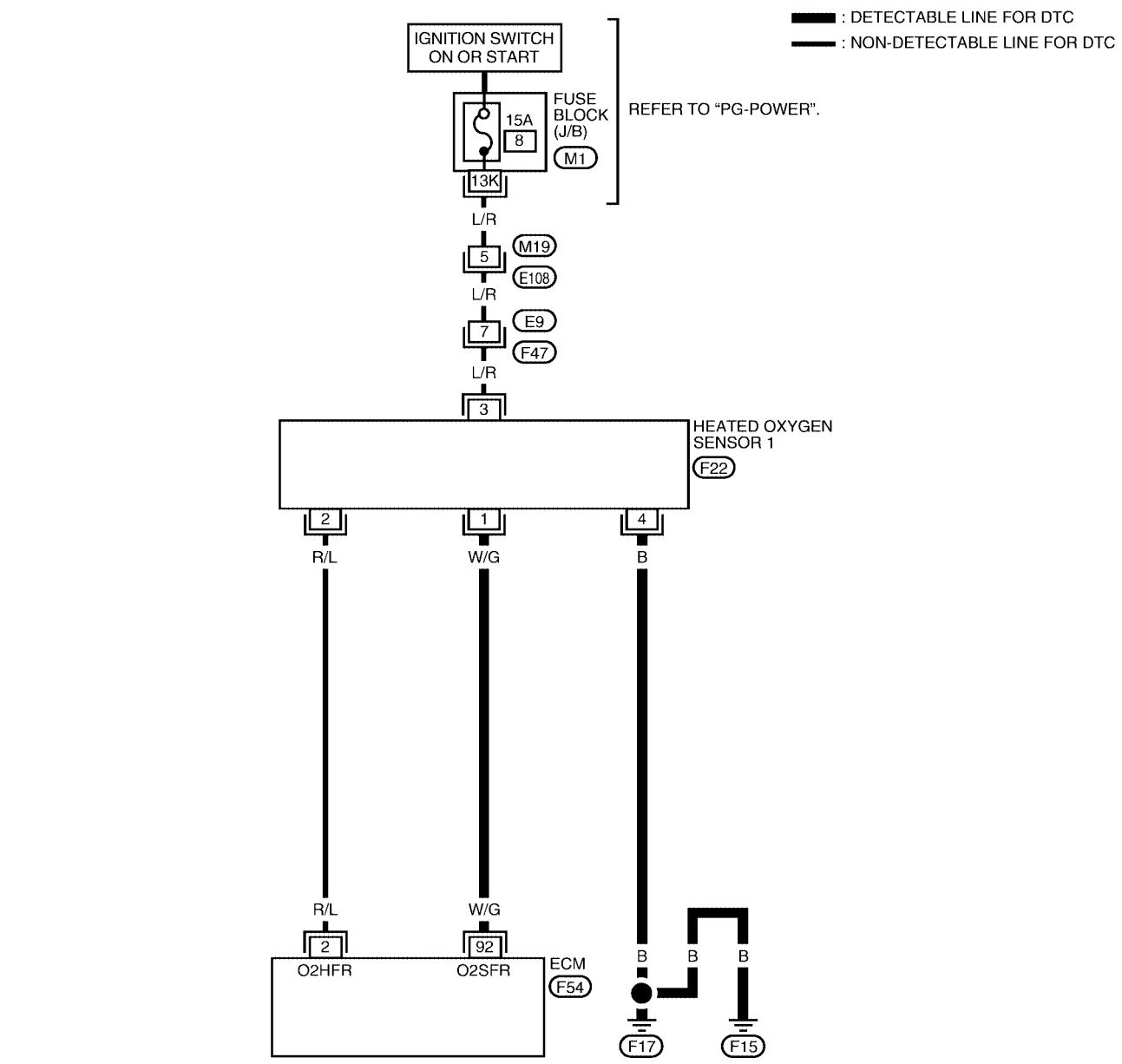
4. If NG, go to EC-1416, "Diagnostic Procedure" .

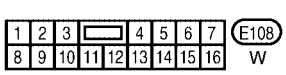


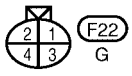
Wiring Diagram

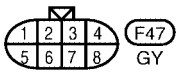
UBS002AG

EC-HO2S1-01

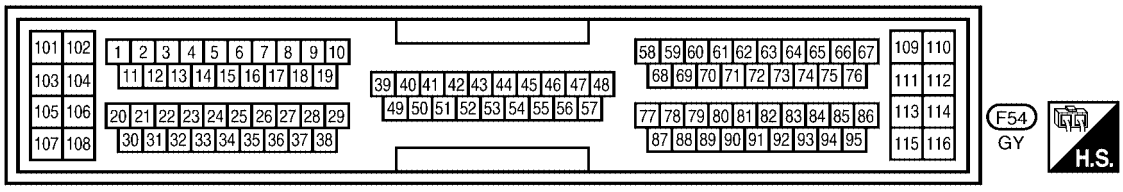








REFER TO THE FOLLOWING.
M1 - FUSE BLOCK - JUNCTION BOX (J/B)



BBWA0414E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
92	W/G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

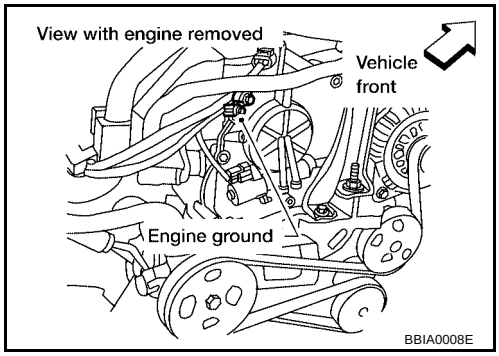
Diagnostic Procedure

UBS002AH

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

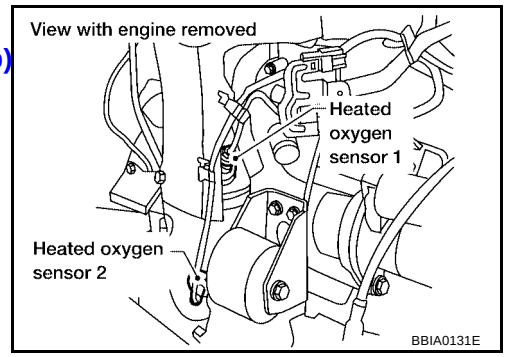


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

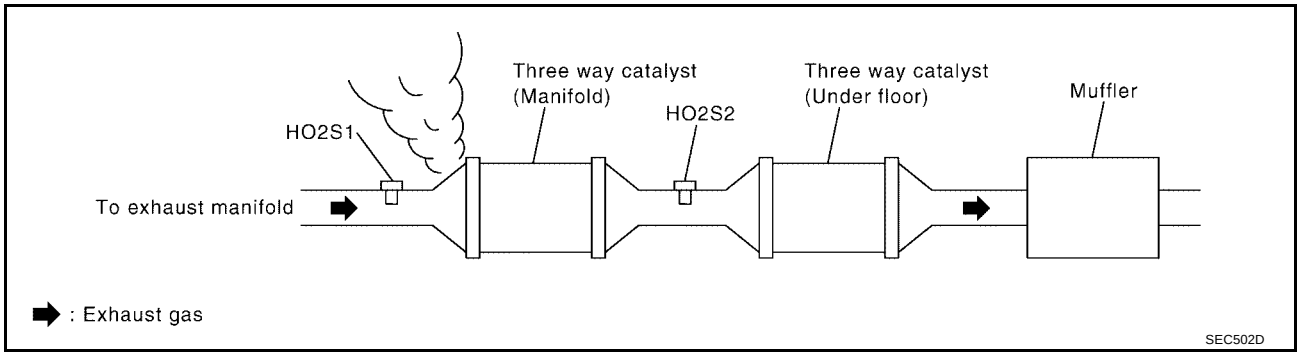
Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

>> GO TO 3.



3. CHECK FOR EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (Manifold).



OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

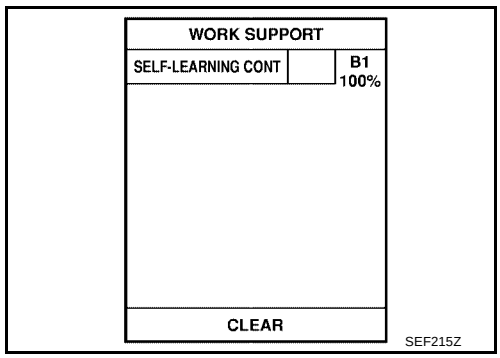
OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

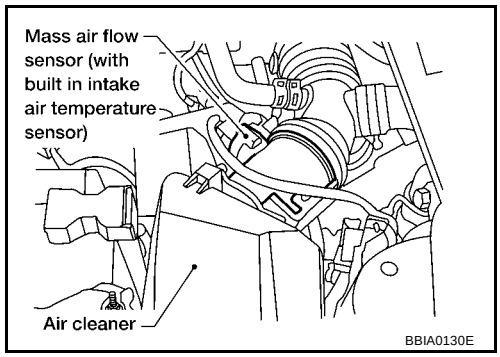
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or DTC P0172 (Refer to EC-1442 or EC-1449).
No >> GO TO 6.

6. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor1 harness connector.
3. Check harness continuity between HO2S1 terminal 4 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

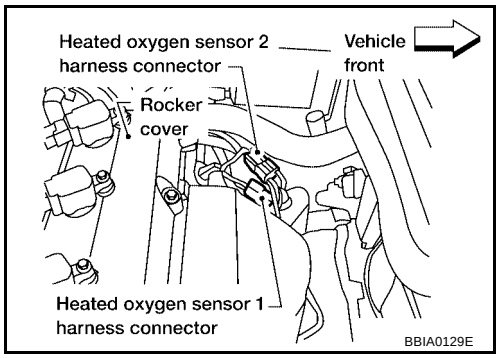
OK >> GO TO 7.
NG >> Repair open circuit or short to power in harness or connectors.

7. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and engine ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



4. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1361, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace malfunctioning heated oxygen sensor 1.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-1374, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK PCV VALVE

Refer to EC-1858, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace PCV valve.

11. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1418, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace heated oxygen sensor 1.

12. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

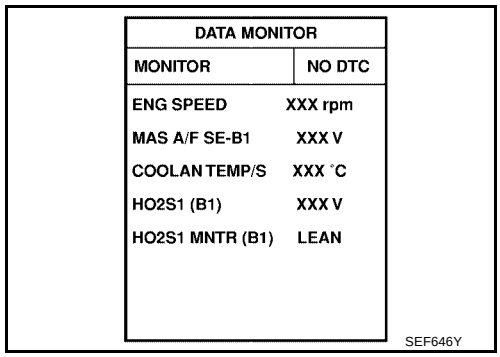
UBS002AI

HEATED OXYGEN SENSOR 1

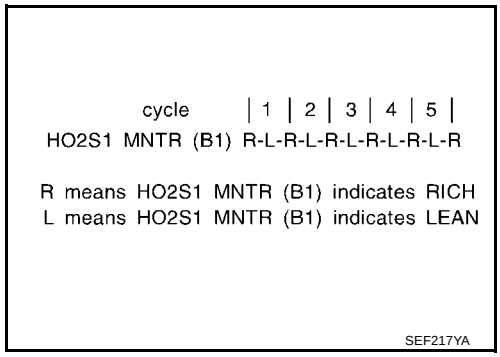
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.

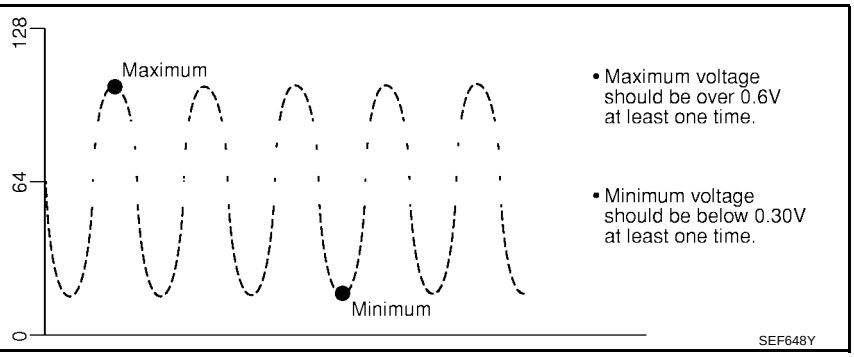
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



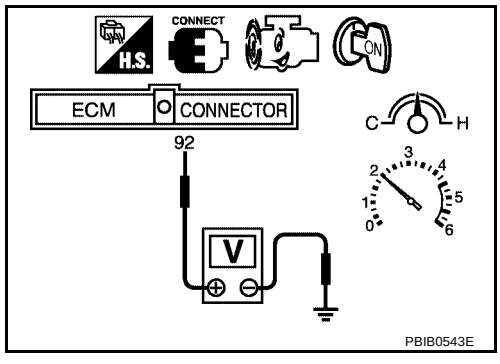
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002AJ

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

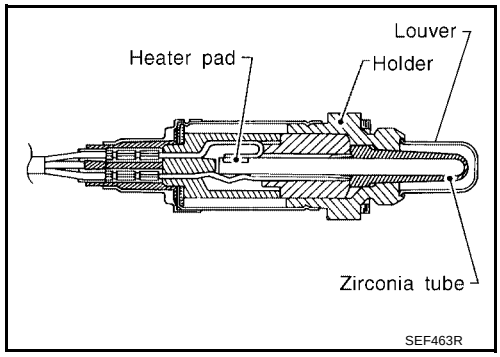
DTC P0134 HO2S1

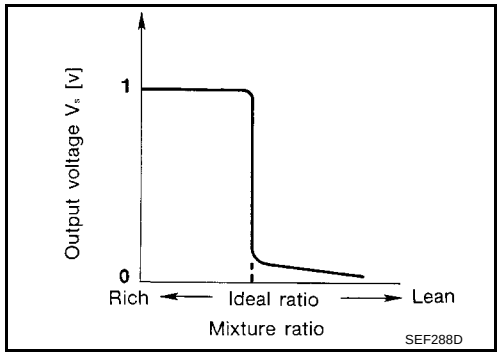
PFP:22690

Component Description

UBS002AK

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002AL

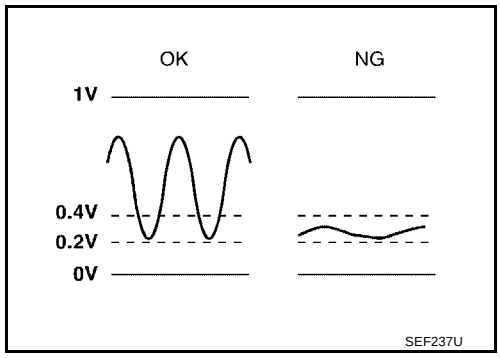
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002AM

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1

DTC Confirmation Procedure

UBS002AN

CAUTION:
Always drive vehicle at a safe speed.

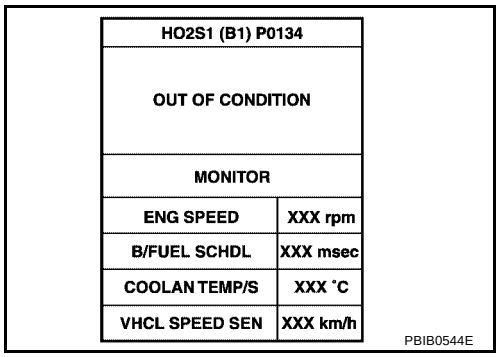
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

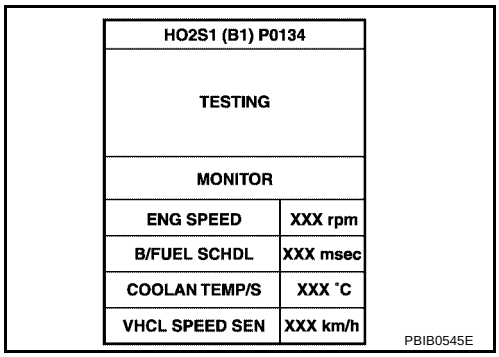
1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 (B1) P0134” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
3. Touch “START”.
4. Let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 4.



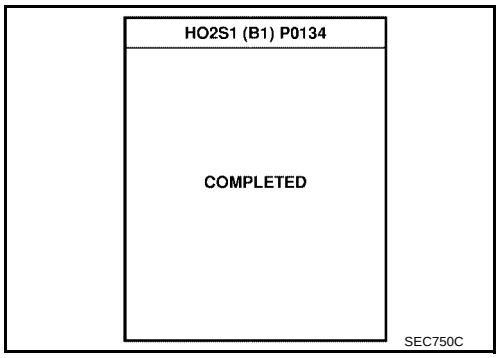
5. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,200 - 3,200 rpm
Vehicle speed	More than 64 km/h (40 MPH)
B/FUEL SCHDL	1.9 - 13.0 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1425, "Diagnostic Procedure" .



Overall Function Check

UBS002AO

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a D TC might not be confirmed.

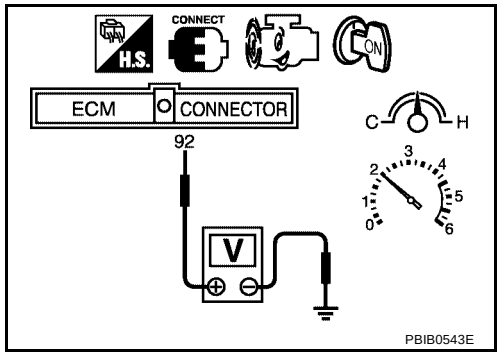
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage does not remain in the range of 0.2 to 0.4V.

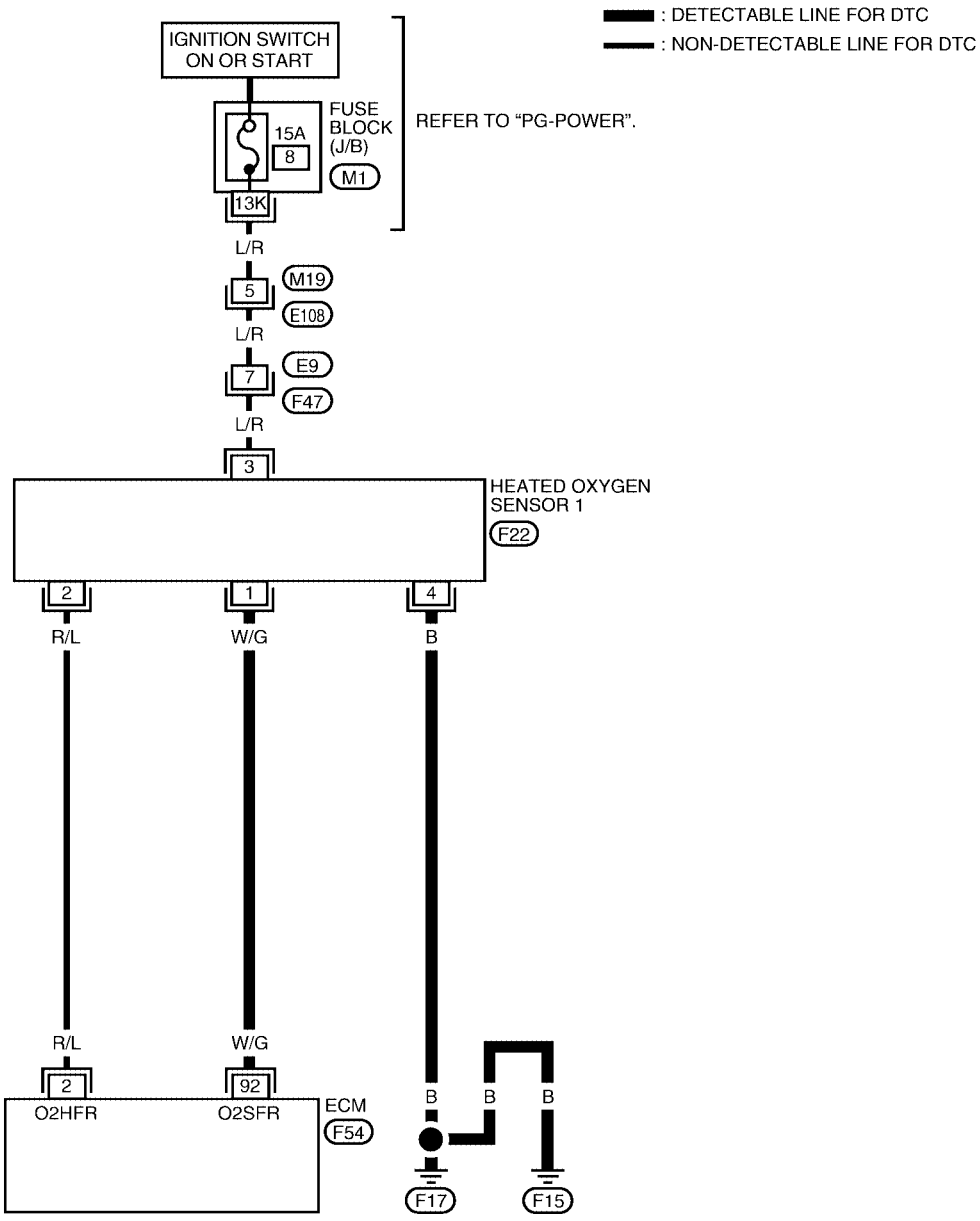
4. If NG, go to EC-1425, "Diagnostic Procedure" .

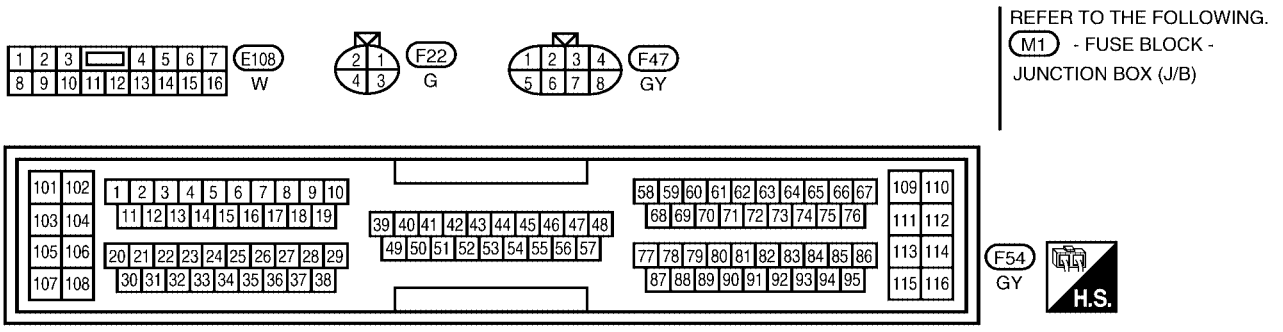


Wiring Diagram

UBS002AP

EC-HO2S1-01





BBWA0414E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
92	W/G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

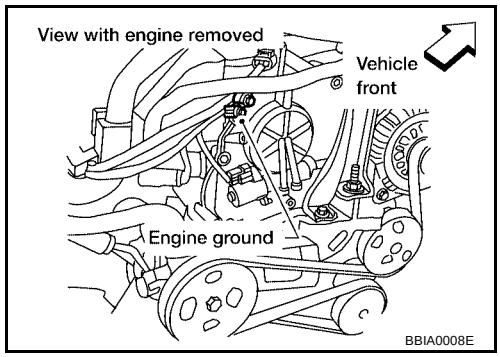
Diagnostic Procedure

UBS002AQ

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor1 harness connector.
3. Check harness continuity between HO2S1 terminal 4 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

3. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

Continuity should not exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1426, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002AR

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

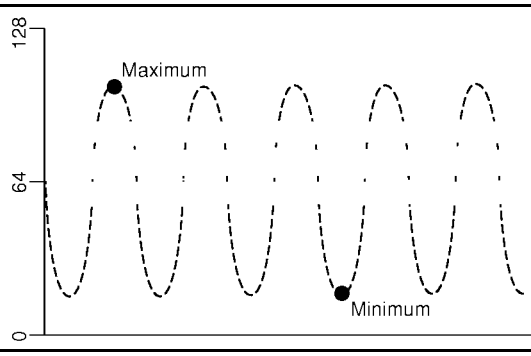
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

CAUTION:

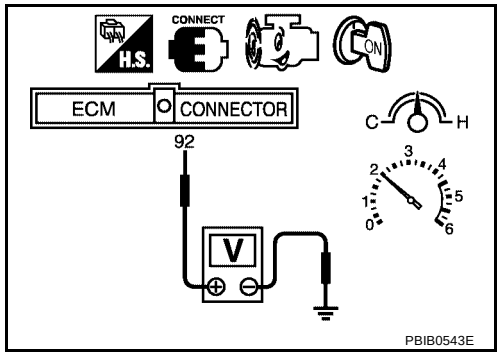
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002AS

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

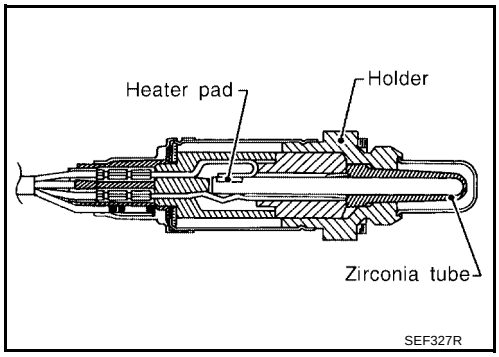
DTC P0138 HO2S2

PFP:226A0

Component Description

UBS002AT

The heated oxygen sensor 2, after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS002AU

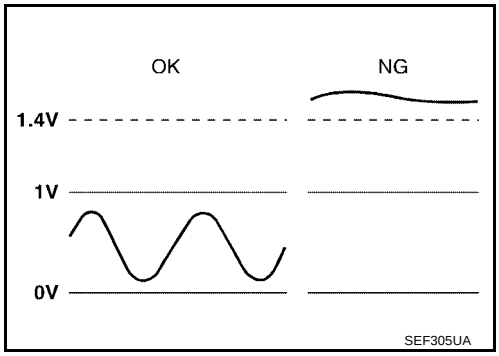
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Warm-up condition ● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

On Board Diagnosis Logic

UBS002AV

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2

DTC Confirmation Procedure

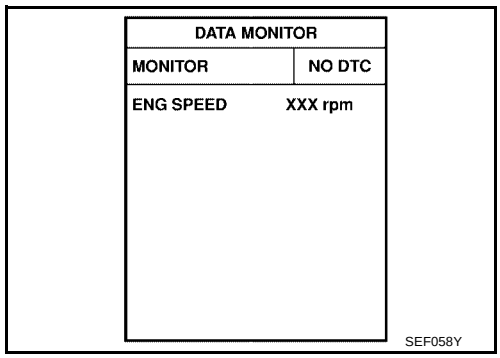
UBS002AW

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF”and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for two minutes.
6. If 1st trip DTC is detected, go to EC-1431, "Diagnostic Procedure" .



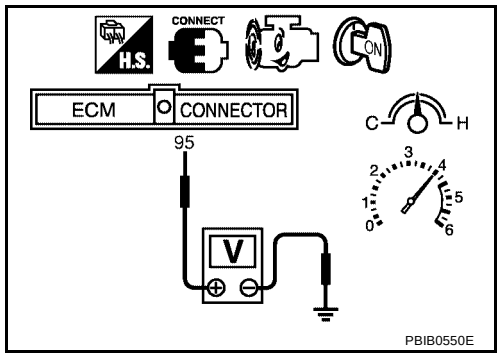
Overall Function Check

UBS002AX

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

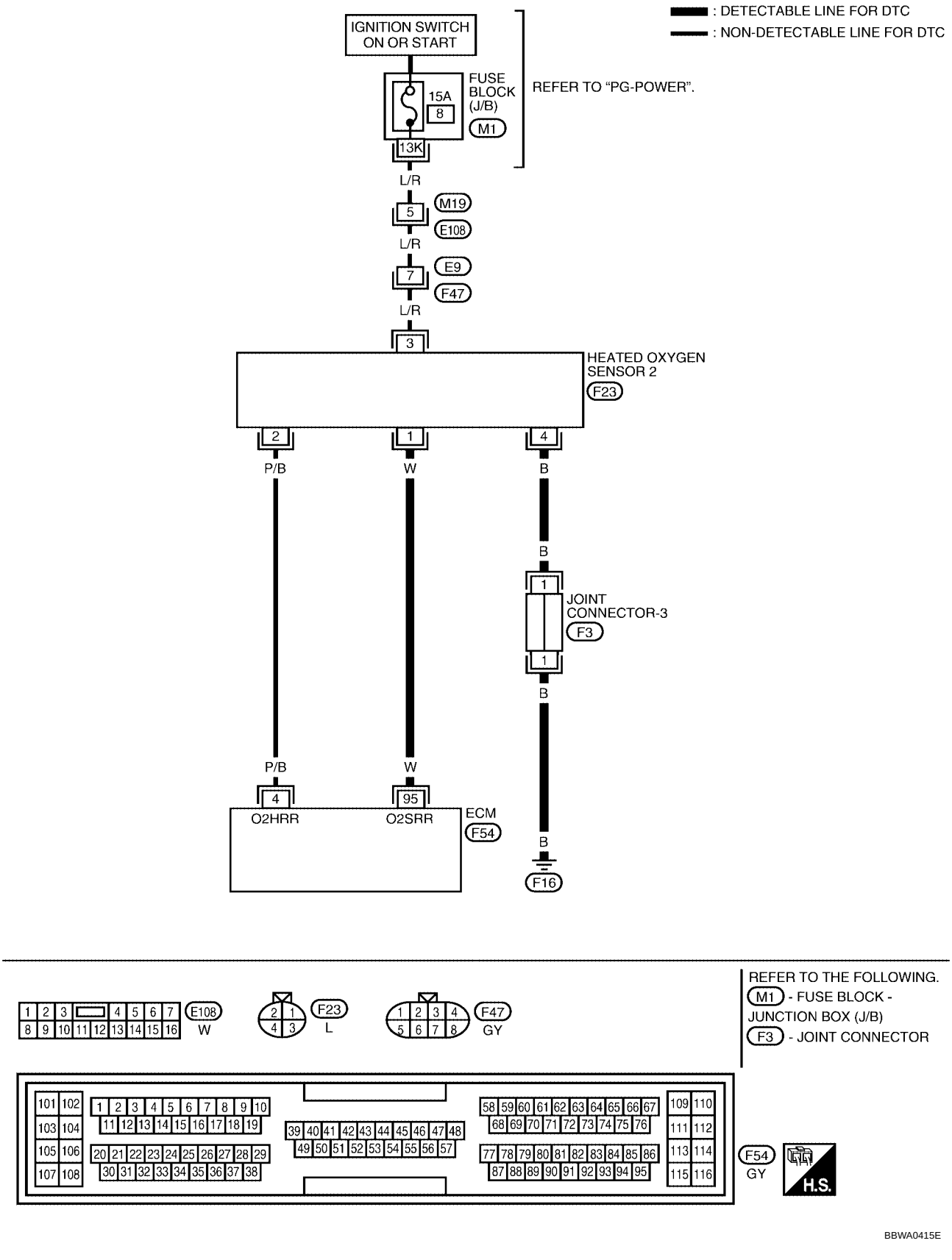
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for two minutes.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and keep the engine speed at between 3,500 to 4,000 rpm for at least one minute under no load.
7. Let engine idle for two minutes.
8. Select “Mode 3” with GST.
9. If DTC is detected, go to EC-1431, "Diagnostic Procedure" .



Wiring Diagram

UBS002AY

EC-HO2S2-01



BBWA0415E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600rpm after the following conditions are met. – Engine after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V

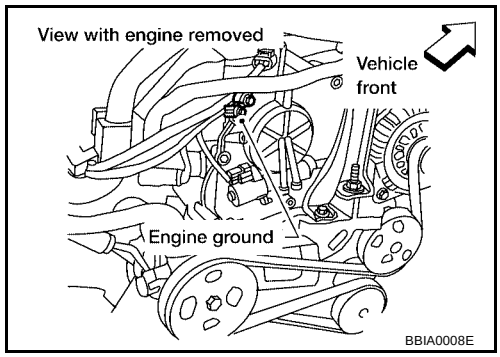
Diagnostic Procedure

UBS002AZ

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

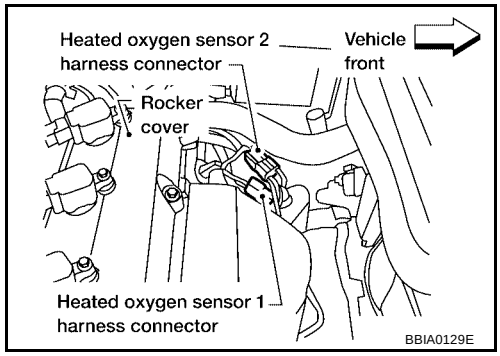
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open and short between HO2S2 and engine ground

>> Repair open circuit or short to power in harness connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 95 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Check harness continuity between ECM terminal 95 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.
4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HARNESS CONNECTOR

Check HO2S2 harness connector for water.

Water should not exist.

OK or NG

OK >> GO TO 6.
NG >> Repair or replace harness connector.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1432, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002B0

HEATED OXYGEN SENSOR 2

With CONSULT-II

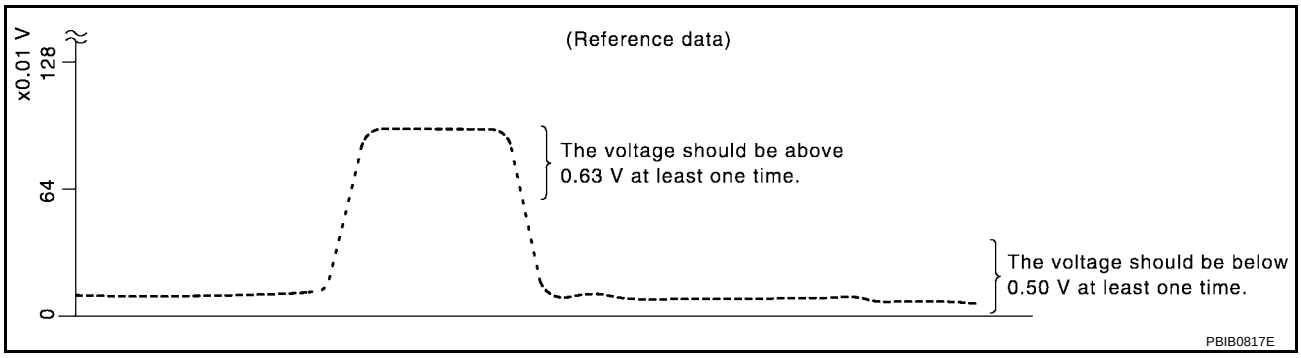
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for two minutes.

6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



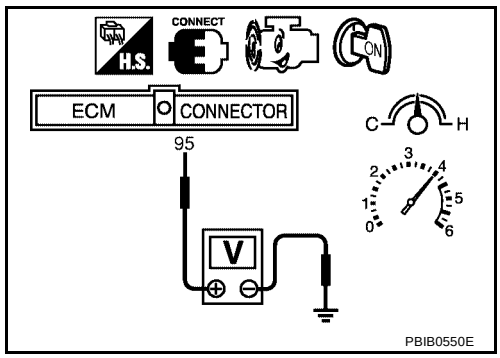
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is –25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine warm it up to the normal operating temperature.
2. Turn ignition switch “OFF“ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002B1

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

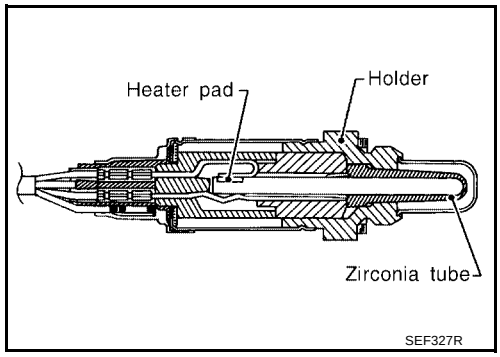
DTC P0139 HO2S2

PFP:226A0

Component Description

UBS002B2

The heated oxygen sensor 2, after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS002B3

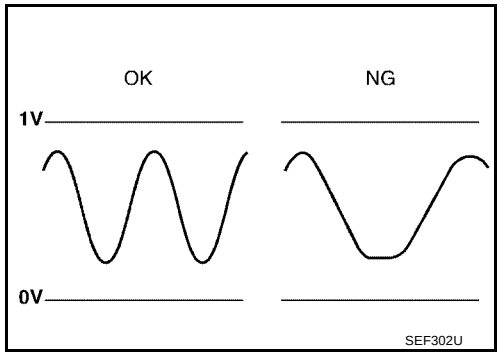
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Warm-up condition	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.		LEAN ←→ RICH

On Board Diagnosis Logic

UBS002B4

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

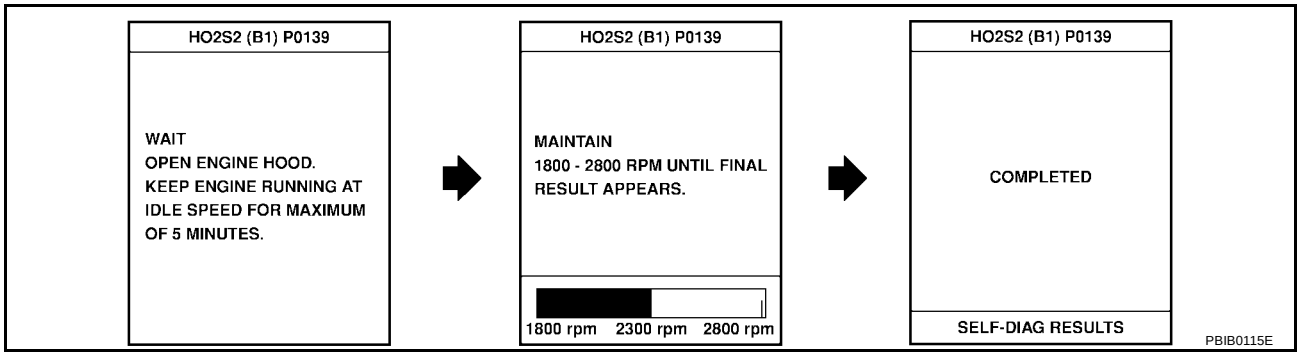
UBS002B5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
For the best results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Select “HO2S2 (B1) P0139” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-1438, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 3.

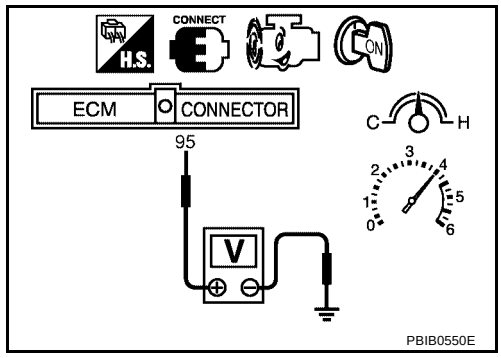
Overall Function Check

UBS002B6

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   A change of voltage should be more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.

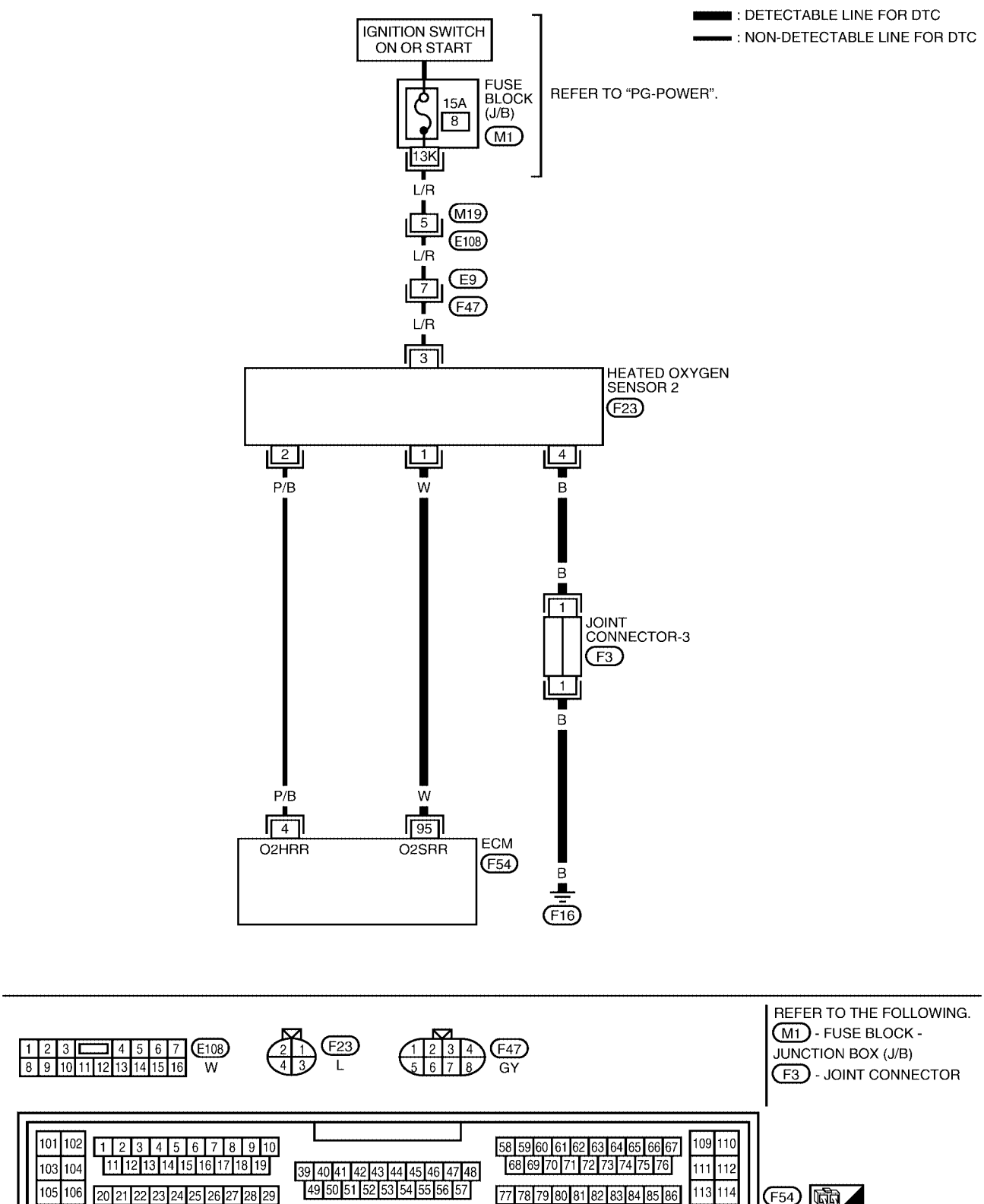


7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should change at more than 0.06V for 1 second during this procedure.
8. If NG, go to EC-1438, "Diagnostic Procedure" .

Wiring Diagram

UBS002B7

EC-HO2S2-01



BBWA0415E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600rpm after the following conditions are met. – Engine after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V

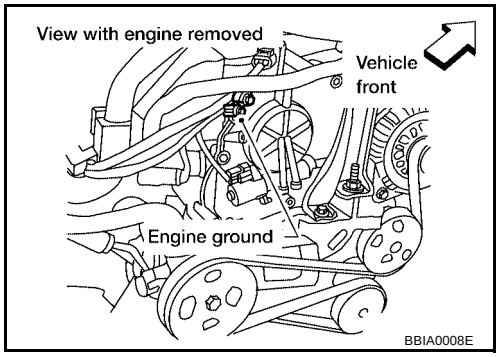
Diagnostic Procedure

UBS002B8

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

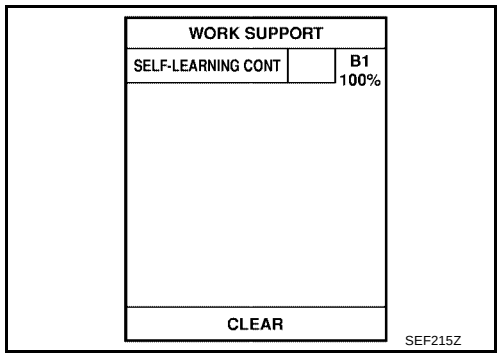
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

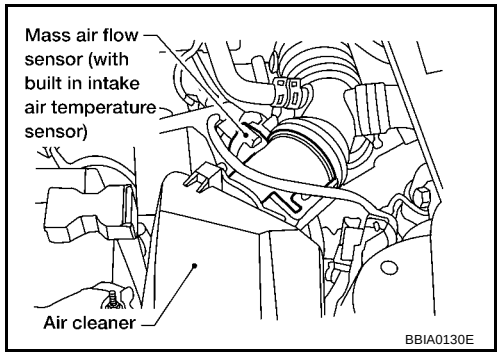
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-1442 or EC-1449 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

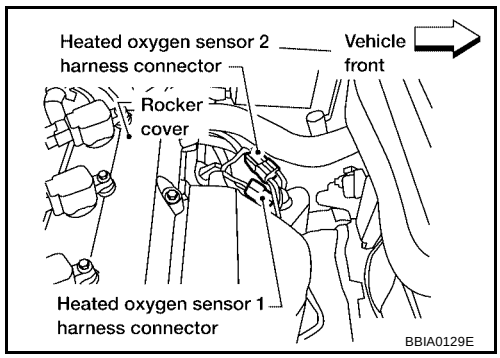
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open and short between HO2S2 and engine ground

>> Repair open circuit or short to power in harness or connectors.

5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 95 and HO2S2 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Check harness continuity between ECM terminal 95 or HO2S2 terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should not exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1440, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

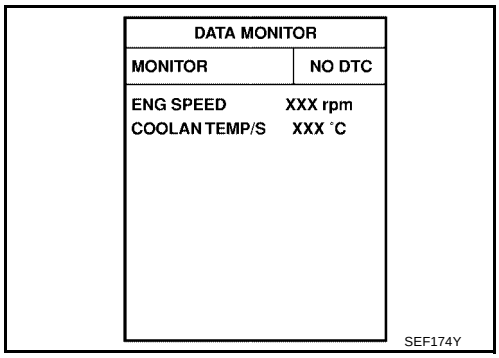
Component Inspection

UBS002B9

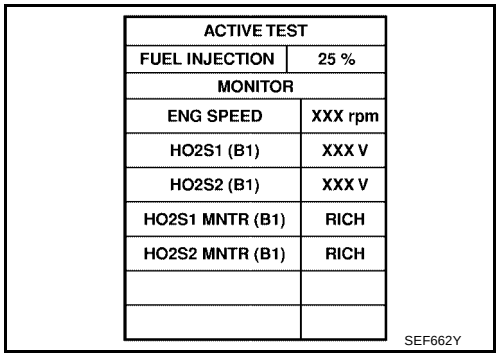
HEATED OXYGEN SENSOR 2

With CONSULT-II

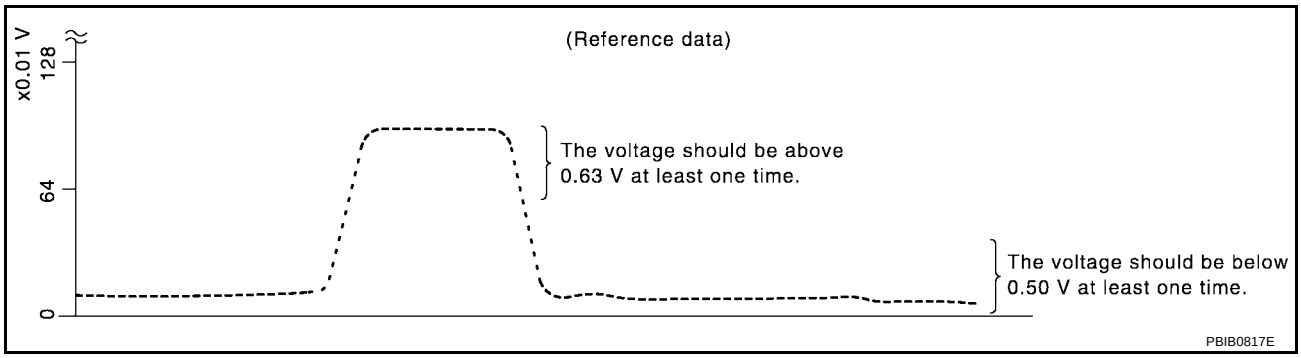
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minutes.



6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



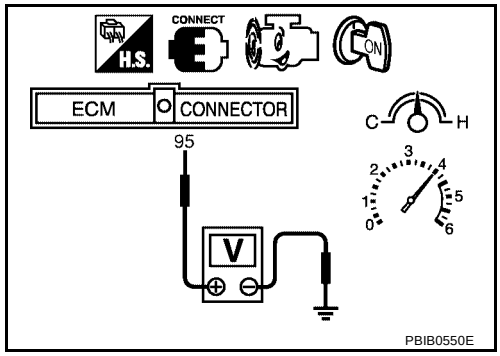
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002BA

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P0171 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

UBS002BB

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171	Fuel injection system too lean	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor ● Incorrect PCV hose connection

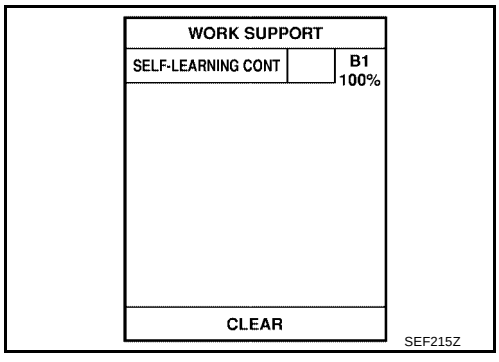
DTC Confirmation Procedure

UBS002BC

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

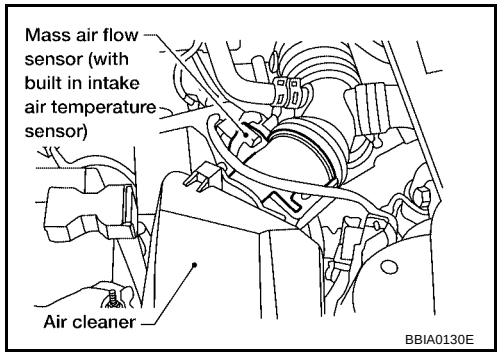
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-1445, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-1445, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

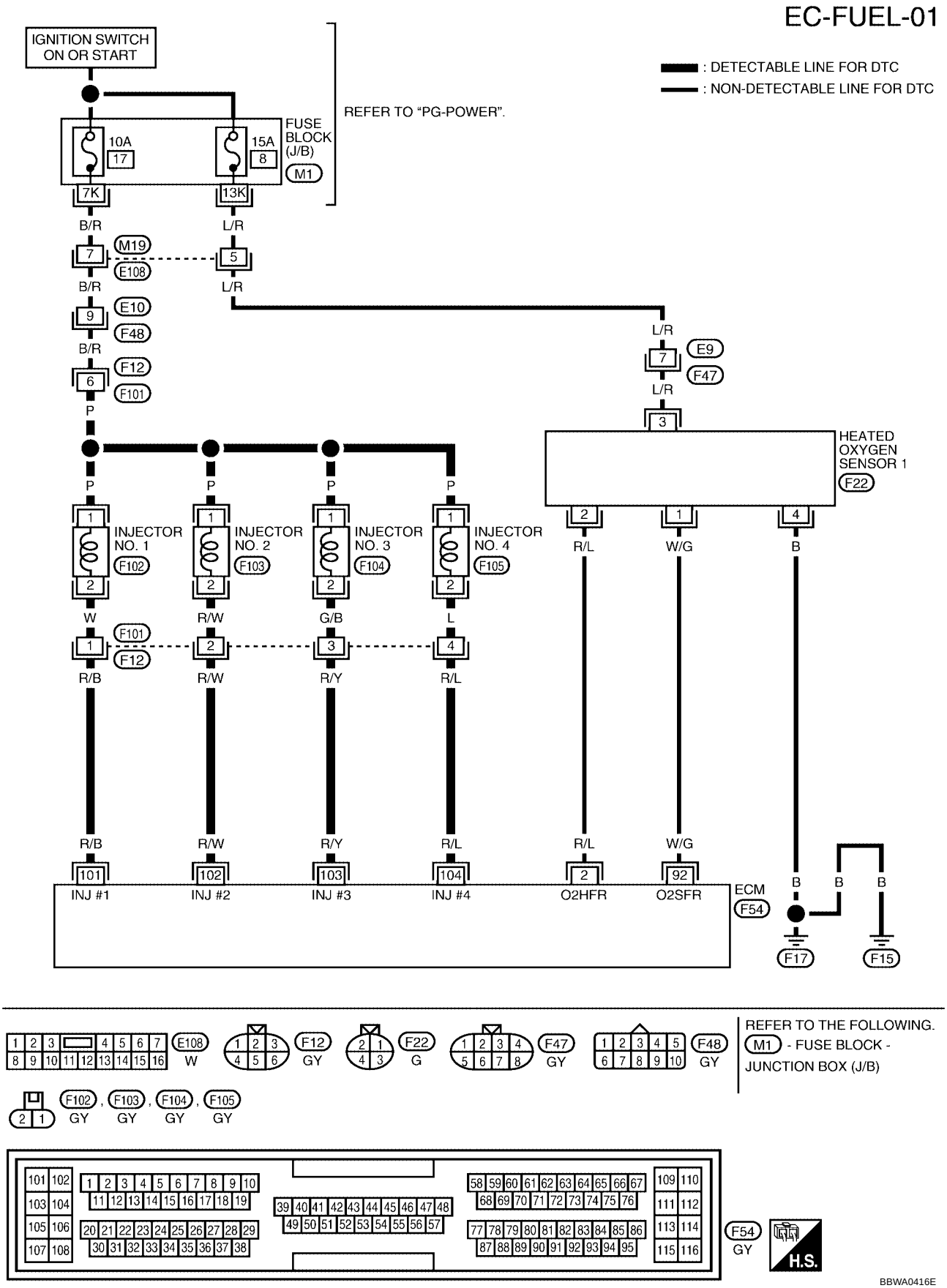
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-1445, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.



10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-1445, "Diagnostic Procedure" .
    If engine does not start, check exhaust and intake air leak visually.

Wiring Diagram

UBS002BD

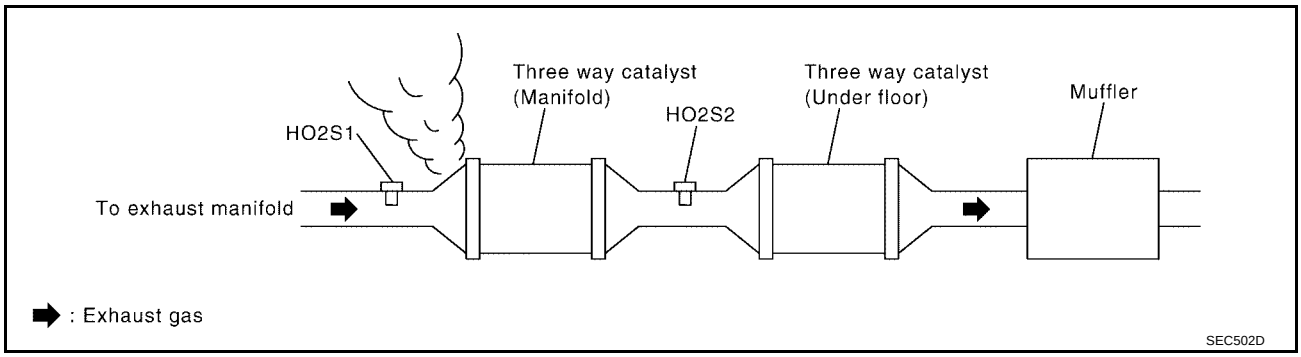


Diagnostic Procedure

UBS002BE

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

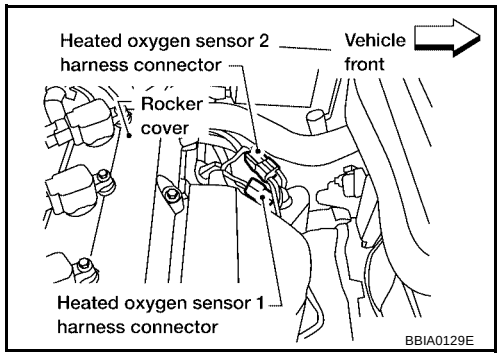
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-1257, "Fuel Pressure Check" .

At idling: Approximately 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

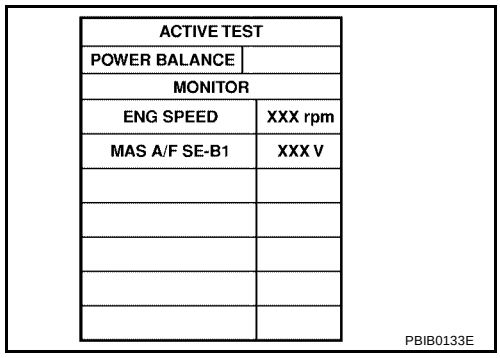
OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1375, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

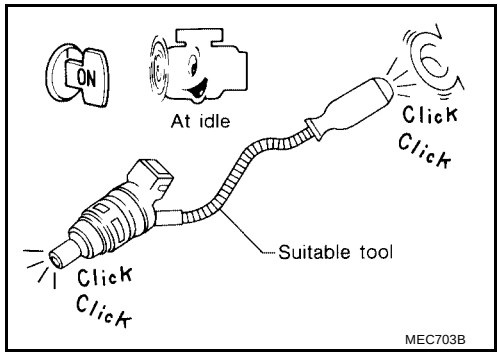
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



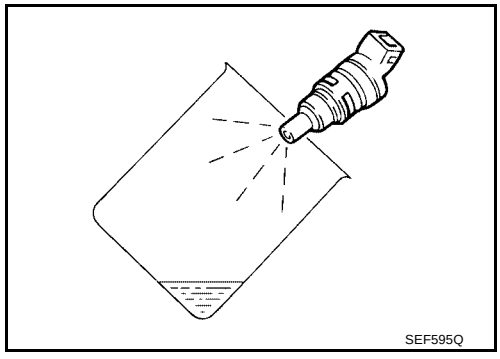
OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-1796, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Disconnect injector harness connectors.
4. Remove injector gallery assembly. Refer to EM-118, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

Fuel should be sprayed evenly for each injector.



OK or NG

OK >> GO TO 8.
NG >> Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0172 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

UBS002BF

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172	Fuel injection system too rich	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

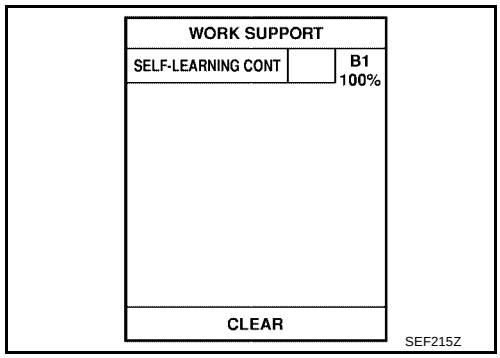
DTC Confirmation Procedure

UBS002BG

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

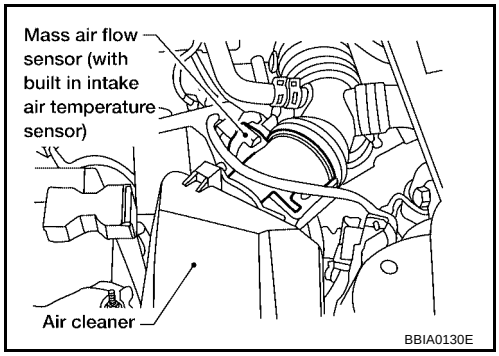
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-1452, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal.
   If engine starts, go to EC-1452, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.



WITH GST

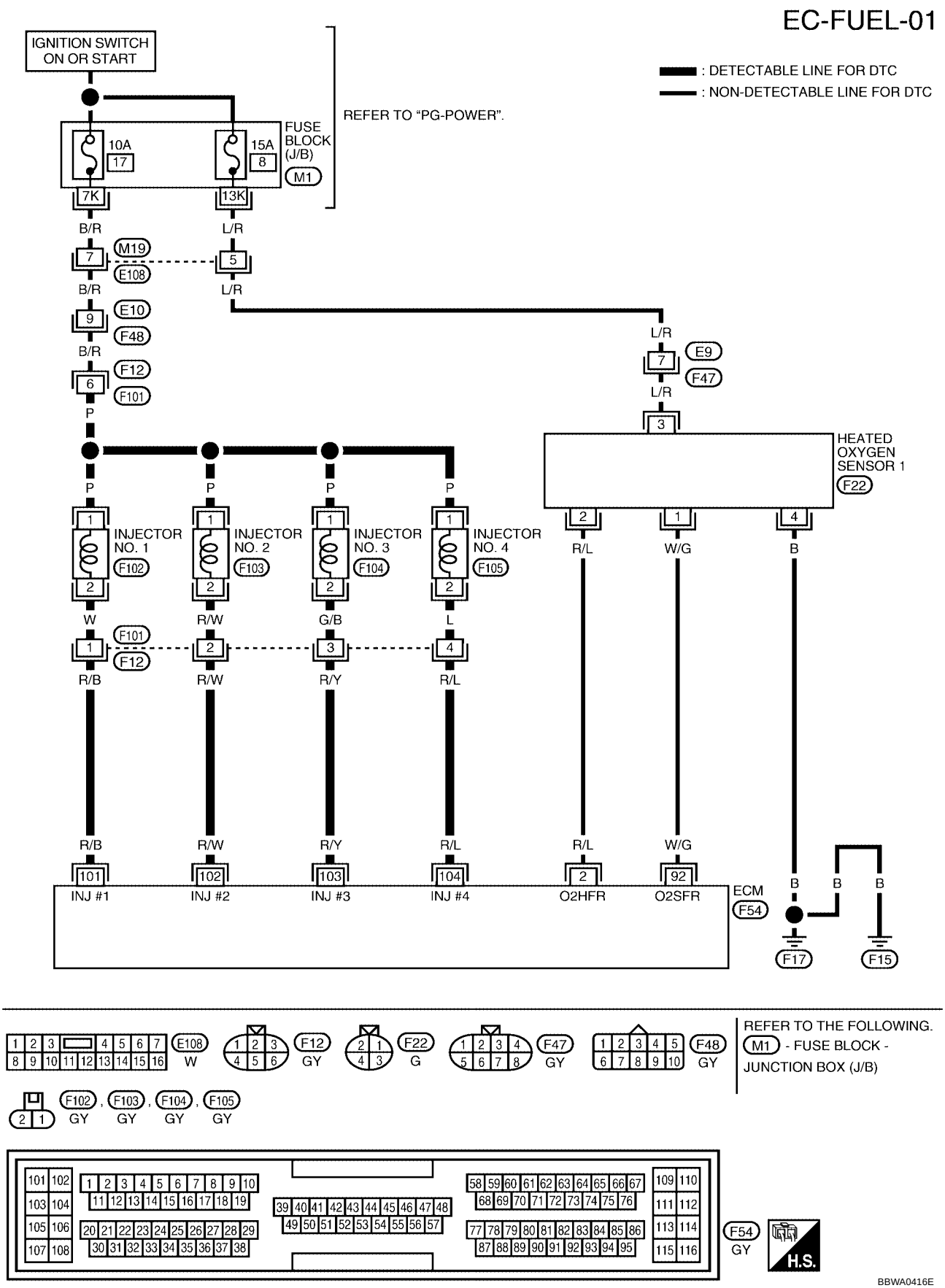
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-1452, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-1452, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



Wiring Diagram

UBS002BH



REFER TO THE FOLLOWING.
M1 - FUSE BLOCK - JUNCTION BOX (J/B)

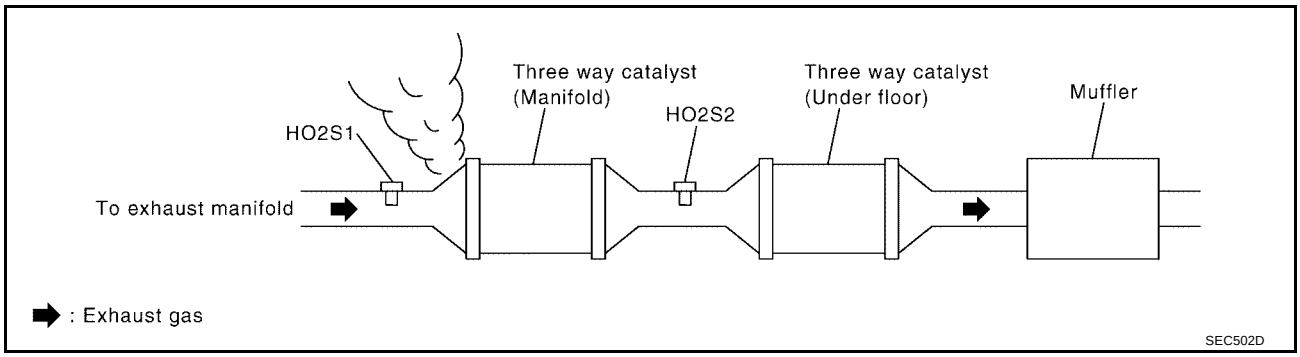
BBWA0416E

Diagnostic Procedure

UBS002BI

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

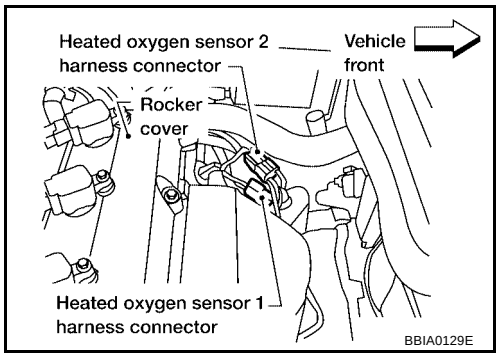
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and engine ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-1257, "Fuel Pressure Check" .

   At idling: 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

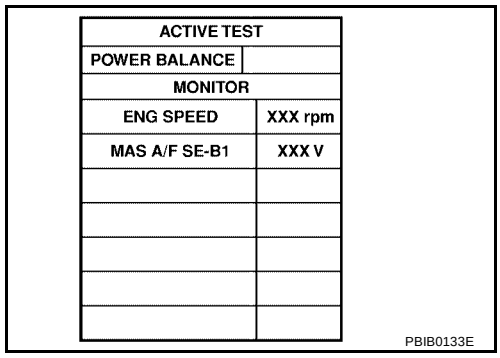
OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1375, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

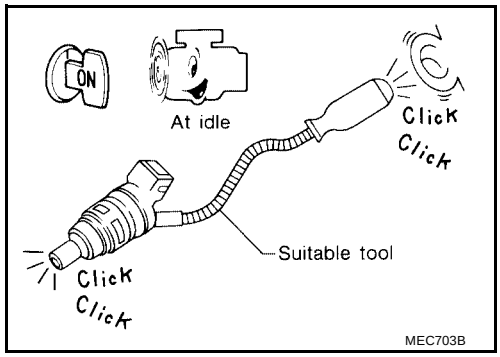
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-1796, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Remove injector assembly. Refer to EM-118, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect injector harness connectors.
   The injector harness connectors should remain connected.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

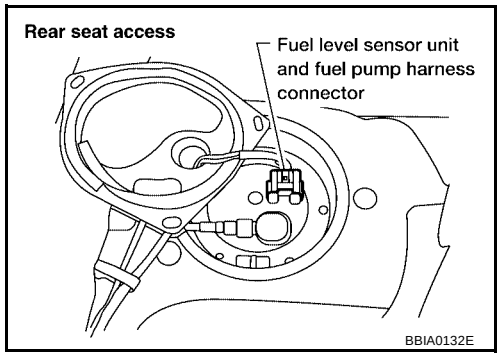
DTC P0181 FTT SENSOR

PFP:22630

Component Description

UBS002BJ

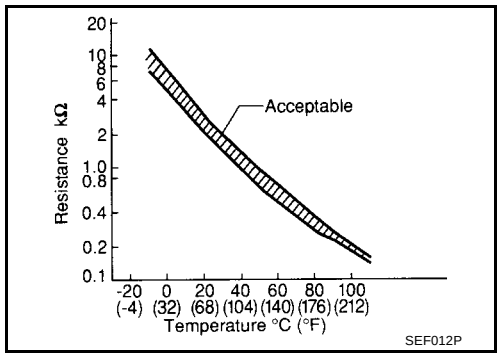
The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 70 (Fuel tank temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may lead to ECM's transistor damage. Use ground other than ECM, such as engine ground.

On Board Diagnosis Logic

UBS002BK

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181 0181	Fuel tank temperature sensor circuit range/ performance	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel tank temperature sensor

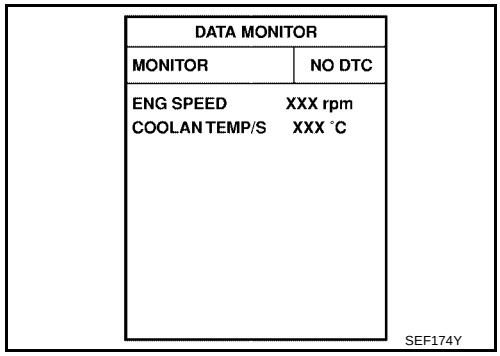
DTC Confirmation Procedure

UBS002BL

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Check “COOLAN TEMP/S” value.
   If “COOLAN TEMP/S” is less than 60°C (140°F), the result will be OK.
   If “COOLAN TEMP/S” is above 60°C (140°F), go to the following step.
4. Cool engine down until “COOLAN TEMP/S” signal is less than 60°C (140°F).
5. Wait at least 10 seconds.
6. If 1st trip DTC is detected, go to EC-1456, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002BM

1. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace fuel tank temperature sensor.

2. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
Refer to EC-1458, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

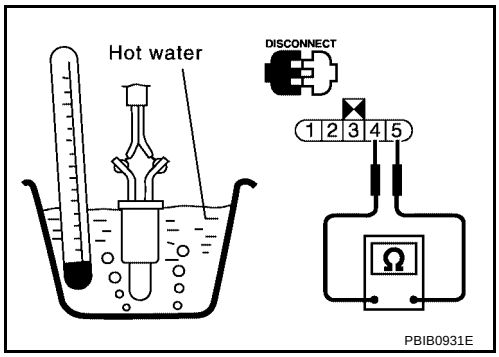
UBS002BN

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace fuel level sensor unit.



Removal and Installation

UBS002BO

FUEL TANK TEMPERATURE SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

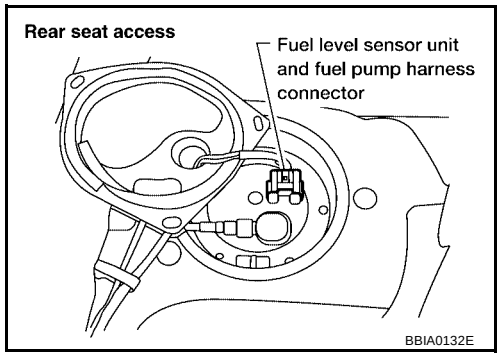
DTC P0182, P0183 FTT SENSOR

PFP:22630

Component Description

UBS002BP

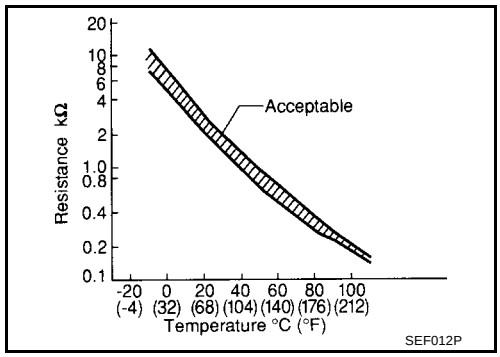
The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 70 (Fuel tank temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may lead to ECM's transistor damage. Use ground other than ECM, such as engine ground.

On Board Diagnosis Logic

UBS002BQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182 0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Fuel tank temperature sensor
P0183 0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

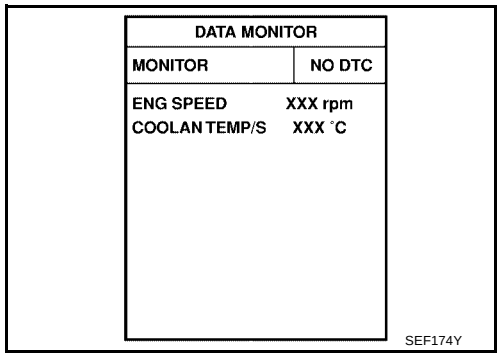
DTC Confirmation Procedure

UBS002BR

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1459, "Diagnostic Procedure" .



WITH GST

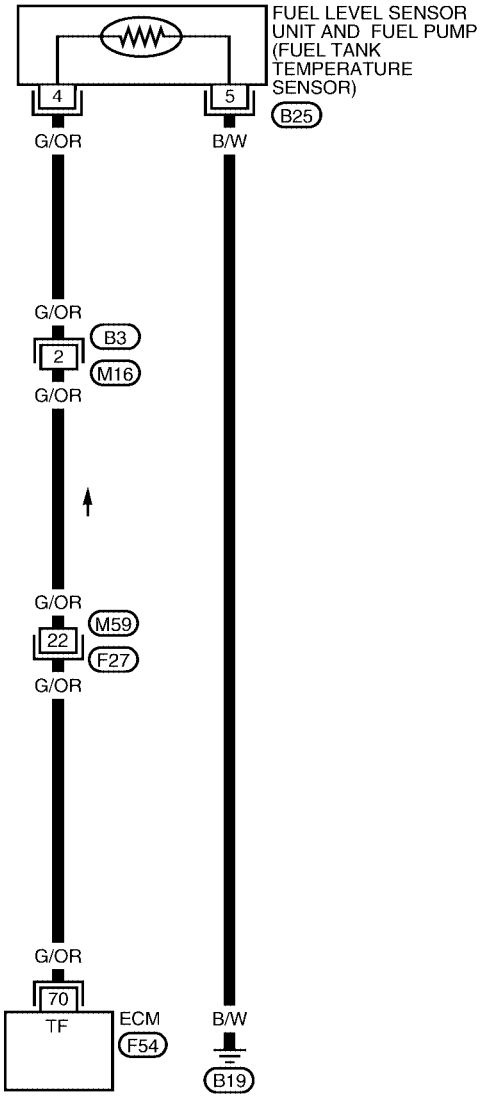
Follow the procedure “WITH CONSULT-II” above.

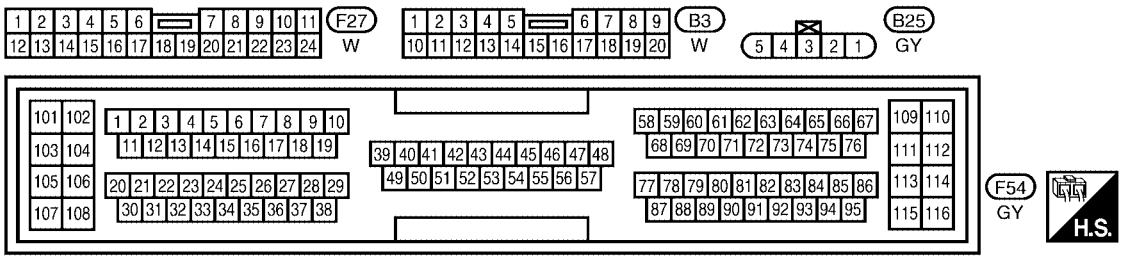
Wiring Diagram

UBS002BS

EC-FTTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





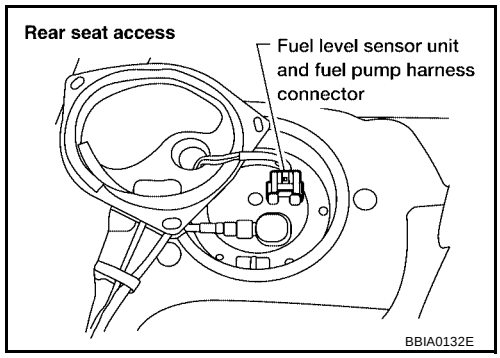
BBWA0221E

Diagnostic Procedure

UBS002BT

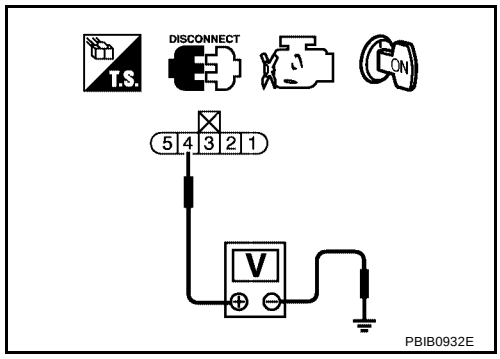
1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and body ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M59, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair harness or connector.

3. CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1460, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel tank temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

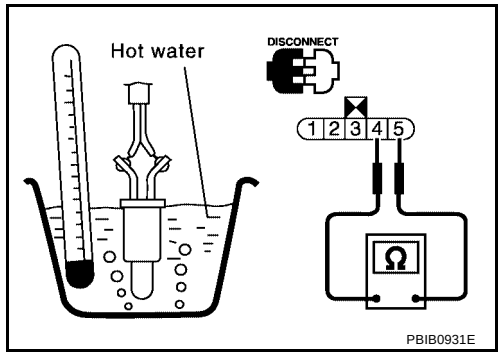
UBS002BU

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace fuel level sensor unit.



Removal and Installation

UBS002BV

FUEL TANK TEMPERATURE SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

DTC P0217 COOLANT OVERTEMPERATURE ENRICHMENT PROTECTION

PFP:00019

System Description

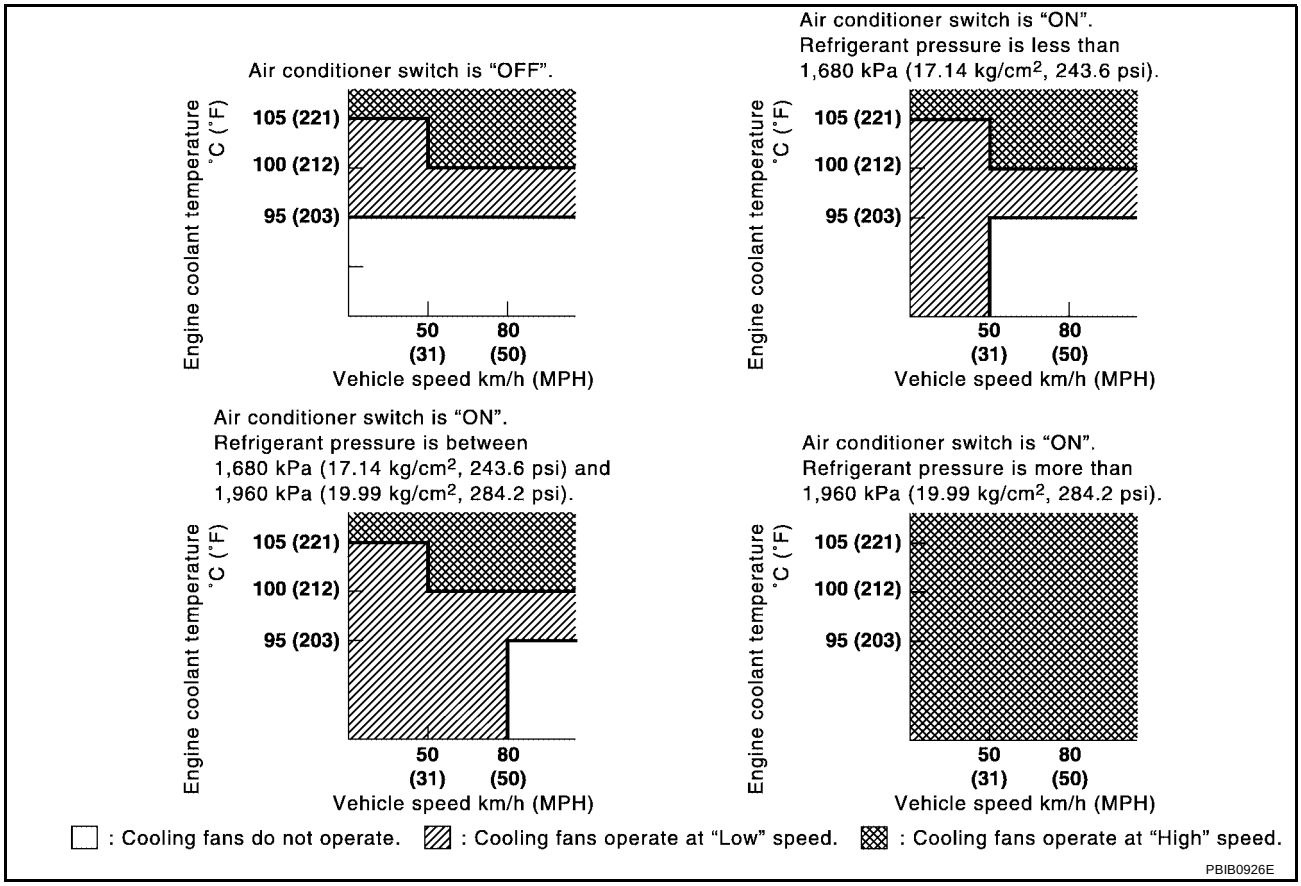
UBS002BW

COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

UBS002BX

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

On Board Diagnosis Logic

UBS002BY

This diagnosis checks whether the engine coolant temperature is extraordinary high, even when the load is not heavy.
When malfunction is detected, the malfunction indicator lamp (MIL) will light up even in the first trip.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0217 0217	Engine coolant over temperature condition	Engine coolant temperature is excessively high under normal engine speed.	● Harness or connectors (The cooling fan circuit is open or shorted) ● Cooling fan ● Thermostat ● Improper ignition timing ● Engine coolant temperature sensor ● Blocked radiator ● Blocked front end (Improper fitting of nose mask) ● Crushed vehicle frontal area (Vehicle frontal is collided but not repaired) ● Blocked air passage by improper installation of front fog lamp or fog lamps ● Improper mixture ratio of coolant ● Damaged bumper For more information, refer to EC-1473, "Main 12 Causes of Overheating" .

CAUTION:
When a malfunction is indicated, be sure to replace the coolant. Refer to MA-23, "Changing Engine Coolant" . Also, replace the engine oil. Refer to LU-17, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

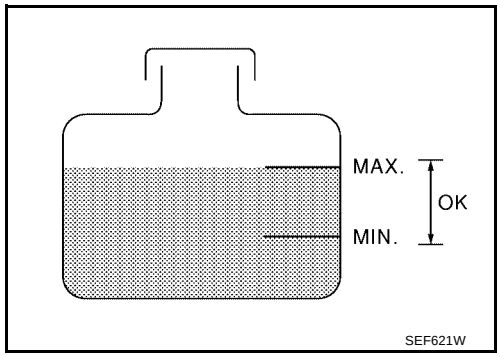
Overall Function Check

UBS002BZ

Use this procedure to check the overall function of the coolant overtemperature enrichment protection check, a DTC might not be confirmed.

WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high-pressure fluid escaping from the radiator.
Wrap a thick cloth around the cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II



1. Check the coolant level and mixture ratio (using coolant tester) in the reservoir tank and radiator.
Allow engine to cool before checking coolant level and mixture ratio.
   - If the coolant level in the reservoir and/or radiator is below the proper range, go to EC-1466, "Diagnostic Procedure" .
   - If the coolant mixture ratio is out of the range of 45 to 55%, replace the coolant in the following procedure MA-23, "Changing Engine Coolant" .

a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant from a kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .

b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

c. After checking or replacing coolant, go to step 3 below.

2. Ask the customer if engine coolant has been added. If it has been added, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.

3. Start engine and let it idle.

4. Make sure that A/C switch is “OFF” and air conditioner is not operating. If NG, check air conditioner circuit. Refer to MTC-19, "TROUBLE DIAGNOSIS" After repair, go to the next step.

5. Perform “ENG COOLANT TEMP” in “ACTIVE TEST” mode with CONSULT-II at idle.

a. Set “ENG COOLANT TEMP” to 95°C (203°F) and make sure that cooling fan operates at low speed.
If NG, go to EC-1466, "Diagnostic Procedure" .

b. Set “ENG COOLANT TEMP” to 105°C (221°F) and make sure that cooling fan operates at high speed. If NG, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.

6. Check for blocked coolant passage.

a. Warm up engine to normal operating temperature, then grasp radiator upper hose and lower hose and make sure that coolant flows.
If NG, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.
Be extremely careful not to touch any moving or adjacent parts.

7. Check for blocked radiator air passage.

a. When market fog lamps have been installed, check for damaged fans and clogging in the condenser and radiator.

b. Check the front end for clogging caused by insects or debris.

c. Check for improper fitting of front-end cover, damaged radiator grille or bumper, damaged vehicle front.
If NG, take appropriate action and then go to the next step.

8. Check function of ECT sensor.
Refer to EC-1390, "Component Inspection" .
If NG, replace ECT sensor and go to the next step.

9. Check ignition timing. Refer to EC-1291, "Basic Inspection" .
Make sure that ignition timing is 15°±5° at idle.
If NG, refer to EC-1291, "Basic Inspection" , and then recheck.

WITH GST

1. Check the coolant level and mixture ratio (using coolant tester) in the reservoir tank and radiator.
Allow engine to cool before checking coolant level and mixture ratio.
   - If the coolant level in the reservoir and/or radiator is below the proper range, and go to EC-1466, "Diagnostic Procedure" .
   - If the coolant mixture ratio is out of the range of 45 to 55%, replace the coolant in the following procedure MA-23, "Changing Engine Coolant" .

a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant from a kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .

b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

c. After checking or replacing coolant, go to step 3 below.

2. Ask the customer if engine coolant has been added. If it has been added, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.
3. Start engine and let it idle.
4. Make sure that A/C switch is “OFF” and air conditioner is not operating. If NG, check air conditioner circuit. Refer to MTC-19, "TROUBLE DIAGNOSIS" . After repair, go to the next step.
5. Turn ignition switch “OFF”.
6. Disconnect engine coolant temperature sensor harness connector.
7. Connect 150Ω resistor to engine coolant temperature sensor.
8. Start engine and make sure that cooling fan operates.
   Be careful not to overheat engine.
   If NG, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.
9. Check for blocked coolant passage.

a. Warm up engine to normal operating temperature, then grasp radiator upper hose and lower hose and make sure that coolant flows.
   If NG, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.
   Be extremely careful not to touch any moving or adjacent parts.

10. Check for blocked radiator air passage.

a. When market fog lamps have been installed, check for damaged fans and clogging in the condenser and radiator.

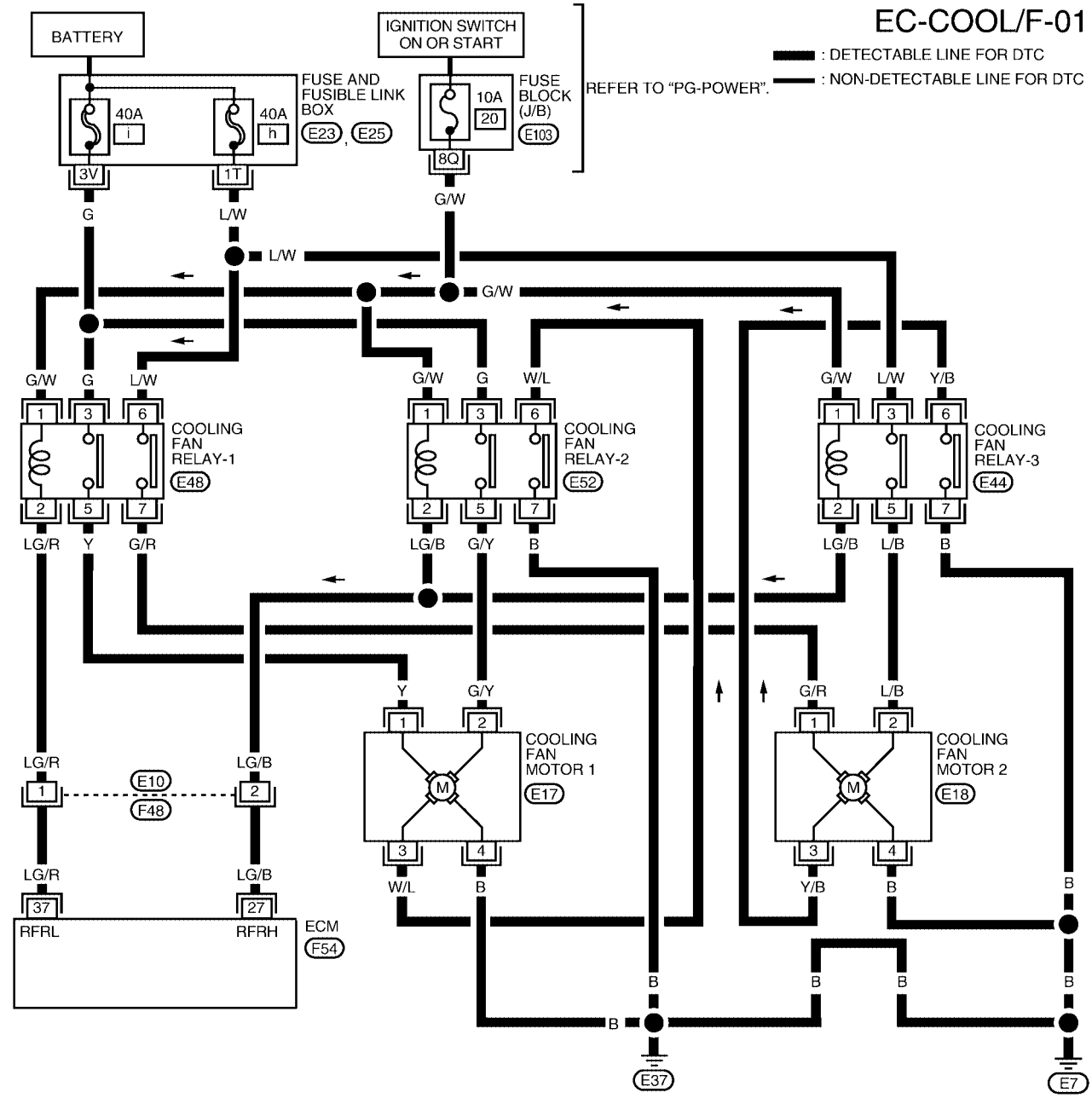
b. Check the front end for clogging caused by insects or debris.

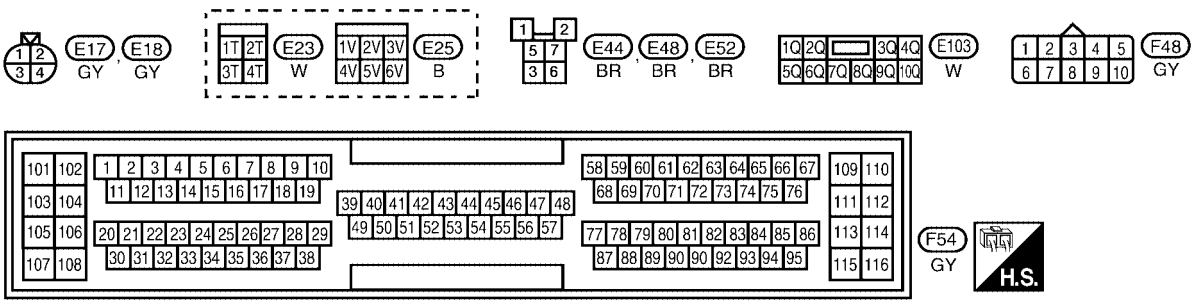
c. Check for improper fitting of front-end cover, damaged radiator grille or bumper, damaged vehicle front.
   If NG, take appropriate action and then go to the next step.

11. Check function of ECT sensor.
    Refer to EC-1390, "Component Inspection" .
    If NG, replace ECT sensor and go to the next step.
12. Check ignition timing. Refer to EC-1291, "Basic Inspection" .
    Make sure that ignition timing is 15°±5° at idle.
    If NG, refer to EC-1291, "Basic Inspection" , and then recheck.

Wiring Diagram

UBS002C0





BBWA0431E

Diagnostic Procedure

UBS002C1

1. INSPECTION START

Do you have CONSULT-II?

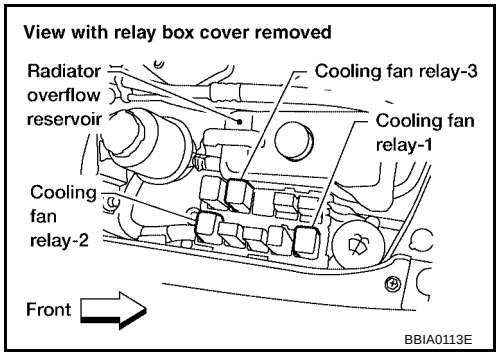
Yes or No

Yes >> GO TO 2.
No >> GO TO 4.

2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.



3. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “LOW” on the CONSULT-II screen.
4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 3.
NG >> Check cooling fan low speed control circuit. (Go to EC-1470, "PROCEDURE A" .)

ACTIVE TEST	
COOLING FAN	LOW
MONITOR	
COOLAN TEMP/S	XXX °C

SEF784Z

3. CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relays-2 and -3.
3. Start engine and let it idle.
4. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “HIGH” on the CONSULT-II screen.
5. Make sure that cooling fans-1 and -2 operate at high speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-1472, "PROCEDURE B" .)

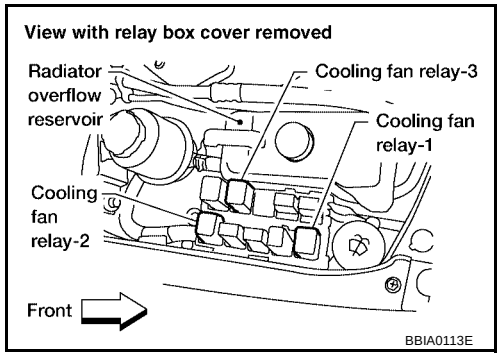
ACTIVE TEST	
COOLING FAN	HIGH
MONITOR	
COOLAN TEMP/S	XXX °C

SEF785Z

4. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

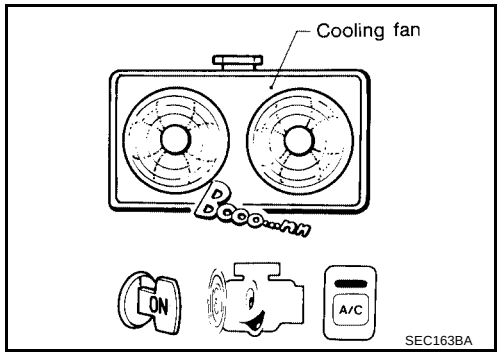
1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.
3. Turn air conditioner switch “ON”.
4. Turn blower fan switch “ON”.



5. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 5.
NG >> Check cooling fan low speed control circuit. (Go to EC-1470, "PROCEDURE A" .)



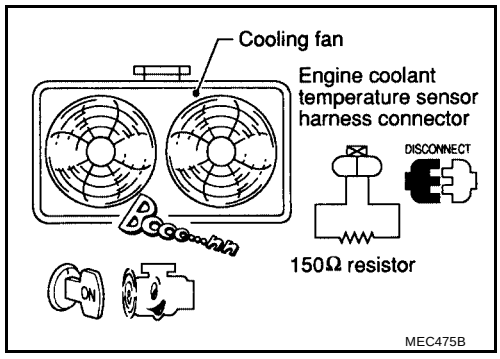
5. CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relays-2 and -3.
3. Turn air conditioner switch and blower fan switch “OFF”.
4. Disconnect engine coolant temperature sensor harness connector.
5. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
6. Restart engine and make sure that cooling fans-1 and -2 operate at high speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-1472, "PROCEDURE B" .)



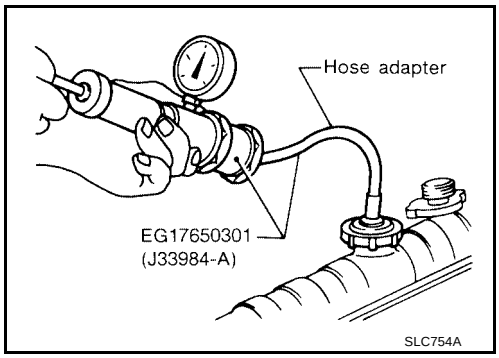
6. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.6 kg/cm^2 , 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.

Pressure should not drop.



OK or NG

OK >> GO TO 7.
NG >> Check the following for leak.

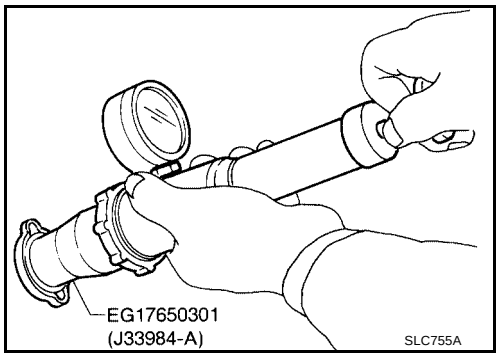
- Hose
- Radiator
- Water pump
  Refer to CO-26, "WATER PUMP" .

7. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure:

59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 8.
NG >> Replace radiator cap.

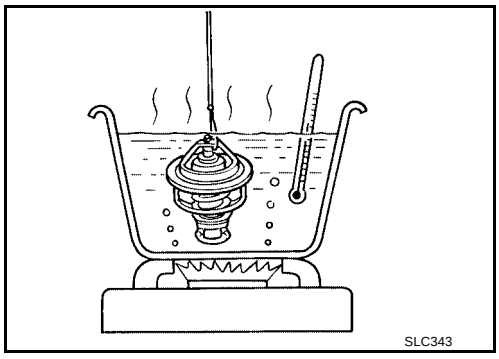
8. CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.

   Valve opening temperature: 82°C (180°F) [standard]

   Valve lift: More than 8 mm/95°C (0.31 in/203°F)

3. Check if valve is closed at 5°C (9°F) below valve opening temperature.
   For details, refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .



OK or NG

OK >> GO TO 9.
NG >> Replace thermostat.

9. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1390, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace engine coolant temperature sensor.

10. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to EC-1473, "Main 12 Causes of Overheating" .

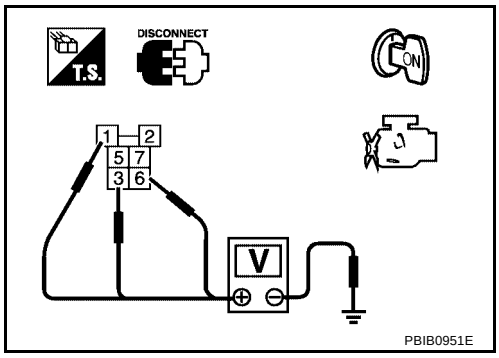
>> **INSPECTION END**

PROCEDURE A

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

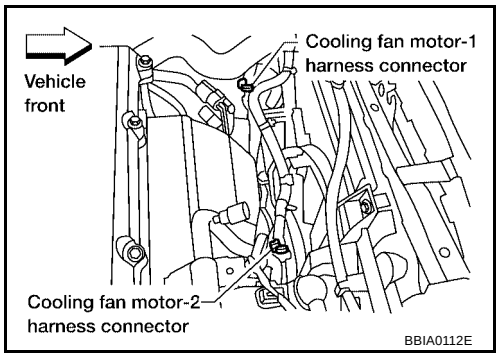
- 10A fuse
- Fuse block (J/B) connector E103
- 40A fusible links
- Fuse and fusible link box connectors E23, E25
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and fusible links

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 4 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 4 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 37 and cooling fan relay-1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relay-1 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-1474, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1474, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

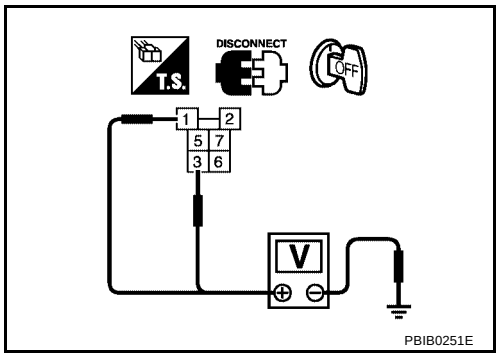
>> **INSPECTION END**

PROCEDURE B

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relays-2 and -3 terminals 1, 3 and body ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

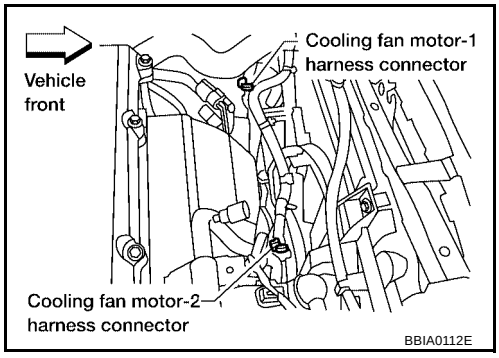
- Harness for open or short between cooling fan relays-2 and -3 and fuse
- Harness for open or short between cooling fan relays-2 and -3 and fusible links

>> Repair harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between the following;
   cooling fan relay-2 terminal 5 and cooling fan motor-1 terminal 2,
   cooling fan relay-2 terminal 6 and cooling fan motor-1 terminal 3,
   cooling fan relay-2 terminal 7 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between the following;
   cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 2,
   cooling fan relay-3 terminal 6 and cooling fan motor-2 terminal 3,
   cooling fan relay-3 terminal 7 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 27 and cooling fan relay-2 terminal 2, cooling fan relay-3 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relays-2, -3 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAYS-2 AND -3

Refer to EC-1474, "COOLING FAN RELAYS-1, -2 AND -3" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relays.

7. CHECK COOLING FAN MOTORS

Refer to EC-1474, "COOLING FAN MOTORS-1 AND -2" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

UBS002C2

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-14, "Anti-freeze Coolant Mixture Ratio" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-23, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa ($0.6 - 1.0$ kg/cm^2 , 9 - 14 psi) (Limit)	See CO-34, "CHECKING RADIATOR CAP" .

Engine	Step	Inspection item	Equipment	Standard	Reference page
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-24, "CHECKING COOLING SYSTEM FOR LEAKS" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" , and CO-30, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P0217 (EC-1461).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-23, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-24, "CHECKING RESERVOIR LEVEL" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-145, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-145, "CYLINDER HEAD" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-22, "OVERHEATING CAUSE ANALYSIS" .

Component Inspection

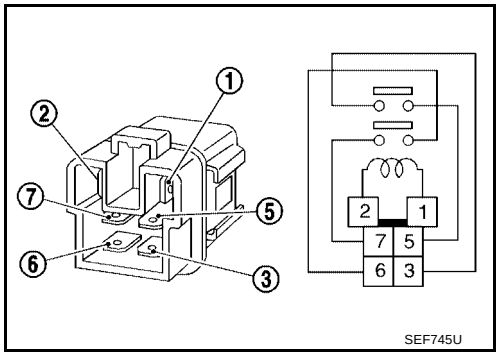
UBS002C3

COOLING FAN RELAYS-1, -2 AND -3

Check continuity between terminals 3 and 5, 6 and 7.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace relay.

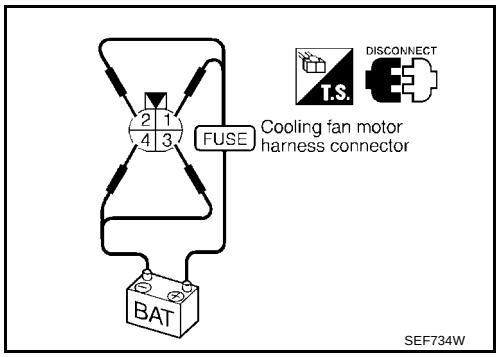


COOLING FAN MOTORS-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(+)	(–)
Cooling fan motor	Low	1	4
	High	1, 2	3, 4

Cooling fan motor should operate.
If NG, replace cooling fan motor.



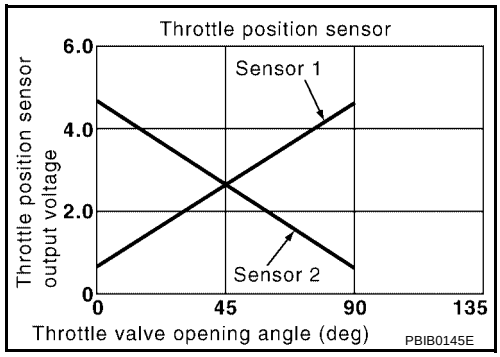
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

UBS0055P

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS0055Q

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2★	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

★: Throttle position sensor2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS0055R

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode an the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

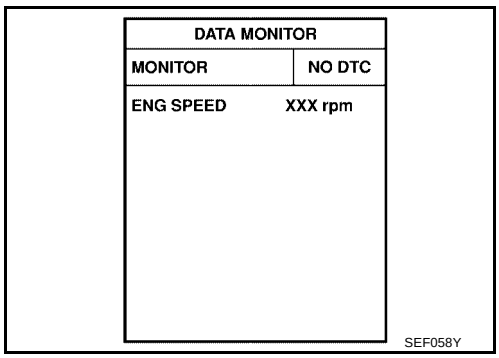
DTC Confirmation Procedure

UBS0055S

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1478, "Diagnostic Procedure" .

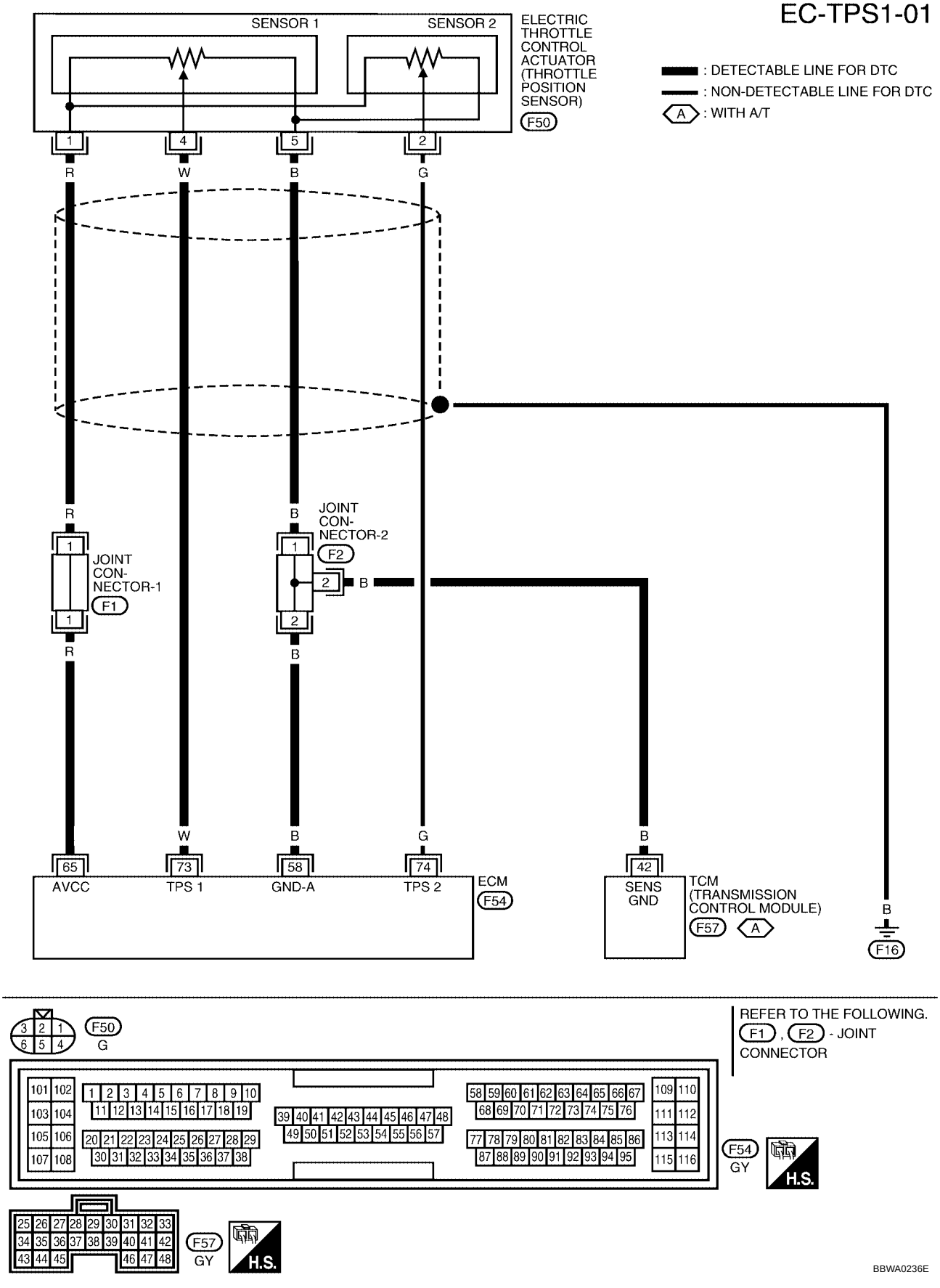


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0055T



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
73	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position: "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● **Engine stopped** ● Shift lever position: "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
74	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position: "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● **Engine stopped** ● Shift lever position: "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

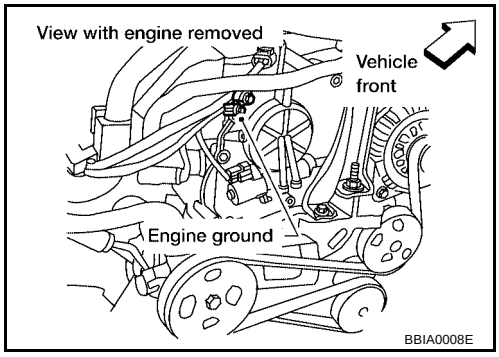
Diagnostic Procedure

UBS0055U

1. RETIGHTEN GROUND SCREWS

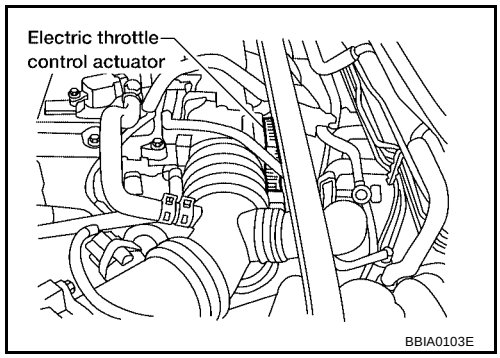
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

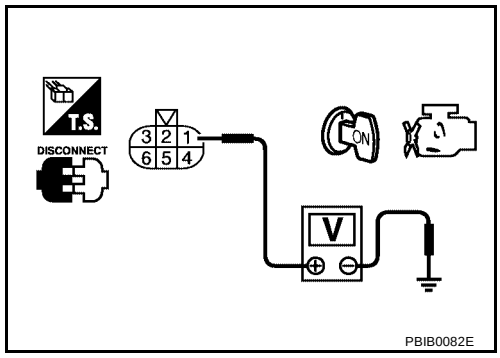


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between electric throttle control actuator and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electric throttle control actuator terminal 5 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-2
- Harness for open or short between electric throttle control actuator and ECM
- Harness for open or short between electric throttle control actuator and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 73 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE POSITION SENSOR

Refer to EC-1480, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

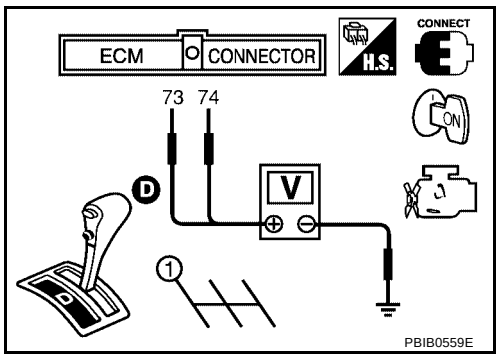
Component Inspection

UBS0055V

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 73 (TP sensor 1), 74 (TP sensor 2) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
73 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
74 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1255, "Throttle Valve Closed Position Learning" .
8. Perform EC-1255, "Idle Air Volume Learning" .

Removal and Installation

UBS0055W

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

PFP:00000

On Board Diagnosis Logic

UBS002D0

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor (POS) signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● The injector circuit is open or shorted ● Fuel injectors ● Intake air leak ● The ignition signal circuit is open or shorted ● Lack of fuel ● Drive plate or flywheel ● Heated oxygen sensor 1 ● Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	

DTC Confirmation Procedure

UBS002D1

CAUTION:

Always drive vehicle at a safe speed.

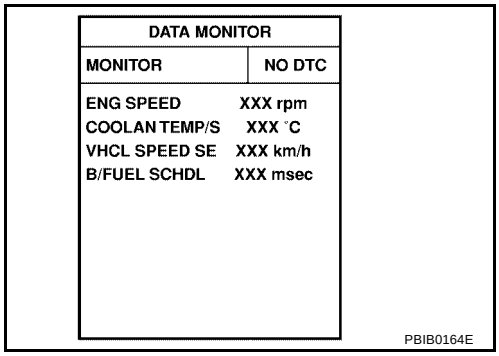
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”, and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.

4. Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
   NOTE:
   Refer to the freeze frame data for the test driving conditions.
5. If 1st trip DTC is detected, go to EC-1482, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002D2

1. CHECK FOR INTAKE AIR LEAK

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

OK or NG

OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

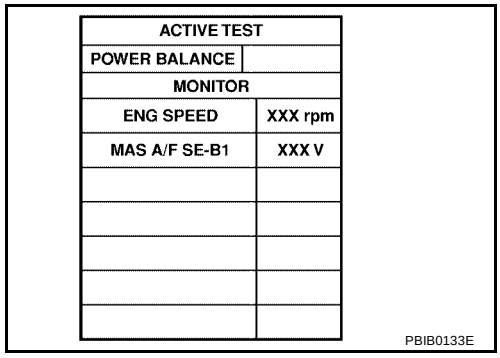
OK or NG

OK >> GO TO 3.
NG >> Repair or replace it.

3. PERFORM POWER BALANCE TEST

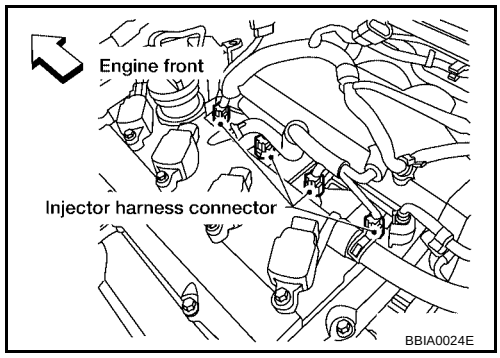
With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?



Without CONSULT-II

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



Yes or No

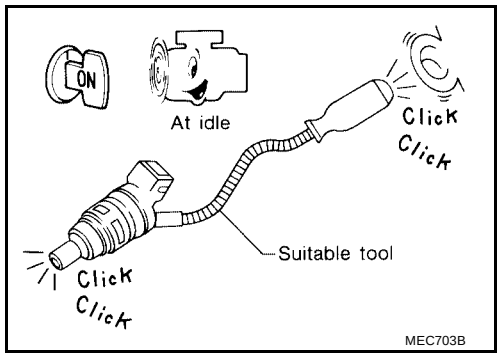
Yes >> GO TO 4.
No >> GO TO 7.

4. CHECK INJECTOR

Does each injector make an operating sound at idle?

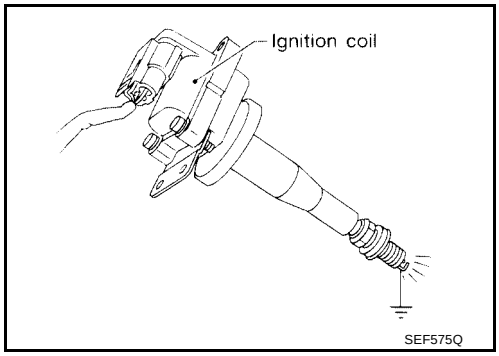
Yes or No

Yes >> GO TO 5.
No >> Check injector(s) and circuit(s). Refer to EC-1796, "INJECTOR CIRCUIT" .



5. CHECK IGNITION SPARK

1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

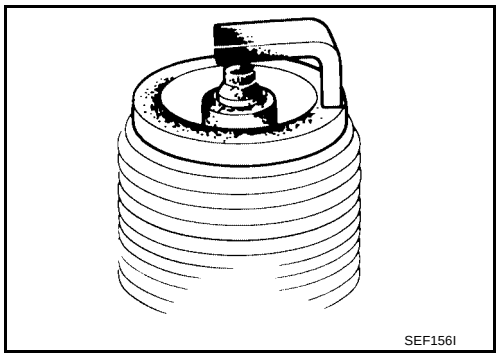


OK or NG

OK >> GO TO 6.
NG >> Check ignition coil, power transistor and their circuits. Refer to EC-1777, "IGNITION SIGNAL" .

6. CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.



OK or NG

OK >> GO TO 7.
NG >> Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-27, "Changing Spark Plugs (Double Platinum - Tipped Type)" .

7. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-145, "CHECKING COMPRESSION PRESSURE" .

Standard:	**1,190 kPa (12.1 kg/cm^2 , 172 psi)/250 rpm**
Minimum:	**990 kPa (10.1 kg/cm^2 , 144 psi)/250 rpm**
Difference between each cylinder:	**98 kPa (1.0 kg/cm^2 , 14 psi)/250 rpm**

OK or NG

OK >> GO TO 8.
NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

8. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-1257, "Fuel Pressure Check" .

At idle: Approx. 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 9.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

9. CHECK IGNITION TIMING

Check the following items. Refer to EC-1291, "Basic Inspection" .

Items		Specifications
Target idle speed	A/T	700 ± 50 rpm (in “P” or “N” position)
	M/T	700 ± 50 rpm
Ignition timing	A/T	15 ± 5° BTDC (in “P” or “N” position)
	M/T	15 ± 5° BTDC

OK or NG

OK >> GO TO 10.
NG >> Follow the “Basic Inspection”.

10. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1410, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. CHECK MASS AIR FLOW SENSOR

With CONSULT-II
Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT-II.

1.4 - 4.0 g·m/sec: at idling
4.0 - 10.0 g·m/sec: at 2,500 rpm

With GST
Check mass air flow sensor signal in MODE 1 with GST.

1.4 - 4.0 g·m/sec: at idling
4.0 - 10.0 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 12.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1375, "DTC P0102, P0103 MAF SENSOR" .

12. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-1295, "Symptom Matrix Chart" .

OK or NG

OK >> GO TO 13.
NG >> Repair or replace.

13. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

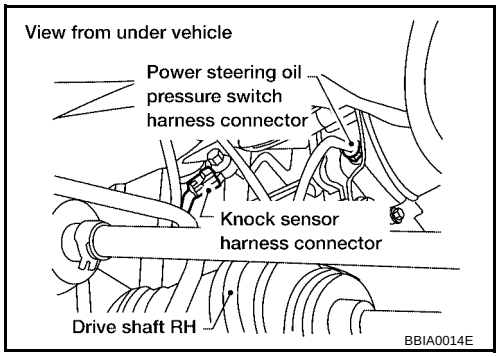
DTC P0327, P0328 KS

PFP:22060

Component Description

UBS002D3

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

UBS002D4

The MIL will not light for knock sensor malfunction.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

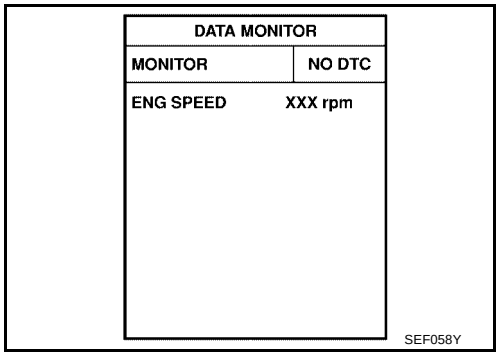
UBS002D5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-1488, "Diagnostic Procedure" .



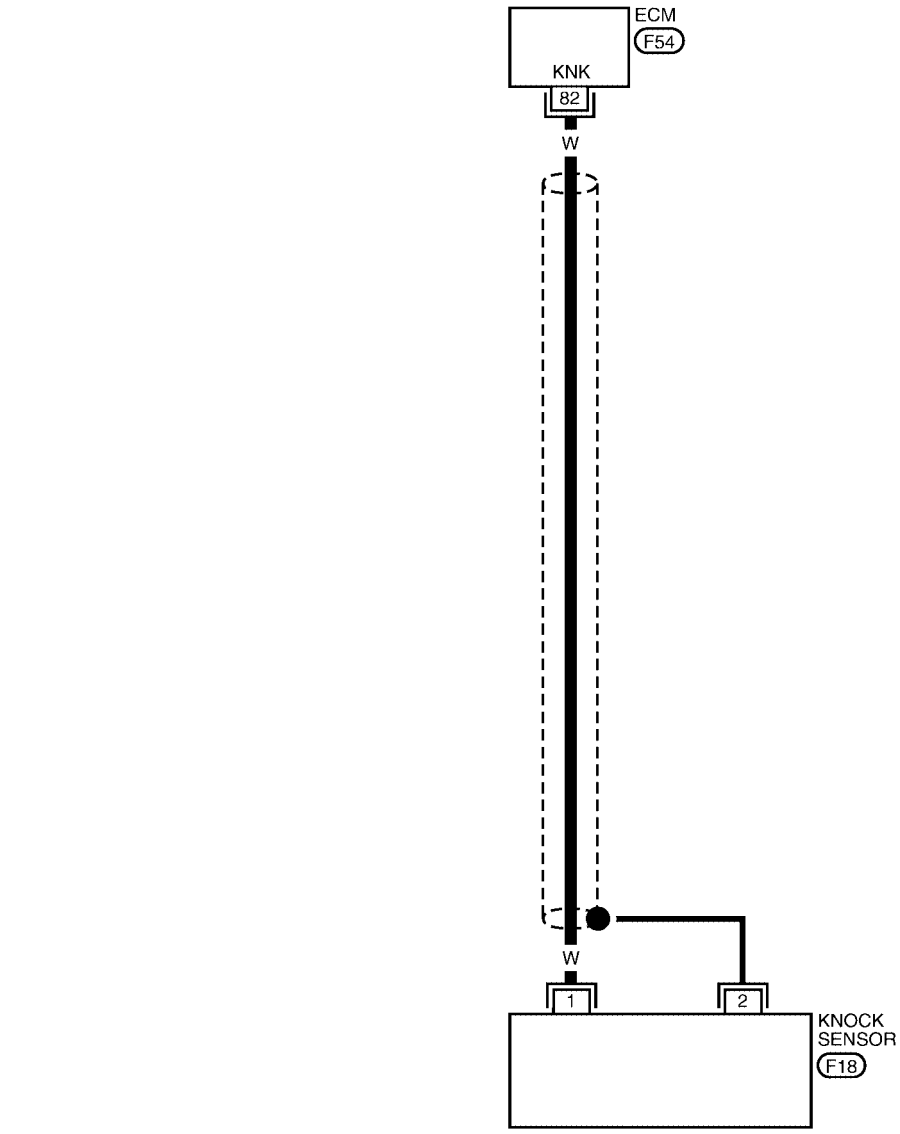
WITH GST

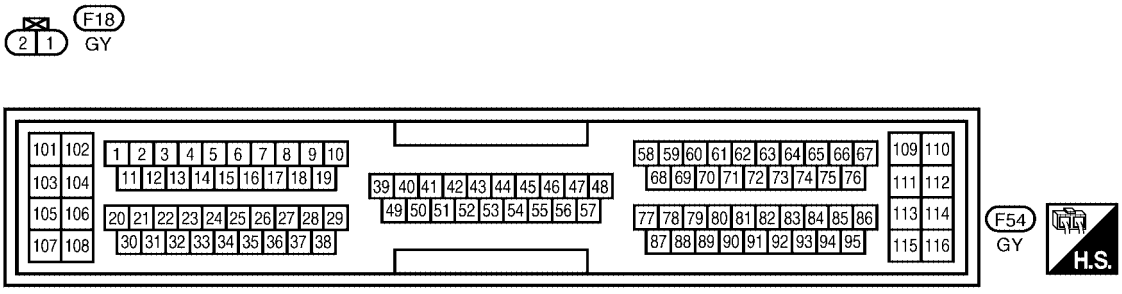
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002D6

EC-KS-01





BBWA0016E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V

Diagnostic Procedure

UBS002D7

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 82 and engine ground. Refer to Wiring Diagram.

   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

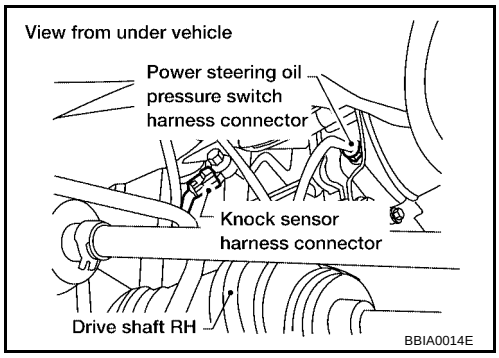
OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 82 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

Refer to EC-1489, "Component Inspection" .

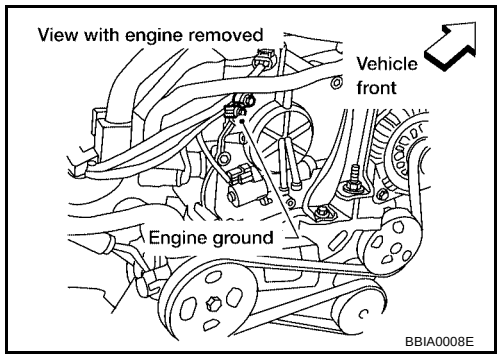
OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 5.



5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002D8

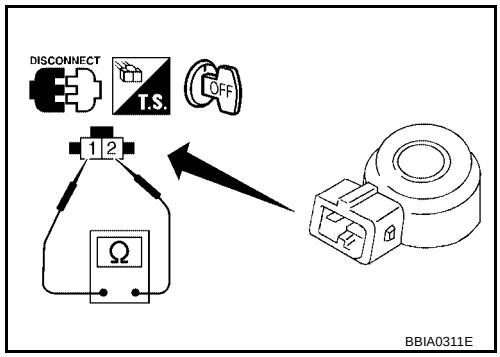
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



Removal and Installation

UBS002D9

KNOCK SENSOR

Refer to EM-160, "CYLINDER BLOCK" .

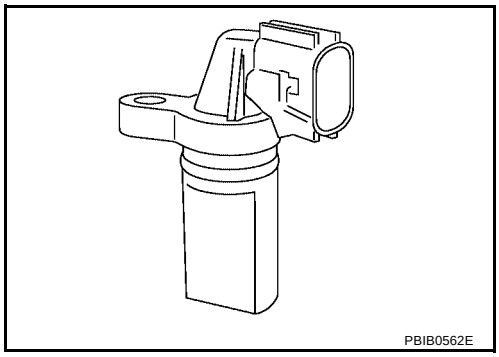
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

UBS002DA

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

UBS002DB

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED·	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

UBS002DC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted) ● Crankshaft position sensor (POS) ● Signal plate

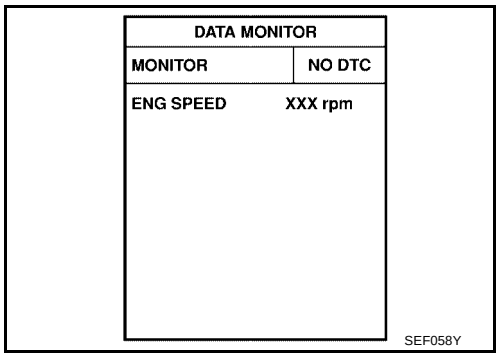
DTC Confirmation Procedure

UBS002DD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-1492, "Diagnostic Procedure" .



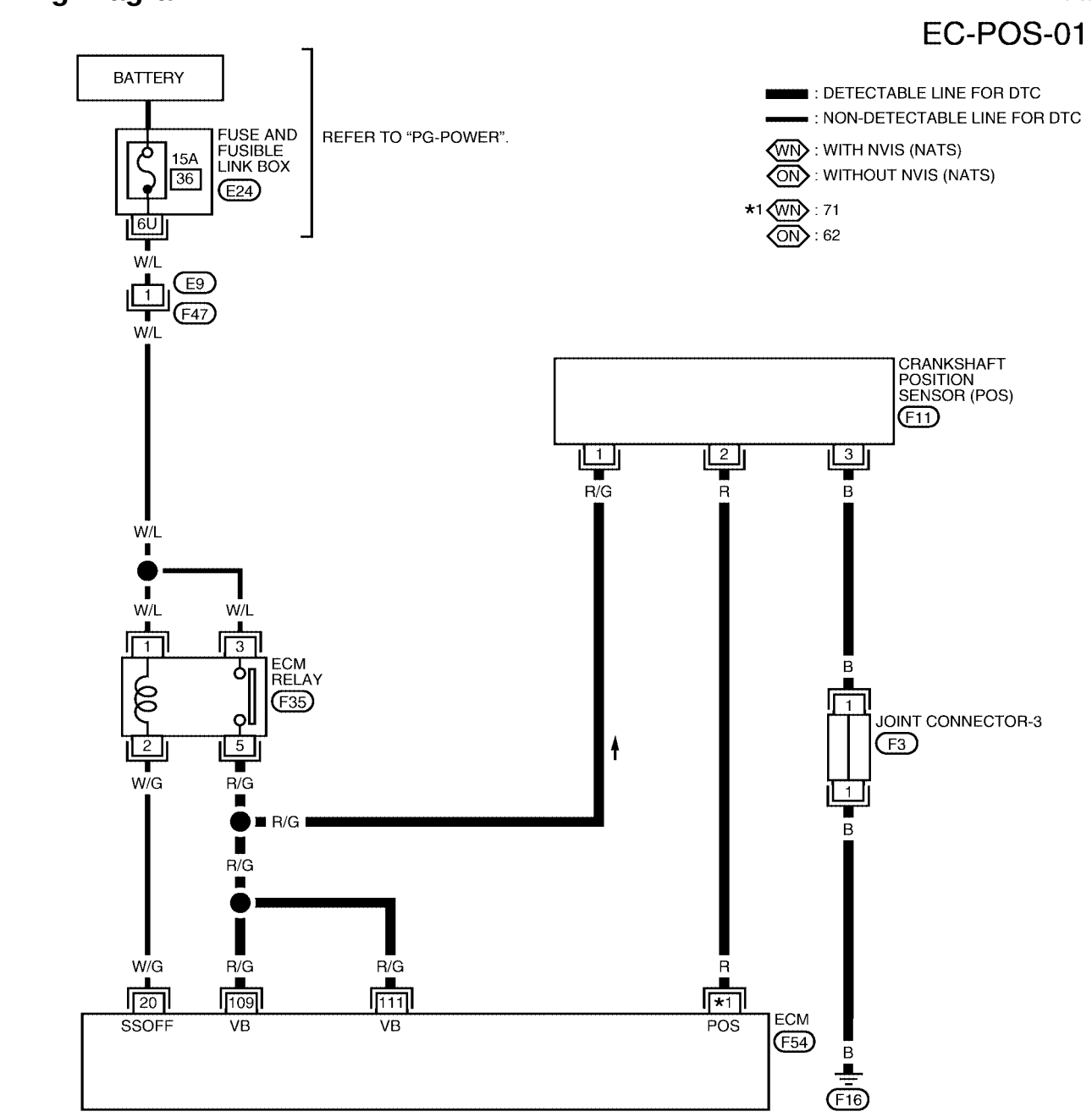
SEF058Y

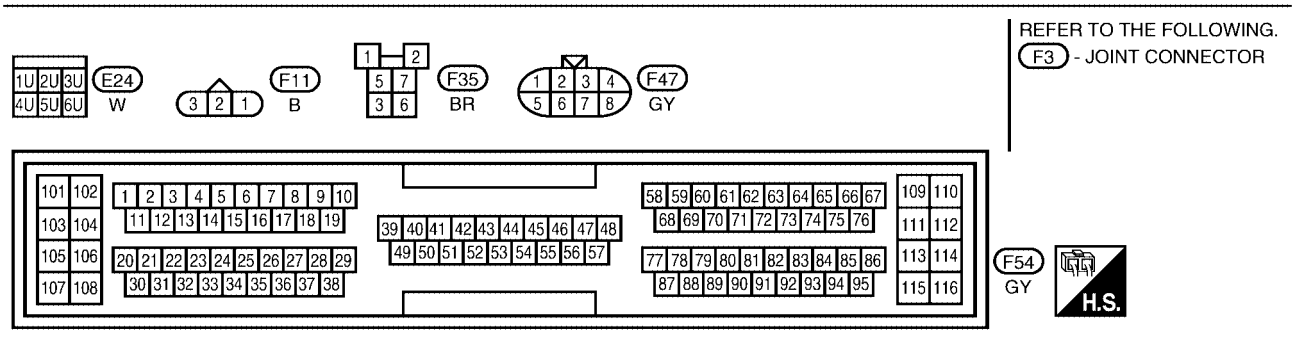
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002DE



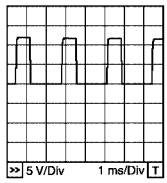
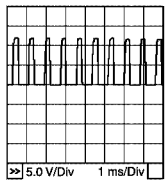


BBWA0222E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62 (Without NVIS) 71 (With NVIS)	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

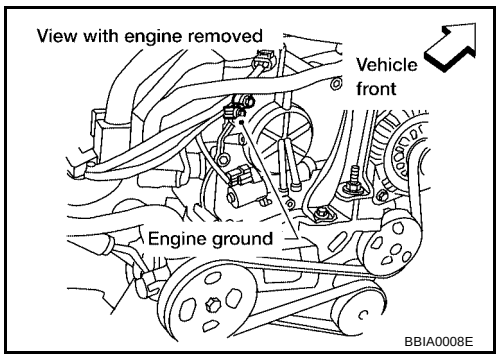
Diagnostic Procedure

UBS002DF

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

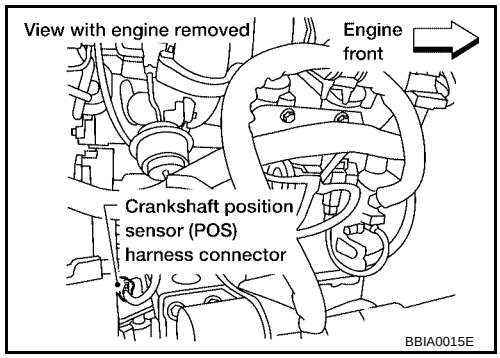
>> GO TO 2.



BBIA0008E

2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch “ON”.



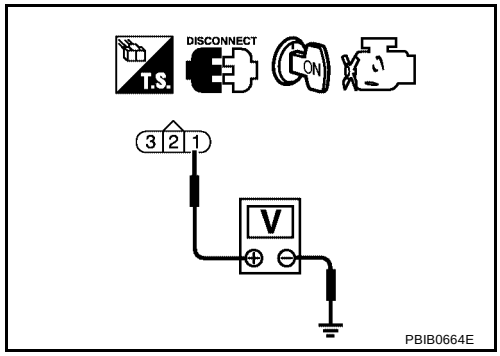
3. Check voltage between CKP sensor (POS) terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between CKP sensor (POS) terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open or short between crankshaft position sensor (POS) and engine ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 62 or 71 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1494, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace crankshaft position sensor (POS).

8. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 9.
NG >> Replace the signal plate.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

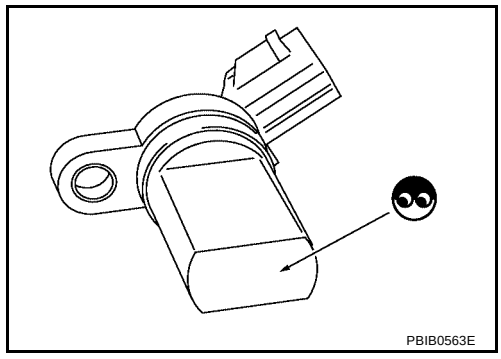
>> **INSPECTION END**

Component Inspection

UBS002DG

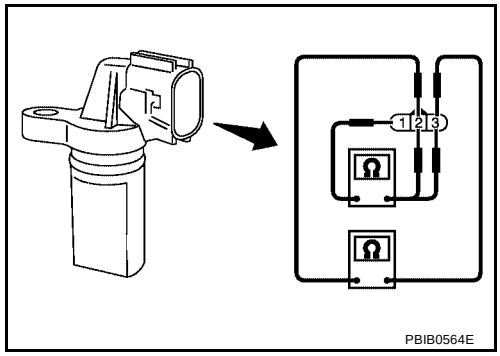
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞
1 (+) - 3 (-)	
2 (+) - 3 (-)	



UBS002DH

6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-160, "CYLINDER BLOCK" .

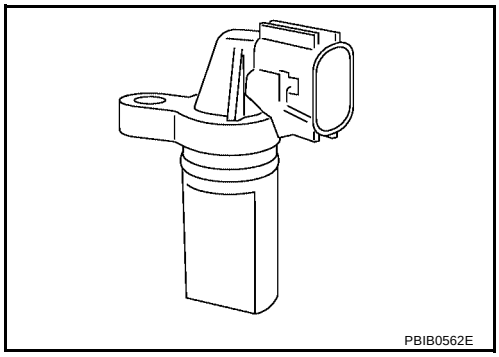
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

UBS002DI

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

UBS002DJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-9 .) ● Starting system circuit (Refer to SC-9 .) ● Dead (Weak) battery

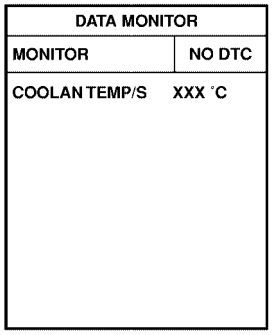
DTC Confirmation Procedure

UBS002DK

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-1498, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-1498, "Diagnostic Procedure" .



SEF013Y

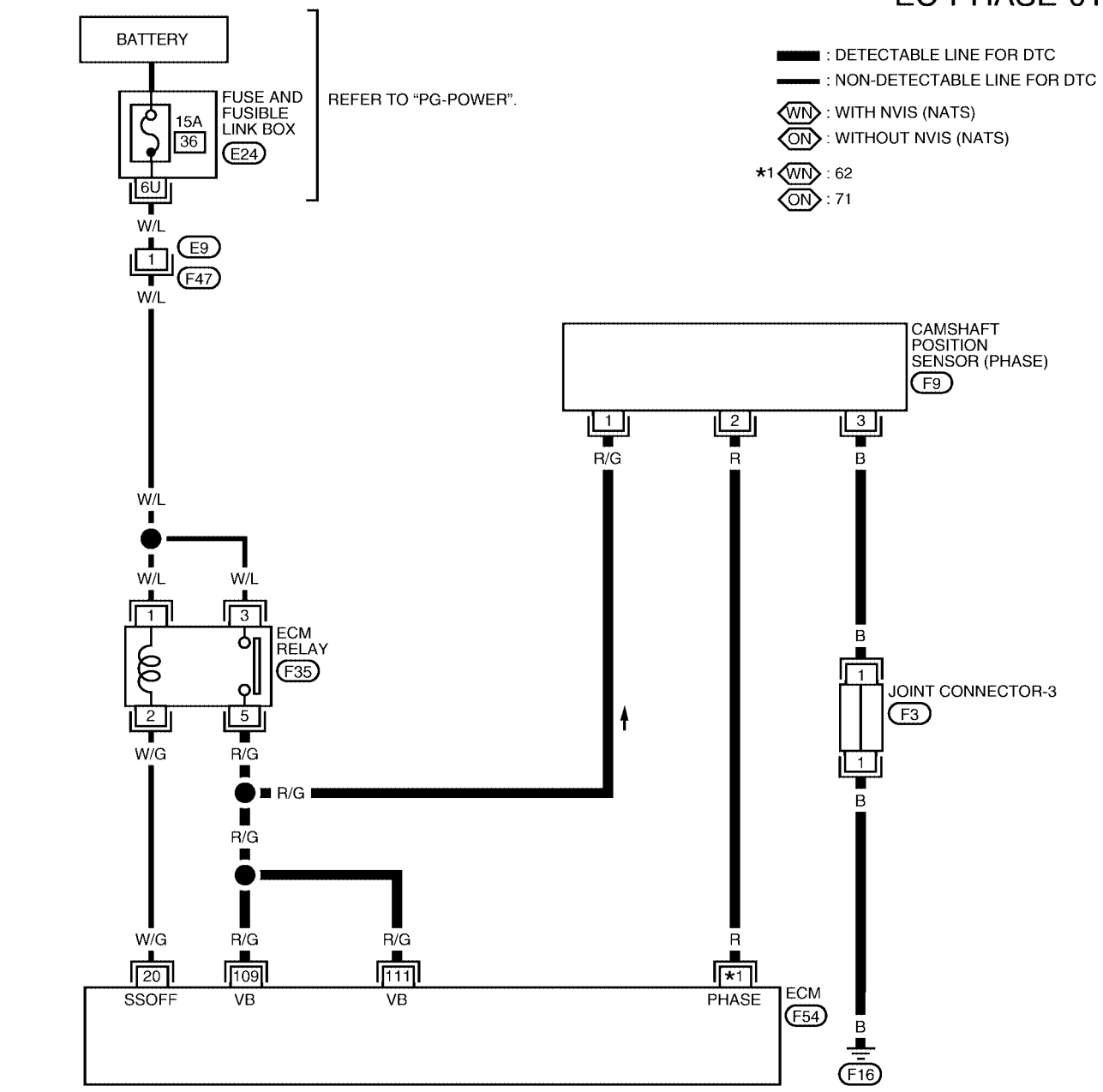
WITH GST

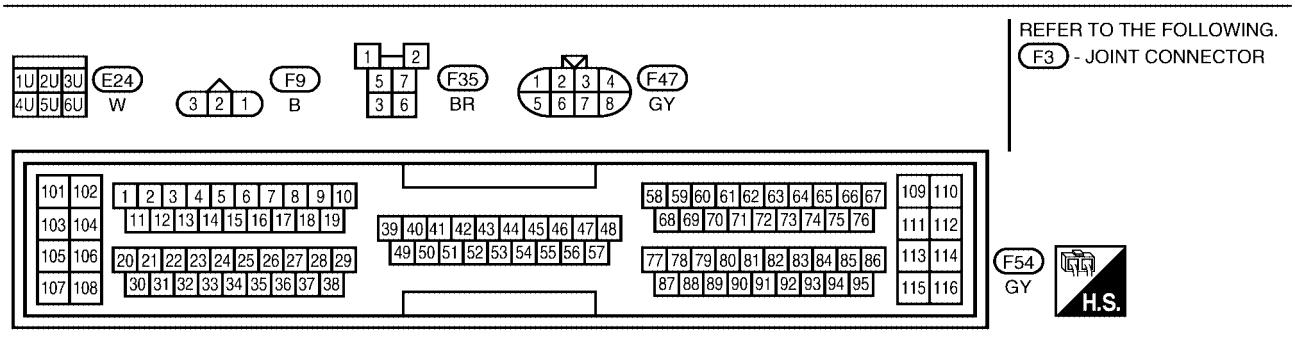
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002DL

EC-PHASE-01



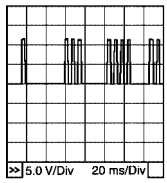
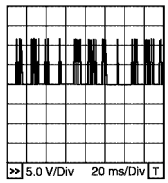


BBWA0223E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62 (With NVIS) 71 (Without NVIS)	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002DM

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

Yes or No

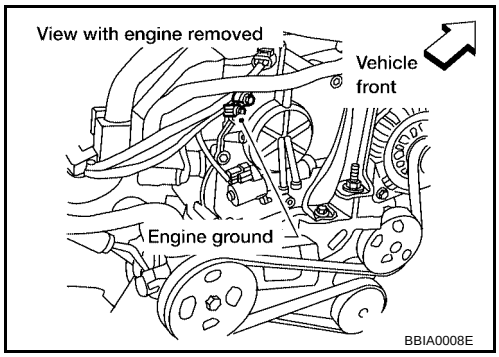
Yes >> GO TO 2.

No >> Check starting system. (Refer to SC-9, "STARTING SYSTEM" .)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

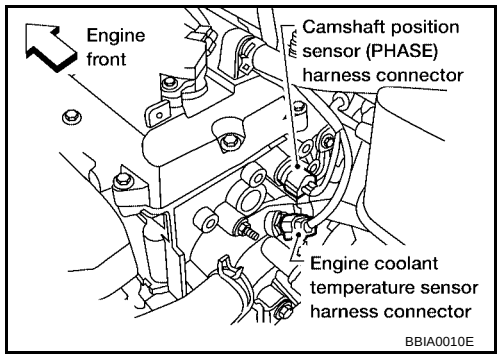
>> GO TO 3.



BBIA0008E

3. CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



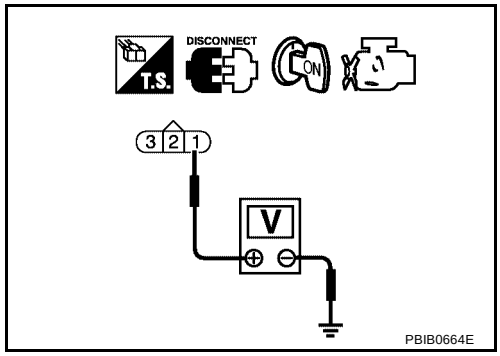
3. Check voltage between CMP sensor (PHASE) terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between CMP sensor (PHASE) terminal 3 and engine ground.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open or short between camshaft position sensor (PHASE) and engine ground

>> Repair open circuit or short to power in harness or connectors.

7. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 62 or 71 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1500, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace camshaft position sensor (PHASE).

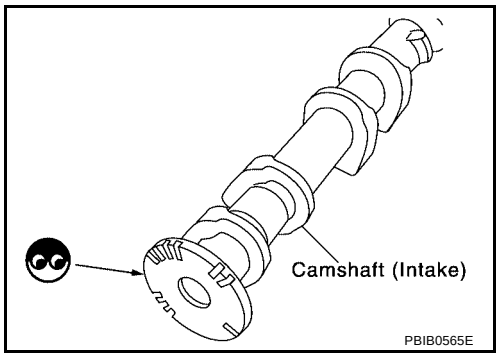
9. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 10.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



10. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

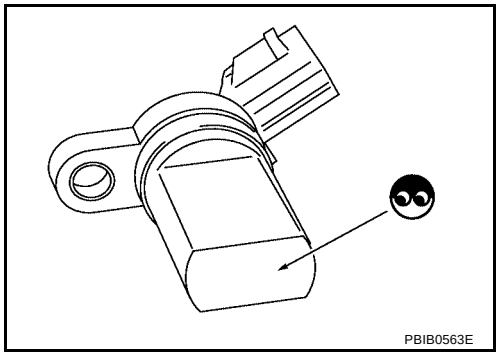
>> **INSPECTION END**

Component Inspection

UBS002DN

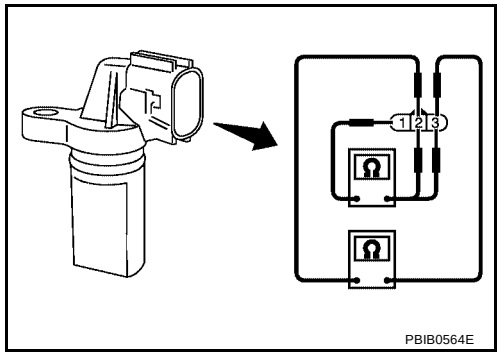
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞
1 (+) - 3 (-)	
2 (+) - 3 (-)	



UBS002DO

Removal and Installation

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-123, "CAMSHAFT" .

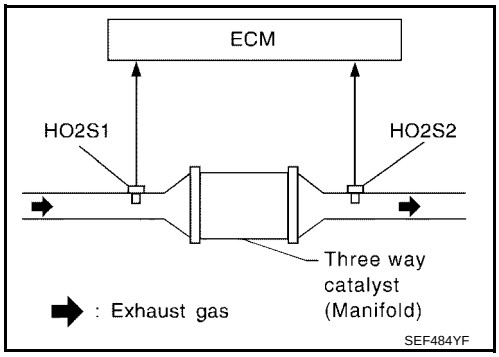
DTC P0420 THREE WAY CATALYST FUNCTION

PFP:20905

On Board Diagnosis Logic

UBS002DP

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 and 2.
A three way catalyst (Manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst (Manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	● Three way catalyst (Manifold) does not operate properly. ● Three way catalyst (Manifold) does not have enough oxygen storage capacity.	● Three way catalyst (Manifold) ● Exhaust tube ● Intake air leaks ● Fuel injectors ● Fuel injector leaks ● Spark plug ● Improper ignition timing

DTC Confirmation Procedure

UBS002DQ

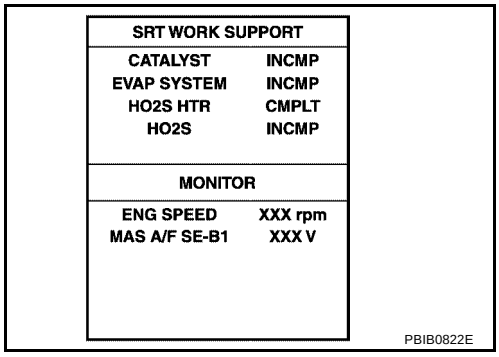
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

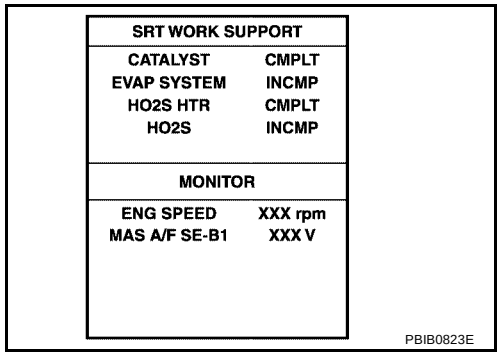
TESTING CONDITION:

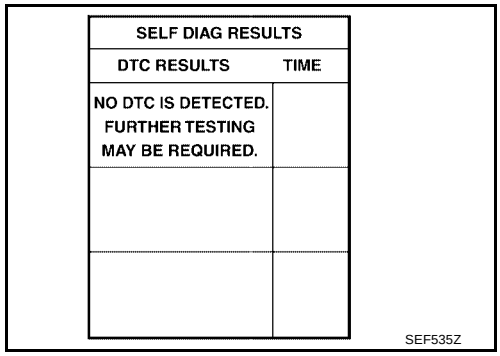
- **Do not hold engine speed for more than the specified minutes below.**

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Open engine hood.
6. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
7. Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
   If “INCMP” of “CATALYST” changed to “COMPLT”, go to step 10.
8. Wait 5 seconds at idle.



9. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).
   If not “CMPLT”, perform the following.
   a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
   b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
   c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.
   d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 6.
10. Select “SELF-DIAG RESULTS” mode with CONSULT-II.
11. Confirm that the 1st trip DTC is not detected.
    If the 1st trip DTC is detected, go to EC-1504, "Diagnostic Procedure" .





Overall Function Check

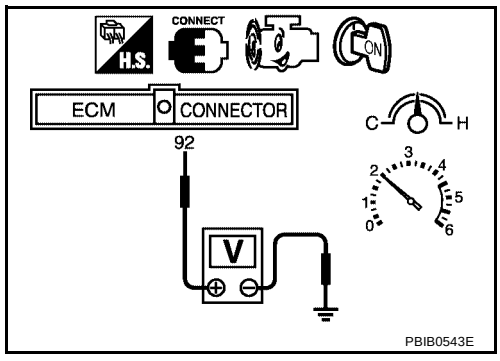
UBS002DR

Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a DTC might not be confirmed.

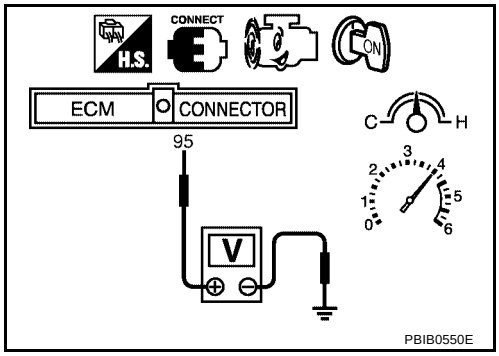
CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 92 [HO2S1 signal] and engine ground, and ECM terminal 95 [HO2S2 signal] and engine ground.
6. Keep engine speed at 2,000 rpm constant under no load.



7. Make sure that the voltage switching frequency (high & low) between ECM terminal 95 and engine ground is very less than that of ECM terminal 92 and engine ground.
   Switching frequency ratio = A/B
   A: Heated oxygen sensor 2 voltage switching frequency
   B: Heated oxygen sensor 1 voltage switching frequency
   This ratio should be less than 0.75.
   If the ratio is greater than above, it means three way catalyst (manifold) does not operate properly. Go to EC-1504, "Diagnostic Procedure" .



NOTE:
If the voltage at terminal 92 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for “DTC P0133” first. (See EC-1412 .)

Diagnostic Procedure

UBS002DS

1. CHECK EXHAUST SYSTEM

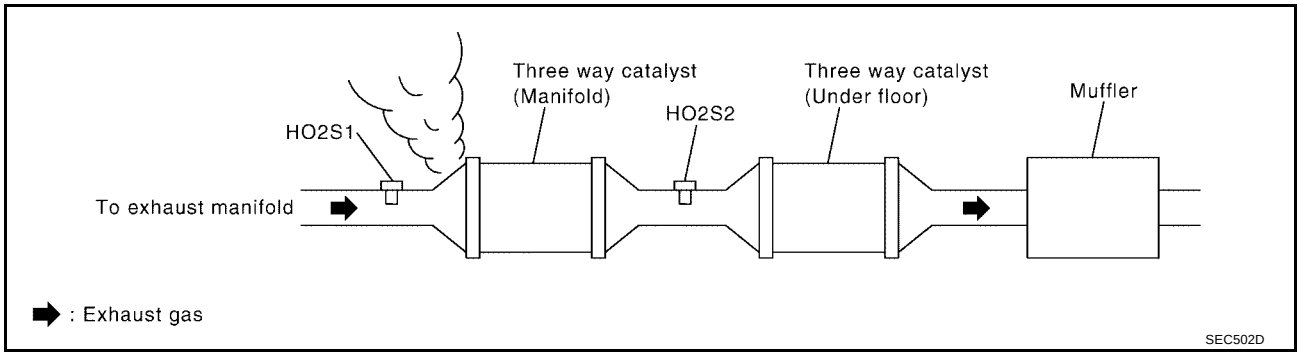
Visually check exhaust tubes and muffler for dent.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before the three way catalyst (Manifold).



OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check the following items. Refer to EC-1291, "Basic Inspection" .

Items		Specifications
Ignition timing	A/T	15° ± 5° BTDC (in “P” or “N” position)
	M/T	15° ± 5° BTDC
Target idle speed	A/T	700 ± 50 rpm (in “P” or “N” position)
	M/T	700 ± 50 rpm

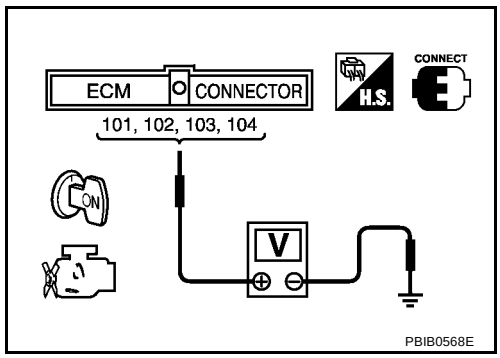
OK or NG

OK >> GO TO 5.
NG >> Follow the “Basic Inspection”.

5. CHECK INJECTORS

1. Stop engine and then turn ignition switch “ON”.
2. Check voltage between ECM terminals 101, 102, 103, 104 and ground with CONSULT-II or tester.
   Refer to Wiring Diagram for Injectors, EC-1797 .

Battery voltage should exist.

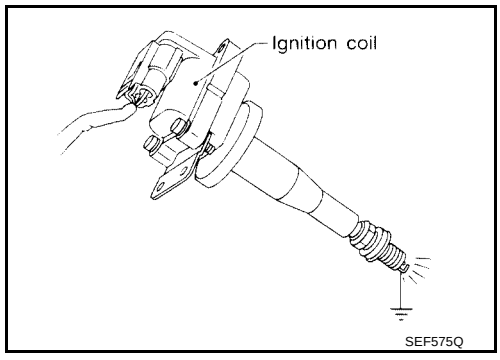


OK or NG

OK >> GO TO 6.
NG >> Perform EC-1798, "Diagnostic Procedure" .

6. CHECK IGNITION SPARK

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



OK or NG

OK >> GO TO 7.
NG >> Check ignition coil with power transistor and their circuit.
Refer to EC-1777, "IGNITION SIGNAL" .

7. CHECK INJECTOR

1. Turn ignition switch “OFF”.
2. Remove injector assembly.
   Refer to EM-118, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Turn ignition switch “ON”.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injector(s) from which fuel is dripping.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Trouble is fixed.>>**INSPECTION END**
Trouble is not fixed.>>Replace three way catalyst (Manifold).

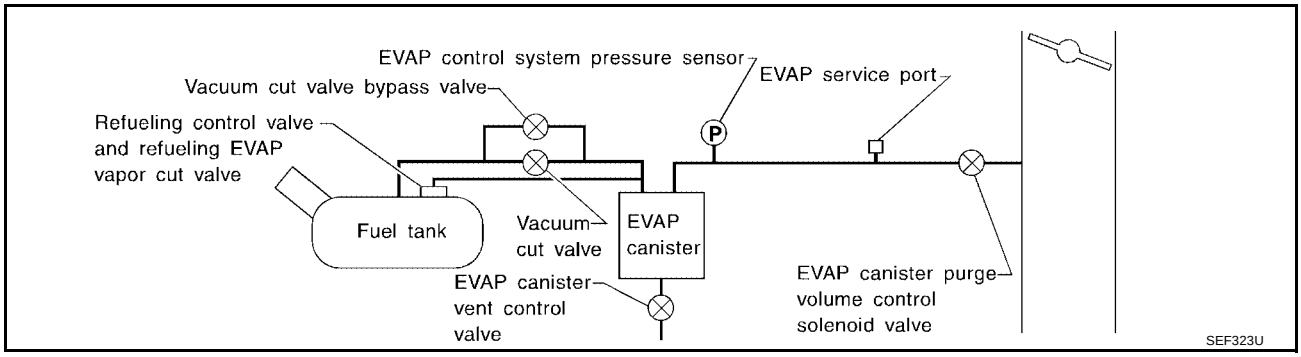
DTC P0441 EVAP CONTROL SYSTEM

PFP:14950

System Description

UBS002DT

NOTE:
If DTC P0441 is displayed with P2122, P2123, P2127, P2128 or P2138, perform trouble diagnosis for displayed other DTC.



In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

On Board Diagnosis Logic

UBS002DU

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441 0441	EVAP control system incorrect purge flow	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	● EVAP canister purge volume control solenoid valve stuck closed ● EVAP control system pressure sensor and the circuit ● Loose, disconnected or improper connection of rubber tube ● Blocked rubber tube ● Cracked EVAP canister ● EVAP canister purge volume control solenoid valve circuit ● Accelerator pedal position sensor ● Blocked purge port ● EVAP canister vent control valve

DTC Confirmation Procedure

UBS002DV

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Always perform test at a temperature of 0°C (32°F) or more.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

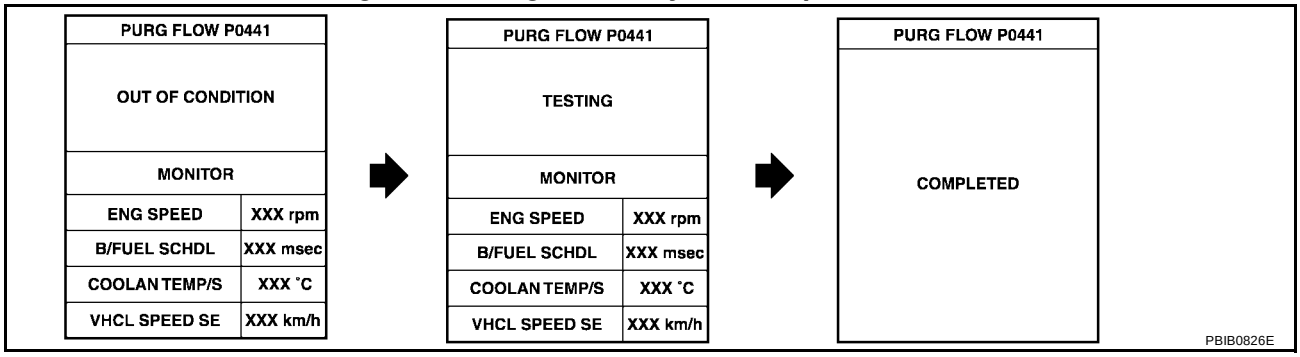
WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and let it idle for at least 70 seconds.
4. Select “PURG FLOW P0441” of “EVAPORATIVE SYSTEM” in “DTC CONFIRMATION” mode with CONSULT-II.

5. Touch “START”.
   If “COMPLETED” is displayed, go to step 7.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take at least 35 seconds.)

Selector lever	Suitable position
Vehicle speed	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,800 rpm
B/FUEL SCHDL	1.0 - 10.0 msec
Engine coolant temperature	70 - 100°C (158 - 212°F)

If “TESTING” is not changed for a long time, retry from step 2.



7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1509, "Diagnostic Procedure" .

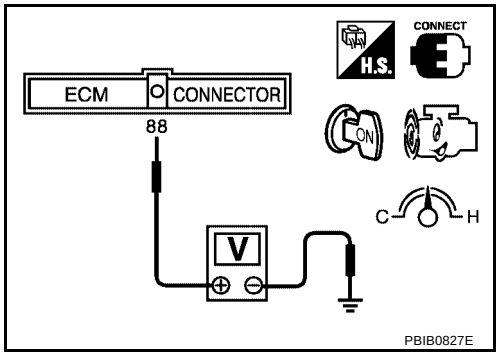
Overall Function Check

UBS002DW

Use this procedure to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine (TCS switch “OFF”) and warm it up to normal operating temperature.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Start engine and wait at least 70 seconds.
5. Set voltmeter probes to ECM terminals 88 (EVAP control system pressure sensor signal) and ground.
6. Check EVAP control system pressure sensor value at idle speed and note it.
7. Establish and maintain the following conditions for at least 1 minute.



Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than “P”, “N” or “R”

8. Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed (measured at step 6) for at least 1 second.
9. If NG, go to EC-1509, "Diagnostic Procedure" .

Diagnostic Procedure

UBS002DX

1. CHECK EVAP CANISTER

1. Turn ignition switch “OFF”.
2. Check EVAP canister for cracks.

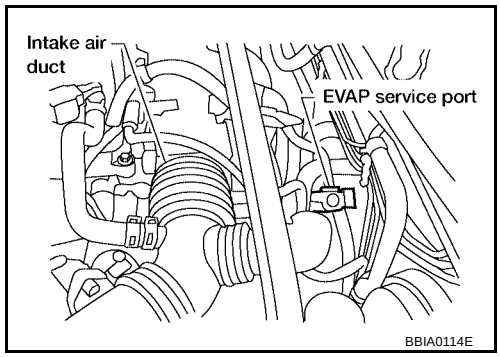
OK or NG

OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> Replace EVAP canister.

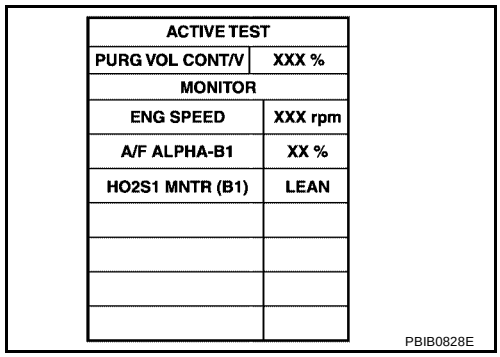
2. CHECK PURGE FLOW

With CONSULT-II

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
2. Start engine and let it idle.



3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II.
4. Rev engine up to 2,000 rpm.
5. Touch “Qd” and “Qu” on CONSULT-II screen to adjust “PURG VOL CONT/V” opening and check vacuum existence.



PURG VOL CONT/V	Vacuum
100.0%	Should exist.
0.0%	Should not exist.

OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

3. CHECK PURGE FLOW

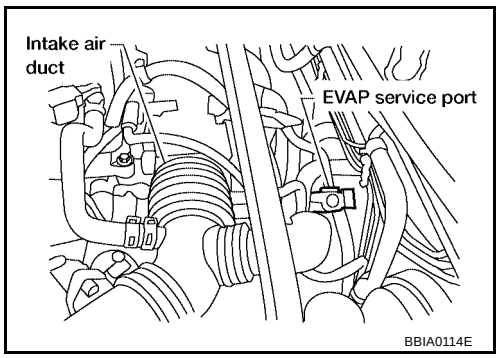
Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum gauge indication when revving engine up to 2,000 rpm.

   Vacuum should exist.

6. Release the accelerator pedal fully and let idle.

   Vacuum should not exist.



OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

4. CHECK EVAP PURGE LINE

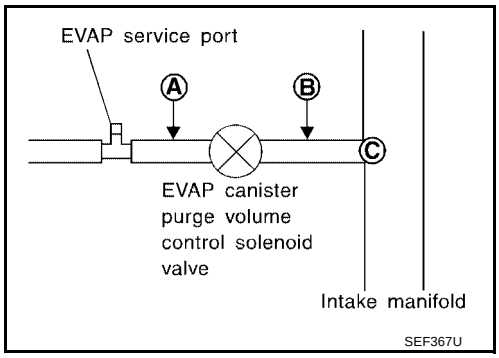
1. Turn ignition switch “OFF”.
2. Check EVAP purge line for improper connection or disconnection. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK (With CONSULT-II)>>GO TO 5.
OK (Without CONSULT-II)>>GO TO 6.
NG >> Repair it.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

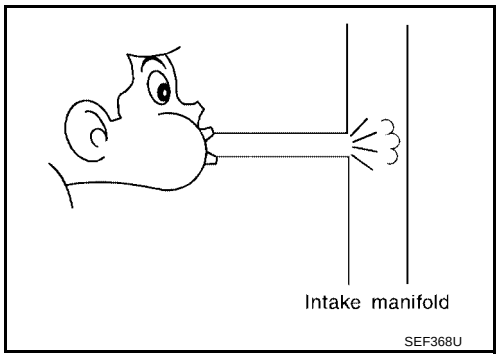
1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B** .
2. Blow air into each hose and EVAP purge port **C** .



3. Check that air flows freely.

OK or NG

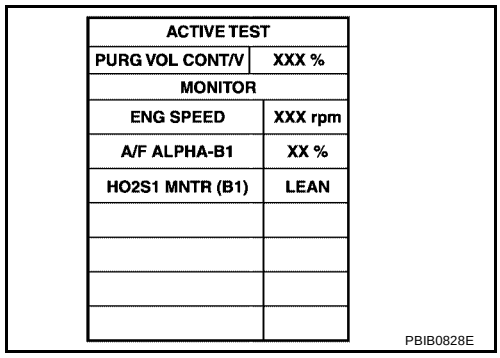
OK >> GO TO 6.
NG >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

1. Turn ignition switch “OFF”.
2. Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 9.
NG >> Repair it.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to “DTC Confirmation Procedure” for DTC P0452 (EC-1534) and P0453 (EC-1540).

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP control system pressure sensor.

11. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 12.
NG >> Clean the rubber tube using an air blower.

12. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace EVAP canister vent control valve.

13. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 14.
NG >> Replace it.

14. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 15.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

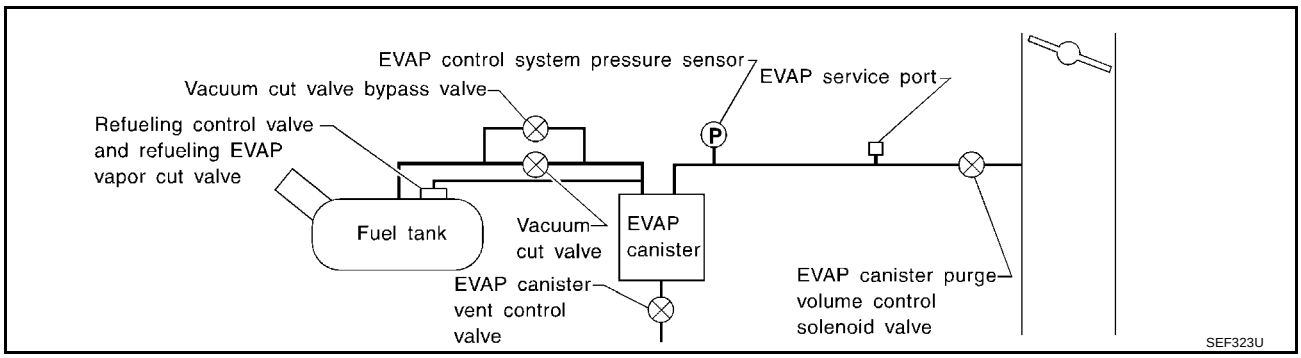
DTC P0442 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS002DY

NOTE:
If DTC P0442 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-1687 .)
This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.
The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve is opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0442 0442	EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Fuel level sensor and the circuit ● Refueling control valve ● ORVR system leaks

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS002DZ

NOTE:

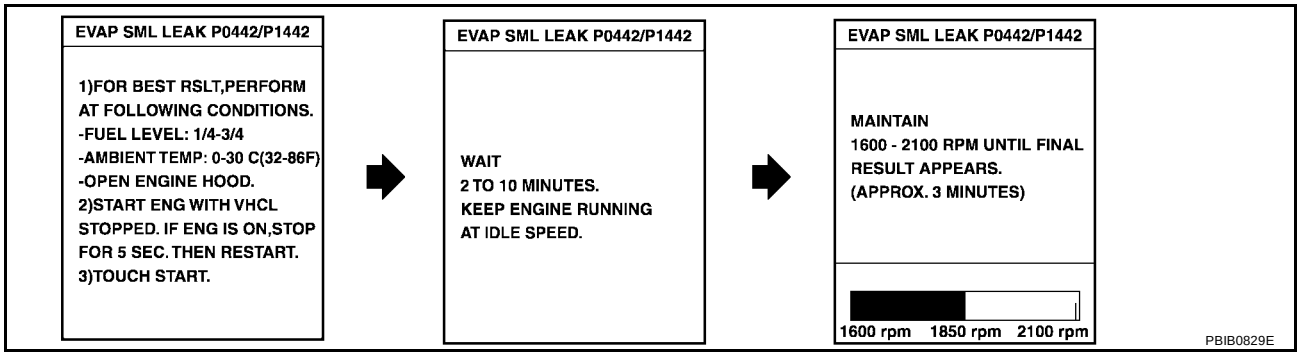
- **If DTC P0442 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-1687 .)**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Always perform test at a temperature of 0 to 30°C (32 to 86°F).**

WITH CONSULT-II

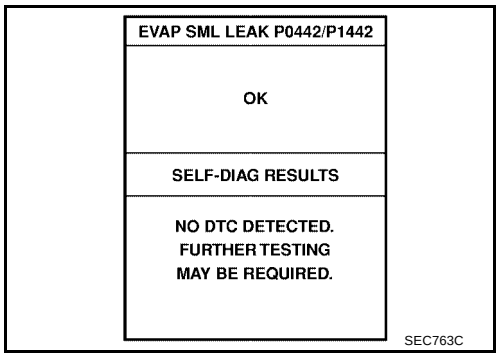
1. Turn ignition switch "ON".
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
4. Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 30°C (32 - 86°F)
5. Select "EVAP SML LEAK P0442/P1442" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
   Follow the instruction displayed.



NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-1291, "Basic Inspection" .

6. Make sure that "OK" is displayed.
   If "NG" is displayed, refer to EC-1515, "Diagnostic Procedure" .

NOTE:
Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.



WITH GST

NOTE:
Be sure to read the explanation of "Driving Pattern" on EC-1270 before driving vehicle.

1. Start engine.

2. Drive vehicle according to “Driving Pattern”, EC-1270 .
3. Stop vehicle.
4. Select “MODE 1” with GST.
   If SRT of EVAP system is not set yet, go to the following step.
   If SRT of EVAP system is set, the result will be OK.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine.
   It is not necessary to cool engine down before driving.
7. Drive vehicle again according to the “Driving Pattern”, EC-1270 .
8. Stop vehicle.
9. Select “MODE 3” with GST.
   If P0442 is displayed on the screen, go to EC-1515, "Diagnostic Procedure" .
   If P0441 is displayed on the screen, go to “Diagnostic Procedure” for DTC P0441, EC-1509 .
   If P0441 and P0442 are not displayed on the screen, go to the following step.
10. Select “MODE 1” with GST.
    If SRT of EVAP system is set, the result will be OK.
    If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

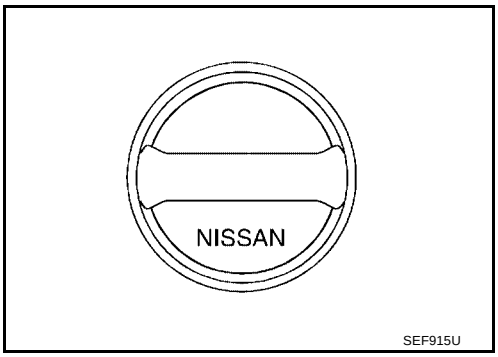
UBS002E0

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)" .

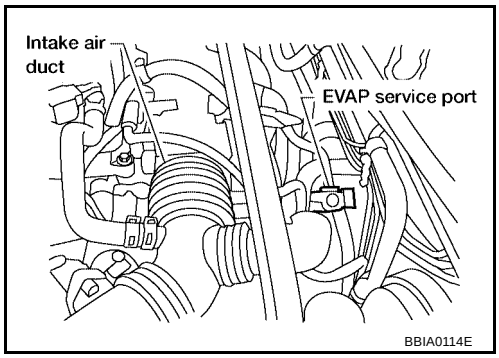
OK or NG

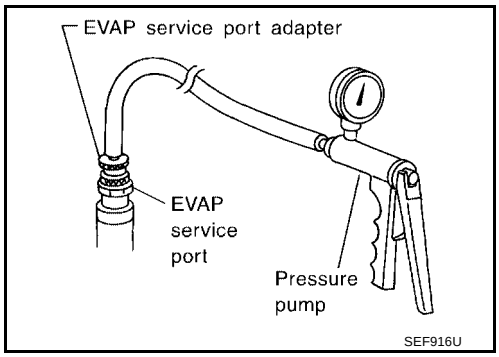
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





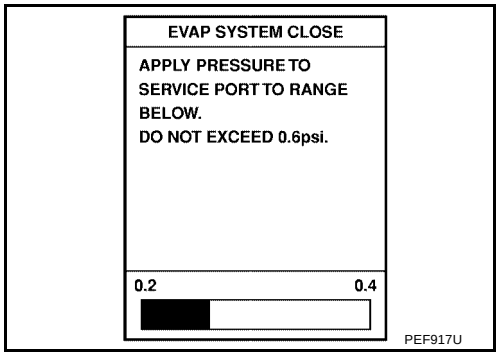
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

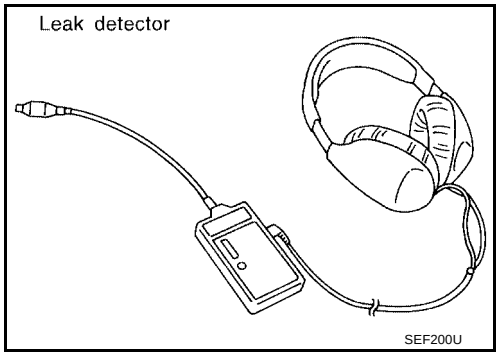
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

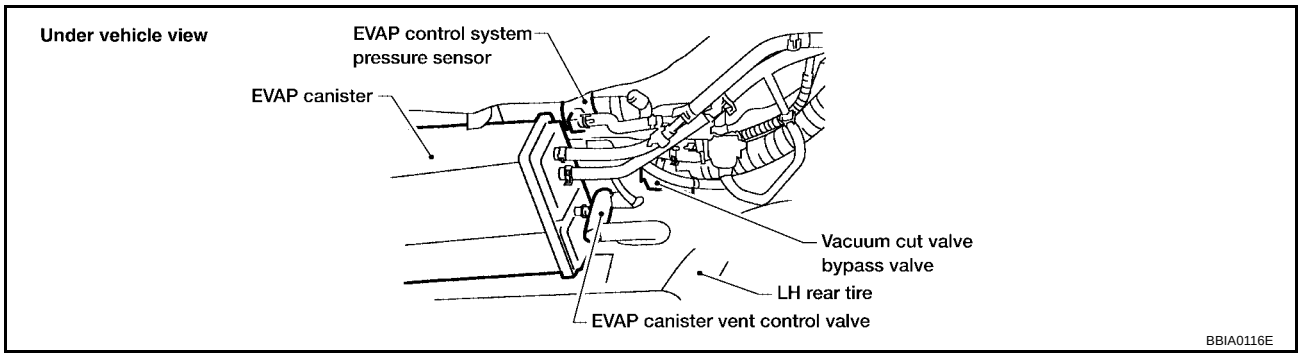
OK >> GO TO 8.
NG >> Repair or replace.



7. CHECK FOR EVAP LEAK

Without CONSULT-II

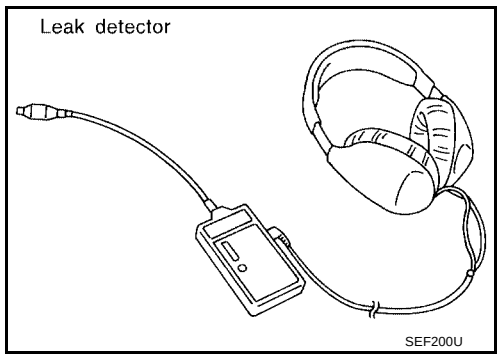
1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**

5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-1687, "DTC Confirmation Procedure" .

OK or NG

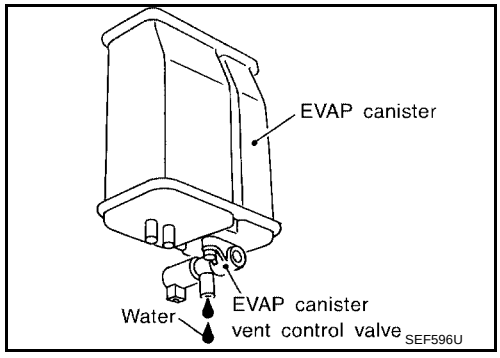
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

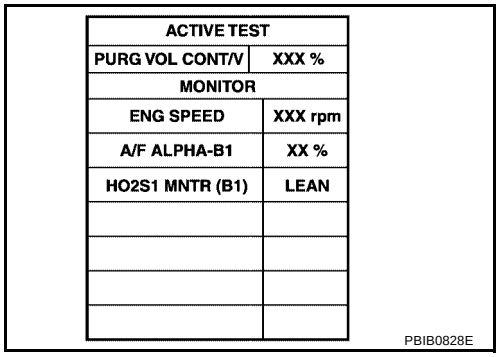
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK REFUELING EVAP VAPOR LINE

Check refueling EVAP vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1852, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses, tubes or filler neck tube.

22. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling control valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

UBS002E2

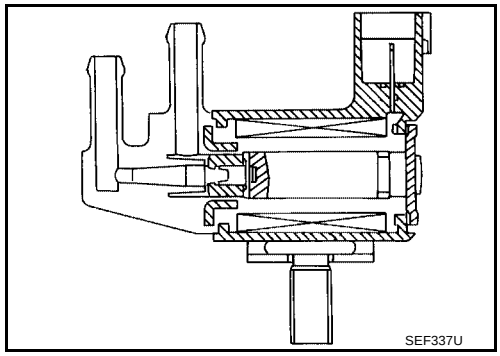
SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed sensor	Vehicle speed		

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

UBS002E3

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

On Board Diagnosis Logic

UBS002E4

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	● Harness or connectors (The sensor circuit is shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

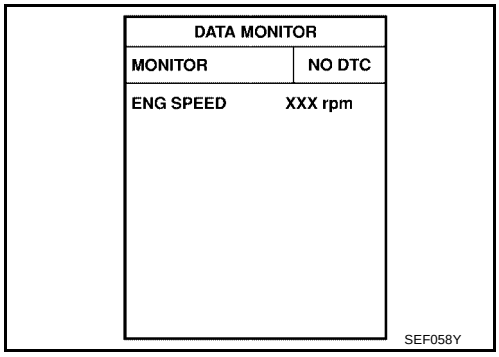
UBS002E5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 13 seconds.
4. If 1st trip DTC is detected, go to EC-1524, "Diagnostic Procedure" .



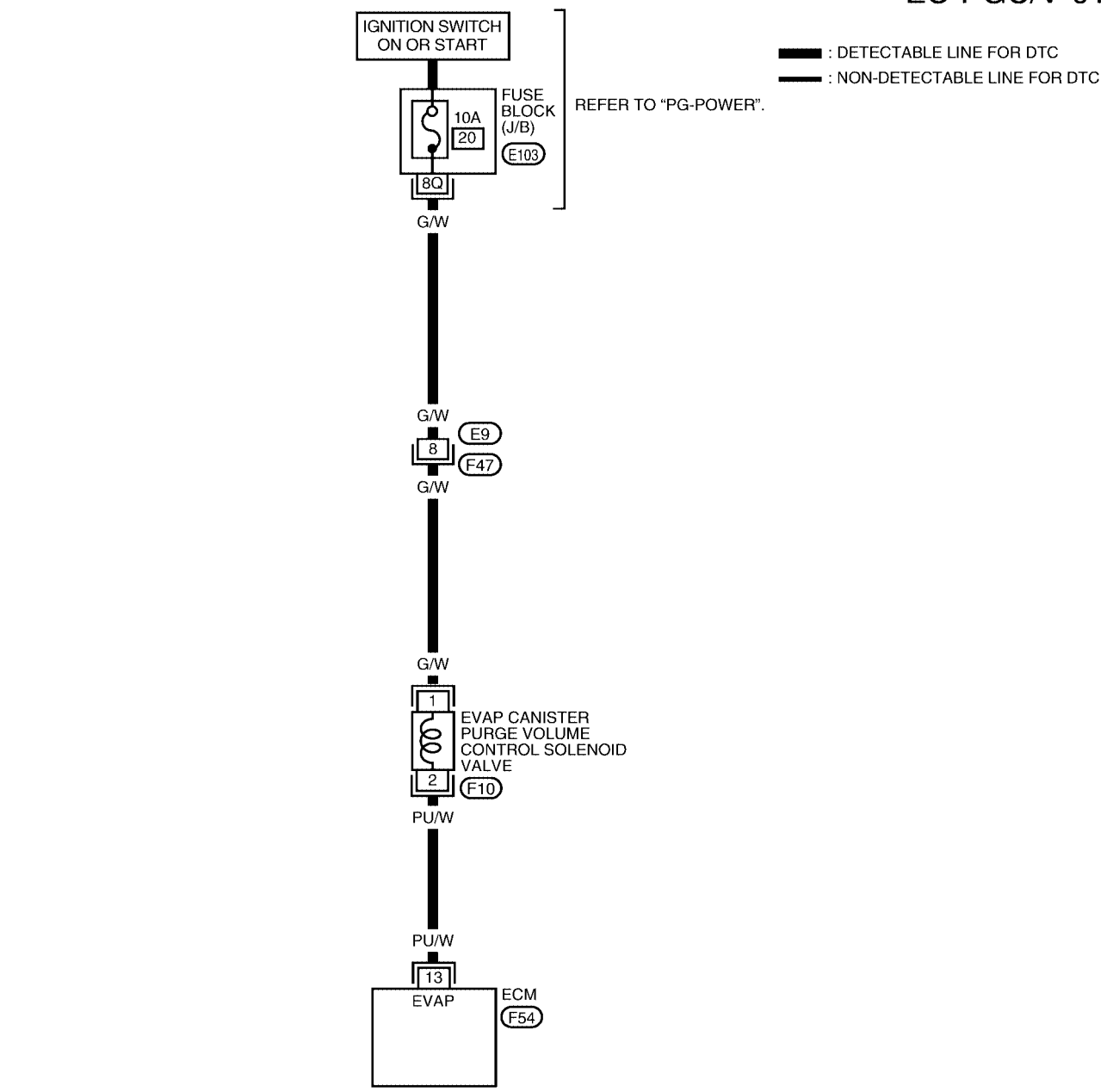
WITH GST

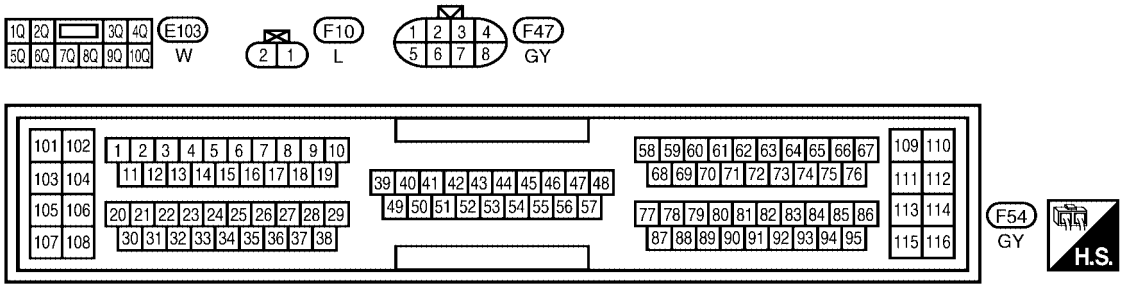
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002E6

EC-PGC/V-01



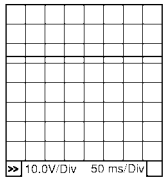
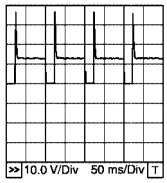


BBWA0224E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	PU/W	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

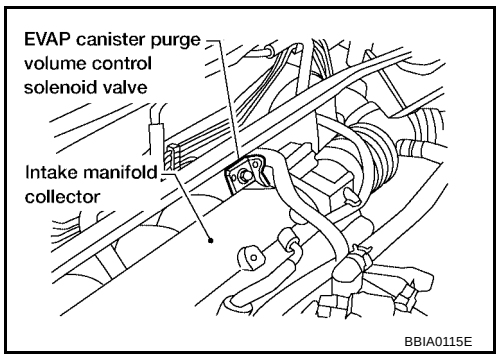
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002E7

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



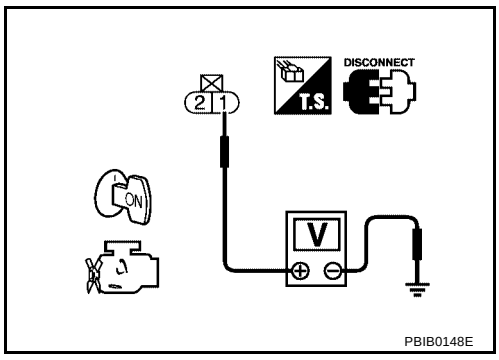
BBIA0115E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and engine ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



PBIB0148E

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse block (J/B) connector E103
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 13 and EVAP canister purge volume control solenoid valve terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

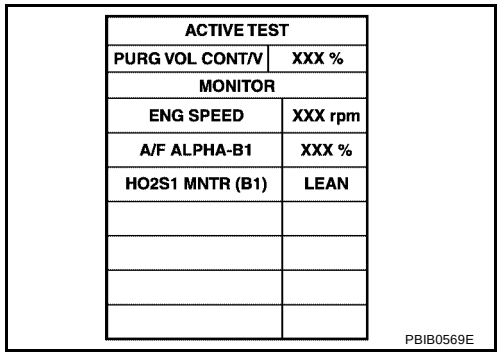
OK or NG

OK (With CONSULT-II)>>GO TO 4.
OK (Without CONSULT-II)>>GO TO 5.
NG >> Repair open circuit or short to ground and short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

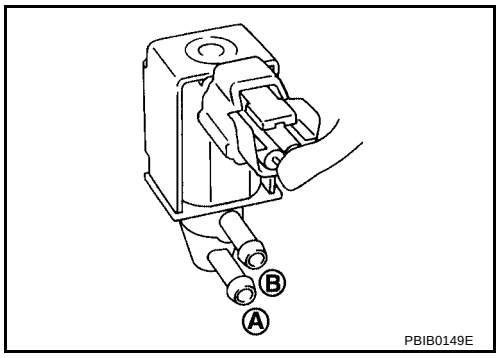
UBS002E8

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

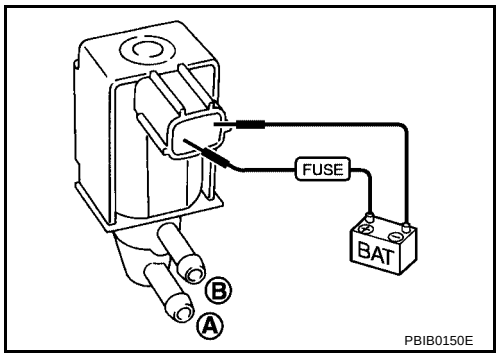
Condition (PURG VOL CONT/V value)	Air passage continuity between **A** and **B**
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	Yes
No supply	No



Removal and Installation

UBS002E9

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-105, "INTAKE MANIFOLD" .

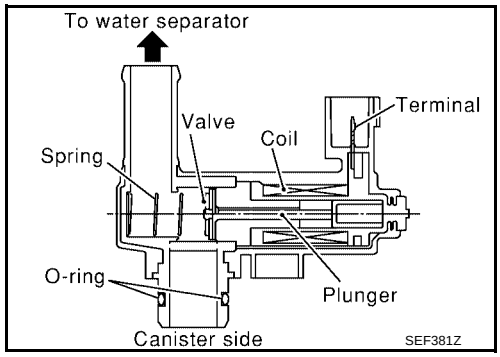
DTC P0447 EVAP CANISTER VENT CONTROL VALVE

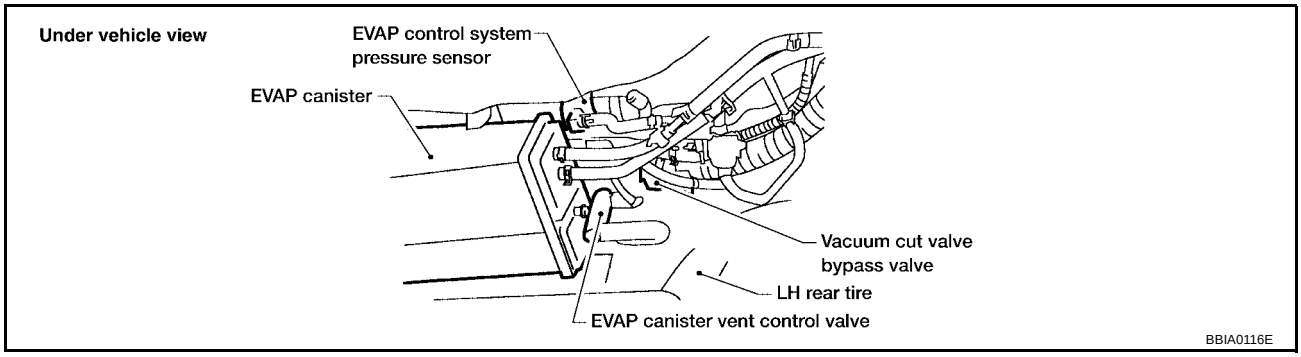
PFP:14935

Component Description

UBS002EA

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002EB

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002EC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447 0447	EVAP canister vent control valve circuit open	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister vent control valve

DTC Confirmation Procedure

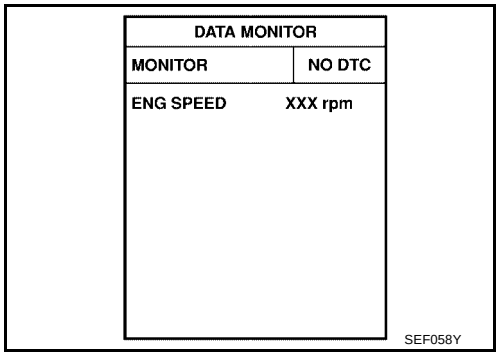
UBS002ED

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch "ON".

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 8 seconds.
4. If 1st trip DTC is detected, go to EC-1530, "Diagnostic Procedure" .



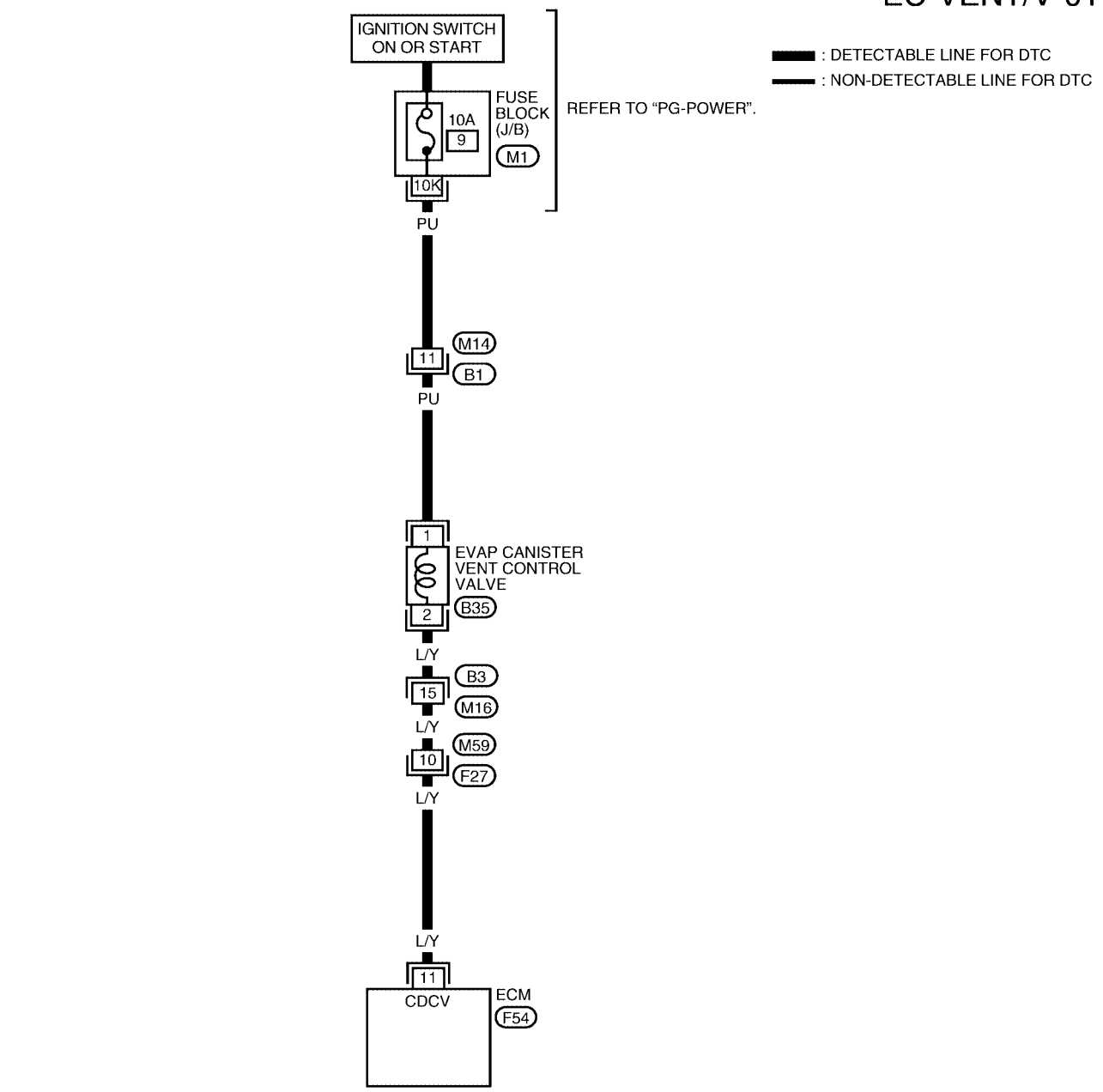
WITH GST

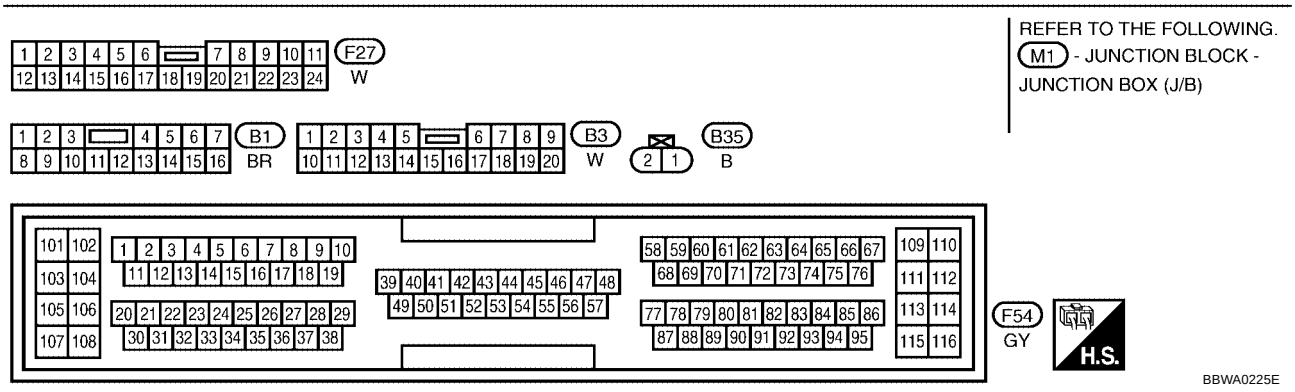
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002EE

EC-VENT/V-01





Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002EF

1. INSPECTION START

Do you have CONSULT-II?

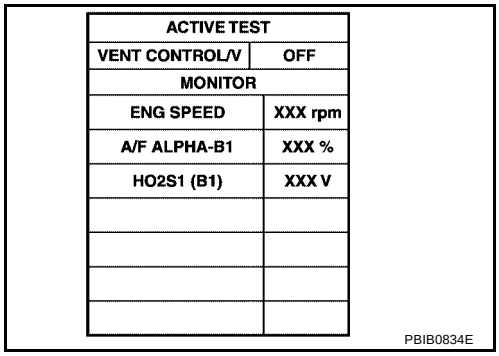
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch "OFF" and then turn "ON".
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON/OFF" on CONSULT-II screen.
4. Check for operating sound of the valve.
   Clicking noise should be heard.

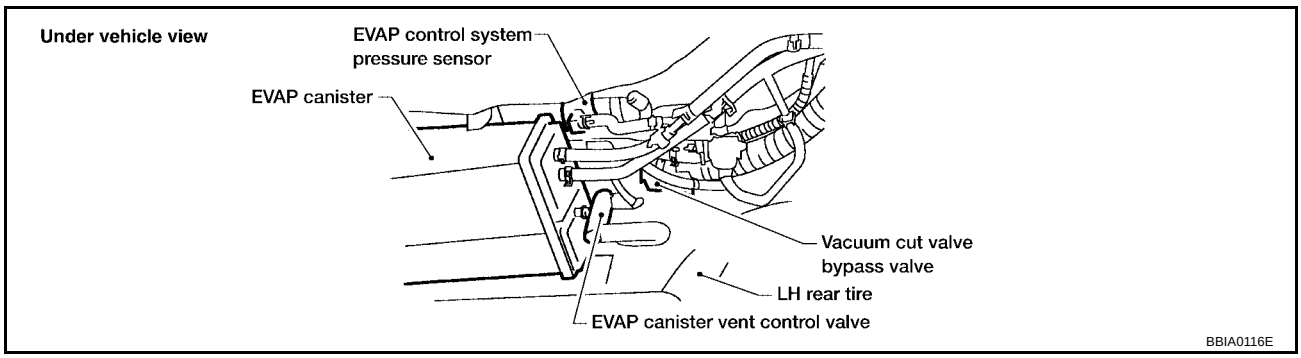


OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

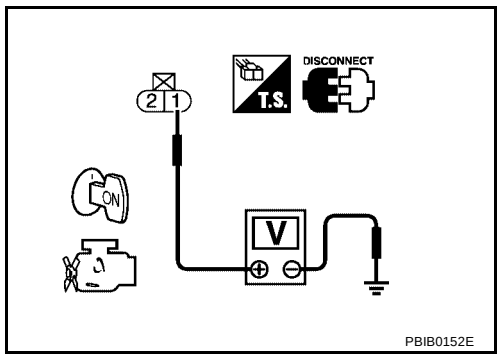
3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister vent control valve harness connector.



3. Turn ignition switch “ON”.
4. Check voltage between EVAP canister vent control valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M14, B1
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between EVAP canister vent control valve and fuse

>> Repair harness or connectors.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 11 and EVAP canister vent control valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M59, F27
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 8.
NG >> Clean the rubber tube using an air blower.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister vent control valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

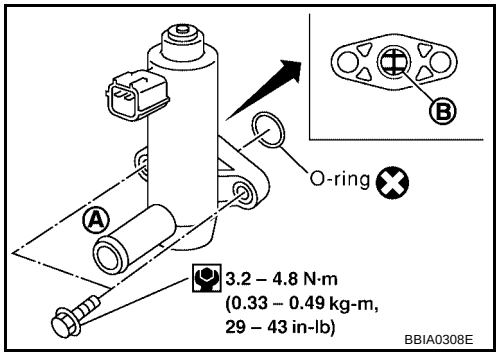
Component Inspection

UBS002EG

EVAP CANISTER VENT CONTROL VALVE

With CONSULT-II

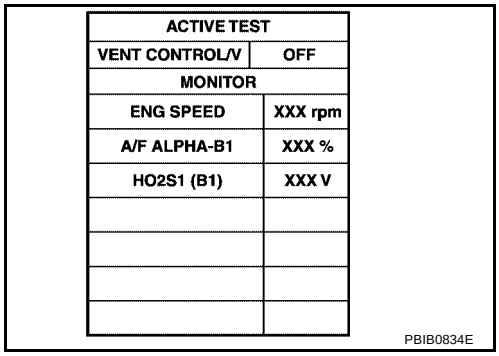
1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.

Condition	Air passage continuity between **A** and **B**
ON	No
OFF	Yes

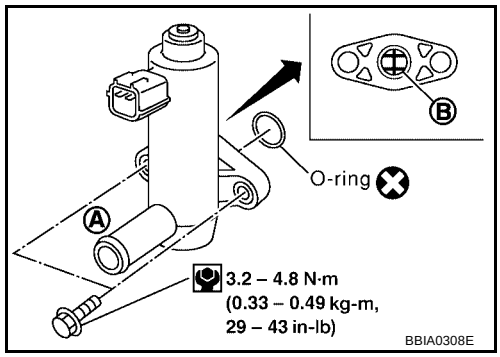
Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.



7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform inspection again.

Without CONSULT-II

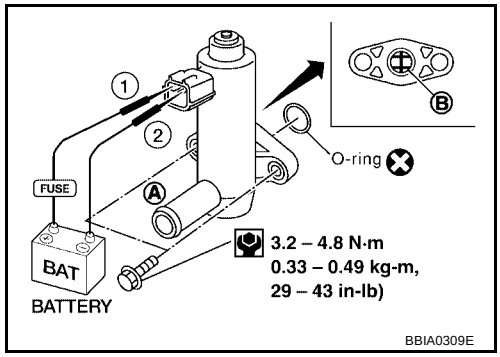
1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	No
OFF	Yes

Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.



4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform inspection again.

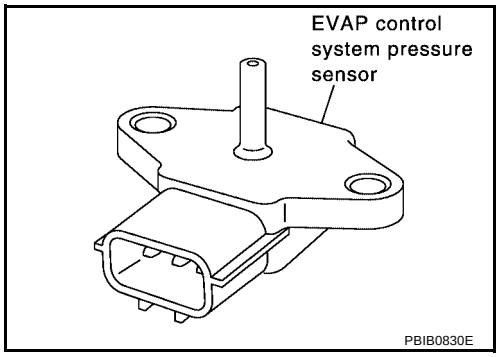
DTC P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

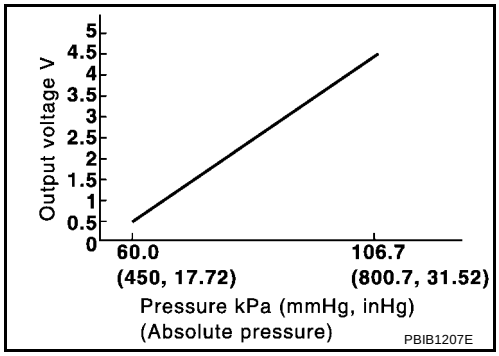
PFP:25085

Component Description

UBS002EH

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002EI

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	1.8 - 4.8V

On Board Diagnosis Logic

UBS002EJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452 0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP control system pressure sensor

DTC Confirmation Procedure

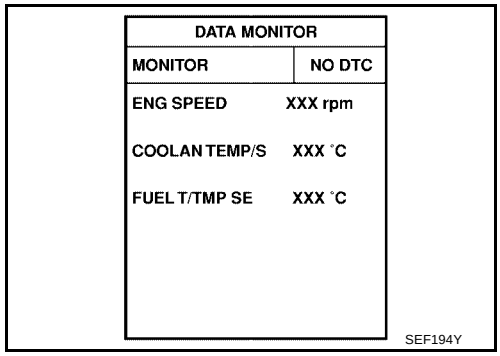
UBS002EK

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

WITH CONSULT-II

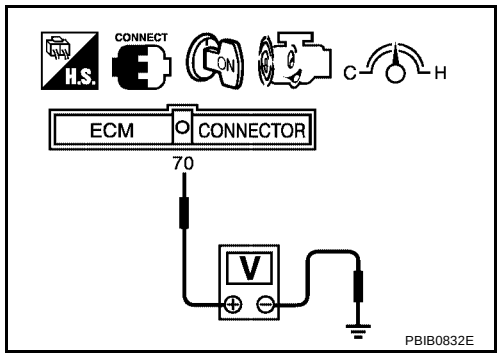
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.

4. Select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
   If 1st trip DTC is detected, go to EC-1537, "Diagnostic Procedure" .



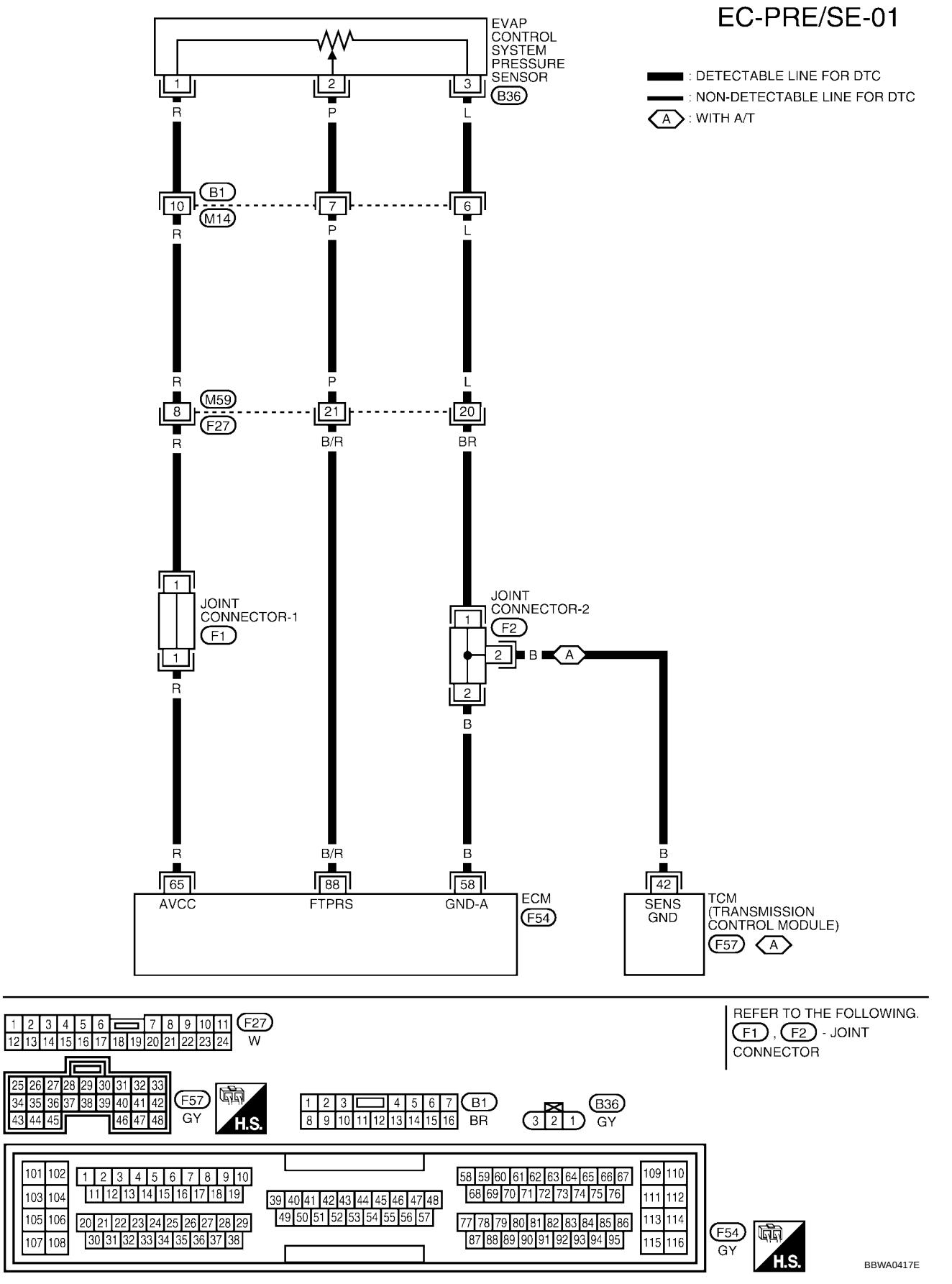
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 70 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and wait at least 20 seconds.
5. Select “MODE 7” with GST.
   If 1st trip DTC is detected, go to EC-1537, "Diagnostic Procedure" .



Wiring Diagram

UBS002EL



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
88	B/R	EVAP control system pressure sensor	**[Ignition switch "ON"]**	1.8 - 4.8V

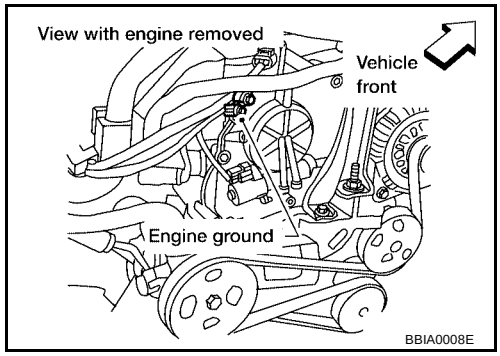
Diagnostic Procedure

UBS002EM

1. RETIGHTEN GROUND SCREWS

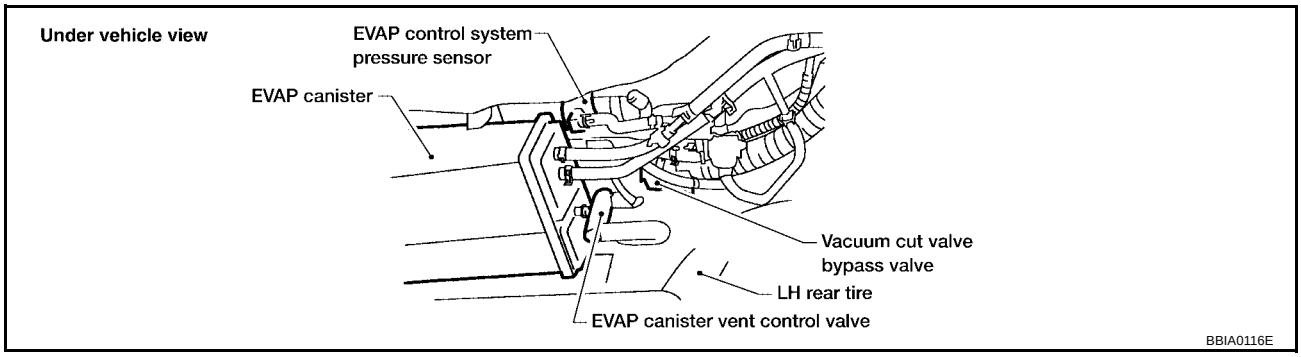
Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check sensor harness connector for water.

Water should not exist.

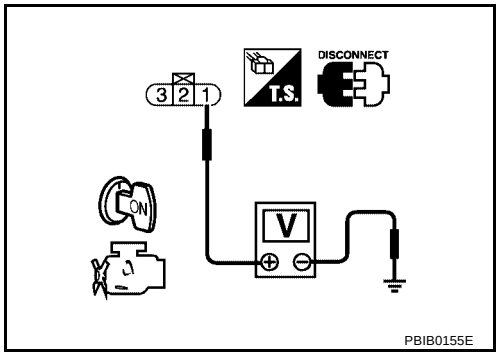
OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “ON”.
2. Check voltage between EVAP control system pressure sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EVAP control system pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-2
- Harness for open or short between EVAP control system pressure sensor and ECM
- Harness for open or short between EVAP control system pressure sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 88 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between ECM and EVAP control system pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

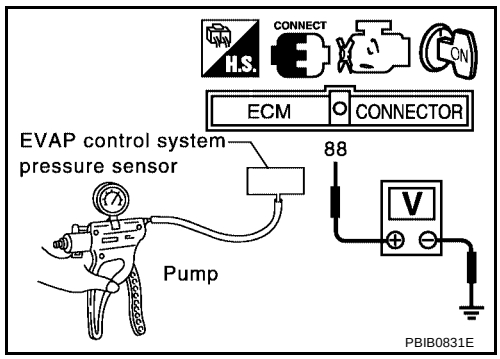
Component Inspection

UBS002EN

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch “ON” and check output voltage between ECM terminal 88 and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value



CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or over pressure 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

5. If NG, replace EVAP control system pressure sensor.

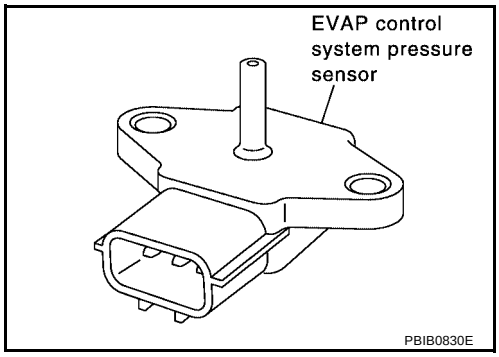
DTC P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

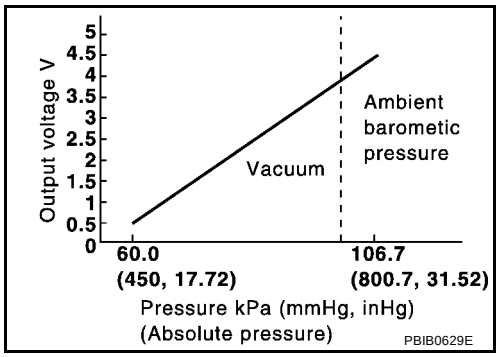
PFP:25085

Component Description

UBS002EO

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002EP

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	1.8 - 4.8V

On Board Diagnosis Logic

UBS002EQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453 0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP control system pressure sensor ● EVAP canister vent control valve ● EVAP canister ● Rubber hose from EVAP canister vent control valve to vehicle frame

DTC Confirmation Procedure

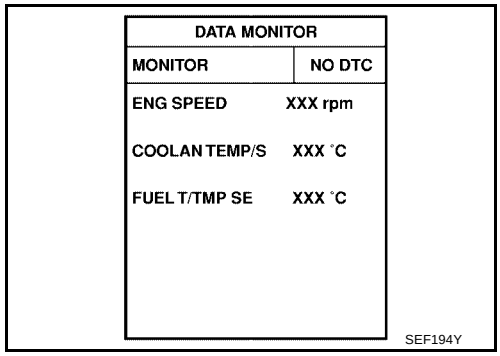
UBS002ER

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

WITH CONSULT-II

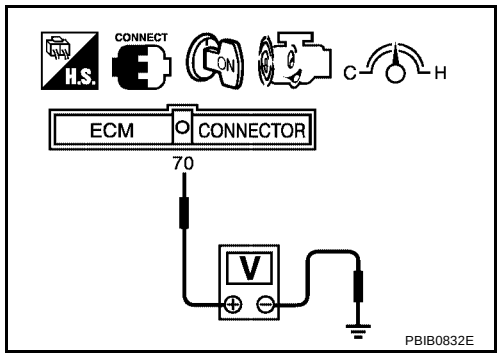
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.

4. Select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6. Wait at least 10 seconds.
7. If 1st trip DTC is detected, go to EC-1543, "Diagnostic Procedure" .



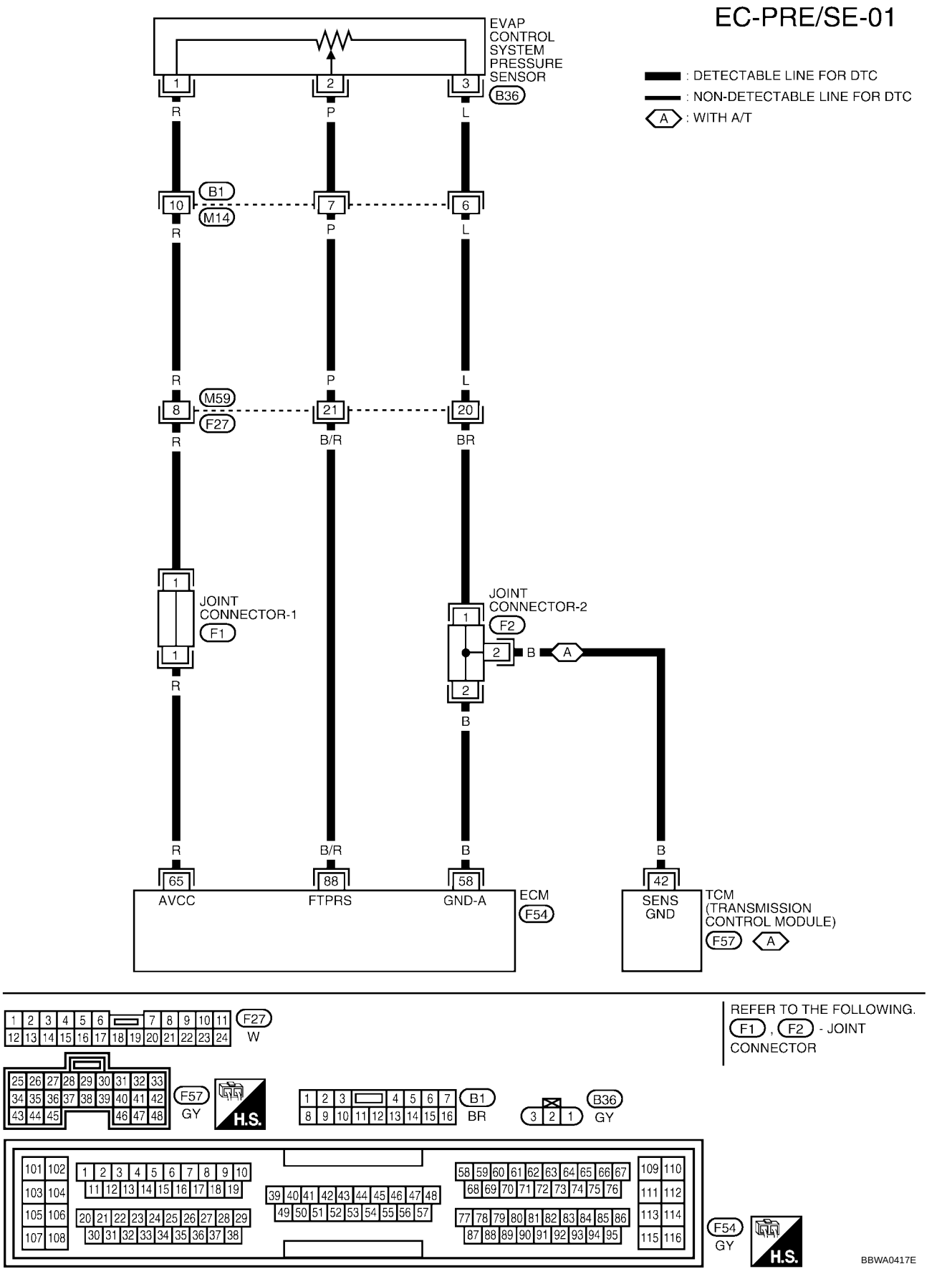
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Wait at least 10 seconds.
5. Select “MODE 7” with GST.
6. If 1st trip DTC is detected, go to EC-1543, "Diagnostic Procedure" .



Wiring Diagram

UBS002ES



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
88	B/R	EVAP control system pressure sensor	**[Ignition switch "ON"]**	1.8 - 4.8V

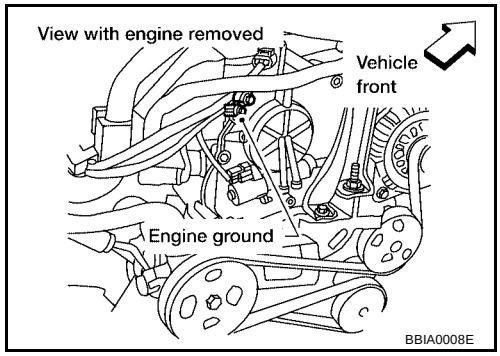
Diagnostic Procedure

UBS002ET

1. RETIGHTEN GROUND SCREWS

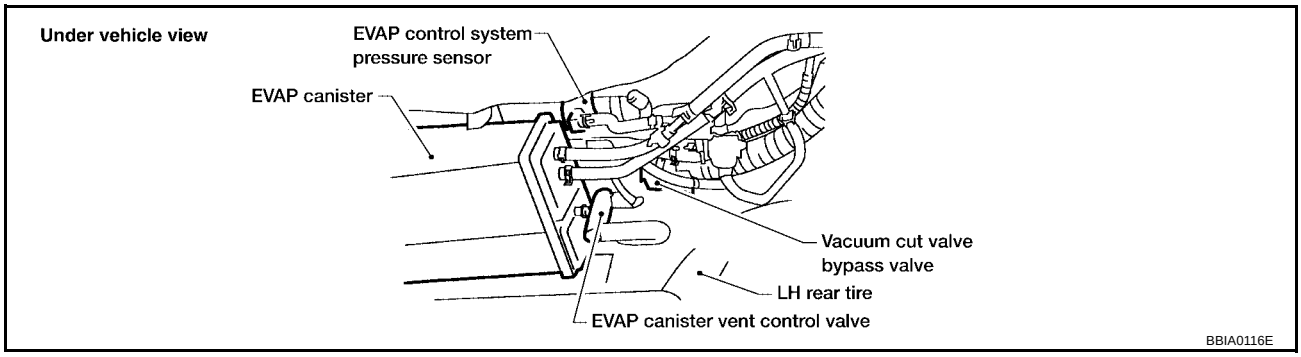
Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check sensor harness connector for water.

Water should not exist.

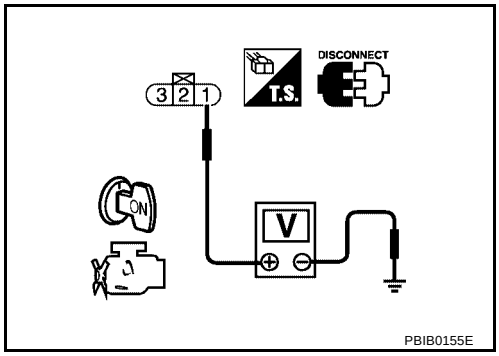
OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “ON”.
2. Check voltage between EVAP control system pressure sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EVAP control system pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-2
- Harness for open or short between EVAP control system pressure sensor and ECM
- Harness for open or short between EVAP control system pressure sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 88 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between ECM and EVAP control system pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 10.
NG >> Clean the rubber tube using an air blower.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP canister vent control valve.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1546, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP control system pressure sensor.

12. CHECK RUBBER TUBE

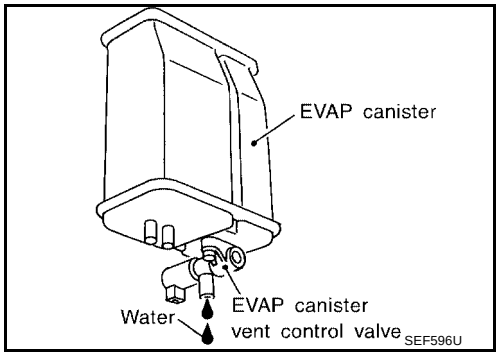
Check obstructed rubber tube connected to EVAP canister vent control valve.

OK or NG

OK >> GO TO 13.
NG >> Clean rubber tube using an air blower, repair or replace rubber tube.

13. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



Yes or No

Yes >> GO TO 14.
No >> GO TO 16.

14. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

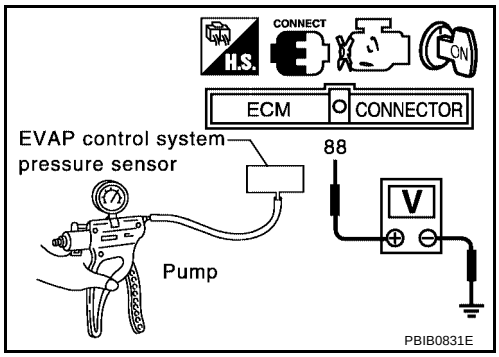
>> **INSPECTION END**

Component Inspection

UBS002EU

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch “ON” and check output voltage between ECM terminal 88 and ground under the following conditions.



Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200 mmHg, -7.87)	2.1 to 2.5V lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

5. If NG, replace EVAP control system pressure sensor.

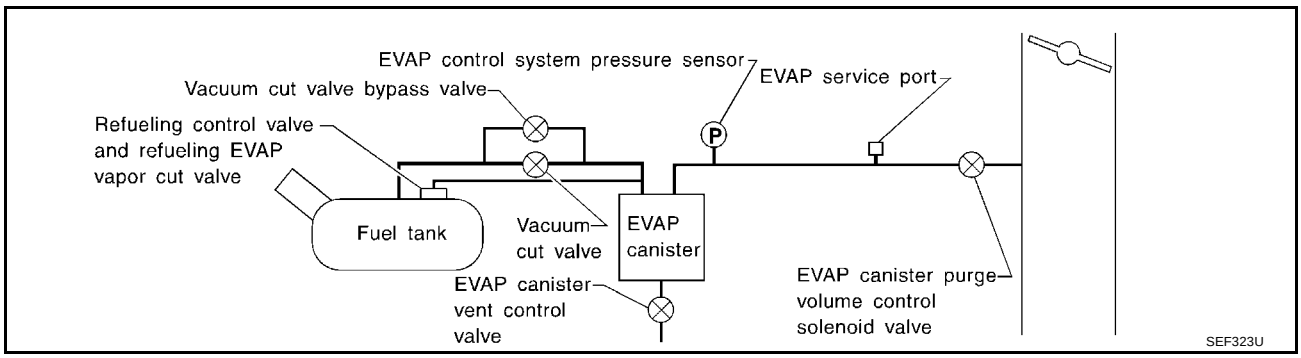
DTC P0455 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS002EV

NOTE:
If DTC P0455 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (EC-1687 .)
This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0455 0455	EVAP control system gross leak detected	EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.	● Fuel filler cap remains open or fails to close. ● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent. ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged. ● EVAP control system pressure sensor ● Refueling control valve ● ORVR system leaks

CAUTION:
- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS002EW

CAUTION:
Never remove fuel filler cap during the DTC Confirmation Procedure.

NOTE:

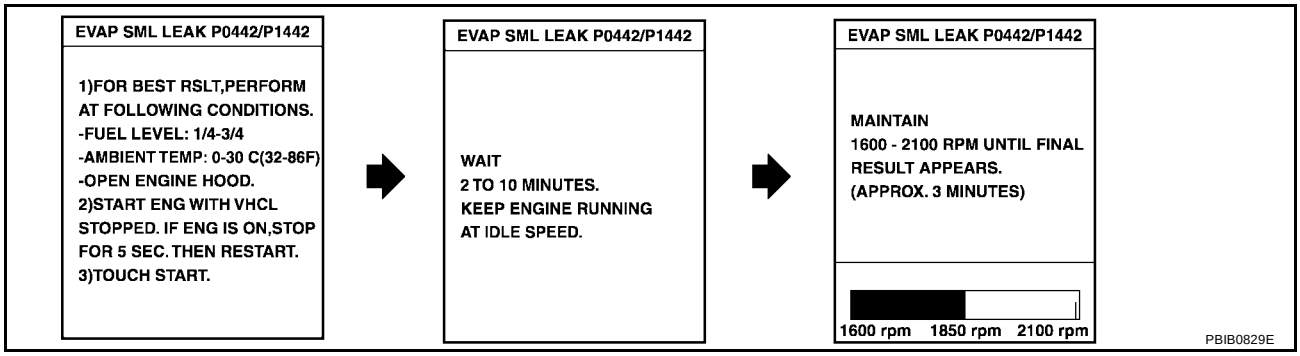
- **If DTC P0455 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (EC-1687 .)**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedures.**

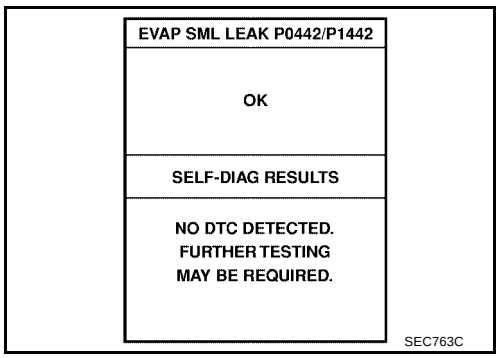
WITH CONSULT-II

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch “ON”.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.



NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-1291, "Basic Inspection" .

7. Make sure that “OK” is displayed.
   If “NG” is displayed, select “SELF-DIAG RESULTS” mode and make sure that “EVAP GROSS LEAK [P0455]” is displayed. If it is displayed, refer to EC-1549, "Diagnostic Procedure" .
   If P0442 is displayed, perform “Diagnostic Procedure” for DTC P0442, EC-1515 .



WITH GST

NOTE:
Be sure to read the explanation of “Driving Pattern” on EC-1270 before driving vehicle.

1. Start engine.
2. Drive vehicle according to “Driving Pattern”, EC-1270 .
3. Stop vehicle.
4. Select “MODE 1” with GST.
   - If SRT of EVAP system is not set yet, go to the following step.

- If SRT of EVAP system is set, the result will be OK.

5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine.
   It is not necessary to cool engine down before driving.
7. Drive vehicle again according to the “Driving Pattern”, EC-1270 .
8. Stop vehicle.
9. Select “MODE 3” with GST.
   - If P0455 is displayed on the screen, go to EC-1549, "Diagnostic Procedure" .
   - If P0442 is displayed on the screen, go to “Diagnostic Procedure”, for DTC P0442, EC-1515 .
   - If P0441 is displayed on the screen, go to “Diagnostic Procedure” for DTC P0441, EC-1509 .
   - If P0455, P0441and P0442 are not displayed on the screen, go to the following step.
10. Select “MODE 1” with GST.
    - If SRT of EVAP system is set, the result will be OK.
    - If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

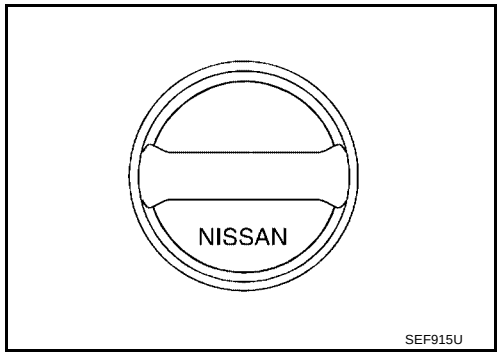
UBS002EX

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 6.
NG >> Repair or reconnect the hose.

6. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-1687, "DTC Confirmation Procedure" .

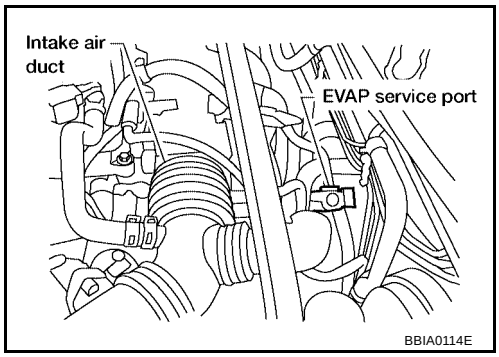
OK or NG

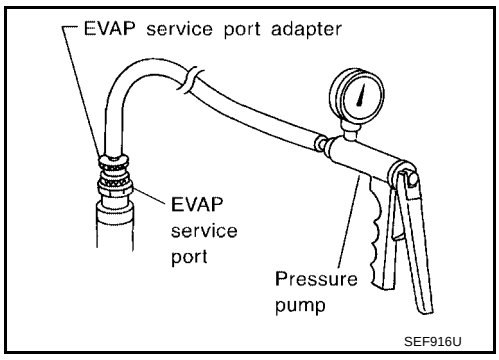
OK >> GO TO 8.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

8. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





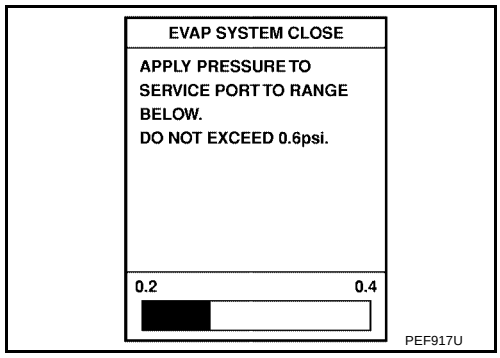
Models with CONSULT-II>>GO TO 9.
Models without CONSULT-II>>GO TO 10.

9. CHECK FOR EVAP LEAK

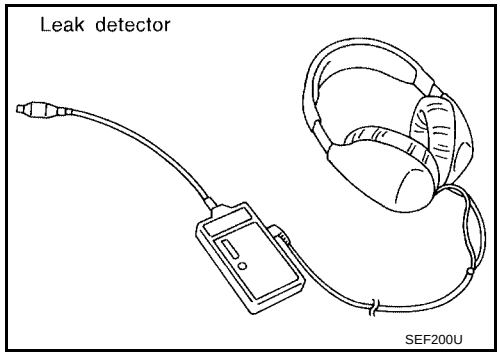
With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



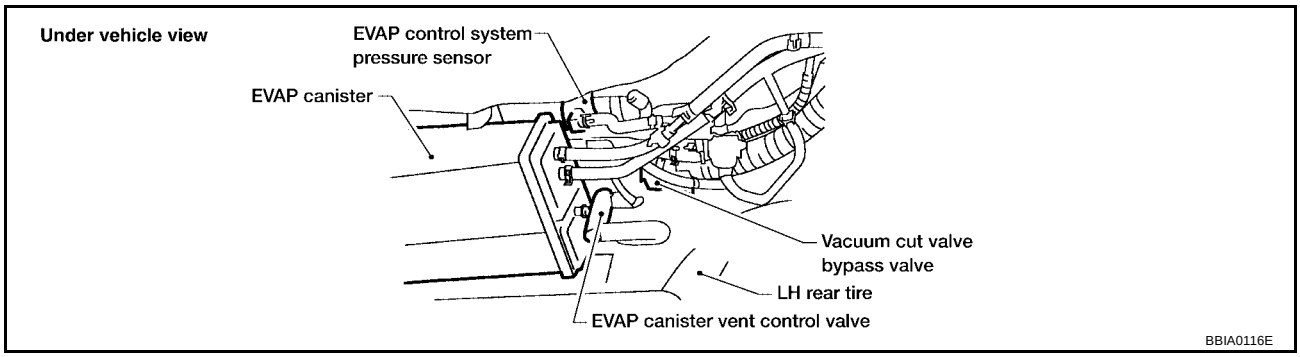
OK or NG

OK >> GO TO 11.
NG >> Repair or replace.

10. CHECK FOR EVAP LEAK

Without CONSULT-II

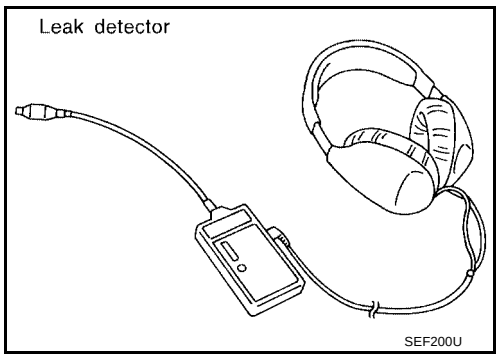
1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**

5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



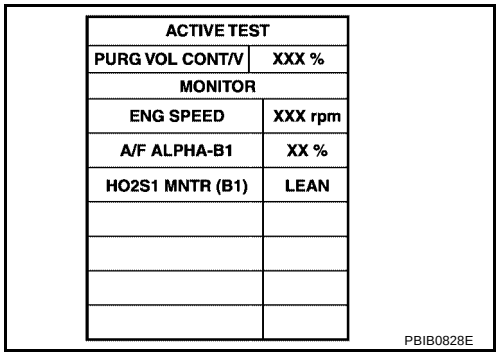
OK or NG

OK >> GO TO 12.
NG >> Repair or replace.

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

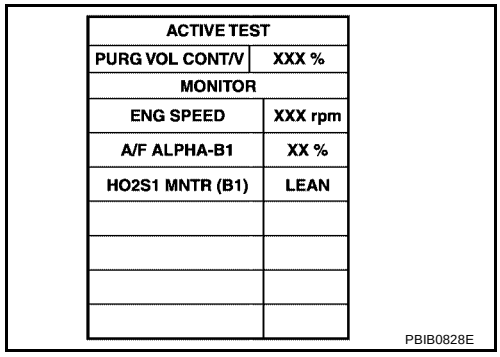
OK or NG

OK (With CONSULT-II)>>GO TO 14.
OK (Without CONSULT-II)>>GO TO 15.
NG >> Repair or reconnect the hose.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK REFUELING EVAP VAPOR LINE

Check refueling EVAP vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1852, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 19.
NG >> Repair or replace hoses and tubes.

19. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 20.
NG >> Repair or replace hoses, tubes or filler neck tube.

20. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 21.
NG >> Replace refueling control valve with fuel tank.

21. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

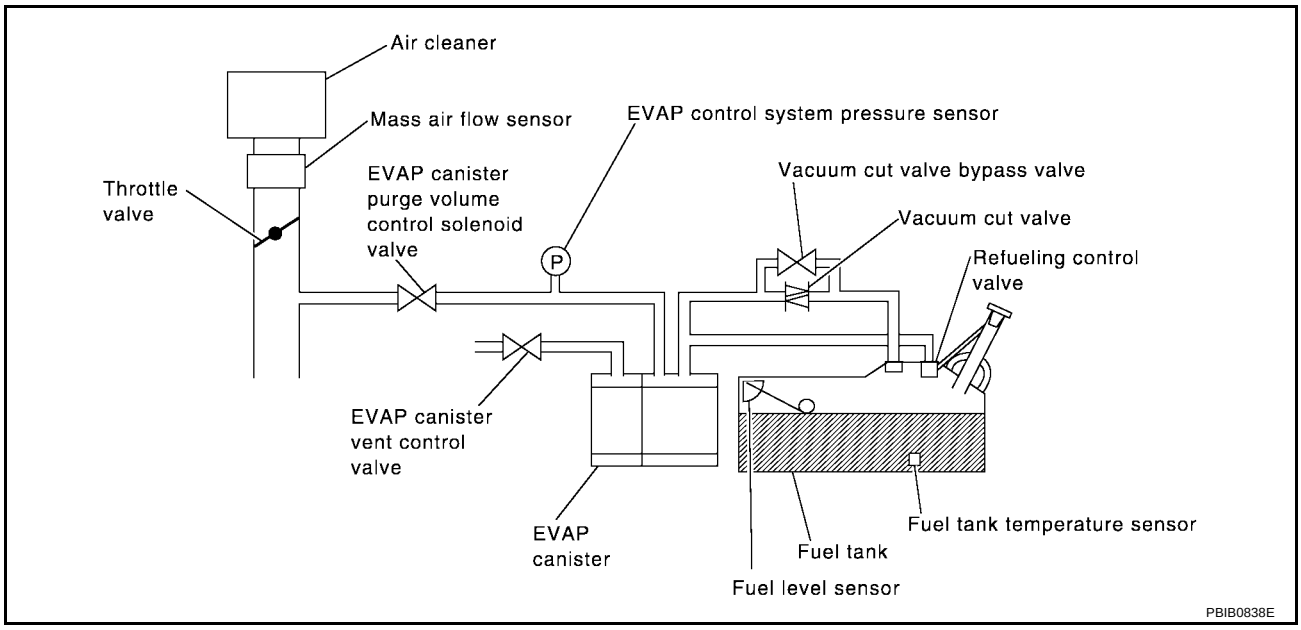
DTC P0456 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS002EY

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.
The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve is opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.
If ECM judges a leak which corresponds to a very small leak, the very small leak P0456 will be detected.
If ECM judges a leak equivalent to a small leak, EVAP small leak P0442 will be detected.
If ECM judges there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456 0456	Evaporative emission control system very small leak (negative pressure check)	● EVAP system has a very small leak. ● EVAP system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Refueling control valve ● ORVR system leaks ● Fuel level sensor and the circuit ● Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS002EZ

NOTE:

- **If DTC P0456 is displayed with P0442, first perform TROUBLE DIAGNOSIS FOR DTC P0456.**
- **After repair, make sure that the hoses and clips are installed properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

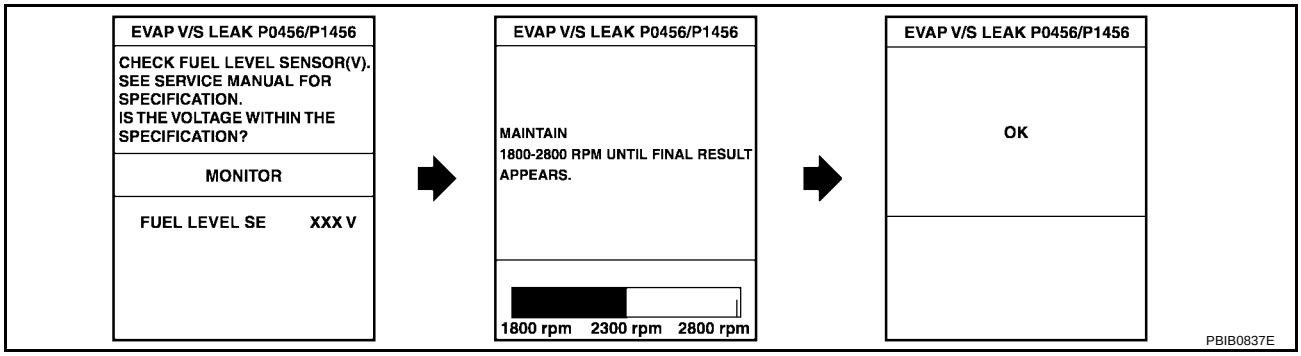
- **Open engine hood before conducting following procedure.**
- **If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**
  - **Fuel filler cap is removed.**
  - **Refilled or drained the fuel.**
  - **EVAP component parts is/are removed.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Make sure the following conditions are met.
   FUEL LEVEL SE: 0.25 - 1.15V

COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
INT A/TEMP SE: More than 0°C (32°F)
If NG, turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle) or refilling/draining fuel until the output voltage condition of the “FUEL LEVEL SE” meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1).

3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Select “EVAP V/S LEAK P0456/P1456” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
Follow the instruction displayed.



6. Make sure that “OK” is displayed.
If “NG” is displayed, refer to EC-1558, "Diagnostic Procedure" .

NOTE:
- **If the engine speed cannot be maintained within the range displayed on CONSULT-II screen, go to EC-1291, "Basic Inspection" .**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

Overall Function Check

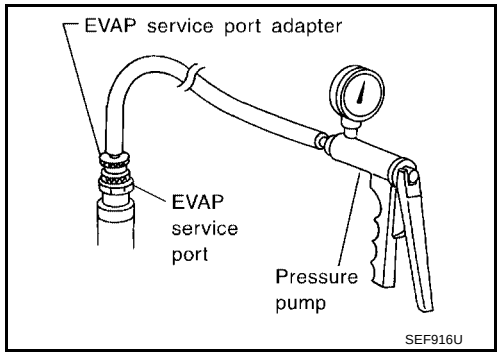
UBS002F0

WITH GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a DTC might not be confirmed.

CAUTION:
- **Never use compressed air, doing so may damage the EVAP system.**
- **Do not start engine.**
- **Do not exceeded 4.12 kPa (0.042 kg/cm^2 , 0.6 psi).**

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch “ON”.
5. Connect GST and select MODE 8.
6. Using MODE 8 control the EVAP canister vent control valve (close) and vacuum cut valve bypass valve (open).
7. Apply pressure and make sure the following conditions are satisfied.
Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg)
Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (3 mmHg, 0.12 inHg).
If NG, go to EC-1558, "Diagnostic Procedure" .
If OK, go to next step.
8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.



10. Turn ignition switch “OFF” and wait at least 10 seconds.
11. Restart engine and let it idle for 90 seconds.
12. Keep engine speed at 2,000 rpm for 30 seconds.
13. Turn ignition switch “OFF”.

NOTE:
For more information, refer to GST instruction manual.

Diagnostic Procedure

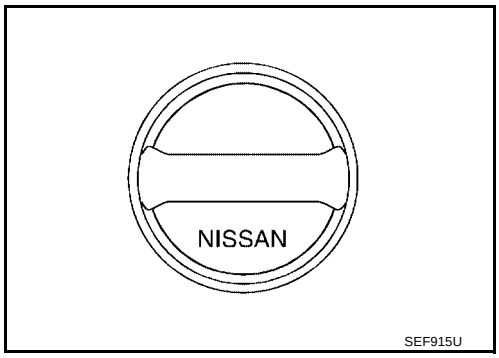
UBS002F1

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "Component Inspection" .

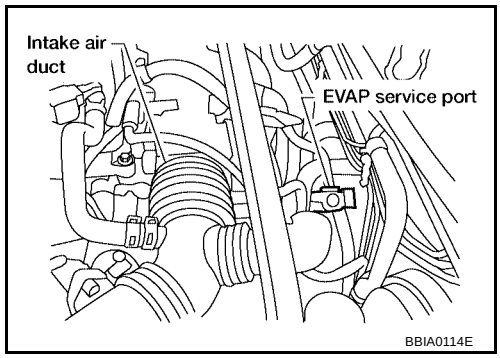
OK or NG

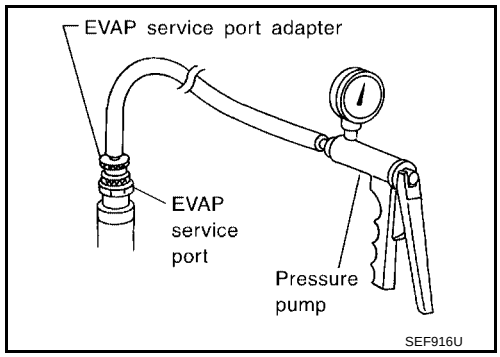
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





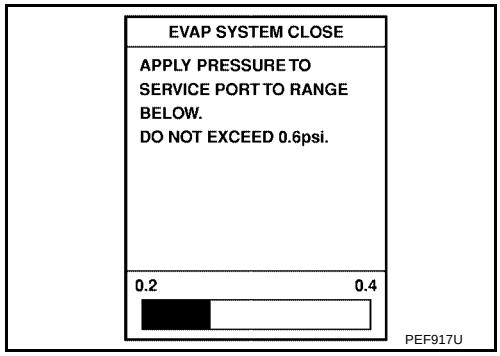
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

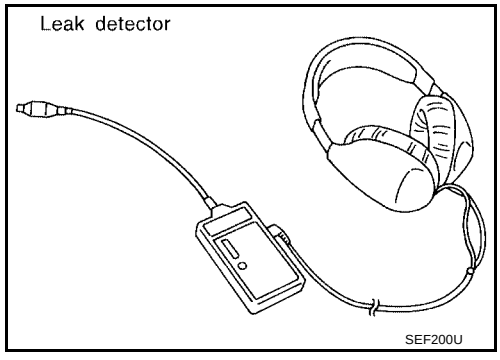
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

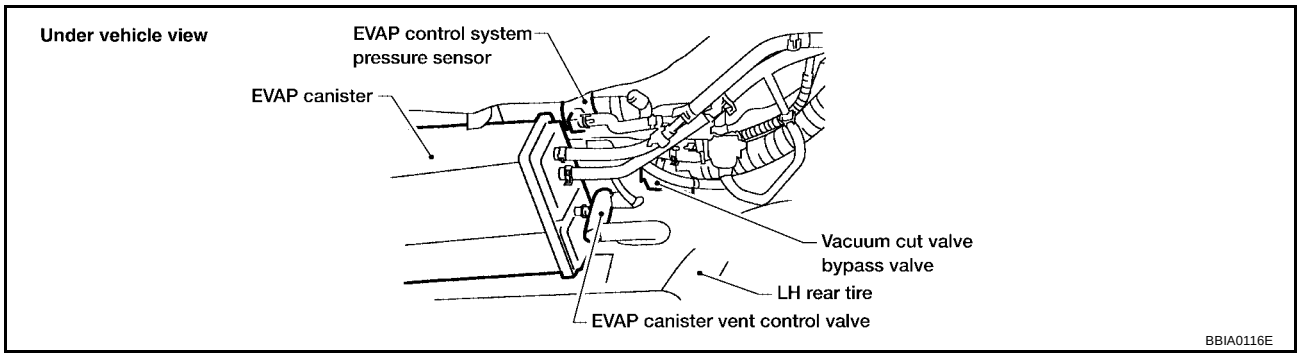
OK >> GO TO 8.
NG >> Repair or replace.



7. CHECK FOR EVAP LEAK

Without CONSULT-II

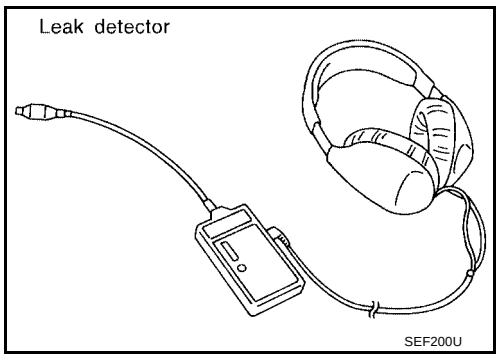
1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**

5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-1693, "Component Inspection" .

OK or NG

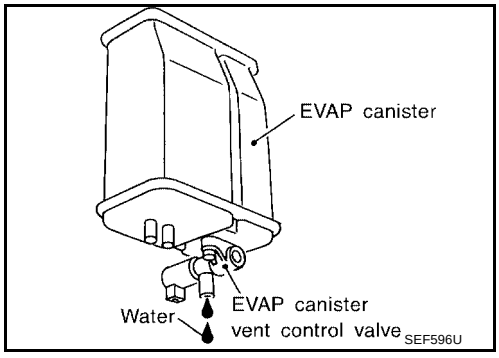
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

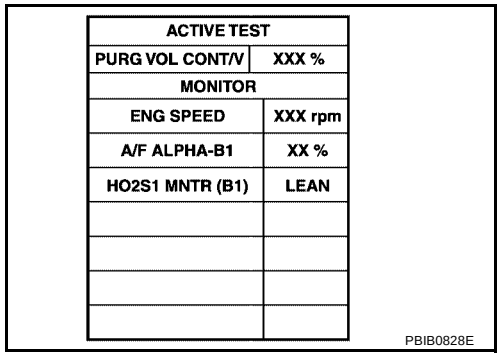
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "FUEL TANK TEMPERATURE SENSOR" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK REFUELING EVAP VAPOR LINE

Check refueling EVAP vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1852, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses, tubes or filler neck tube.

22. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling control valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

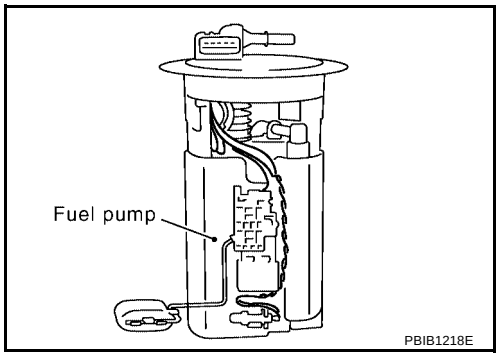
DTC P0460 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS002F3

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS002F4

When the vehicle is parked, naturally the fuel level in the fuel tank is stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0460 0460	Fuel level sensor circuit noise	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor

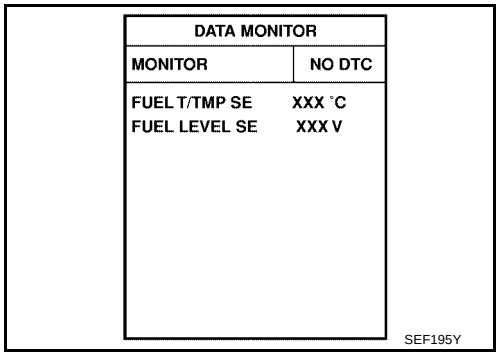
DTC Confirmation Procedure

UBS002F5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait maximum of 2 consecutive minutes.
4. If 1st trip DTC is detected, go to EC-1566, "Diagnostic Procedure" .

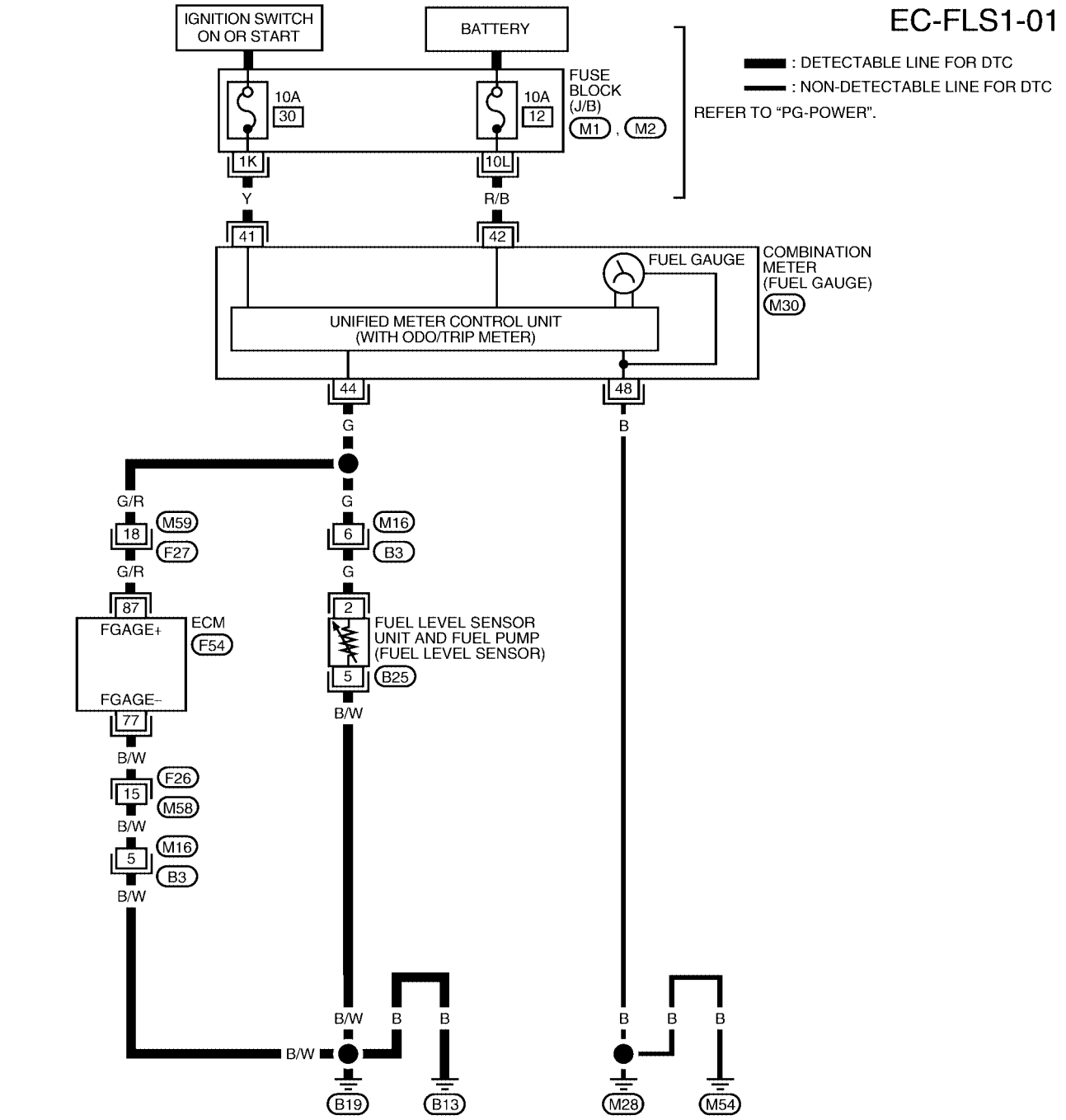


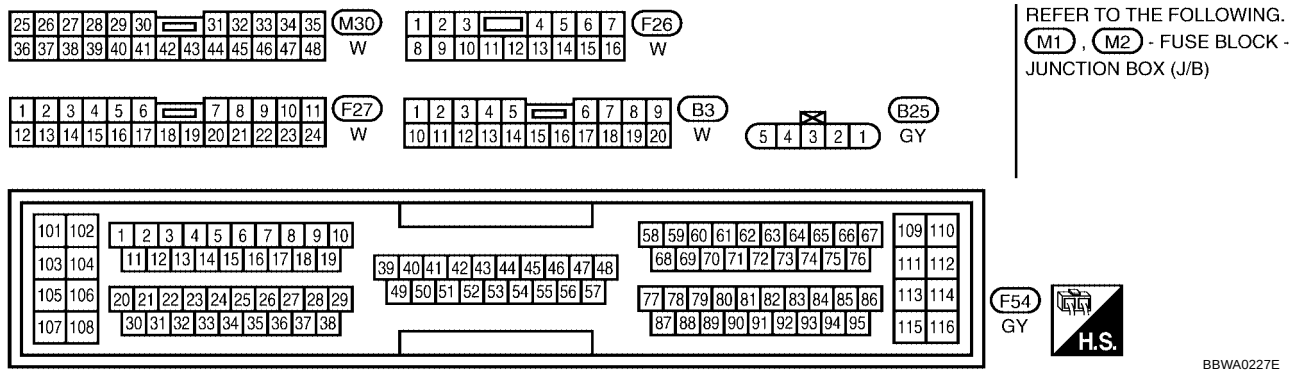
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002F6





BBWA0227E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

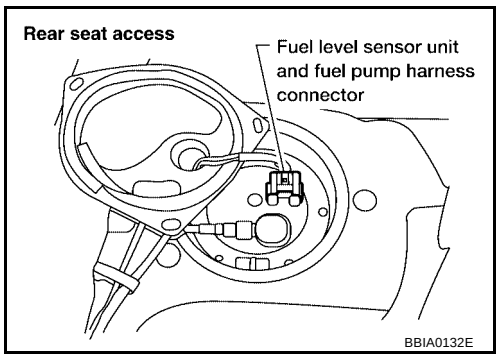
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
77	B/W	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V
87	G/R	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.

Diagnostic Procedure

UBS002F7

1. CHECK FUEL LEVEL SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch "ON".

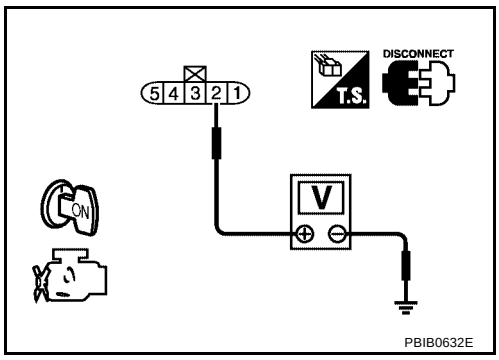


4. Check voltage between fuel level sensor unit and fuel pump terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M16, B3
- Harness for open or short between combination meter and fuel level sensor until and fuel pump

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between fuel level sensor unit and fuel pump and body ground

>> Repair open circuit or short to power in harness or connectors.

5. CHECK FUEL LEVEL SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 87 and fuel level sensor unit and fuel pump terminal 2, ECM terminal 77 and fuel level sensor unit and fuel pump terminal 5. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M16, B3
- Harness connectors M58, F26
- Harness connectors M59, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 8.
NG >> Replace fuel level sensor unit.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Remove and Installation

UBS002F8

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

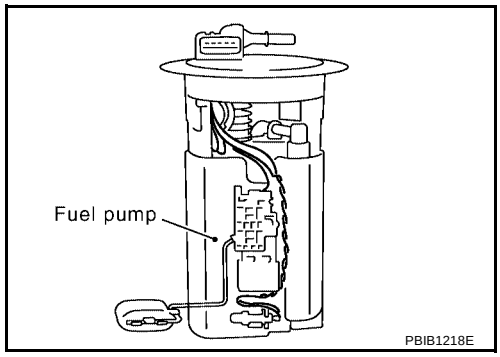
DTC P0461 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS002F9

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS002FA

Driving long distances naturally affect fuel gauge level.
This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0461 0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor

Overall Function Check

UBS002FB

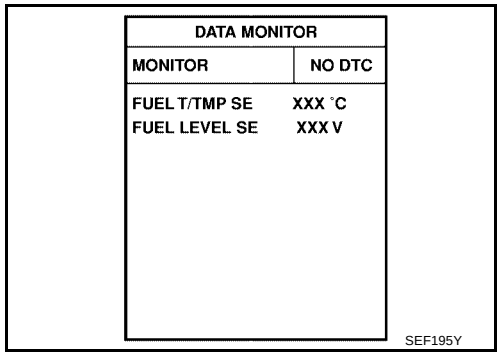
Use this procedure to check the overall function of the fuel level sensor function. During this check, a 1st trip DTC might not be confirmed.

WARNING:
When performing following procedure, be sure to observe the handling of the fuel. Refer to FL-7, "FUEL TANK" .
TESTING CONDITION:
Before starting overall function check, preparation of draining fuel and refilling fuel is required.

WITH CONSULT-II

NOTE:
Start from step 11, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-1257, "FUEL PRESSURE RELEASE" .
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch “OFF” and wait at least 10 seconds then turn “ON”.
6. Select “FUEL LEVEL SE” in “DATA MONITOR” mode with CONSULT-II.
7. Check “FUEL LEVEL SE” output voltage and note it.
8. Select “FUEL PUMP” in “ACTIVE TEST” mode with CONSULT-II.
9. Touch “ON” and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
11. Check “FUEL LEVEL SE” output voltage and note it.
12. Check “FUEL LEVEL SE” output voltage and confirm whether the voltage changes more than 0.03V during step 7 to 11.
    If NG, check the fuel level sensor, refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

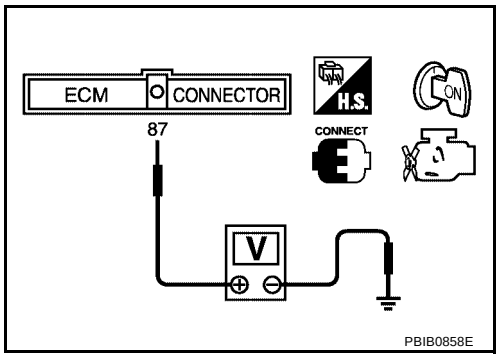


WITH GST

NOTE:

Start from step 11, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-1257, "FUEL PRESSURE RELEASE" .
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch “OFF”.
6. Set voltmeters probe between ECM terminal 87 (fuel level sensor signal) and ground.
7. Turn ignition switch “ON”.
8. Check voltage between ECM terminal 87 and ground and note it.
9. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
10. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
11. Confirm that the voltage between ECM terminal 87 and ground changes more than 0.03V during step 8 - 10.
    If NG, check component of fuel level sensor, refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .



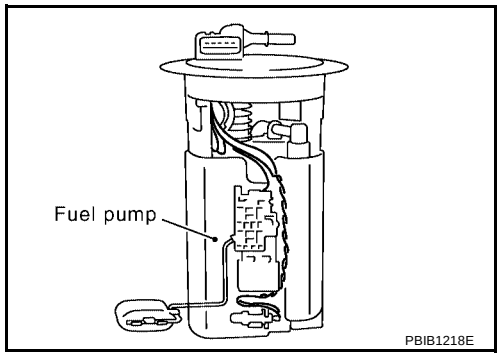
DTC P0462, P0463 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS002FC

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS002FD

ECM receives two signals from the fuel level sensor circuit.
One is fuel level sensor power supply circuit, and the other is fuel level sensor ground circuit.
This diagnosis indicates the former, to detect open or short circuit malfunction.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462 0462	Fuel level sensor circuit low input	An excessively low voltage is sent from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor
P0463 0463	Fuel level sensor circuit high input	An excessively high voltage is sent from the sensor is sent to ECM.	

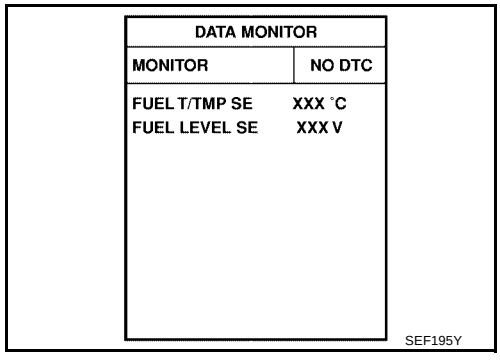
DTC Confirmation Procedure

UBS002FE

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1573, "Diagnostic Procedure" .

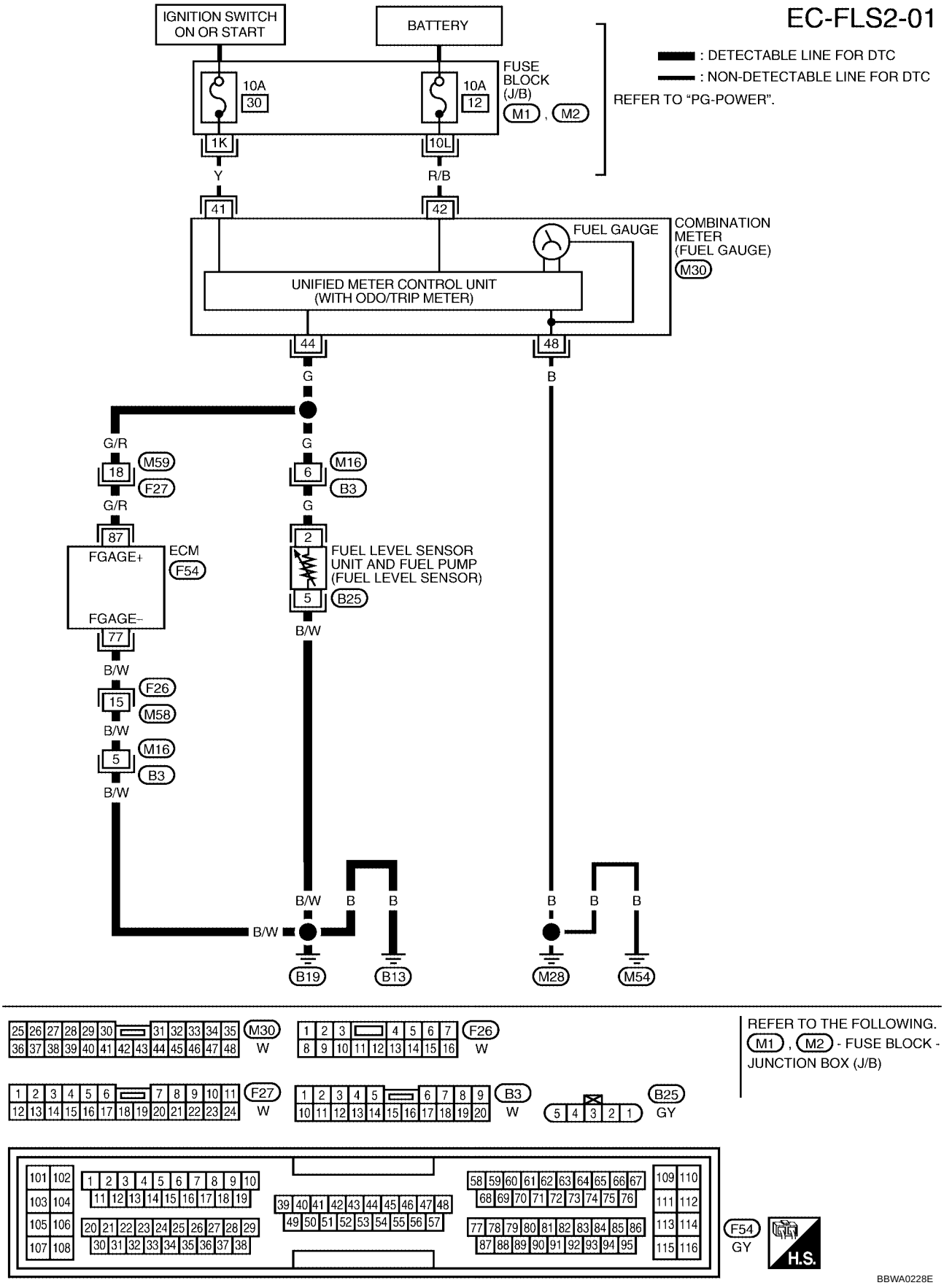


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002FF



BBWA0228E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

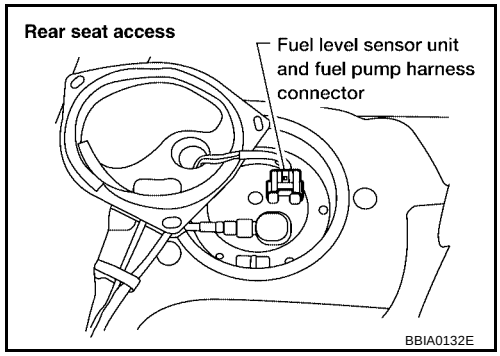
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
77	B/W	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V
87	G/R	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.

Diagnostic Procedure

UBS002FG

1. CHECK FUEL LEVEL SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch "ON".

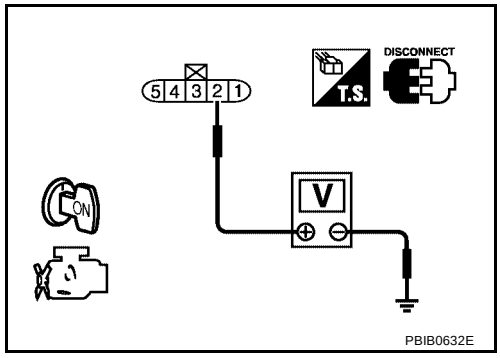


4. Check voltage between fuel level sensor unit and fuel pump terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M16, B3
- Harness for open or short between combination meter and fuel level sensor unit and fuel pump

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK FUEL LEVEL SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 87 and fuel level sensor unit and fuel pump terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M16, B3
- Harness connectors M59, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 7.
NG >> Replace fuel level sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS002FH

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

DTC P0500 VSS

PFP:32702

Description

UBS002FI

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the combination meter. The combination meter then sends a signal to the ECM.

On Board Diagnosis Logic

UBS002FJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The vehicle speed sensor circuit is open or shorted) ● Vehicle speed sensor ● Combination meter

DTC Confirmation Procedure

UBS002FK

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

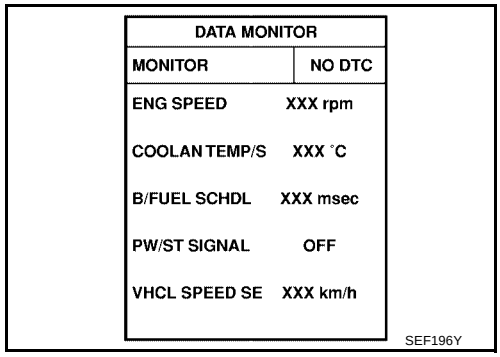
TESTING CONDITION:

Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-1577, "Diagnostic Procedure" .
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,200 - 6,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	6.0 - 31.8 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF



6. If 1st trip DTC is detected, go to EC-1577, "Diagnostic Procedure" .

Overall Function Check

UBS002FL

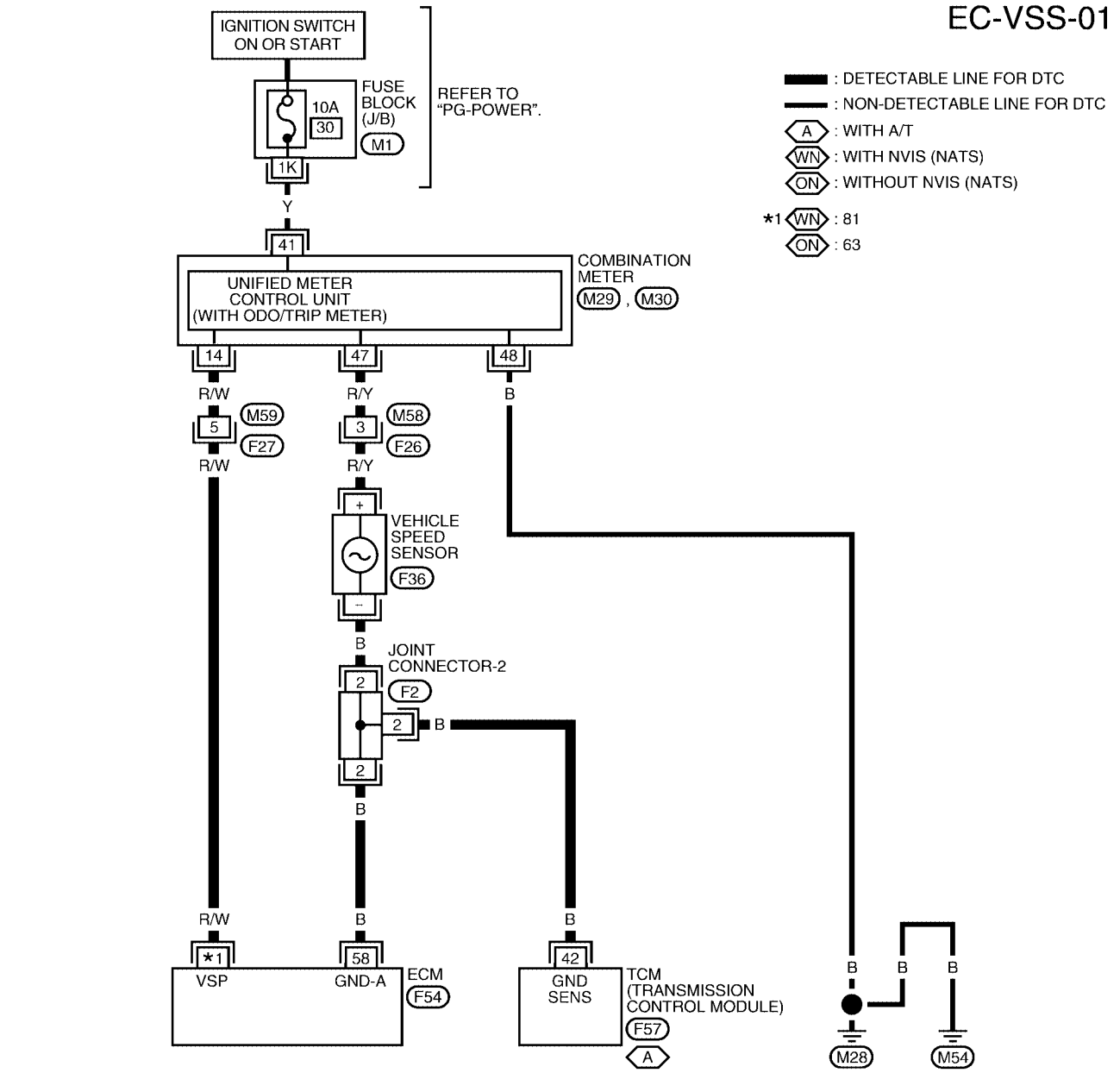
Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a 1st trip DTC might not be confirmed.

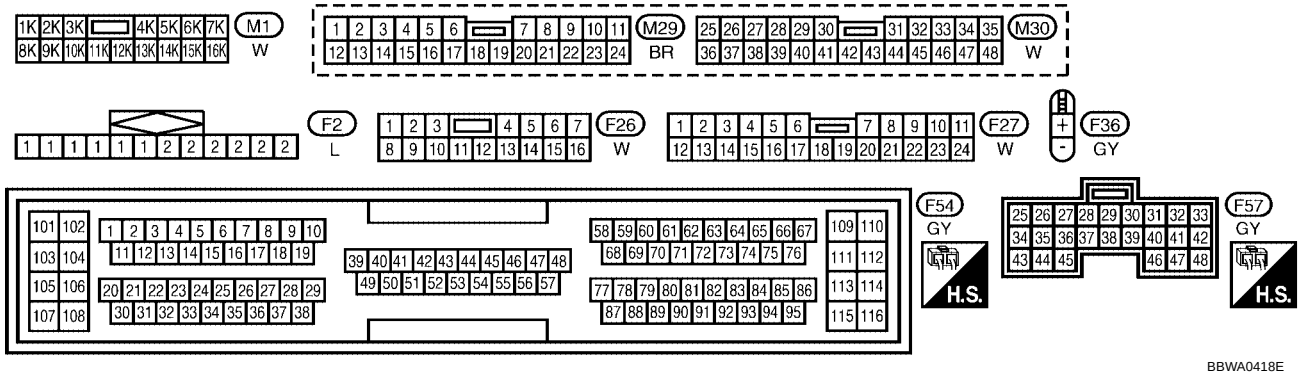
WITH GST

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed sensor signal in “MODE 1” with GST.
   The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-1577, "Diagnostic Procedure" .

Wiring Diagram

UBS002FM



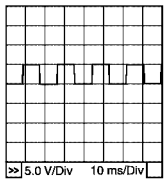


BBWA0418E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63 (Without NVIS) 81 With (NVIS)	R/W	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● Vehicle speed is 40 km/h (25MPH)	Approximately 2.3V★  PBIB0531E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002FN

1. CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM terminal 81 (Models with NVIS) or 63 (Models without NVIS) and combination meter terminal 14.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and combination meter

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK SPEEDOMETER FUNCTION

Make sure that speedometer functions properly.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT

Check the following.

- Harness connectors M58, F26
- Joint connector-2
- Harness for open or short between combination meter and vehicle speed sensor
- Harness for open or short between vehicle speed sensor and ECM
- Harness for open or short between vehicle speed sensor and TCM

OK or NG

OK >> Check combination meter and vehicle speed sensor. Refer to DI-3, "METERS AND GAUGES" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0506 ISC SYSTEM

PFP:23781

Description

UBS002FO

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC displayed.
The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

UBS002FP

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506 0506	Idle speed control system RPM lower than expected	The idle speed is less than the target idle speed by 100 rpm or more.	● Electric throttle control actuator ● Intake air leak

DTC Confirmation Procedure

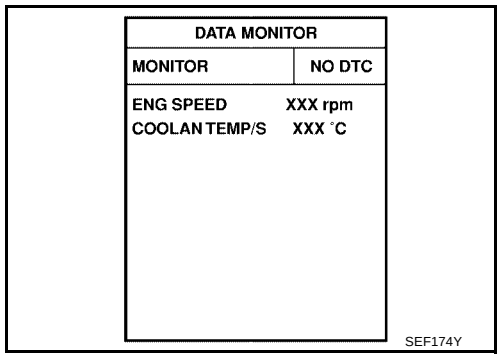
UBS002FQ

NOTE:
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform EC-1255, "Idle Air Volume Learning" , before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the EC-1862, "SERVICE DATA AND SPECIFICATIONS (SDS)" .**

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

WITH CONSULT-II

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” again and select “DATA MONITOR” mode with CONSULT-II.
5. Start engine and run it for at least 1 minute at idle speed.
6. If 1st trip DTC is detected, go to EC-1580, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002FR

1. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .
4. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
5. Perform EC-1255, "Throttle Valve Closed Position Learning" .
6. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P0507 ISC SYSTEM

PFP:23781

Description

UBS002FS

NOTE:
If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC displayed.
The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

UBS002FT

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507 0507	Idle speed control system RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	● Electric throttle control actuator ● Intake air leak ● PCV system

DTC Confirmation Procedure

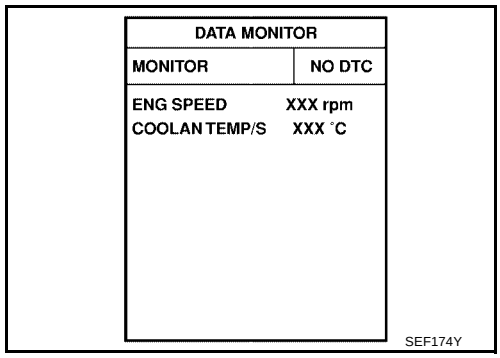
UBS002FU

NOTE:
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform EC-1255, "Idle Air Volume Learning" , before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the EC-1862, "SERVICE DATA AND SPECIFICATIONS (SDS)" .**

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

WITH CONSULT-II

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” again and select “DATA MONITOR” mode with CONSULT-II.
5. Start engine and run it for at least 1 minute at idle speed.
6. If 1st trip DTC is detected, go to EC-1582, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002FV

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Discover air leak location and repair.

3. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .
4. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
5. Perform EC-1255, "Throttle Valve Closed Position Learning" .
6. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

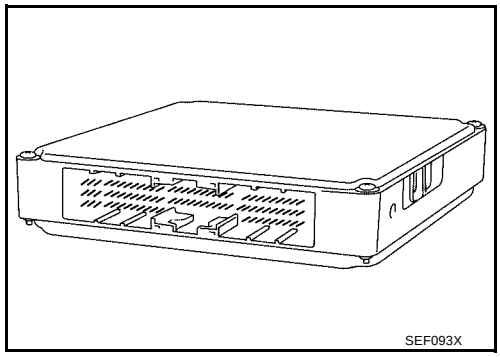
DTC P0605 ECM

PFP:23710

Component Description

UBS002FW

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


SEF093X

On Board Diagnosis Logic

UBS002FX

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	● ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. ● ECM deactivates ASCD operation.

DTC Confirmation Procedure

UBS002FY

Perform “PROCEDURE FOR MALFUNCTION A” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no malfunction on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

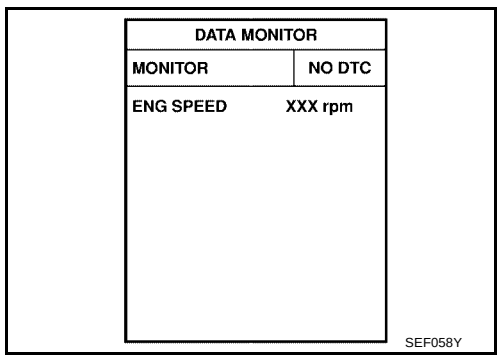
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1584, "Diagnostic Procedure" .



SEF058Y

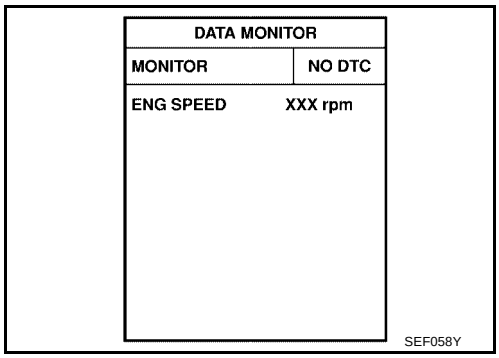
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-1584, "Diagnostic Procedure" .



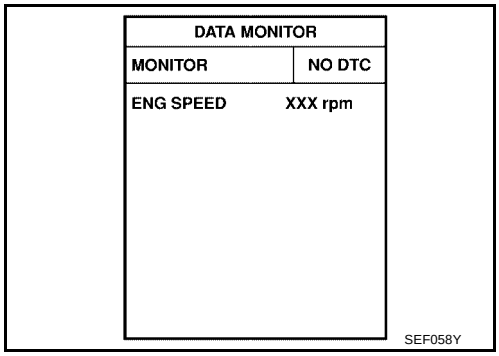
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 procedure, 32 times.
5. If 1st trip DTC is detected, go to EC-1584, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS002FZ

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1583 .
5. Is the 1st trip DTC P0605 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1583 .
5. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .
3. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
4. Perform EC-1255, "Throttle Valve Closed Position Learning" .
5. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P0650 MIL

PFP:24810

Component Description

UBS002G0

Malfunction Indicator Lamp (MIL) is located on the instrument panel. When the ignition switch is turned ON without engine running, MIL will light up. This is a bulb check. When the engine is started, MIL should go off. If MIL remains on, the on board diagnostic system has detected an engine system malfunction.

On Board Diagnosis Logic

UBS002G1

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0650 0650	Malfunction indicator (MIL) control circuit	● An excessively high voltage is sent to ECM through the MIL circuit under the condition that calls for MIL light up. ● An excessively low voltage is sent to ECM through the MIL circuit under the condition that calls for MIL not to light up.	● Harness or connectors (MIL circuit is open or shorted.) ● MIL

FAIL-SAFE MODE

ECM enters in fail-safe mode when both DTC P0650 and another DTC, which calls for MIL to light up, are detected at the same time.

Detected items	Engine operating condition in fail-safe mode
MIL circuit	Engine speed will not rise more than 2,500 rpm due to the fuel cut

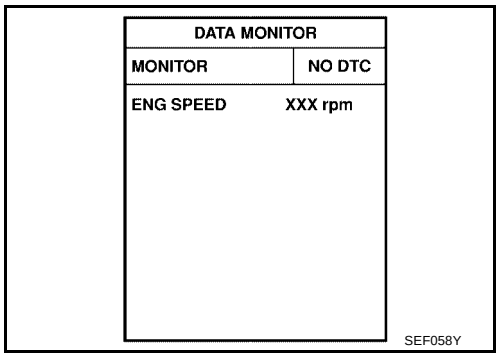
DTC Confirmation Procedure

UBS002G2

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1588, "Diagnostic Procedure" .



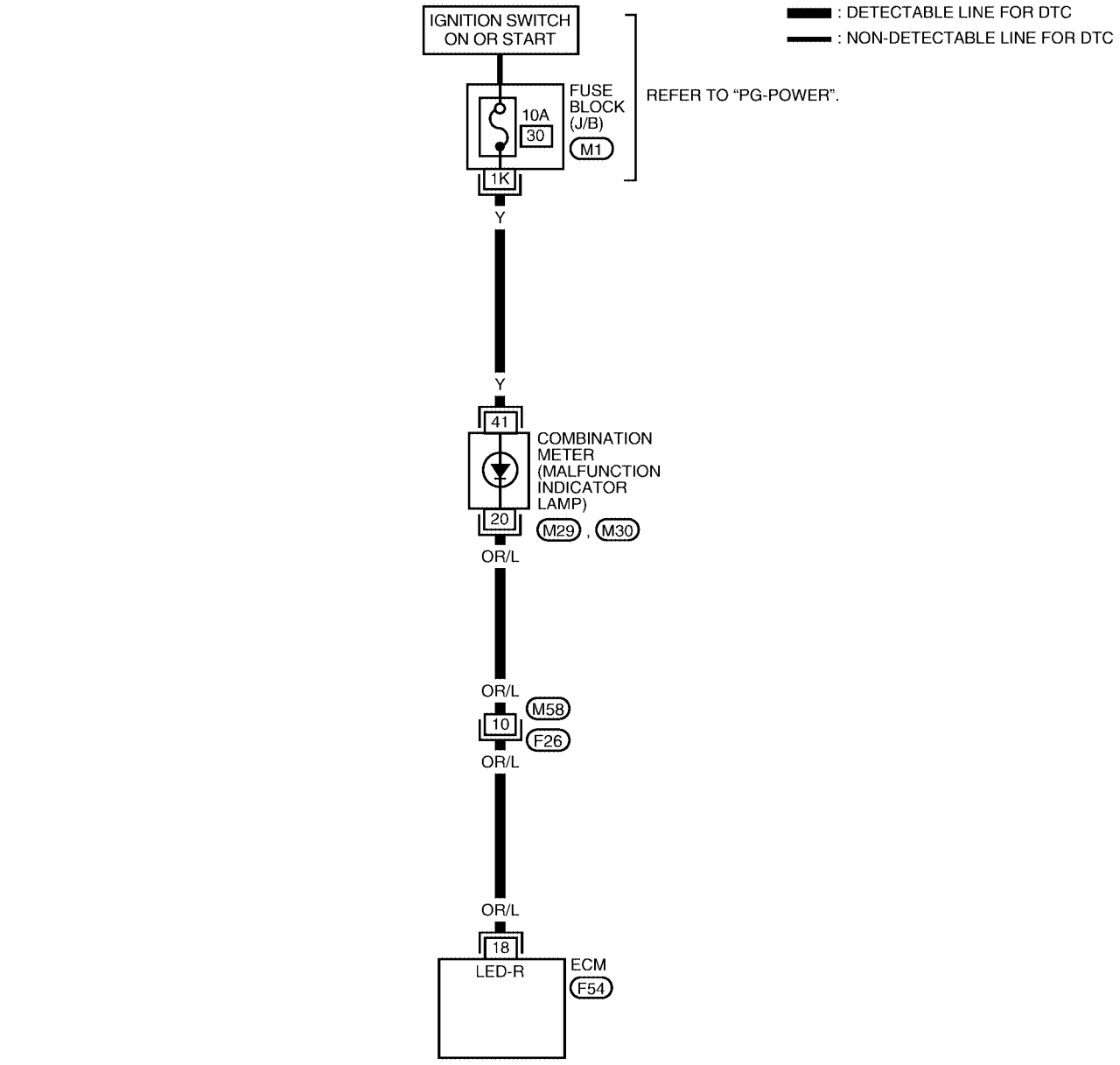
WITH GST

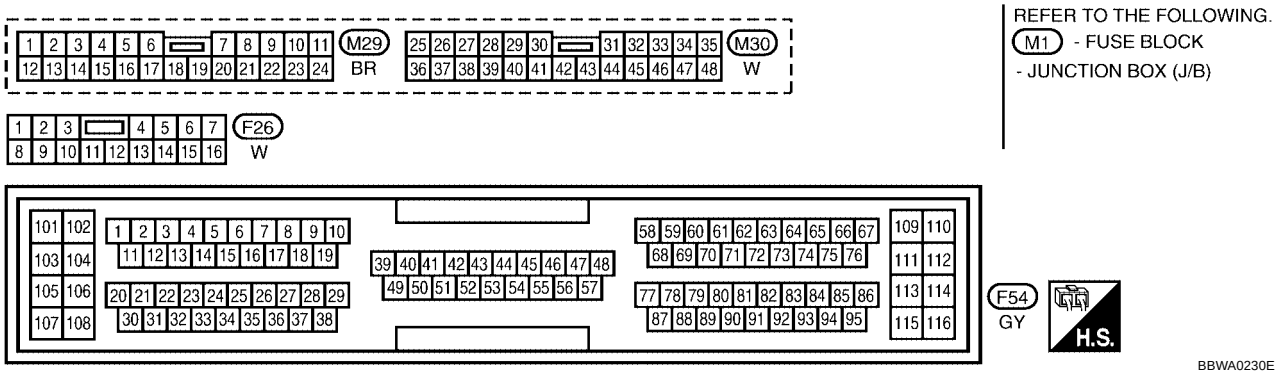
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002G3

EC-MIL-01





BBWA0230E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
18	OR/L	MIL	**[Ignition switch "ON"]**	0 - 1.0V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)

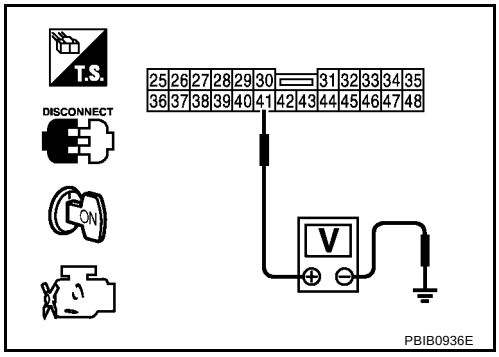
Diagnostic Procedure

UBS002G4

1. CHECK MIL POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector.
3. Turn ignition switch "ON".
4. Check voltage between combination meter terminal 41 and ground with CONSULT-II or tester

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between fuse and combination meter

>> Repair harness or connectors.

3. CHECK MIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 18 and combination meter terminal 20. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

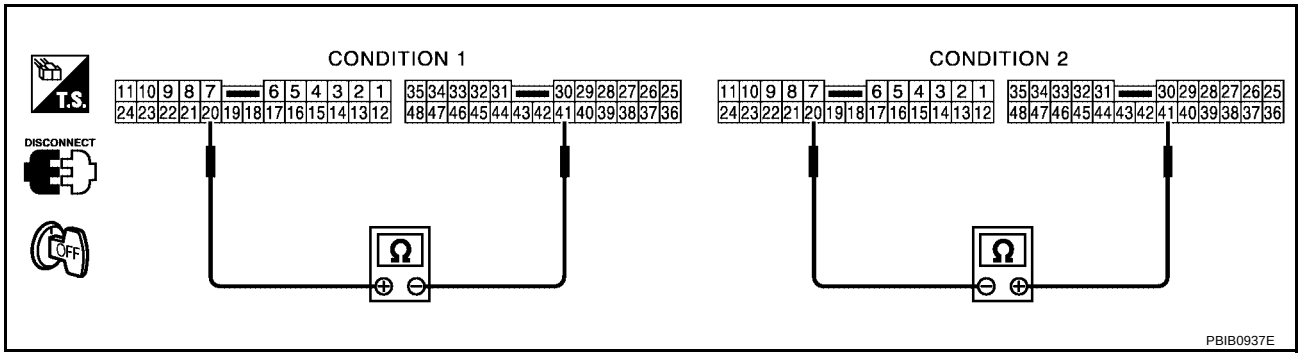
Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and combination meter

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK COMBINATION METER

1. Turn ignition switch “OFF”.
2. Disconnect combination meter harness connectors.
3. Check continuity under the following conditions.



CONDITION	Combination meter terminal No. (Polarity)	Continuity
1	20 (+) - 41 (–)	Should not exist.
2	41 (+) - 20 (–)	Should exist.

OK or NG

OK >> GO TO 6.
NG >> Replace combination meter. Refer to DI-8, "Combination Meter" .

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

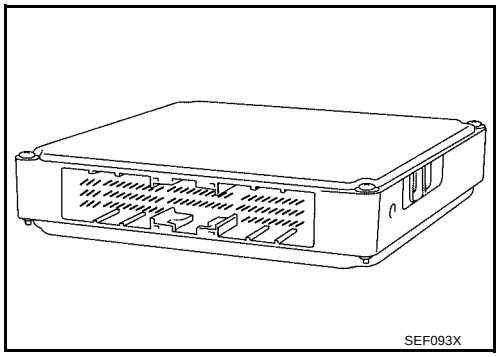
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

UBS002G5

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.



On Board Diagnosis Logic

UBS002G6

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back-up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

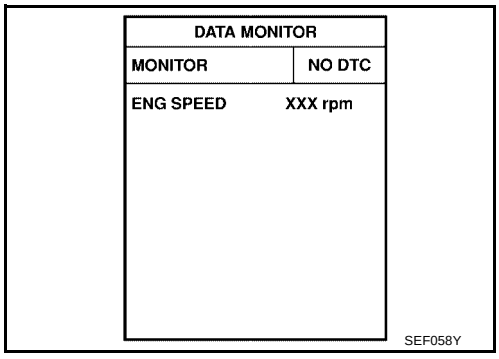
DTC Confirmation Procedure

UBS002G7

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-1592, "Diagnostic Procedure" .



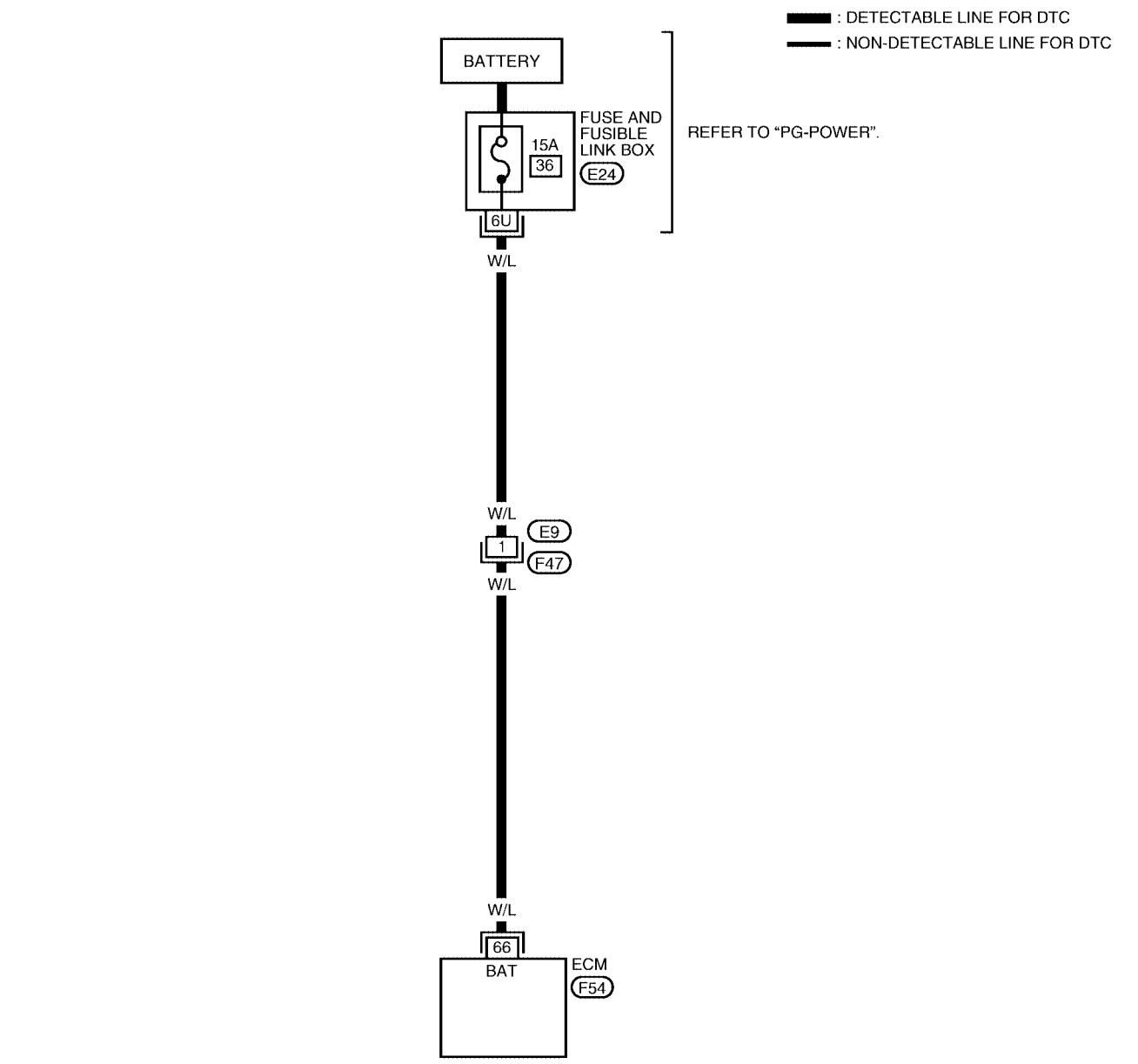
WITH GST

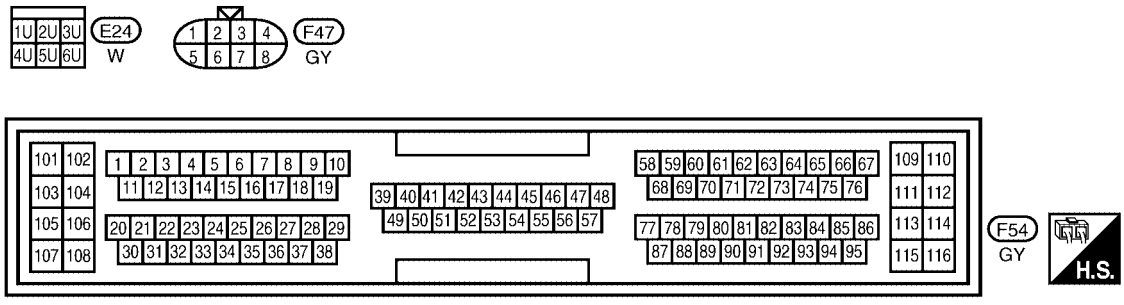
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002G8

EC-ECM/PW-01





BBWA0419E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
66	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

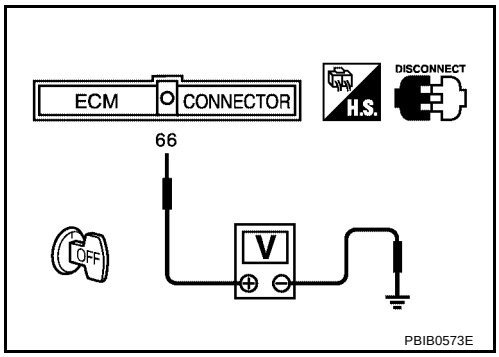
Diagnostic Procedure

UBS002G9

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 66 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse and fusible link box connector E24
- 15A fuse
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 4.
NG >> Repair or replace harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1590 .
5. Is the 1st trip DTC P1065 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1590 .
5. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .
3. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
4. Perform EC-1255, "Throttle Valve Closed Position Learning" .
5. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

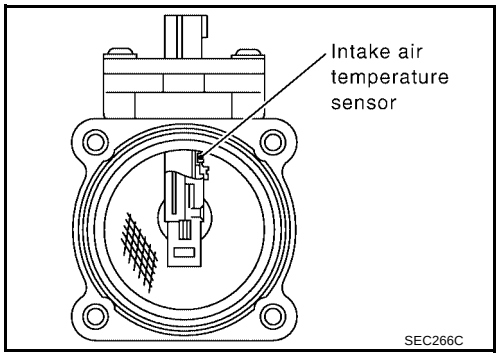
DTC P1102 MAF SENSOR

PFP:22680

Component Description

UBS002GA

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS002GB

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS002GC

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1102 1102	Mass air flow sensor circuit range/performance problem	A voltage from the sensor is constantly approx.1.0V when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

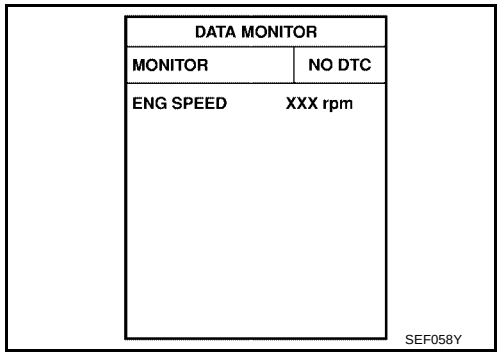
UBS002GD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-1597, "Diagnostic Procedure" .



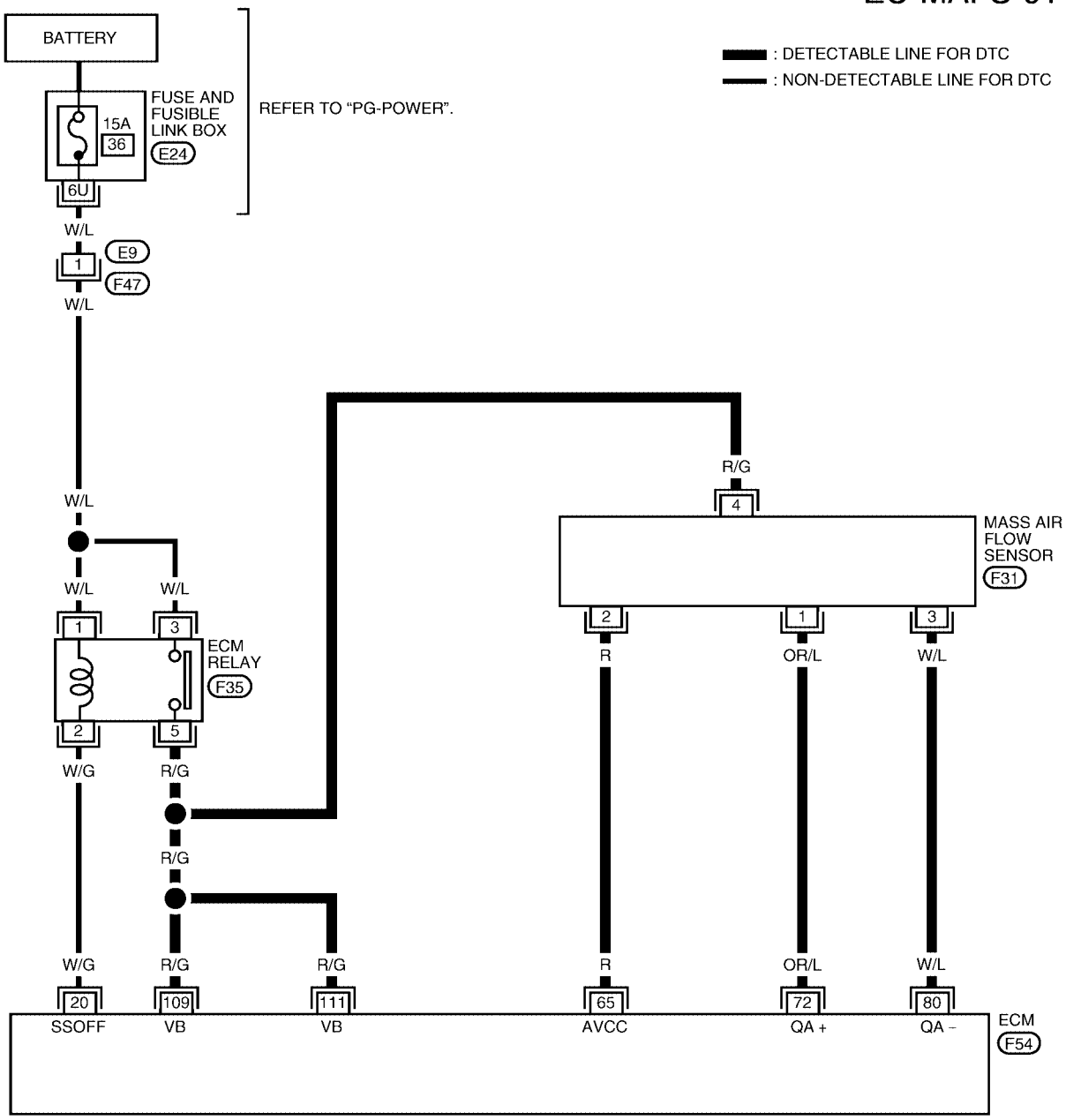
WITH GST

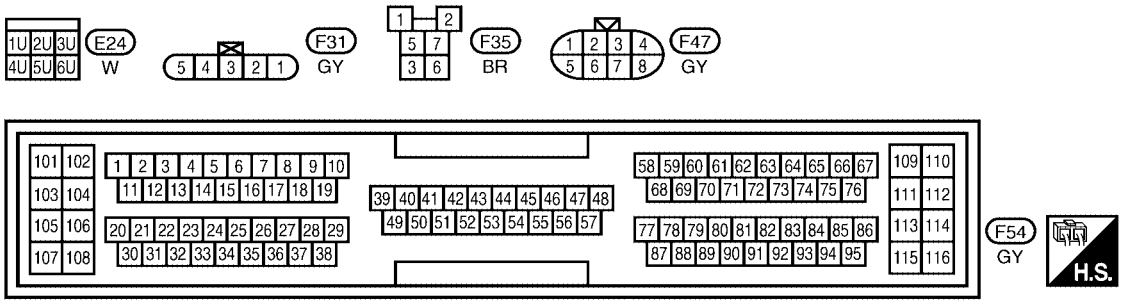
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS002GE

EC-MAFS-01





BBWA0213E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
72	OR/L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
80	W/L	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

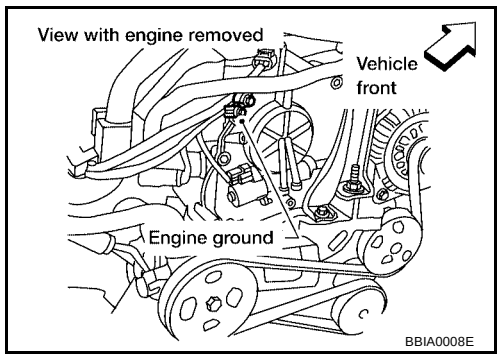
Diagnostic Procedure

UBS002GF

1. RETIGHTEN GROUND SCREWS

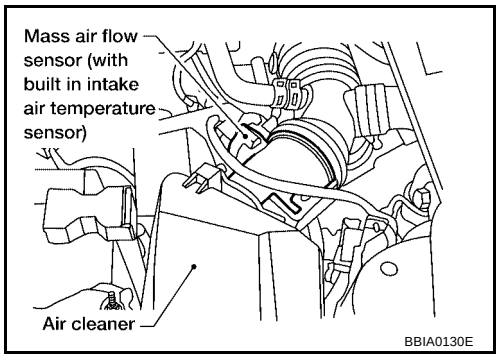
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



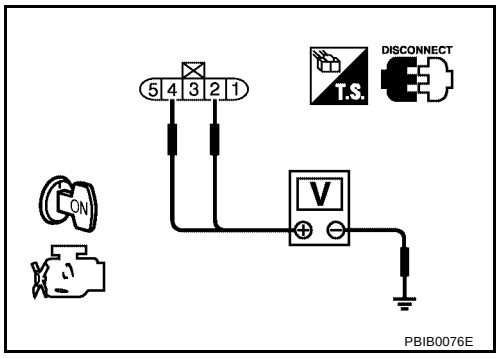
2. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM relay
- Harness for open or short between mass air flow sensor and ECM

>> Repair harness or connectors.

4. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 80. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 72. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MASS AIR FLOW SENSOR

Refer to EC-1599, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace mass air flow sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

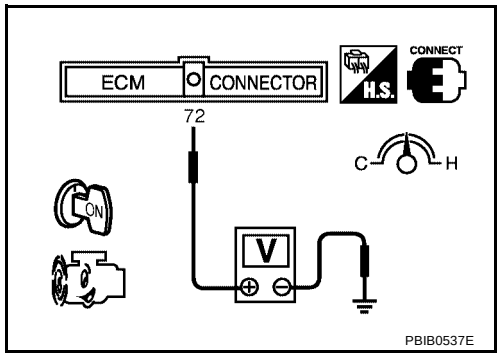
UBS002GG

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 72 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.5
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

UBS002GH

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

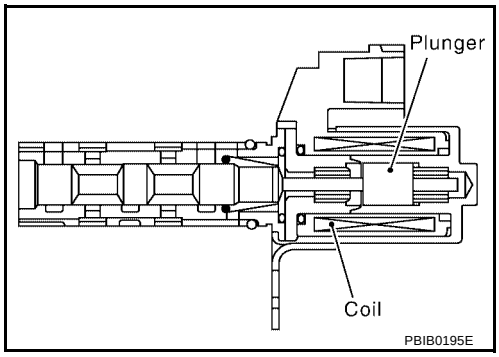
DTC P1111 IVT CONTROL SOLENOID VALVE

PFP:23796

Component Description

UBS002GI

Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
The shorter pulse width retards valve angle.
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

UBS002GJ

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 25% - 60%

On Board Diagnosis Logic

UBS002GK

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111 1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	● Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

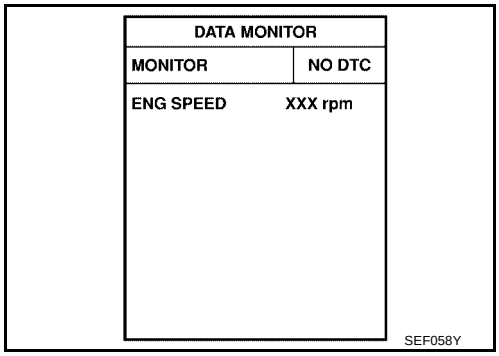
DTC Confirmation Procedure

UBS002GL

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If 1st trip DTC is detected, go to EC-1602, "Diagnostic Procedure" .



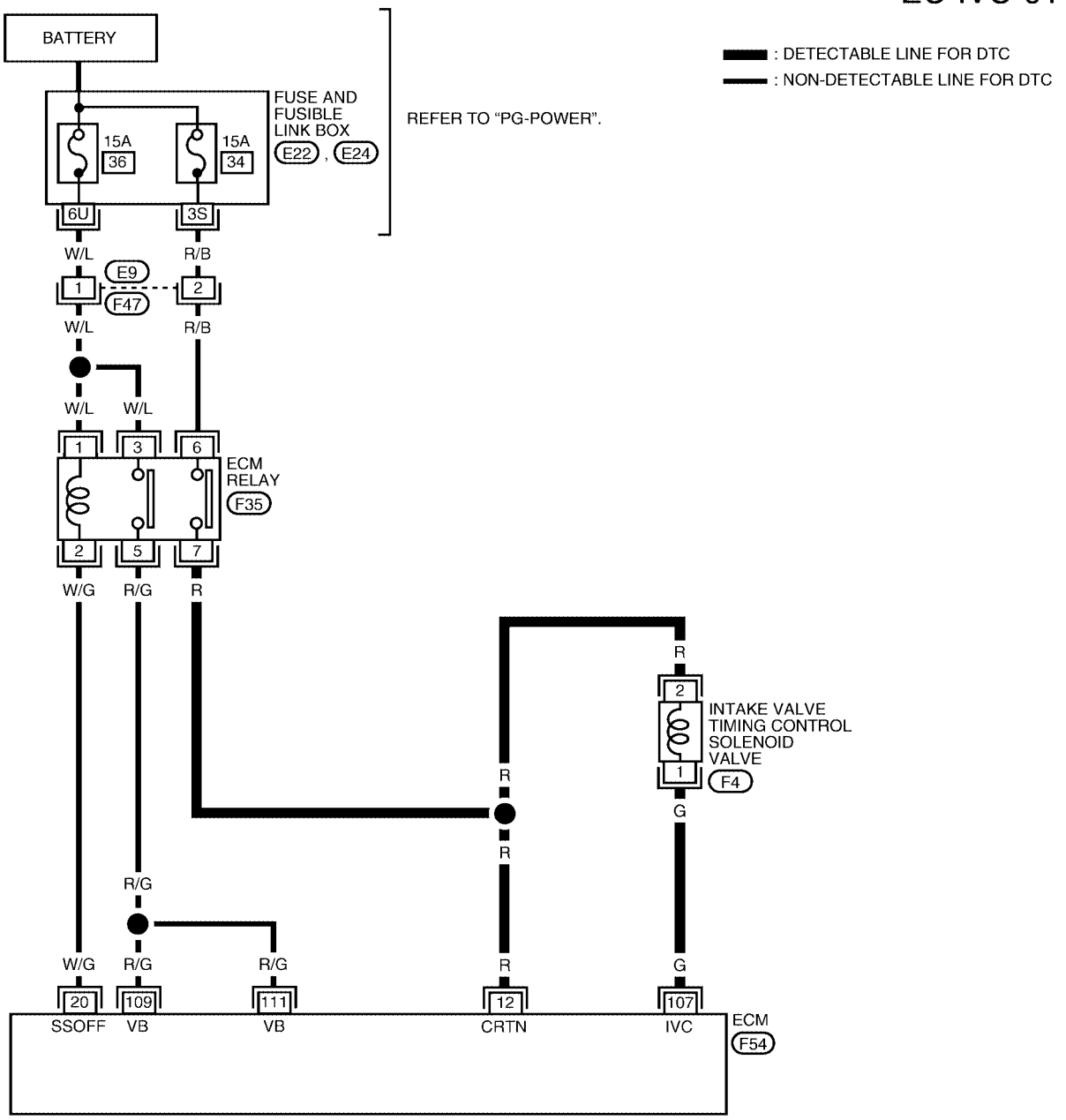
WITH GST

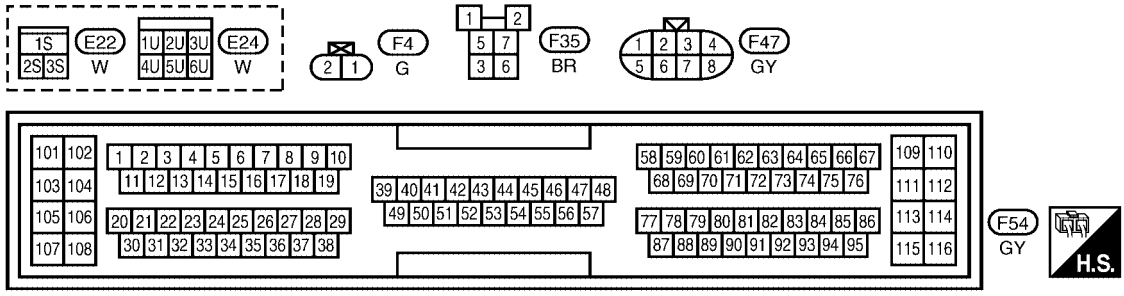
Following the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002GM

EC-IVC-01



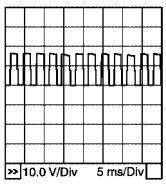


BBWA0232E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
107	G	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 9V★  PBIB0532E

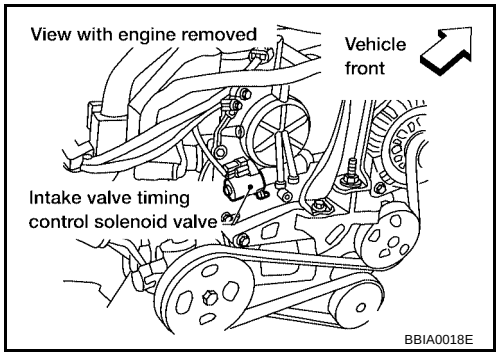
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002GN

1. CHECK POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



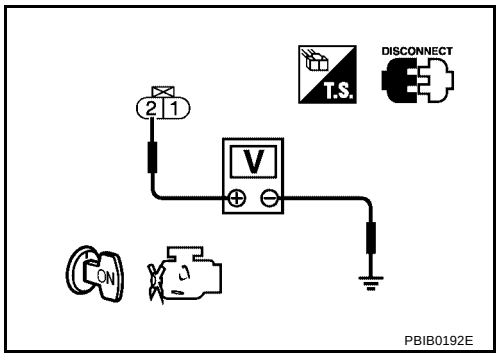
BBIA0018E

4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



PBIB0192E

2. DETECT MALFUNCTION PART

Check the following.

- Harness for open or short between intake valve timing control solenoid valve and ECM
- Harness for open or short between intake valve timing control solenoid valve and ECM relay

>> Repair or replace harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 107 and intake valve timing control solenoid valve terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-1603, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace intake valve timing control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

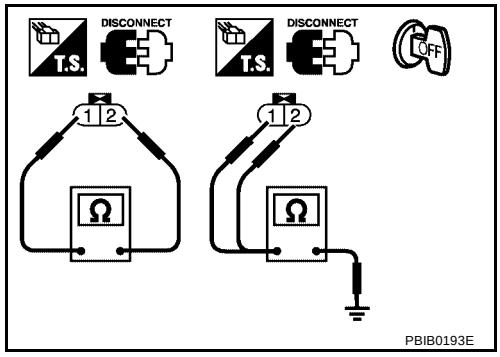
Component Inspection

UBS002GO

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

UBS002GP

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-134, "TIMING CHAIN" .

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

UBS0056D

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS0056E

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters fail-safe mode and the MIL lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

UBS0056F

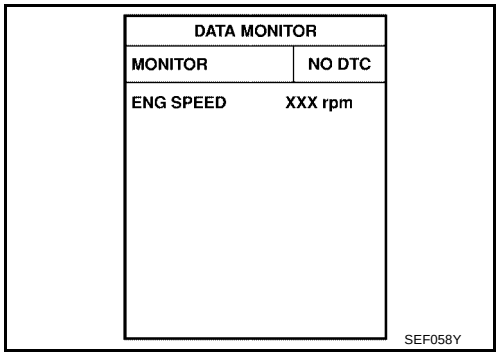
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
  If there is no malfunction on “PROCEDURE FOR MALFUNCTION A AND B”, perform “PROCEDURE FOR MALFUNCTION C”.
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-1605, "Diagnostic Procedure" .



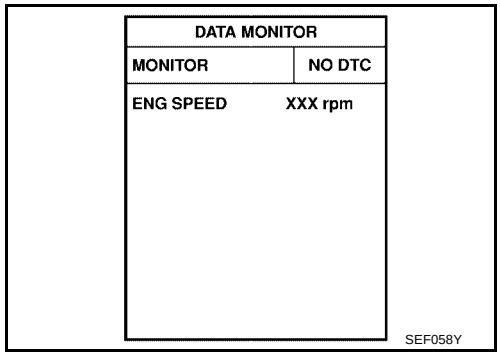
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-1605, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

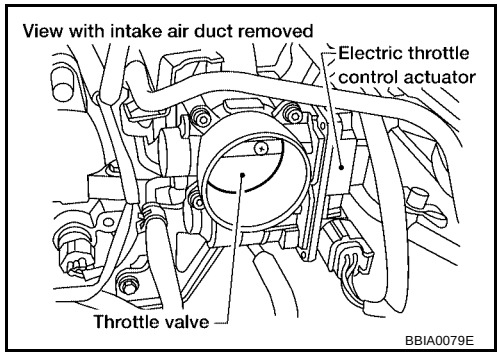
UBS0056G

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

UBS006JN

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-1604 or EC-1613 .
Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS006JO

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted) ● Electric throttle control actuator

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

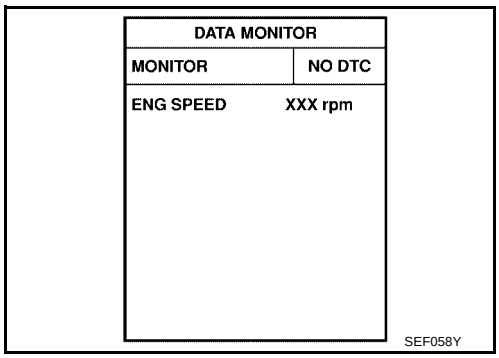
DTC Confirmation Procedure

UBS006JP

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1608, "Diagnostic Procedure" .



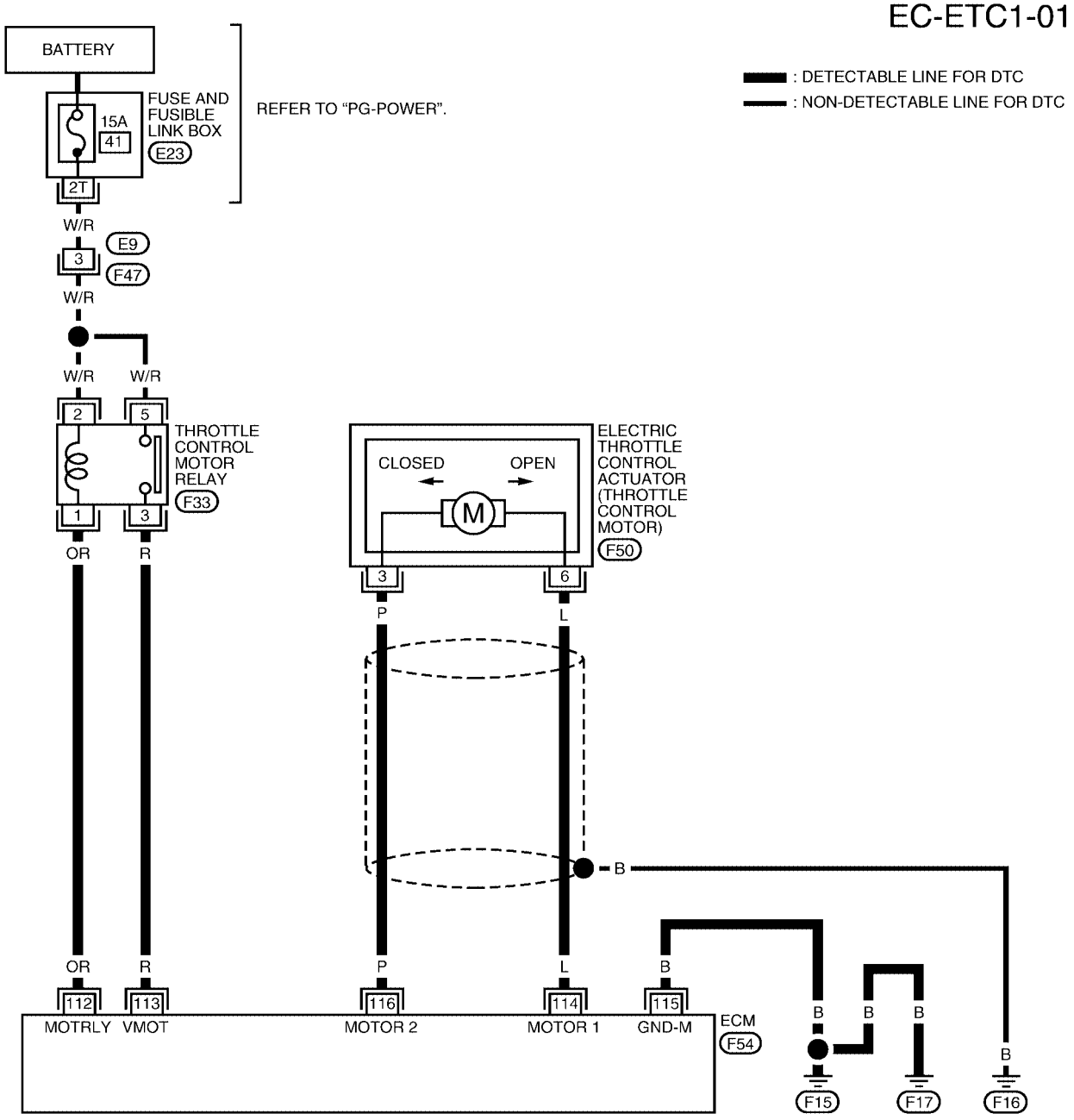
WITH GST

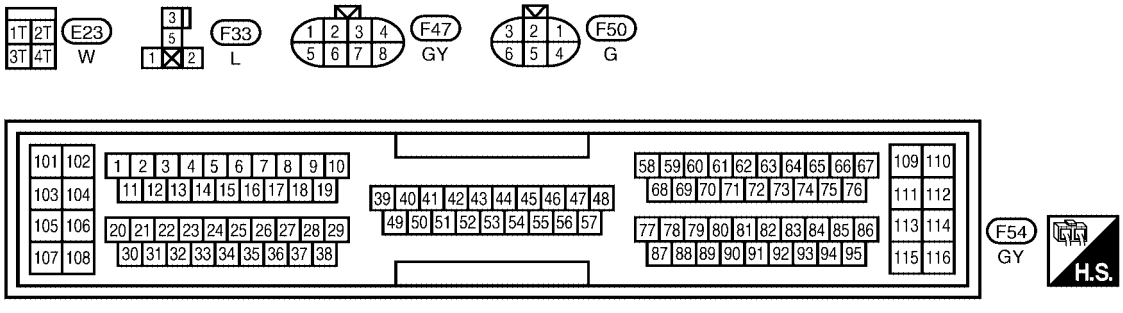
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006JQ

EC-ETC1-01



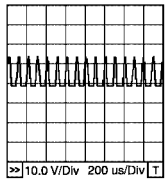
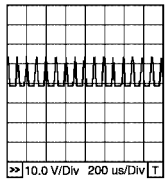


BBWA0249E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
112	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
113	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
114	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
115	B	Throttle control motor ground	**[Engine is running]** ● Idle speed	Approximately 0V
116	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

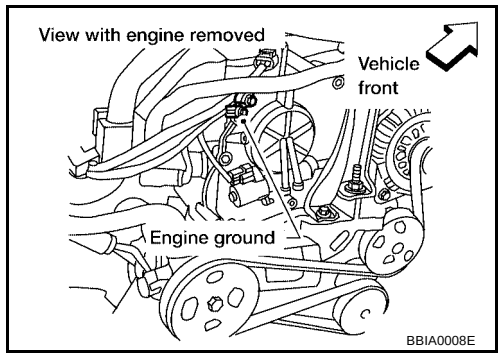
Diagnostic Procedure

UBS006JR

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



BBIA0008E

2. CHECK THROTTLE CONTROL MOTOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 115 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

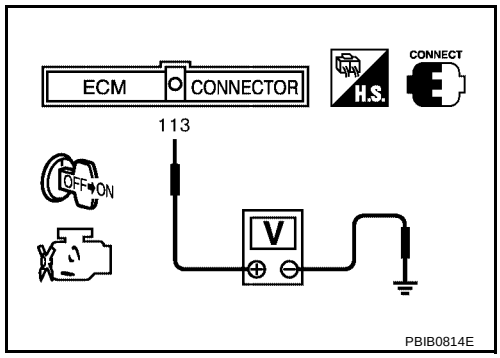
OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Reconnect harness connectors disconnected.
2. Check voltage between ECM terminal 113 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

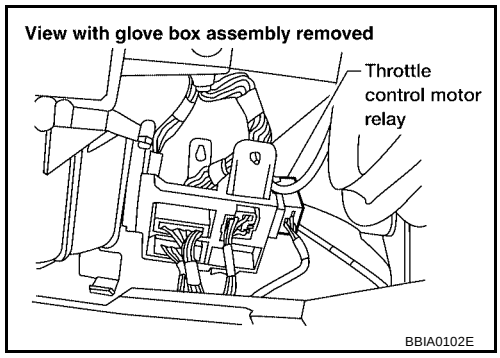


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay harness connector.

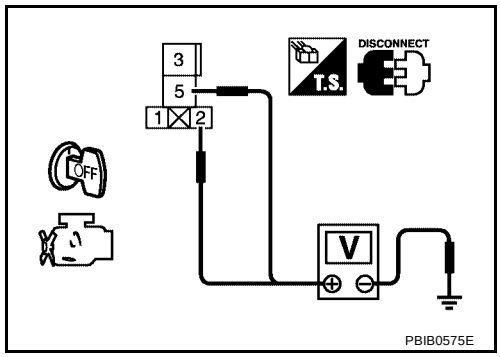


3. Check voltage between throttle control motor relay terminals 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse and fusible link box connector E23
- 15A fuse
- Harness for open or short between throttle control motor relay and battery

>> Repair or replace harness or connectors.

6. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check continuity between ECM terminal 113 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check continuity between ECM terminal 112 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-1612, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace throttle control motor relay.

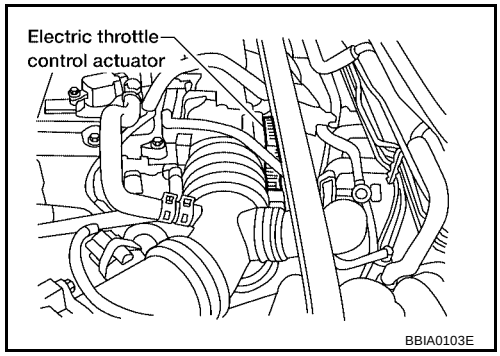
9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	114	Should not exist
	116	Should exist
6	114	Should exist
	116	Should not exist

5. Also check harness for short to ground and short to power.

OK or NG

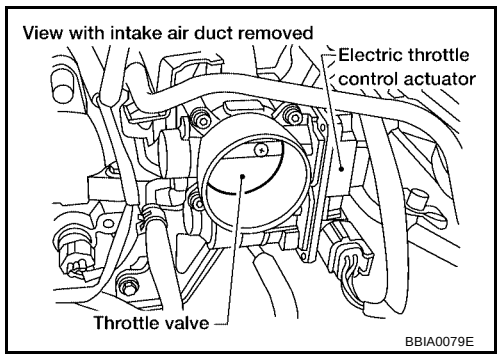
OK >> GO TO 11.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1612, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

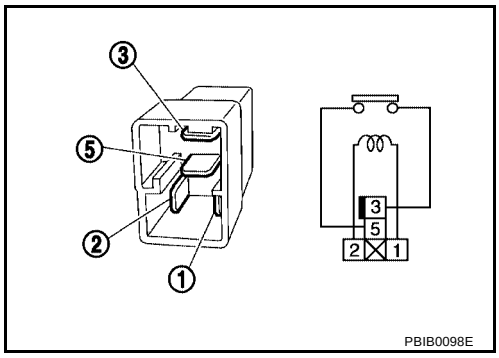
UBS006JS

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



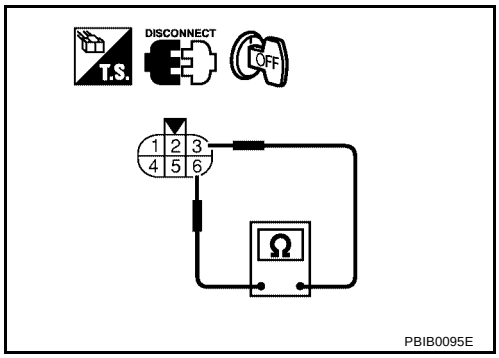
PBIB0098E

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-1255, "Throttle Valve Closed Position Learning" .
5. Perform EC-1255, "Idle Air Volume Learning" .



PBIB0095E

Remove and Installation

UBS006JT

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

UBS006JU

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

UBS006JV

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

UBS006JW

These self-diagnosis have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	● Harness or connectors (Throttle control motor relay circuit is open) ● Throttle control motor relay

FAIL-SAFE MODE

When the DTC is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

UBS006JX

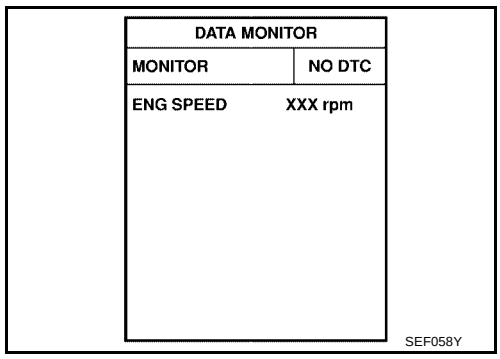
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-1616, "Diagnostic Procedure" .



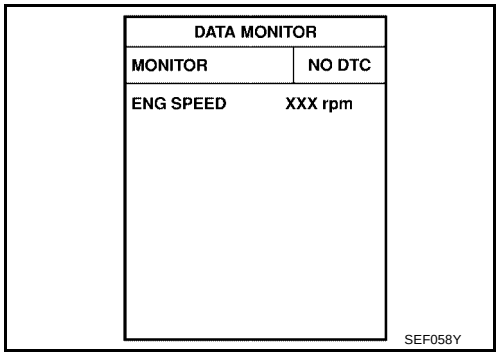
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1616, "Diagnostic Procedure" .



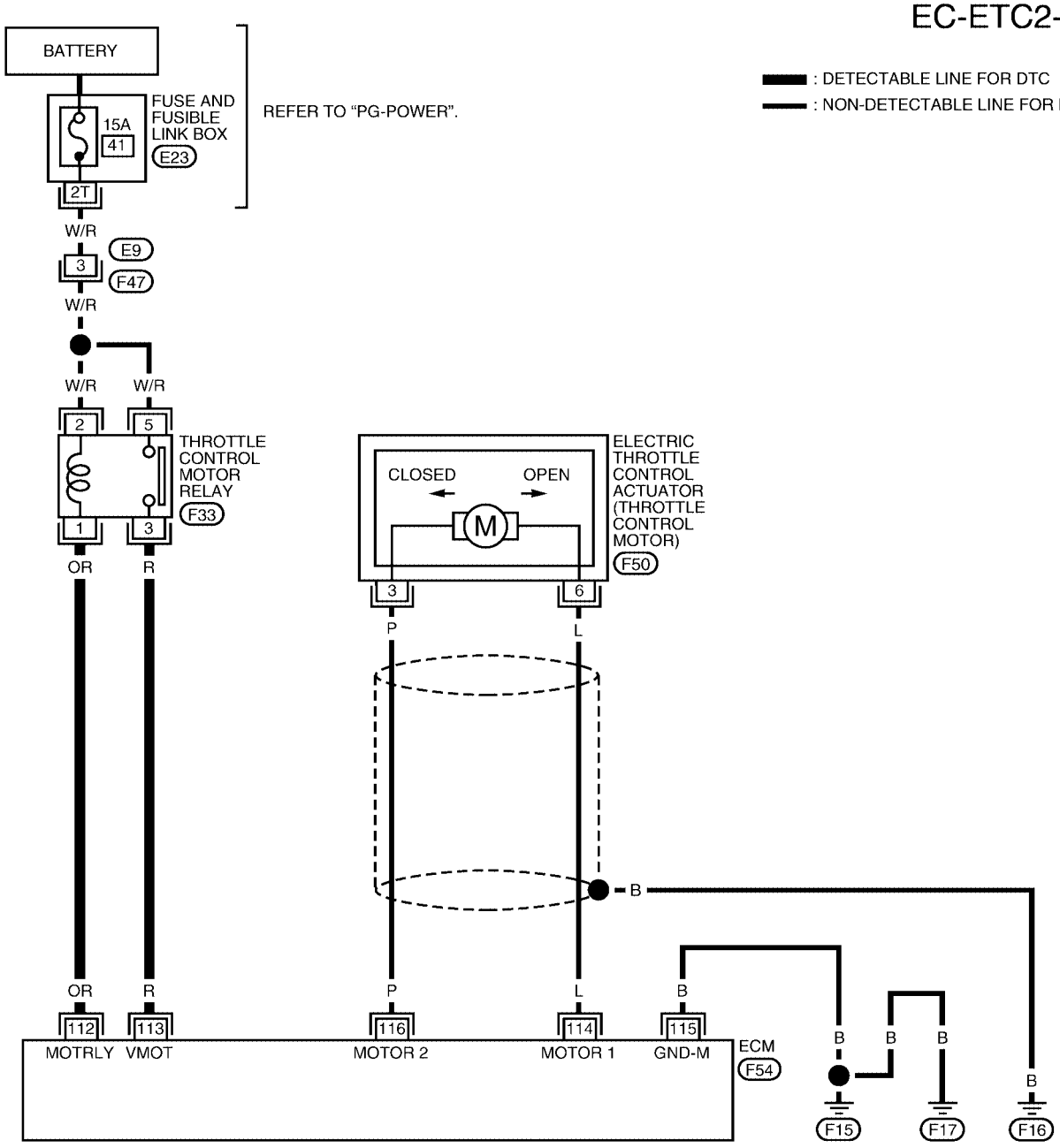
With GST

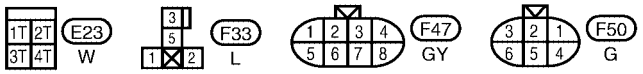
Follow the procedure “With CONSULT-II” above.

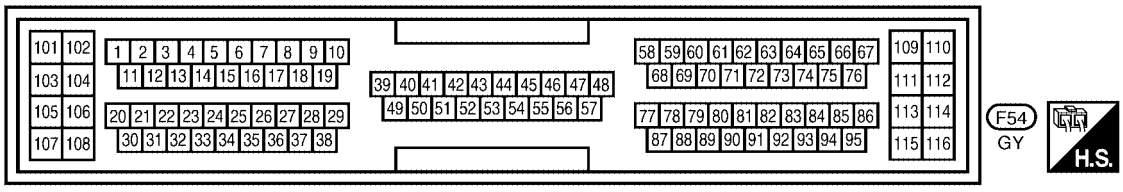
Wiring Diagram

UBS006JY

EC-ETC2-01







BBWA0250E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

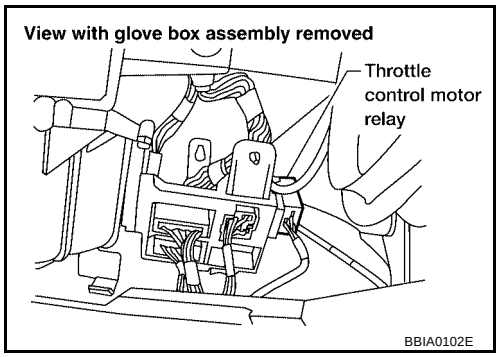
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
112	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
113	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS006JZ

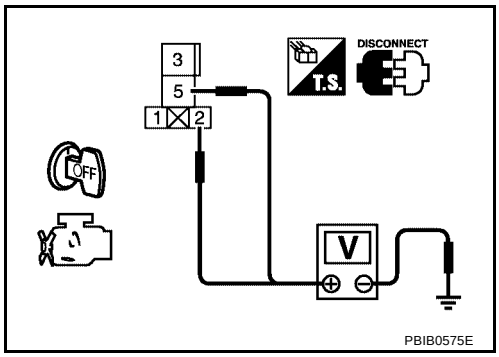
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay harness connector.



3. Check voltage between throttle control motor relay terminal 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse and fusible link connector E23
- 15A fuse
- Harness for open or short between throttle control motor relay and battery

>> Repair or replace harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check continuity between ECM terminal 113 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check continuity between ECM terminal 112 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-1617, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace throttle control motor relay.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

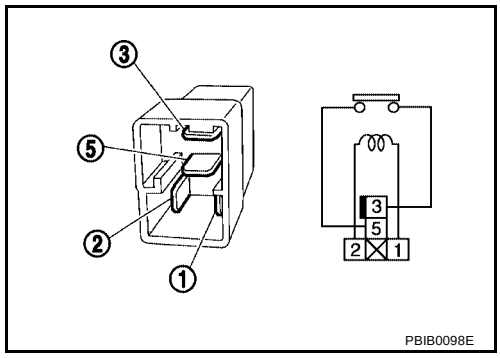
UBS006K0

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



PBIB0098E

DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

UBS006K1

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS006K2

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

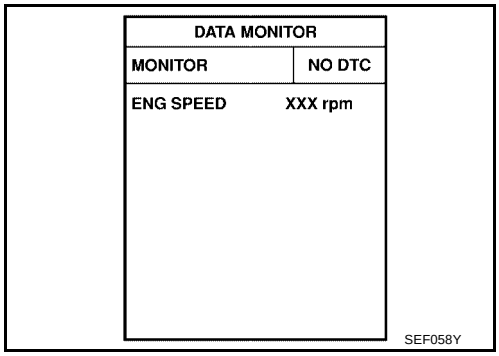
DTC Confirmation Procedure

UBS006K3

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1620, "Diagnostic Procedure" .



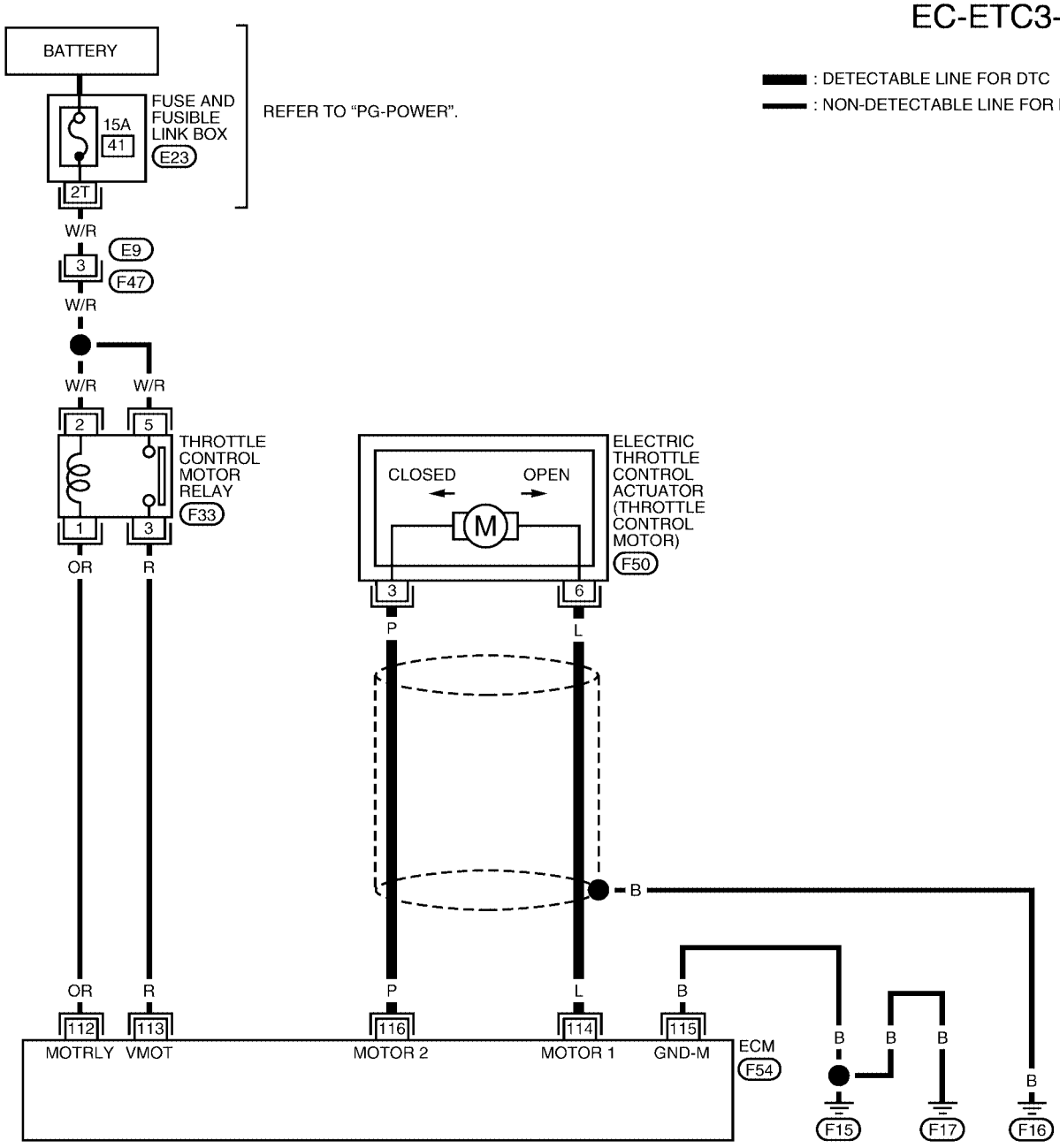
WITH GST

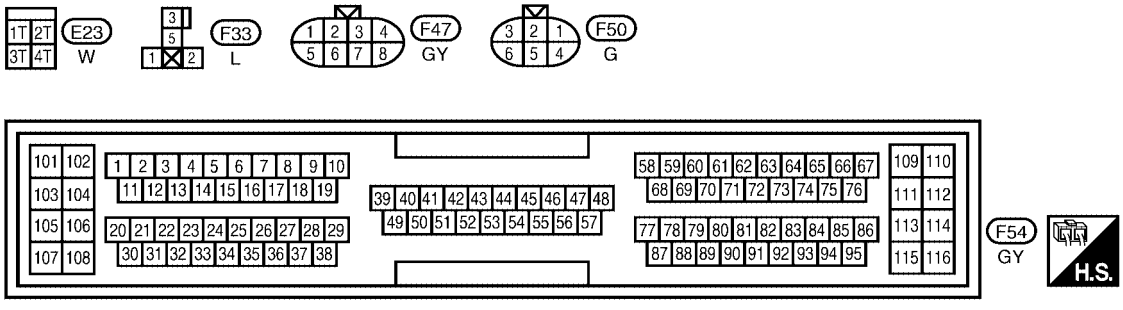
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006K4

EC-ETC3-01



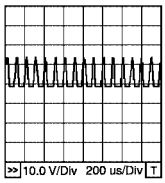
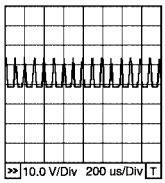


BBWA0251E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
114	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
116	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

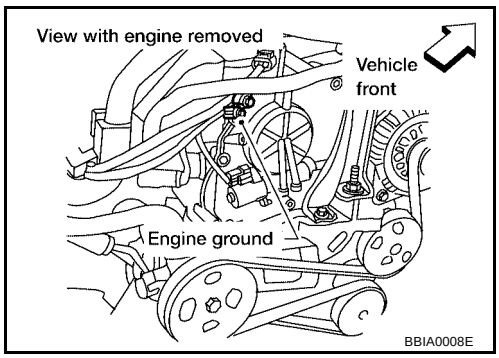
Diagnostic Procedure

UBS006K5

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

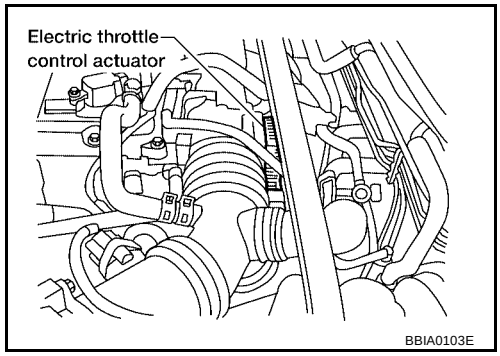
>> GO TO 2.



BBIA0008E

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	114	Should not exist
	116	Should exist
6	114	Should exist
	116	Should not exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1621, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

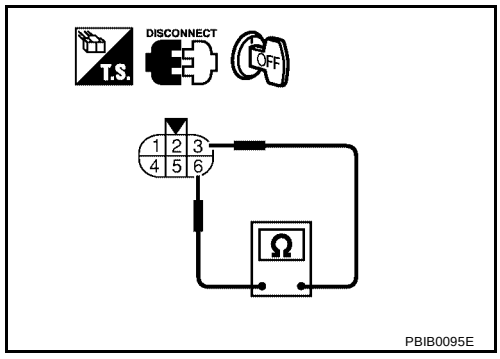
Component Inspection

UBS006K6

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-1255, "Throttle Valve Closed Position Learning" .
5. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006K7

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

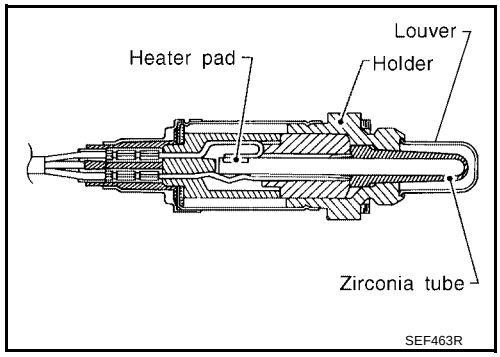
DTC P1143 HO2S1

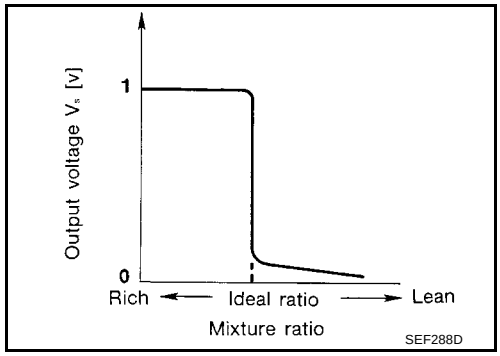
PFP:22690

Component Description

UBS002HF

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002HG

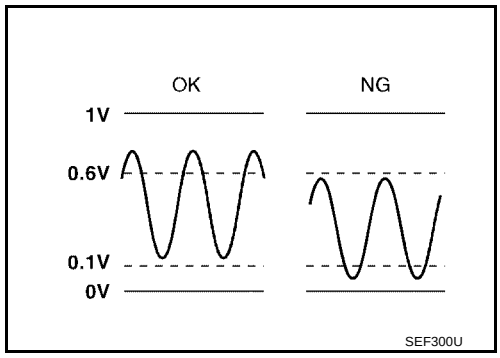
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002HH

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1143 1143	Heated oxygen sensor 1 lean shift monitoring	The maximum and minimum voltage from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

UBS002HI

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

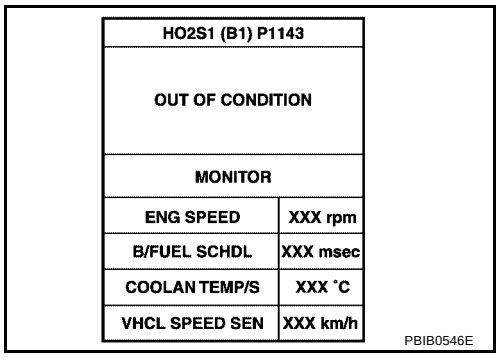
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

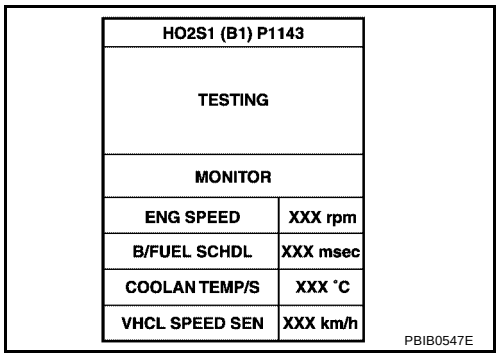
   NOTE:

   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



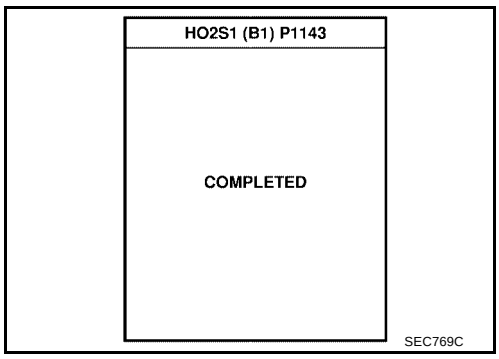
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,200 - 3,200 rpm
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	1.9 - 13.0 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1625, "Diagnostic Procedure" .



Overall Function Check

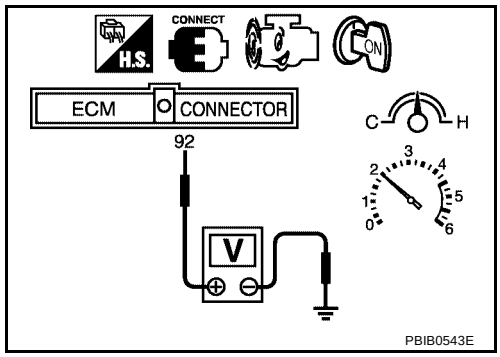
UBS002HJ

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.

2. Set voltmeter probes between ECM terminal 92 [HO2S1(B1) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is over 0.6V at at least one time.
   - The minimum voltage is over 0.1V at at least one time.
4. If NG, go to EC-1625, "Diagnostic Procedure" .



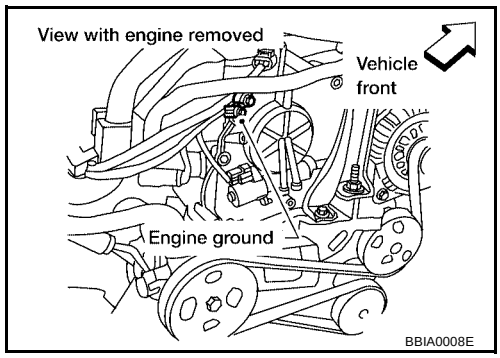
Diagnostic Procedure

UBS002HK

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



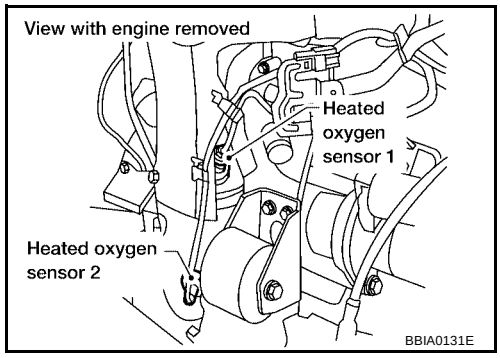
2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque:

40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

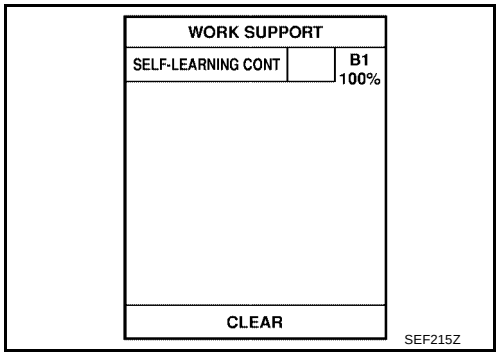
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

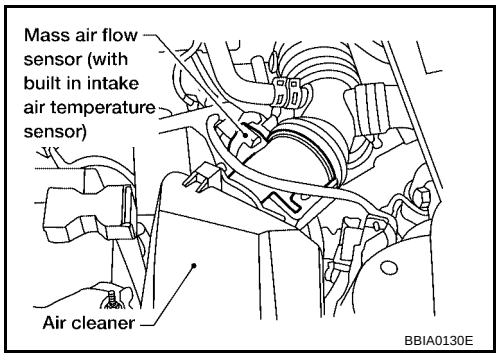
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-1442 .
No >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1361, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1627, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-1408, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

UBS002HL

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

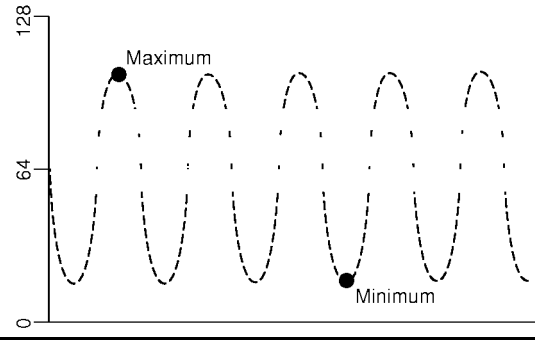
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



CAUTION:

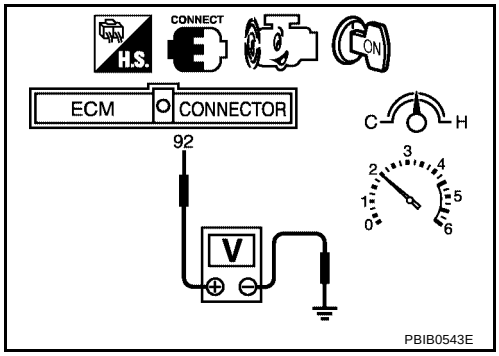
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002HM

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

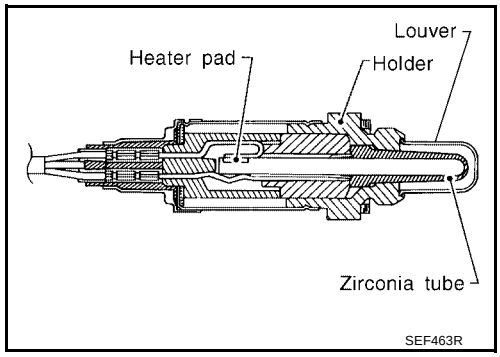
DTC P1144 HO2S1

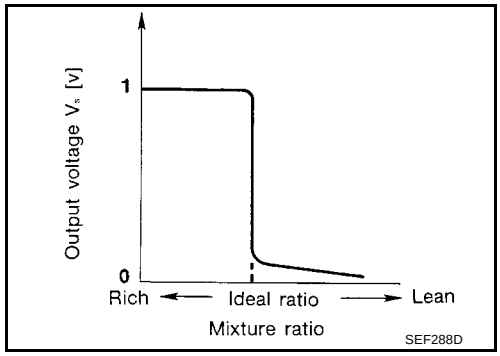
PFP:22690

Component Description

UBS002HN

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002HO

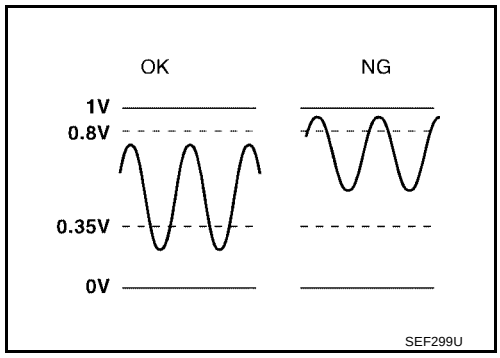
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002HP

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144 1144	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors

DTC Confirmation Procedure

UBS002HQ

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

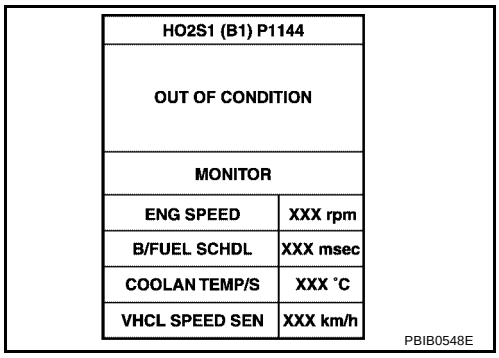
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 5 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1144” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

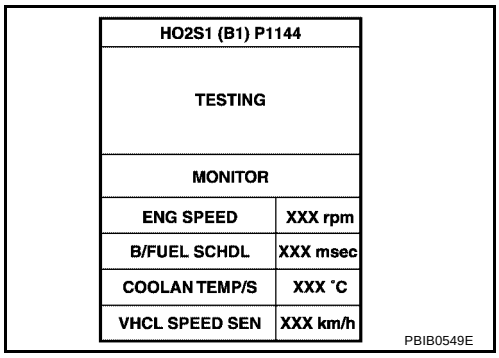
   NOTE:

   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



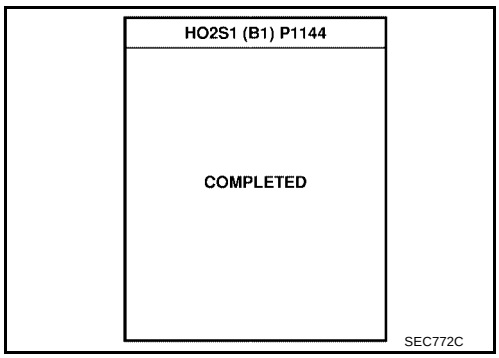
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,200 - 3,200 rpm
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	1.9 - 13.0 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1631, "Diagnostic Procedure" .



Overall Function Check

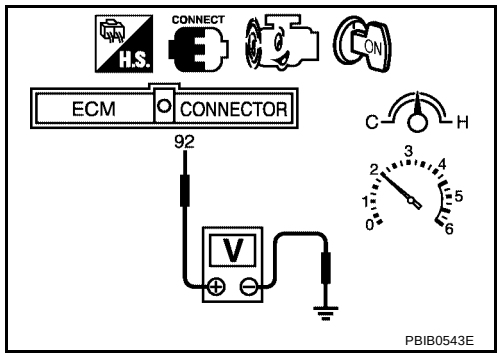
UBS002HR

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.

2. Set voltmeter probes between ECM terminal 92 [HO2S1(B1) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is below 0.8V at least one time.
   - The minimum voltage is below 0.35V at least one time.
4. If NG, go to EC-1631, "Diagnostic Procedure" .



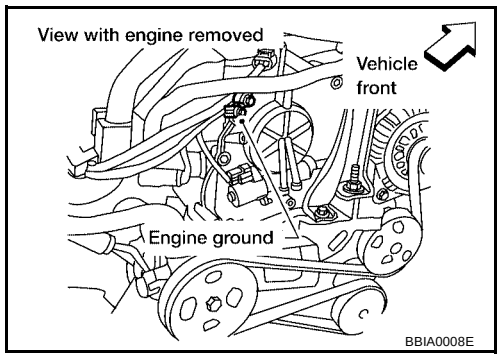
Diagnostic Procedure

UBS002HS

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

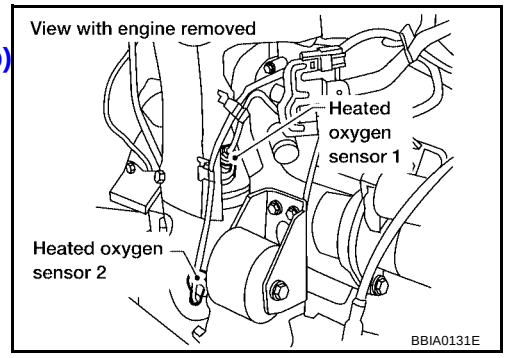


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

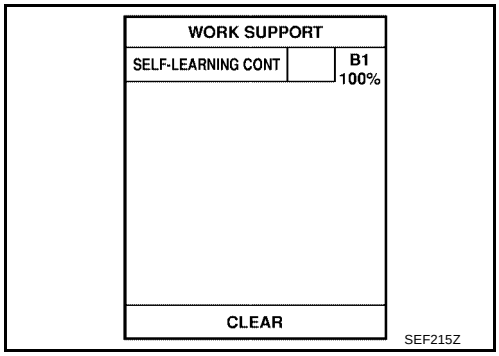
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

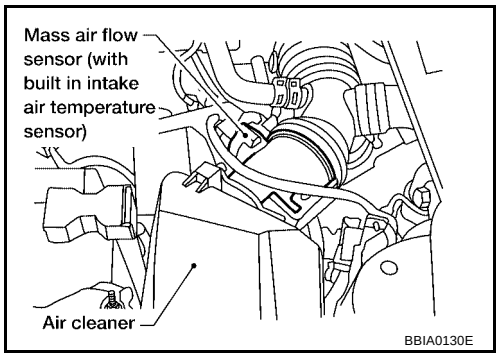
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-1449 .
No >> GO TO 4.

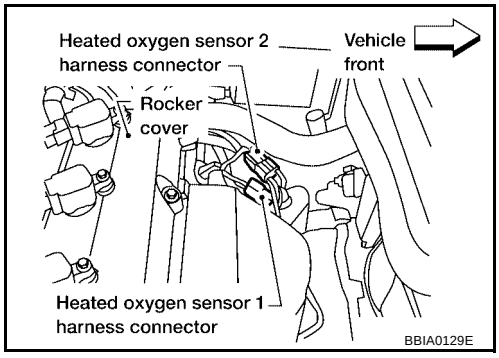
4. CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.



5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1361, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1633, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-1408, "Wiring Diagram" .

>> **INSPECTION END**

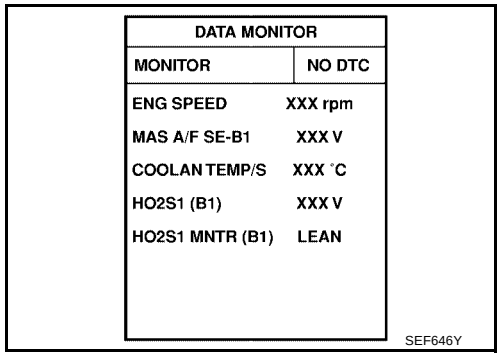
Component Inspection

UBS002HT

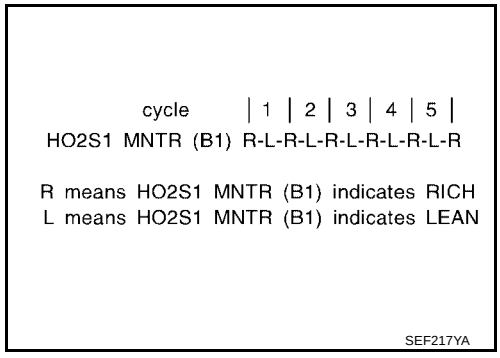
HEATED OXYGEN SENSOR 1

With CONSULT-II

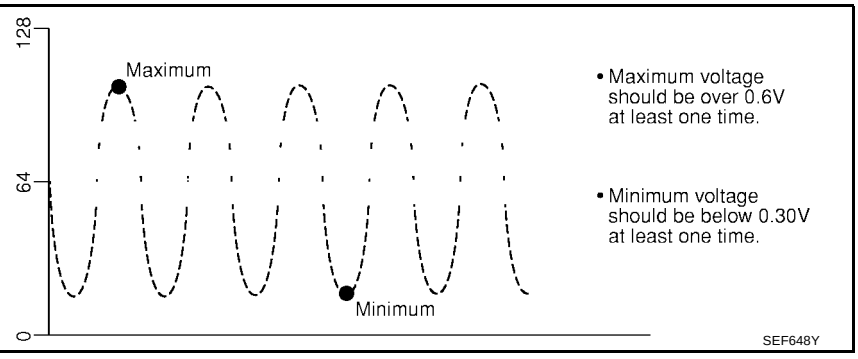
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



CAUTION:

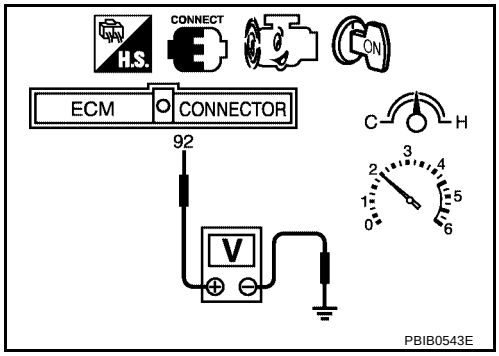
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002HU

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

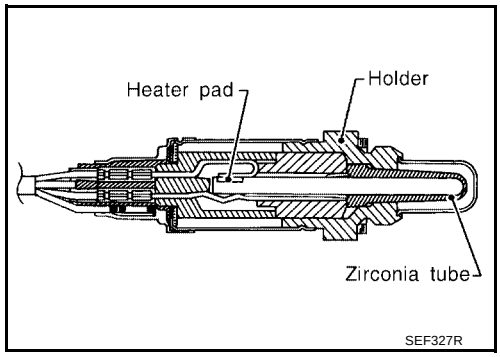
DTC P1146 HO2S2

PFP:226A0

Component Description

UBS002HV

The heated oxygen sensor 2, after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS002HW

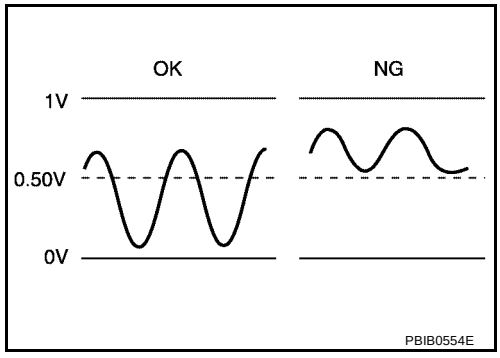
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Warm-up condition ● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

On Board Diagnosis Logic

UBS002HX

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146 1146	Heated oxygen sensor 2 minimum voltage monitoring	The minimum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors

DTC Confirmation Procedure

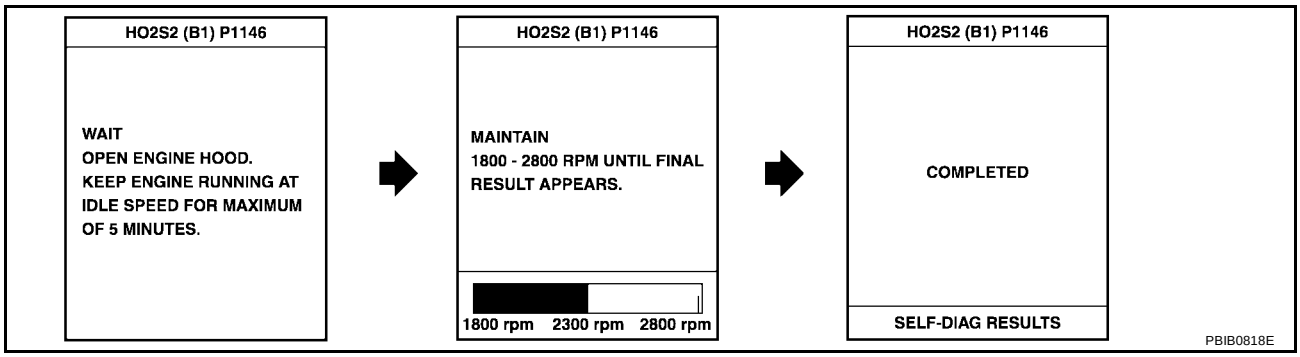
UBS002HY

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Open engine hood before conducting following procedure.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.

4. Let engine idle for one minutes.
5. Select “HO2S2 (B1) P1146” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, go to EC-1638, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANTEMP/S” indiction on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step3.

Overall Function Check

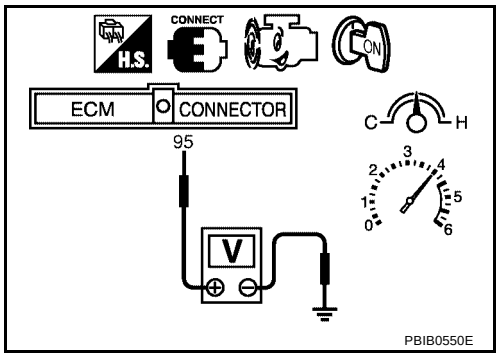
UBS002HZ

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.50V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.

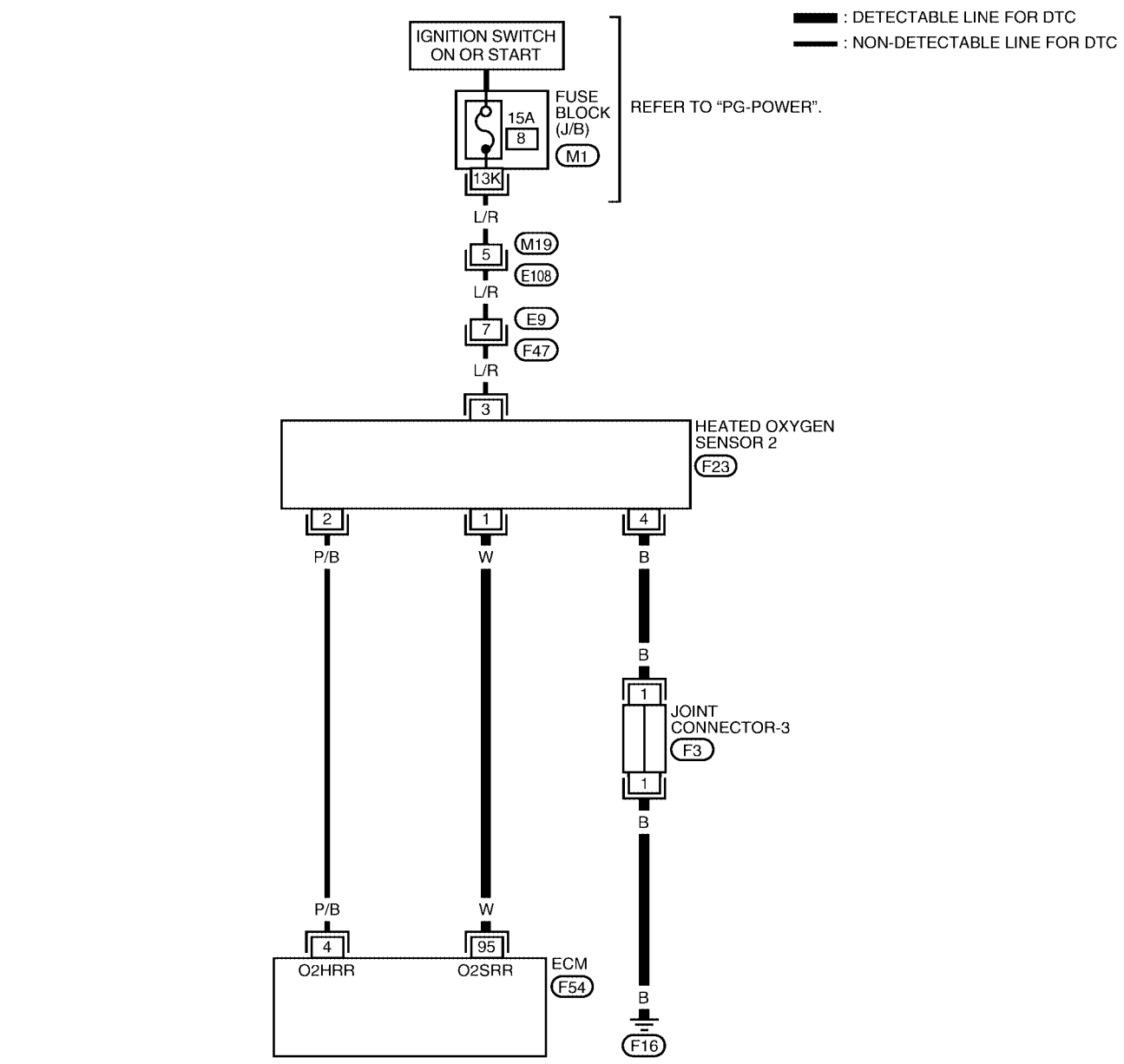


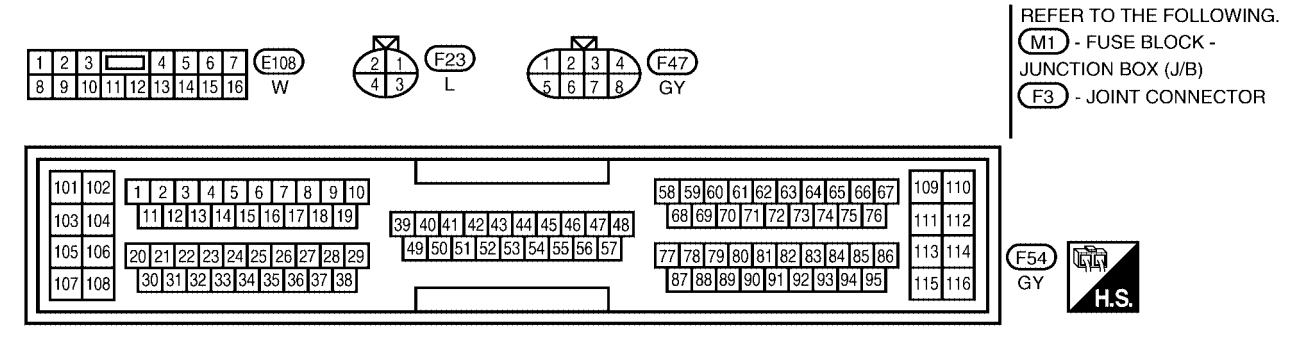
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, go to EC-1638, "Diagnostic Procedure" .

Wiring Diagram

UBS002I0

EC-HO2S2-01





BBWA0415E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600rpm after the following conditions are met. – Engine after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V

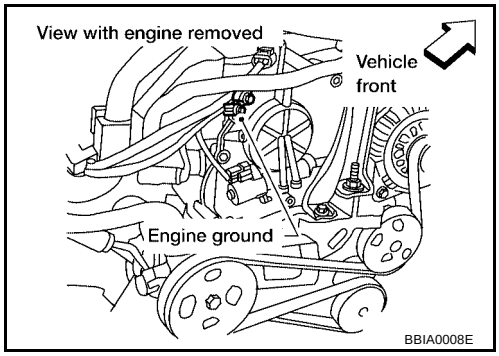
Diagnostic Procedure

UBS002I1

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

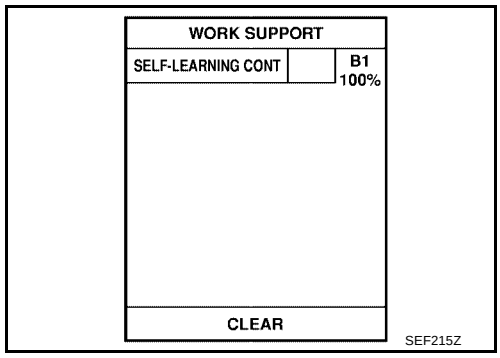
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

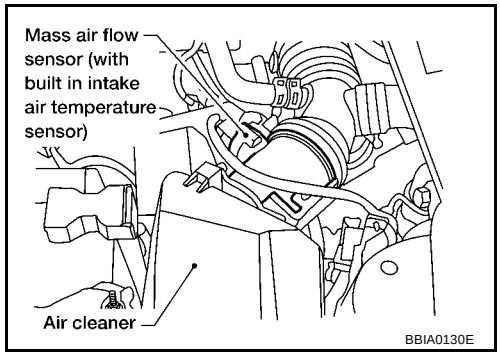
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-1449 .
No >> GO TO 3.

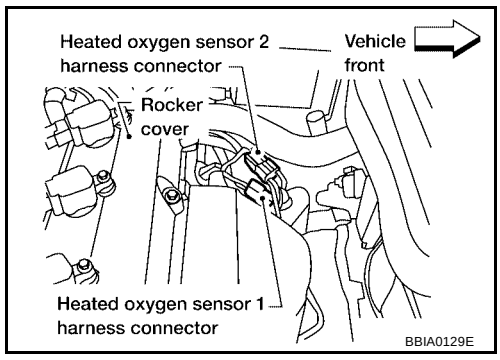
3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open and short between HO2S2 and engine ground

>> Repair open circuit or short to power in harness or connectors.

5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 95 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Check harness continuity between ECM terminal 95 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.
4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1640, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

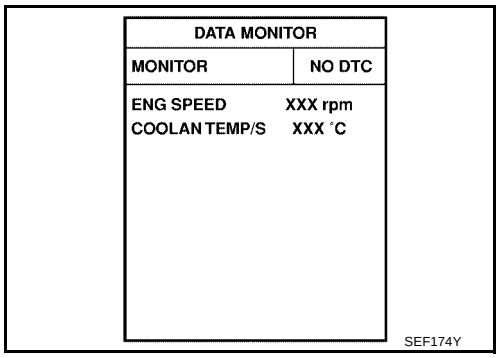
Component Inspection

UBS002I2

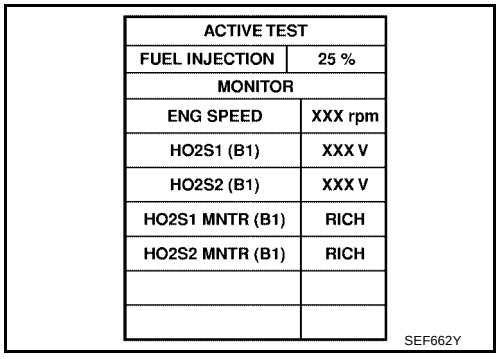
HEATED OXYGEN SENSOR 2

With CONSULT-II

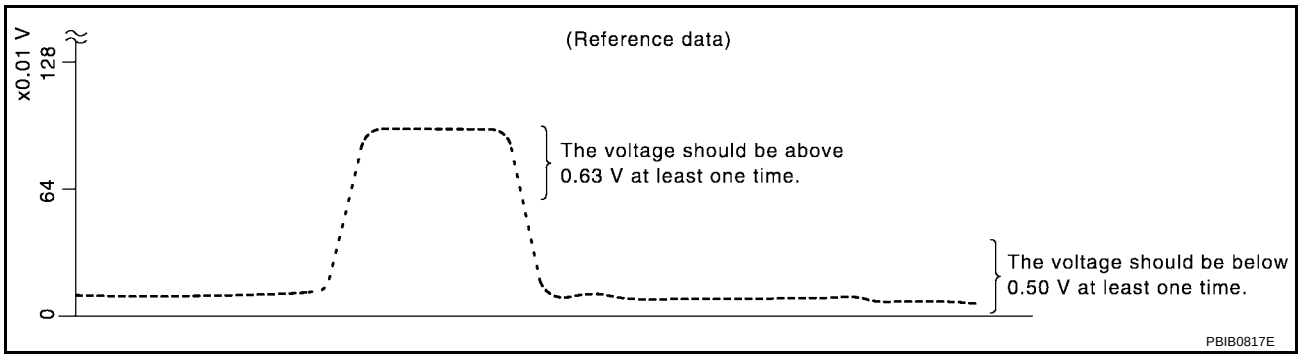
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minutes.



6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



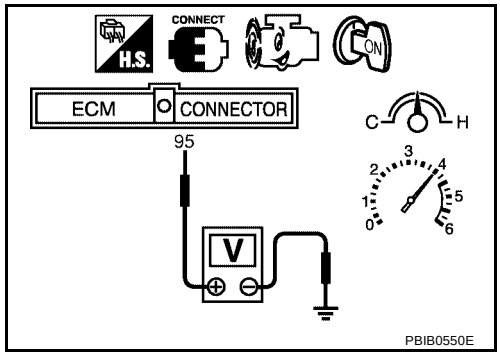
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002I3

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

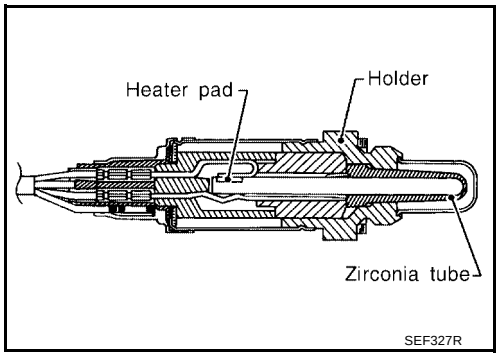
DTC P1147 HO2S2

PFP:226A0

Component Description

UBS002I4

The heated oxygen sensor 2, after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS002I5

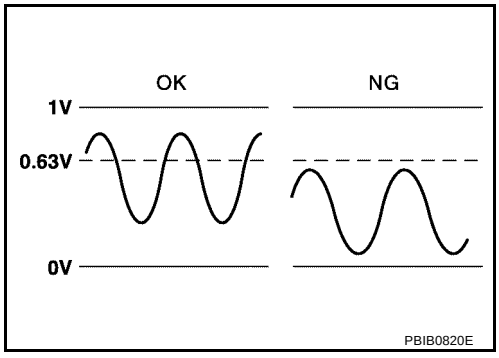
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Warm-up condition	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.		LEAN ←→ RICH

On Board Diagnosis Logic

UBS002I6

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147 1147	Heated oxygen sensor 2 maximum voltage monitoring	The maximum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

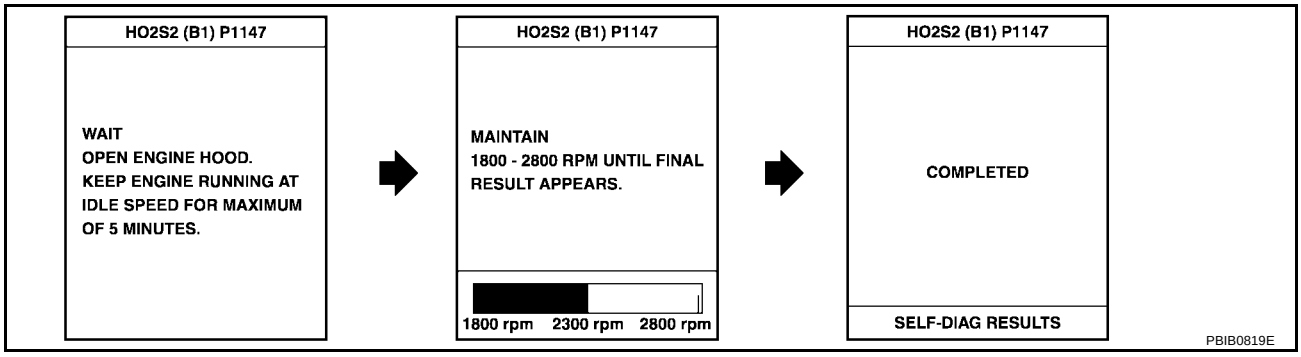
UBS002I7

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
For the best result, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “HO2S2 (B1) P1147” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, go to EC-1645, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 3.

Overall Function Check

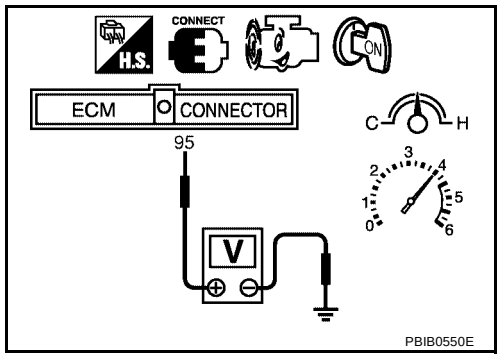
UBS002I8

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
5. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage can be confirmed in step 5, step 6 is not necessary.

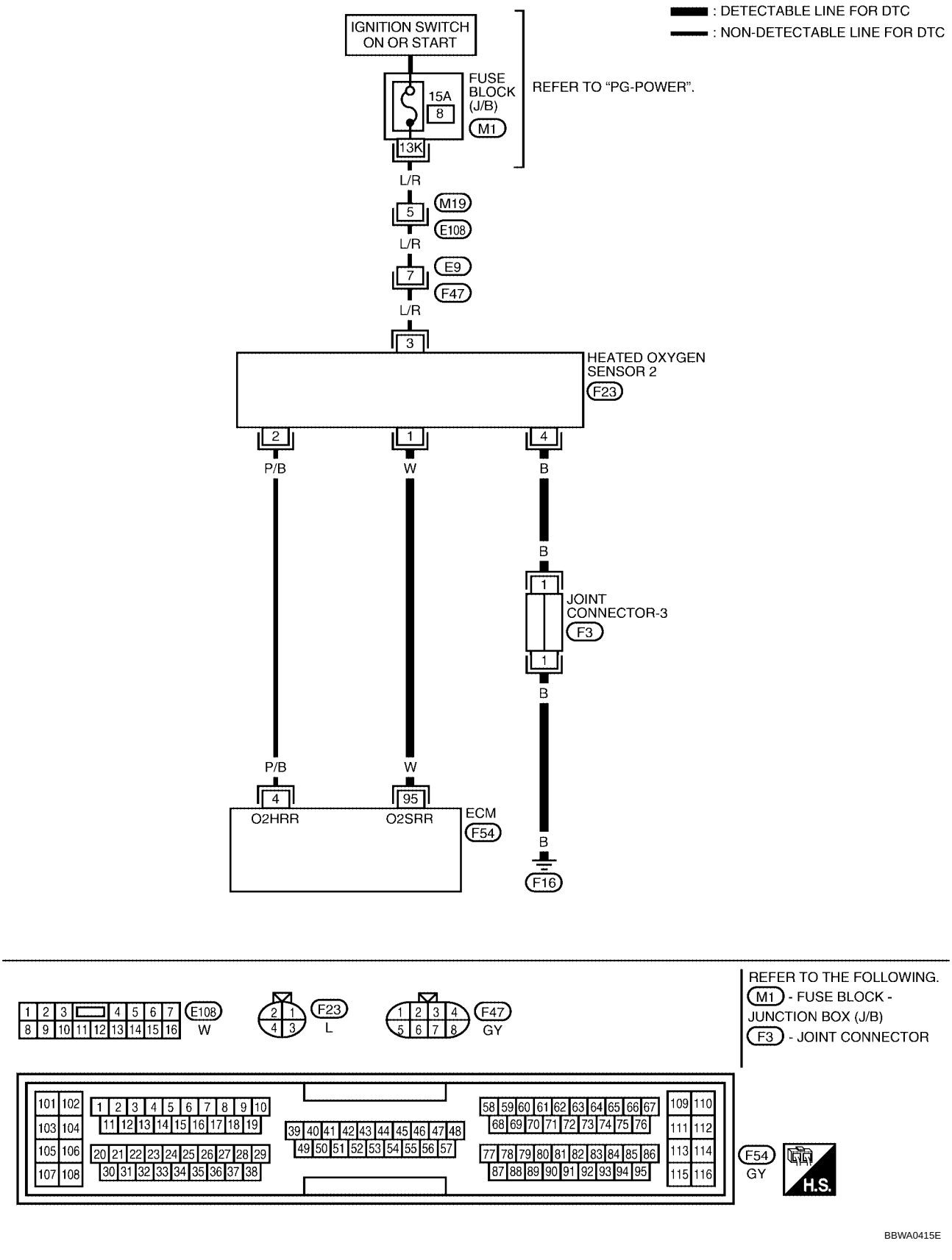


6. Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be above 0.63V at least once during this procedure.
7. If NG, go to EC-1645, "Diagnostic Procedure" .

Wiring Diagram

UBS002I9

EC-HO2S2-01



BBWA0415E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600rpm after the following conditions are met. – Engine after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V

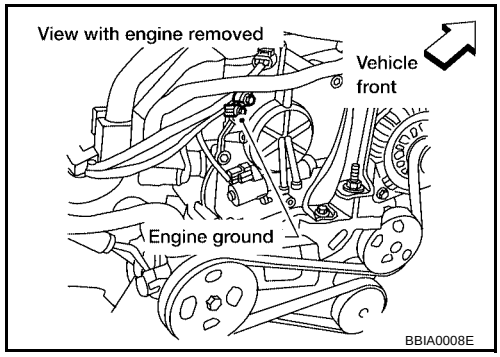
Diagnostic Procedure

UBS002IA

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

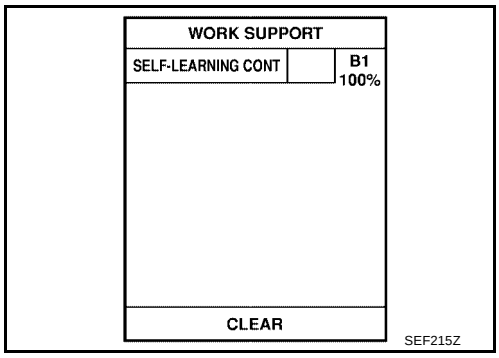
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

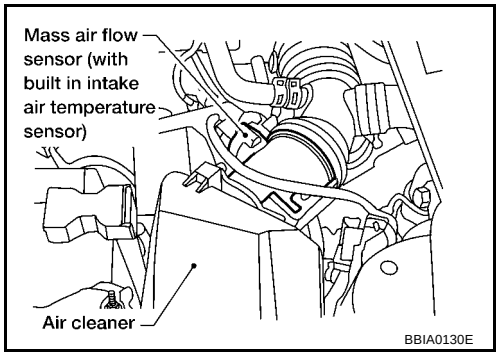
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-1442 .
No >> GO TO 3.

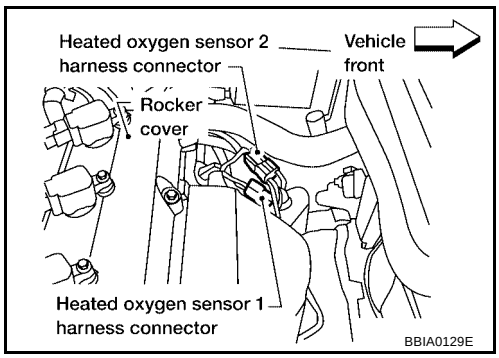
3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open or short between HO2S2 and engine ground

>> Repair open circuit or short to power in harness or connectors.

5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 95 and HO2S2 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Check harness continuity between ECM terminal 95 or HO2S2 terminal 1 and ground. Refer to Wiring Diagram.

Continuity should not exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1647, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

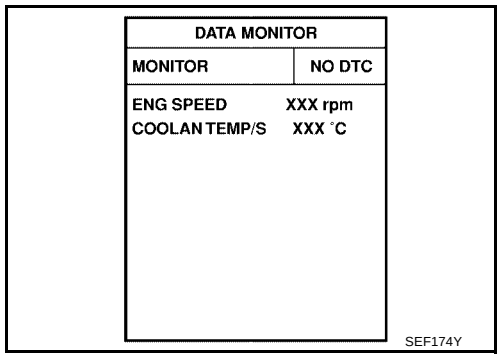
Component Inspection

UBS002IB

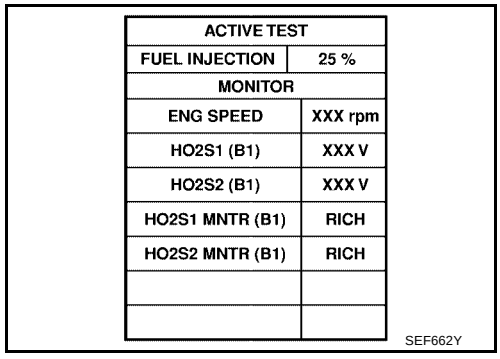
HEATED OXYGEN SENSOR 2

With CONSULT-II

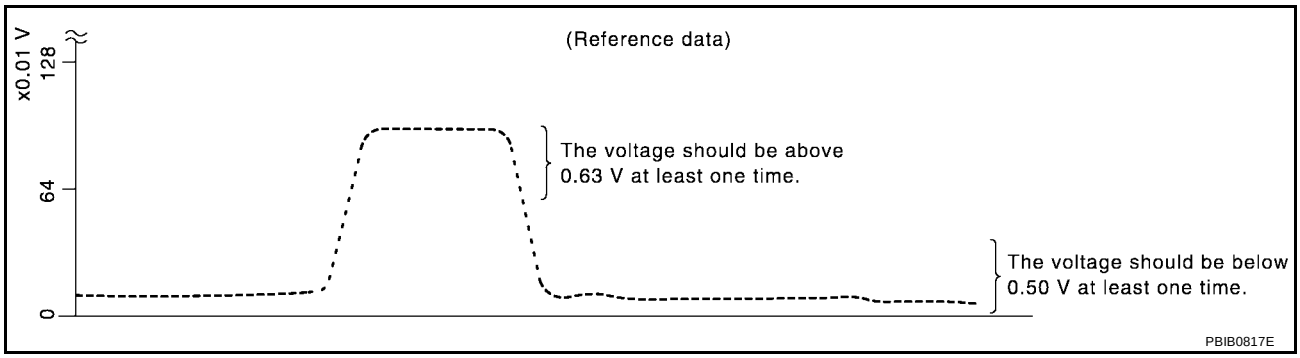
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minutes.



6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



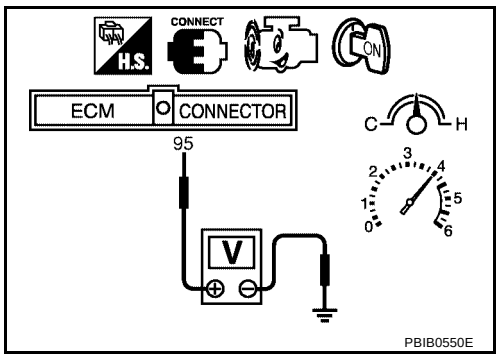
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is –25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002IC

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P1148 CLOSED LOOP CONTROL

PFP:22690

On Board Diagnosis Logic

UBS002ID

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148	Closed loop control function	The closed loop control function does not operate even when vehicle is driving in the specified condition.	● The heated oxygen sensor 1 circuit is open or shorted. ● Heated oxygen sensor 1 ● Heated oxygen sensor heater

DTC Confirmation Procedure

UBS002IE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

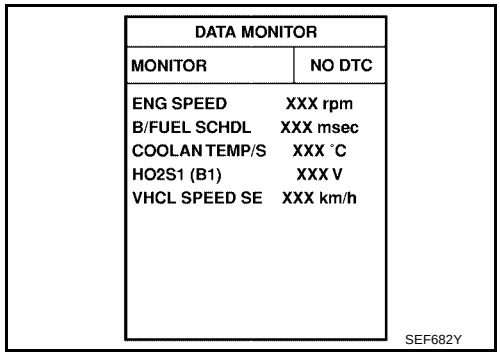
TESTING CONDITION:

- **Never raise engine speed above 3,600 rpm during the “DTC Confirmation Procedure”. If the engine speed limit is exceeded, retry the procedure from step 2.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Hold engine speed at 2,000 rpm and check one of the following.
   - “HO2S1 (B1)” voltage should go above 0.70V at least once.
   - “HO2S1 (B1)” voltage should go below 0.21V at least once.

   If the check result is NG, perform EC-1650, "Diagnostic Procedure" .
   If the check result is OK, perform the following step.
4. Let engine idle at least 5 minutes.
5. Maintain the following condition at least 50 consecutive seconds.



B/FUEL SCHDL	2.8 msec or more
ENG SPEED	More than 1,600 rpm
Selector lever	Suitable position
VHCL SPEED SE	More than 70 km/h (43 MPH)

During this test, P0134 may be displayed on CONSULT-II screen.

6. If DTC is detected, go to EC-1650, "Diagnostic Procedure" .

Overall Function Check

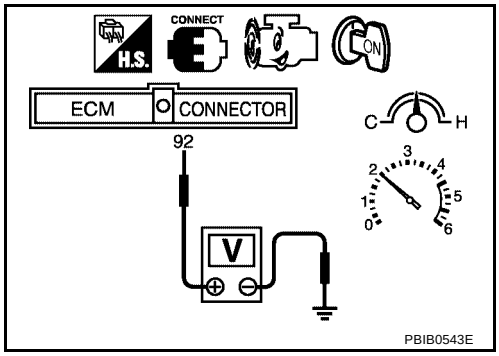
UBS002IF

Use this procedure to check the overall function of the closed loop control. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.

2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no-load.
   - The voltage should go above 0.70V at least once.
   - The voltage should go below 0.21V at least once.
4. If NG, go to EC-1650, "Diagnostic Procedure" .



Diagnostic Procedure

UBS002IG

Perform trouble diagnosis for “DTC P0133”, EC-1416 .

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

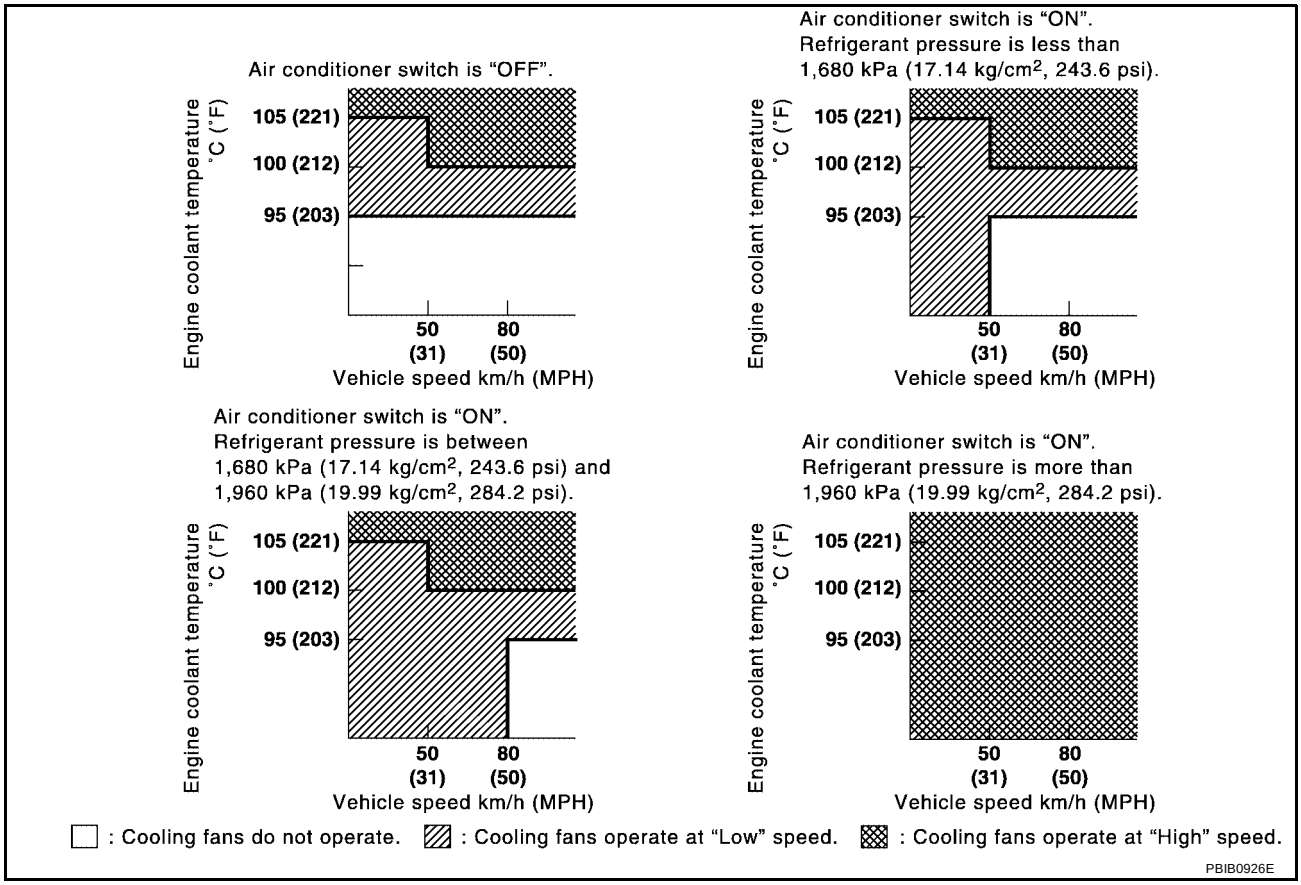
UBS002IH

COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

UBS002II

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

On Board Diagnosis Logic

UBS002IJ

This self-diagnosis has the one trip detection logic.
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-1662, "Main 12 Causes of Overheating" .

CAUTION:
When a malfunction is indicated, be sure to replace the coolant. Refer to MA-23, "Changing Engine Coolant" . Also, replace the engine oil. Refer to LU-17, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

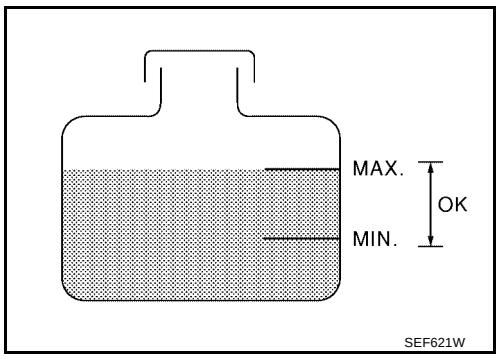
UBS002IK

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

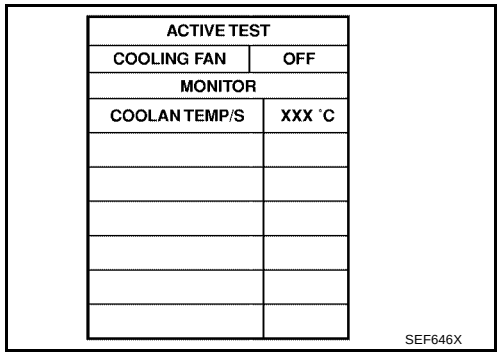
WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1655, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1655, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.

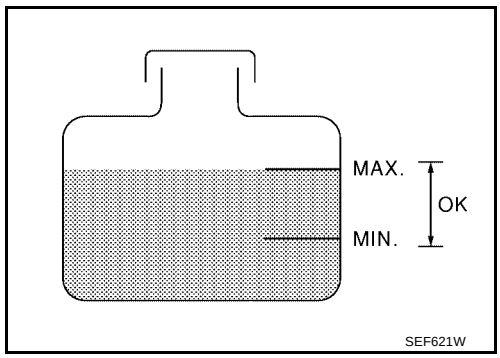


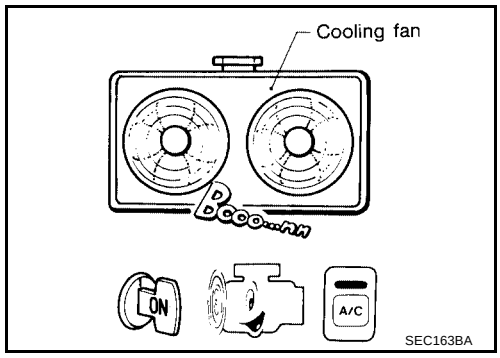
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-1655, "Diagnostic Procedure" .



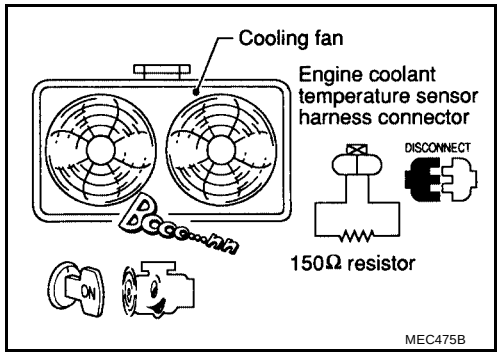
WITH GST

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1655, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1655, "Diagnostic Procedure" .
3. Start engine.
   Be careful not to overheat engine.
4. Turn air conditioner switch “ON”.
5. Turn blower fan switch “ON”.
6. Make sure that cooling fan operates at low speed.
   If NG, go to EC-1655, "Diagnostic Procedure" .
   If OK, go to the following step.
7. Turn ignition switch “OFF”.
8. Turn air conditioner switch and blower fan switch “OFF”.
9. Disconnect engine coolant temperature sensor harness connector.
10. Connect 150Ω resistor to engine coolant temperature sensor harness connector.



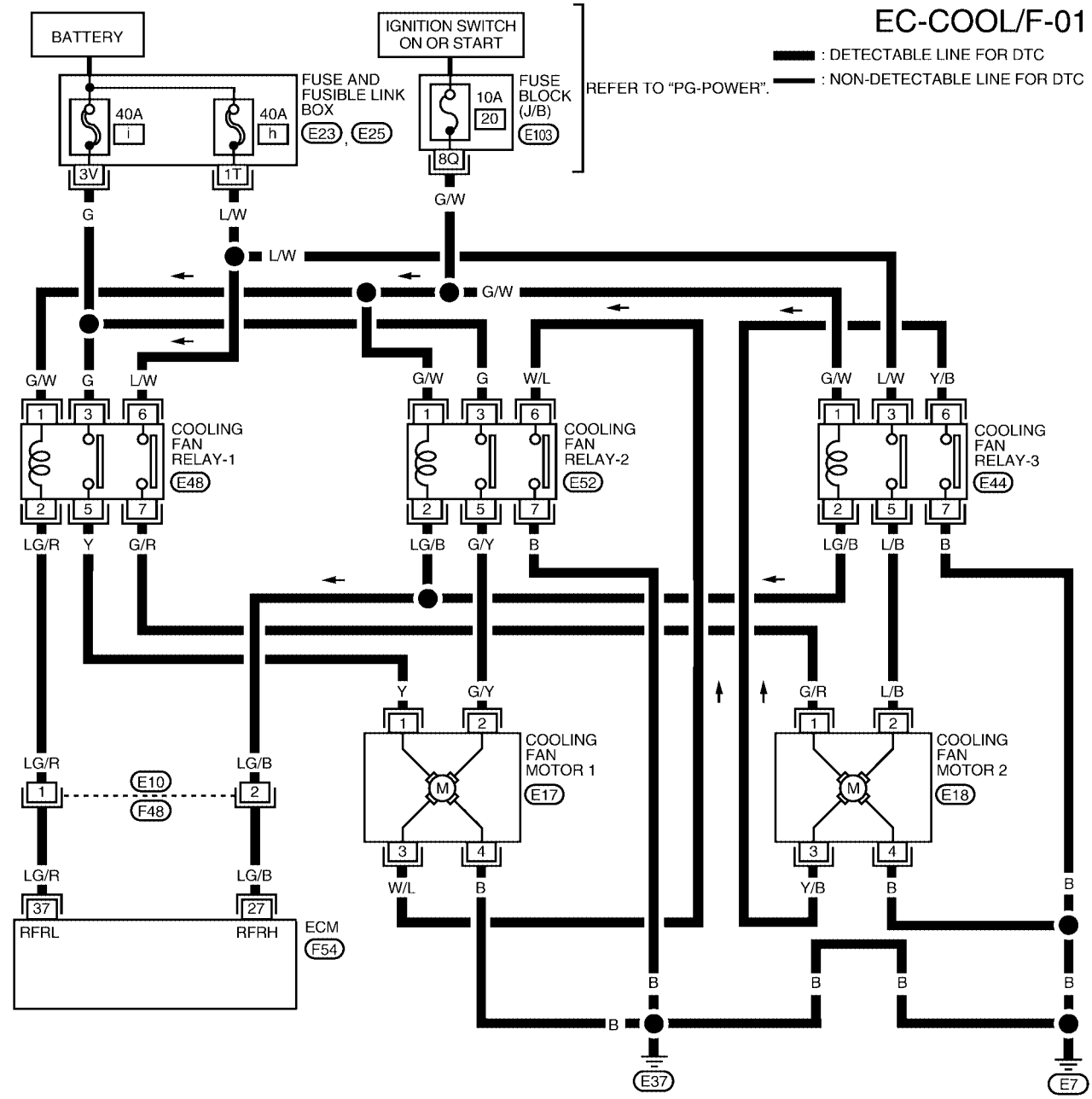


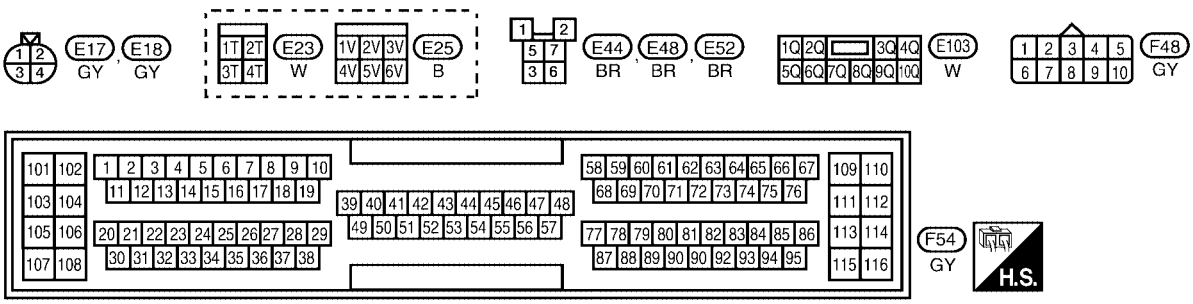
11. Restart engine and make sure that cooling fan operates at higher speed than low speed.
    Be careful not to overheat engine.
12. If NG, go to EC-1655, "Diagnostic Procedure" .



Wiring Diagram

UBS002IL





BBWA0431E

Diagnostic Procedure

UBS002IM

1. INSPECTION START

Do you have CONSULT-II?

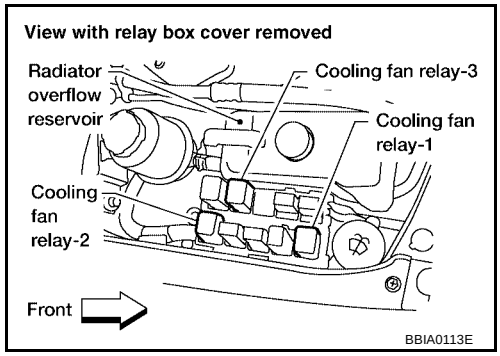
Yes or No

Yes >> GO TO 2.
No >> GO TO 4.

2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

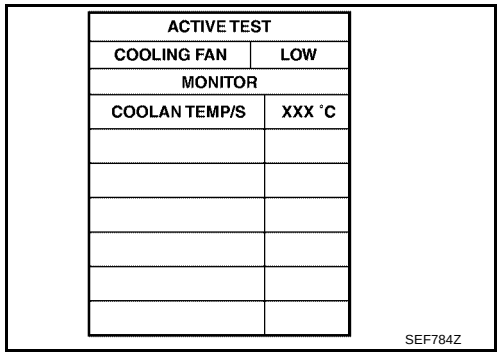
1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.



3. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “LOW” on the CONSULT-II screen.
4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 3.
NG >> Check cooling fan low speed control circuit. (Go to EC-1659, "PROCEDURE A" .)



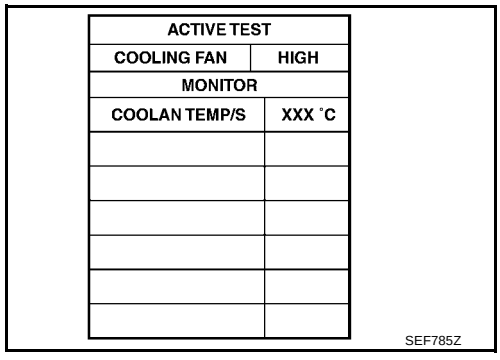
3. CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relays-2 and -3.
3. Start engine and let it idle.
4. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “HIGH” on the CONSULT-II screen.
5. Make sure that cooling fans-1 and -2 operate at high speed.

OK or NG

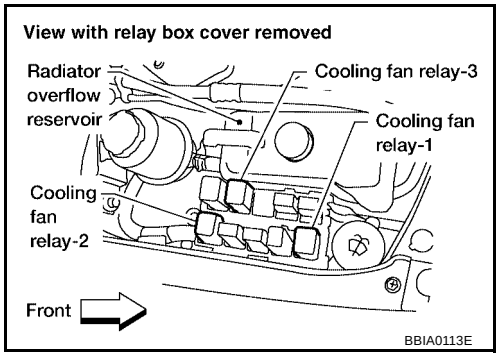
OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-1661, "PROCEDURE B" .)



4. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

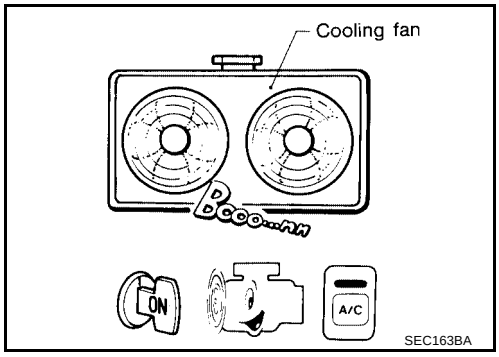
1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.
3. Turn air conditioner switch “ON”.
4. Turn blower fan switch “ON”.



5. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 5.
NG >> Check cooling fan low speed control circuit. (Go to EC-1659, "PROCEDURE A" .)



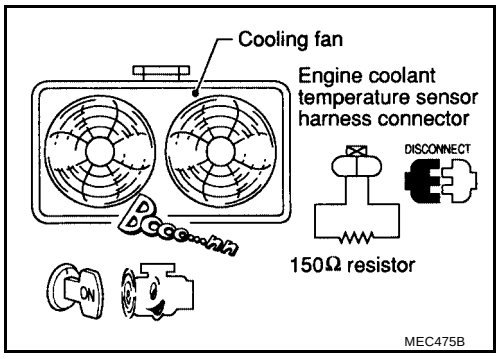
5. CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relays-2 and -3.
3. Turn air conditioner switch and blower fan switch “OFF”.
4. Disconnect engine coolant temperature sensor harness connector.
5. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
6. Restart engine and make sure that cooling fans-1 and -2 operate at high speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-1661, "PROCEDURE B" .)



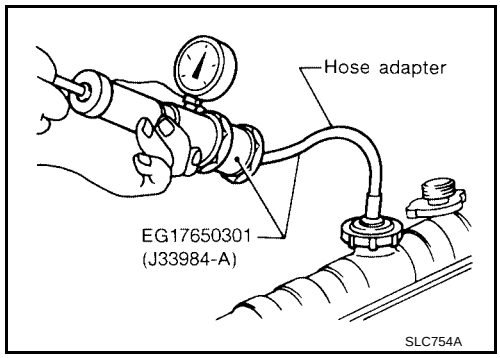
6. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.6 kg/cm^2 , 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.

Pressure should not drop.



OK or NG

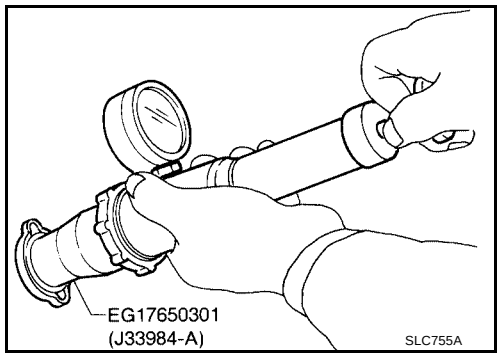
OK >> GO TO 7.
NG >> Check the following for leak.
- Hose
- Radiator
- Water pump
  Refer to CO-26, "WATER PUMP" .

7. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure:

59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 8.
NG >> Replace radiator cap.

8. CHECK THERMOSTAT

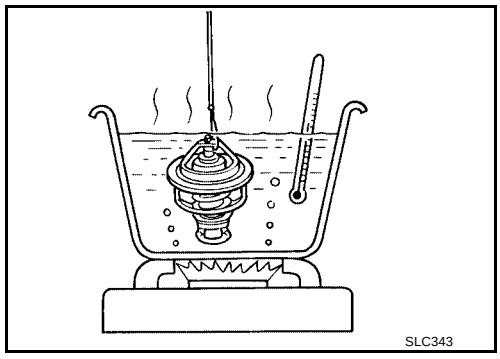
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.

   Valve opening temperature:

   82°C (180°F) [standard]

   Valve lift:

   More than 8 mm/95°C (0.31 in/203°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.
   For details, refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .



OK or NG

OK >> GO TO 9.
NG >> Replace thermostat.

9. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1390, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace engine coolant temperature sensor.

10. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to EC-1662, "Main 12 Causes of Overheating" .

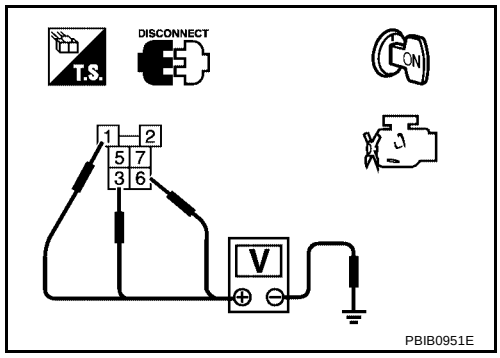
>> **INSPECTION END**

PROCEDURE A

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

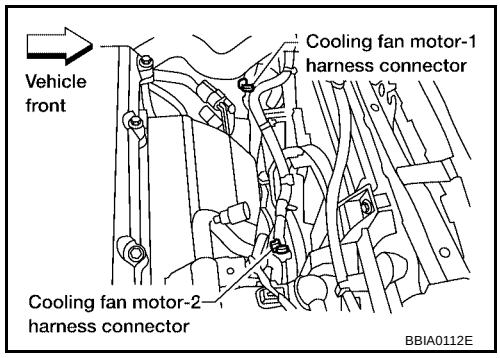
- 10A fuse
- Fuse block (J/B) connector E103
- 40A fusible links
- Fuse and fusible link box connectors E23, E25
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and fusible links

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 4 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 4 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 37 and cooling fan relay-1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relay-1 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-1663, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1663, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

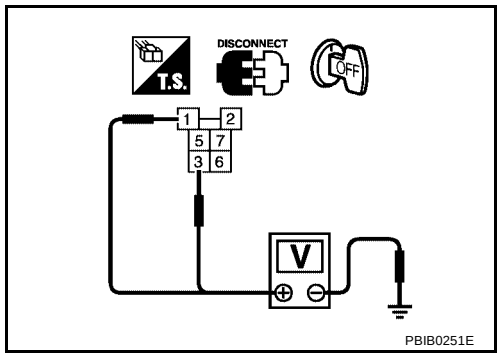
>> **INSPECTION END**

PROCEDURE B

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relays-2 and -3 terminals 1, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

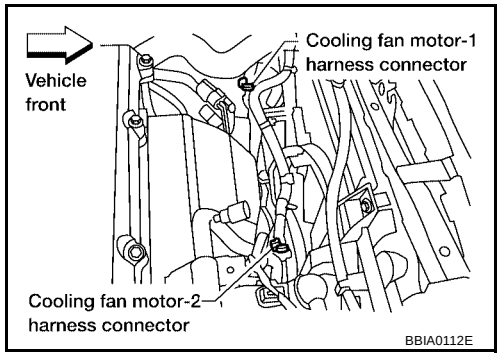
- Harness for open or short between cooling fan relays-2 and -3 and fuse
- Harness for open or short between cooling fan relays-2 and -3 and fusible links

>> Repair harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between the following;
   cooling fan relay-2 terminal 5 and cooling fan motor-1 terminal 2,
   cooling fan relay-2 terminal 6 and cooling fan motor-1 terminal 3,
   cooling fan relay-2 terminal 7 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between the following;
   cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 2,
   cooling fan relay-3 terminal 6 and cooling fan motor-2 terminal 3,
   cooling fan relay-3 terminal 7 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 27 and cooling fan relay-2 terminal 2, cooling fan relay-3 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relays-2, -3 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAYS-2 AND -3

Refer to EC-1663, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relays.

7. CHECK COOLING FAN MOTORS

Refer to EC-1663, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

UBS002IN

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-14, "Anti-freeze Coolant Mixture Ratio" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-23, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See CO-34, "CHECKING RADIATOR CAP" .

Engine	Step	Inspection item	Equipment	Standard	Reference page
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-24, "CHECKING COOLING SYSTEM FOR LEAKS" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" , and CO-30, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-1651).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-23, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-24, "CHECKING RESERVOIR LEVEL" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-145, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-145, "CYLINDER HEAD" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-22, "OVERHEATING CAUSE ANALYSIS" .

Component Inspection

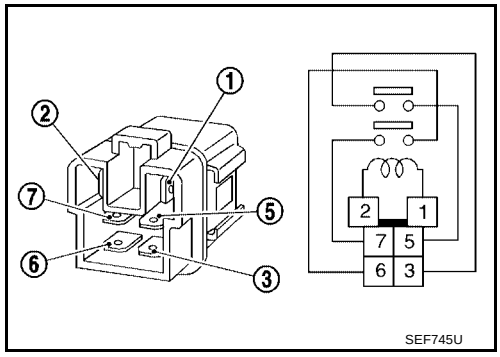
UBS002IO

COOLING FAN RELAYS-1, -2 AND -3

Check continuity between terminals 3 and 5, 6 and 7.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace relay.



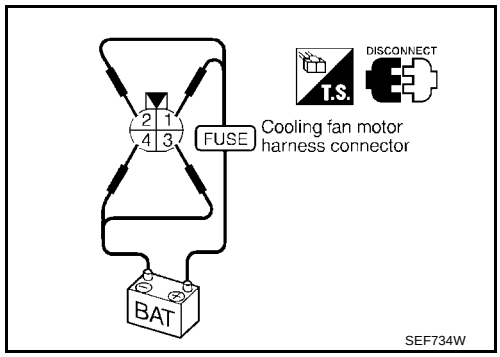
COOLING FAN MOTORS-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(+)	(–)
Cooling fan motor	Low	1	4
	High	1, 2	3, 4

Cooling fan motor should operate.

If NG, replace cooling fan motor.



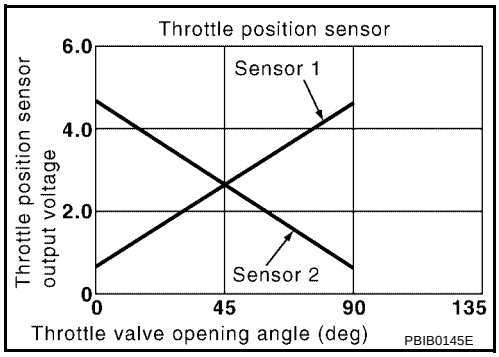
DTC P1225 TP SENSOR

PFP:16119

Component Description

UBS002IX

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

UBS002IY

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

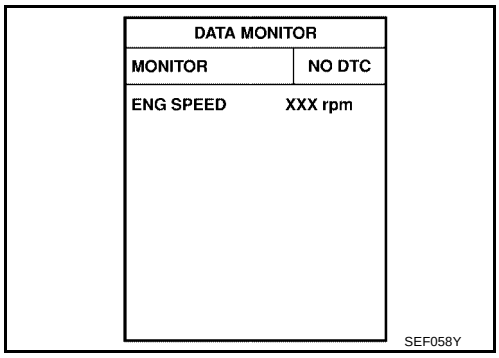
DTC Confirmation Procedure

UBS002IZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-1665, "Diagnostic Procedure" .



WITH GST

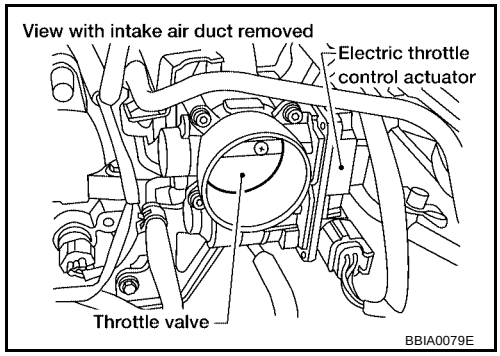
Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS002J0

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

UBS002J1

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

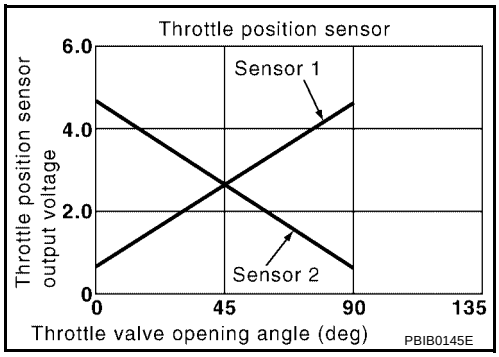
DTC P1226 TP SENSOR

PFP:16119

Component Description

UBS002J2

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

UBS002J3

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

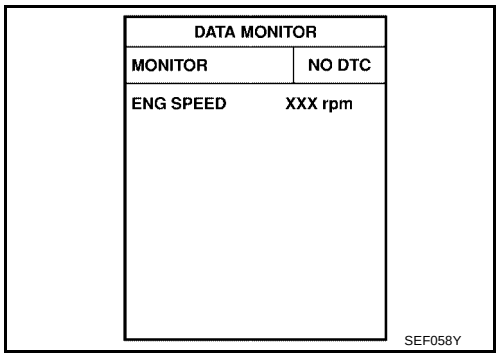
DTC Confirmation Procedure

UBS002J4

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-1667, "Diagnostic Procedure" .



WITH GST

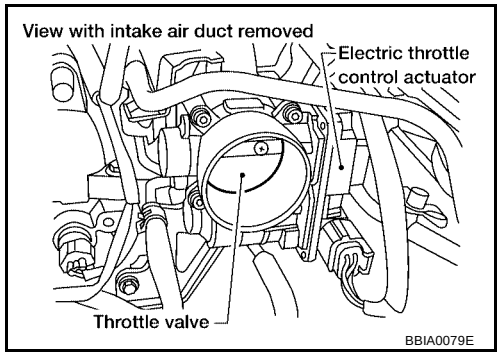
Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS002J5

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

UBS002J6

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

UBS002JF

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) (APP sensor 1 circuit is shorted.) (MAF sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2) ● Accelerator pedal position sensor (APP sensor 1) ● MAF sensor ● EVAP control system pressure sensor ● Refrigerant pressures sensor ● ECM pin terminal

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

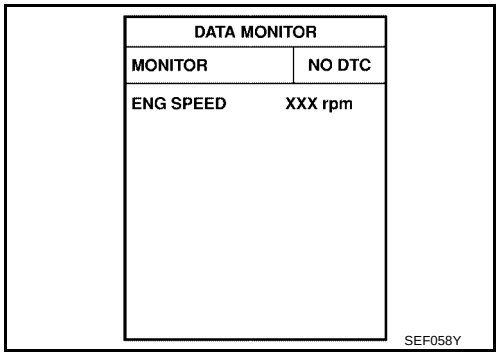
DTC Confirmation Procedure

UBS002JG

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1670, "Diagnostic Procedure" .

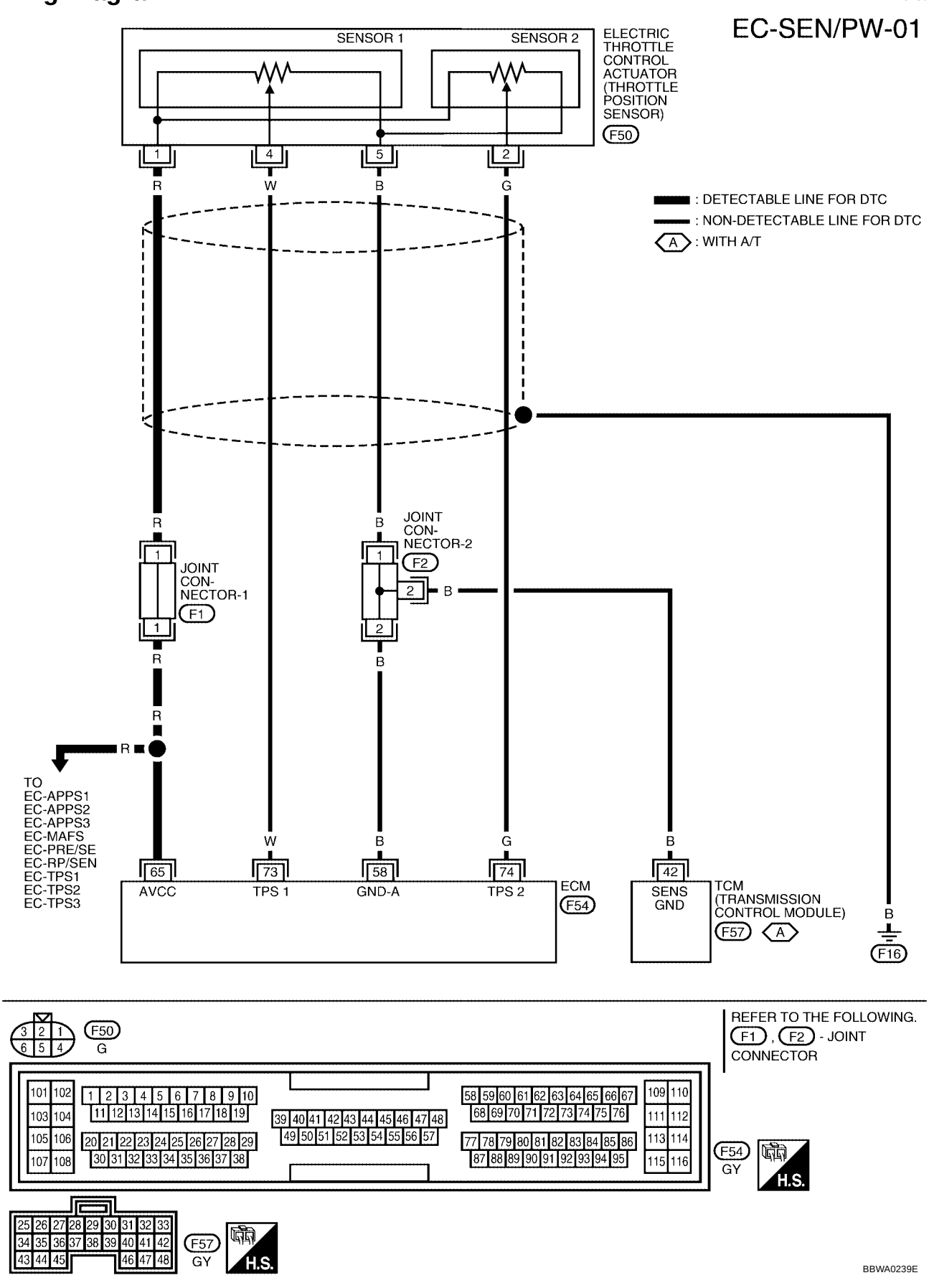


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002JH



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V

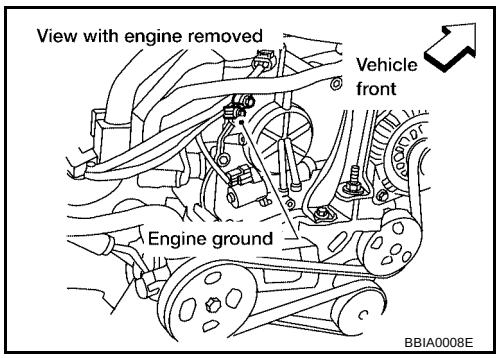
Diagnostic Procedure

UBS002JI

1. RETIGHTEN GROUND SCREWS

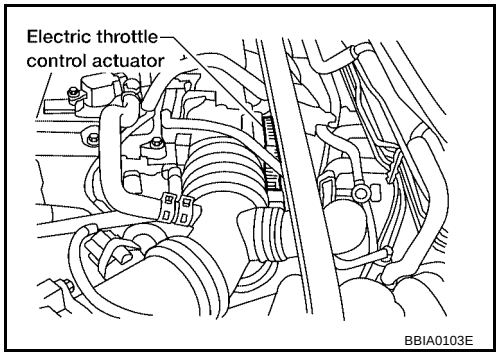
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch "ON".

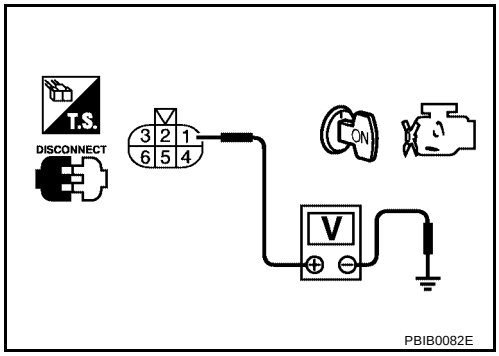


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 5.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground, between the following terminals

ECM terminal	Sensor terminals	Reference Wiring Diagram
65	Electric throttle control actuator terminal 1	EC-1765
	APP sensor terminal 2	EC-1772
	MAF sensor terminal 2	EC-1371
	EVAP control system pressure sensor terminal 1	EC-1536
	Refrigerant pressure sensor terminal 3	EC-1817

- Joint connector-1
- ECM pin terminal

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Accelerator pedal position sensor (Refer to EC-1775, "Component Inspection" .)
- Mass air flow sensor (Refer to EC-1374, "Component Inspection" .)
- EVAP control system pressure sensor (Refer to EC-1539, "Component Inspection" .)
- Refrigerant pressure sensor (Refer to MTC-19, "TROUBLE DIAGNOSIS" .)

OK or NG

OK >> GO TO 7.
NG >> Replace malfunctioning component.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-1768, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

UBS002JJ

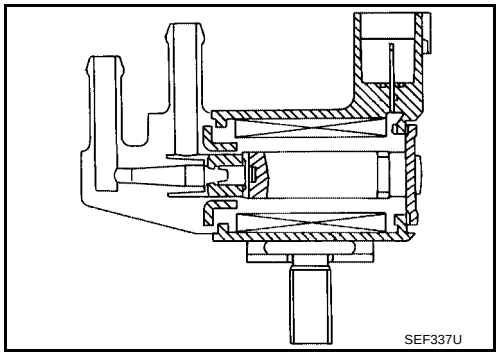
SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor (CAN communication line)	Vehicle speed		

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

UBS002JK

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

On Board Diagnosis Logic

UBS002JL

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1444 1444	EVAP canister purge volume control solenoid valve	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	● EVAP control system pressure sensor ● EVAP canister purge volume control solenoid valve (The valve is stuck open.) ● EVAP canister vent control valve ● EVAP canister ● Hoses (Hoses are connected incorrectly or clogged.)

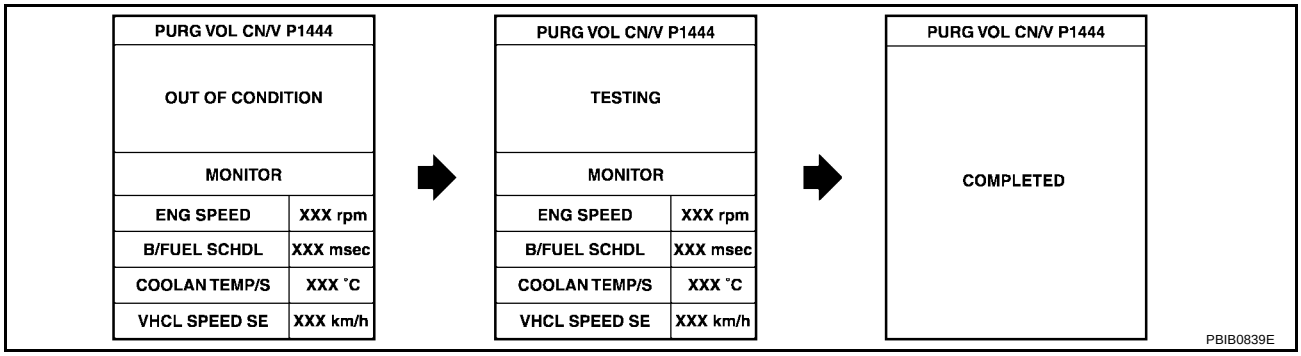
DTC Confirmation Procedure

UBS002JM

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
5. Touch “START”.
6. Start engine and let it idle until “TESTING” on CONSULT-II changes to “COMPLETED”. (It will take approximately 10 seconds.)
   If “TESTING” is not displayed after 5 minutes, retry from step 2.



7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1675, "Diagnostic Procedure" .

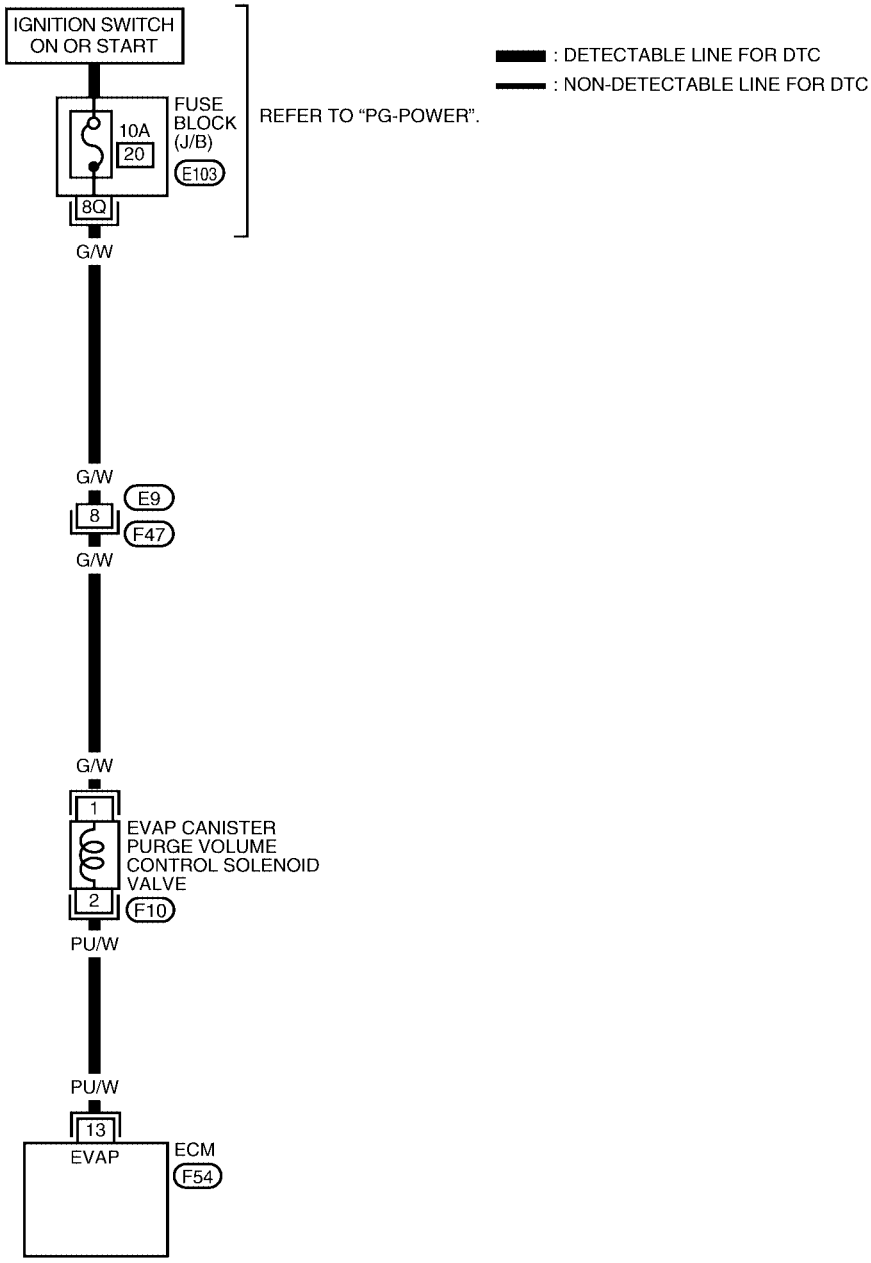
WITH GST

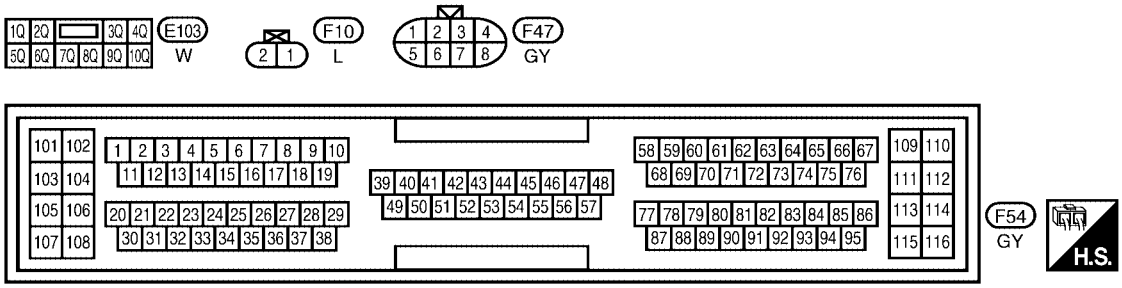
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and let it idle for at least 20 seconds.
4. Select “MODE 7” with GST.
5. If 1st trip DTC is detected, go to EC-1675, "Diagnostic Procedure" .

Wiring Diagram

UBS002JN

EC-PGC/V-01



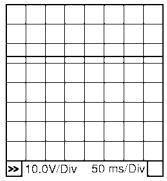
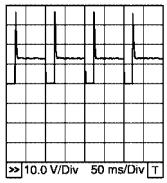


BBWA0224E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	PU/W	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

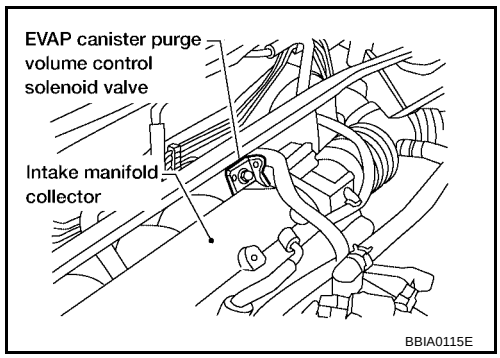
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002JO

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

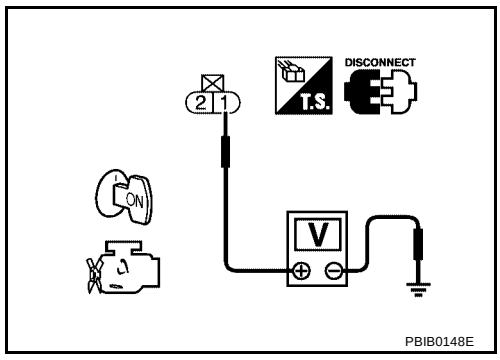
1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



BBIA0115E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and engine ground with CONSULT-II or tester.

Voltage: Battery voltage



PBIB0148E

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse block (J/B) connector E103
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 13 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

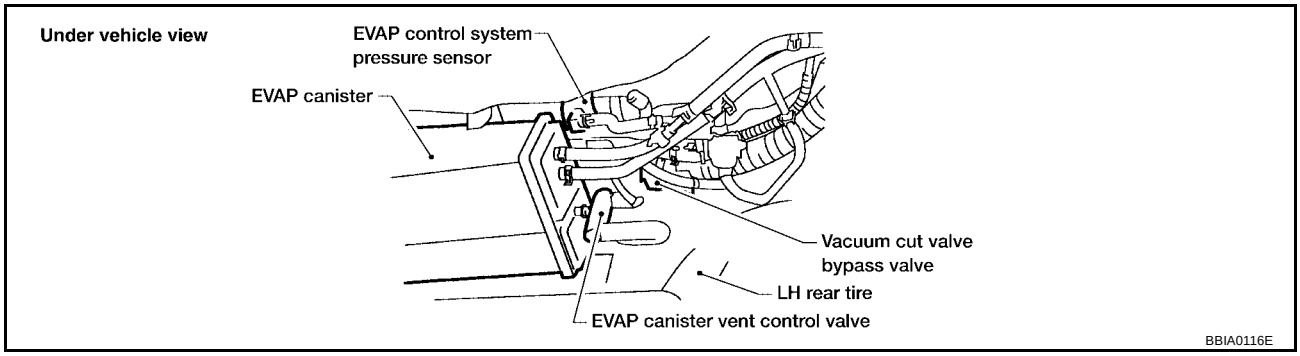
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 5.
NG >> Repair it.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP control system pressure sensor.

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

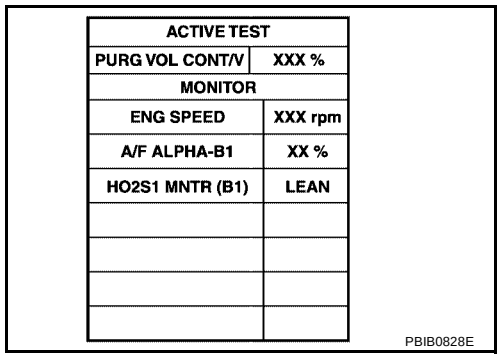
OK or NG

OK (With CONSULT-II)>>GO TO 7.
OK (Without CONSULT-II)>>GO TO 8.
NG >> Replace EVAP control system pressure sensor.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect harness connectors disconnected.
3. Start engine.
4. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister purge volume control solenoid valve.

9. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 10.
NG >> Clean the rubber tube using an air blower.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

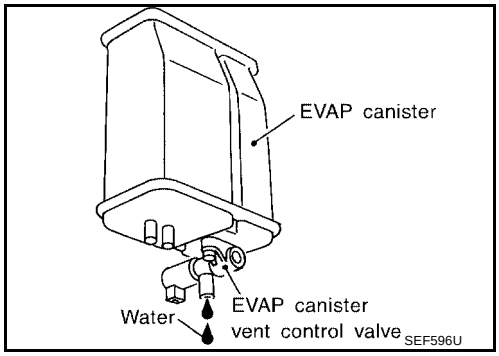
Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP canister vent control valve.

11. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



Yes or No

Yes >> GO TO 12.
No >> GO TO 14.

12. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

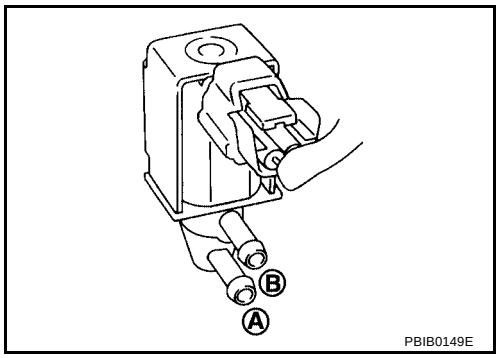
UBS002JP

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

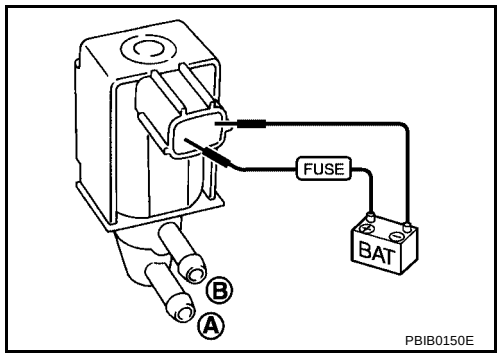
Condition (PURG VOL CONT/V value)	Air passage continuity between **A** and **B**
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	Yes
No supply	No



UBS002JQ

Removal and Installation

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-105, "INTAKE MANIFOLD" .

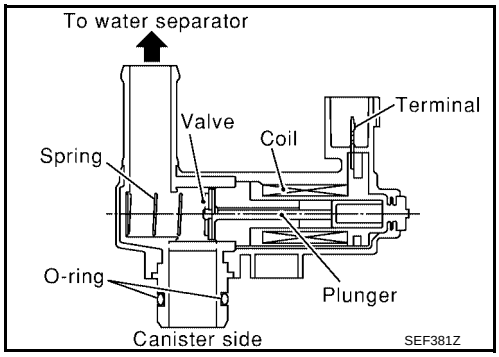
DTC P1446 EVAP CANISTER VENT CONTROL VALVE

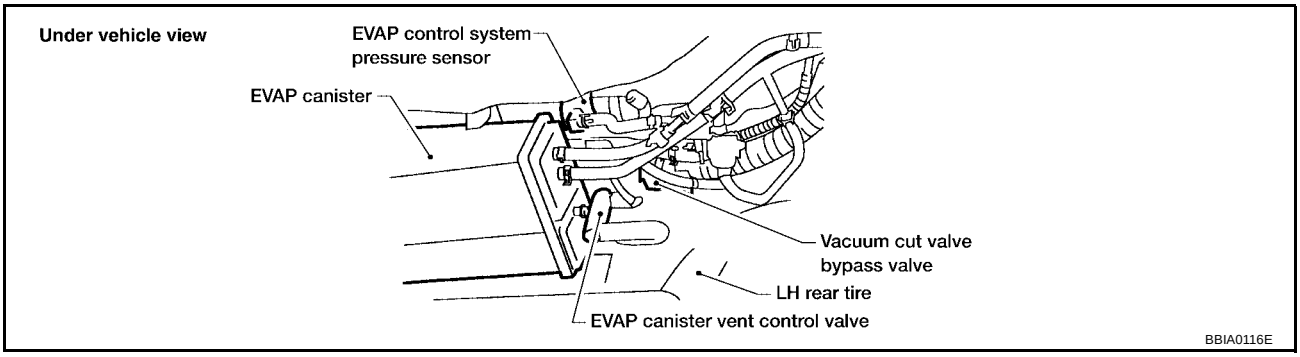
PFP:14935

Component Description

UBS002JR

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002JS

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002JT

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1446 1446	EVAP canister vent control valve close	EVAP canister vent control valve remains closed under specified driving conditions.	● EVAP canister vent control valve ● EVAP control system pressure sensor and the circuit ● Blocked rubber tube to EVAP canister vent control valve ● EVAP canister is saturated with water

DTC Confirmation Procedure

UBS002JU

CAUTION:
Always drive vehicle at a safe speed.

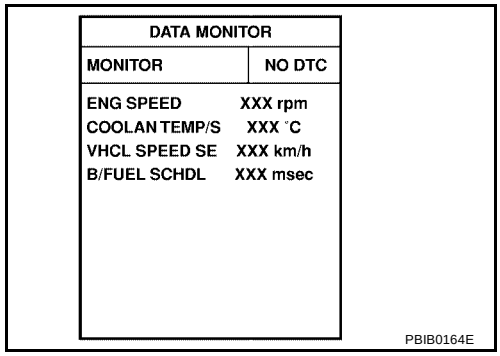
NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch "ON".

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine.
4. Drive vehicle at a speed of approximately 80 km/h (50 MPH) for a maximum of 15 minutes.

   NOTE:
   If a malfunction exists, NG result may be displayed quicker.
5. If 1st trip DTC is detected, go to EC-1683, "Diagnostic Procedure" .



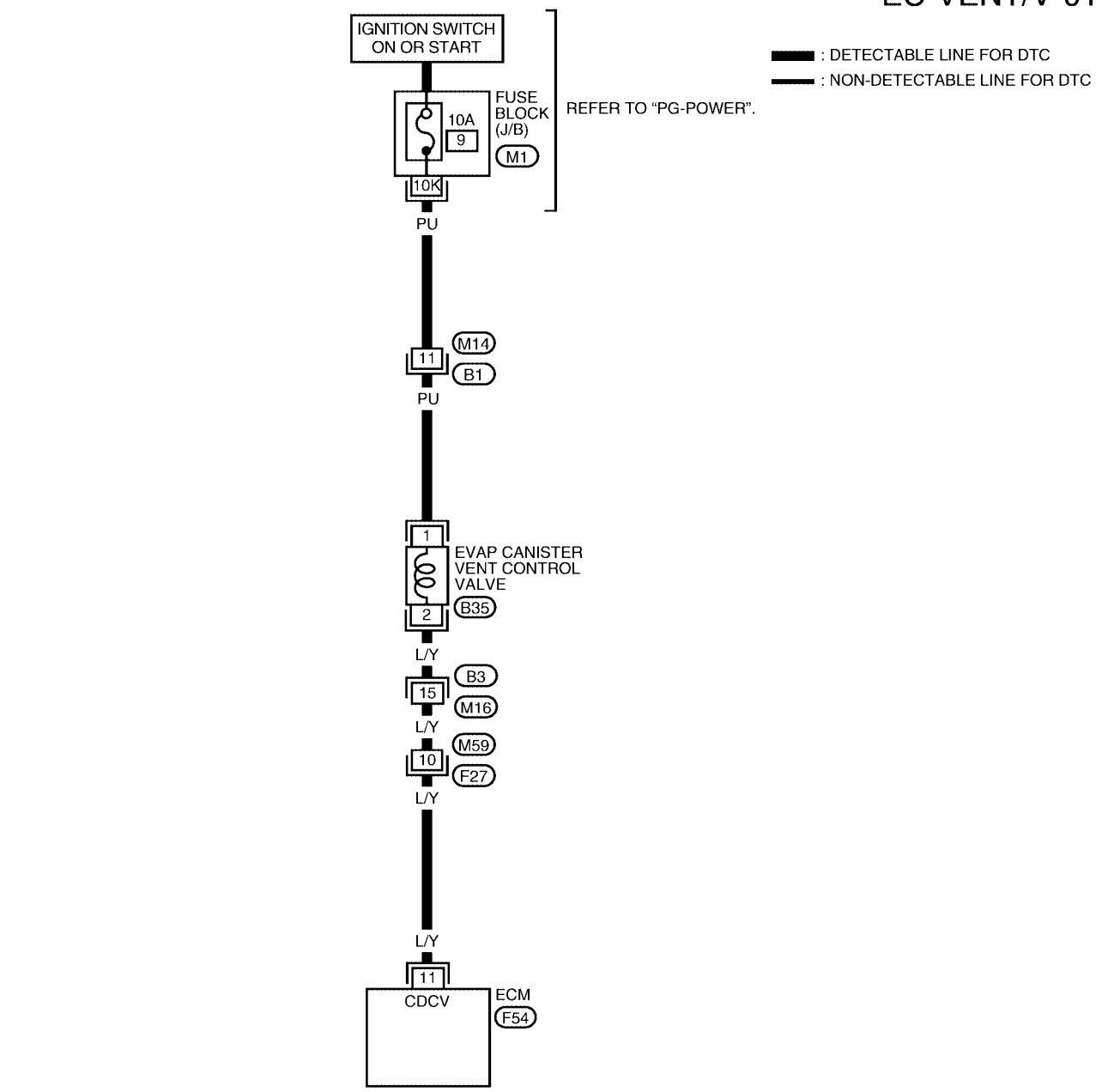
WITH GST

Follow the procedure “WITH CONSULT-II” above.

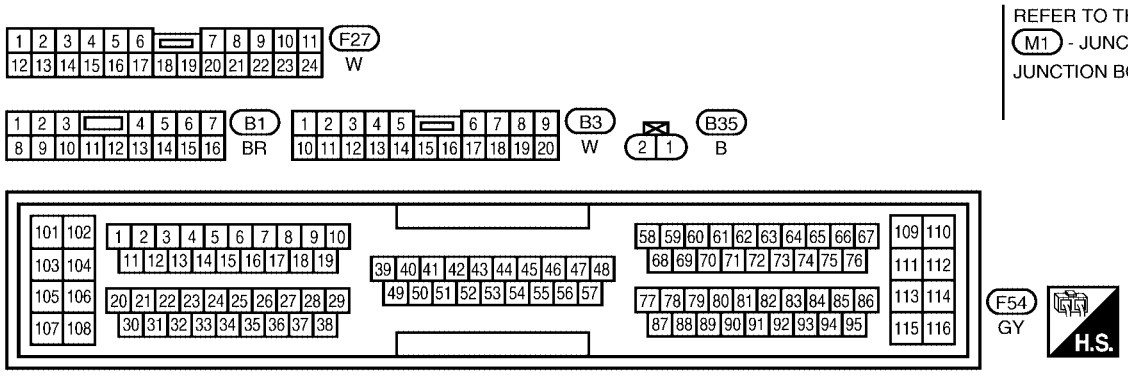
Wiring Diagram

UBS002JV

EC-VENT/V-01



REFER TO THE FOLLOWING.
M1 - JUNCTION BLOCK - JUNCTION BOX (J/B)



BBWA0225E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

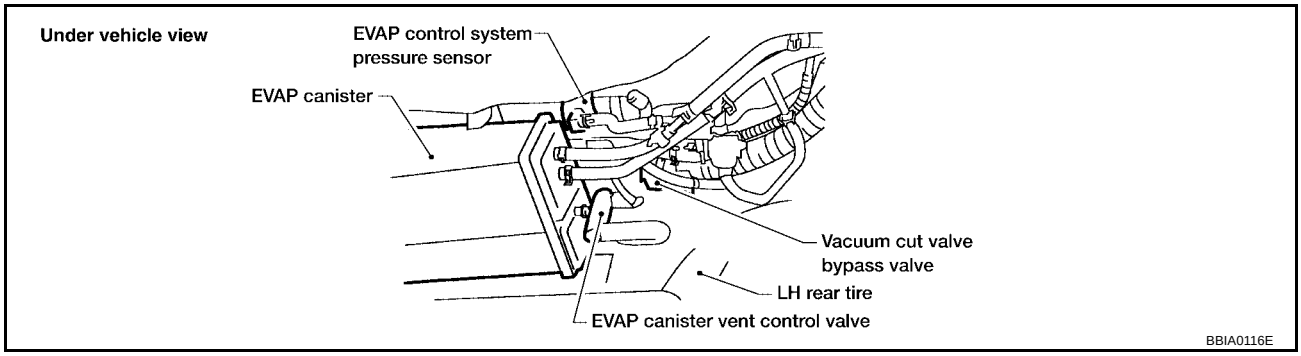
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002JW

1. CHECK RUBBER TUBE

1. Turn ignition switch "OFF".
2. Disconnect rubber tube connected to EVAP canister vent control valve.



3. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 2.
NG >> Clean rubber tube using an air blower.

2. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1685, "Component Inspection" .

OK or NG

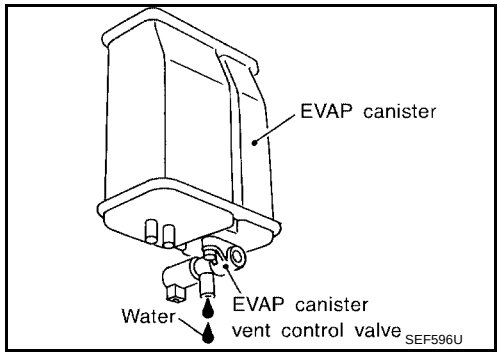
OK >> GO TO 3.
NG >> Replace EVAP canister vent control valve.

3. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.

Yes or No

Yes >> GO TO 4.
No >> GO TO 6.



4. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

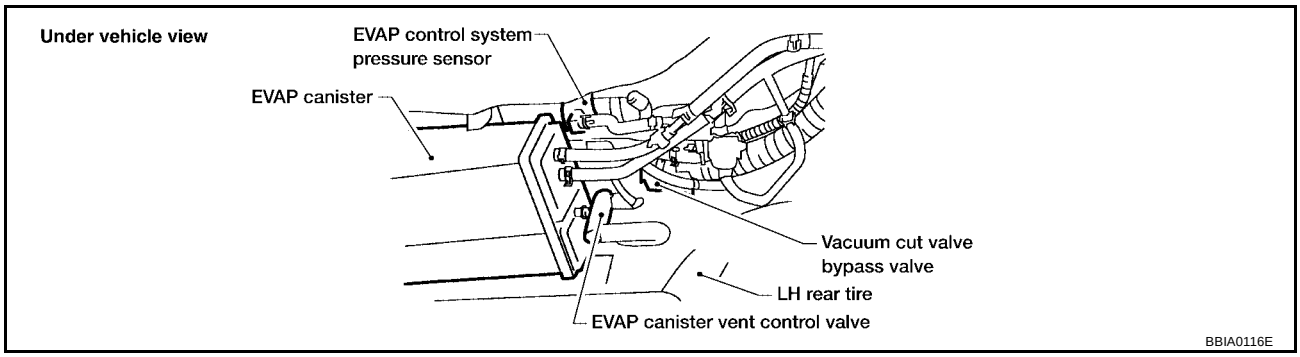
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 7.
NG >> Repair it.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP control system pressure sensor.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP control system pressure sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

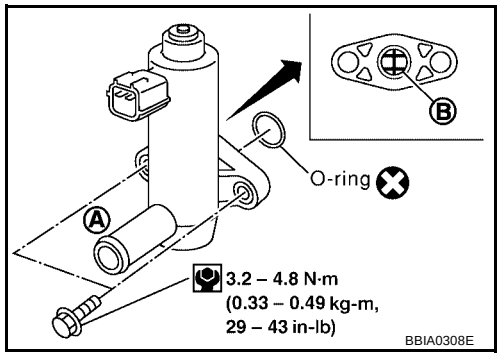
Component Inspection

UBS002JX

EVAP CANISTER VENT CONTROL VALVE

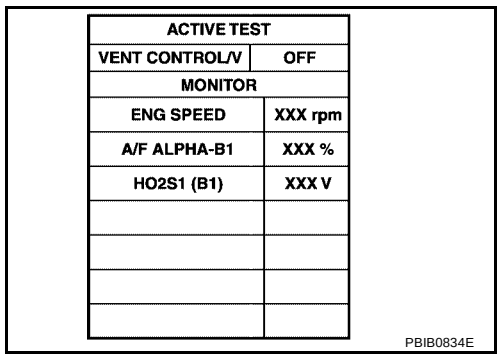
With CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.

Condition	Air passage continuity between **A** and **B**
ON	No
OFF	Yes

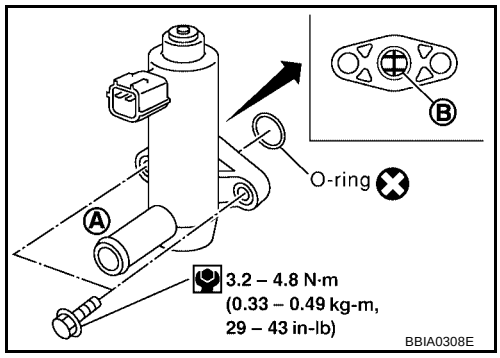


Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform inspection again.

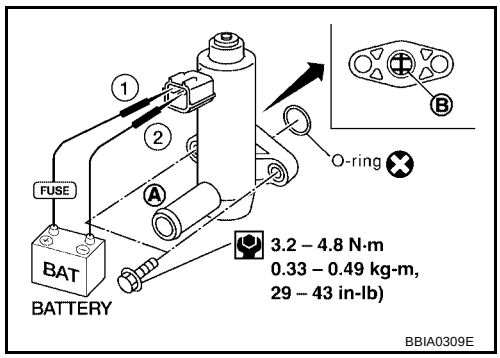
Without CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	No
OFF	Yes



Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.

5. Perform inspection again.

DTC P1448 EVAP CANISTER VENT CONTROL VALVE

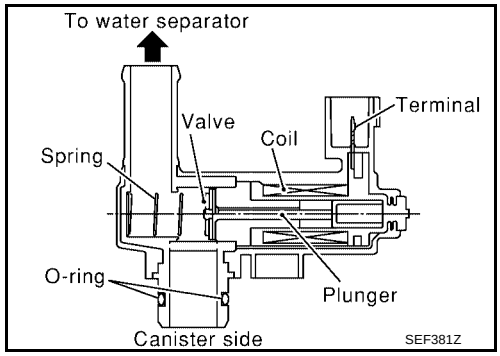
PFP:14935

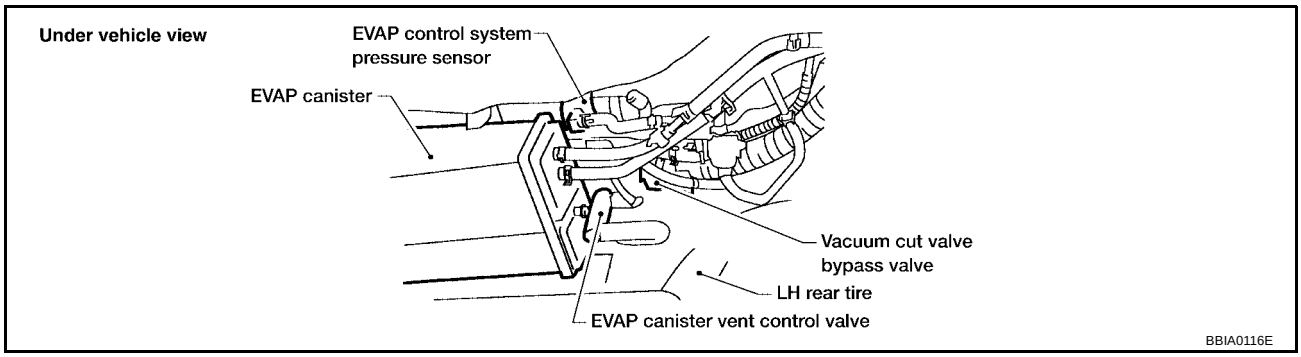
Component Description

UBS002JY

NOTE:
If DTC P1448 is displayed with P0442, perform trouble diagnosis for DTC P1448 first.

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002JZ

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002K0

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1448 1448	EVAP canister vent control valve open	EVAP canister vent control valve remains opened under specified driving conditions.	● EVAP canister vent control valve ● EVAP control system pressure sensor and the circuit ● Blocked rubber tube to EVAP canister vent control valve ● EVAP canister is saturated with water ● Vacuum cut valve

DTC Confirmation Procedure

UBS002K1

NOTE:
- **If DTC P1448 is displayed with P0442, perform trouble diagnosis for DTC P1448 first.**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

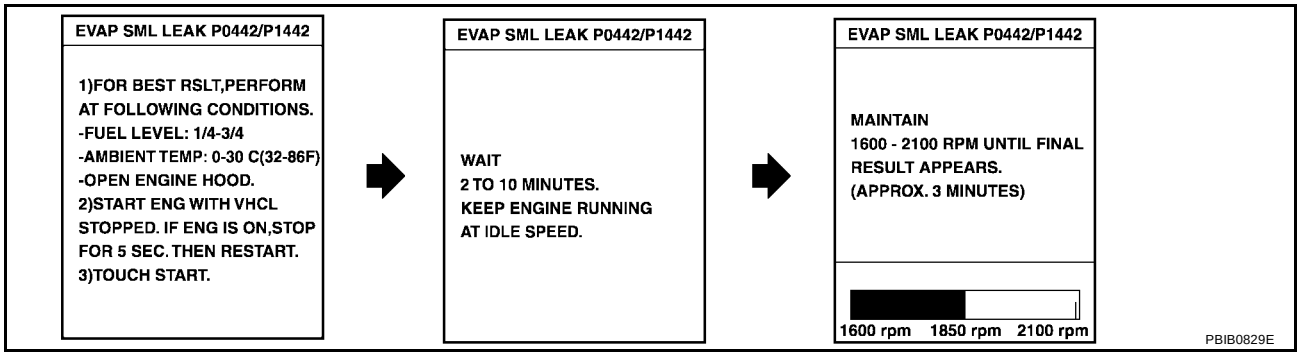
WITH CONSULT-II

TESTING CONDITION:
- **Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Always perform test at a temperature of 0 to 30°C (32 to 86°F).**

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Make sure that the following conditions are met.

COOLAN TEMP/S	0 - 70°C (32 - 158°F)
INT/A TEMP SE	0 - 30°C (32 - 86°F)

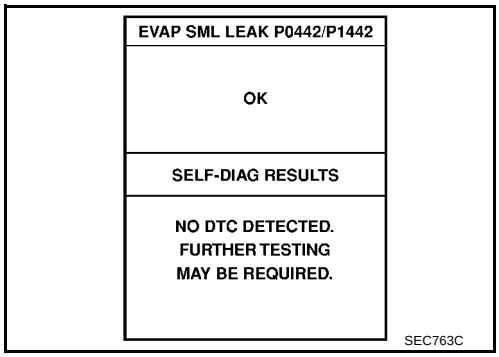
5. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.



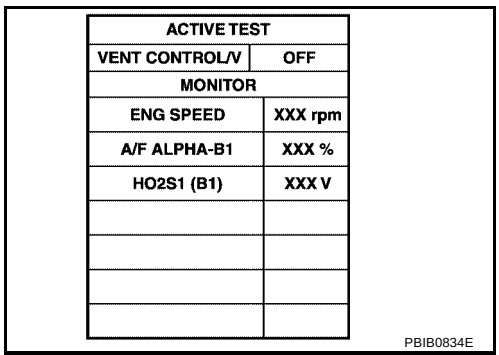
   If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-1291, "Basic Inspection" .

6. Make sure that “OK” is displayed.
   If “NG” is displayed, go to the following step.

   NOTE:
   Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

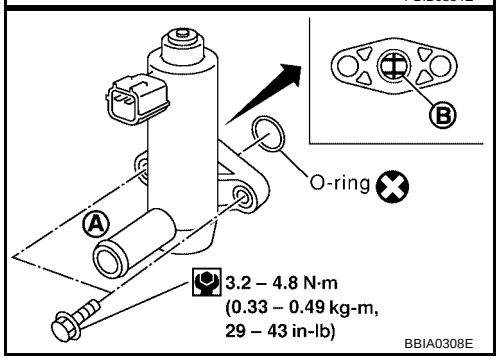


7. Stop engine and wait at least 10 seconds, then turn “ON”.
8. Disconnect hose from vehicle frame.
9. Select “VENT CONTROL/V” of “ACTIVE TEST” mode with CONSULT-II.
10. Touch “ON” and “OFF” alternately.



11. Make sure the following.

Condition VENT CONTROL/V	Air passage continuity between **A** and **B**
ON	No
OFF	Yes



   If the result is NG, go to EC-1691, "Diagnostic Procedure" .
   If the result is OK, go to “Diagnostic Procedure” for DTC P0442, EC-1515 .

Overall Function Check

UBS002K2

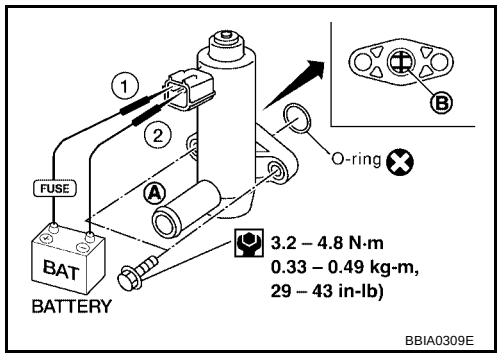
Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Disconnect hose from vehicle frame.
2. Disconnect EVAP canister vent control valve harness connector.
3. Verify the following.

Condition	Air passage continuity
12V direct current supply between terminals 1 and 2	No
No supply	Yes

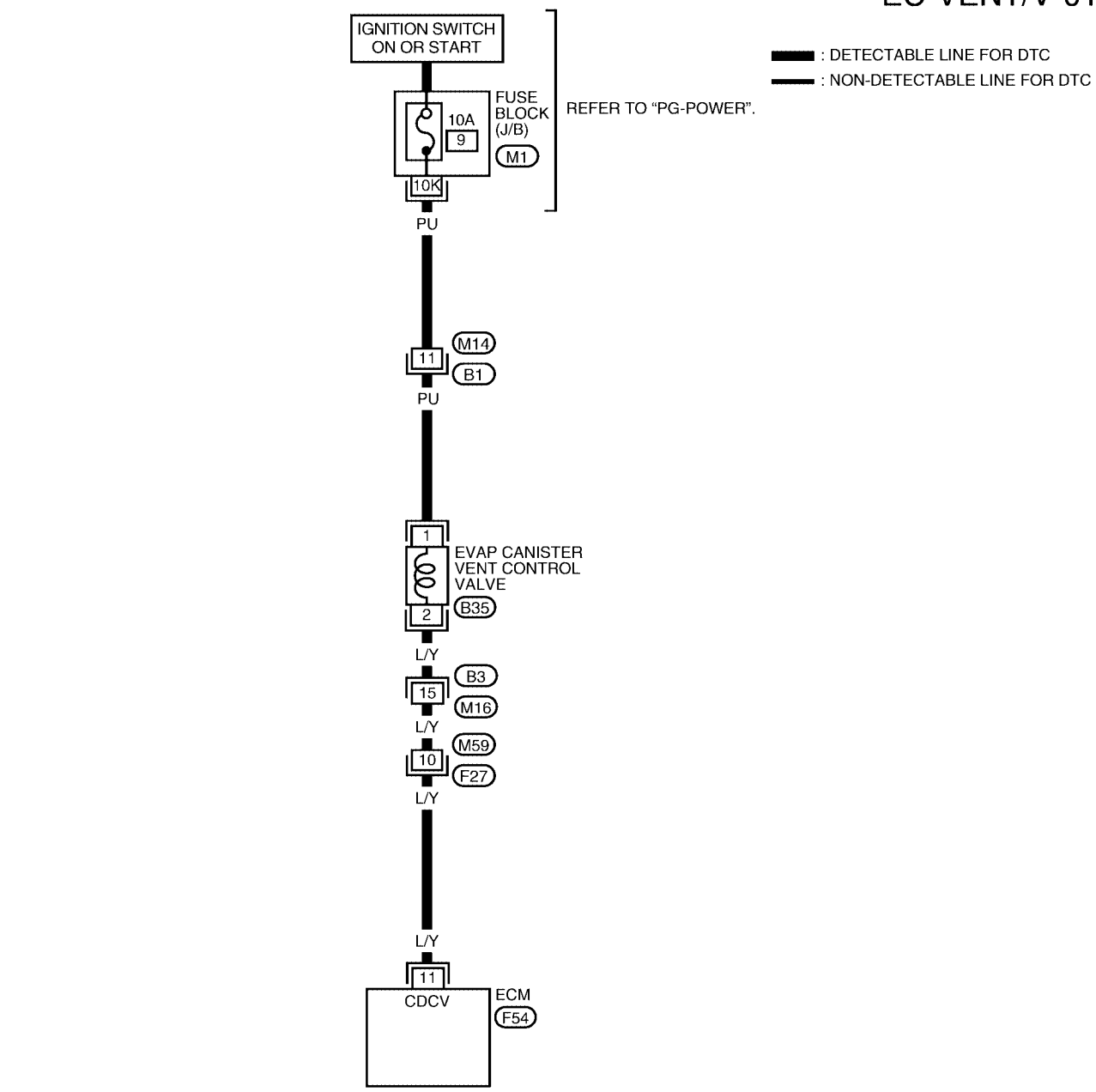
If the result is NG, go to EC-1691, "Diagnostic Procedure" .
If the result is OK, go to “Diagnostic Procedure” for DTC P0442, EC-1515 .

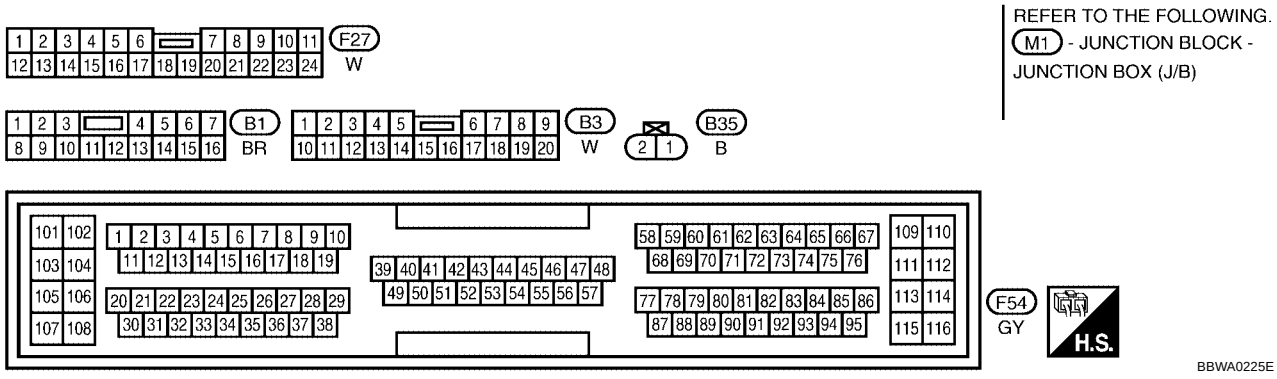


Wiring Diagram

UBS002K3

EC-VENT/V-01





BBWA0225E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

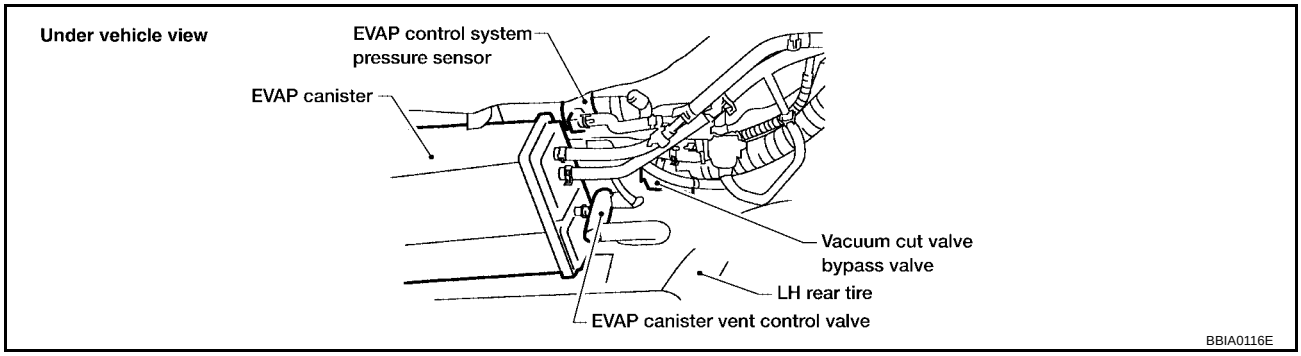
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002K4

1. CHECK RUBBER TUBE

1. Turn ignition switch "OFF".
2. Disconnect rubber tube connected to EVAP canister vent control valve.



3. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 2.
NG >> Clean rubber tube using an air blower.

2. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1693, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace EVAP canister vent control valve.

3. CHECK VACUUM CUT VALVE

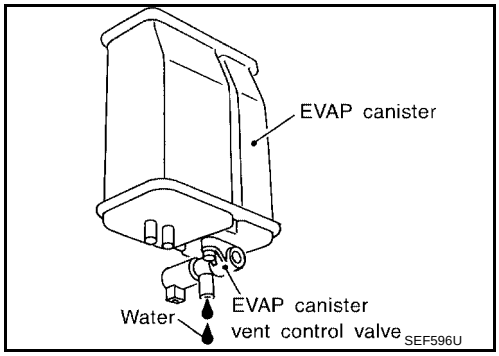
Refer to EC-1721, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace vacuum cut valve.

4. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



Yes or No

Yes >> GO TO 5.
No >> GO TO 7.

5. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

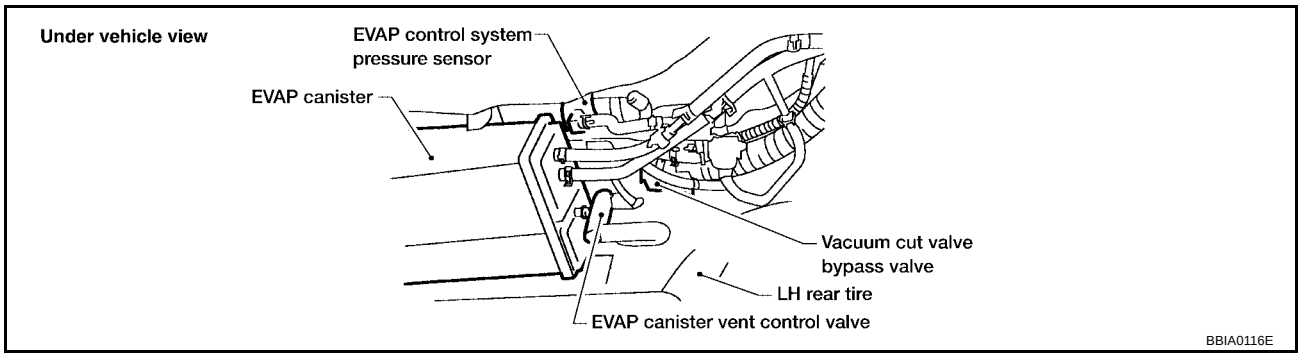
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 8.
NG >> Repair it.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP control system pressure sensor.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

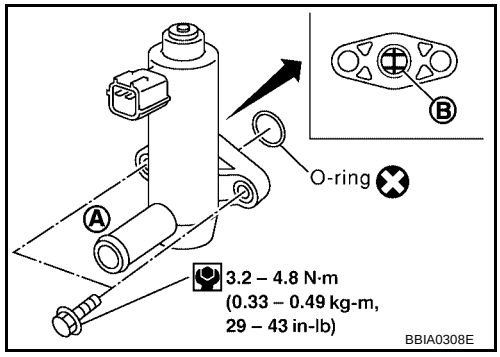
Component Inspection

UBS002K5

EVAP CANISTER VENT CONTROL VALVE

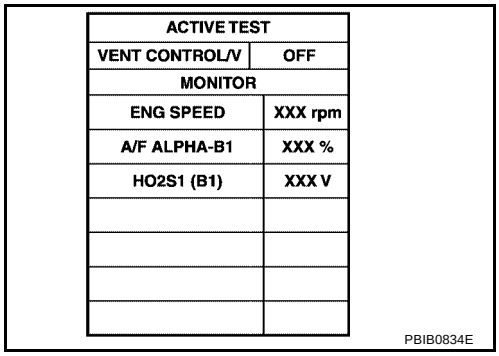
With CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.

Condition	Air passage continuity between **A** and **B**
ON	No
OFF	Yes

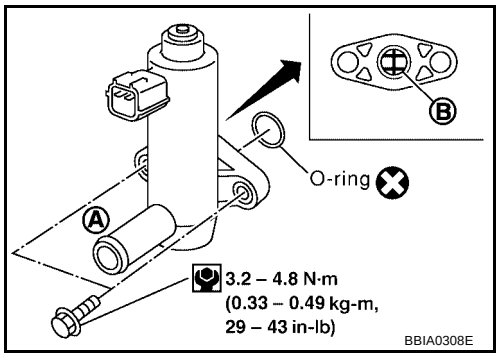


Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform inspection again.

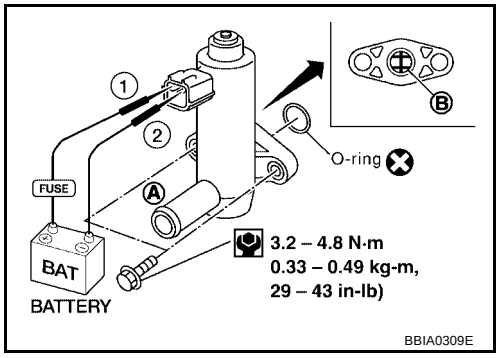
Without CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	No
OFF	Yes



Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform inspection again.

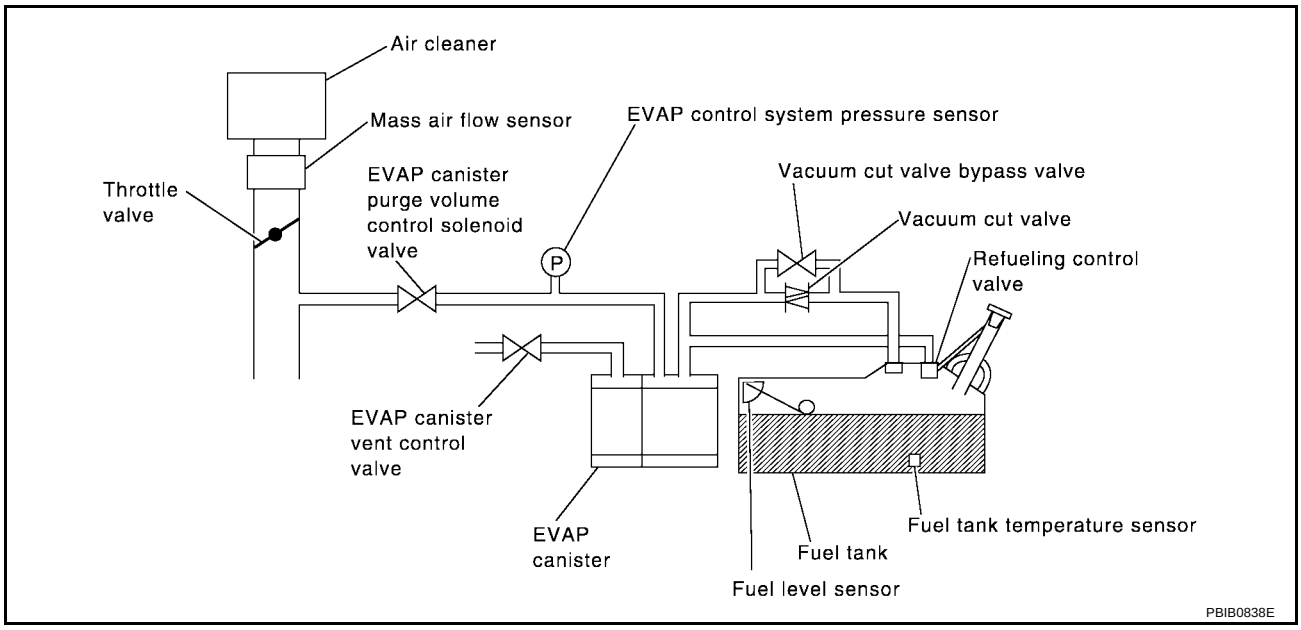
DTC P1456 EVAP CONTROL SYSTEM

PFP:14710

On Board Diagnosis Logic

UBS002K6

This diagnosis detects very small leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using of vapor pressure in the fuel tank.
The EVAP canister vent control valve is closed to shut the EVAP purge line. The vacuum cut valve bypass valve will then be opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP control system pressure sensor can now monitor the pressure inside the fuel tank. If pressure increases, the ECM will check for leaks in the line between the vacuum cut valve and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1456 1456	Evaporative emission control system very small leak (positive pressure check)	● EVAP system has a very small leak. ● EVAP system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Refueling control valve ● ORVR system leaks ● Fuel level sensor and the circuit ● Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS002K7

NOTE:

- **After repair, make sure that the hoses and clips are installed properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

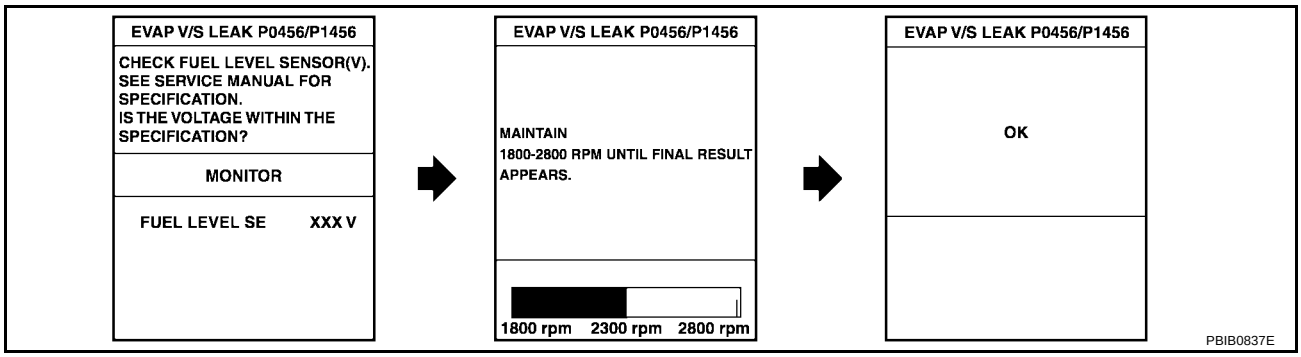
- **Open engine hood before conducting following procedure.**
- **If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**
  - **Fuel filler cap is removed.**
  - **Refilled or drained the fuel.**
  - **EVAP component parts is/are removed.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Make sure the following conditions are met.
   FUEL LEVEL SE: 0.25 - 1.15V
   COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
   FUEL T/TMP SE: 0 - 35°C (32 - 95°F)

INT A/TEMP SE: More than 0°C (32°F)
If NG, turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle) or refilling/draining fuel until the output voltage condition of the “FUEL LEVEL SE” meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1).

3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Select “EVAP V/S LEAK P0456/P1456” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.



6. Make sure that “OK” is displayed.
   If “NG” is displayed, refer to EC-1698, "Diagnostic Procedure" .

NOTE:
- **If the engine speed cannot be maintained within the range displayed on CONSULT-II screen, go to EC-1291, "Basic Inspection" .**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

Overall Function Check

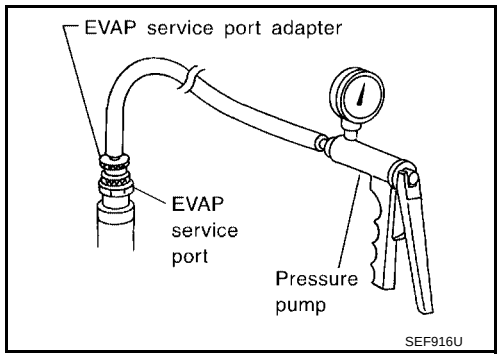
UBS002K8

WITH GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a 1st trip DTC might not be confirmed.

CAUTION:
- **Never use compressed air, doing so may damage the EVAP system.**
- **Do not start engine.**
- **Do not exceeded 4.12 kPa (0.042 kg/cm^2 , 0.6 psi).**

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch “ON”.
5. Connect GST and select MODE 8.
6. Using MODE 8 control the EVAP canister vent control valve (close) and vacuum cut valve bypass valve (open).
7. Apply pressure and make sure the following conditions are satisfied.
   Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg)
   Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (3 mmHg, 0.12 inHg).
   If NG, go to EC-1698, "Diagnostic Procedure" .
   If OK, go to next step.



8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.
10. Turn ignition switch “OFF” and wait at least 10 seconds.
11. Restart engine and let it idle for 90 seconds.

12. Keep engine speed at 2,000 rpm for 30 seconds.
13. Turn ignition switch “OFF”.

NOTE:
For more information, refer to GST instruction manual.

Diagnostic Procedure

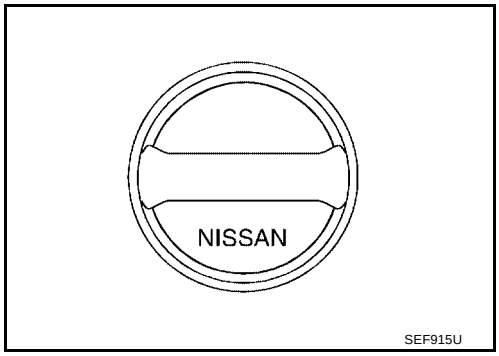
UBS002K9

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)" .

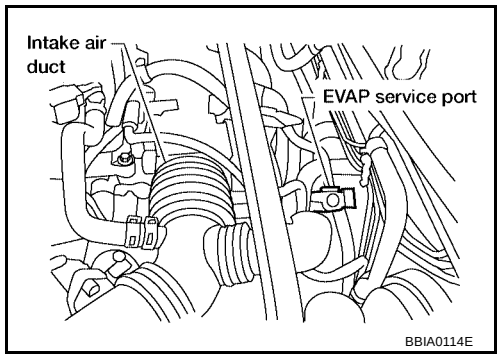
OK or NG

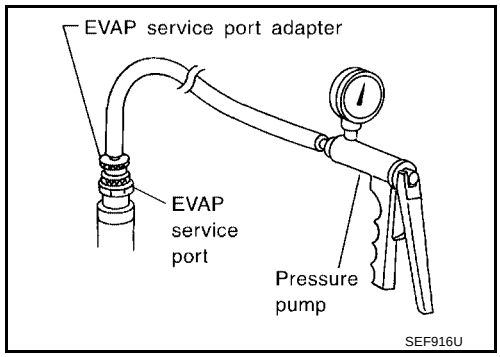
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





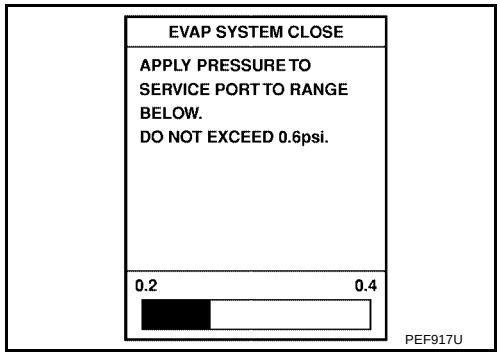
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

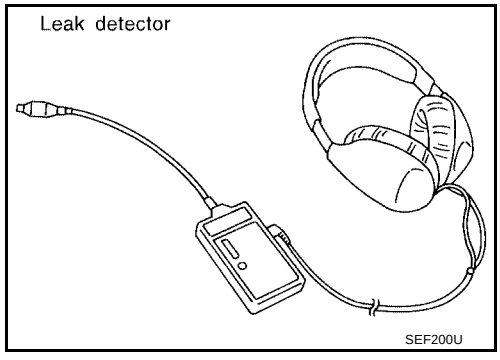
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

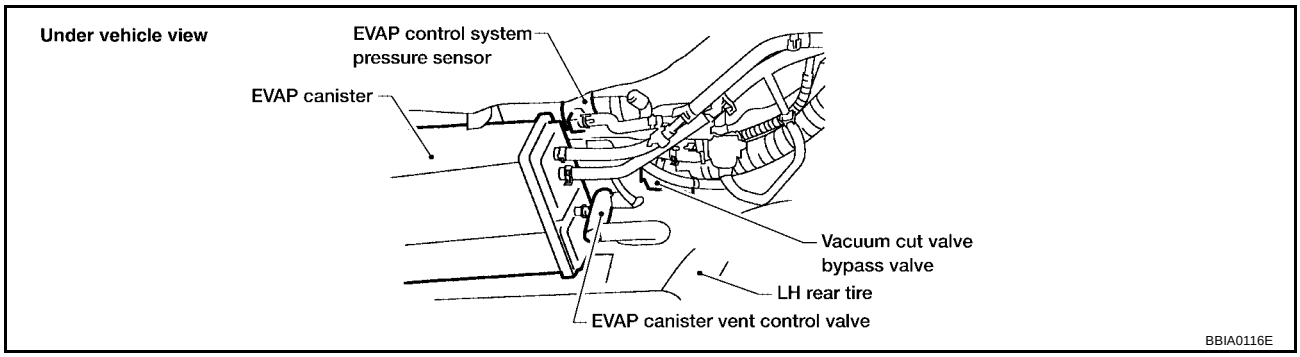
OK >> GO TO 8.
NG >> Repair or replace.



7. CHECK FOR EVAP LEAK

Without CONSULT-II

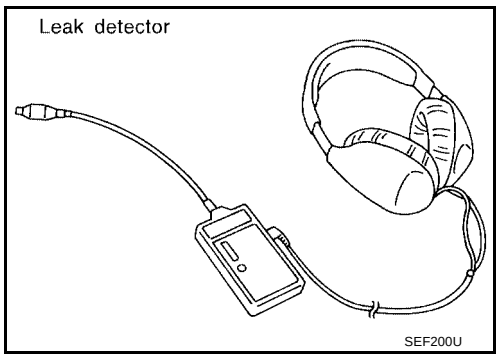
1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**

5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to “DTC Confirmation Procedure”, EC-1687 .

OK or NG

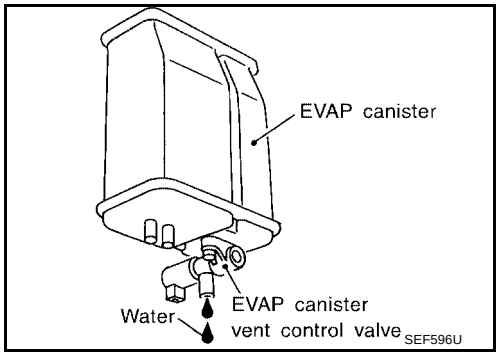
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 11.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 12.

11. DETECT MALFUNCTIONING PART

Check the following.

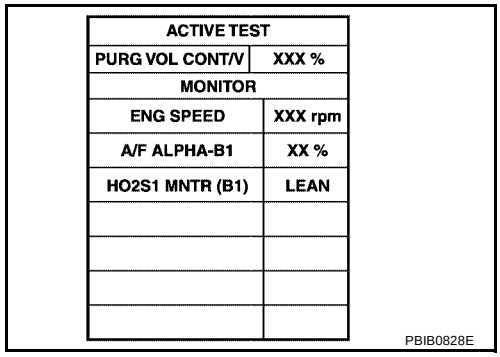
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK REFUELING EVAP VAPOR LINE

Check refueling EVAP vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1852, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses, tubes or filler neck tube.

22. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling control valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

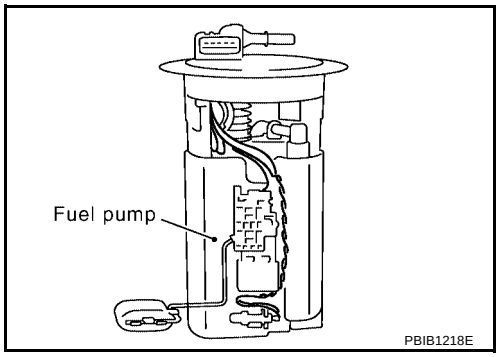
DTC P1464 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS002KB

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS002KC

ECM receives two signals from the fuel level sensor.
One is fuel level sensor power supply circuit, and the other is fuel level sensor ground circuit.
This diagnosis indicates the latter to detect open circuit malfunction.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1464 1464	Fuel level sensor circuit ground signal	A high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted)

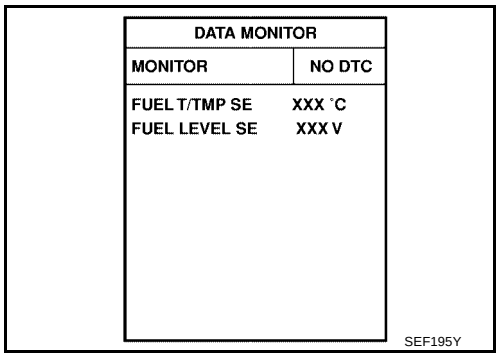
DTC Confirmation Procedure

UBS002KD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1706, "Diagnostic Procedure" .

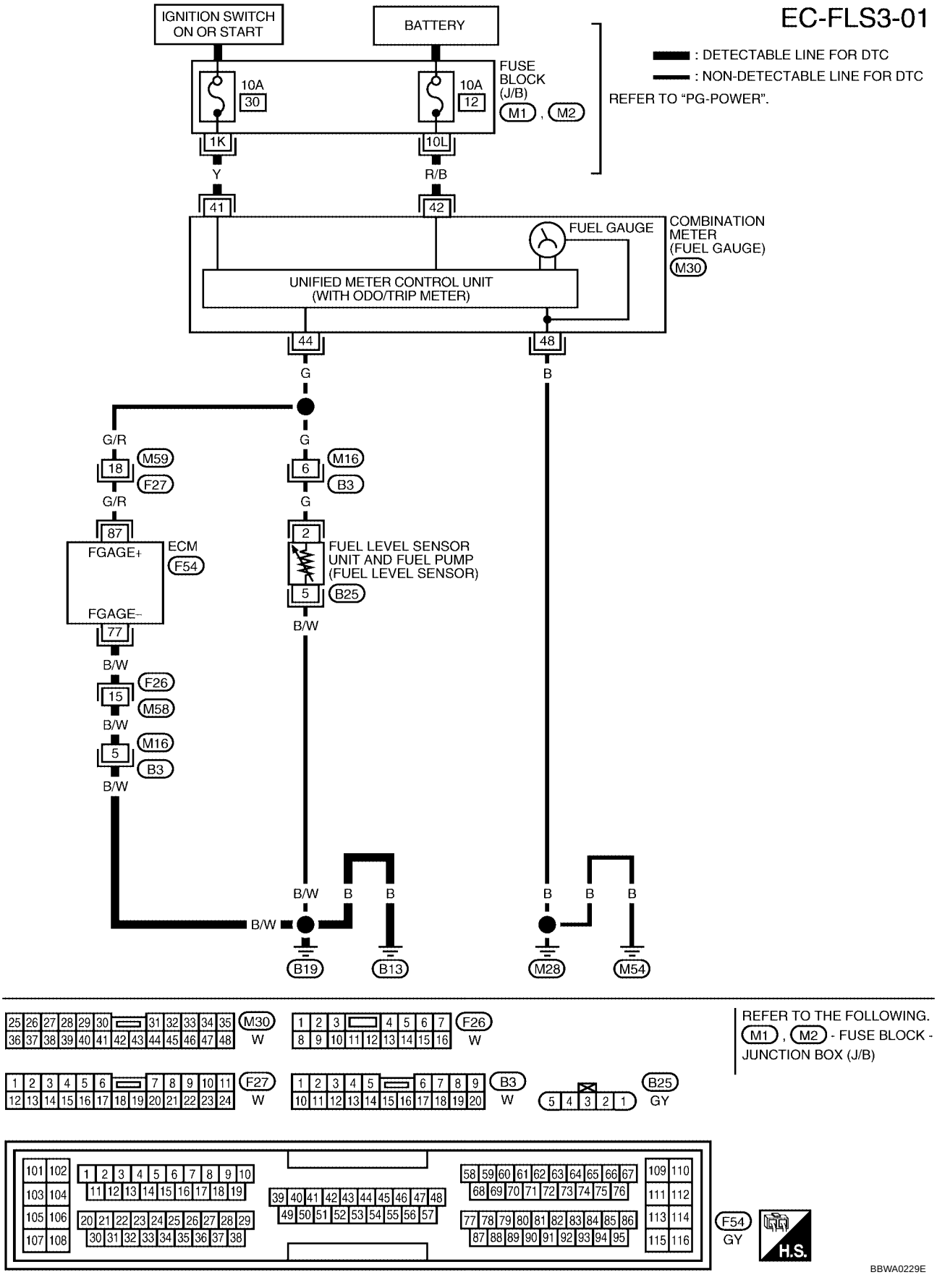


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002KE



BBWA0229E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
77	B/W	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V
87	G/R	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.

Diagnostic Procedure

UBS002KF

1. CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 77 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F26, M58
- Harness connectors M16, B3
- Harness for open and short between ECM and body ground

>> Replace open circuit or short to power in harness or connectors.

3. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 4.
NG >> Replace fuel level sensor unit.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS002KG

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

DTC P1490 VACUUM CUT VALVE BYPASS VALVE

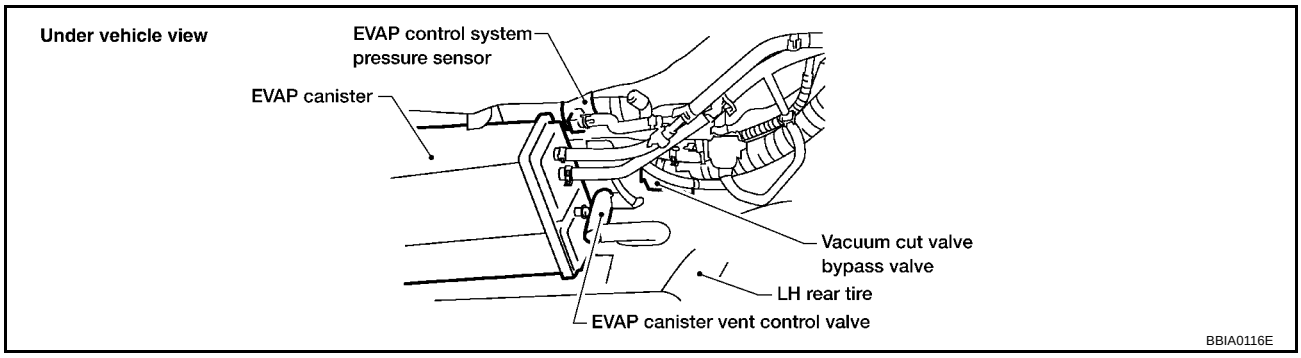
PFP:17372

Description

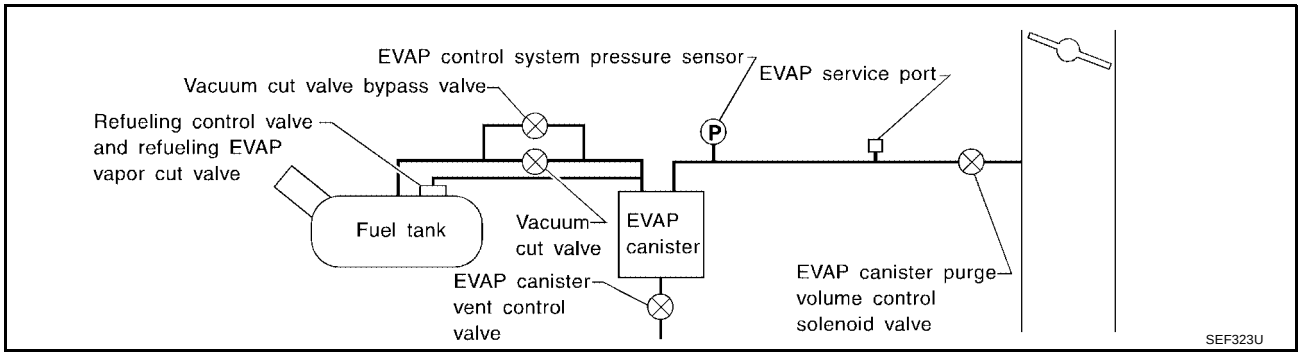
UBS002KH

COMPONENT DESCRIPTION

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.
The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.
The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.



EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT-II Reference Value in Data Monitor Mode

UBS002KI

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPAS S/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002KJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1490 1490	Vacuum cut valve bypass valve circuit	An improper voltage signal is sent to ECM through vacuum cut valve bypass valve.	● Harness or connectors (The vacuum cut valve bypass valve circuit is open or shorted) ● Vacuum cut valve bypass valve

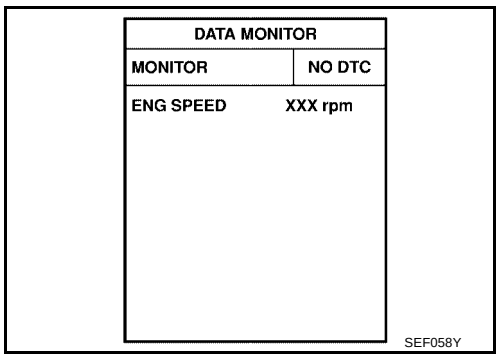
DTC Confirmation Procedure

UBS002KK

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle speed.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1710, "Diagnostic Procedure" .



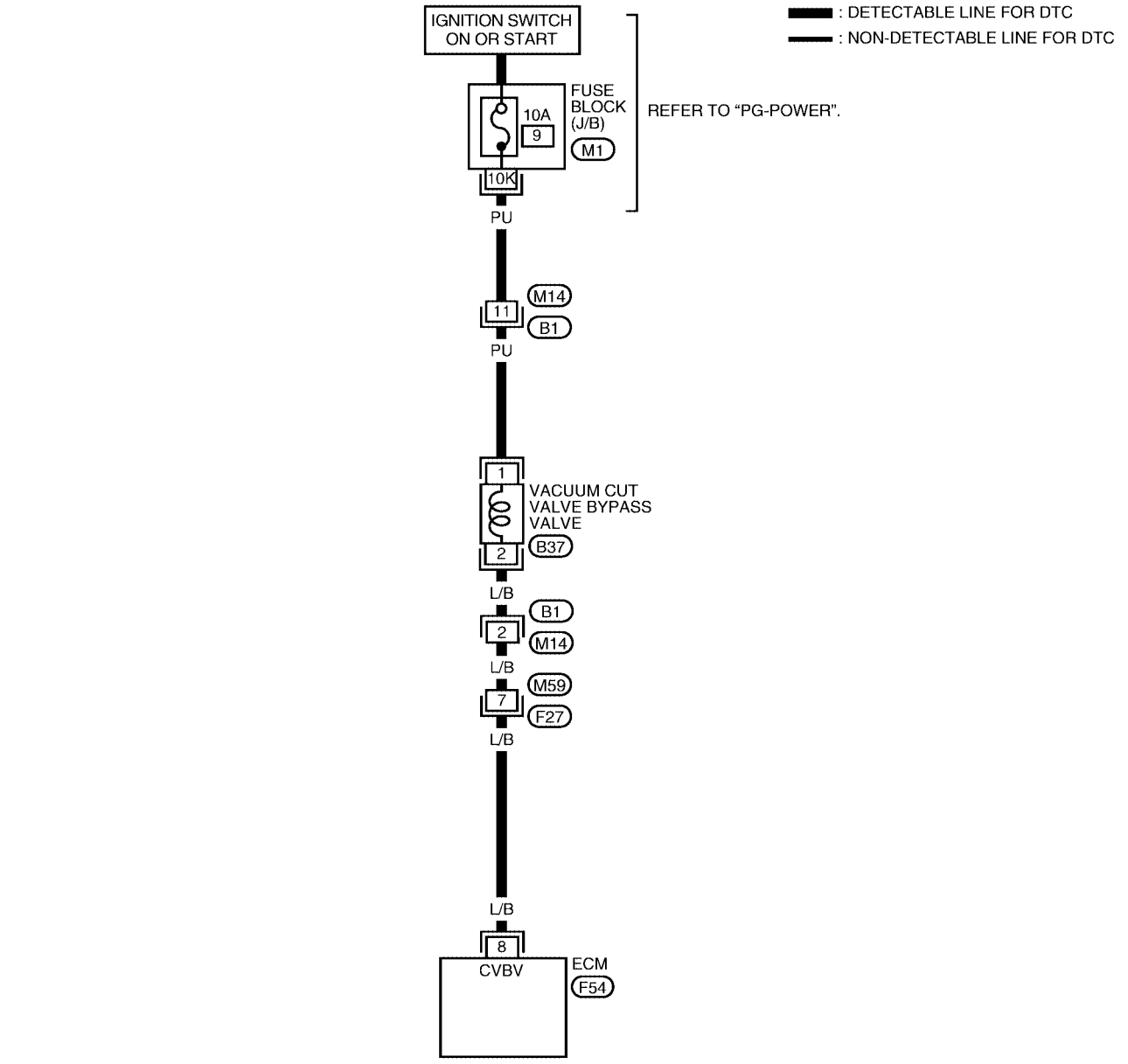
WITH GST

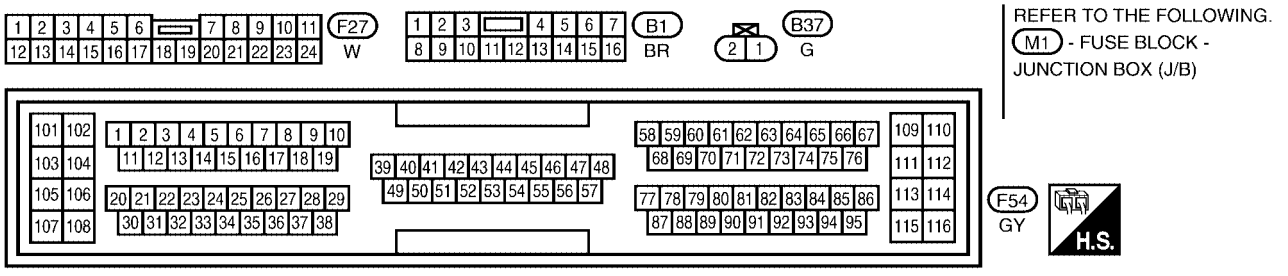
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002KL

EC-BYPS/V-01





BBWA0240E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8	L/B	Vacuum cut valve bypass valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002KM

1. INSPECTION START

Do you have CONSULT-II?

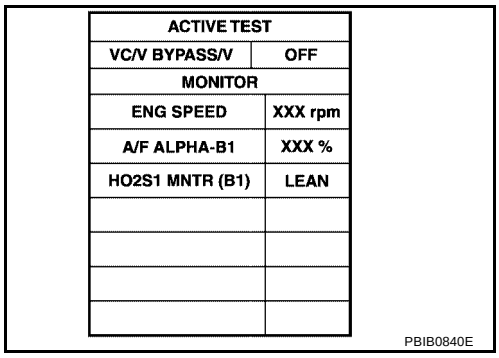
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK VACUUM CUT VALVE BYPASS VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch "OFF" and then "ON".
2. Select "VC/V BYPASS/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON/OFF" on CONSULT-II screen.
4. Make sure that clicking sound is heard from the vacuum cut valve bypass valve.

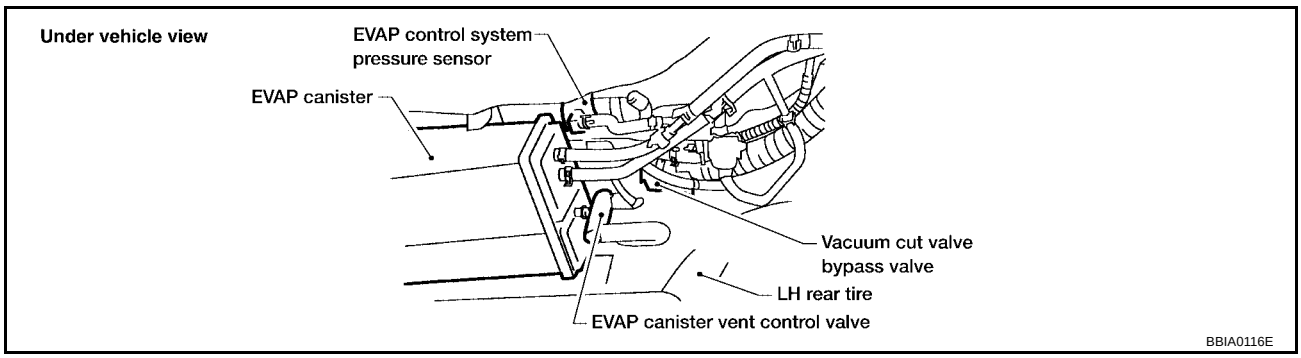


OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

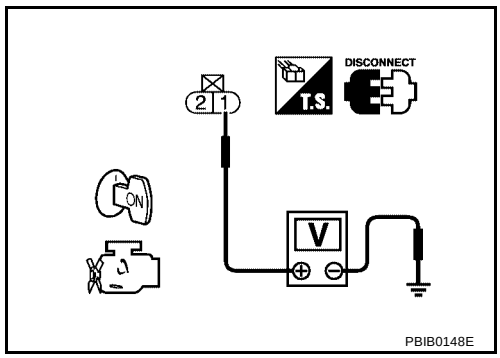
3. CHECK VACUUM CUT VALVE BYPASS VALUE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect vacuum cut valve bypass valve harness connector.



3. Turn ignition switch “ON”.
4. Check voltage between vacuum cut valve bypass valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M14, B1
- Fuel block (J/B) connector M1
- 10A fuse
- Harness for open or short between vacuum cut valve bypass valve and fuse

>> Repair harness or connectors.

5. CHECK VACUUM CUT VALVE BYPASS VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 8 and vacuum cut valve bypass valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between vacuum cut valve bypass valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK VACUUM CUT VALVE BYPASS VALVE

Refer to EC-1712, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace vacuum cut valve bypass valve.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002KN

VACUUM CUT VALVE BYPASS VALVE

With CONSULT-II

1. Reconnect harness disconnected connectors.
2. Turn ignition switch ON.
3. Perform “VC/V BYPASS/V” in “ACTIVE TEST” mode.

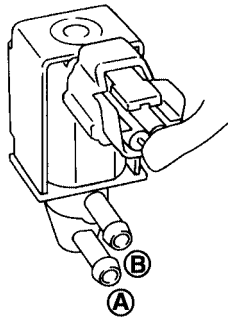
ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0840E

4. Check air passage continuity and operation delay time under the following conditions.

Condition VC/V BYPASS/V	Air passage continuity between **A** and **B**
ON	Yes
OFF	No

Operation takes less than 1 second.
If NG, replace vacuum cut valve bypass valve.



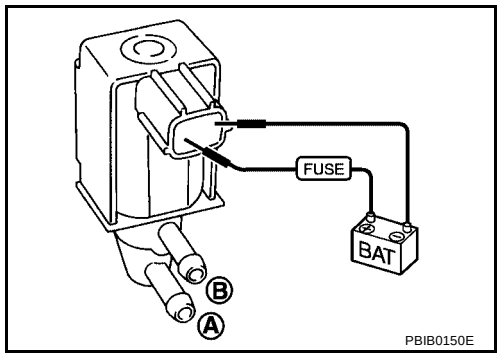
PBIB0149E

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	Yes
No supply	No

Operation takes less than 1 second.
If NG, replace vacuum cut valve bypass valve.



DTC P1491 VACUUM CUT VALVE BYPASS VALVE

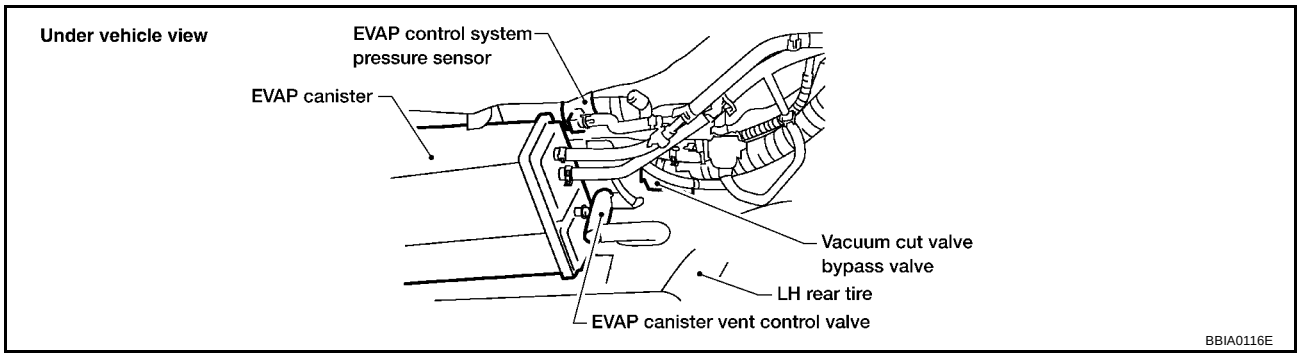
PFP:17372

Description

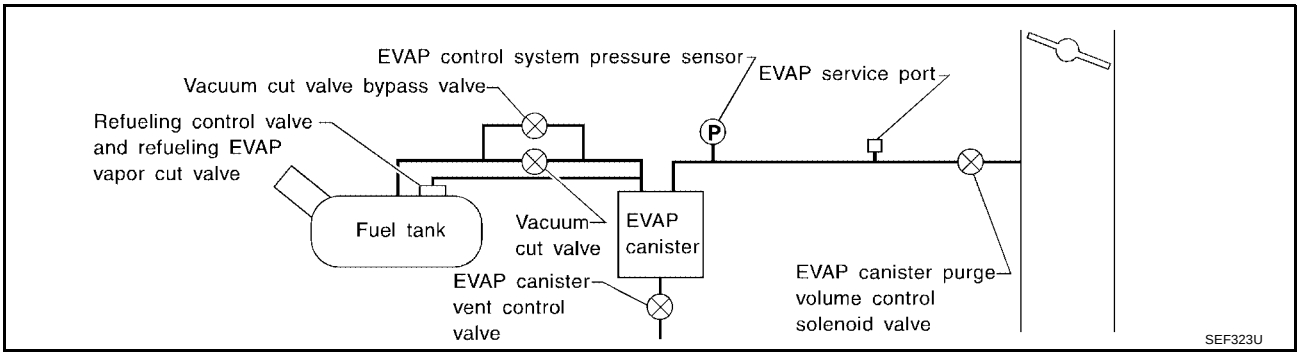
UBS002KO

COMPONENT DESCRIPTION

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.
The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.
The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.



EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT-II Reference Value in Data Monitor Mode

UBS002KP

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPAS S/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002KQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1491 1491	Vacuum cut valve bypass valve	Vacuum cut valve bypass valve does not operate properly.	● Vacuum cut valve bypass valve ● Vacuum cut valve ● Bypass hoses for clogging ● EVAP control system pressure sensor and circuit ● EVAP canister vent control valve ● Hose between fuel tank and vacuum cut valve clogged ● Hose between vacuum cut valve and EVAP canister clogged ● EVAP canister ● EVAP purge port of fuel tank for clogging

DTC Confirmation Procedure

UBS002KR

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

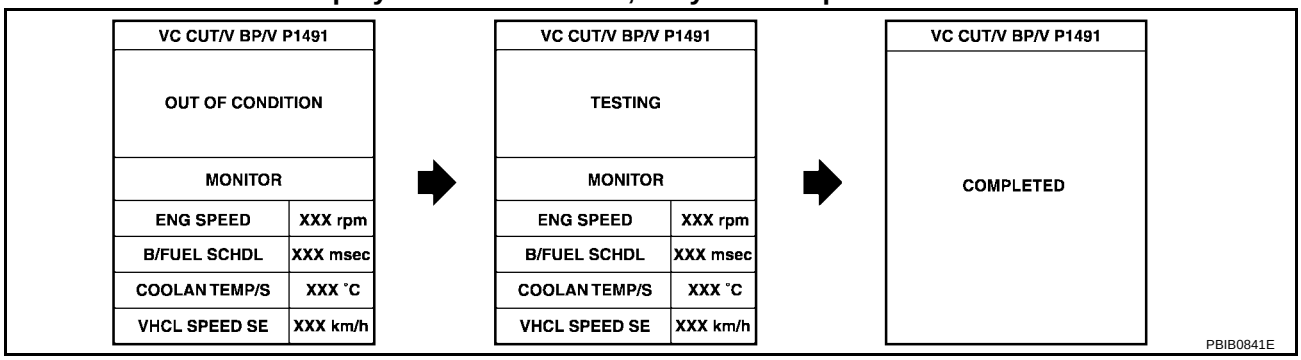
TESTING CONDITION:
Always perform test at a temperature of 5 to 30°C (41 to 86°F).

WITH CONSULT-II

1. Turn ignition switch "ON".
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch "OFF" and wait at least 10 seconds.
4. Start engine and let it idle for at least 70 seconds.
5. Select "VC CUT/V BP/V P1491" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
6. Touch "START".
7. When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)

ENG SPEED	1,000 - 3,800 rpm
Selector lever	Suitable position
Vehicle speed	36 - 120 km/h (22 - 75 MPH)
B/FUEL SCHDL	1.0 - 7.2 msec

If "TESTING" is not displayed after 5 minutes, retry from step 3.



8. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to EC-1718, "Diagnostic Procedure" .

Overall Function Check

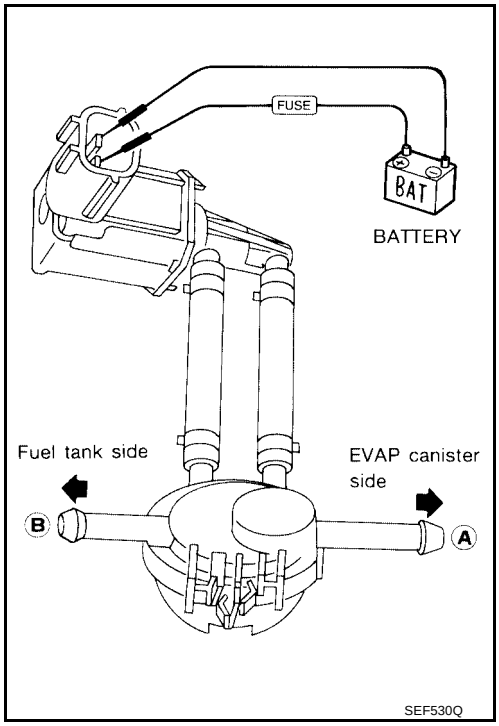
UBS002KS

Use this procedure to check the overall function of vacuum cut valve bypass valve. During this check, the 1st trip DTC might not be confirmed.

WITH GST

1. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.

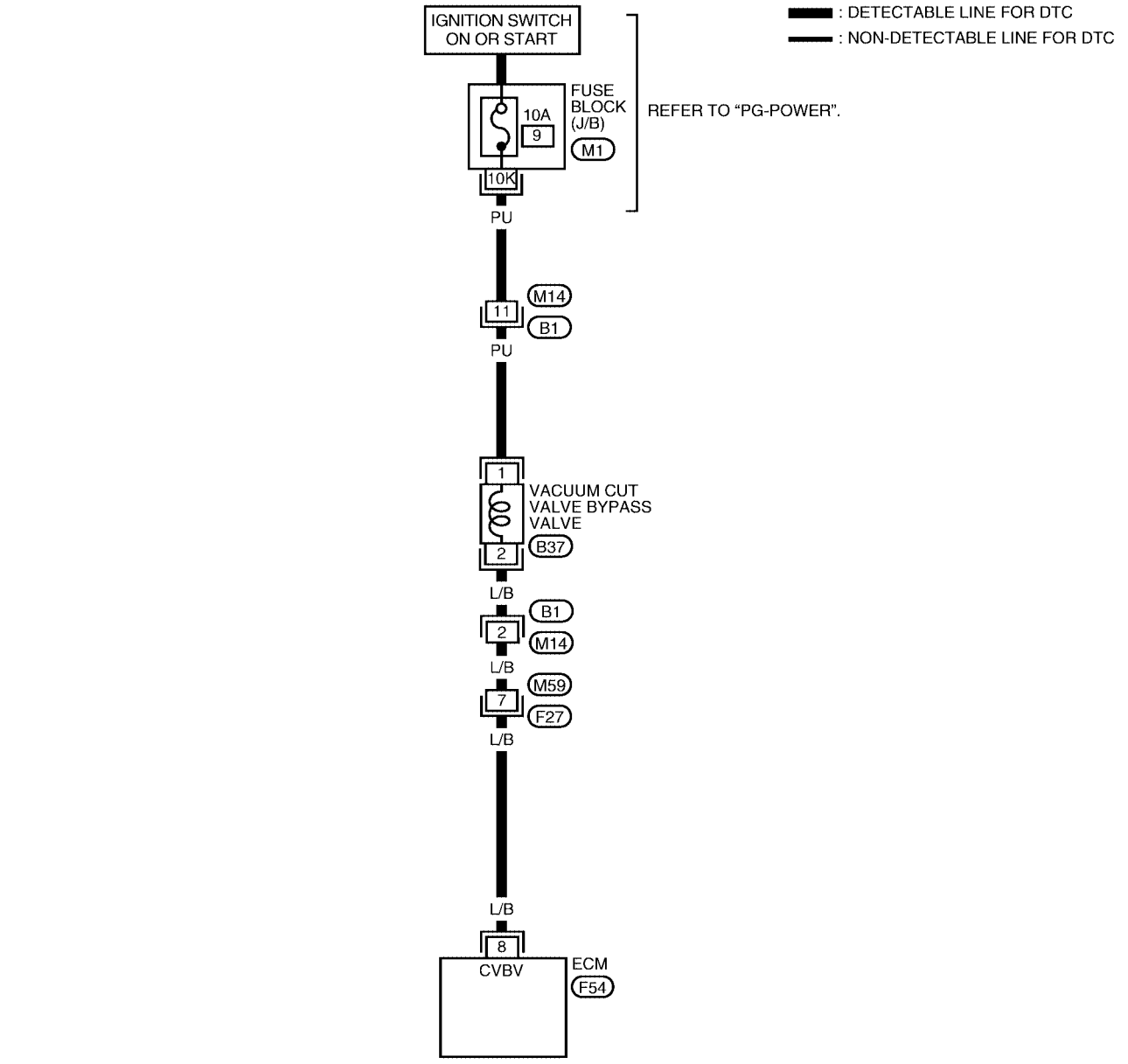
2. Apply vacuum to port **A** and check that there is no suction from port **B** .
3. Apply vacuum to port **B** and check that there is suction from port **A** .
4. Blow air in port **B** and check that there is a resistance to flow out of port **A** .
5. Supply battery voltage to the terminal.
6. Blow air in port **A** and check that air flows freely out of port **B** .
7. Blow air in port **B** and check that air flows freely out of port **A** .
8. If NG, go to EC-1718, "Diagnostic Procedure" .

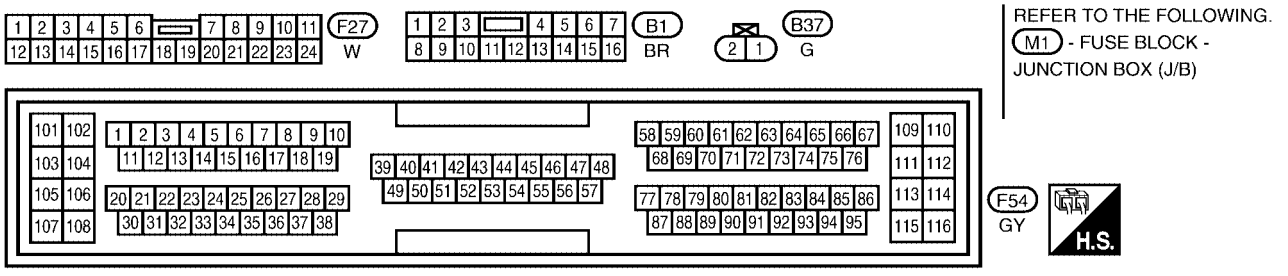


Wiring Diagram

UBS002KT

EC-BYPS/V-01





BBWA0240E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8	L/B	Vacuum cut valve bypass valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002KU

1. INSPECTION START

Do you have CONSULT-II?

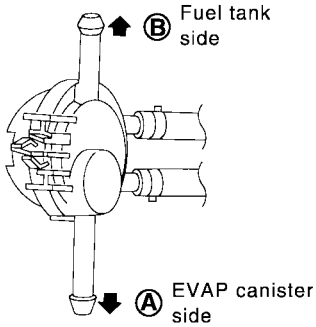
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK VACUUM CUT VALVE BYPASS VALVE OPERATION

With CONSULT-II

1. Turn ignition switch "OFF".
2. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
3. Apply vacuum to port **A** and check that there is no suction from port **B** .
4. Apply vacuum to port **B** and check that there is suction from port **A** .
5. Blow air in port **B** and check that there is a resistance to flow out of port **A** .
6. Turn ignition switch "ON".
7. Select "VC/V BYPASS/V" in "ACTIVE TEST" mode with CONSULT-II and touch "ON".
8. Blow air in port **A** and check that air flows freely out of port **B** .
9. Blow air in port **B** and check that air flows freely out of port **A** .



ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0842E

OK or NG

OK >> GO TO 4.
NG >> GO TO 7.

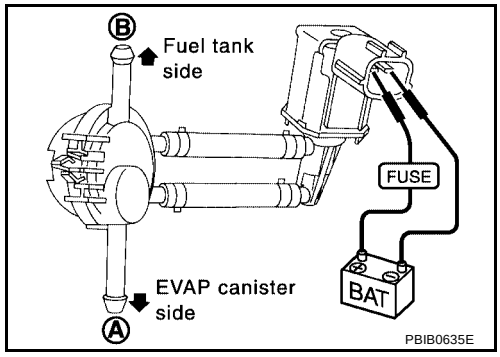
3. CHECK VACUUM CUT VALVE BYPASS VALVE OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
3. Apply vacuum to port **A** and check that there is no suction from port **B** .
4. Apply vacuum to port **B** and check that there is suction from port **A** .
5. Blow air in port **B** and check that there is a resistance to flow out of port **A** .
6. Disconnect vacuum cut valve bypass valve harness connector.
7. Supply battery voltage to the terminal.
8. Blow air in port **A** and check that air flows freely out of port **B** .
9. Blow air in port **B** and check that air flows freely out of port **A** .

OK or NG

OK >> GO TO 4.
NG >> GO TO 7.



4. CHECK EVAP PURGE LINE

Check EVAP purge line between EVAP canister and fuel tank for clogging or disconnection.

OK or NG

OK >> GO TO 5.
NG >> Repair it.

5. CHECK EVAP PURGE PORT

Check EVAP purge port of fuel tank for clogging.

OK or NG

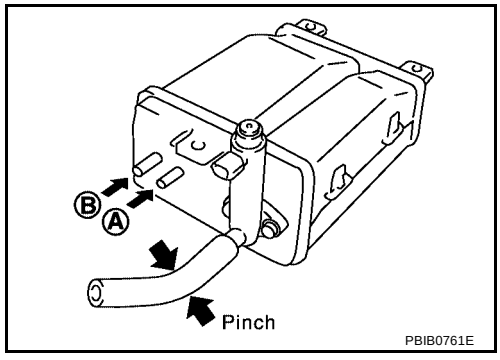
OK >> GO TO 6.
NG >> Clean EVAP purge port.

6. CHECK EVAP CANISTER

1. Pinch the fresh air hose.
2. Blow air into port **A** and check that it flows freely out of port **B** .

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP canister.



7. CHECK BYPASS HOSE

Check bypass hoses for clogging.

OK or NG

OK >> GO TO 8.
NG >> Repair or replace hoses.

8. CHECK VACUUM CUT VALVE BYPASS VALVE

Refer to EC-1721, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace vacuum cut valve bypass valve.

9. CHECK VACUUM CUT VALVE

Refer to EC-1721, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace vacuum cut valve.

10. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

1. Turn ignition switch “OFF”.
2. Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 11.
NG >> Repair or replace.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP control system pressure sensor.

12. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace EVAP control system pressure sensor.

13. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 14.
NG >> Clean the rubber tube using an air blower.

14. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 15.
NG >> Replace EVAP canister vent control valve.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002KV

VACUUM CUT VALVE BYPASS VALVE

With CONSULT-II

1. Reconnect harness disconnected connectors.
2. Turn ignition switch ON.
3. Perform “VC/V BYPASS/V” in “ACTIVE TEST” mode.

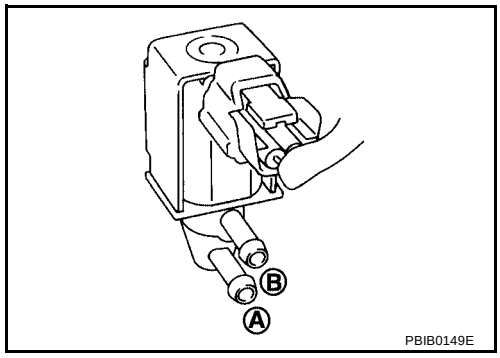
ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0840E

4. Check air passage continuity and operation delay time under the following conditions.

Condition VC/V BYPASS/V	Air passage continuity between **A** and **B**
ON	Yes
OFF	No

Operation takes less than 1 second.
If NG, replace vacuum cut valve bypass valve.



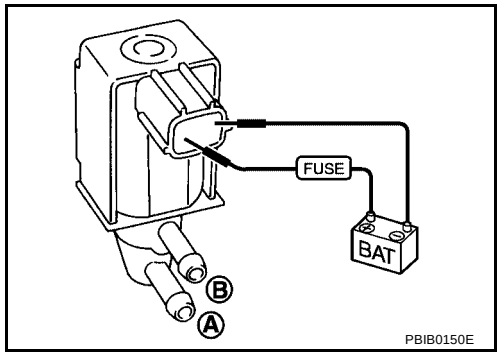
PBIB0149E

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	Yes
No supply	No

Operation takes less than 1 second.
If NG, replace vacuum cut valve bypass valve.

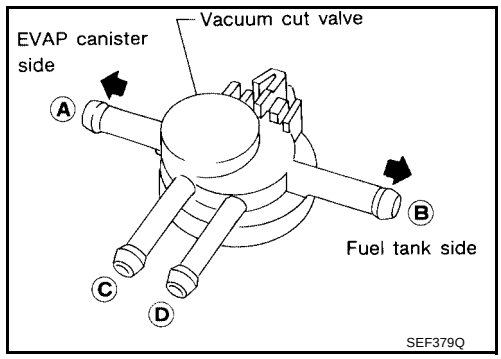


PBIB0150E

VACUUM CUT VALVE

Check vacuum cut valve as follows:

1. Plug port **C** and **D** with fingers.
2. Apply vacuum to port **A** and check that there is no suction from port **B** .
3. Apply vacuum to port **B** and check that there is suction from port **A** .
4. Blow air in port **B** and check that there is a resistance to flow out of port **A** .
5. Open port **C** and **D** .
6. Blow air in port **A** check that air flows freely out of port **C** .
7. Blow air in port **B** check that air flows freely out of port **D** .
8. If NG, replace vacuum cut valve.



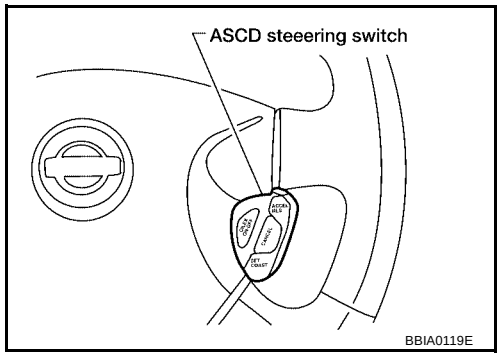
DTC P1564 ASCD STEERING SWITCH

PFP:25551

Component Description

UBS002KW

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS002KX

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAIN SW	● Ignition switch: ON	● CRUISE switch: Depressed	ON
		● CRUISE switch: Released	OFF
CANCEL	● Ignition switch: ON	● CANCEL switch: Depressed	ON
		● CANCEL switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	● ACCEL/RES switch: Depressed	ON
		● ACCEL/RES switch: Released	OFF
SET SW	● Ignition switch: ON	● COAST/SET switch: Depressed	ON
		● COAST/SET switch: Released	OFF

On Board Diagnosis Logic

UBS002KY

This self-diagnosis has the one trip detection logic.
The MIL will not light up for this diagnosis.

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1583 .

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1564 1564	ASCD steering switch	● An excessively high voltage signal from the ASCD steering switch is sent to ECM. ● ECM detects that input signal from the ASCD steering switch is out of the specified range. ● ECM detects that the ASCD steering switch is stuck ON.	● Harness or connectors (The switch circuit is open or shorted.) ● ASCD steering switch ● ECM

DTC Confirmation Procedure

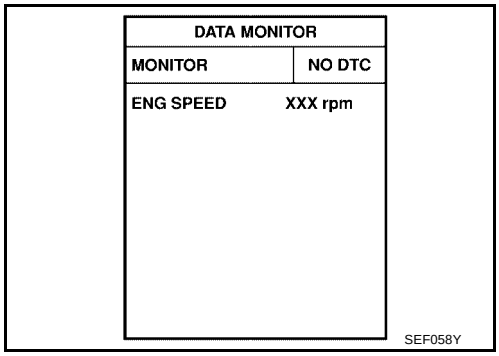
UBS002KZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 10 seconds.
4. Press “CRUISE” switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press “ACCEL/RES” switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press “COAST/SET” switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Press “CANCEL” switch for at least 10 seconds, then release it and wait at least 10 seconds.
8. If 1st trip DTC is detected, go to EC-1727, "Diagnostic Procedure" .



WITH GST

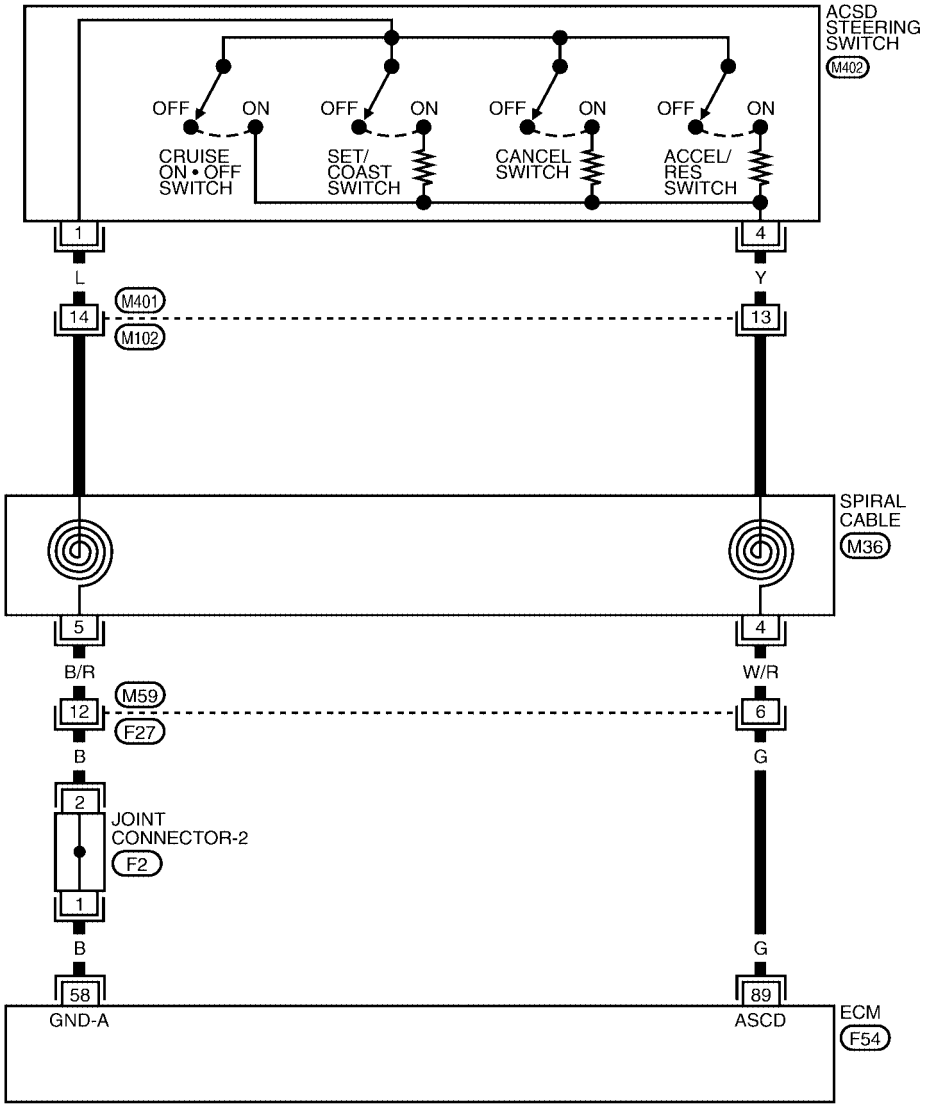
Follow the procedure “WITH CONSULT-II” above.

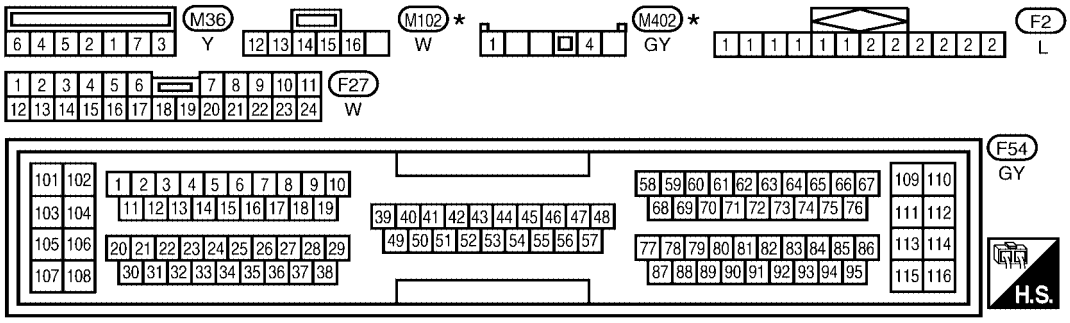
Wiring Diagram

UBS002L0

EC-ASC/SW-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





★: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" OF PG SECTION.

BBWA0420E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
89	G	ASCD steering switch	**[Ignition switch "ON"]** ● ASCD steering switch is "OFF".	Approximately 4.0V
			[Ignition switch "ON"] ● CRUISE switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1.0V
			[Ignition switch "ON"] ● SET/COAST switch is "ON".	Approximately 2.0V
			[Ignition switch "ON"] ● ACCEL/RES switch is "ON".	Approximately 3.0V

Diagnostic Procedure

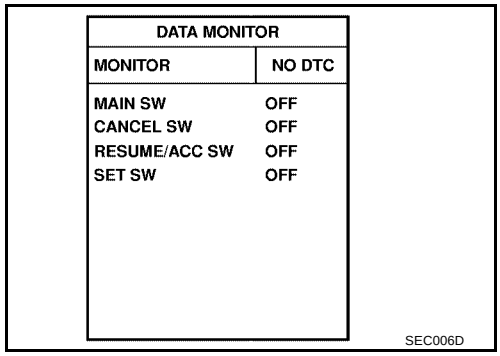
UBS002L1

1. CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “MAIN SW”, “RESUME/ACC SW”, “SET SW” and “CANCEL SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check each item indication under the following conditions.

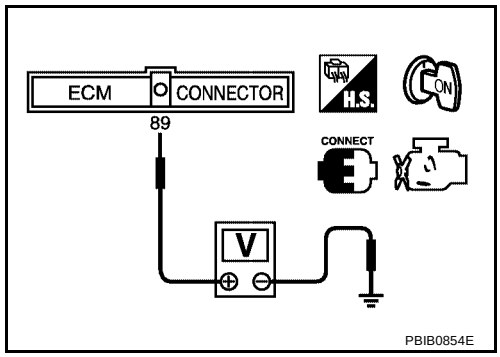
Switch	Monitor item	Condition	Indication
CUISE	MAIN SW	Pressed	ON
		Released	OFF
COAST/SET	SET SW	Pressed	ON
		Released	OFF
ACCEL/RES	RESUME/ACC SW	Pressed	ON
		Released	OFF
CANCEL	CANCEL SW	Pressed	ON
		Released	OFF



Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 89 and ground with pressing each button.

Switch	Condition	Voltage [V]
CRUISE	Pressed	Approx. 0.5
	Released	Approx. 4.0
COAST/SET	Pressed	Approx. 2.0
	Released	Approx. 4.0
ACCEL/RES	Pressed	Approx. 3.0
	Released	Approx. 4.0
CANCEL	Pressed	Approx. 1.0
	Released	Approx. 4.0



OK or NG

OK >> GO TO 7.
NG >> GO TO 2.

2. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

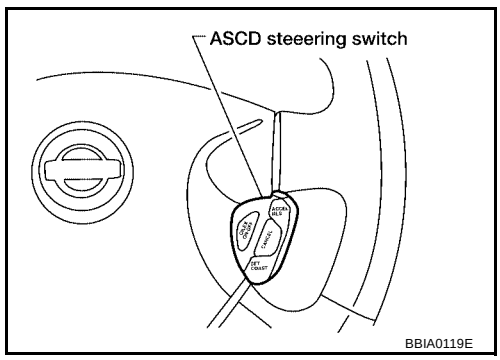
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect ASCD steering switch harness connector.
4. Check harness continuity between ASCD steering switch terminal 1 and ECM terminal 58. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors M102, M401
- Joint connector-2
- Spiral cable
- Harness for open and short between ECM and ASCD steering switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 89 and ASCD steering switch terminal 4. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors M102, M401
- Spiral cable
- Harness for open and short between ECM and ASCD steering switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD STEERING SWITCH

Refer to EC-1728, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace ASCD steering switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1606, "DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION" .

>> **INSPECTION END**

Component Inspection

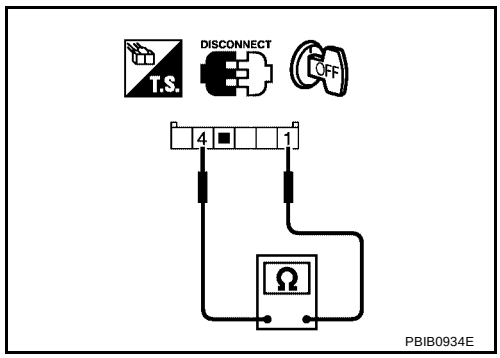
UBS002L2

ASCD STEERING SWITCH

1. Disconnect ASCD steering switch.

2. Check continuity between ASCD steering switch terminals 1 and 4 with pushing each switch.

Switch	Condition	Resistance [Ω]
CRUISE SW	Pressed	Approx. 4,000
	Released	Approx. 0
COAST/SET SW	Pressed	Approx. 660
	Released	Approx. 0
ACCEL/RES SW	Pressed	Approx. 1,000
	Released	Approx. 0
CANCEL SW	Pressed	Approx. 250
	Released	Approx. 0



If NG, replace ASCD steering switch.

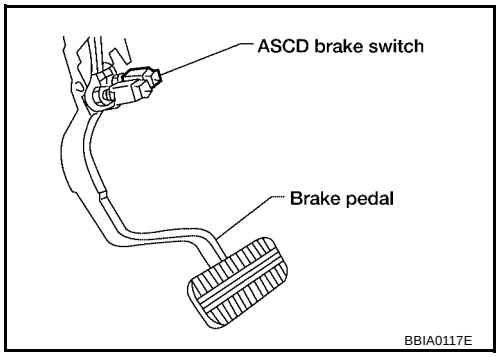
DTC P1572 ASCD BRAKE SWITCH

PFP:25320

Component Description

UBS002L3

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS002L4

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (ASCD brake switch)	● Ignition switch: ON	● Brake pedal: Fully released	ON
		● Brake pedal: Slightly depressed	OFF
BRAKE SW2 (stop lamp switch)	● Ignition switch: ON	● Brake pedal: Fully released	OFF
		● Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

UBS002L5

The MIL will not light up for this diagnosis.

NOTE:
If DTC P1572 is displayed with DTC P0605 or P1805, first perform the trouble diagnosis for DTC P0605 or P1805. Refer to EC-1583 or EC-1746 .

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1572 1572	ASCD brake switch	ON signals from the stop lamp switch and the ASCD brake switch are sent to ECM at the same time.	● Harness or connectors (The stop lamp switch circuit is open or shorted.) ● Harness or connectors (The ASCD brake switch circuit is open or shorted.) ● Harness or connectors (The ASCD clutch switch circuit is open or shorted.) ● Stop lamp switch ● ASCD brake switch ● ASCD clutch switch ● Incorrect stop lamp switch installation ● Incorrect ASCD brake switch installation ● Incorrect ASCD clutch switch installation ● ECM

DTC Confirmation Procedure

UBS002L6

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:

Steps 3 and 4 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position

If 1st trip DTC is detected, go to EC-1733, "Diagnostic Procedure" .
If 1st trip DTC is not detected, go to the following step.

4. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned condition.

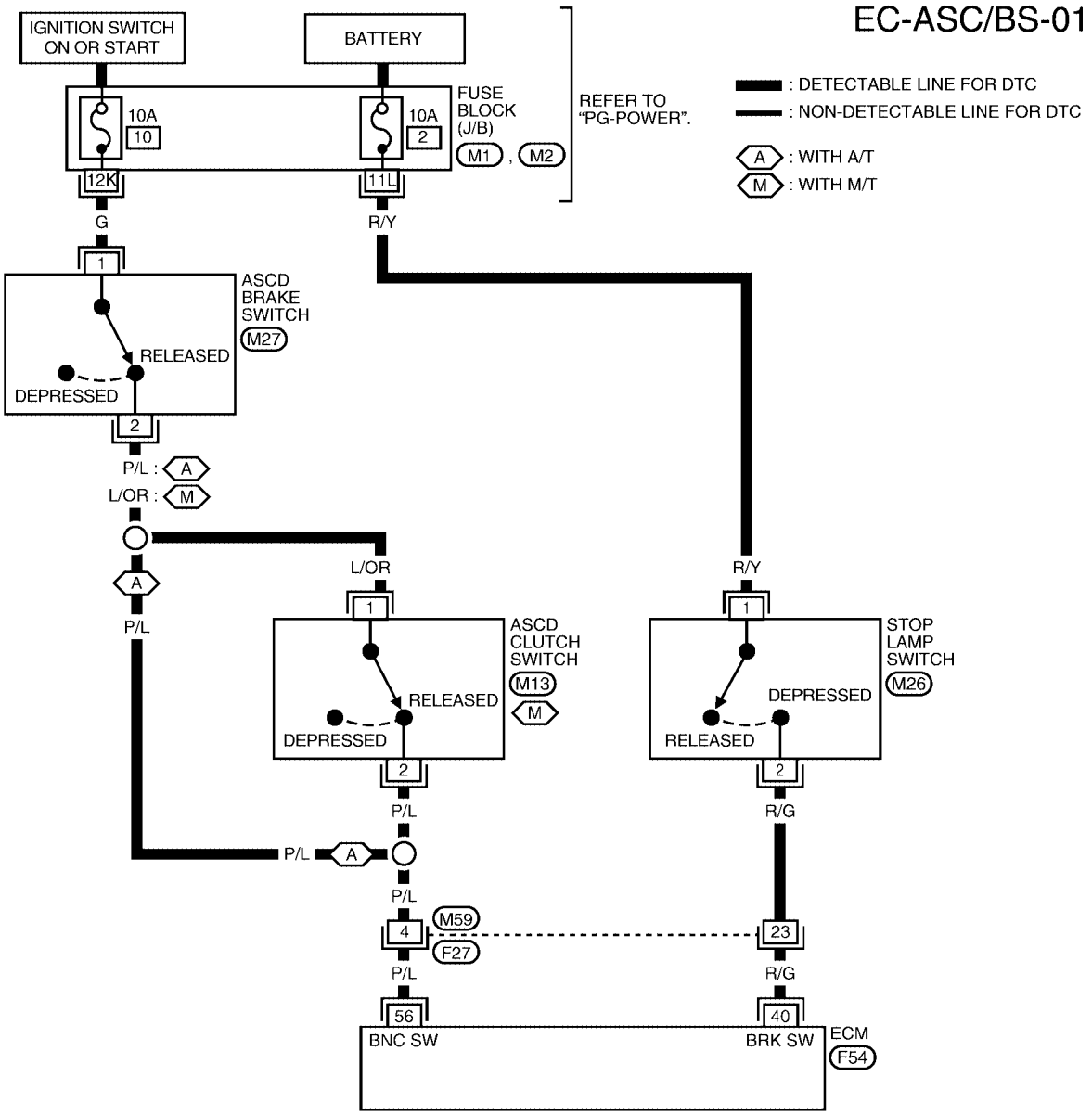
5. If 1st trip DTC is detected, go to EC-1733, "Diagnostic Procedure" .

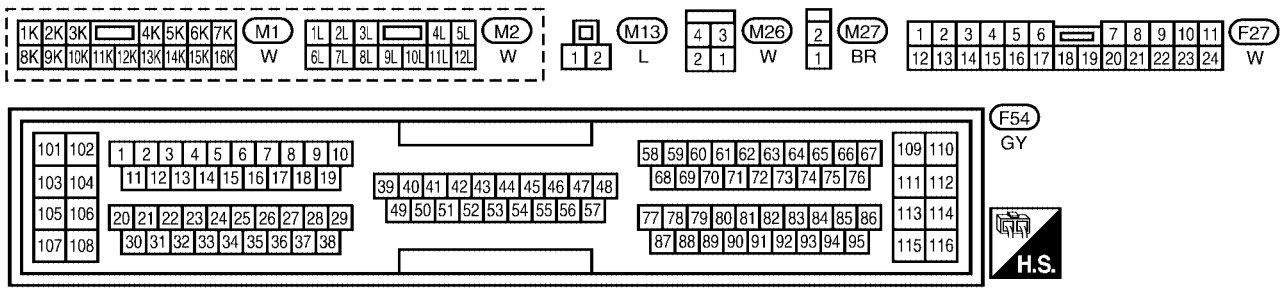
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002L7





BBWA0421E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
56	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released ● Clutch pedal is fully released (M/T models)	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002L8

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

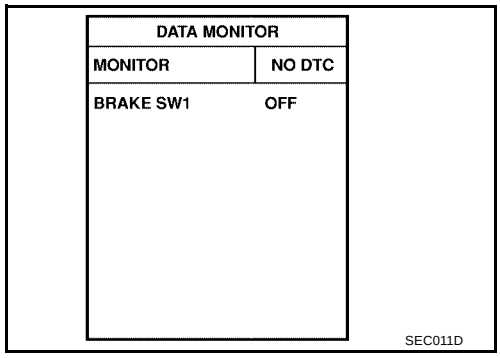
1. Turn ignition switch "ON".
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-II.
3. Check "BRAKE SW1" indication under the following conditions.

M/T models

CONDITION	INDICATION
When clutch pedal or brake pedal is depressed	OFF
When clutch pedal and brake pedal are fully released	ON

A/T models

CONDITION	INDICATION
When brake pedal is depressed	OFF
When brake pedal is fully released	ON



Without CONSULT-II

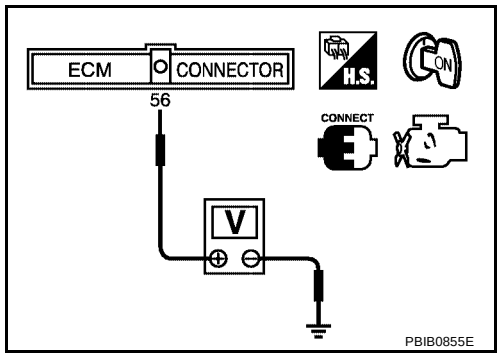
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 56 and ground under the following conditions.

M/T models

CONDITION	VOLTAGE
When clutch pedal or brake pedal is depressed	Approximately 0V
When clutch pedal and brake pedal are fully released	Battery voltage

A/T models

CONDITION	VOLTAGE
When brake pedal is depressed	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

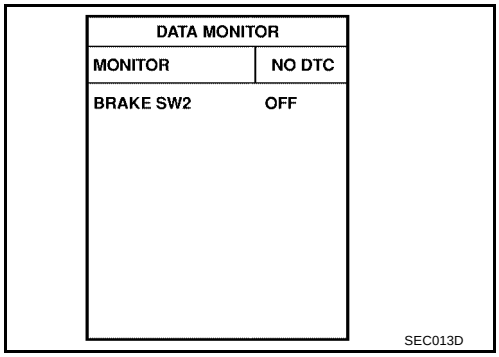
OK >> GO TO 2.
NG (M/T models) >>GO TO 3.
NG (A/T models) >>GO TO 4.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

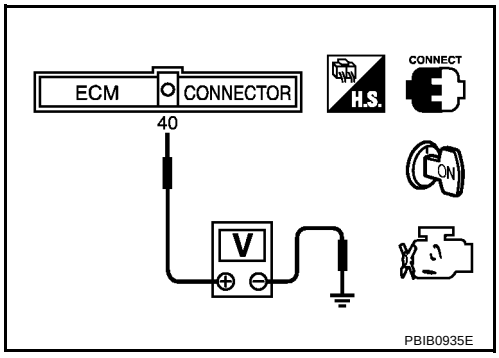
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 40 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

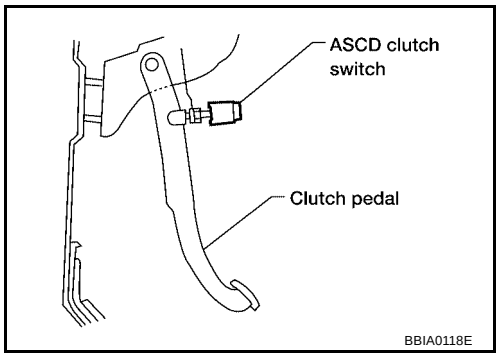


OK or NG

OK >> GO TO 18.
NG >> GO TO 13.

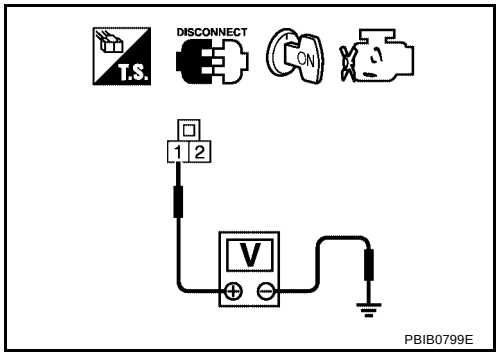
3. CHECK ASCD BRAKE SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-II or tester.

CONDITION	VOLTAGE
When brake pedal is released	Battery voltage
When brake pedal is depressed	Approx. 0V

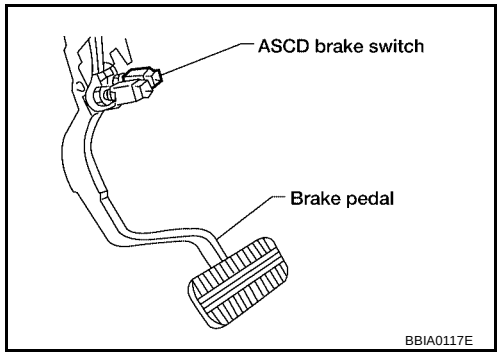


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch “ON”.

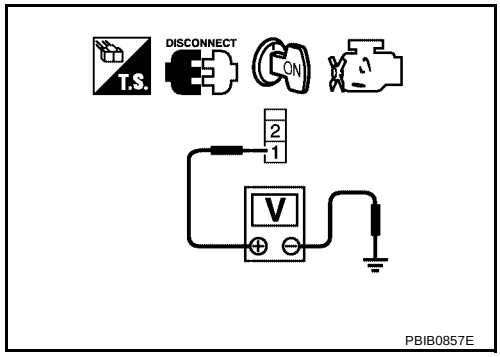


4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK (M/T models)>>GO TO 6.
OK (A/T models)>>GO TO 7.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ASCD BRAKE SWITCH

Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD brake switch.

10. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and ASCD clutch switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD clutch switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

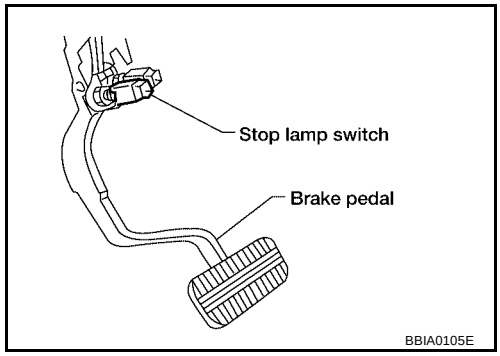
Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD clutch switch.

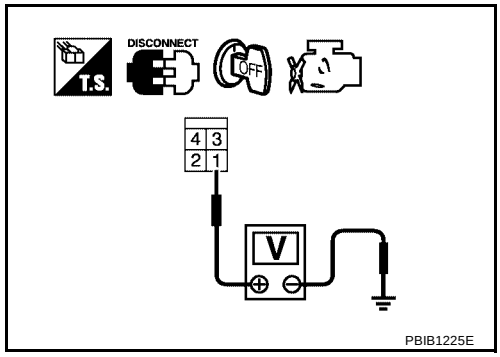
13. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT -II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 40 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK STOP LAMP SWITCH

Refer to EC-1738, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace stop lamp switch.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

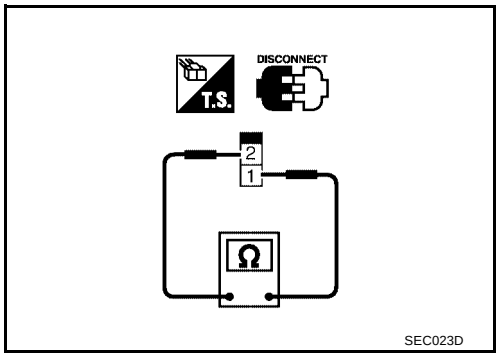
UBS002L9

ASCD BRAKE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Check continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should exist.
When brake pedal is depressed.	Should not exist.

If NG, adjust ASCD brake switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.

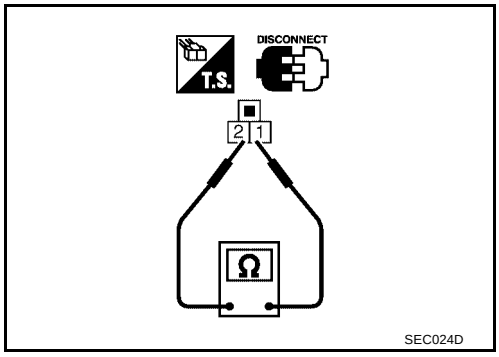


ASCD CLUTCH SWITCH (FOR M/T MODELS)

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When clutch pedal is fully released.	Should exist.
When clutch pedal is depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to CL-23, "CLUTCH SYSTEM" , and perform step 3 again.

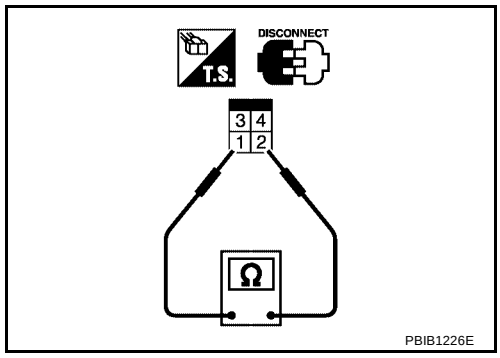


STOP LAMP SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.



DTC P1574 ASCD VEHICLE SPEED SENSOR

PFP:31036

Component Description

UBS002LA

The ECM receives two vehicle speed sensor signals. One is sent from combination meter, and the other is from TCM (Transmission control module) via CAN communication line. The ECM uses these signals for ASCD control. Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for ASCD functions.

On Board Diagnosis Logic

UBS002LB

The MIL will not light up for this diagnosis.

NOTE:

- **If DTC P1574 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1350, "DTC U1000, U1001 CAN COMMUNICATION LINE" .**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-1575, "DTC P0500 VSS" .**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1583, "DTC P0605 ECM" .**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1574 1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	● Harness or connectors (The CAN communication line is open or shorted.) ● Harness or connectors (The combination meter circuit is open or shorted.) ● TCM ● Combination meter ● Vehicle speed sensor ● ECM

DTC Confirmation Procedure

UBS002LC

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

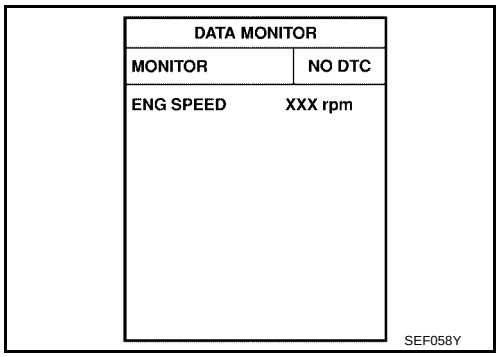
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Step 3 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Drive the vehicle at more than 40 km/h (25MPH).
4. If 1st trip DTC is detected, go to EC-1741, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002LD

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-428, "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" .

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2. CHECK VEHICLE SPEED SENSOR CIRCUIT

Refer to DI-26, "VEHICLE SPEED SENSOR SIGNAL CHECK" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-3, "METERS AND GAUGES" .

>> **INSPECTION END**

DTC P1706 PNP SWITCH

PFP:32006

Component Description

UBS002LE

When the shift lever position is “P” (A/T models only) or “N”, park/neutral position (PNP) switch is “ON”. ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

UBS002LF

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF

On Board Diagnosis Logic

UBS002LG

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706 1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	● Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.] ● Park/neutral position (PNP) switch

DTC Confirmation Procedure

UBS002LH

CAUTION:

Always drive vehicle at a safe speed.

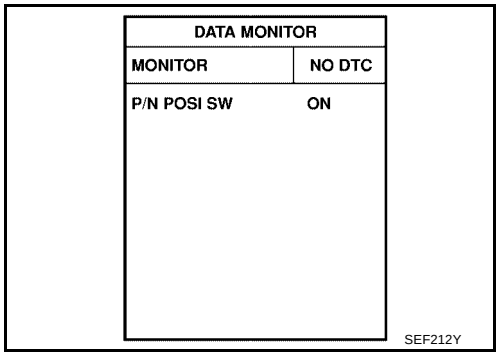
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II. Then check the “P/N POSI SW” signal under the following conditions.

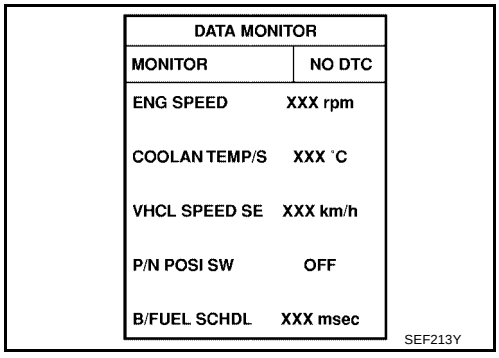
Position (Selector lever)	Known-good signal
“N” and “P” position	ON
Except the above position	OFF



If NG, go to EC-1745, "Diagnostic Procedure" .
If OK, go to following step.

3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and warm it up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,500 - 3,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.0 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 MPH)
Selector lever	Suitable position



6. If 1st trip DTC is detected, go to EC-1745, "Diagnostic Procedure" .

Overall Function Check

UBS002LI

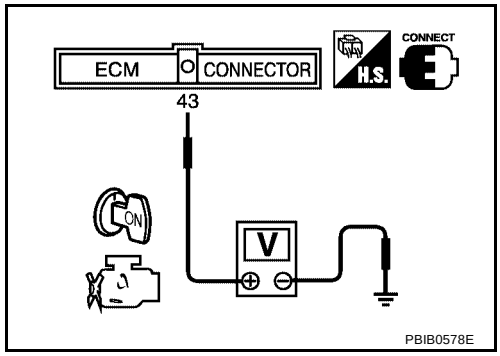
Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 43 (PNP switch signal) and body ground under the following conditions.

Condition (Gear position)	Voltage V (Known good data)
“P” (A/T models only) and “N” position	Approx. 0
Except the above position	A/T models: Battery voltage M/T: Approximately 5V

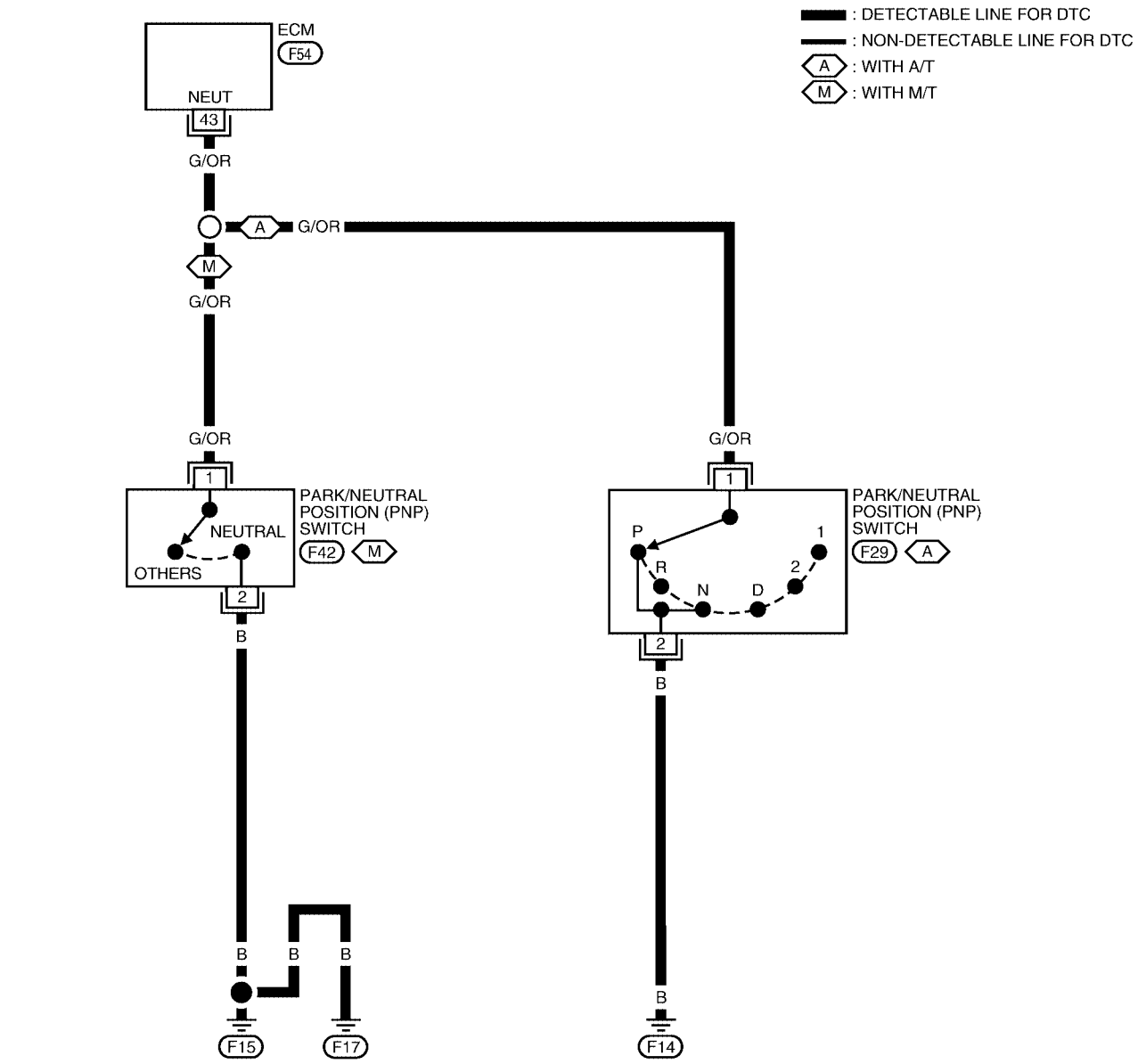
3. If NG, go to EC-1745, "Diagnostic Procedure" .

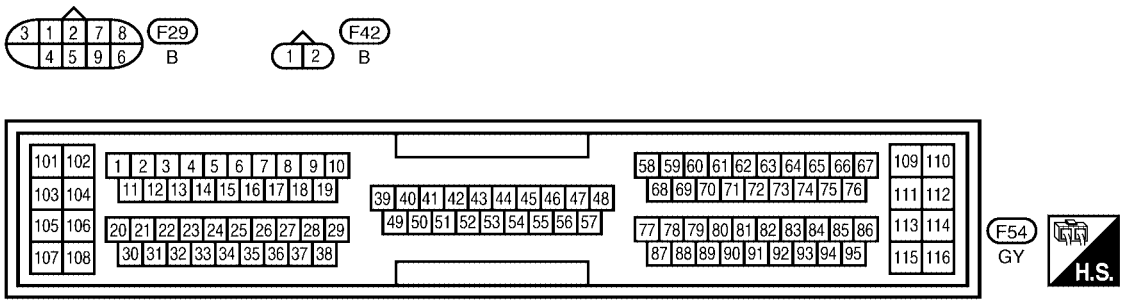


Wiring Diagram

UBS002LJ

EC-PNP/SW-01





BBWA0241E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
43	G/OR	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models), "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

UBS002LK

1. CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and body ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to power in harness or connectors.

2. CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 43 and PNP switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK PNP SWITCH

Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" (A/T models), MT-139, "POSITION SWITCH" (6M/T models) or MT-78, "POSITION SWITCH" (5M/T models).

OK or NG

OK >> GO TO 4.
NG >> Replace PNP switch.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

UBS002LL

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

UBS002LM

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

UBS002LN

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

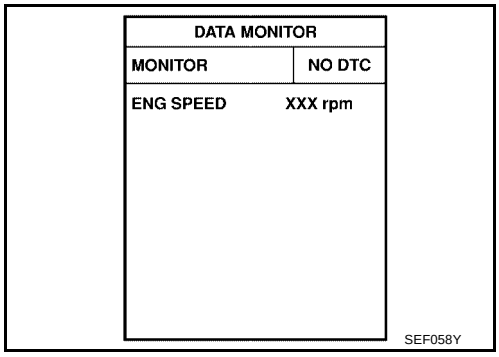
Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range.	
	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

UBS002LO

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-1748, "Diagnostic Procedure" .

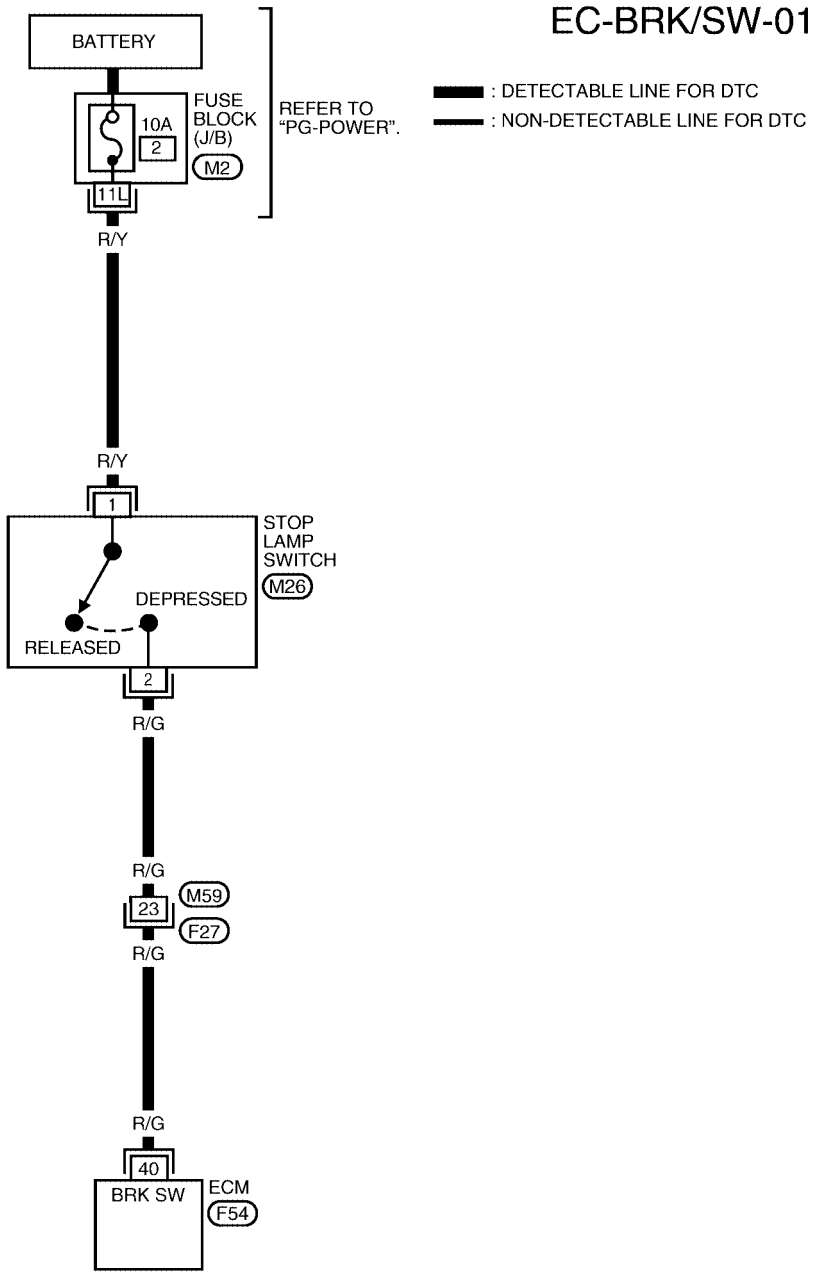


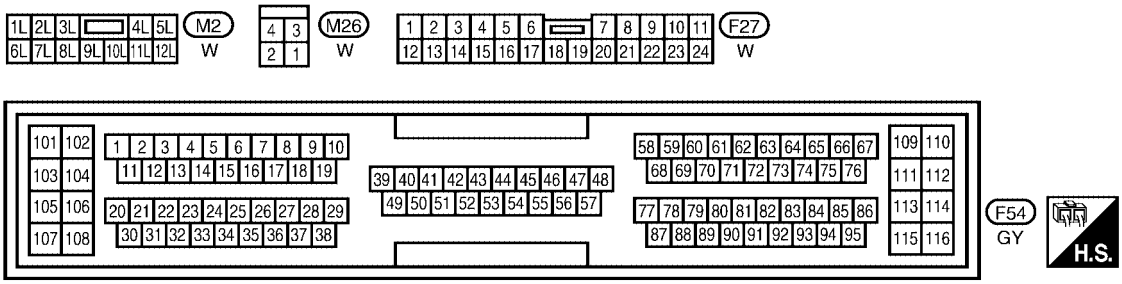
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002LP





BBWA0422E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002LQ

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the brake pedal.

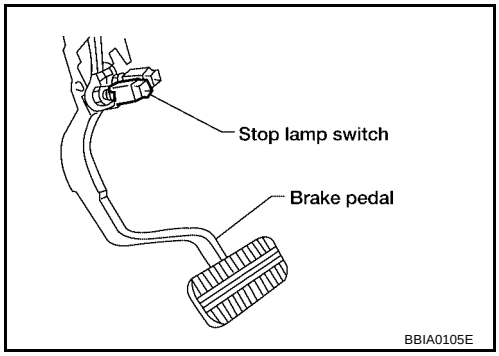
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

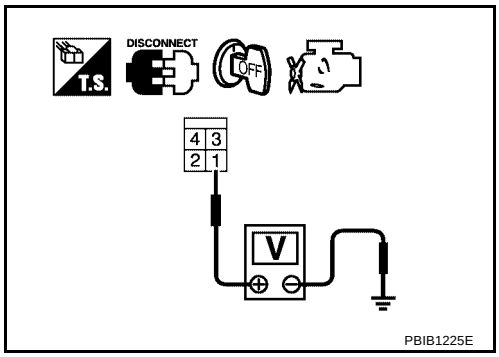
2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.



2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

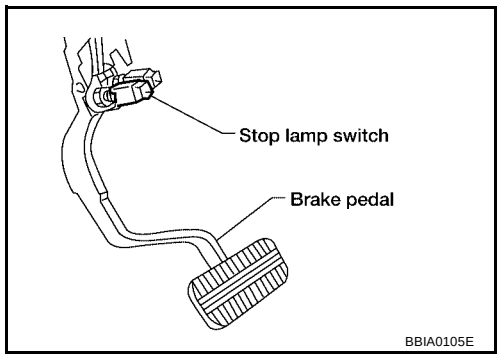
- 10A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.
4. Check harness continuity between ECM terminal 40 and stop lamp switch terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.
5. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-1750, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

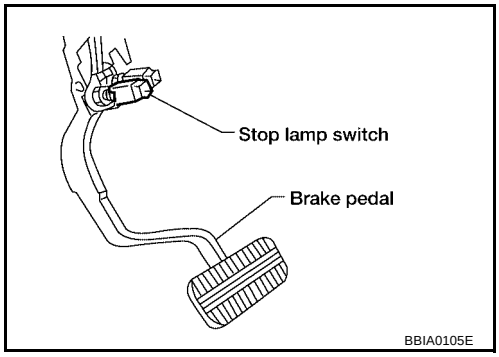
>> **INSPECTION END**

Component Inspection

UBS002LR

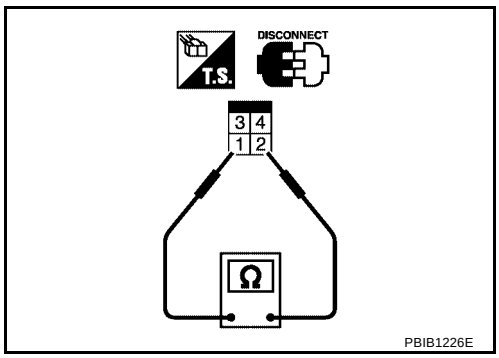
STOP LAMP SWITCH

1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.



If NG, adjust brake pedal installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 2 again.

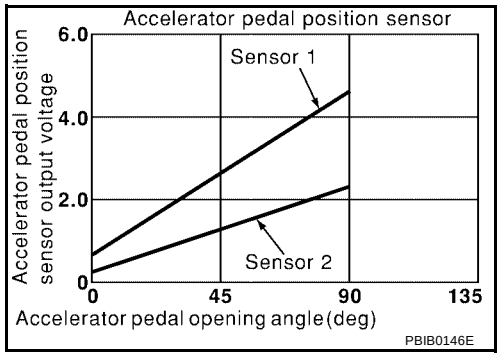
DTC P2122, P2123 APP SENSOR

PFP:18002

Component Description

UBS006K8

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS006K9

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

UBS006KA

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122 2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P2123 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

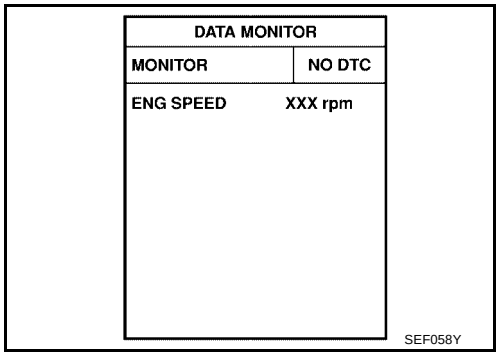
UBS006KB

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1754, "Diagnostic Procedure" .



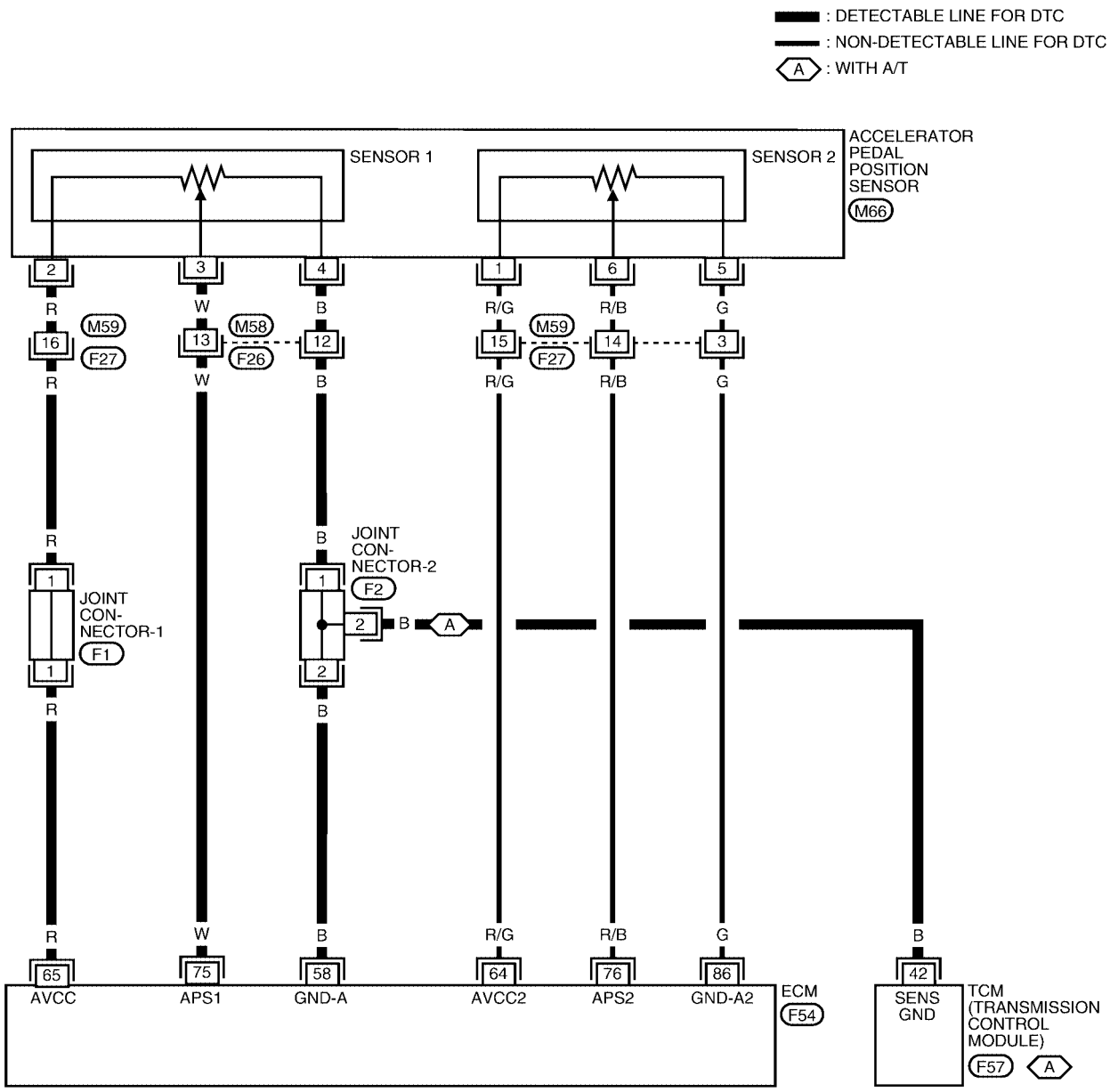
WITH GST

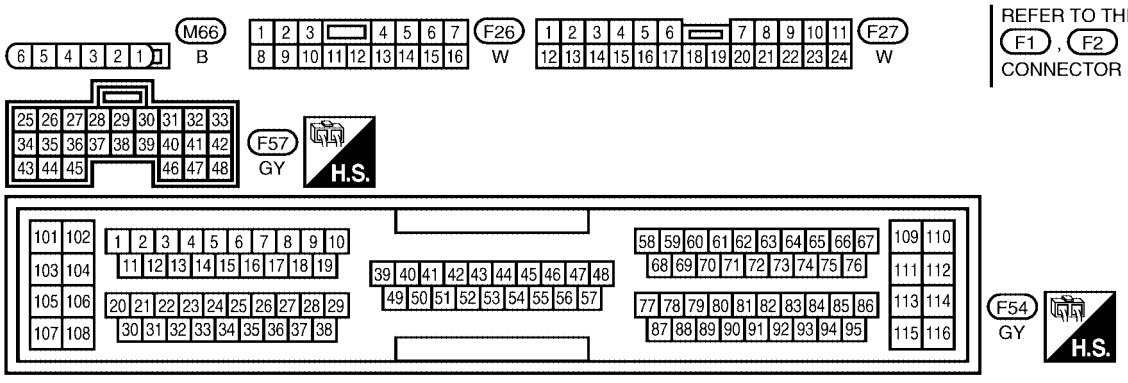
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006KC

EC-APPS1-01





Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
64	R/G	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 2.5V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
75	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 4.2V
76	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.21 - 0.36V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 2.1V
86	G	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V

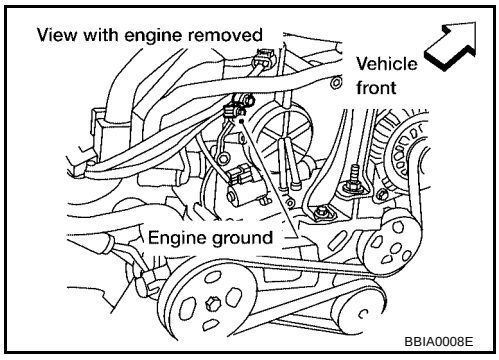
Diagnostic Procedure

UBS006KD

1. RETIGHTEN GROUND SCREWS

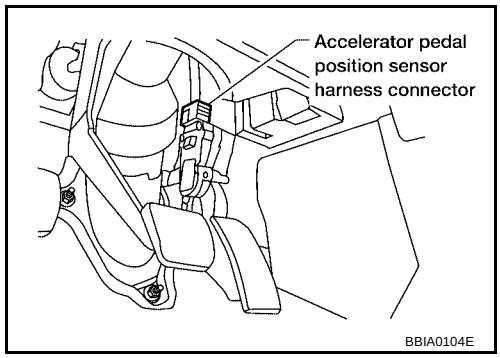
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



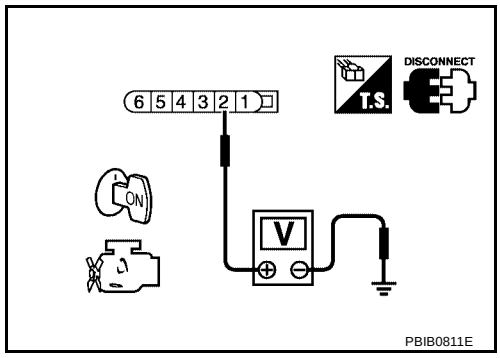
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between APP sensor terminal 4 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Joint connector-2
- Harness for open or short between ECM and accelerator pedal position sensor
- Harness for open or short between TCM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 75 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1756, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace accelerator pedal assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

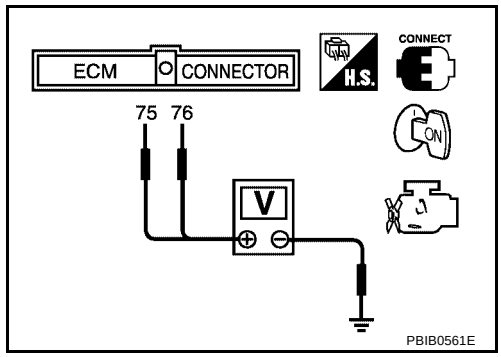
>> **INSPECTION END**

Component Inspection

UBS006KE

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 75 (APP sensor 1 signal), 76 (APP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
75 (Accelerator pedal position sensor 1)	Fully released	0.41 - 0.71V
	Fully depressed	More than 4.2V
76 (Accelerator pedal position sensor 2)	Fully released	0.21 - 0.36V
	Fully depressed	More than 2.1V

4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1255, "Throttle Valve Closed Position Learning" .
7. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006KF

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

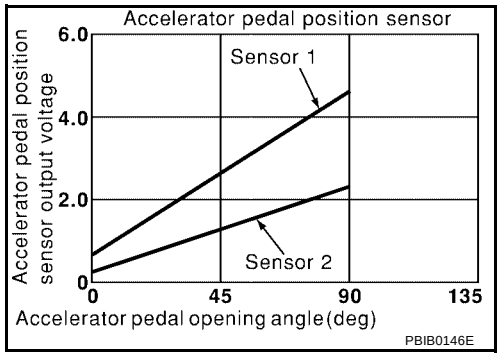
DTC P2127, P2128 APP SENSOR

PFP:18002

Component Description

UBS006KG

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS006KH

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN2★	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

★: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006KI

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127 2127	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2)
P2128 2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

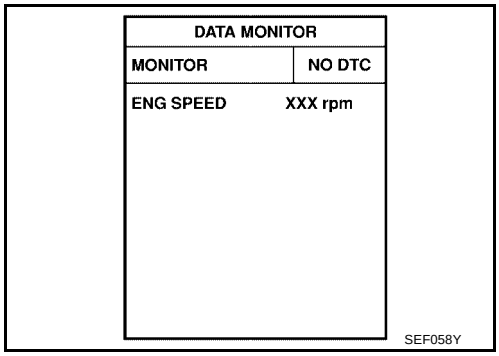
UBS006KJ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1760, "Diagnostic Procedure" .



WITH GST

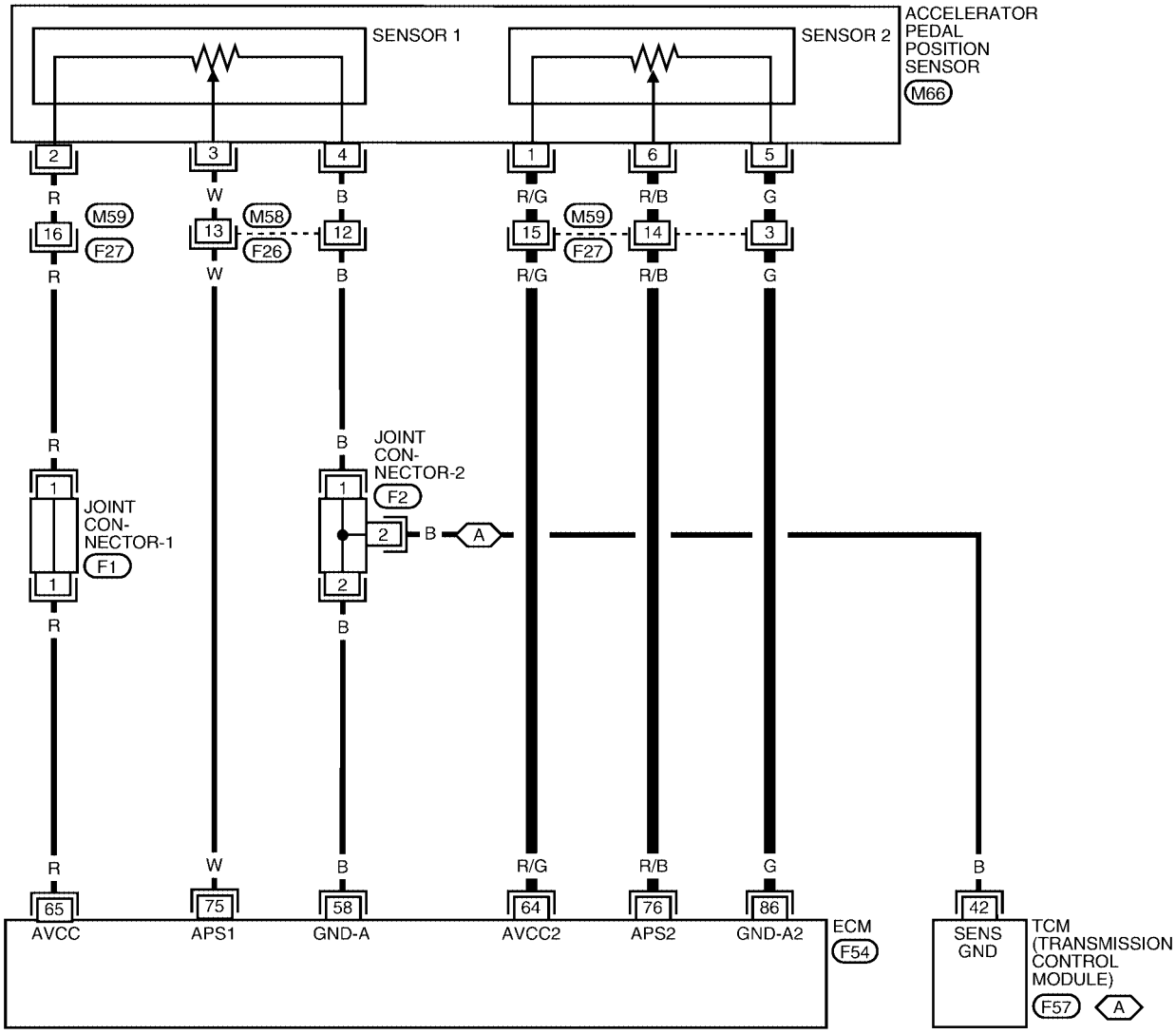
Follow the procedure “WITH CONSULT-II” above.

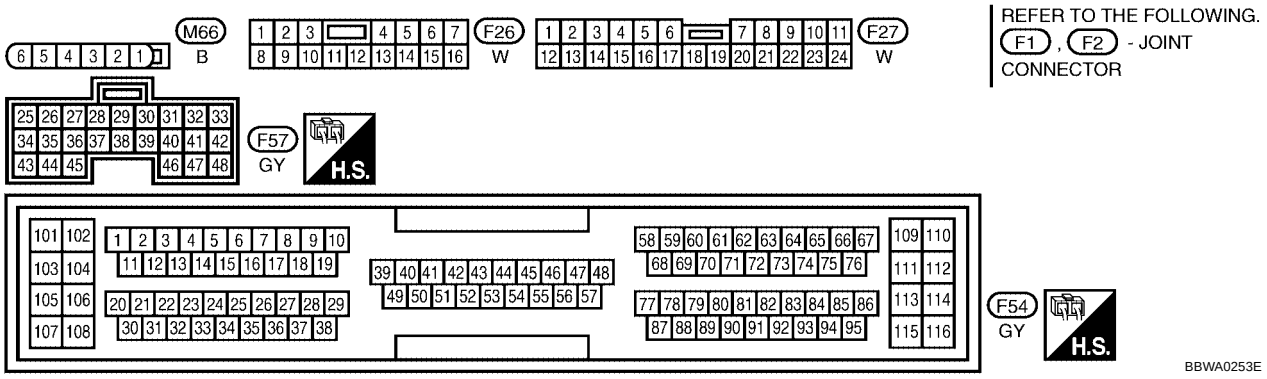
Wiring Diagram

UBS006KK

EC-APPS2-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
A : WITH A/T





Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
64	R/G	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 2.5V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
75	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 4.2V
76	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.21 - 0.36V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 2.1V
86	G	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V

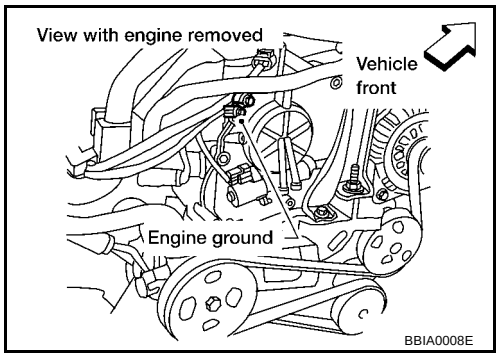
Diagnostic Procedure

UBS006KL

1. RETIGHTEN GROUND SCREWS

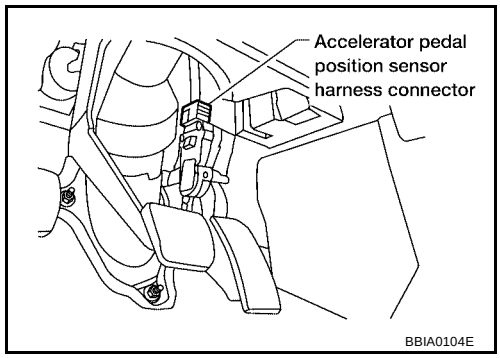
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



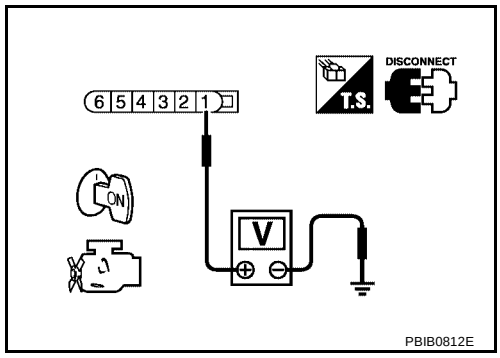
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 2.5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between APP sensor terminal 5 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 76 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1762, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace accelerator pedal assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

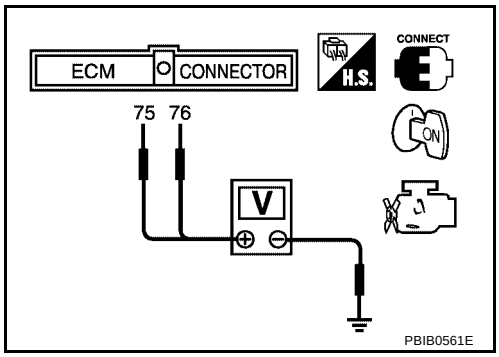
Component Inspection

UBS006KM

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 75 (APP sensor 1 signal), 76 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
75 (Accelerator pedal position sensor 1)	Fully released	0.41 - 0.71V
	Fully depressed	More than 4.2V
76 (Accelerator pedal position sensor 2)	Fully released	0.21 - 0.36V
	Fully depressed	More than 2.1V



4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1255, "Throttle Valve Closed Position Learning" .
7. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006KN

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

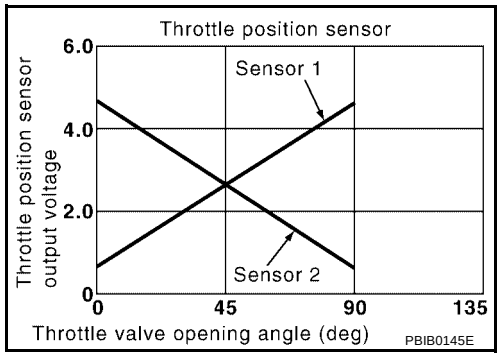
DTC P2135 TP SENSOR

PFP:16119

Component Description

UBS006KO

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS006KP

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2★	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

★: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006KQ

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135 2135	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

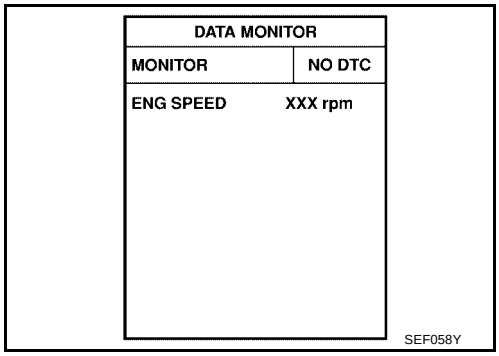
UBS006KR

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1766, "Diagnostic Procedure" .

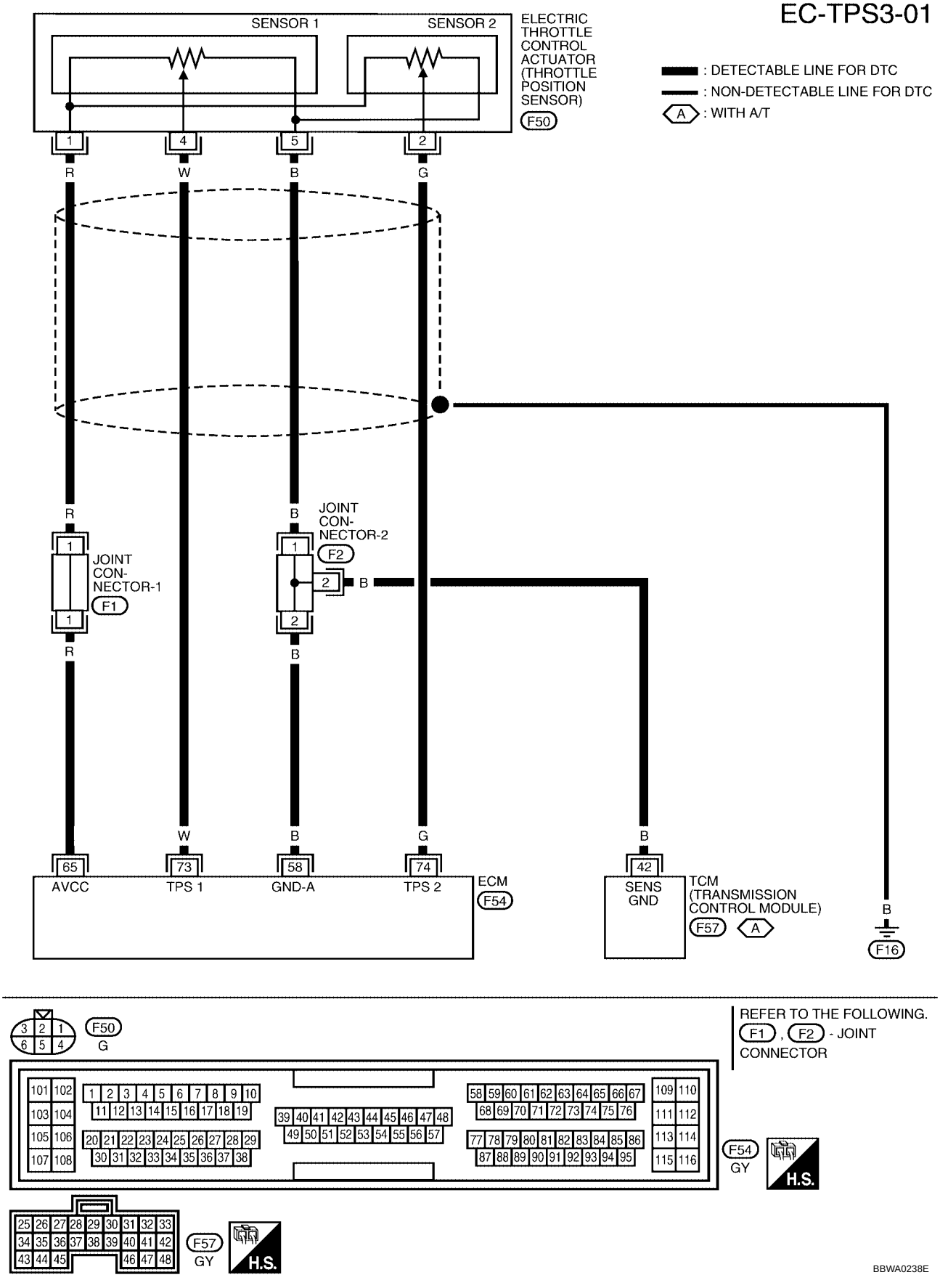


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006KS



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
73	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● **Engine speed** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● **Engine speed** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
74	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● **Engine speed** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● **Engine speed** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

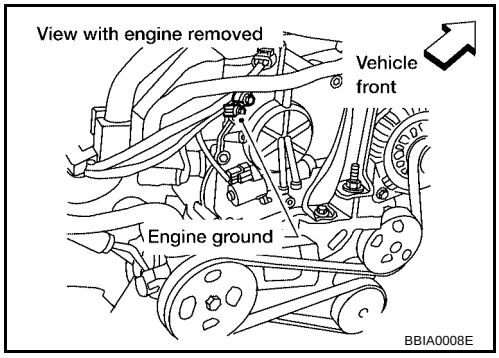
Diagnostic Procedure

UBS006KT

1. RETIGHTEN GROUND SCREWS

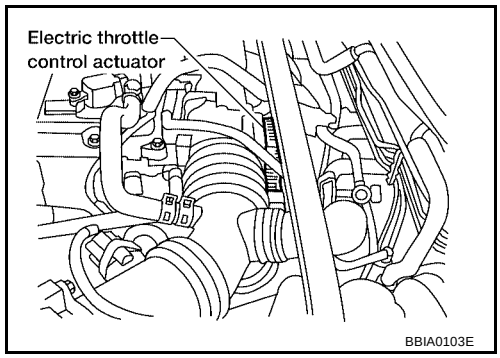
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

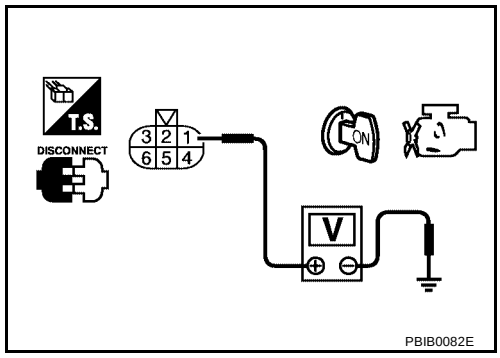


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between electric throttle control actuator and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electric throttle control actuator terminal 5 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-2
- Harness for open or short between electric throttle control actuator and ECM
- Harness for open or short between electric throttle control actuator and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 73 and electric throttle control actuator terminal 4, ECM terminal 74 and electric throttle control actuator terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE POSITION SENSOR

Refer to EC-1768, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

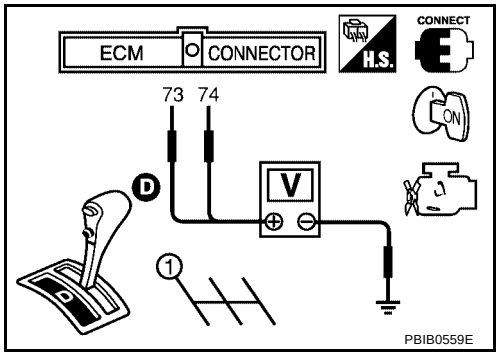
Component Inspection

UBS006KU

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 73 (TP sensor 1), 74 (TP sensor 2) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
73 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
74 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1255, "Throttle Valve Closed Position Learning" .
8. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006KV

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

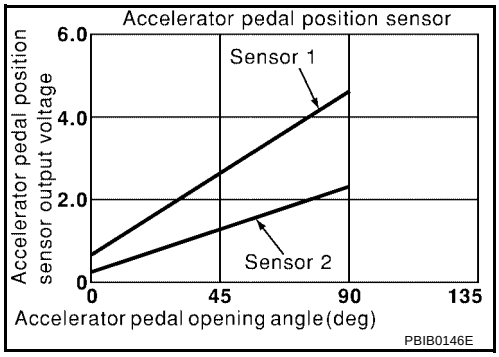
DTC P2138 APP SENSOR

PFP:18002

Component Description

UBS006KW

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS006KX

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2★	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

★: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006KY

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138 2138	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

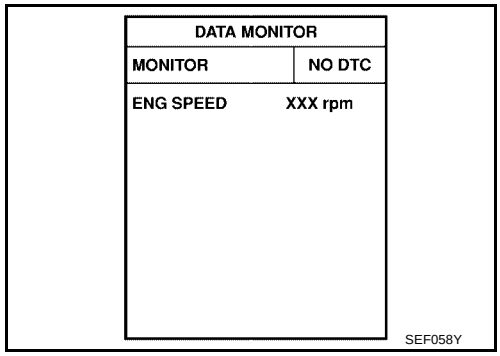
UBS006KZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1773, "Diagnostic Procedure" .



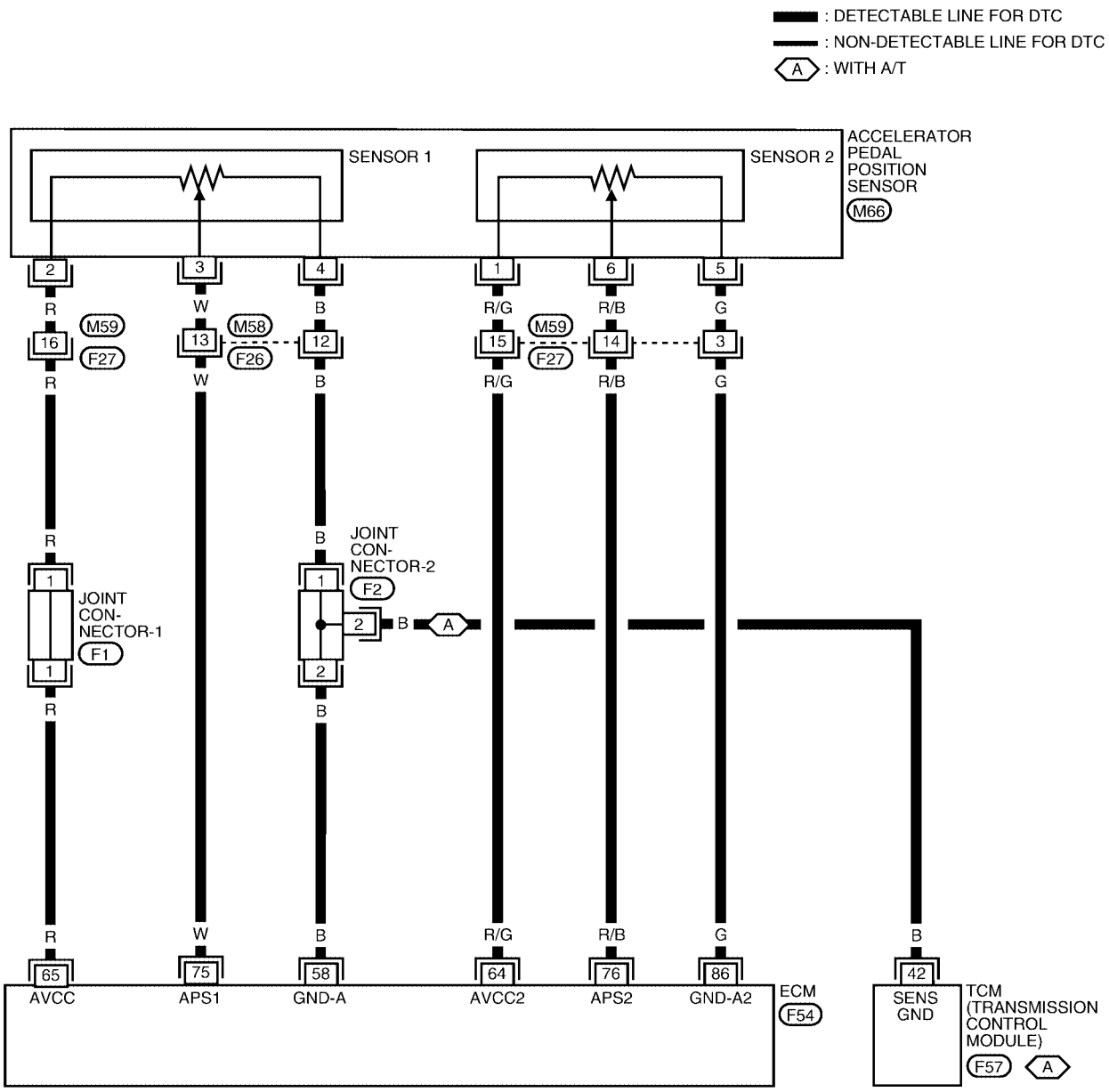
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006L0

EC-APPS3-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
64	R/G	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 2.5V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
75	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 4.2V
76	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.21 - 0.36V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 2.1V
86	G	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V

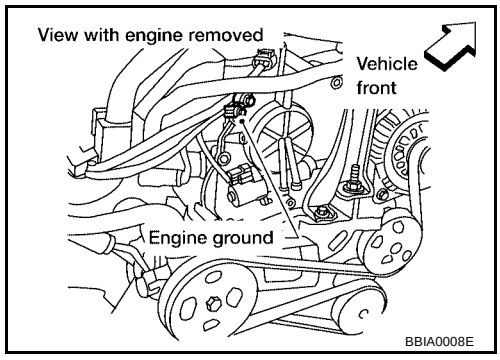
Diagnostic Procedure

UBS006L1

1. RETIGHTEN GROUND SCREWS

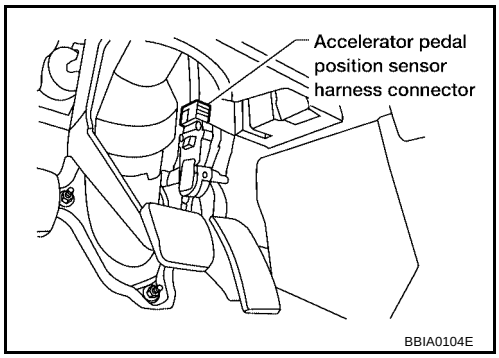
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



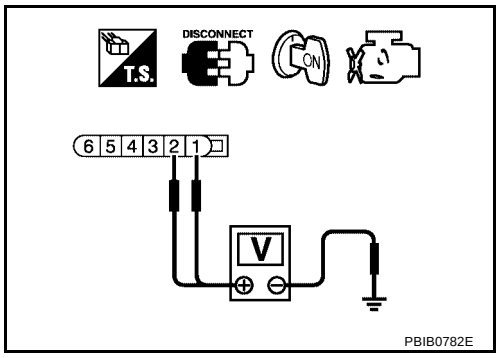
2. CHECK APP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminals 1, 2 and ground with CONSULT-II or tester.

APP sensor terminal	Voltage (V)
1	Approximately 2.5
2	Approximately 5



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E59, F27
- Joint connector-1
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between APP sensor terminal 4, 5 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness connectors M59, F27
- Joint connector-2
- Harness for open or short between ECM and accelerator pedal position sensor
- Harness for open or short between TCM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 75 and APP sensor terminal 3, ECM terminal 76 and APP sensor terminal 6.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness connectors M59, F27
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1775, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace accelerator pedal assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

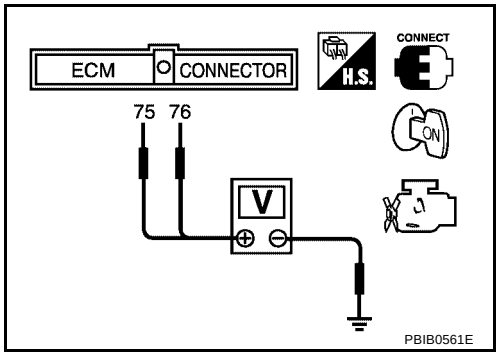
UBS006L2

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.

3. Check voltage between ECM terminals 75 (APP sensor 1 signal), 76 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
75 (Accelerator pedal position sensor 1)	Fully released	0.41 - 0.71V
	Fully depressed	More than 4.2V
76 (Accelerator pedal position sensor 2)	Fully released	0.21 - 0.36V
	Fully depressed	More than 2.1V



4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1255, "Throttle Valve Closed Position Learning" .
7. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006L3

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

IGNITION SIGNAL

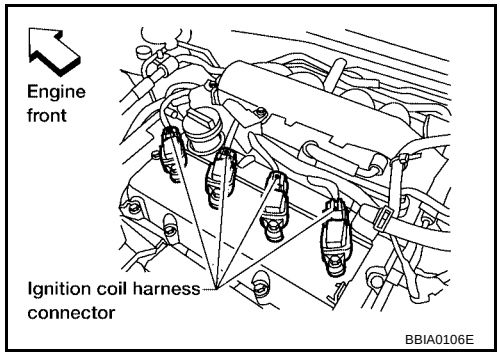
PFP:22448

Component Description

UBS002LS

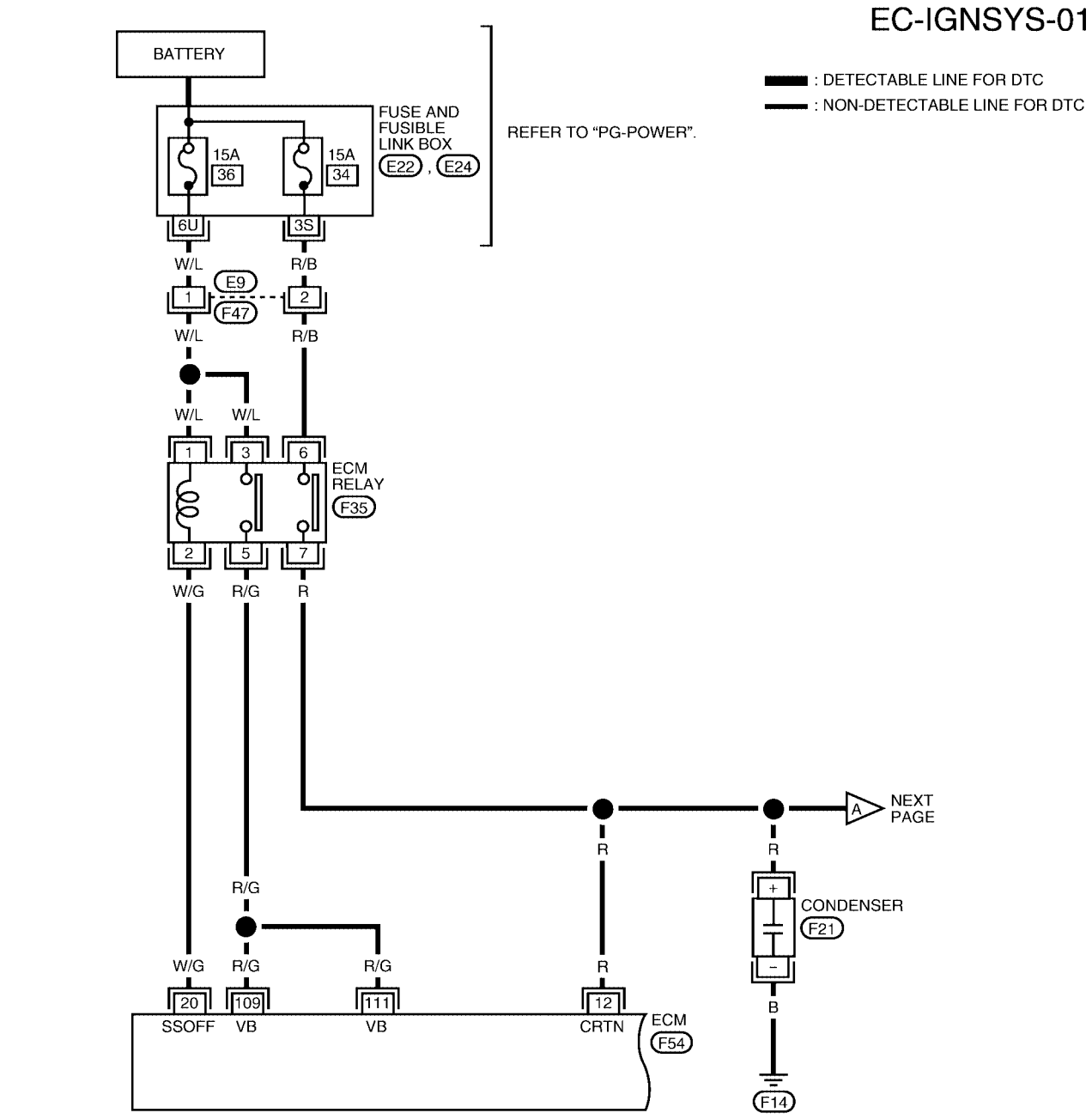
IGNITION COIL & POWER TRANSISTOR

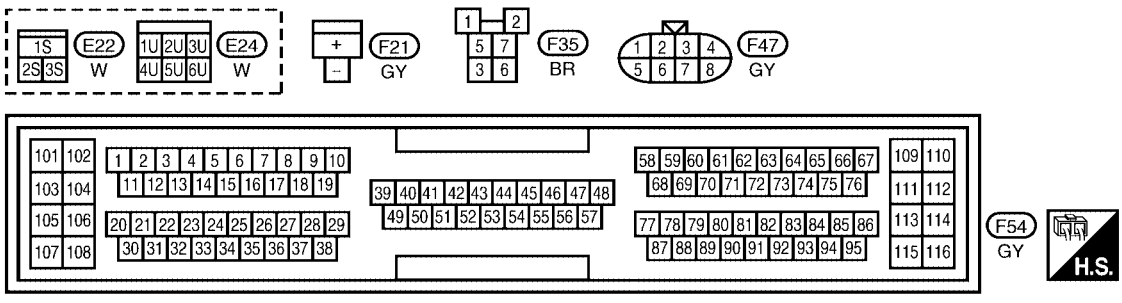
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.



Wiring Diagram

UBS002LT





BBWA0233E

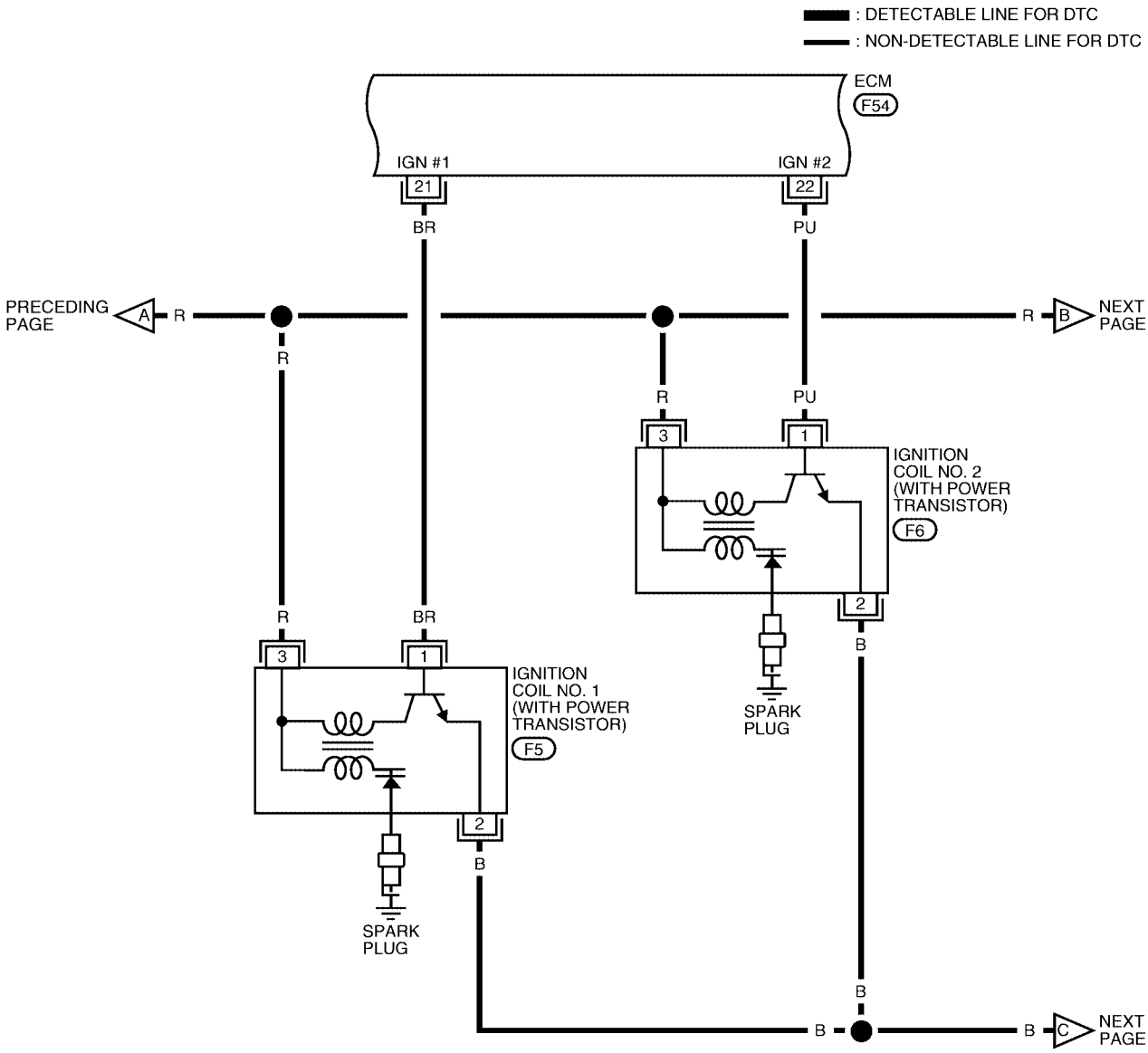
Specification data are reference values and are measured between each terminal and ground.

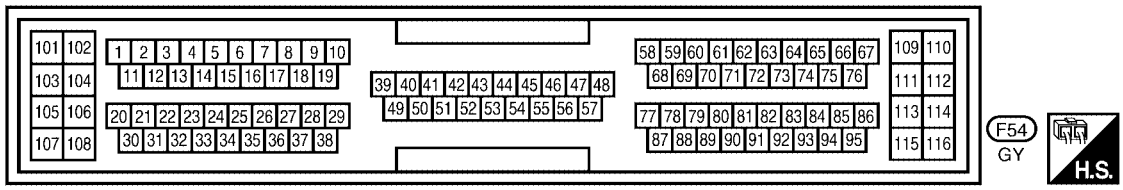
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	R	Counter current return	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
20	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
109 111	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02



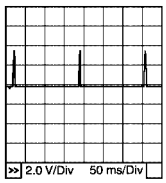
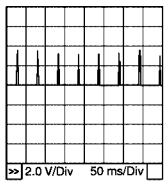


BBWA0234E

Specification data are reference values and are measured between each terminal and ground.

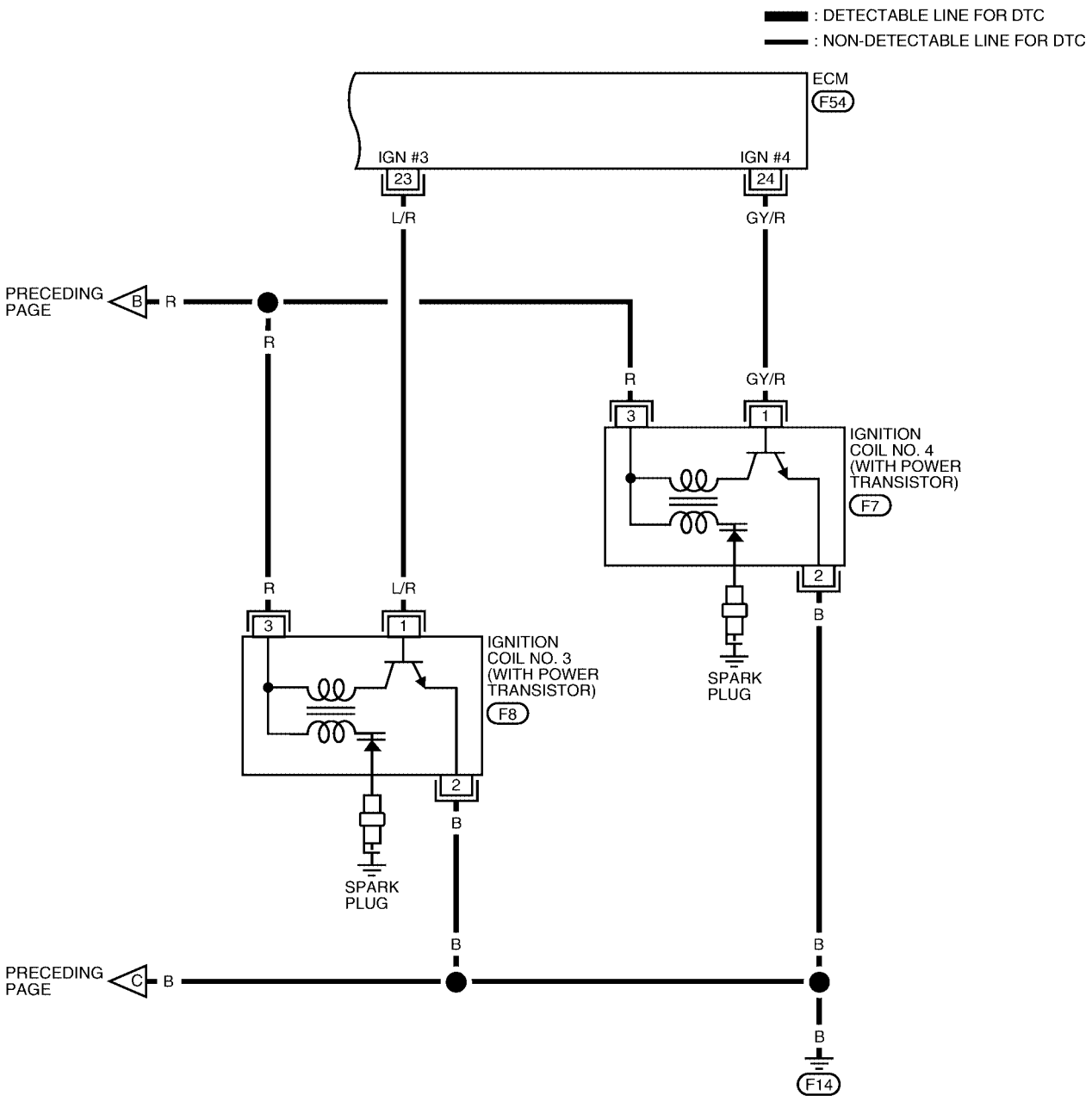
CAUTION:

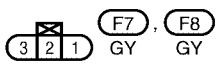
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

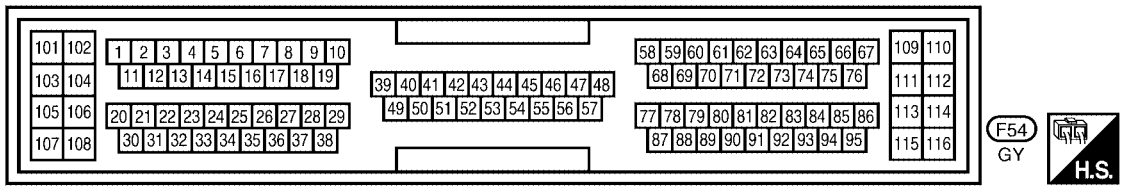
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22	BR PU	Ignition signal No. 1 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-IGNSYS-03





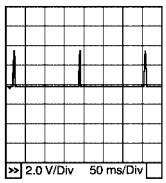
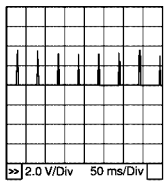


BBWA0235E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23 24	L/R GY/R	Ignition signal No. 3 Ignition signal No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002LU

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.

Is engine running?

Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

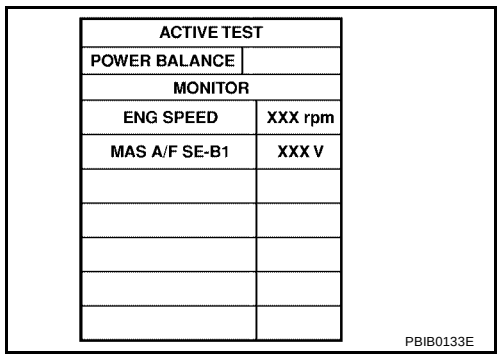
2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that all circuits do not produce a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

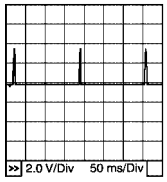


PBIB0133E

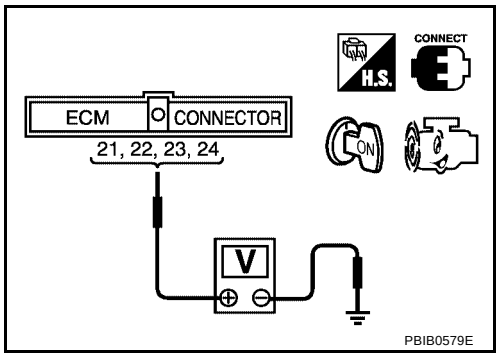
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 21, 22, 23, 24 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



PBIB0579E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

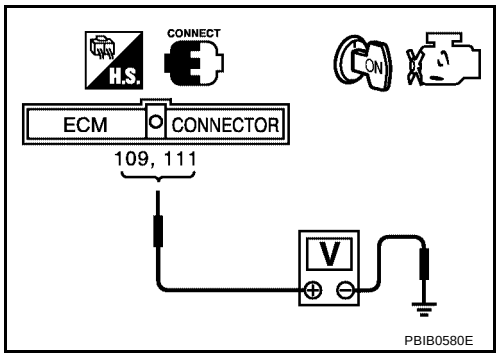
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check voltage between ECM terminals 109, 111 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-1342, "POWER SUPPLY CIRCUIT FOR ECM" .



PBIB0580E

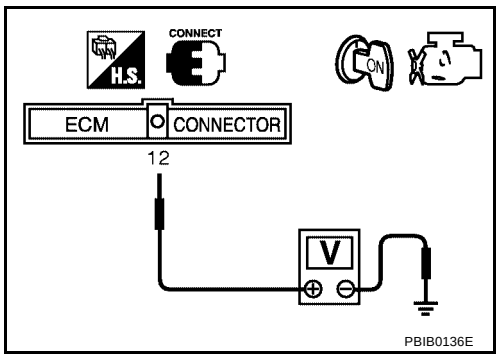
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

Check voltage between ECM terminal 12 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.
NG >> Go to EC-1342, "POWER SUPPLY CIRCUIT FOR ECM" .



PBIB0136E

6. CHECK CONDENSER CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check harness continuity between ECM terminal 12 and condenser terminal **+** , condenser terminal **–** and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CONDENSER

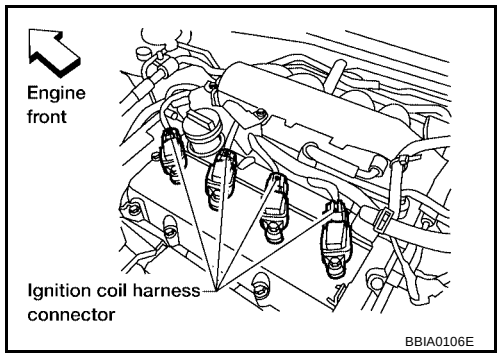
Refer to EC-1786, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace condenser.

8. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch ON.

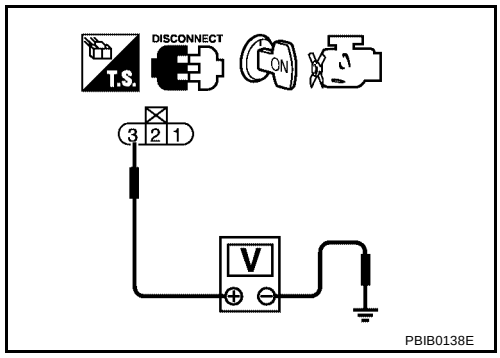


5. Check voltage between ignition coil terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.



9. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ignition coil and ECM relay
- Harness for open or short between ignition coil and ECM

>> Repair or replace harness or connectors.

10. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between ignition coil terminal 2 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 11.
NG >> Repair open circuit or short to power in harness or connectors.

11. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 21, 22, 23, 24 and ignition coil terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1786, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace ignition coil with power transistor.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

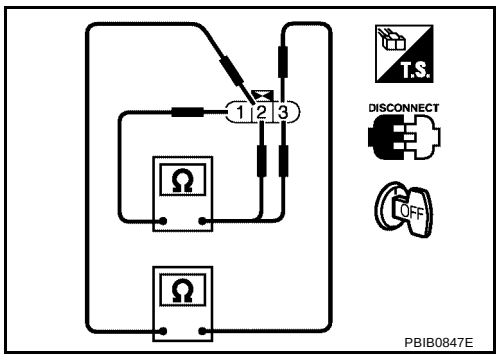
Component Inspection

UBS002LV

IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
1 and 2	Except 0 or ∞
1 and 3	Except 0
2 and 3	

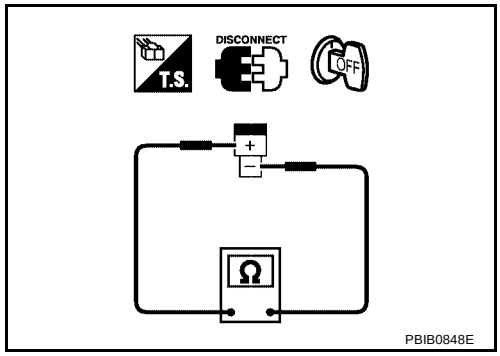


CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.

3. Check resistance between condenser terminals as **+** and **–** .

Resistance: Above 1 MΩ at 25°C (77°F)



UBS002LW

Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-115, "IGNITION COIL" .

VIAS

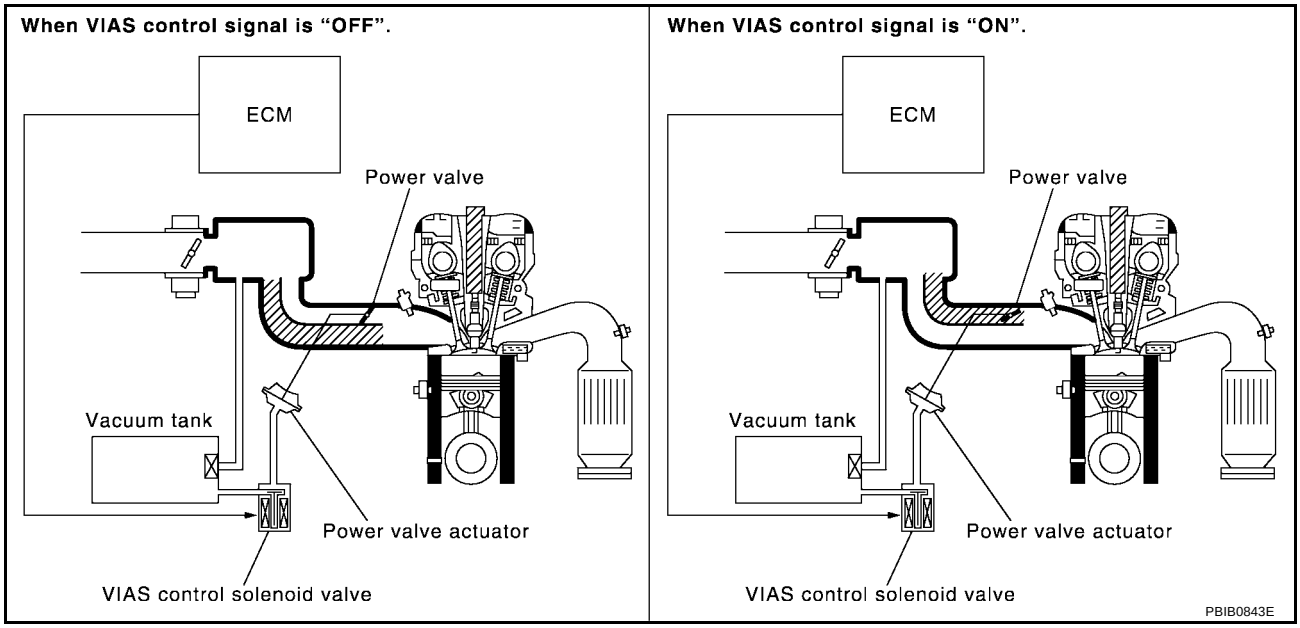
PFP:14956

Description

UBS002LX

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Mass air flow sensor	Amount of intake air	VIAS control	VIAS control solenoid valve
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Ignition switch	Start signal		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Engine coolant temperature sensor	Engine coolant temperature		



When the engine is running at low or medium speed, the power valve is fully closed. Under this condition, the effective suction port length is equivalent to the total length of the intake manifold collector's suction port including the intake valve. This long suction port provides increased air intake which results in improved suction efficiency and higher torque generation.

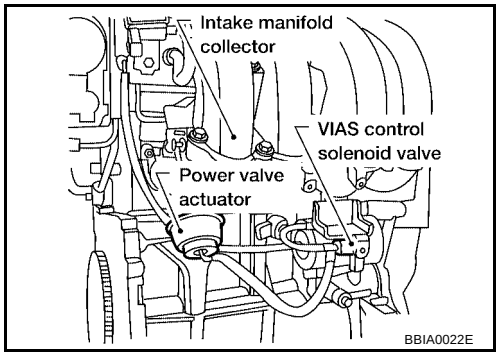
The surge tank and one-way valve are provided. When engine is running at high speed, the ECM sends the signal to the VIAS control solenoid valve. This signal introduces the intake manifold vacuum into the power valve actuator and therefore opens the power valve to two suction passages together in the collector.

Under this condition, the effective port length is equivalent to the length of the suction port provided independently for each cylinder. This shortened port length results in enhanced engine output with reduced suction resistance under high speeds.

COMPONENT DESCRIPTION

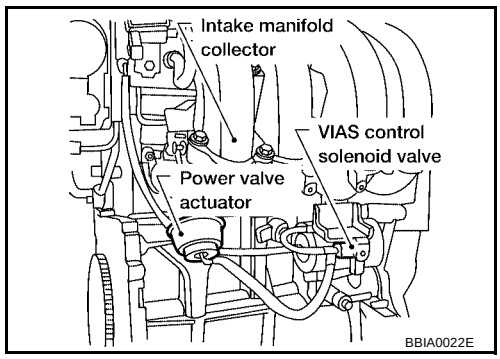
Power Valve

The power valve is installed in intake manifold collector and used to control the suction passage of the variable induction air control system. It is set in the fully closed or fully opened position by the power valve actuator operated by the vacuum stored in the surge tank. The vacuum in the surge tank is controlled by the VIAS control solenoid valve.



VIAS Control Solenoid Valve

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and feeds the vacuum signal to the power valve actuator.



CONSULT-II Reference Value in Data Monitor Mode

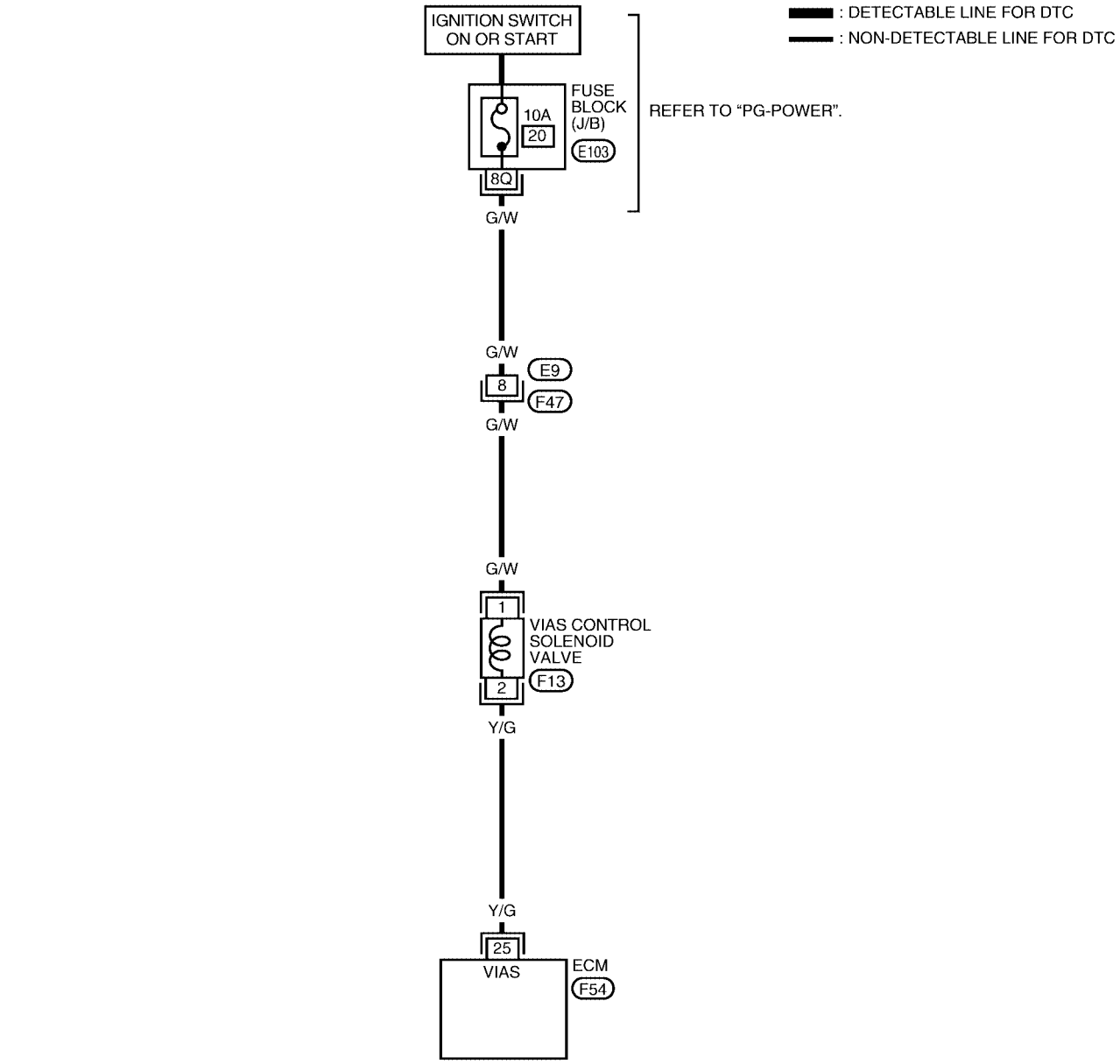
UBS002LY

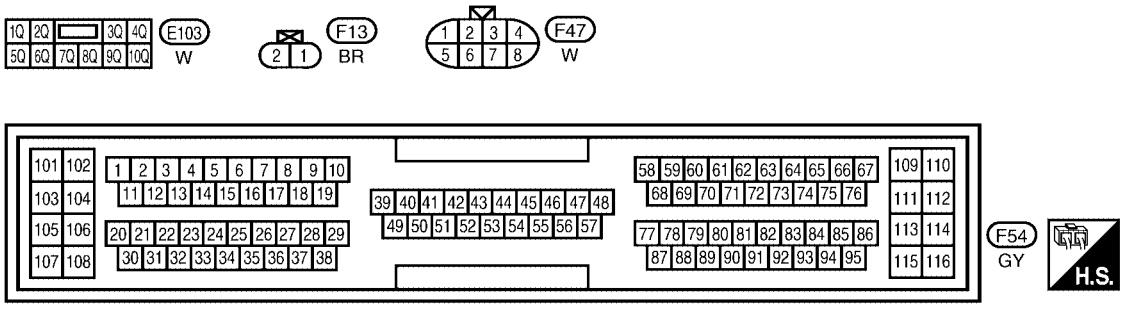
MONITOR ITEM	CONDITION		SPECIFICATION
VIAS S/V	● Engine: After warming up	Idle	OFF
		More than 5,000 rpm	ON

Wiring Diagram

UBS002LZ

EC-VIAS-01





BBWA0243E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	Y/G	VIAS control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is above 5,000 rpm	0 - 1.0V

Diagnostic Procedure

UBS002M0

1. CHECK OVERALL FUNCTION

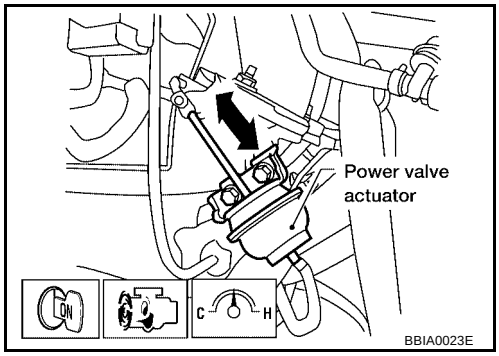
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode with CONSULT-II.

ACTIVE TEST	
VIAS SOL VALVE	OFF
MONITOR	
ENG SPEED	XXX rpm

PBIB0844E

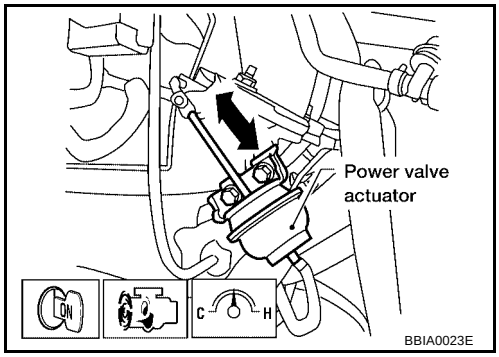
3. Turn VIAS control solenoid valve “ON” and “OFF”, and make sure that power valve actuator rod moves.



BBIA0023E

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Rev engine quickly up to above 5,000 rpm and make sure that power valve actuator rod moves.



BBIA0023E

OK or NG

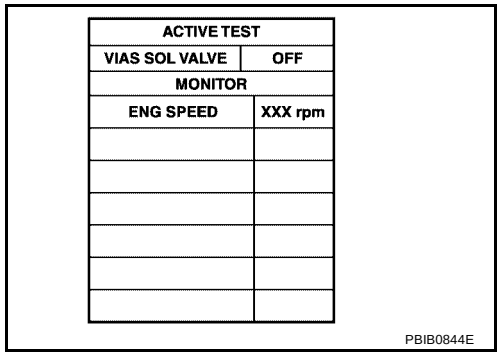
OK >> **INSPECTION END**
NG (With CONSULT-II)>>GO TO 2.
NG (Without CONSULT-II)>>GO TO 3.

2. CHECK VACUUM EXISTENCE

With CONSULT-II

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Start engine and let it idle.
3. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode with CONSULT-II.
4. Turn VIAS control solenoid valve “ON” and “OFF”, and check vacuum existence under the following conditions.

VIAS SOL VALVE	Vacuum
ON	Should exist.
OFF	Should not exist.



OK or NG

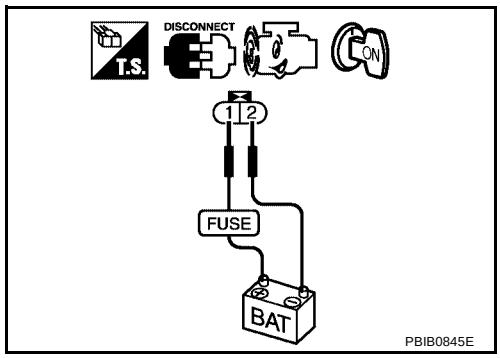
OK >> Repair or replace power valve actuator.
NG >> GO TO 4.

3. CHECK VACUUM EXISTENCE

Without CONSULT-II

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Disconnect VIAS control solenoid valve harness connector.
3. Start engine and let it idle.
4. Apply 12V of direct current between VIAS control solenoid valve terminals 1 and 2.
5. Check vacuum existence under the following conditions.

Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.



OK or NG

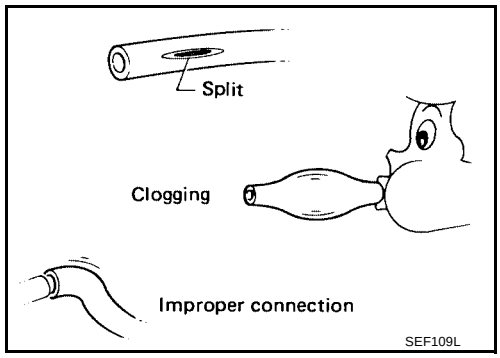
OK >> Repair or replace power valve actuator.
NG >> GO TO 4.

4. CHECK VACUUM HOSE

1. Stop engine.
2. Check hoses and tubes between intake manifold and power valve actuator for crack, clogging, improper connection or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 5.
NG >> Repair hoses or tubes.



5. CHECK VACUUM TANK

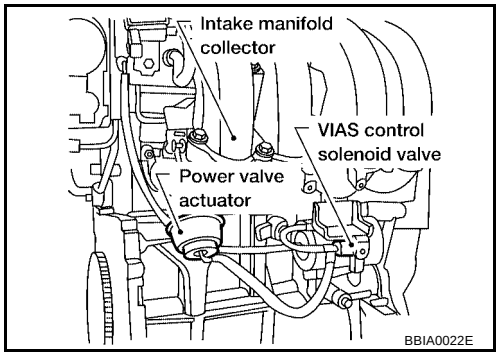
Refer to EC-1795, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace vacuum tank.

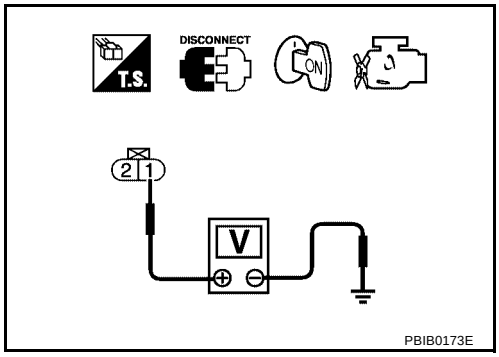
6. CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “ON”.
2. Disconnect VIAS control solenoid valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between VIAS control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse block (J/B) connector E103
- 10A fuse
- Harness continuity between fuse and VIAS control solenoid valve

>> Repair harness or connectors.

8. CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 25 and VIAS control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK VIAS CONTROL SOLENOID VALVE

Refer to EC-1795, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace VIAS control solenoid valve.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002M1

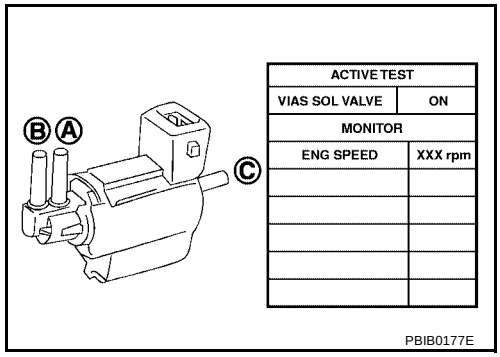
VIAS CONTROL SOLENOID VALVE

With CONSULT-II

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time under the following conditions.

Condition VIAS SOL VALVE	Air passage continuity between **A** and **B**	Air passage continuity between **A** and **C**
ON	Yes	No
OFF	No	Yes

Operation takes less than 1 second.

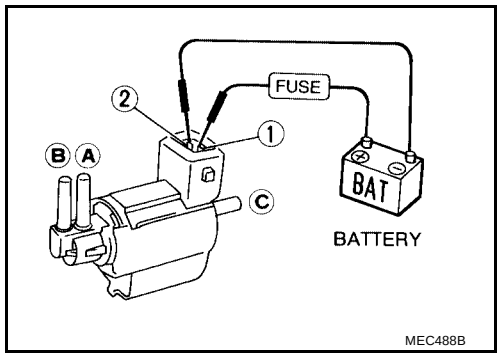


With GST

Check air passage continuity and operation delay time under the following conditions.

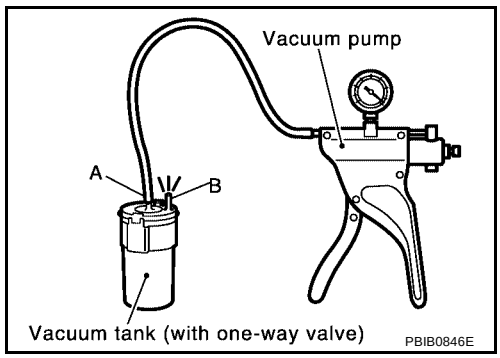
Condition	Air passage continuity between **A** and **B**	Air passage continuity between **A** and **C**
12V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

Operation takes less than 1 second.



VACUUM TANK

1. Disconnect vacuum hose connected to vacuum tank.
2. Connect a vacuum pump to the port **A** of vacuum pump.
3. Apply vacuum and make sure that vacuum exists at the port **B** .



Removal and Installation

UBS002M2

VIAS CONTROL SOLENOID VALVE

Refer to EM-105, "INTAKE MANIFOLD" .

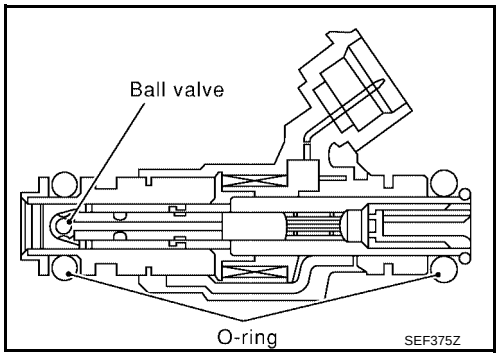
INJECTOR CIRCUIT

PFP:16600

Component Description

UBS002M3

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

UBS002M4

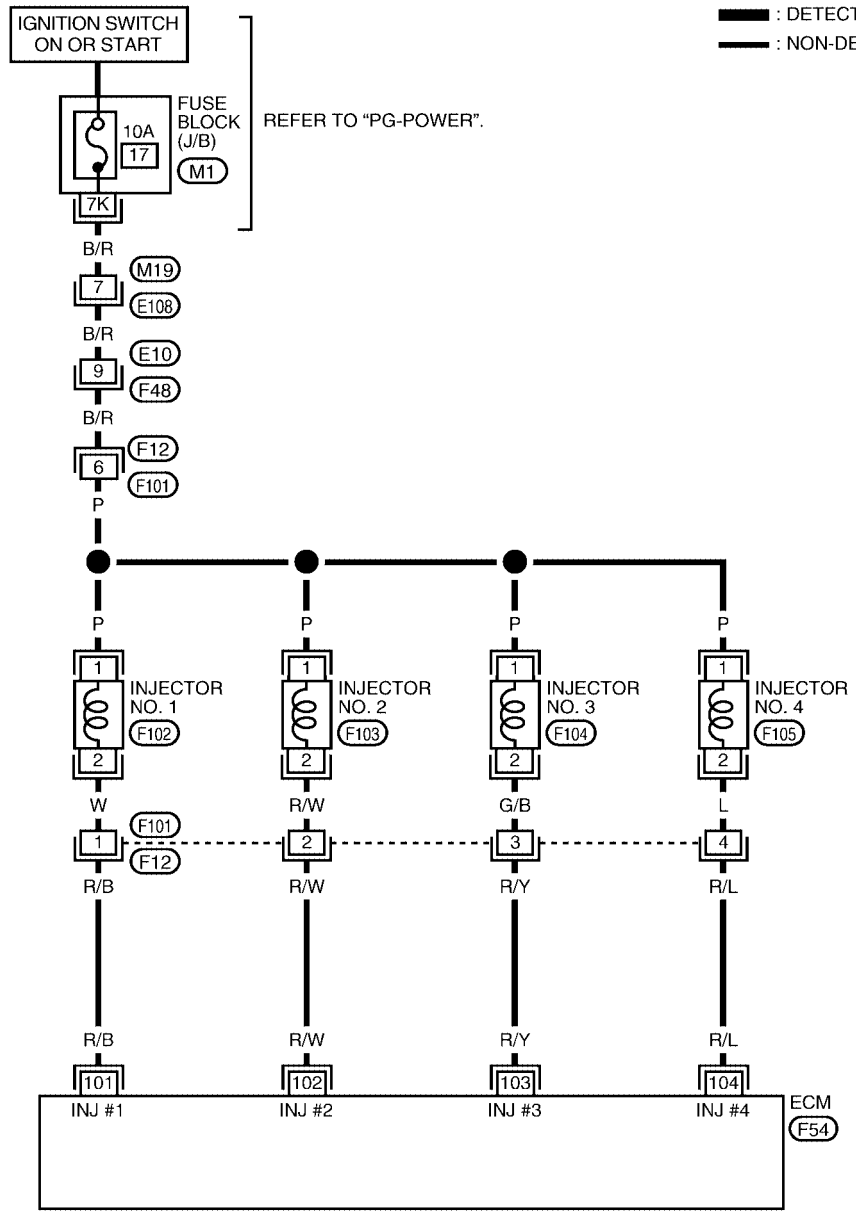
Specification data are reference values.

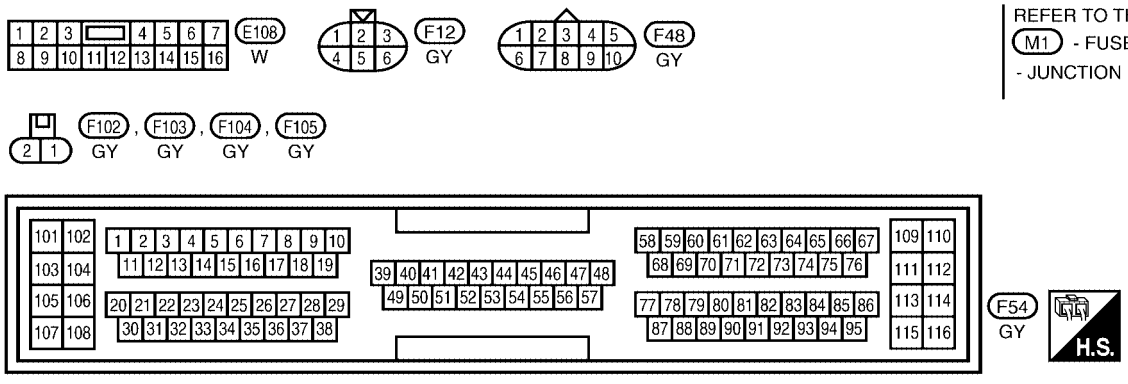
MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.5 - 3.5 msec
		2,000 rpm	2.5 - 3.5 msec
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec

Wiring Diagram

UBS002M5

EC-INJECT-01

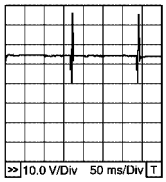
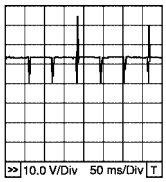




Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101 102 103 104	R/B R/W R/Y R/L	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002M6

1. INSPECTION START

Turn ignition switch to “START”.

Is any cylinder ignited?

Yes or No

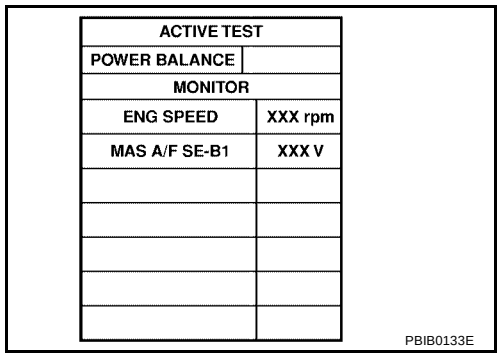
Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

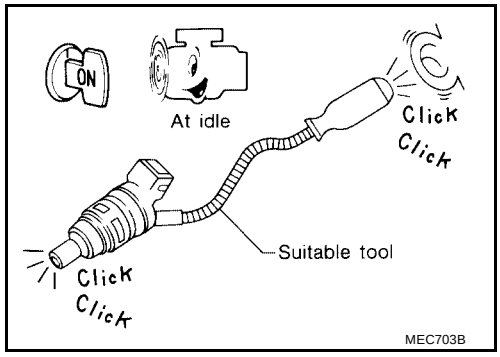
With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.

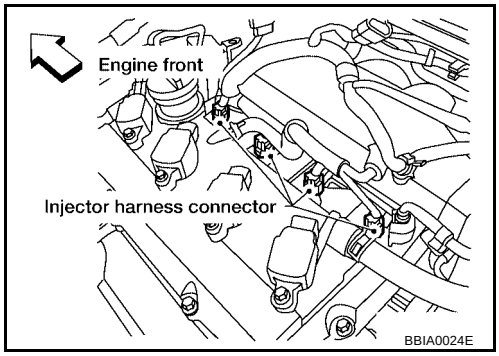


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

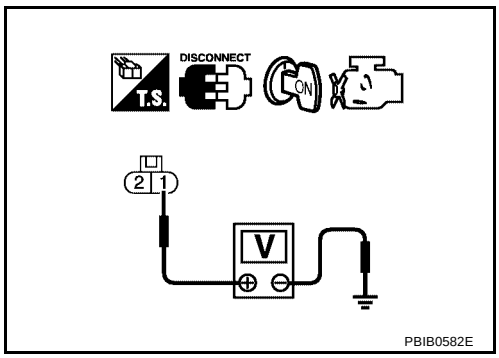
3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E10, F48
- Harness connectors F12, F101
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

>> Repair harness or connectors.

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 101, 102, 103, 104. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F12, F101
- Harness for open or short between injector and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INJECTOR

Refer to EC-1801, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace injector.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

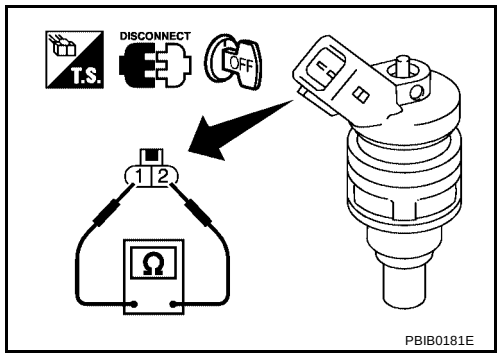
Component Inspection

UBS002M7

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 12.1 - 12.9Ω [at 20°C (68°F)]



PBIB0181E

Removal and Installation

UBS002M8

INJECTOR

Refer to EM-118, "FUEL INJECTOR AND FUEL TUBE" .

START SIGNAL

PFP:48750

CONSULT-II Reference Value in Data Monitor Mode

UBS002M9

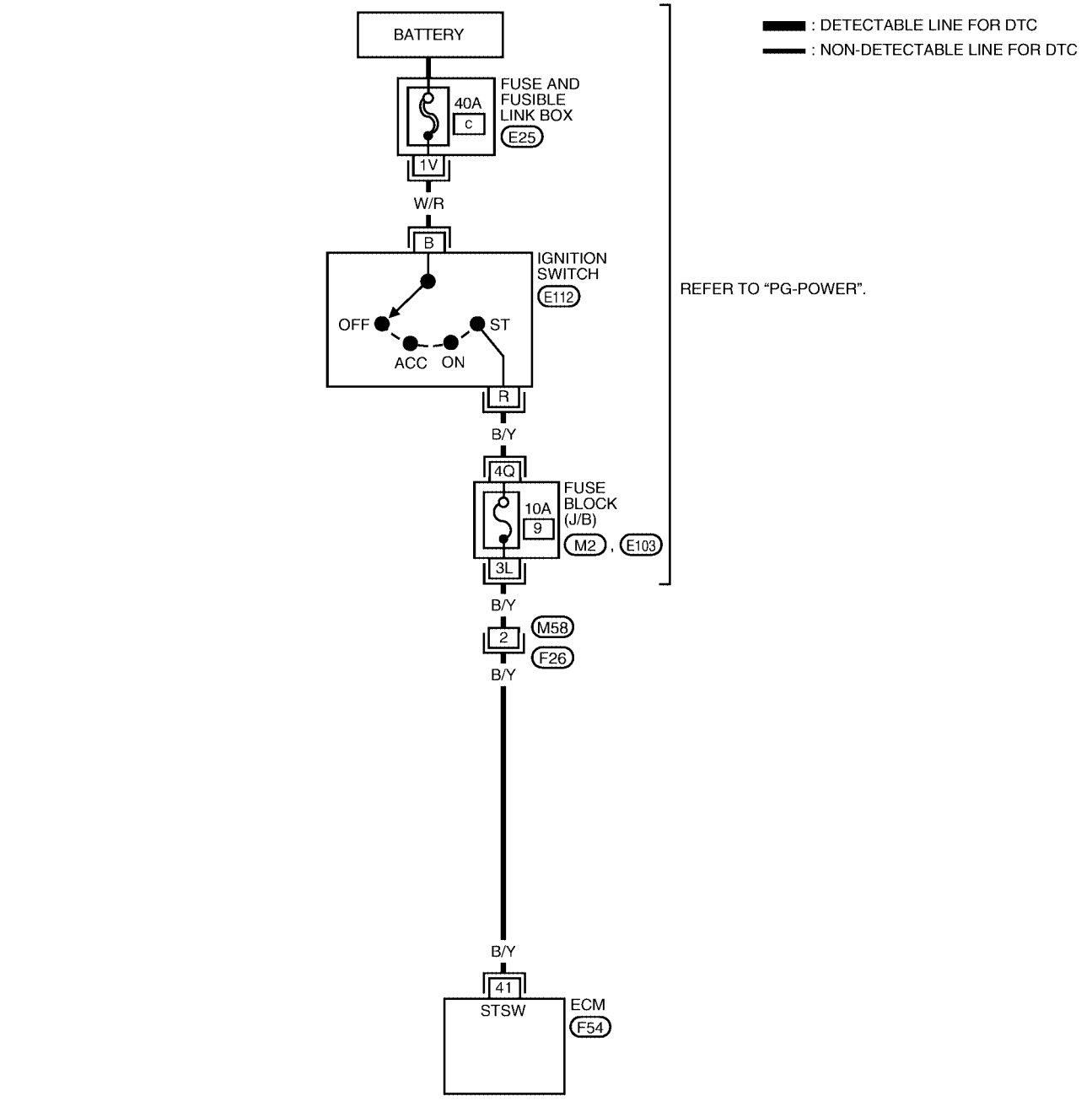
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

Wiring Diagram

UBS002MA

EC-S/SIG-01



BBWA0245E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 14V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002MB

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

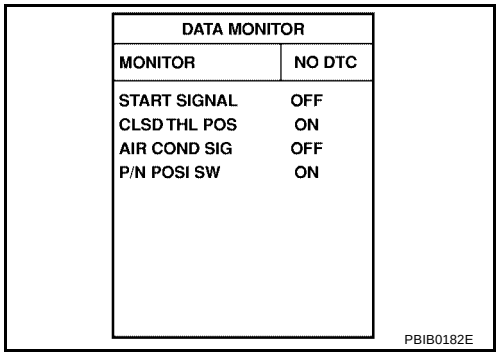
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	START SIGNAL
Ignition switch "ON"	OFF
Ignition switch "START"	ON



OK or NG

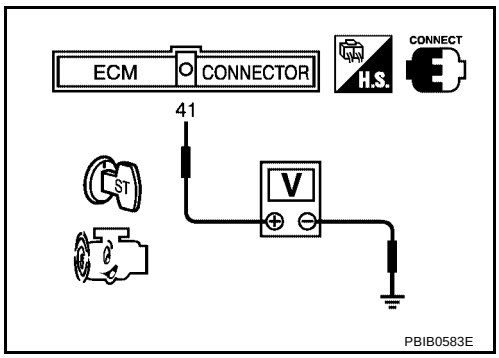
OK >> **INSPECTION END**
NG >> GO TO 4.

3. CHECK OVERALL FUNCTION

Without CONSULT-II

Check voltage between ECM terminal 41 and ground under the following conditions.

Condition	Voltage
Ignition switch "START"	Battery voltage
Other positions	Approximately 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. CHECK STARTING SYSTEM

Turn ignition switch "OFF", then turn it to "START".

Does starter motor operate?

Yes or No

Yes >> GO TO 5.
No >> Refer to SC-9, "STARTING SYSTEM" .

5. CHECK FUSE

1. Turn ignition switch “OFF”.
2. Disconnect 10A fuse.
3. Check if 10A fuse is OK.

OK or NG

OK >> GO TO 6.
NG >> Replace 10A fuse.

6. CHECK START SIGNAL INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Disconnect ignition switch harness connector.
3. Check harness continuity between ECM terminal 41 and fuse block (J/B), ignition switch and fuse block (J/B). Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Fuse block (J/B) connectors M2, E103
- Harness for open or short between ignition switch and fuse block (J/B)
- Harness for open or short between ECM and fuse block (J/B)

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

FUEL PUMP CIRCUIT

PFP:17042

Description

UBS002MC

SYSTEM DESCRIPTION

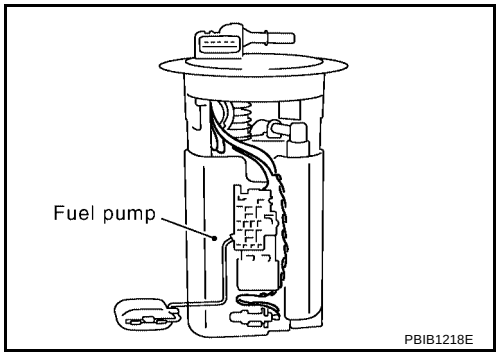
Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed	Fuel pump control	Fuel pump relay
Ignition switch	Start signal		

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

UBS002MD

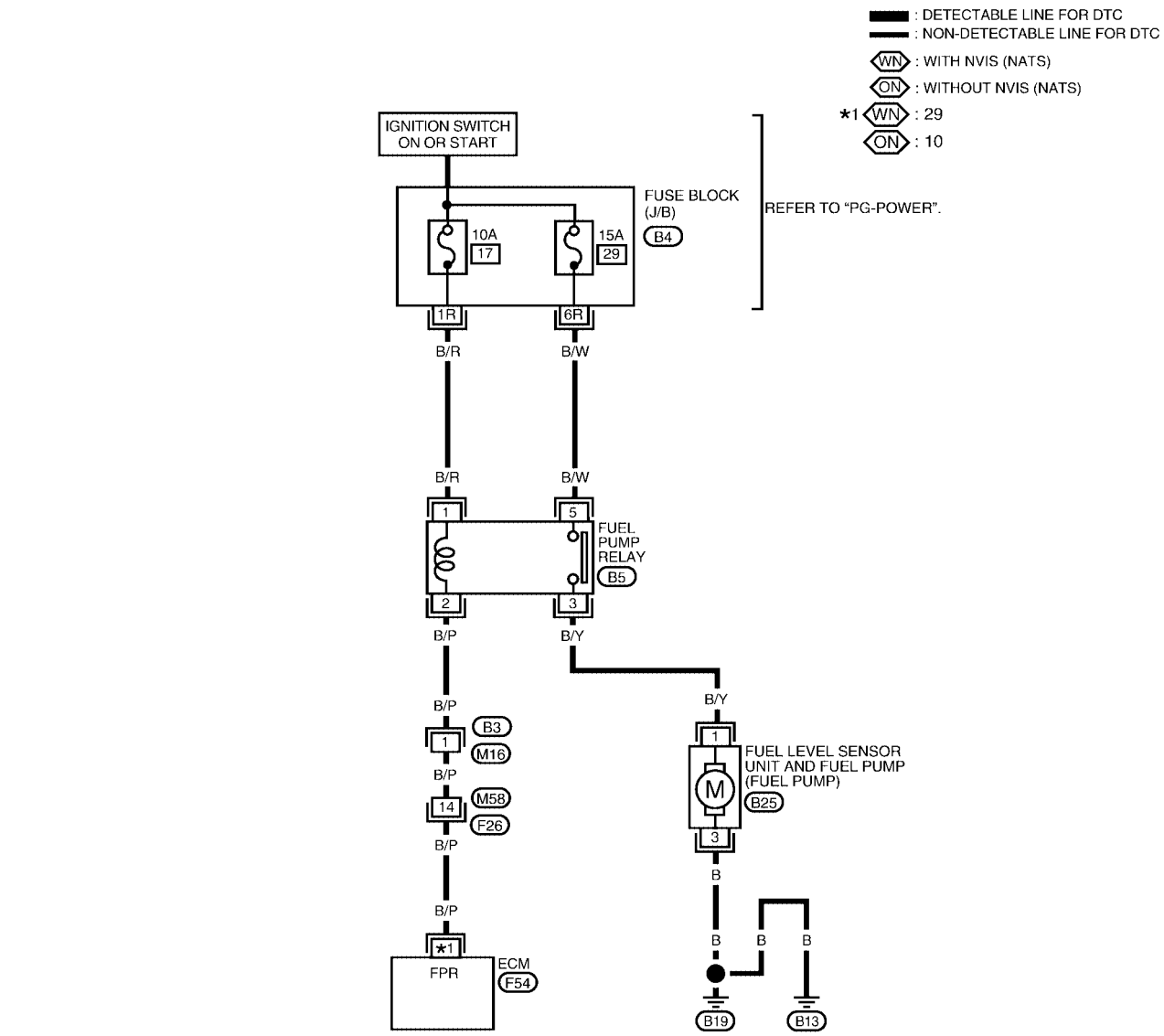
Specification data are reference values.

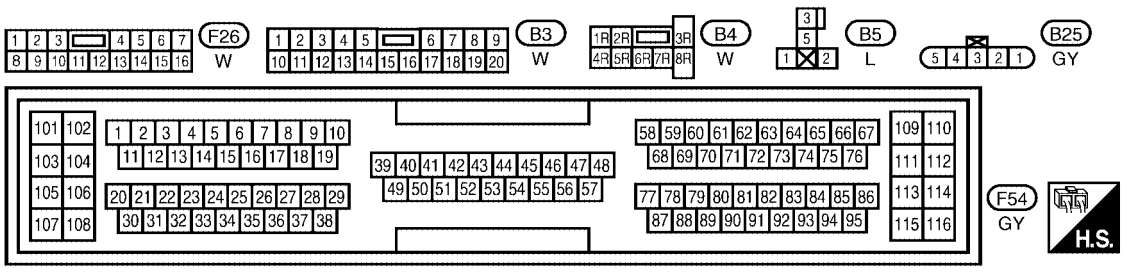
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

UBS002ME

EC-F/PUMP-01





BBWA0423E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

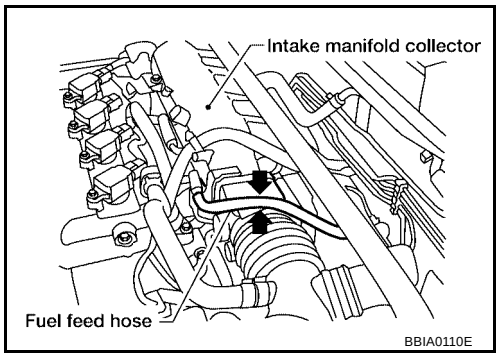
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
10 (Without NVIS)	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
29 (With NVIS)			**[Ignition switch "ON"]** ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002MF

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned "ON".

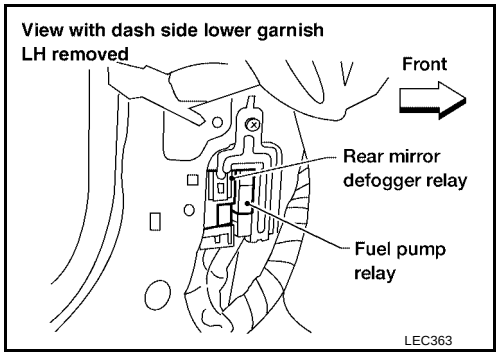


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

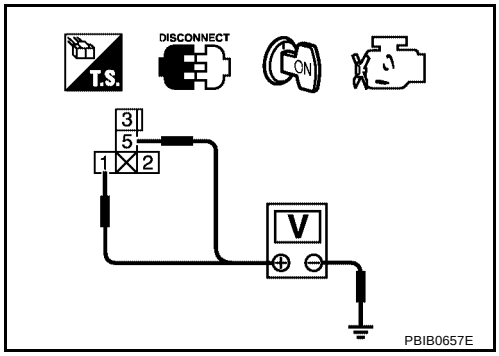
2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B4
- 10A fuse
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

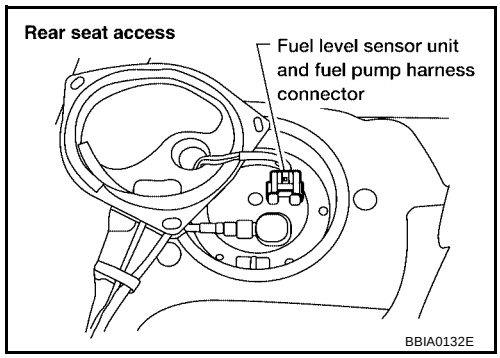
>> Repair harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel pump terminal 1, fuel pump terminal 3 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 10 or 29 and fuel pump relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M58, F26
- Harness for open or short between ECM and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK FUEL PUMP RELAY

Refer to EC-1810, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace fuel pump relay.

8. CHECK FUEL PUMP

Refer to EC-1810, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel pump.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

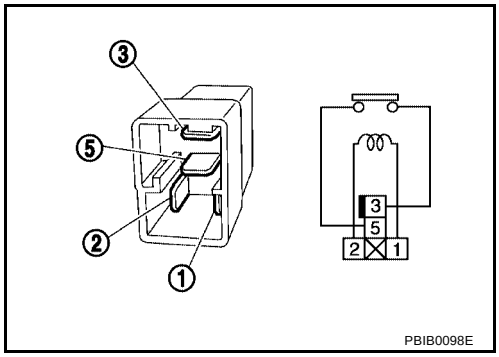
Component Inspection

UBS002MG

FUEL PUMP RELAY

Check continuity between terminals 3 and 5 under the following conditions.

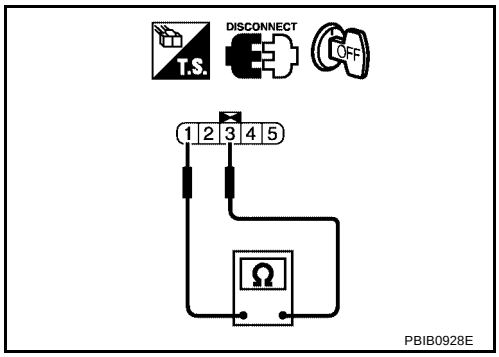
Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No



FUEL PUMP

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between fuel level sensor unit and fuel pump terminals 1 and 3.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]



Removal and Installation

UBS002MH

FUEL PUMP

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

POWER STEERING OIL PRESSURE SWITCH

PFP:49761

Component Description

UBS002MI

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

CONSULT-II Reference Value in Data Monitor Mode

UBS002MJ

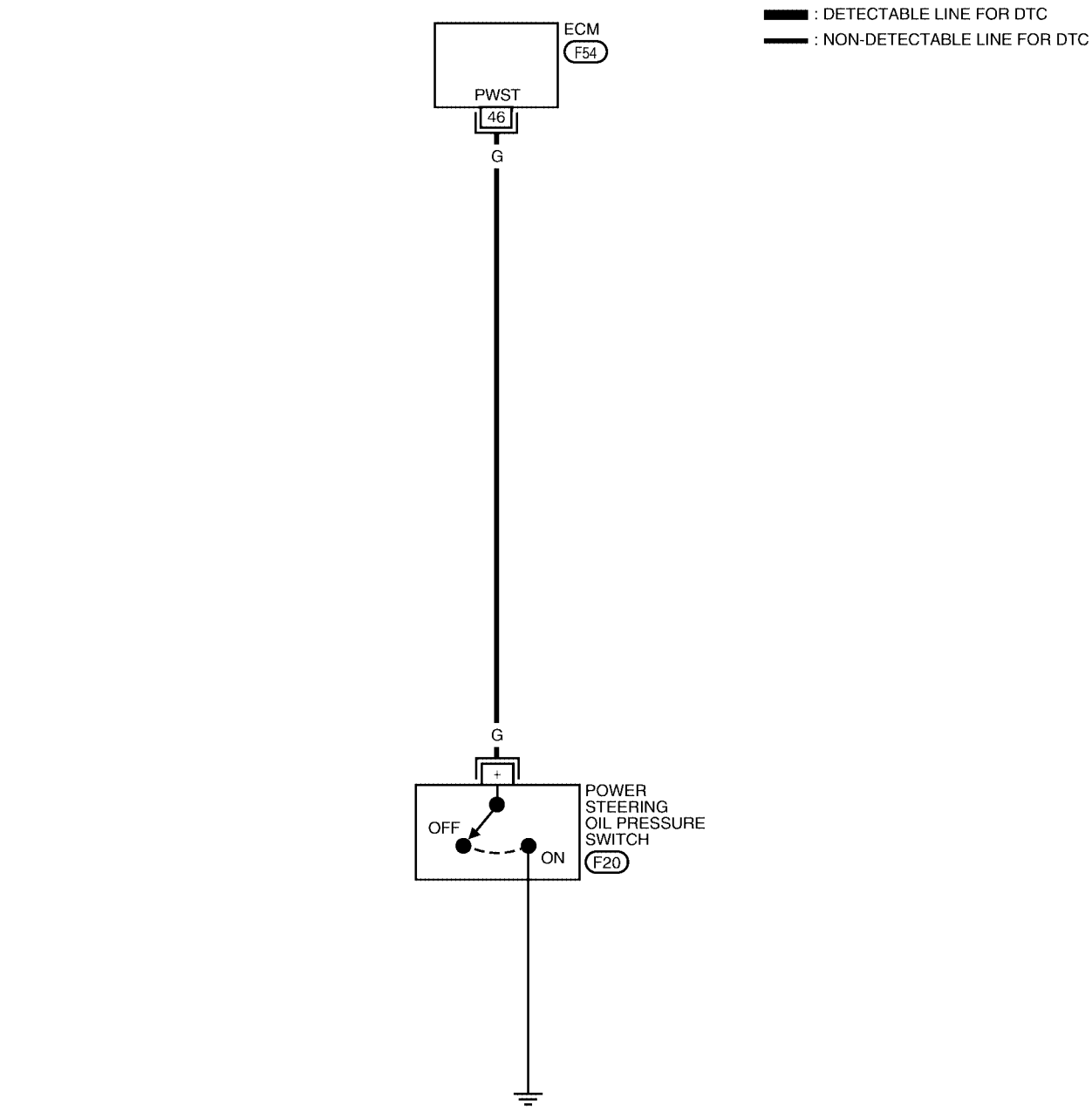
Specification data are reference values.

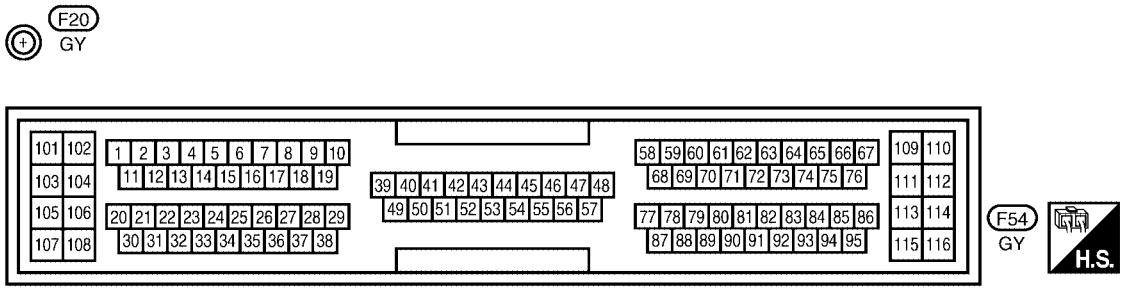
MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is fully turned	ON

Wiring Diagram

UBS002MK

EC-PST/SW-01





BBWA0247E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	G	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned	Approximately 0V
			[Engine is running] ● Steering wheel is not being turned	Approximately 5V

Diagnostic Procedure

UBS002ML

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

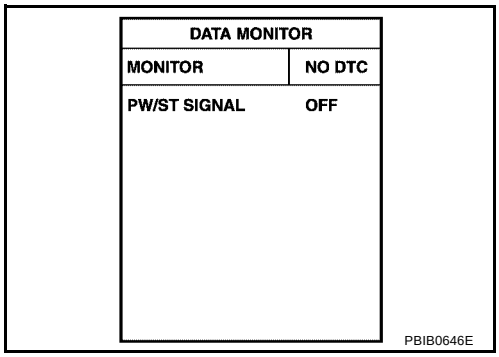
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Check “PW/ST SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Steering in neutral position	OFF
Steering is turned	ON



OK or NG

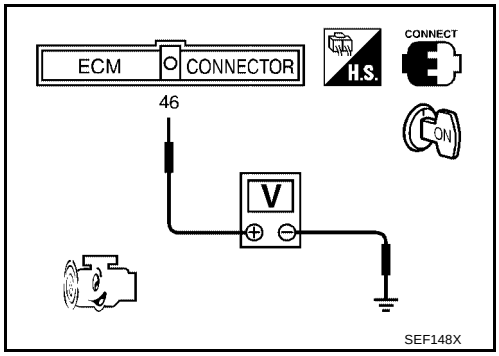
OK >> **INSPECTION END**
NG >> GO TO 4.

3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 46 and ground under the following conditions.

Condition	Voltage
When steering wheel is turned quickly	Approximately 0V
Except above	Approximately 5V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect power steering oil pressure switch harness connector.
4. Check harness continuity between ECM terminal 46 and power steering oil pressure switch terminal **+** . Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM and power steering oil pressure switch.

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK POWER STEERING OIL PRESSURE SWITCH

Refer to EC-1815, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace power steering oil pressure switch.

7. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

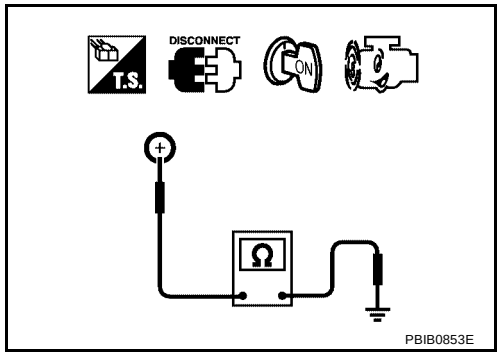
>> **INSPECTION END**

Component Inspection

UBS002MM

POWER STEERING OIL PRESSURE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect power steering oil pressure switch harness connector.
3. Start engine.
4. Check continuity between power steering oil pressure switch terminal **+** and body ground.



Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.

Removal and Installation

UBS002MN

POWER STEERING OIL PRESSURE SWITCH

Refer to PS-21, "POWER STEERING OIL PUMP" .

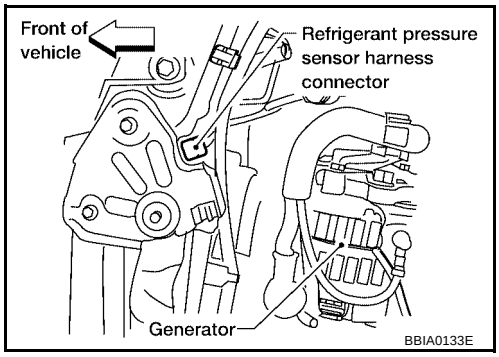
REFRIGERANT PRESSURE SENSOR

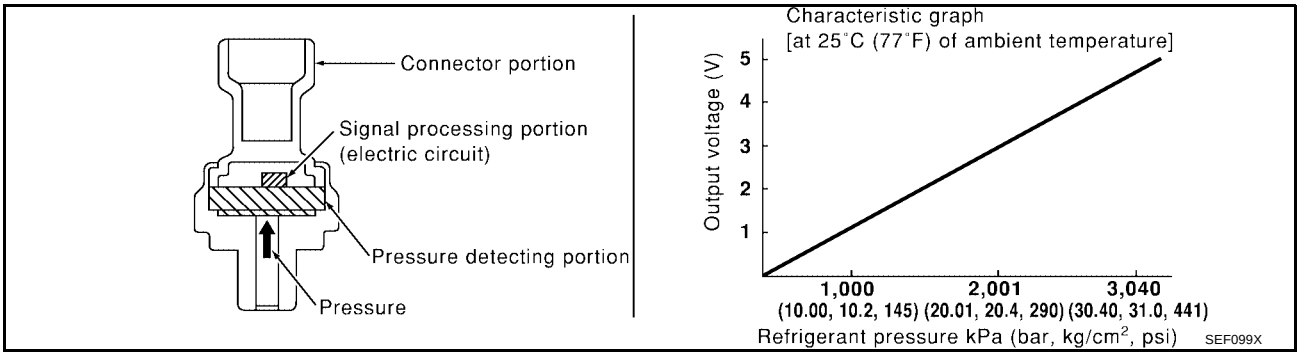
PFP:92136

Component Description

UBS002MO

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

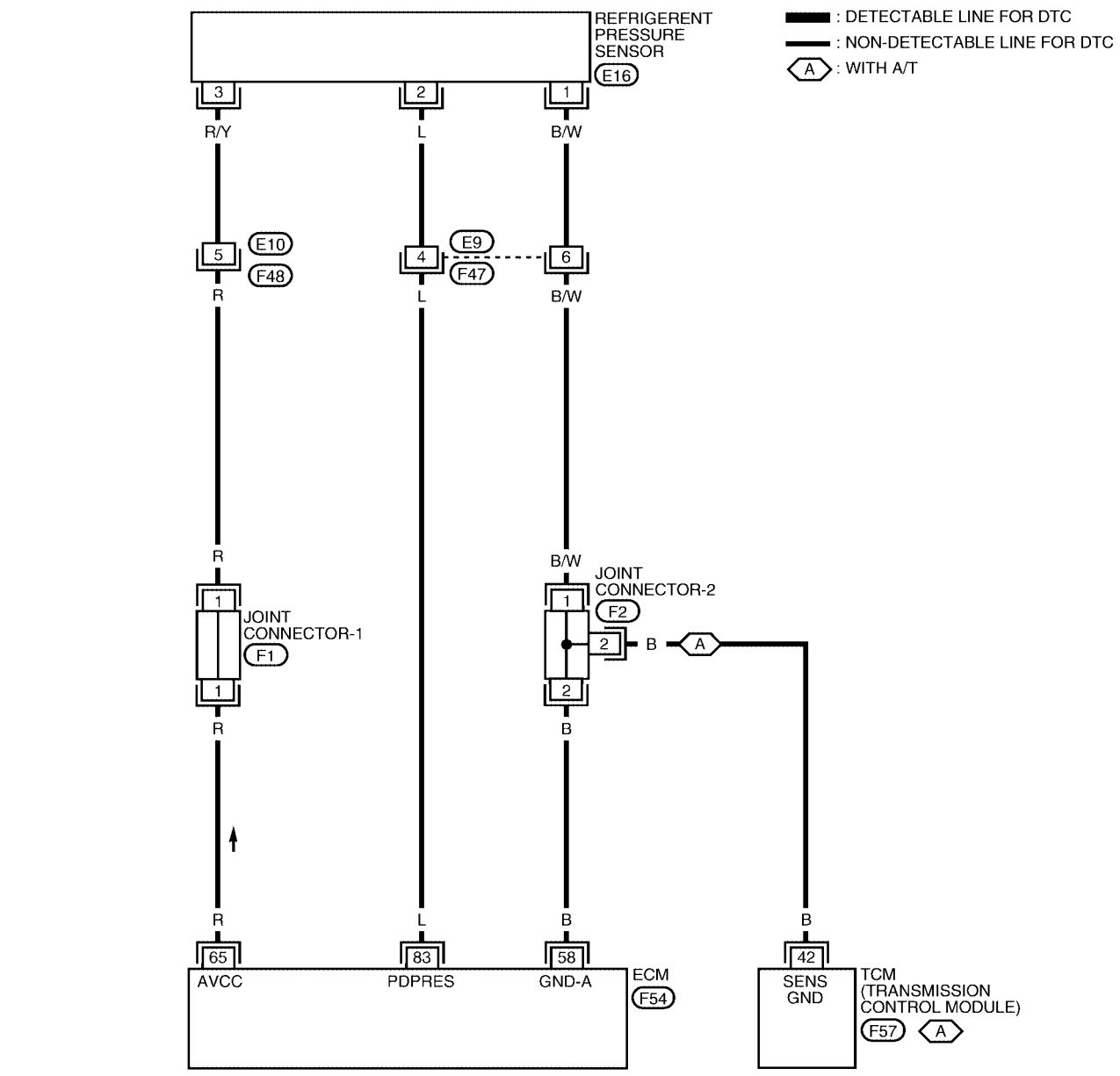


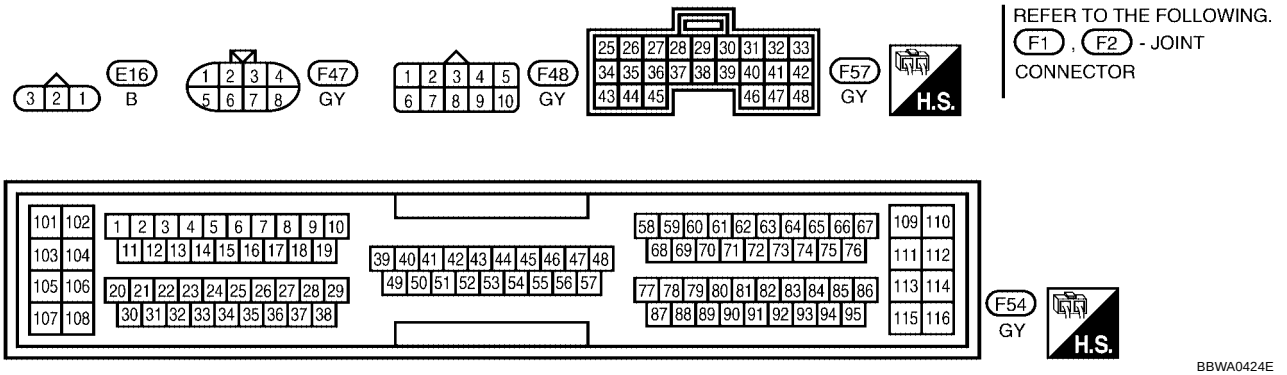


Wiring Diagram

UBS002MP

EC-RP/SEN-01





BBWA0424E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
83	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

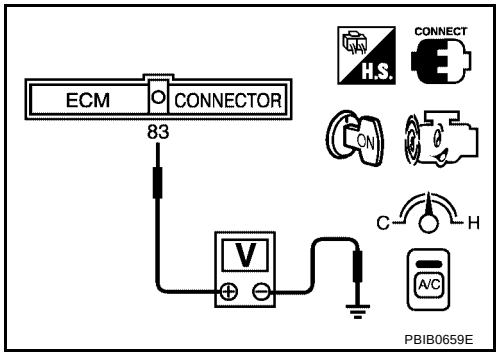
Diagnostic Procedure

UBS002MQ

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 83 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

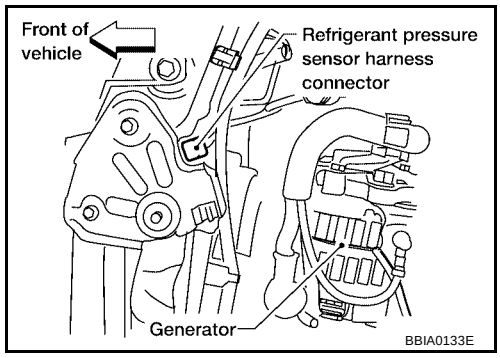


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

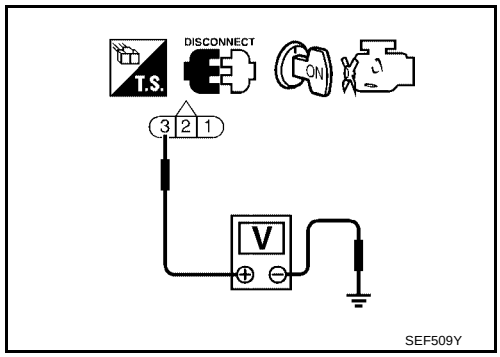
2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Joint connector-1
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between refrigerant pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Joint connector-2
- Harness for open or short between ECM and refrigerant pressure sensor
- Harness for open or short between TCM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 83 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace.

Removal and Installation

UBS002MR

REFRIGERANT PRESSURE SENSOR

Refer to MTC-82, "REFRIGERANT LINES" .

ELECTRICAL LOAD SIGNAL

PFP:25350

CONSULT-II Reference Value in Data Monitor Mode

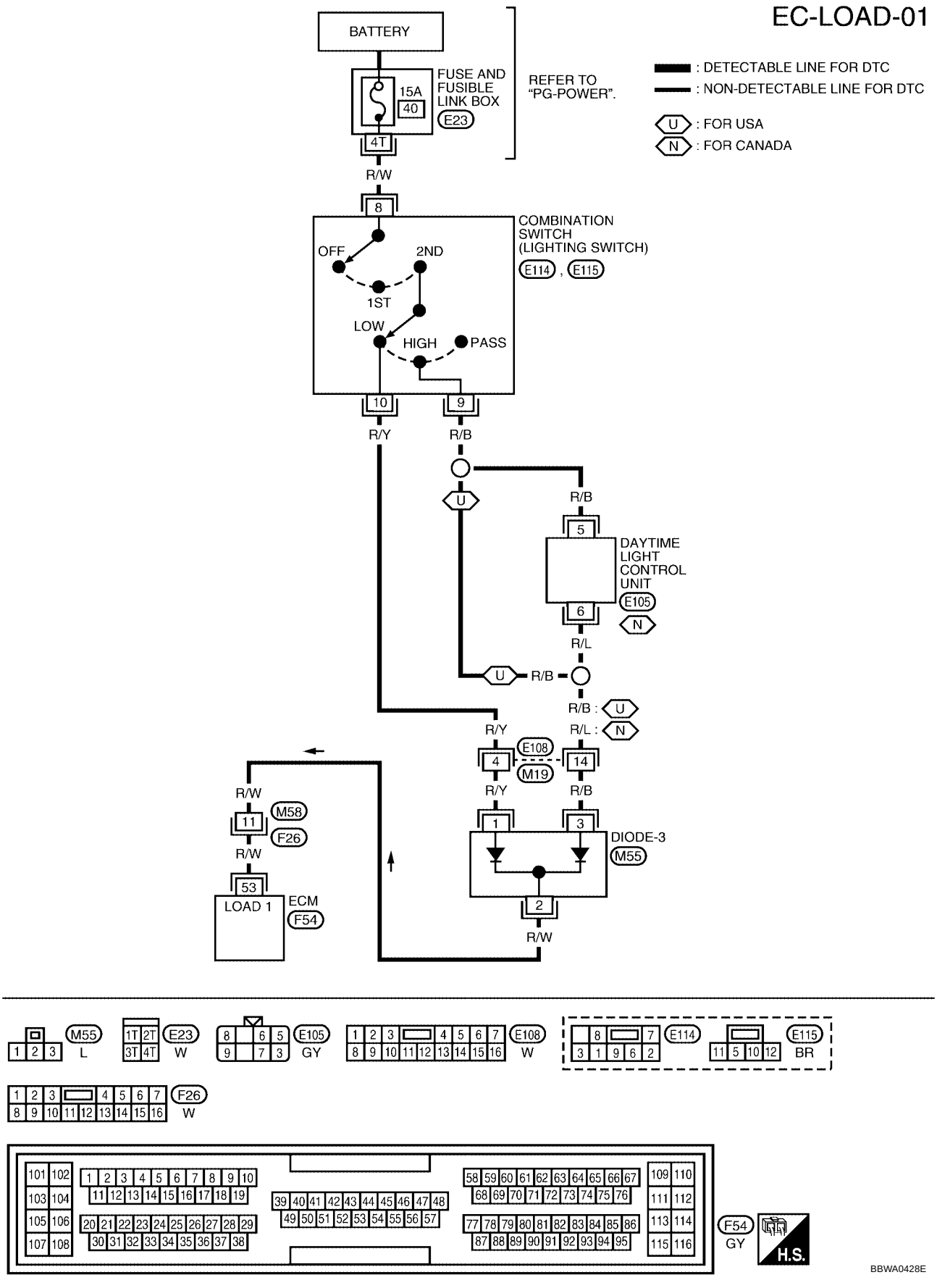
UBS002MS

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF

Wiring Diagram

UBS002MT



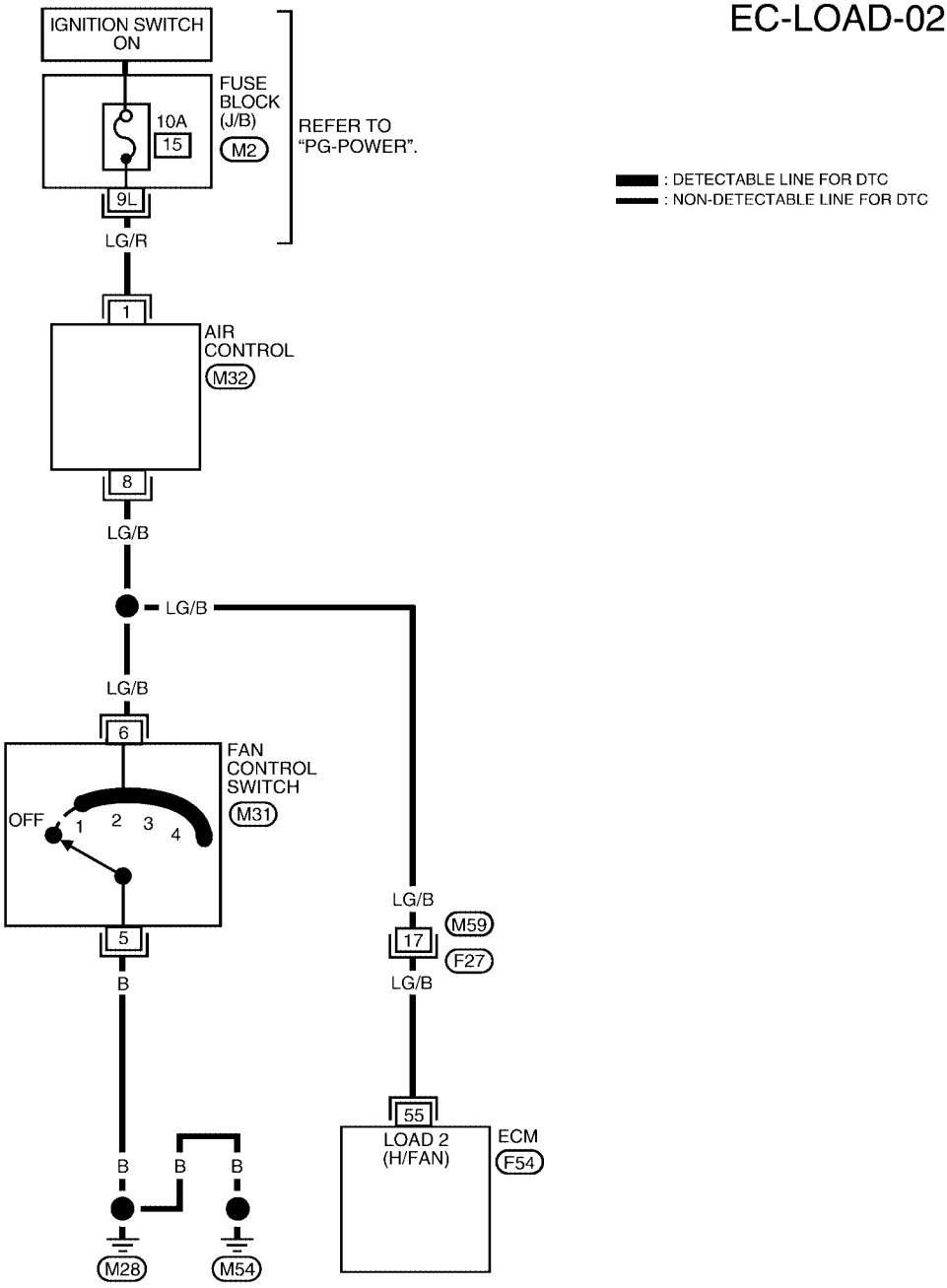
Specification data are reference values and are measured between each terminal and ground.

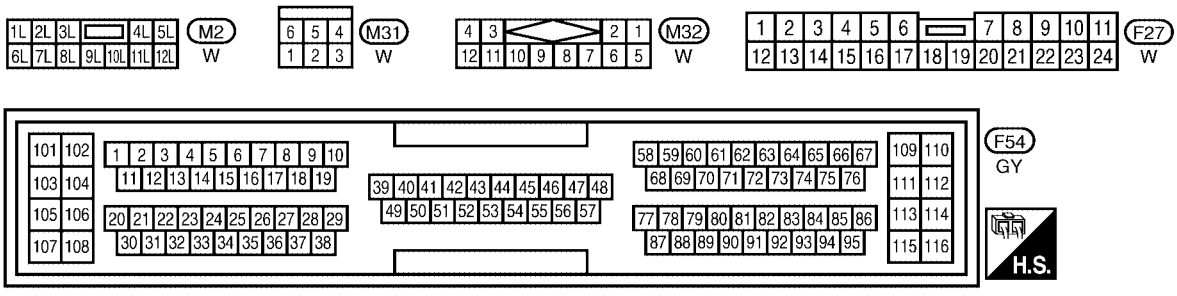
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
53	R/W	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V

EC-LOAD-02





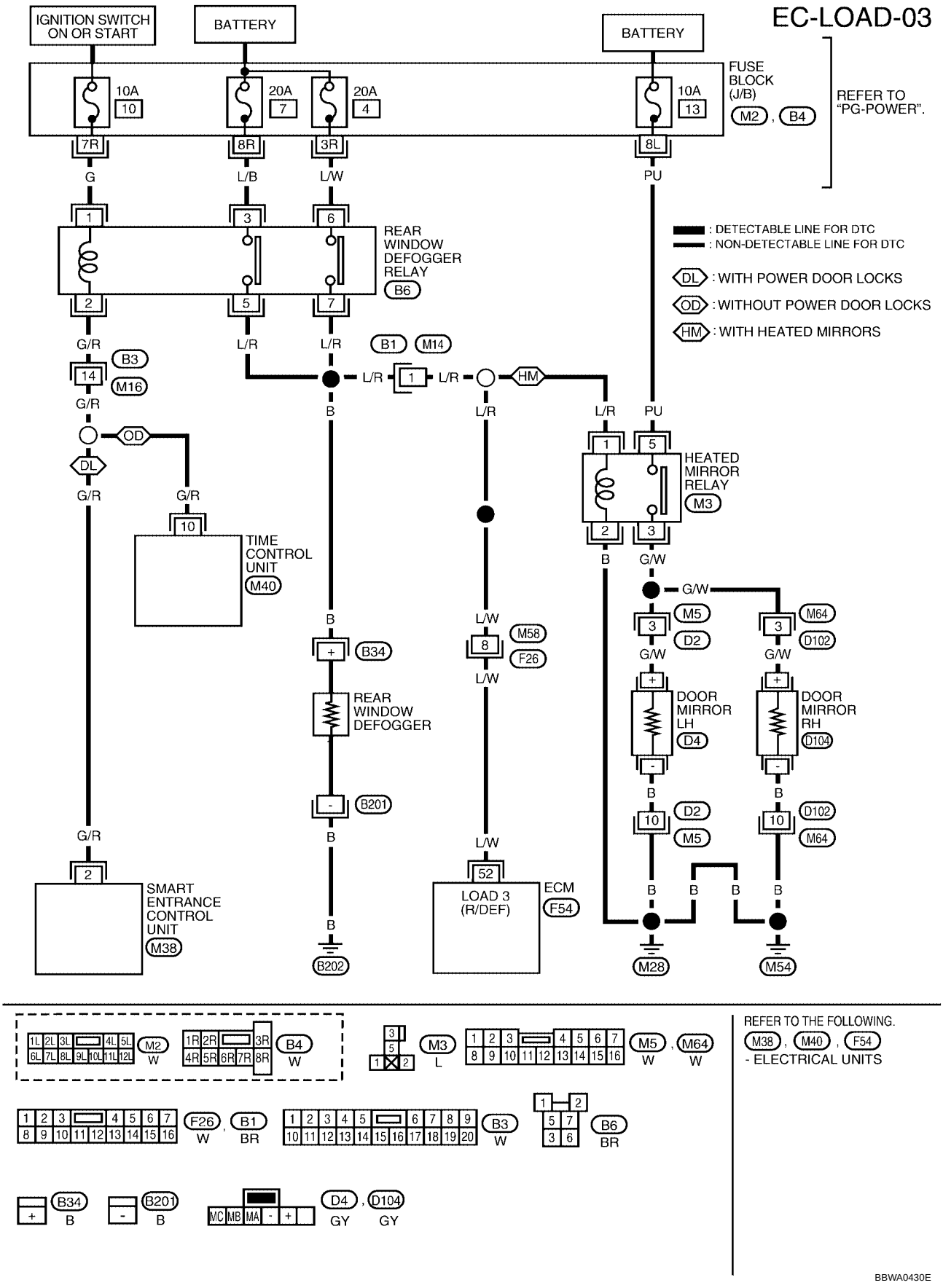
BBWA0429E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
55	LG/B	Heater fan switch	**[Engine is running]** ● Heater fan switch “ON”	Approximately 0V
			[Engine is running] ● Heater fan switch “OFF”	Approximately 5V


EC-LOAD-03
IGNITION SWITCH ON OR START
BATTERY
BATTERY
FUSE BLOCK (J/B)
M2, B4
REFER TO "PG-POWER".
10A 10
20A 7
20A 4
10A 13
7R
8R
3R
8L
G
L/B
L/W
PU
REAR WINDOW DEFOGGER RELAY
B6
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
DL : WITH POWER DOOR LOCKS
OD : WITHOUT POWER DOOR LOCKS
HM : WITH HEATED MIRRORS
G/R
B3
M16
L/R
B1
M14
OD
DL
HEATED MIRROR RELAY
M3
TIME CONTROL UNIT
M40
B
G/W
B34
REAR WINDOW DEFOGGER
L/W
M58
F26
M5
D2
M64
D102
DOOR MIRROR LH
D4
DOOR MIRROR RH
D104
B201
SMART ENTRANCE CONTROL UNIT
M38
LOAD 3 (R/DEF)
ECM
F54
B202
M28
M54
REFER TO THE FOLLOWING.
M38, M40, F54
- ELECTRICAL UNITS
BBWA0430E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
52	L/W	Electrical load signal (Rear window defogger signal)	**[Ignition switch "ON"]** ● Rear window defogger switch is "ON"	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Rear window defogger switch is "OFF"	Approximately 0V

Diagnostic Procedure

UBS002MU

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

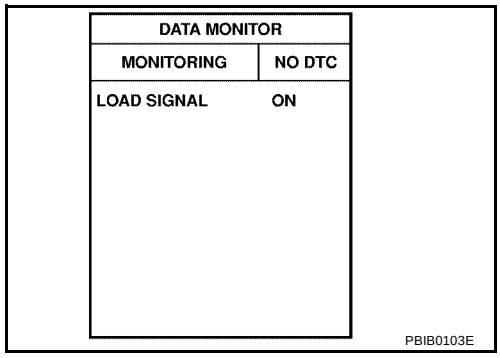
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-1

With CONSULT-II

1. Turn ignition switch "ON".
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

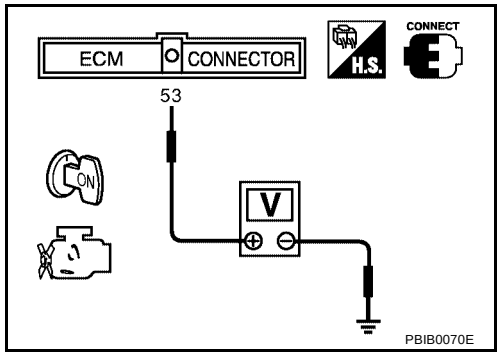
OK >> GO TO 4.
NG >> GO TO 8.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-1

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 53 and ground under the following conditions.

Condition	Voltage
Lighting switch "ON" at 2nd position	BATTERY VOLTAGE
Lighting switch "OFF"	0V



OK or NG

OK >> GO TO 5.
NG >> GO TO 8.

4. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-2

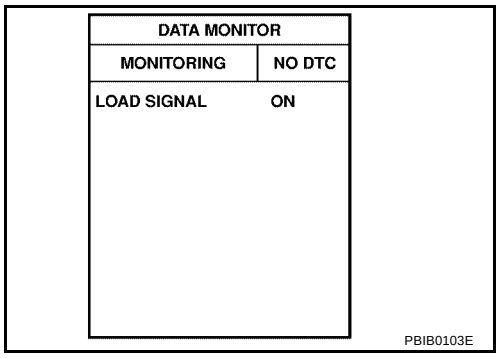
With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
FAN control switch “ON” in any position	ON
FAN control switch “OFF“	OFF

OK or NG

OK >> GO TO 6.
NG >> GO TO 13.



5. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-2

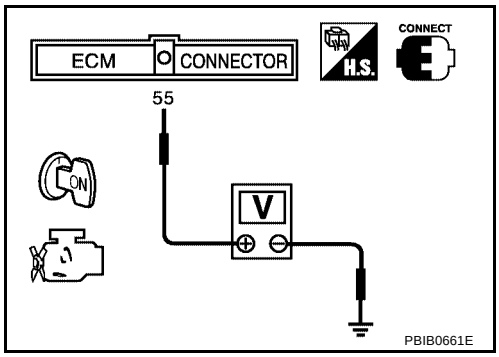
Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 55 and ground under the following conditions.

Condition	Voltage
FAN control switch “ON” in any position	Approximately 0V
FAN control switch “OFF”	Approximately 5V

OK or NG

OK >> GO TO 7.
NG >> GO TO 13.



6. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-3

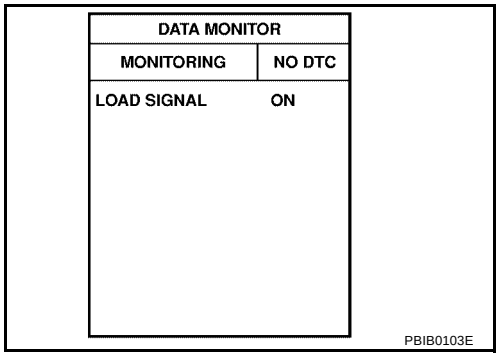
With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Rear window defogger switch “ON”	ON
Rear window defogger switch “OFF“	OFF

OK or NG

OK >> INSPECTION END.
NG >> GO TO 16.

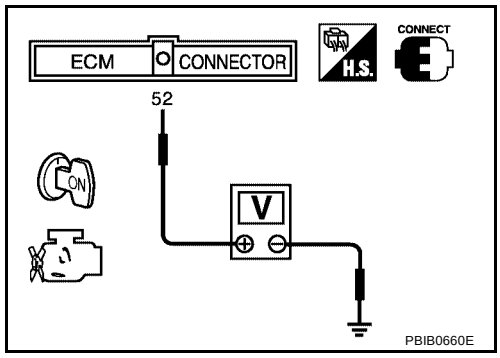


7. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-3

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 52 and ground under the following conditions.

Condition	Voltage
Rear window defogger switch “ON”	BATTERY VOLTAGE
Rear window defogger switch “OFF”	Approximately 0V



OK or NG

OK >> INSPECTION END.
NG >> GO TO 16.

8. CHECK HEADLAMP FUNCTION

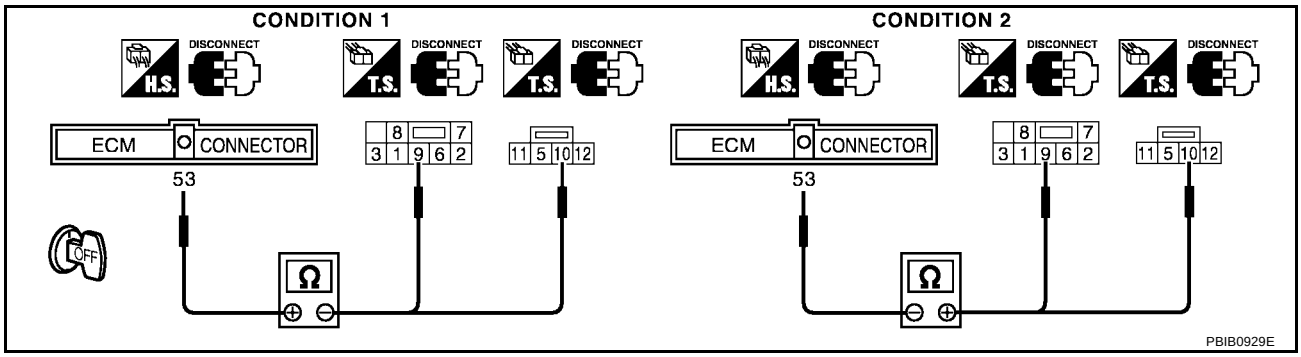
1. Start engine.
2. Turn the lighting switch “ON” at 2nd position.
3. Check that headlamps are illuminated.

OK or NG

OK (Models for USA)>>GO TO 8.
OK (Models for Canada)>>GO TO 11.
NG >> Refer to LT-6, "HEADLAMP (FOR USA)" or LT-10, "HEADLAMP (FOR CANADA) — DAYTIME LIGHT SYSTEM —" .

9. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connectors.
4. Check harness continuity between ECM terminal 53 and lighting switch terminal 9, 10 under the following conditions.



Condition	Continuity
1	Should not exist
2	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

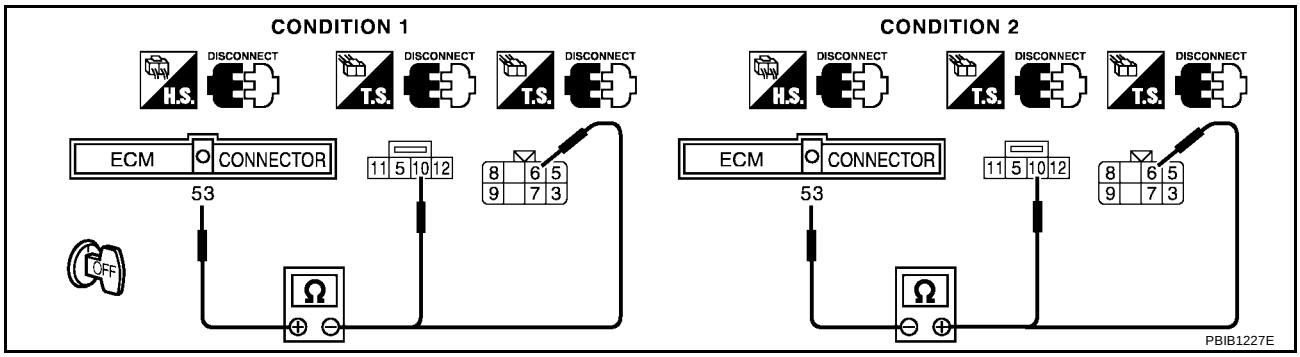
Check the following.

- Harness connectors E108, M19
- Harness connectors M58, F26
- Diode M55
- Harness for open and short between ECM and lighting switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connector E114.
   Disconnect daytime light control unit harness connector.
4. Check harness continuity between ECM terminal 53 and lighting switch terminal 10, daytime light control unit terminal 6 under the following conditions.



Condition	Continuity
1	Should not exist
2	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E108, M19
- Harness connectors M58, F26
- Diode M55
- Harness for open and short between ECM and lighting switch
- Harness for open and short between ECM and daytime light control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

13. CHECK HEATER FAN SWITCH FUNCTION

1. Start engine.
2. Turn the heater fan switch “ON” in any position.
3. Check that heater fan turns properly.

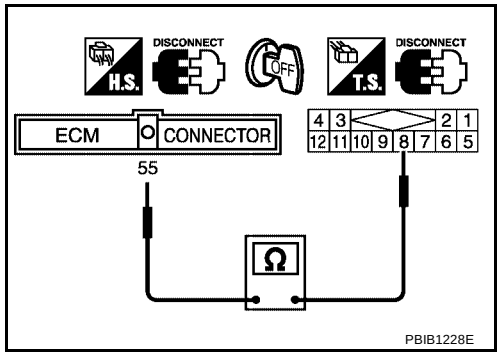
OK or NG

OK >> GO TO 14.
NG >> Refer to MTC-19, "TROUBLE DIAGNOSIS"

14. CHECK HEATER FAN INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect air control connector.
4. Check harness continuity between ECM terminal 55 and air control terminal 8.

Continuity should exist.



5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open and short between ECM and air control

>> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK REAR WINDOW DEFOGGER FUNCTION

1. Start engine.
2. Turn “ON” the rear window defogger switch.
3. Check the rear windshield. Is the rear windshield heated up?

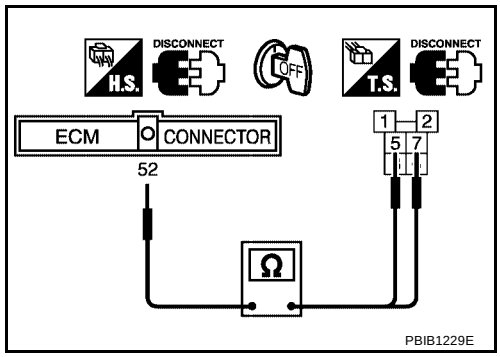
Yes or No

Yes >> GO TO 17.
No >> Refer to GW-17, "REAR WINDOW DEFOGGER"

17. CHECK REAR WINDOW DEFOGGER INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect rear window defogger relay.
4. Check harness continuity between ECM terminal 52 and rear window defogger terminal 5, 7.

Continuity should exist.



5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 18.

18. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M56, F26
- Harness for open and short between ECM and rear window defogger relay.

>> Repair open circuit or short to ground or short to power in harness or connectors.

19. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

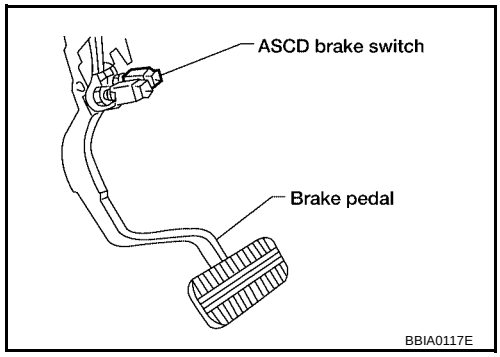
ASCD BRAKE SWITCH

PFP:25320

Component Description

UBS002MV

When depress on the brake pedal, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal)
Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

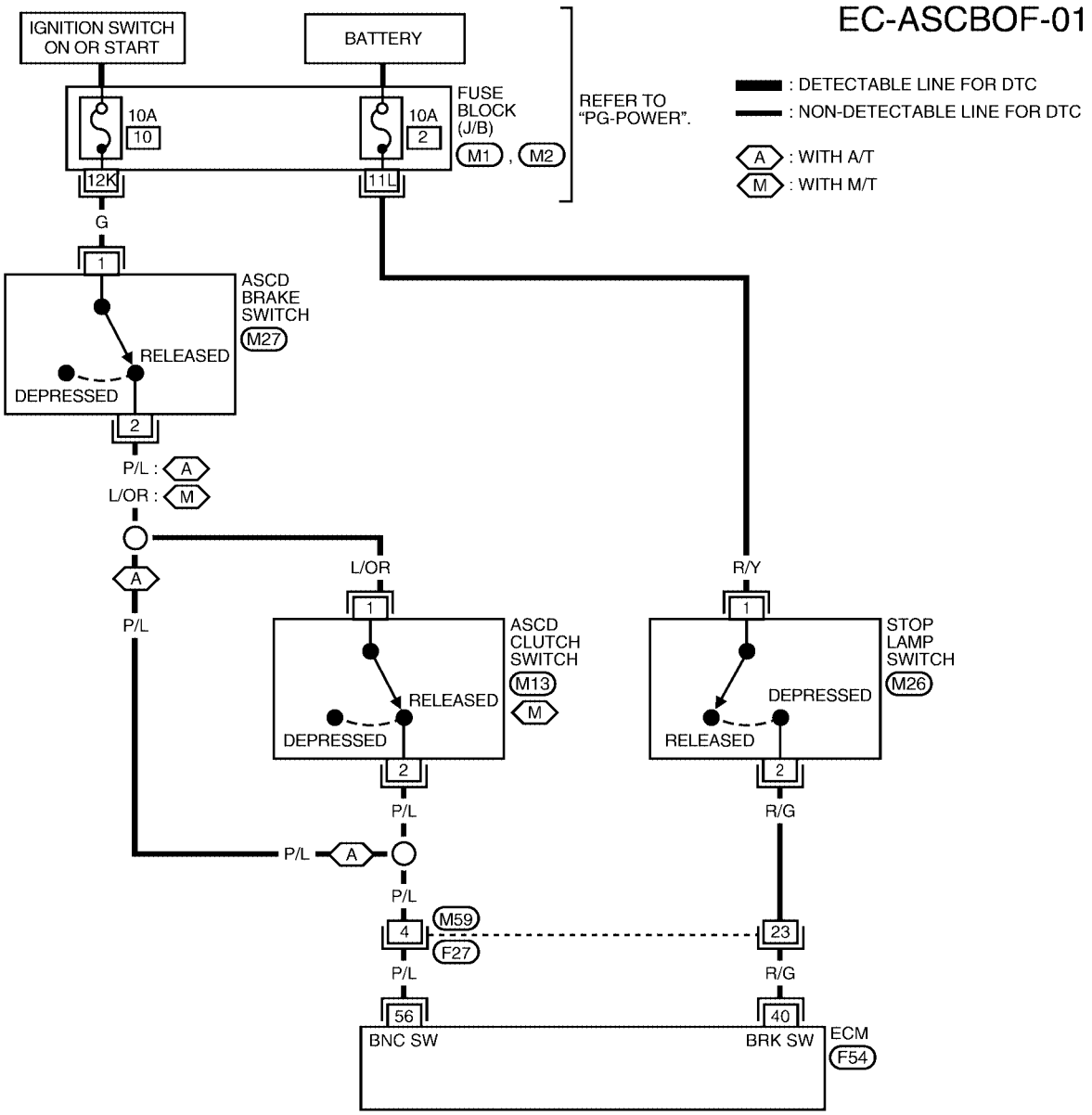
UBS002MW

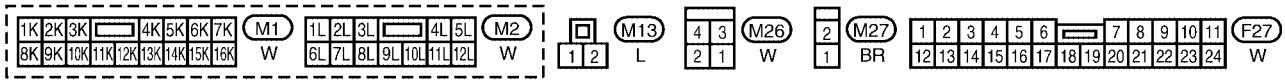
Specification data are reference values.

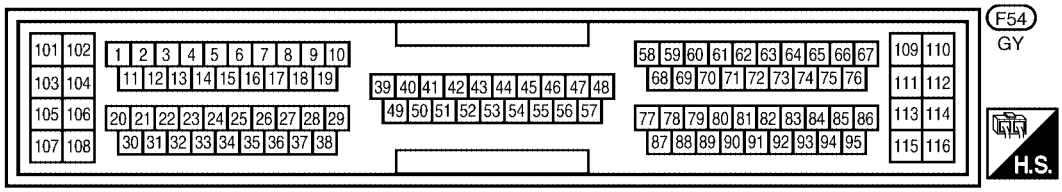
MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (ASCD brake switch)	● Ignition switch: ON	● Brake pedal: Fully released	ON
		● Brake pedal: Slightly	OFF
BRAKE SW2 (Stop lamp switch)	● Ignition switch: ON	● Brake pedal: Fully released	OFF
		● Brake pedal: Depressed	ON

Wiring Diagram

UBS002MX







BBWA0425E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
56	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released ● Clutch pedal is fully released (M/T models)	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002MY

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

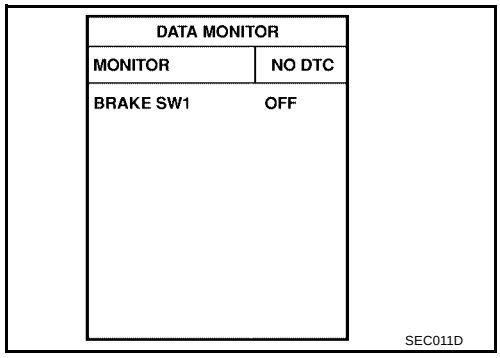
1. Turn ignition switch "ON".
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-II.
3. Check "BRAKE SW1" indication under the following conditions.

M/T models

CONDITION	INDICATION
When clutch pedal or brake pedal is depressed	OFF
When clutch pedal and brake pedal are fully released	ON

A/T models

CONDITION	INDICATION
When brake pedal is depressed	OFF
When brake pedal is fully released	ON



Without CONSULT-II

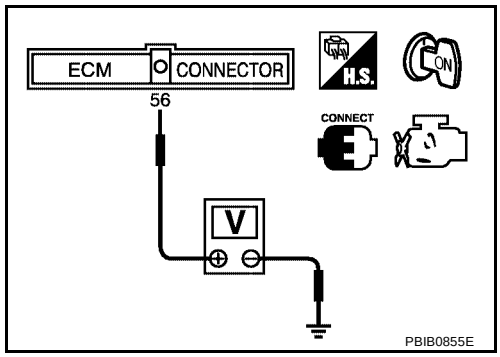
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 56 and ground under the following conditions.

M/T models

CONDITION	VOLTAGE
When clutch pedal or brake pedal is depressed	Approximately 0V
When clutch pedal and brake pedal are fully released	Battery voltage

A/T models

CONDITION	VOLTAGE
When brake pedal is depressed	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

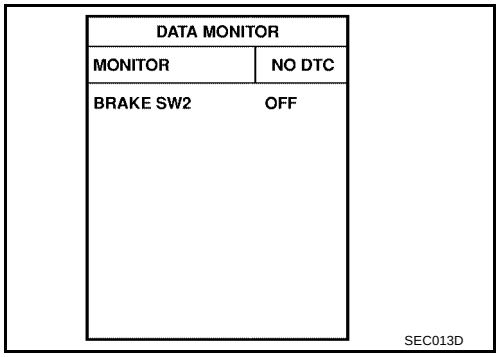
OK >> GO TO 2.
NG (M/T models) >>GO TO 3.
NG (A/T models) >>GO TO 4.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

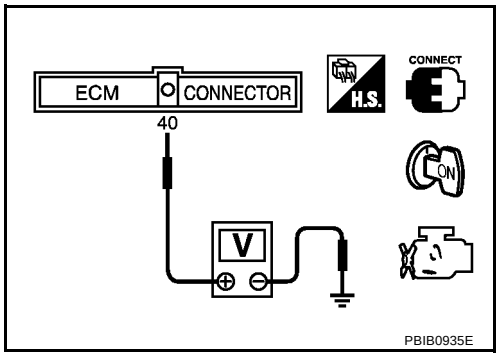
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 40 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

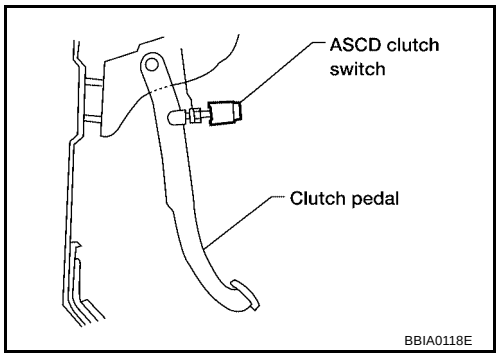


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 13.

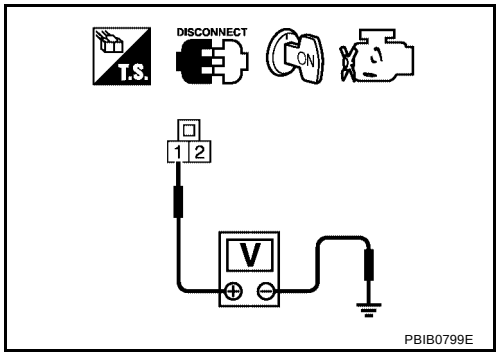
3. CHECK ASCD BRAKE SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-II or tester.

CONDITION	VOLTAGE
When brake pedal is released	Battery voltage
When brake pedal is depressed	Approx. 0V

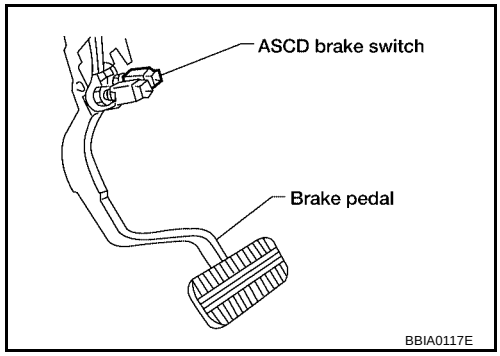


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

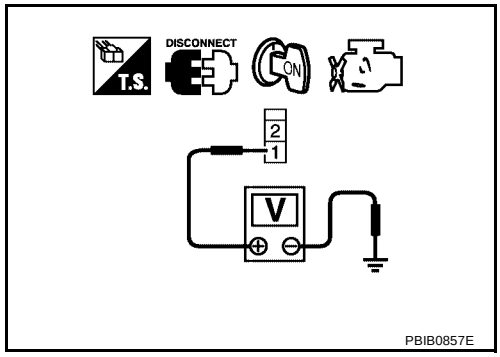
4. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK (M/T models)>>GO TO 6.
OK (A/T models)>>GO TO 7.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ASCD BRAKE SWITCH

Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD brake switch.

10. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and ASCD clutch switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD clutch switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

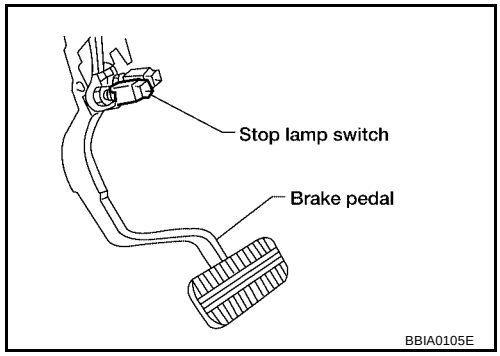
Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD clutch switch.

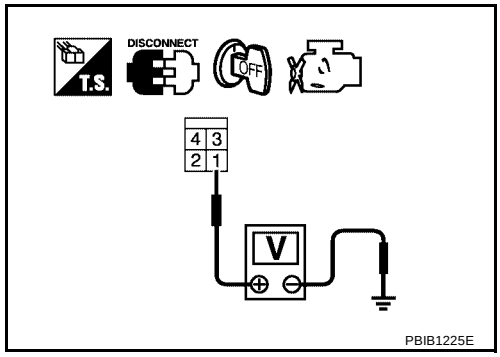
13. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT -II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 40 and stop lamp switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK STOP LAMP SWITCH

Refer to EC-1738, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace stop lamp switch.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

ASCD INDICATOR

PFP:24814

Component Description

UBS002MZ

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.
CRUISE indicator illuminates when CRUISE switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.
SET indicator illuminates when following conditions are met.

- CRUISE indicator is illuminated.
- SET switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET indicator remains lit during ASCD control.
Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.

CONSULT-II Reference Value in Data Monitor Mode

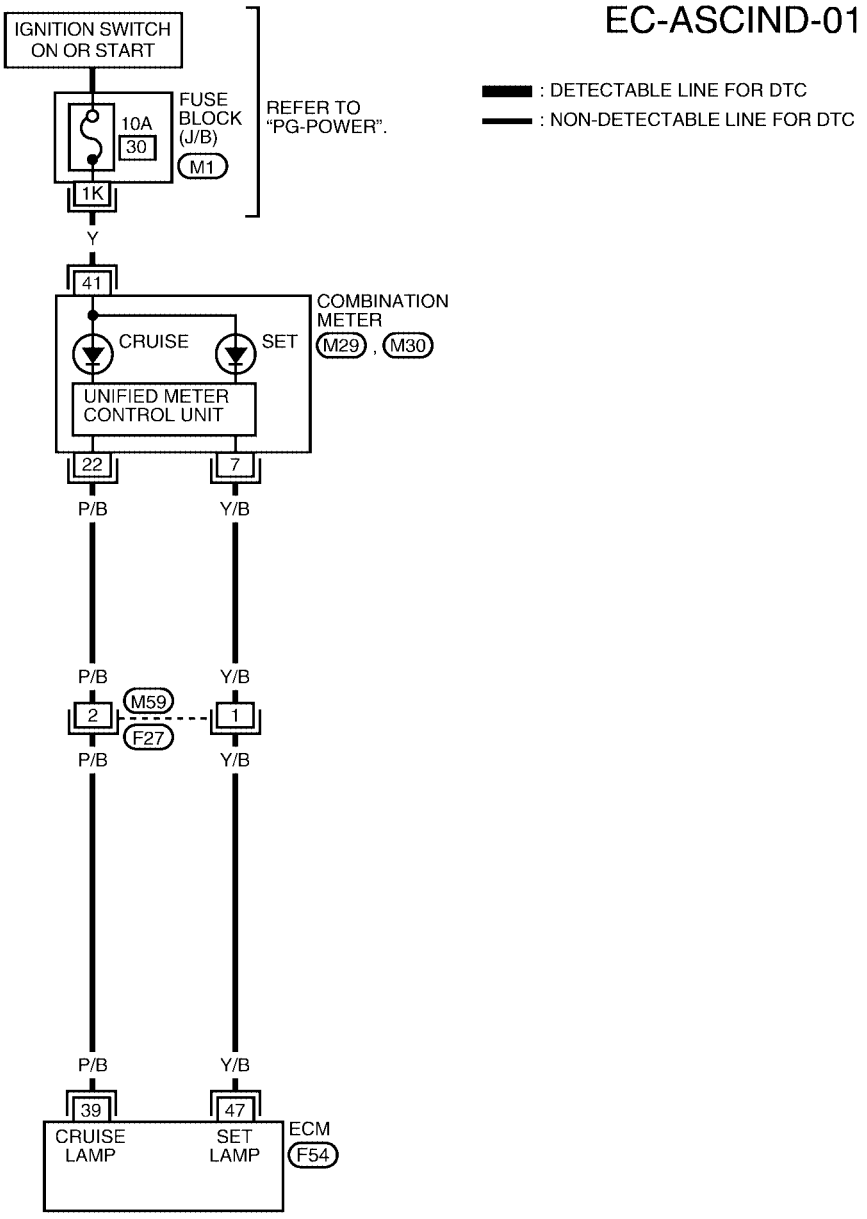
UBS002N0

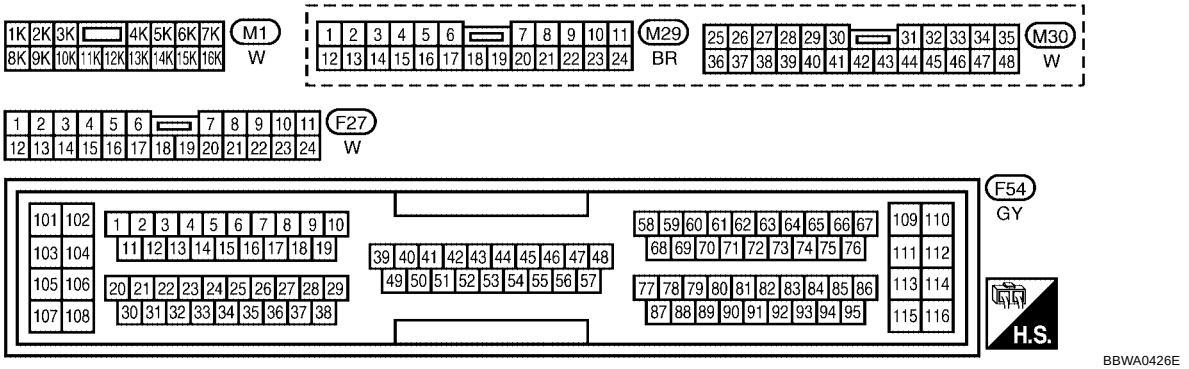
Specification data are reference value.

MONITOR ITEM	CONDITION		SPECIFICATION
CRUISE LAMP	● Ignition switch: ON	● CRUISE switch is depressed at first time → second time	ON → OFF
SET LAMP	● CRUISE switch: ON ● When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	● SET switch pressed	ON
		● ASCD control is canceled	OFF

Wiring Diagram

UBS002N1





BBWA0426E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
39	P/B	ASCD CRUISE lamp	**[Ignition switch "ON"]** ● CRUISE switch is depressed at first time → second time	Approximately 0V ↓ BATTERY VOLTAGE (11 - 14V)
47	Y/B	ASCD SET lamp	**[Engine is running]** ● SET switch is "ON". ● ASCD control is operating.	Approximately 0V
			[Engine is running] ● ASCD control is not operating.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002N2

1. CHECK OVERALL FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE lamp	● Ignition switch: ON	● CRUISE switch is depressed at first time → second time	ON → OFF
SET lamp	● CRUISE switch: ON ● When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	● SET switch pressed	ON
		● ASCD control is canceled	OFF

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 2.

2. CHECK COMBINATION METER OPERATION

Does combination meter operate normally?

Yes or No

Yes >> GO TO 3.

No >> Check combination meter circuit. Refer to DI-8, "Combination Meter" .

3. CHECK ASCD INDICATOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM terminal	Combination meter terminal
39	22
47	7

Continuity should exist.

5. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

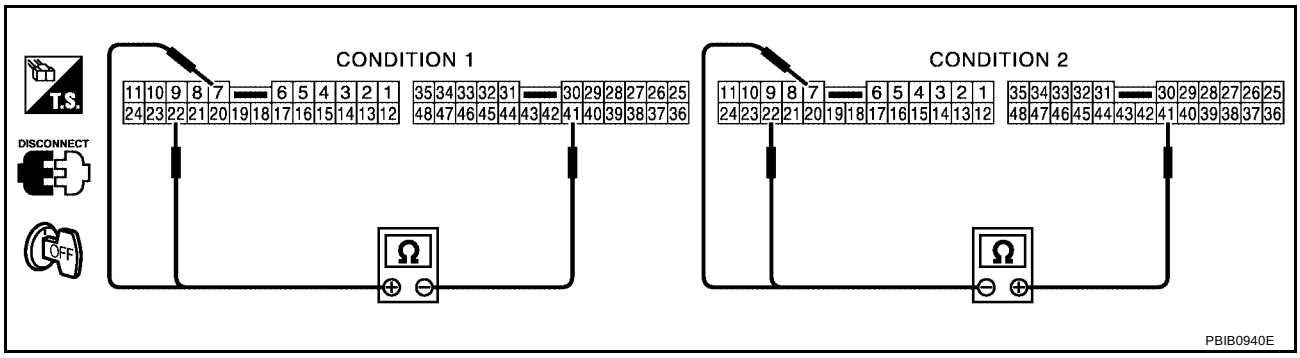
- Harness connectors M59, F27
- Harness for open and short between ECM and combination meter

>> Repair open circuit or short to ground or short to power in harness or connectors

5. CHECK COMBINATION METER

Check continuity under the following conditions.

CONDITION	Combination meter terminal No. (Polarity)	Continuity
1	7 (+) - 41 (–)	Should not exist.
	22 (+) - 41 (–)	
2	41 (+) - 7 (–)	Should exist.
	41 (+) - 22 (–)	



OK or NG

OK >> GO TO 6.
NG >> Replace combination meter. Refer to DI-8 .

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

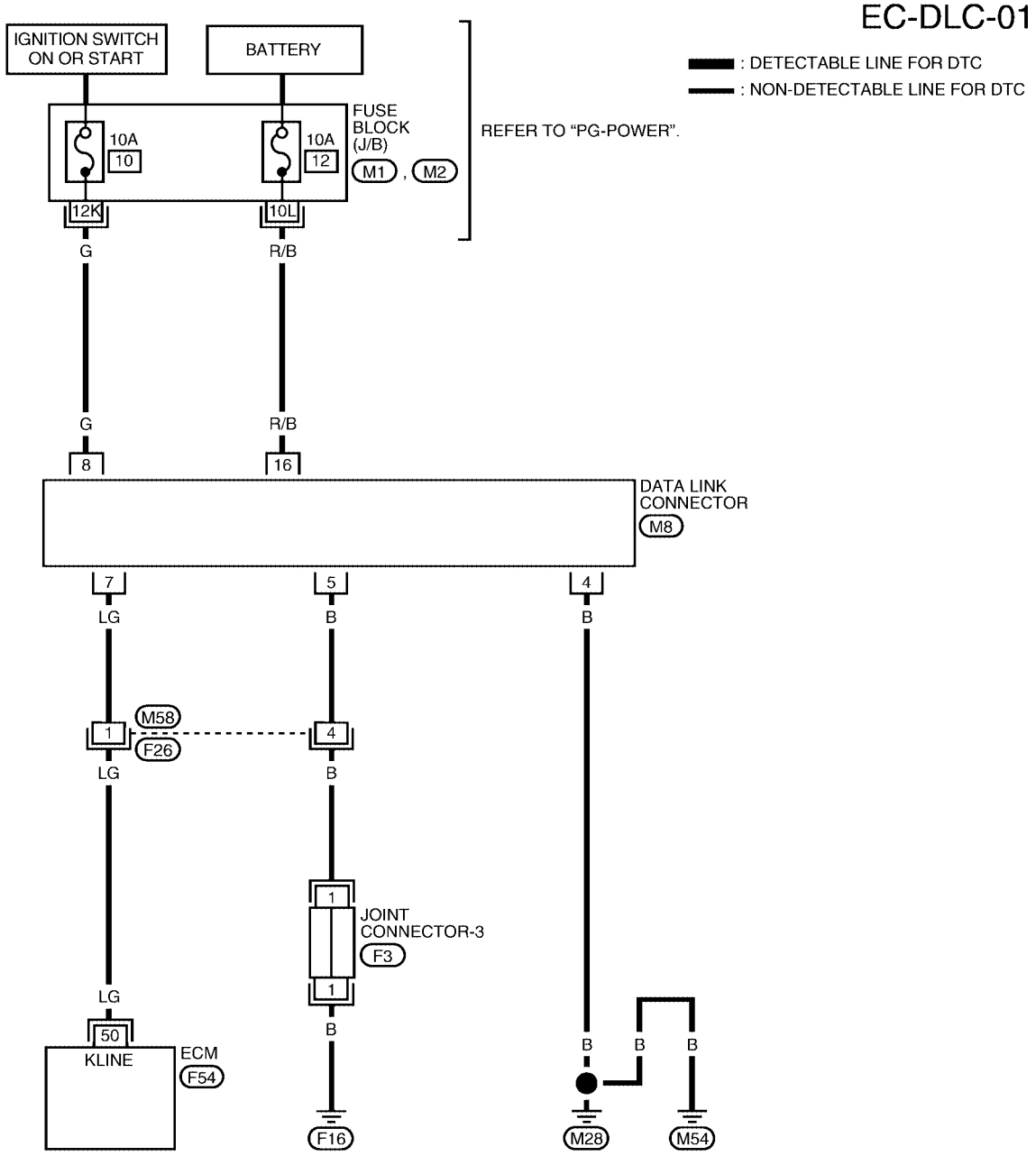
>> **INSPECTION END**

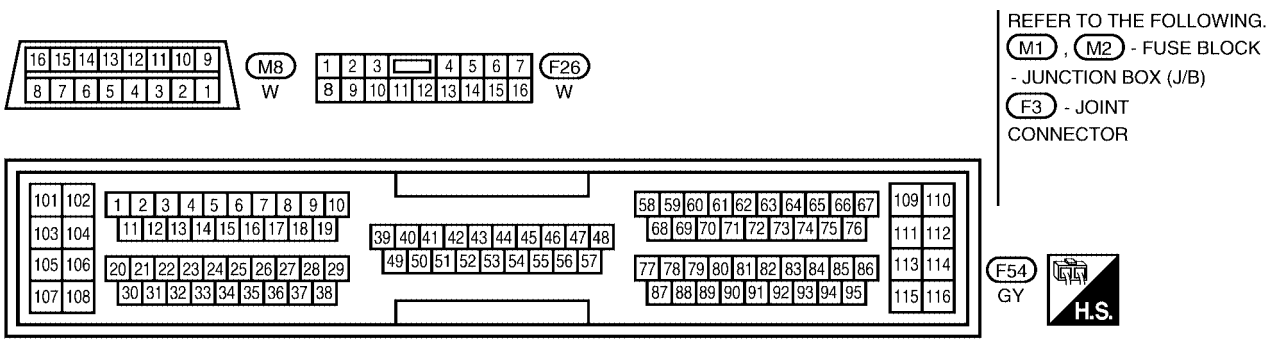
DATA LINK CONNECTOR

PFP:24814

Wiring Diagram

EBS00KLH





BBWA0427E

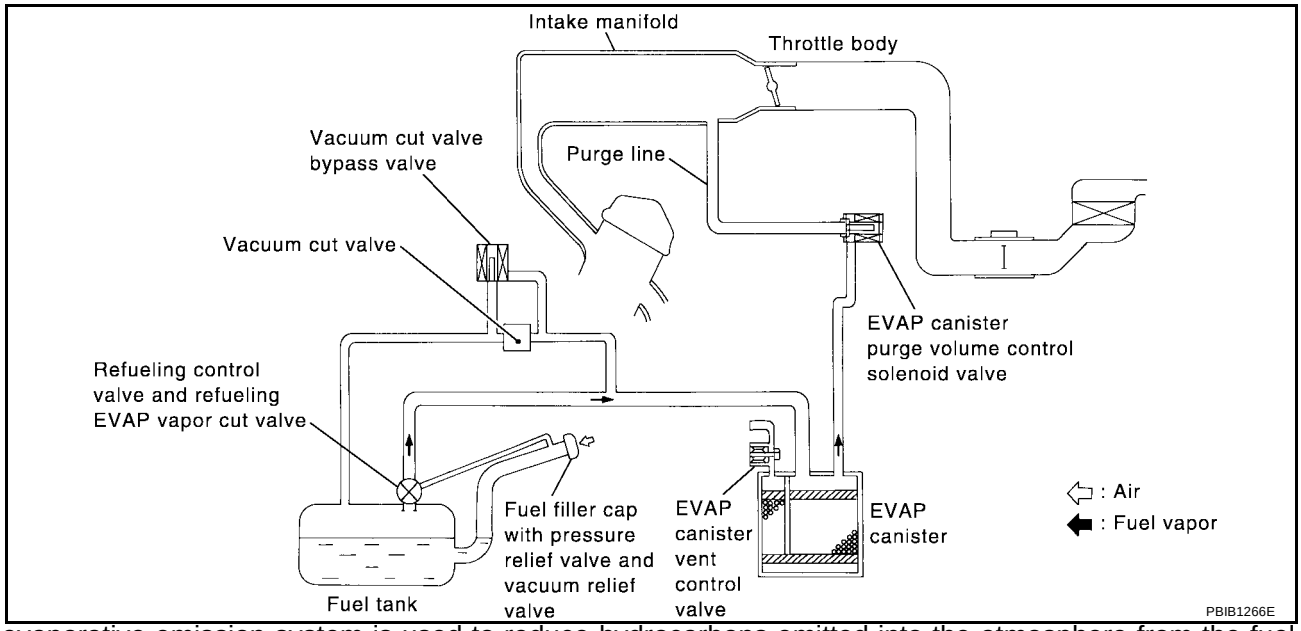
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

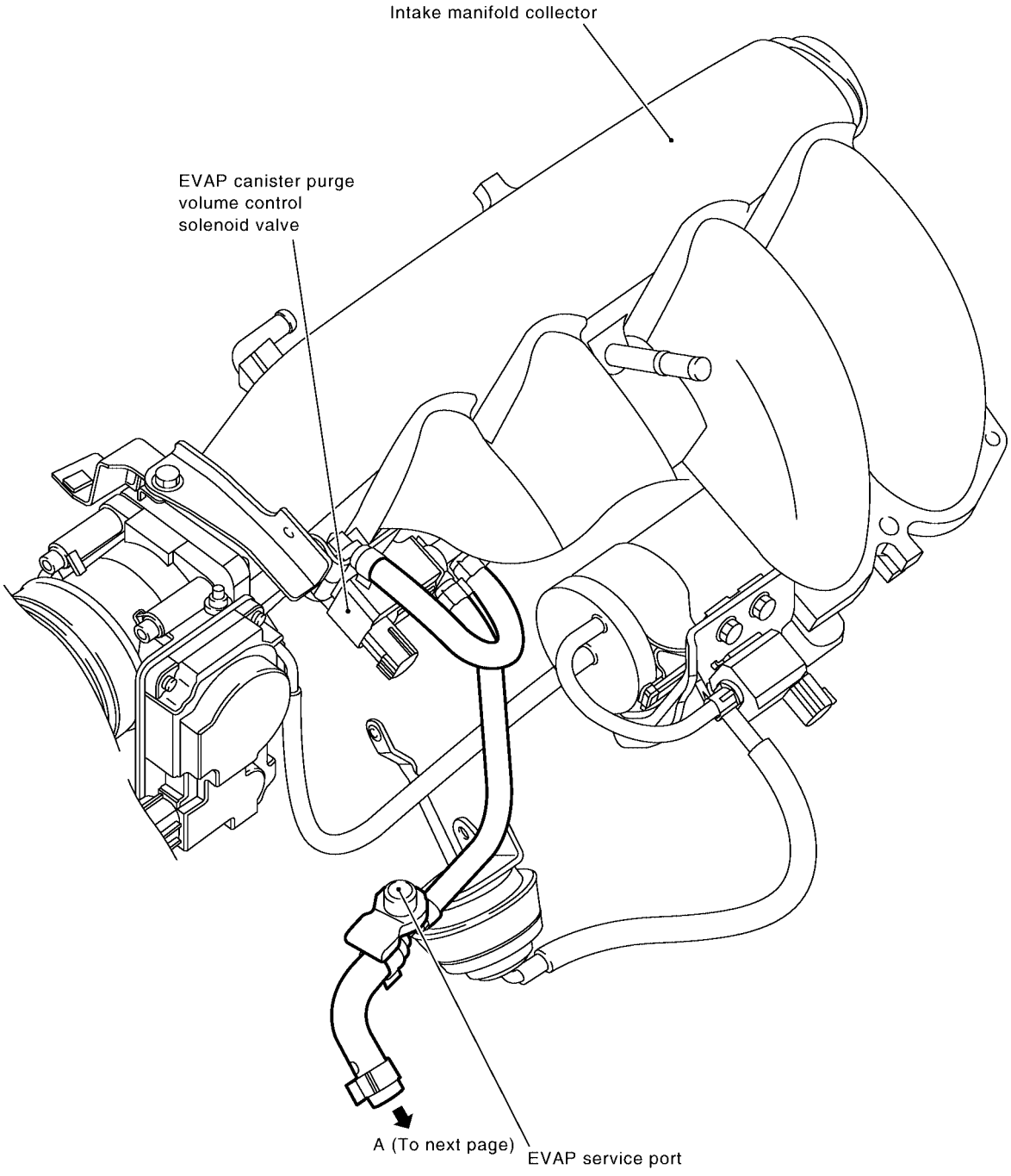
UBS002N4

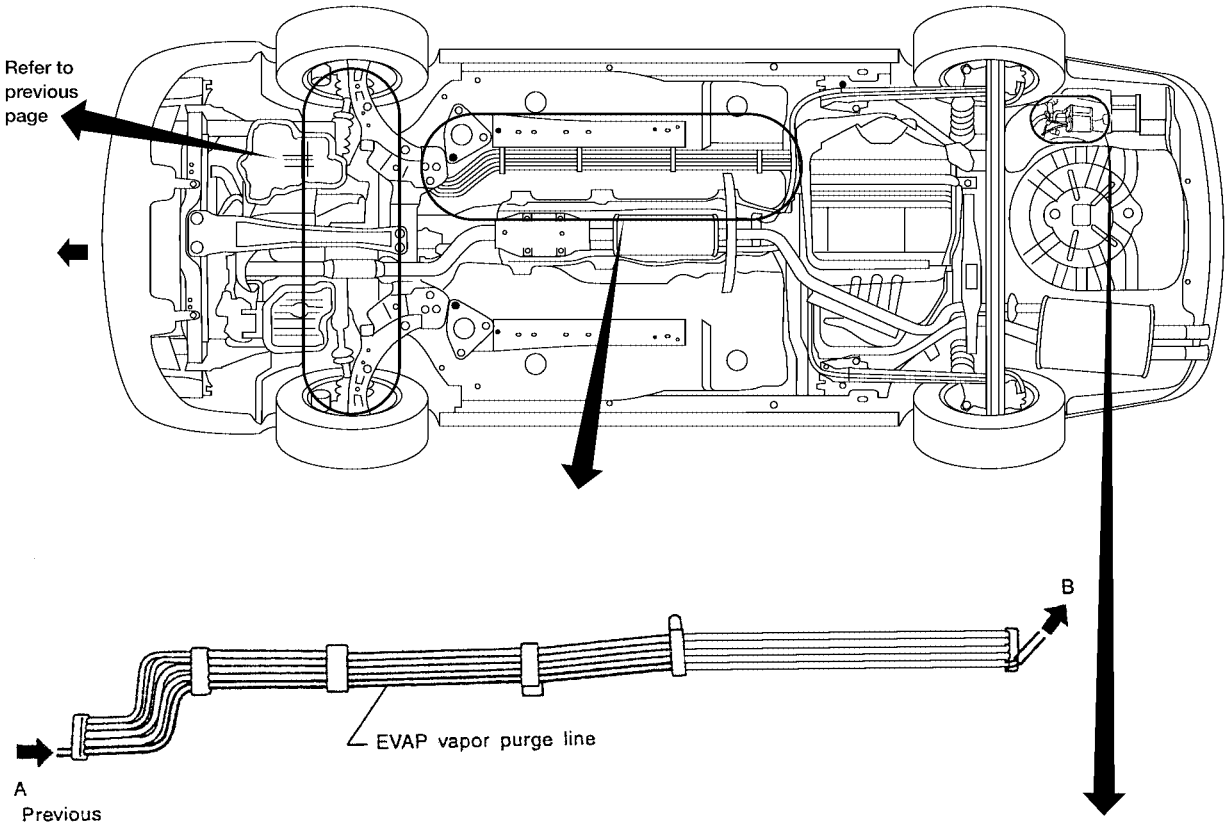
SYSTEM DESCRIPTION

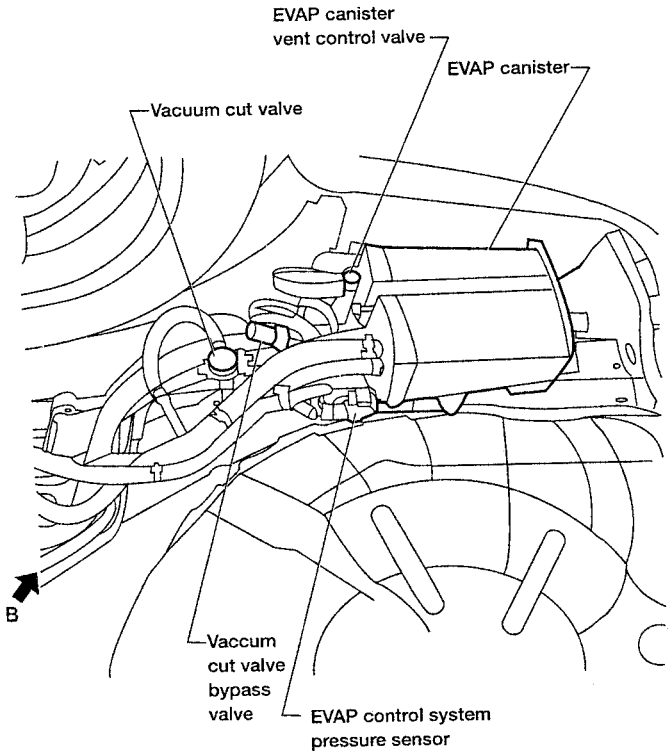


The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING




Refer to previous page
B
EVAP vapor purge line
A
Previous


EVAP canister vent control valve
EVAP canister
Vacuum cut valve
B
Vaccum cut valve bypass valve
EVAP control system pressure sensor

BBIA0212E

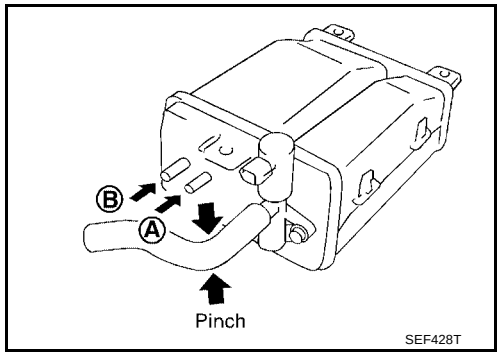
Component Inspection

UBS002N5

EVAP CANISTER

Check EVAP canister as follows:

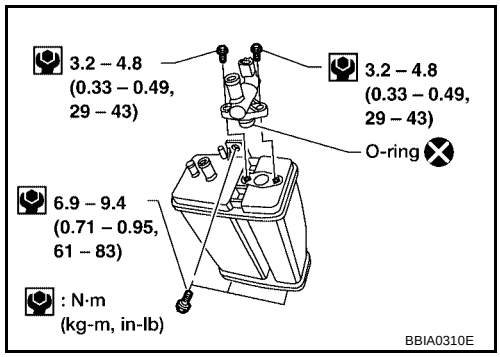
1. Pinch the fresh air hose.
2. Blow air into port **A** and check that it flows freely out of port **B** .



Tightening Torque

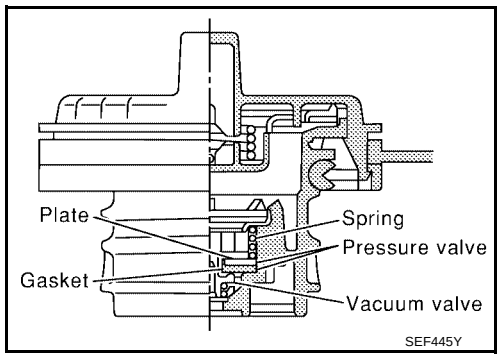
Tighten EVAP canister as shown in the figure.

Make sure new O-ring is installed properly between EVAP canister and EVAP canister vent control valve.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)

1. Wipe clean valve housing.

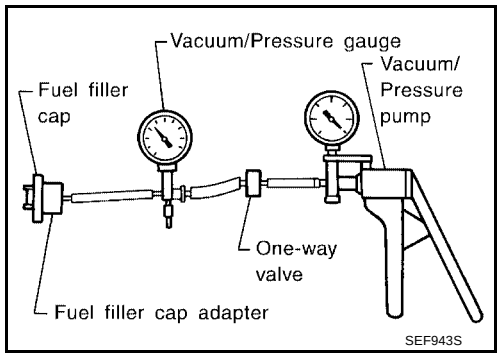


2. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa
(0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)
Vacuum: –6.0 to –3.4 kPa
(–0.061 to –0.035 kg/cm^2 , –0.87 to –0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.

CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.



VACUUM CUT VALVE AND VACUUM CUT VALVE BYPASS VALVE

Refer to EC-1712 .

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

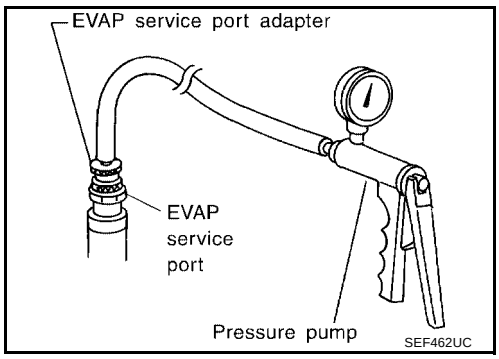
Refer to EC-1526 .

FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456 .

EVAP SERVICE PORT

Positive pressure is delivered to the EVAP system through the EVAP service port. If fuel vapor leakage in the EVAP system occurs, use a leak detector to locate the leak.



How to Detect Fuel Vapor Leakage

UBS002N6

CAUTION:

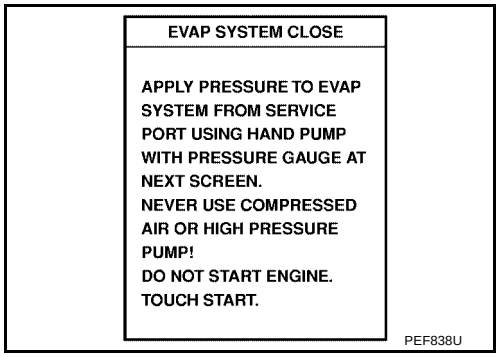
- **Never use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in EVAP system.**

NOTE:

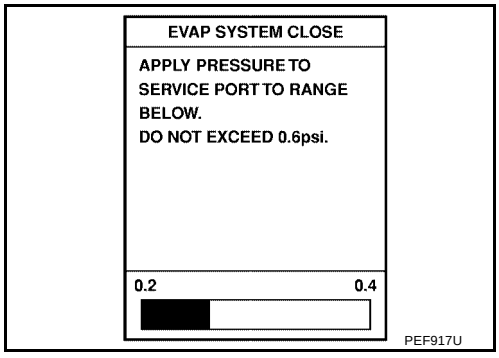
- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

WITH CONSULT-II

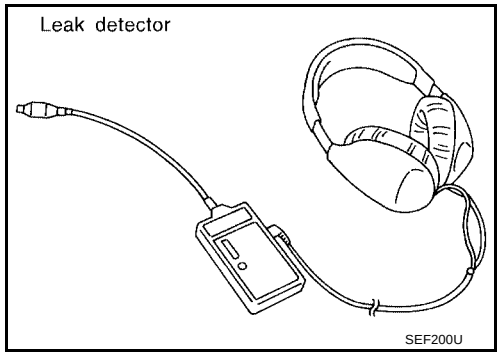
1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump and hose to the EVAP service port adapter.
3. Turn ignition switch “ON”.
4. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT MODE” with CONSULT-II.
5. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.



6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7. Remove EVAP service port adapter and hose with pressure pump.

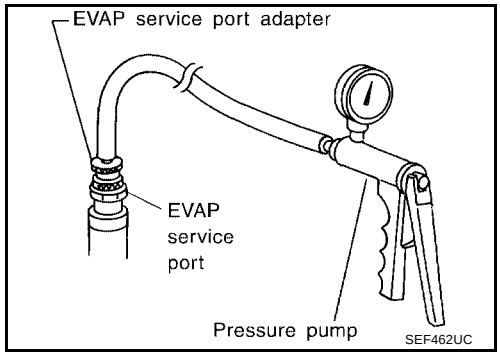


8. Locate the leak using a leak detector. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

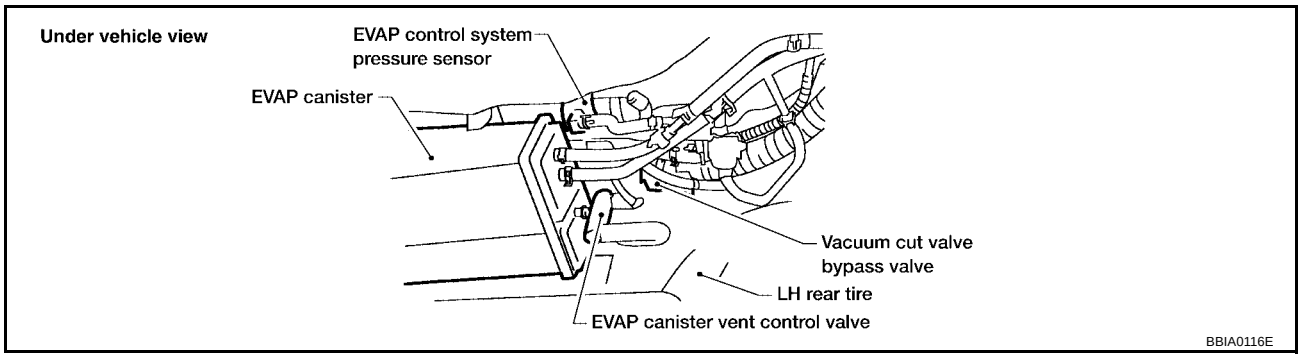


WITHOUT CONSULT-II

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump with pressure gauge to the EVAP service port adapter.



3. Apply battery voltage to between the terminals of both EVAP canister vent control valve and vacuum cut valve bypass valve to make a closed EVAP system.



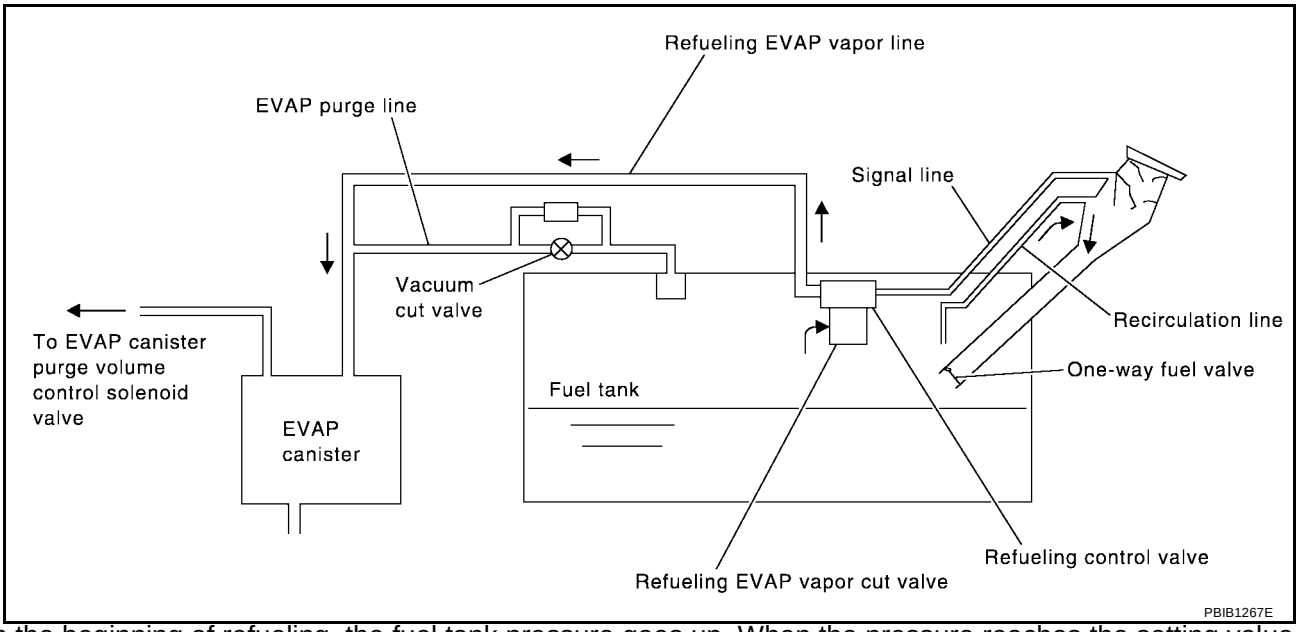
4. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2 , 0.2 to 0.4 psi).
5. Remove EVAP service port adapter and hose with pressure pump.
6. Locate the leak using a leak detector. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

PFP:00032

System Description

UBS002N7



From the beginning of refueling, the fuel tank pressure goes up. When the pressure reaches the setting value of the refueling control valve (RCV) opening pressure, the RCV is opened. After RCV opens, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve, RCV and refueling vapor line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

The RCV is always closed during driving and the evaporative emission control system is operated the same as conventional system.

WARNING:

When conducting inspections below, be sure to observe the following:

- **Put a “CAUTION: INFLAMMABLE” sign in workshop.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to furnish the workshop with a CO_2 fire extinguisher.**

CAUTION:

- **Before removing fuel line parts, carry out the following procedures:**
  - **Put drained fuel in an explosion-proof container and put lid on securely.**
  - **Release fuel pressure from fuel line. Refer to EC-1257, "FUEL PRESSURE RELEASE" .**
  - **Disconnect battery ground cable.**
- **Always replace O-ring when the fuel gauge retainer is removed.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose and clamps excessively to avoid damaging hoses.**
- **After installation, run engine and check for fuel leaks at connection.**
- **Do not attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.**

Diagnostic Procedure

UBS002N8

SYMPTOM: FUEL ODOR FROM EVAP CANISTER IS STRONG.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Weigh the EVAP canister with EVAP canister vent control valve attached.
   The weight should be less than 1.8 kg (4.0 lb).

OK or NG

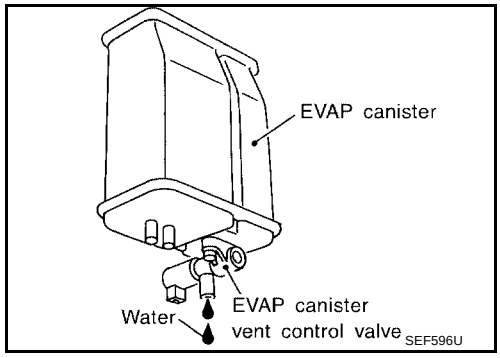
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.
No >> GO TO 5.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

5. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

6. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> **INSPECTION END**
NG >> Replace refueling control valve with fuel tank.

SYMPTOM: CANNOT REFUEL/FUEL ODOR FROM THE FUEL FILLER OPENING IS STRONG WHILE REFUELING.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Weigh the EVAP canister with EVAP canister vent control valve attached.
   The weight should be less than 1.8 kg (4.0 lb).

OK or NG

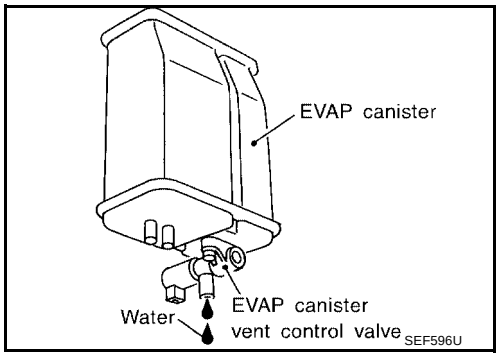
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.
No >> GO TO 5.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

5. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kink, looseness and improper connection.

OK or NG

OK >> GO TO 6.
NG >> Repair or replace hoses and tubes.

6. CHECK FILLER NECK TUBE

Check signal line and recirculation line for clogging, dents and cracks.

OK or NG

OK >> GO TO 7.
NG >> Replace filler neck tube.

7. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace refueling control valve with fuel tank.

8. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

9. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

OK or NG

OK >> GO TO 10.
NG >> Replace fuel filler tube.

10. CHECK ONE-WAY FUEL VALVE-I

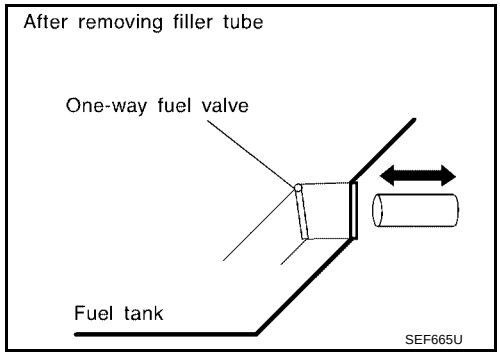
Check one-way valve for clogging.

OK or NG

OK >> GO TO 11.
NG >> Repair or replace one-way fuel valve with fuel tank.

11. CHECK ONE-WAY FUEL VALVE-II

1. Make sure that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as follows.
   When a stick is inserted, the valve should open, when removing stick it should close.
   Do not drop any material into the tank.



OK or NG

OK >> **INSPECTION END**
NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.

Component Inspection

UBS002N9

REFUELING EVAP VAPOR CUT VALVE

With CONSULT-II

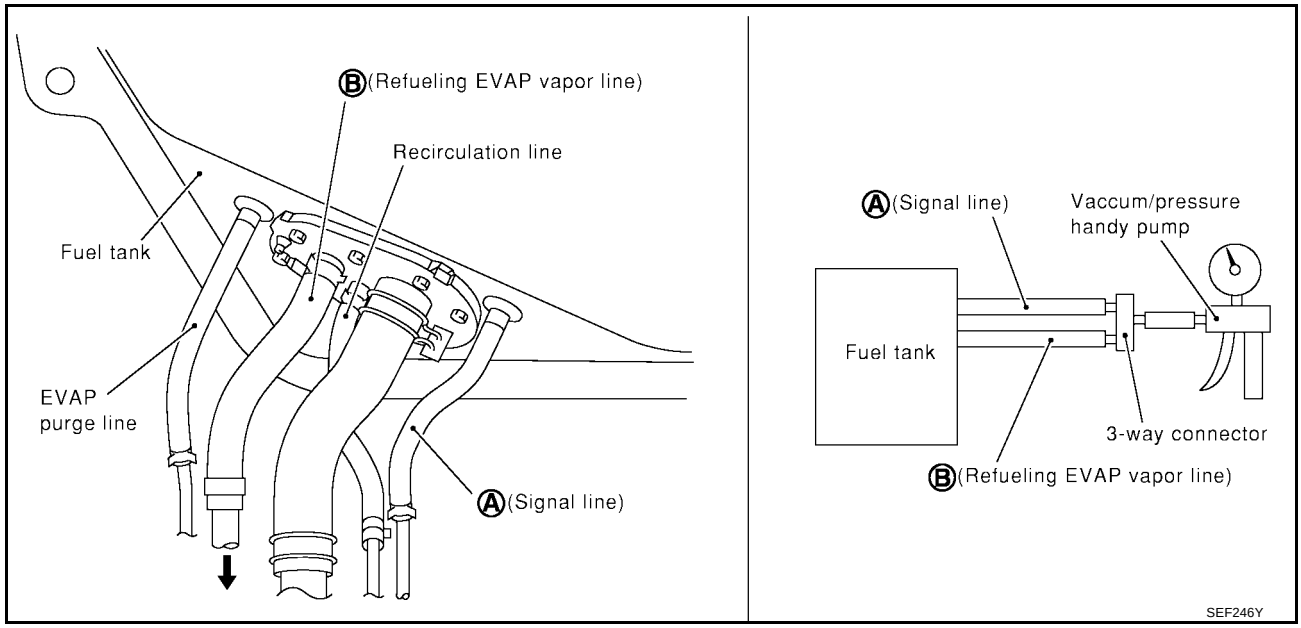
1. Remove fuel tank. Refer to FL-7, "FUEL TANK" .
2. Drain fuel from the tank as follows:

a. Remove fuel feed hose located on the fuel gauge retainer.
b. Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
c. Drain fuel using “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT-II.

3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end **B**), and check that the air flows freely into the tank.
4. Check EVAP vapor cut valve for being stuck to open as follows.

a. Connect vacuum pump to hose ends **A** and **B** using a suitable 3-way connector.
b. Remove fuel gauge retainer with fuel gauge unit.
   Always replace O-ring with new one.
c. Put fuel tank upside down.

d. Apply vacuum pressure to both hose ends **A** and **B** [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



With GST

1. Remove fuel tank. Refer to FL-7, "FUEL TANK" .
2. Drain fuel from the tank as follows:

a. Remove fuel gauge retainer.

b. Drain fuel from the tank using a hand pump into a fuel container.

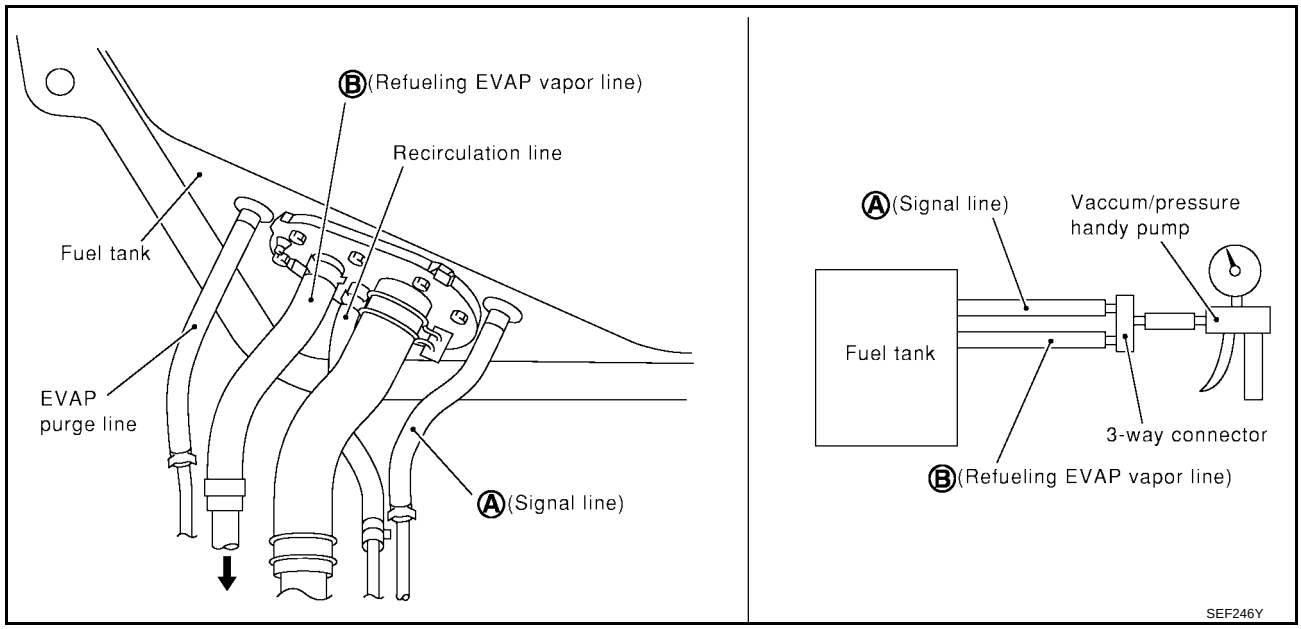
3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end **B**), and check that the air flows freely into the tank.
4. Check EVAP vapor cut valve for being stuck to open as follows.

a. Connect vacuum pump to hose ends **A** and **B** using a suitable 3-way connector.

b. Remove fuel gauge retainer with fuel gauge unit.
   Always replace O-ring with new one.

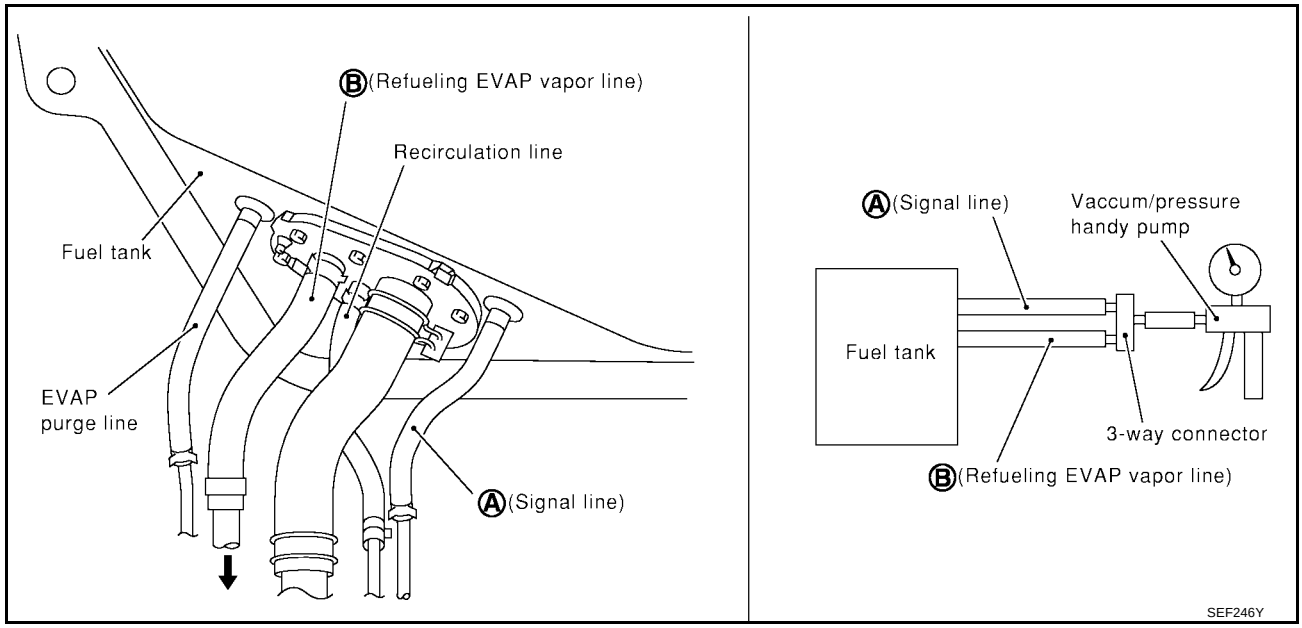
c. Put fuel tank upside down.

d. Apply vacuum pressure to both hose ends **A** and **B** [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



REFUELING CONTROL VALVE

1. Remove fuel filler cap.
2. Check air continuity between hose ends **A** and **B** .
   Blow air into the hose end **B** . Air should flow freely into the fuel tank.
3. Blow air into hose end **A** and check there is no leakage.
4. Apply pressure to both hose ends **A** and **B** [20 kPa (150 mmHg, 5.91 inHg)] using a pressure pump and a suitable 3-way connector. Check that there is no leakage.



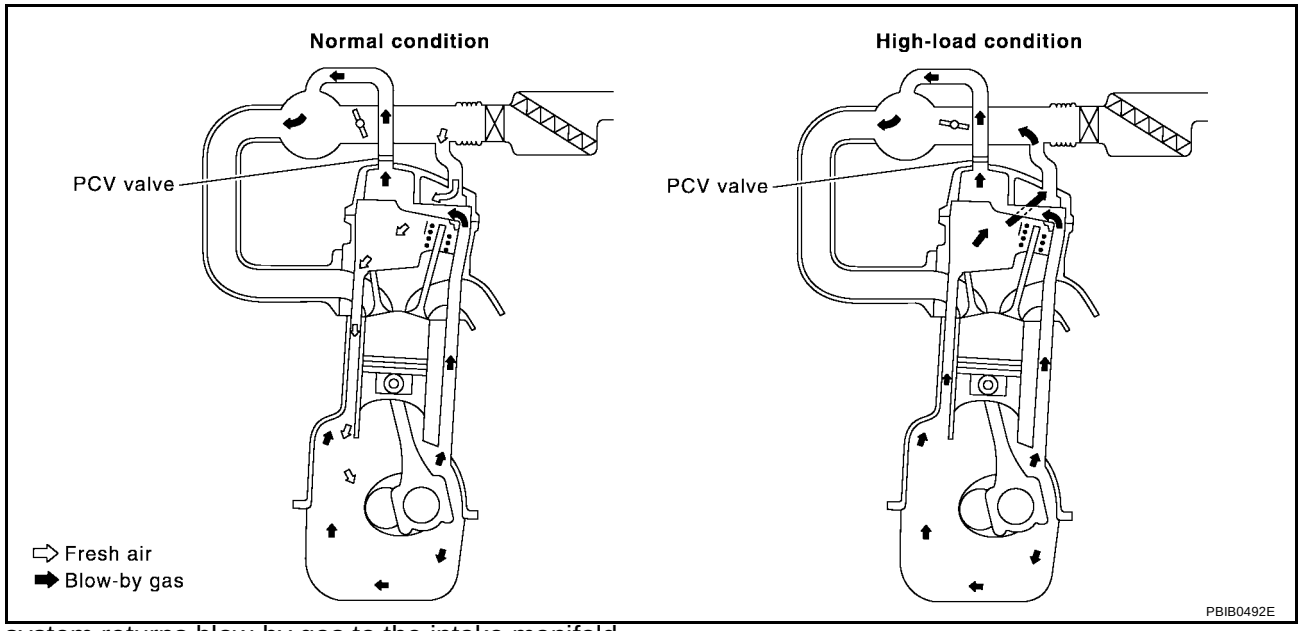
POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

UBS002NA

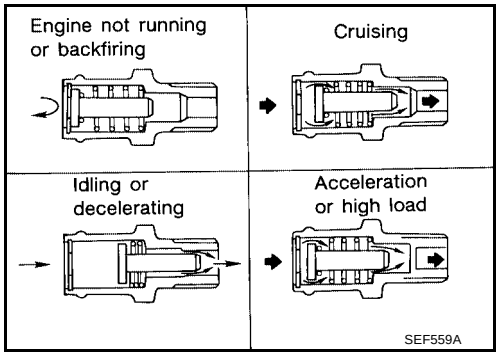
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

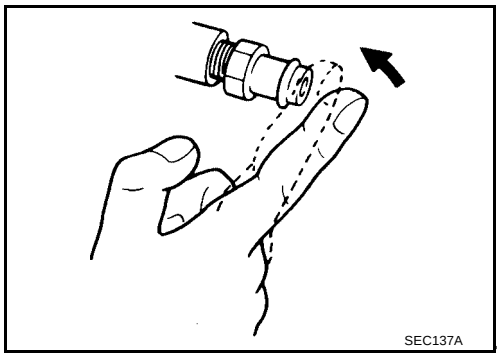


Component Inspection

UBS002NB

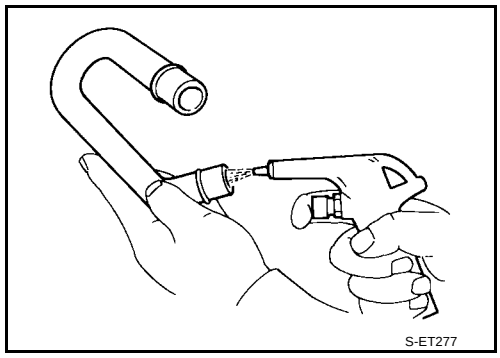
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



AUTOMATIC SPEED CONTROL DEVICE (ASCD)

PFP:18930

System Description

UBS002NC

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation	ASCD vehicle speed control	Electric throttle control actuator
Stop lamp switch	Brake pedal operation		
ASCD clutch switch (MT models)	Clutch pedal operation		
ASCD steering switch	ASCD steering switch operation		
Park/Neutral position (PNP) switch (AT models)	Gear position		
Combination meter	Vehicle speed		
TCM	Power train revolution		

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.
Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).
ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
Operation status of ASCD is indicated by CRUISE indicator and SET indicator in combination meter. If any malfunction occurs in ASCD system, it automatically deactivates control.

SET OPERATION

Press ASCD CRUISE switch (Main switch). (The CRUISE indicator in combination meter illuminates.)
When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press SET switch. (Then SET indicator in combination meter illuminates.)

ACCEL OPERATION

If the RESUME/ACCEL switch is depressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.
And then ASCD will keep the new set speed.

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is depressed
- Brake pedal is depressed
- Clutch pedal is depressed (M/T models)
- A/T selector lever is shifted to P or N position (A/T models)

If MAIN switch is turned to OFF during ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

COAST OPERATION

When the SET/COAST switch is depressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will keep the new set speed.

RESUME OPERATION

When the RESUME/ACCEL switch is depressed after cancel operation other than depressing MAIN switch is performed, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- Brake pedal is released.
- Clutch pedal is released (M/T models)
- A/T selector lever is in other than P and N positions (A/T models)
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

Component Description

UBS002ND

ASCD STEERING SWITCH

Refer to EC-1723 .

ASCD BRAKE SWITCH

Refer to EC-1730 .

ASCD CLUTCH SWITCH

Refer to EC-1730 .

STOP LAMP SWITCH

Refer to EC-1730 .

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EC-1604

ASCD INDICATOR

Refer to EC-1841 .

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

UBS002NE

Fuel pressure at idle	Approximately 350 kPa (3.57kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

UBS002NF

Target idle speed	No-load*1 (in “P” or N” position)	700±50 rpm
Air conditioner: ON	In “P” or N” position	800 rpm or more
Ignition timing	In “P” or N” position	15°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

UBS002NG

	Calculated load value % (Using CONSULT-II or GST)
At idle	10 - 35
At 2,500 rpm	10 - 35

Mass Air Flow Sensor

UBS002NH

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	1.1 - 1.5*V
Mass air flow (Using CONSULT-II or GST)	1.0 - 4.0 g·m/sec at idle* 4.0 - 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

UBS002NI

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1
80 (176)	0.31 - 0.37

Engine Coolant Temperature Sensor

UBS002NJ

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Heated Oxygen Sensor 1 Heater

UBS002NK

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Heated Oxygen Sensor 2 Heater

UBS002NL

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (POS)

UBS002NM

Refer to EC-1494, "Component Inspection" .

Camshaft Position Sensor (PHASE)

UBS002NN

Refer to EC-1500, "Component Inspection" .

Throttle Control Motor

UBS002NO

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Injector

UBS002NP

Resistance [at 20°C (68°F)]	12.1 - 12.9Ω

Fuel Pump

UBS002NQ

Resistance [at 25°C (77°F)]	Approximately 1.0Ω

SECTION EI
EXTERIOR & INTERIOR

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EIS001EH

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

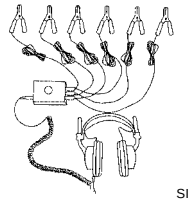
PREPARATION

PFP:00002

Special Service Tools

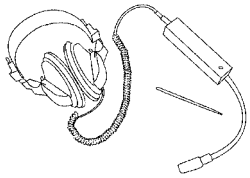
EIS0016R

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
— (J-39570) Chassis ear  SIIA0993E	Locating the noise
— (J-43980) NISSAN Squeak and Rattle kit SIIA0994E	Repairing the cause of noise

Commercial Service Tools

EIS0016S

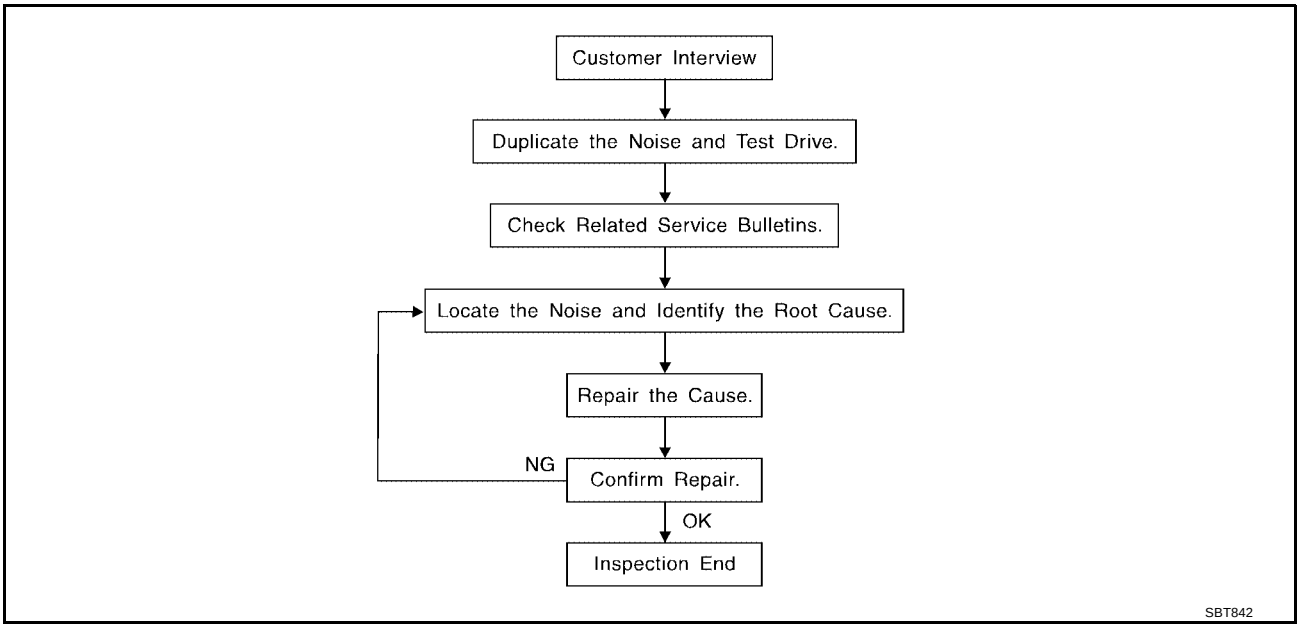
Tool name	Description
Engine ear (J-39565)  SIIA0995E	Locating the noise

SQUEAK AND RATTLE TROUBLE DIAGNOSES

PFP:00003

Work Flow

EIS0016T



CUSTOMER INTERVIEW

Interview the customer, if possible, to determine the conditions that exist when the noise occurs. Use the Diagnostic Worksheet during the interview to document the facts and conditions when the noise occurs and any customer's comments; refer to EI-8, "Diagnostic Worksheet" . This information is necessary to duplicate the conditions that exist when the noise occurs.

- The customer may not be able to provide a detailed description or the location of the noise. Attempt to obtain all the facts and conditions that exist when the noise occurs (or does not occur).
- If there is more than one noise in the vehicle, be sure to diagnose and repair the noise that the customer is concerned about. This can be accomplished by test driving the vehicle with the customer.
- After identifying the type of noise, isolate the noise in terms of its characteristics. The noise characteristics are provided so the customer, service adviser and technician are all speaking the same language when defining the noise.

- Squeak — (Like tennis shoes on a clean floor)
  Squeak characteristics include the light contact/fast movement/brought on by road conditions/hard surfaces = higher pitch noise/softer surfaces = lower pitch noises/edge to surface = chirping
- Creak — (Like walking on an old wooden floor)
  Creak characteristics include firm contact/slow movement/twisting with a rotational movement/pitch dependent on materials/often brought on by activity.
- Rattle — (Like shaking a baby rattle)
  Rattle characteristics include the fast repeated contact/vibration or similar movement/loose parts/missing clip or fastener/incorrect clearance.
- Knock — (Like a knock on a door)
  Knock characteristics include hollow sounding/sometimes repeating/often brought on by driver action.
- Tick — (Like a clock second hand)
  Tick characteristics include gentle contacting of light materials/loose components/can be caused by driver action or road conditions.
- Thump — (Heavy, muffled knock noise)
  Thump characteristics include softer knock/dead sound often brought on by activity.
- Buzz — (Like a bumblebee)
  Buzz characteristics include high frequency rattle/firm contact.

- Often the degree of acceptable noise level will vary depending upon the person. A noise that you may judge as acceptable may be very irritating to the customer.
- Weather conditions, especially humidity and temperature, may have a great effect on noise level.

DUPLICATE THE NOISE AND TEST DRIVE

If possible, drive the vehicle with the customer until the noise is duplicated. Note any additional information on the Diagnostic Worksheet regarding the conditions or location of the noise. This information can be used to duplicate the same conditions when you confirm the repair.
If the noise can be duplicated easily during the test drive, to help identify the source of the noise, try to duplicate the noise with the vehicle stopped by doing one or all of the following:

- Close a door.
- Tap or push/pull around the area where the noise appears to be coming from.
- Rev the engine.
- Use a floor jack to recreate vehicle “twist”.
- At idle, apply engine load (electrical load, half-clutch on M/T model, drive position on A/T model).
- Raise the vehicle on a hoist and hit a tire with a rubber hammer.
- Drive the vehicle and attempt to duplicate the conditions the customer states exist when the noise occurs.
- If it is difficult to duplicate the noise, drive the vehicle slowly on an undulating or rough road to stress the vehicle body.

CHECK RELATED SERVICE BULLETINS

After verifying the customer concern or symptom, check ASIST for Technical Service Bulletins (TSBs) related to that concern or symptom.
If a TSB relates to the symptom, follow the procedure to repair the noise.

LOCATE THE NOISE AND IDENTIFY THE ROOT CAUSE

1. Narrow down the noise to a general area. To help pinpoint the source of the noise, use a listening tool (Chassis Ear: J-39570, Engine Ear: J-39565 and mechanics stethoscope).
2. Narrow down the noise to a more specific area and identify the cause of the noise by:
   - Removing the components in the area that you suspect the noise is coming from.
     Do not use too much force when removing clips and fasteners, otherwise clips and fasteners can be broken or lost during the repair, resulting in the creation of new noise.
   - Tapping or pushing/pulling the component that you suspect is causing the noise.
     Do not tap or push/pull the component with excessive force, otherwise the noise will be eliminated only temporarily.
   - Feeling for a vibration with your hand by touching the component(s) that you suspect is (are) causing the noise.
   - Placing a piece of paper between components that you suspect are causing the noise.
   - Looking for loose components and contact marks.

   Refer to EI-6, "Generic Squeak and Rattle Troubleshooting" .

REPAIR THE CAUSE

- If the cause is a loose component, tighten the component securely.
- If the cause is insufficient clearance between components:

– Separate components by repositioning or loosening and retightening the component, if possible.
– Insulate components with a suitable insulator such as urethane pads, foam blocks, felt cloth tape or urethane tape. A NISSAN Squeak and Rattle Kit (J-43980) is available through your authorized NISSAN Parts Department.

CAUTION:
Do not use excessive force as many components are constructed of plastic and may be damaged. Always check with the Parts Department for the latest parts information.

The following materials are contained in the NISSAN Squeak and Rattle Kit (J-43980). Each item can be ordered separately as needed.
URETHANE PADS [1.5 mm (0.059 in) thick]
Insulates connectors, harness, etc.
76268-9E005: 100 x 135 mm (3.94 x 5.31 in)/76884-71L01: 60 x 85 mm (2.36 x 3.35 in)/76884-71L02: 15 x 25 mm (0.59 x 0.98 in)
INSULATOR (Foam blocks)
Insulates components from contact. Can be used to fill space behind a panel.

73982-9E000: 45 mm (1.77 in) thick, 50 x 50 mm (1.97 x 1.97 in)/73982-50Y00: 10 mm (0.39 in) thick, 50 x 50 mm (1.97 x 1.97 in)
INSULATOR (Light foam block)
80845-71L00: 30 mm (1.18 in) thick, 30 x 50 mm (1.18 x 1.97 in)
FELT CLOTH TAPE
Used to insulate where movement does not occur. Ideal for instrument panel applications.
68370-4B000: 15 x 25 mm (0.59 x 0.98 in) pad/68239-13E00: 5 mm (0.20 in) wide tape roll
The following materials, not found in the kit, can also be used to repair squeaks and rattles.
UHMW (TEFLON) TAPE
Insulates where slight movement is present. Ideal for instrument panel applications.
SILICONE GREASE
Used in place of UHMW tape that will be visible or not fit.
Note: Will only last a few months.
SILICONE SPRAY
Use when grease cannot be applied.
DUCT TAPE
Use to eliminate movement.

CONFIRM THE REPAIR

Confirm that the cause of a noise is repaired by test driving the vehicle. Operate the vehicle under the same conditions as when the noise originally occurred. Refer to the notes on the Diagnostic Worksheet.

Generic Squeak and Rattle Troubleshooting

EIS0016U

Refer to Table of Contents for specific component removal and installation information.

INSTRUMENT PANEL

Most incidents are caused by contact and movement between:

1. The cluster lid A and instrument panel
2. Acrylic lens and combination meter housing
3. Instrument panel to front pillar garnish
4. Instrument panel to windshield
5. Instrument panel mounting pins
6. Wiring harnesses behind the combination meter
7. A/C defroster duct and duct joint

These incidents can usually be located by tapping or moving the components to duplicate the noise or by pressing on the components while driving to stop the noise. Most of these incidents can be repaired by applying felt cloth tape or silicone spray (in hard to reach areas). Urethane pads can be used to insulate wiring harness.

CAUTION:
Do not use silicone spray to isolate a squeak or rattle. If you saturate the area with silicone, you will not be able to recheck the repair.

CENTER CONSOLE

Components to pay attention to include:

1. Shifter assembly cover to finisher
2. A/C control unit and upper/lower cluster lid C
3. Wiring harnesses behind audio and A/C control unit
4. Console lid to console bin.

The instrument panel repair and isolation procedures also apply to the center console.

DOORS

Pay attention to the:

1. Finisher and inner panel making a slapping noise
2. Inside handle escutcheon to door finisher
3. Wiring harnesses tapping
4. Door striker out of alignment causing a popping noise on starts and stops

Tapping or moving the components or pressing on them while driving to duplicate the conditions can isolate many of these incidents. You can usually insulate the areas with felt cloth tape or insulator foam blocks from the NISSAN Squeak and Rattle Kit (J-43980) to repair the noise.

TRUNK

Trunk noises are often caused by a loose jack or loose items put into the trunk by the owner.
In addition look for:

1. Trunk lid bumpers out of adjustment
2. Trunk lid striker out of adjustment
3. The trunk lid torsion bars knocking together
4. A loose license plate or bracket

Most of these incidents can be repaired by adjusting, securing or insulating the item(s) or component(s) causing the noise.

SUNROOF/HEADLINER

Noises in the sunroof/headliner area can often be traced to one of the following:

1. Sunroof lid, rail, linkage or seals making a rattle or light knocking noise
2. Sunvisor shaft shaking in the holder
3. Front or rear windshield touching headliner and squeaking

Again, pressing on the components to stop the noise while duplicating the conditions can isolate most of these incidents. Repairs usually consist of insulating with felt cloth tape.

SEATS

When isolating seat noises it is important to note the position the seat is in and the load placed on the seat when the noise is present. These conditions should be duplicated when verifying and isolating the cause of the noise.
Cause of seat noise include:

1. Headrest rods and holders
2. A squeak between the seat pad cushion and frame
3. The rear seat back lock and bracket

These noises can be isolated by moving or pressing on the suspected components while duplicating the conditions under which the noise occurs. Most of these incidents can be repaired by repositioning the component or applying urethane tape to the contact area.

UNDERHOOD

Some interior noises may be caused by components under the hood or on the engine wall. The noise is then transmitted into the passenger compartment.
Causes of transmitted underhood noises include:

1. Any component mounted to the engine wall
2. Components that pass through the engine wall
3. Engine wall mounts and connectors
4. Loose radiator mounting pins
5. Hood bumpers out of adjustment
6. Hood striker out of adjustment

These noises can be difficult to isolate since they cannot be reached from the interior of the vehicle. The best method is to secure, move or insulate one component at a time and test drive the vehicle. Also, engine RPM or load can be changed to isolate the noise. Repairs can usually be made by moving, adjusting, securing, or insulating the component causing the noise.

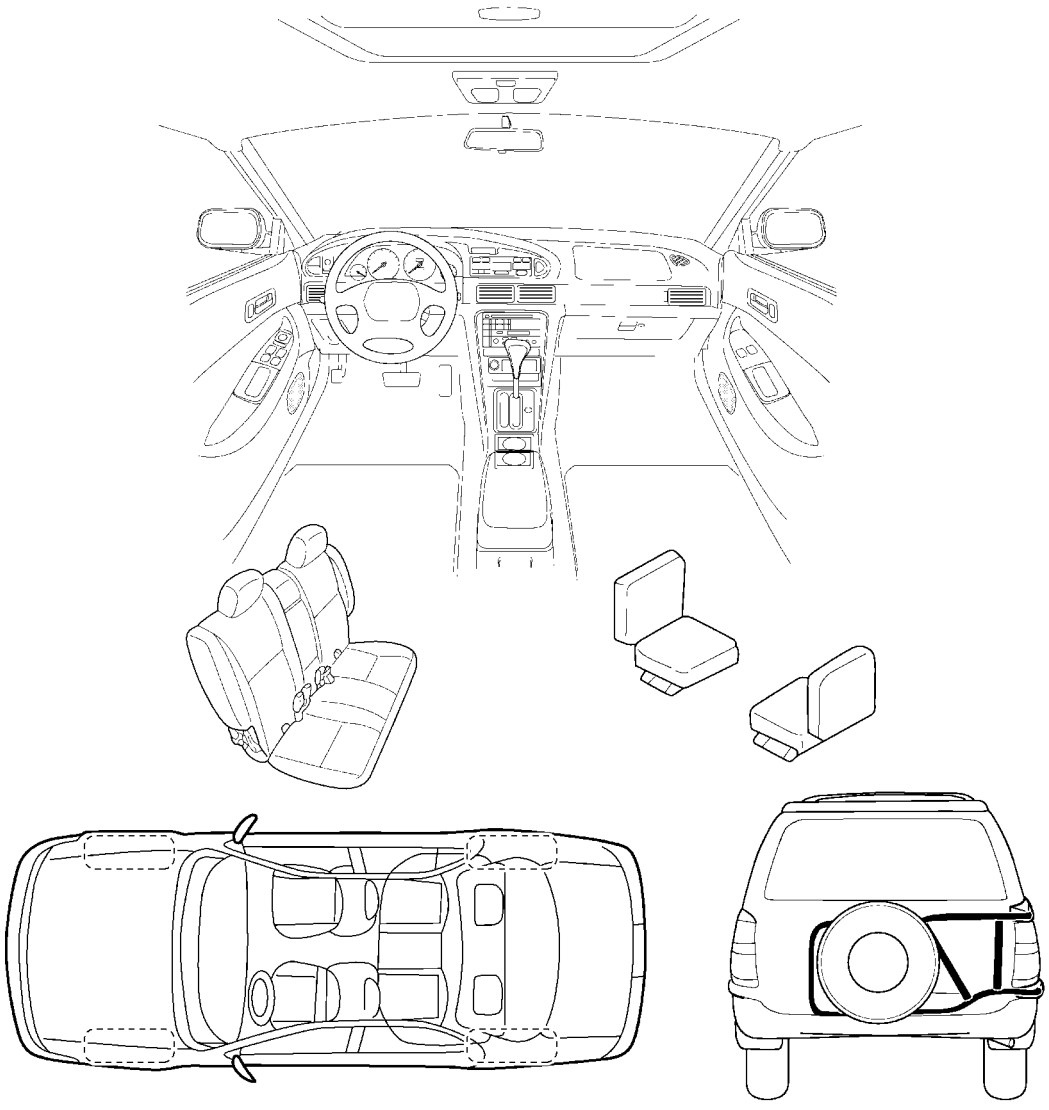
Diagnostic Worksheet

EIS0016V

SQUEAK & RATTLE DIAGNOSTIC WORKSHEET

Dear Nissan Customer:
We are concerned about your satisfaction with your Nissan vehicle. Repairing a squeak or rattle sometimes can be very difficult. To help us fix your Nissan right the first time, please take a moment to note the area of the vehicle where the squeak or rattle occurs and under what conditions. You may be asked to take a test drive with a service advisor or technician to ensure we confirm the noise you are hearing.

I. WHERE DOESTHE NOISE COME FROM? (circle the area of the vehicle)
The illustrations are for reference only, and may not reflect the actual configuration of your vehicle.



Continue to the back of the worksheet and briefly describe the location of the noise or rattle. In addition, please indicate the conditions which are present when the noise occurs.

LIWA0276E

SQUEAK & RATTLE DIAGNOSTIC WORKSHEET- page 2

Briefly describe the location where the noise occurs:

_____

_____

II. WHEN DOES IT OCCUR? (check the boxes that apply)

❑ anytime
❑ 1st time in the morning
❑ only when it is cold outside
❑ only when it is hot outside
❑ after sitting out in the sun
❑ when it is raining or wet
❑ dry or dusty conditions
❑ other: _____

III. WHEN DRIVING:

❑ through driveways
❑ over rough roads
❑ over speed bumps
❑ only at about _____ mph
❑ on acceleration
❑ coming to a stop
❑ on turns : left, right or either (circle)
❑ with passengers or cargo
❑ other: _____
❑ after driving _____ miles or _____ minutes

IV. WHAT TYPE OF NOISE?

❑ squeak (like tennis shoes on a clean floor)
❑ creak (like walking on an old wooden floor)
❑ rattle (like shaking a baby rattle)
❑ knock (like a knock on a door)
❑ tick (like a clock second hand)
❑ thump (heavy, muffled knock noise)
❑ buzz (like a bumble bee)

TO BE COMPLETED BY DEALERSHIP PERSONNEL
Test Drive Notes:

_____

_____

	YES	NO	Initials of person performing
Vehicle test driven with customer	❑	❑	_____
- Noise verified on test drive	❑	❑	
- Noise source located and repaired	❑	❑	_____
- Follow up test drive performed to confirm repair	❑	❑	_____

VIN: _____ Customer Name: _____

W.O. #: _____ Date: _____

This form must be attached to Work Order

SBT844

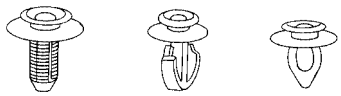
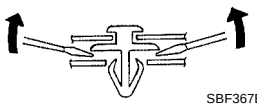
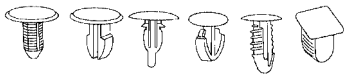
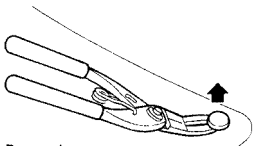
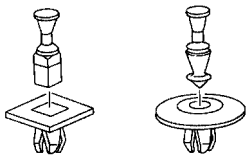
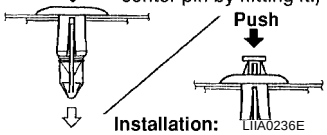
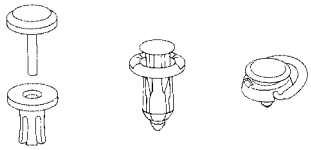
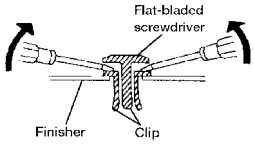
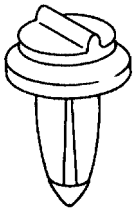
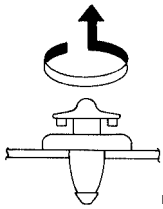
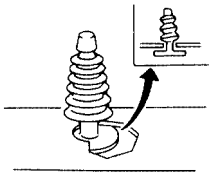
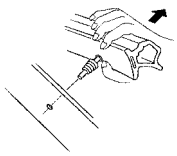
CLIP AND FASTENER

PFP:76906

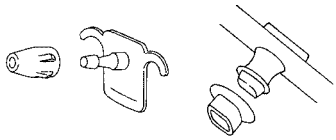
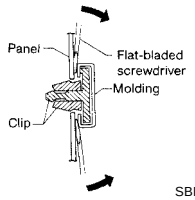
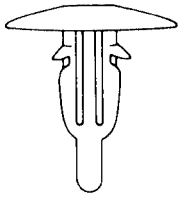
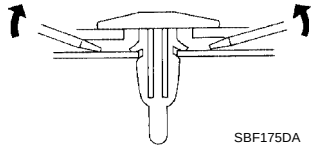
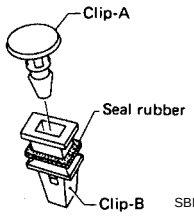
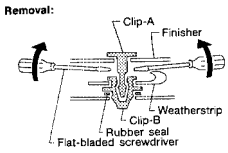
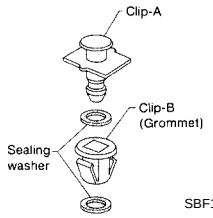
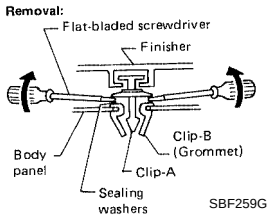
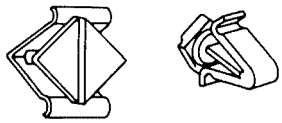
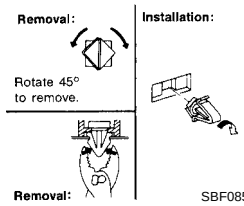
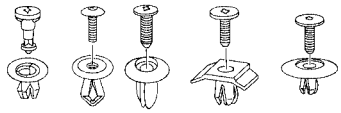
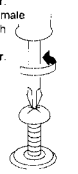
Description

EIS0016W

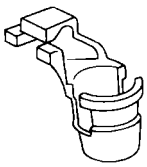
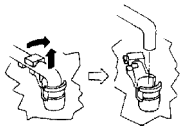
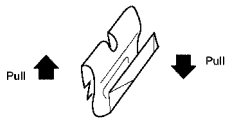
- Clips and fasteners in EI section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

Symbol No.	Shapes	Removal & Installation
C101	 SBF302H	**Removal:** Remove by bending up with flat-bladed screwdrivers or clip remover.  SBF367BA
C103	 SBT095	 **Removal:** Remove with a clip remover. SBF423H
C203	 SBF258G	Push center pin to catching position. (Do not remove center pin by hitting it.) Push Push **Installation:**  LIIA0236E
C205	 MBT080A	**Removal:** Flat-bladed screwdriver Finisher Clip  SBF638CA
C206	 MBF519B	 MBF520B
CE103	 SBF104B	**Removal:**  SBF147B

CLIP AND FASTENER

Symbol No.	Shapes	Removal & Installation
CE107	 SBF411H	 SBF767B
CE117	 SBF174D	**Removal:** Remove by bending up with a flat-bladed screwdriver or pliers.  SBF175DA
CF110	 SBF648B	 SBF649B
CF118	 SBF151D	 SBF259G
CG101	 SBF145B	 SBF085B
CS101	 SBF078B	**Removal:** 1. Screw out with a Phillips screwdriver. 2. Remove female portion with flat-bladed screwdriver.  SBF992G

CLIP AND FASTENER

Symbol No.	Shapes	Removal & Installation
CR103	 SBF768B	**Removal:** Holder portion of clip must be spread out to remove rod.  SBF770B
Metal Clip	WBT072	**Removal:**  WBT073

BODY FRONT END

PFP:H5022

Removal and Installation

EIS0016X

- When removing or installing hood, place a cloth or other padding on front fender panels and cowl top. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Hood adjustment: Adjust at hinge portion. B
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood lock engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.

FRONT BUMPER ASSEMBLY

1. Remove screws securing left and right front fog lamps, and remove the lamps (if equipped); or remove filler trim panel.
2. Remove four clips C205 from the top of the front grille, pull up to unclip bottom and remove. A
3. Remove clips C205 and screws located on front side of fender protector at wheel opening.
4. Remove three bolts from the air deflector.
5. Remove two bolts securing lower side of front bumper fascia.
6. Pull off front bumper fascia and energy absorber.
7. Remove four nuts securing bumper reinforcement, then remove bumper reinforcement.
8. Remove four bolts securing front bumper side stays.
9. Remove front bumper side stays.
10. Remove the air dam if necessary.

QG18DE

SEC. 620 • 623 • 630

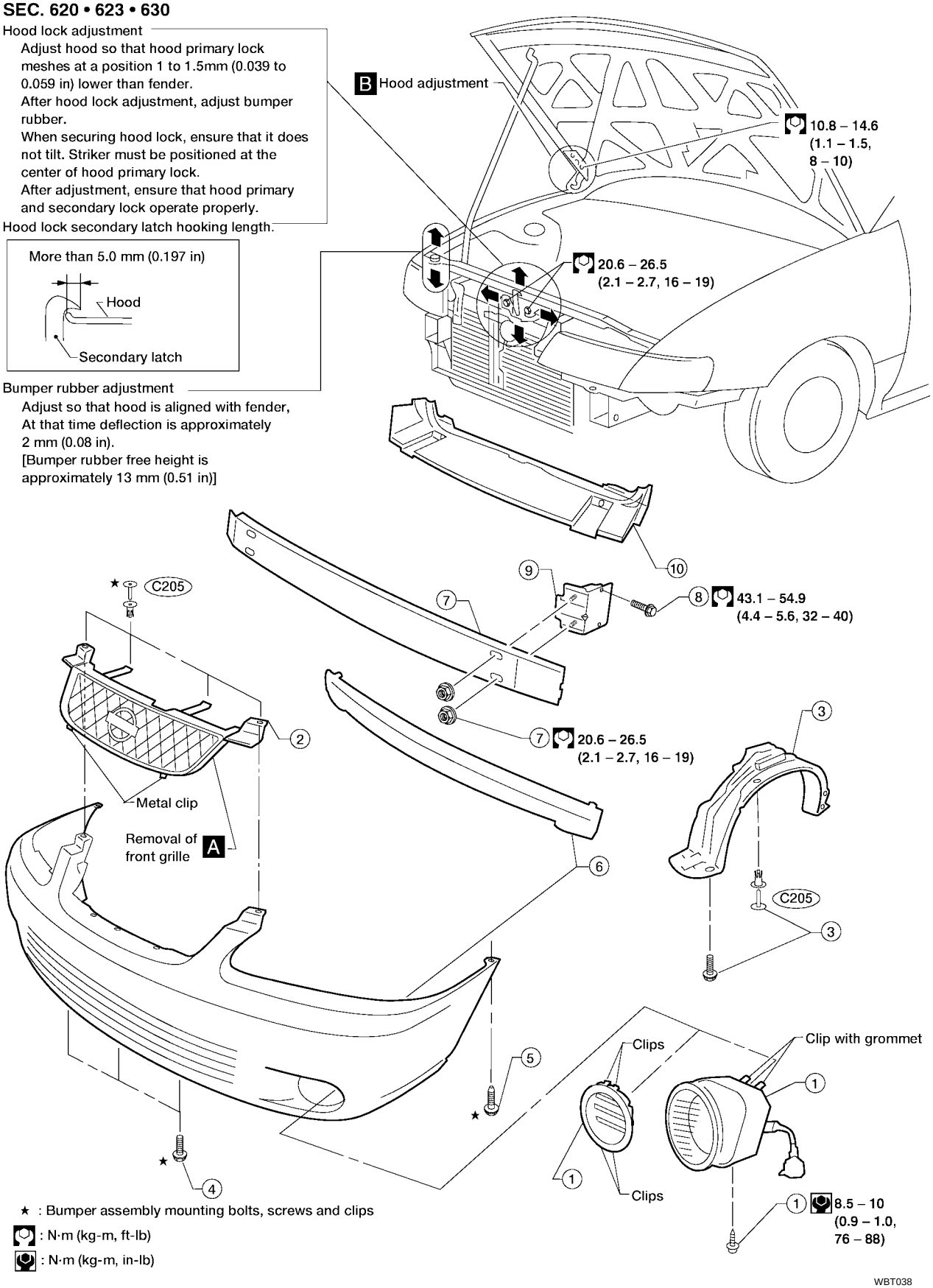
Hood lock adjustment

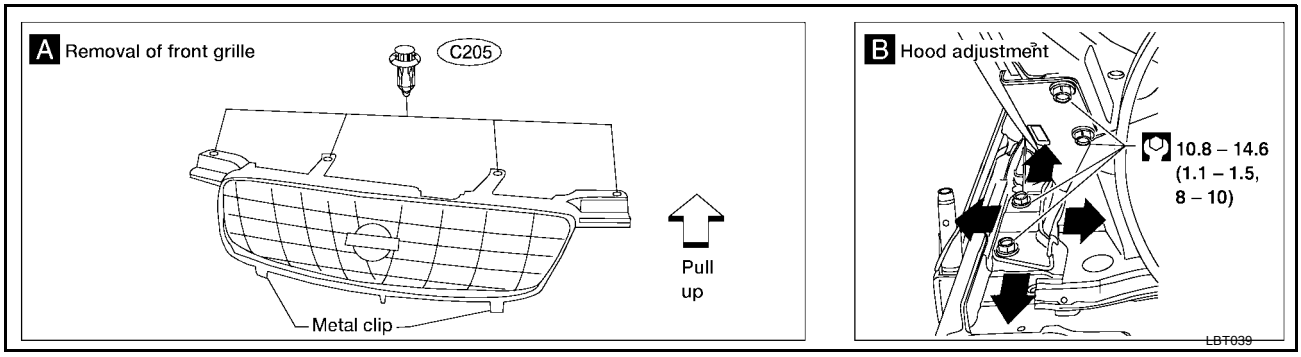
Adjust hood so that hood primary lock meshes at a position 1 to 1.5mm (0.039 to 0.059 in) lower than fender.
After hood lock adjustment, adjust bumper rubber.
When securing hood lock, ensure that it does not tilt. Striker must be positioned at the center of hood primary lock.
After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length.

Bumper rubber adjustment

Adjust so that hood is aligned with fender, At that time deflection is approximately 2 mm (0.08 in).
[Bumper rubber free height is approximately 13 mm (0.51 in)]




A Removal of front grille
C205
Pull up
Metal clip
B Hood adjustment
10.8 – 14.6 (1.1 – 1.5, 8 – 10)
LBT039

QR25DE

SEC. 620 • 623 • 630

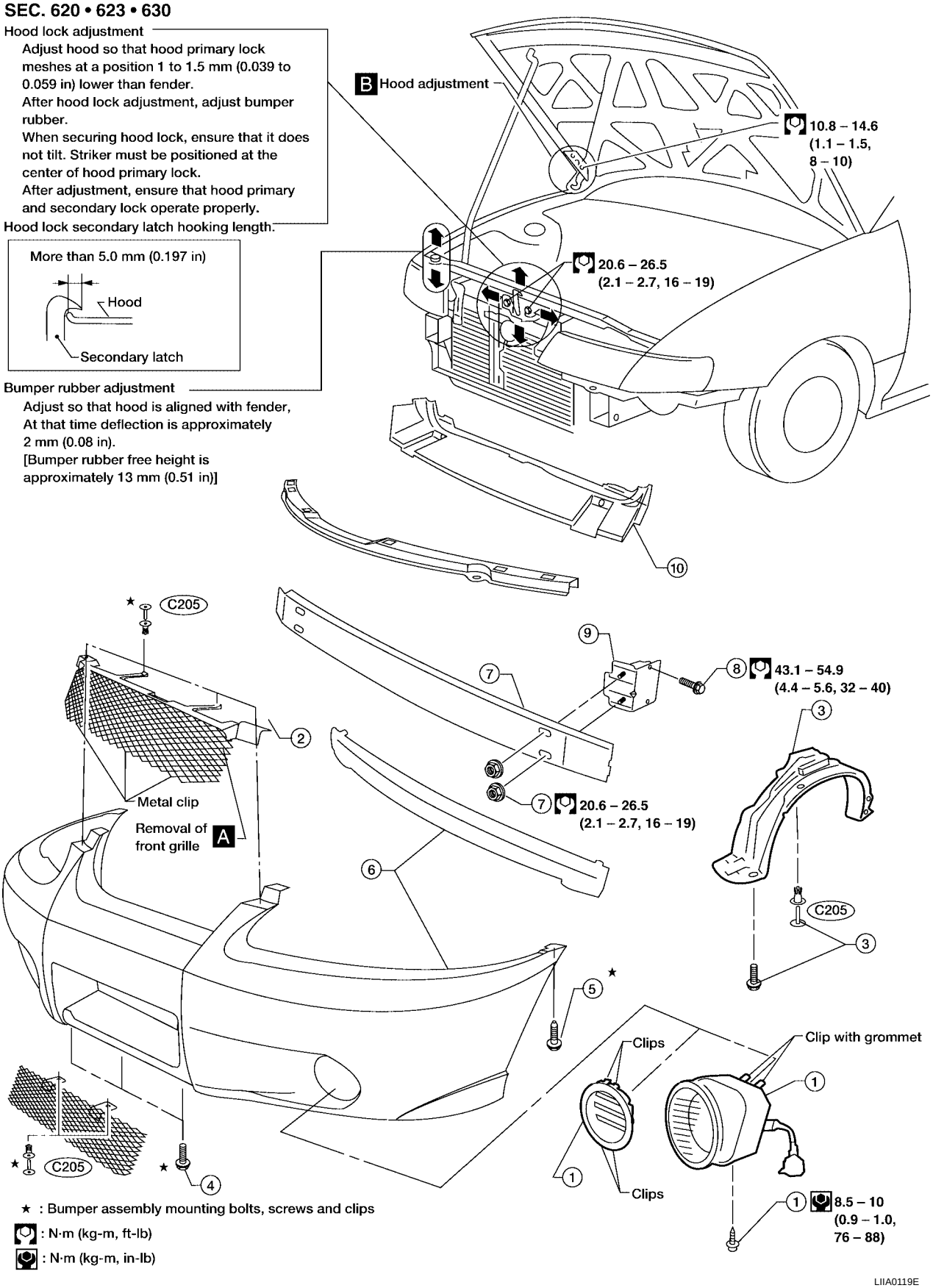
Hood lock adjustment

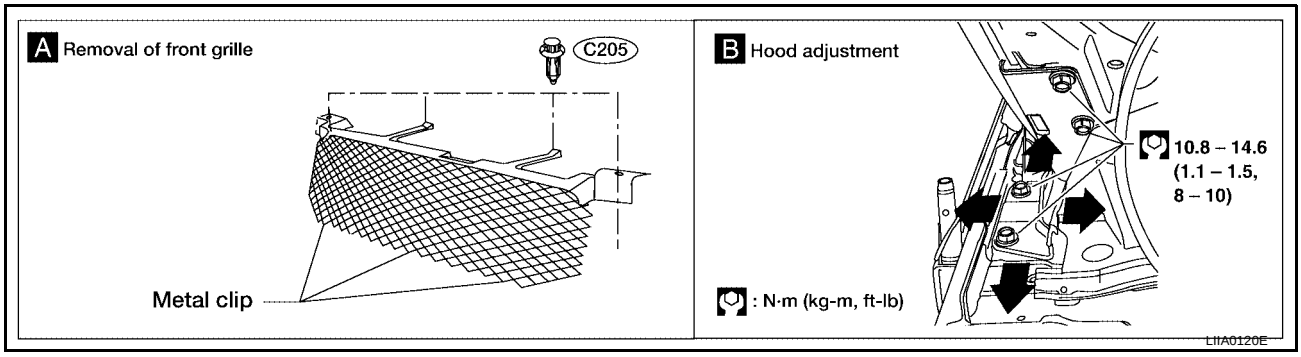
Adjust hood so that hood primary lock meshes at a position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
After hood lock adjustment, adjust bumper rubber.
When securing hood lock, ensure that it does not tilt. Striker must be positioned at the center of hood primary lock.
After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length.

Bumper rubber adjustment

Adjust so that hood is aligned with fender,
At that time deflection is approximately 2 mm (0.08 in).
[Bumper rubber free height is approximately 13 mm (0.51 in)]




A Removal of front grille
C205
Metal clip
B Hood adjustment
10.8 – 14.6
(1.1 – 1.5,
8 – 10)
: N·m (kg-m, ft-lb)
LIIA0120E

BODY REAR END AND OPENER

PFP:F2022

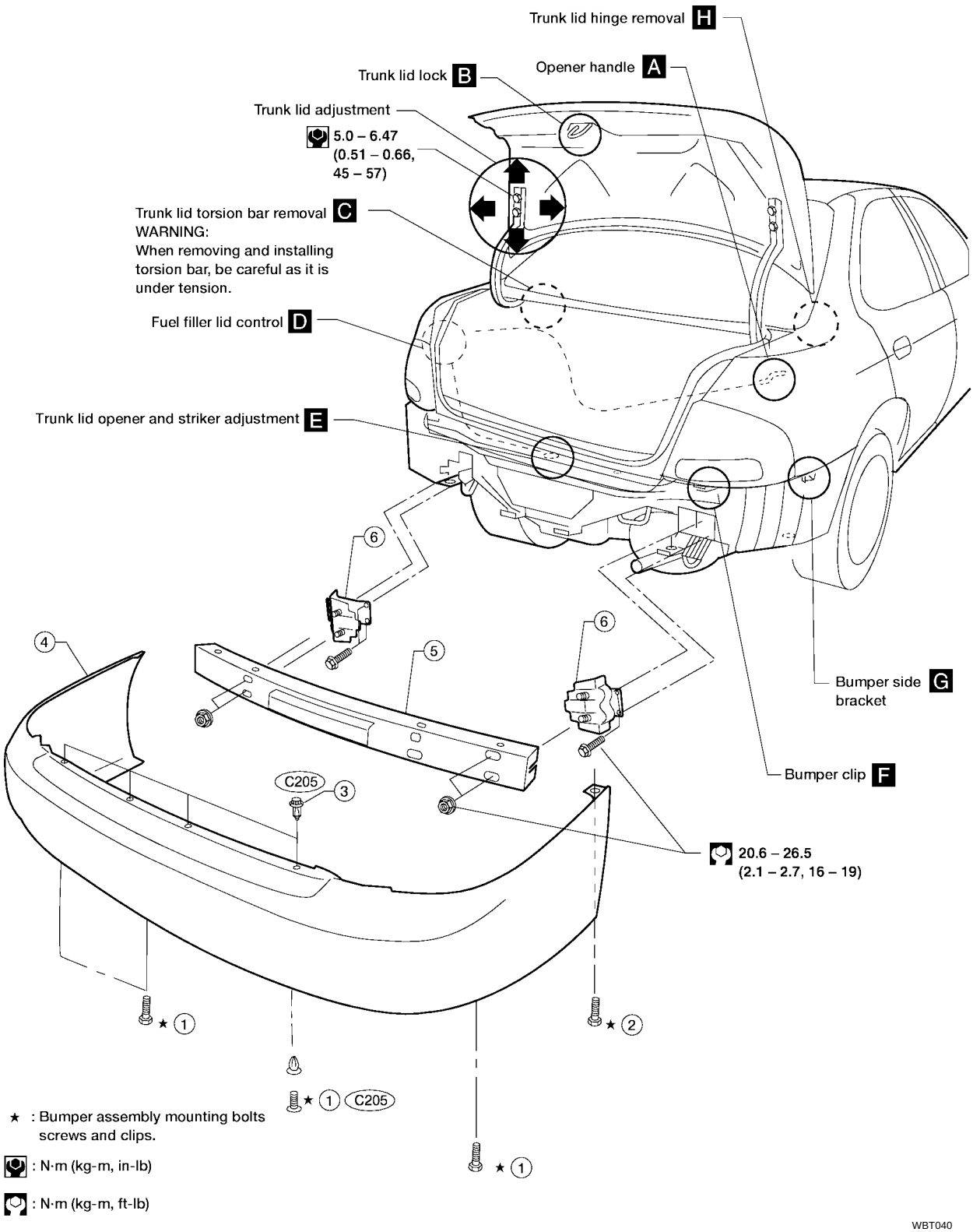
Removal and Installation

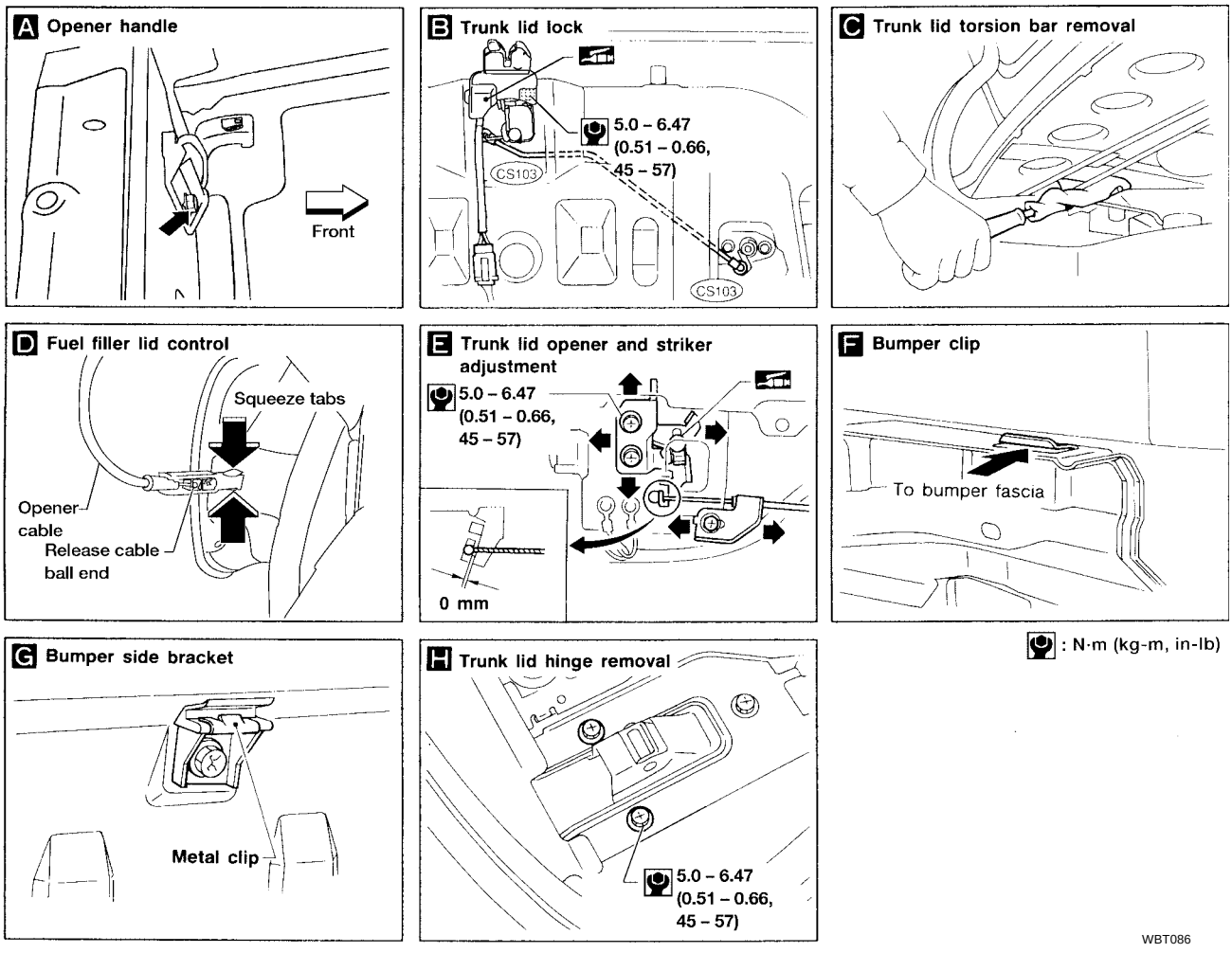
EIS0016Y

- When removing or installing trunk lid, place a cloth or other padding on rear fender panels. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid and fuel filler lid open smoothly.

REAR BUMPER ASSEMBLY

1. Remove four bolts and one clip C205 from lower side of rear bumper fascia.
2. Remove two screws from each quarter panel side.
3. Remove four clips C205 from upper side of rear bumper fascia.
4. Remove rear bumper fascia.
5. Remove four nuts securing bumper reinforcement, then remove bumper reinforcement.
6. Remove four bolts securing bumper side stays, then remove bumper side stays.


Trunk lid hinge removal H
Opener handle A
Trunk lid lock B
Trunk lid adjustment
5.0 – 6.47
(0.51 – 0.66,
45 – 57)
Trunk lid torsion bar removal C
WARNING:
When removing and installing
torsion bar, be careful as it is
under tension.
Fuel filler lid control D
Trunk lid opener and striker adjustment E
Bumper side G
bracket
Bumper clip F
20.6 – 26.5
(2.1 – 2.7, 16 – 19)
C205
★ : Bumper assembly mounting bolts
screws and clips.
: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)
WBT040


A Opener handle
Front
B Trunk lid lock
5.0 – 6.47
(0.51 – 0.66,
45 – 57)
CS103
CS103
C Trunk lid torsion bar removal
D Fuel filler lid control
Squeeze tabs
Opener cable
Release cable ball end
E Trunk lid opener and striker adjustment
5.0 – 6.47
(0.51 – 0.66,
45 – 57)
0 mm
F Bumper clip
To bumper fascia
: N·m (kg-m, in-lb)
G Bumper side bracket
Metal clip
H Trunk lid hinge removal
5.0 – 6.47
(0.51 – 0.66,
45 – 57)
WBT086

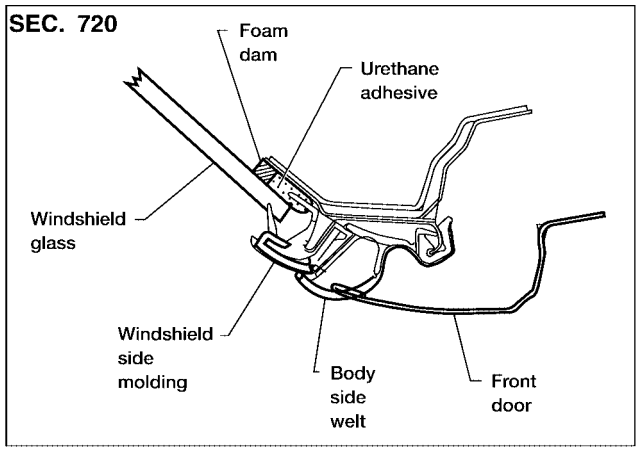
WINDSHIELD MOLDING

PFP:72700

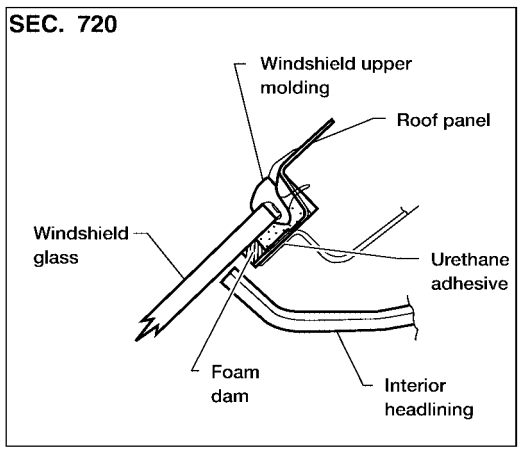
Windshield and Rear Window

EIS0016Z

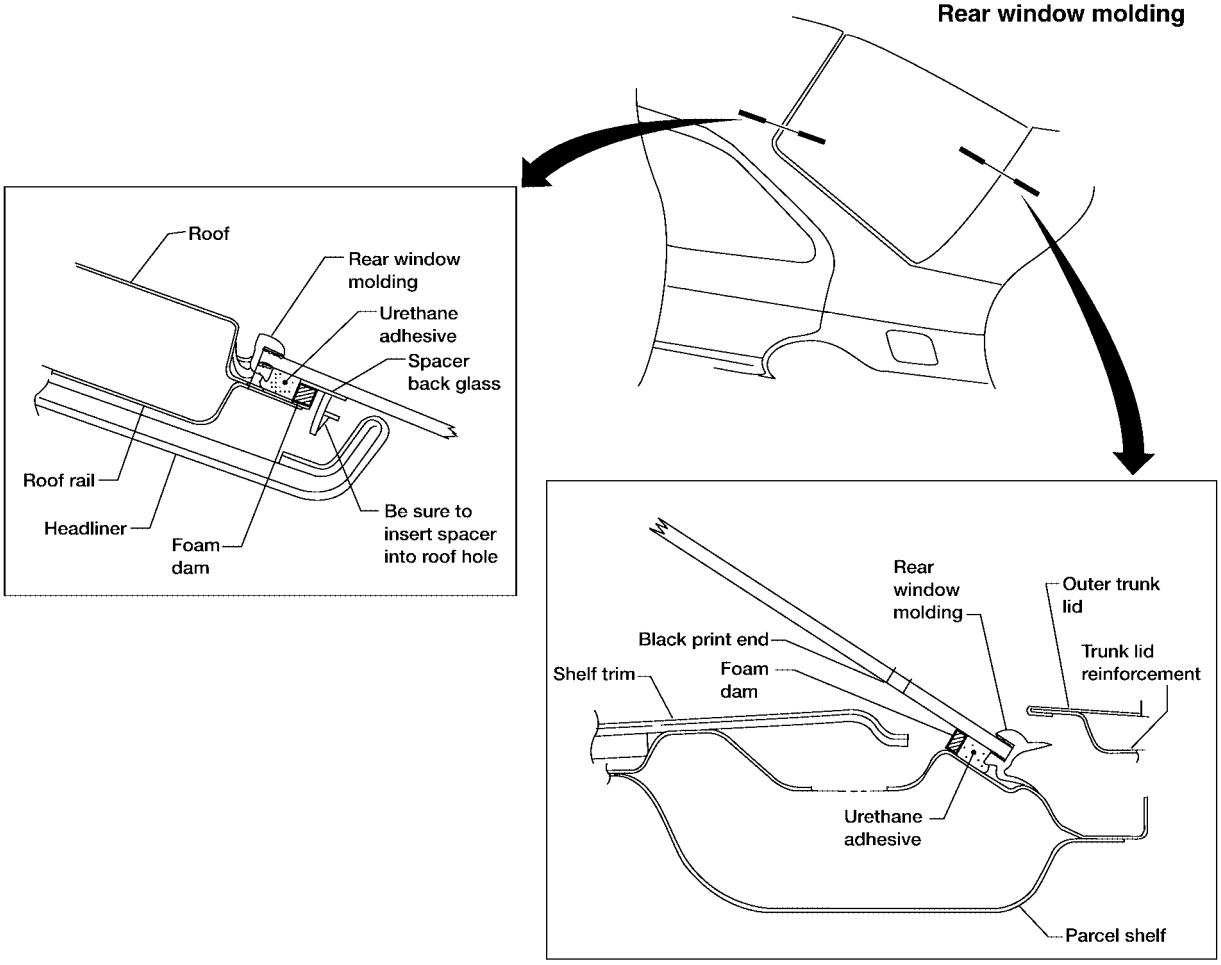
Windshield side molding



Windshield upper molding



Rear window molding



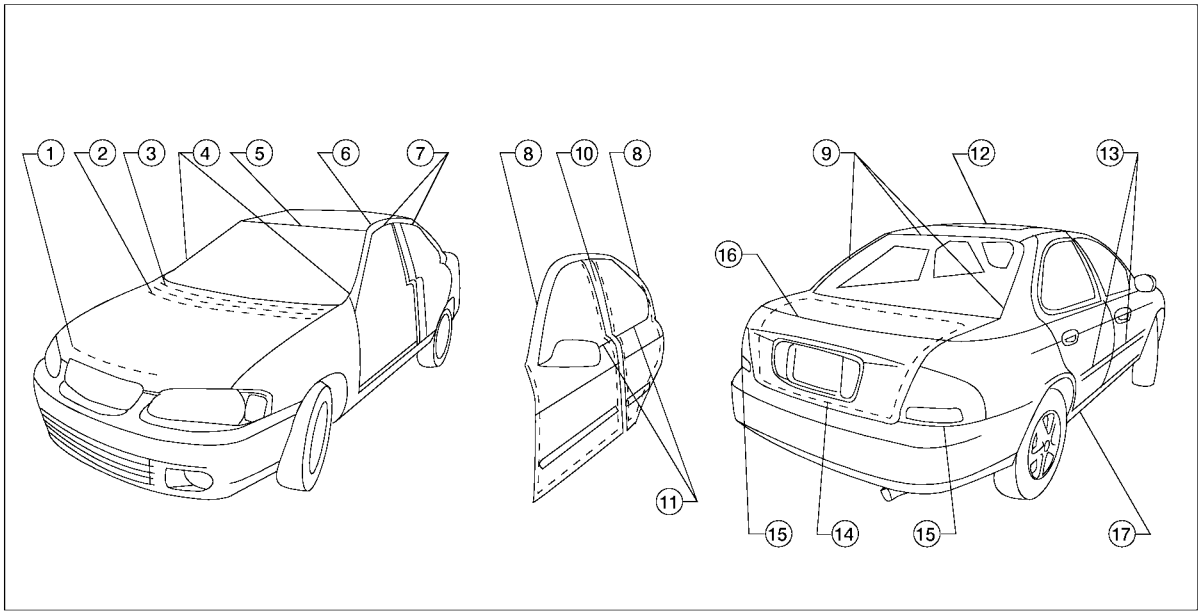
WBT114

EXTERIOR

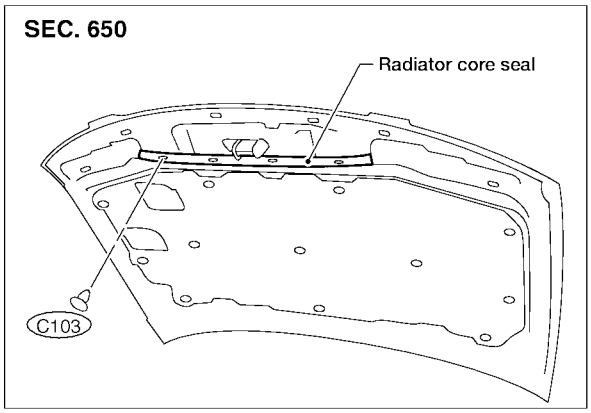
PFP:AAAAA

Removal and Installation

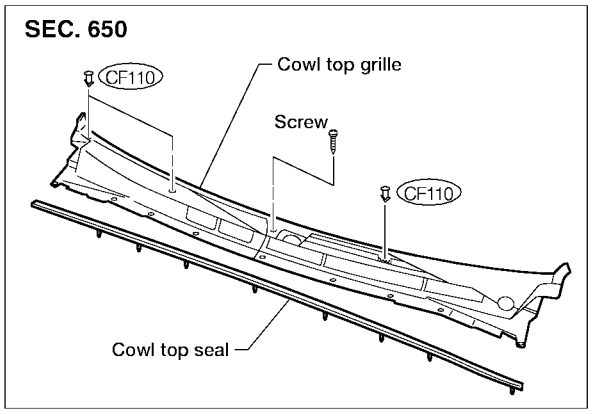
EIS00170



① **Hood front seal**

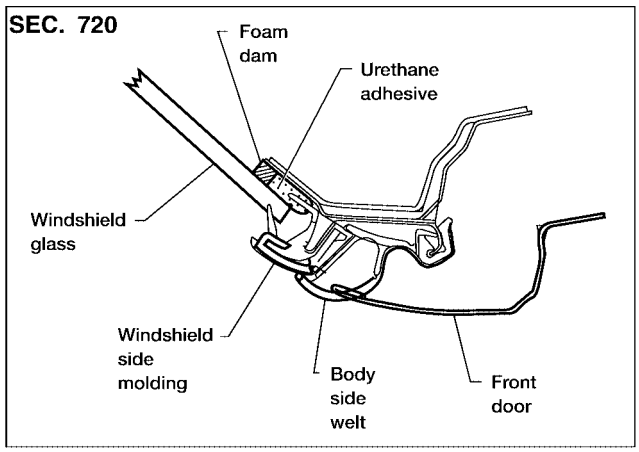


② ③ **Cowl top seal and cowl top grille**

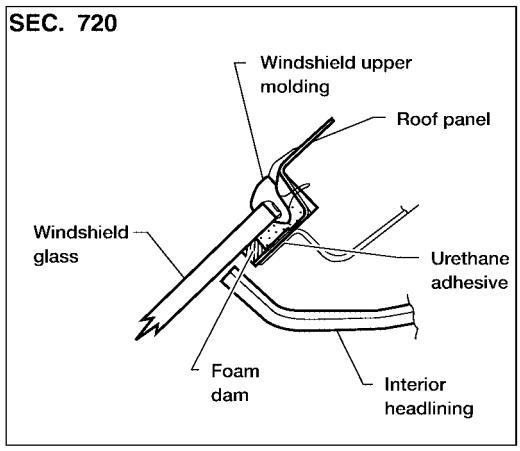


WBT054

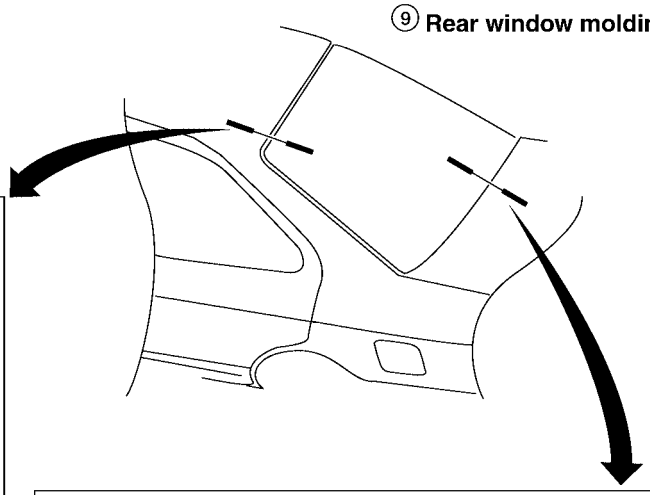
④ Windshield side molding

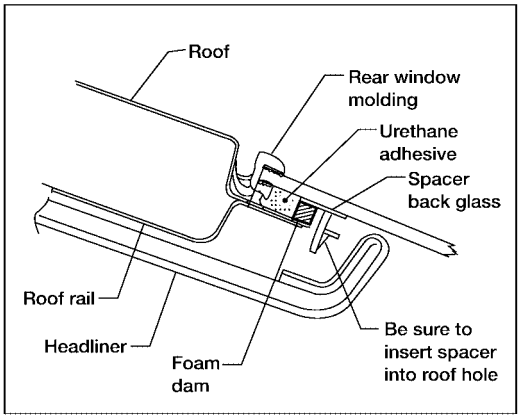


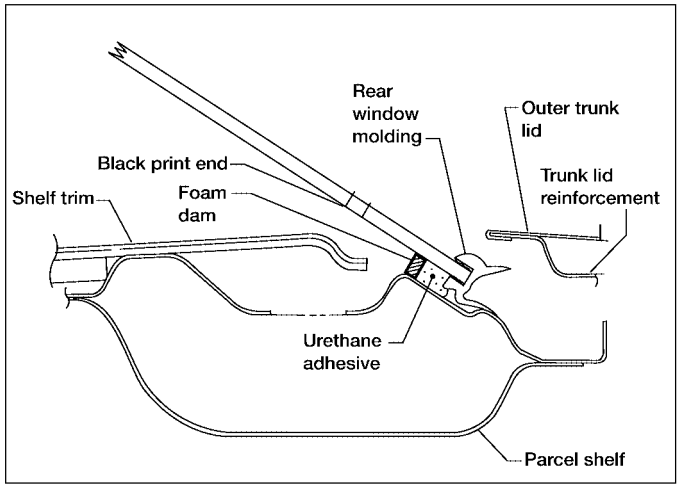
⑤ Windshield upper molding



⑨ Rear window molding

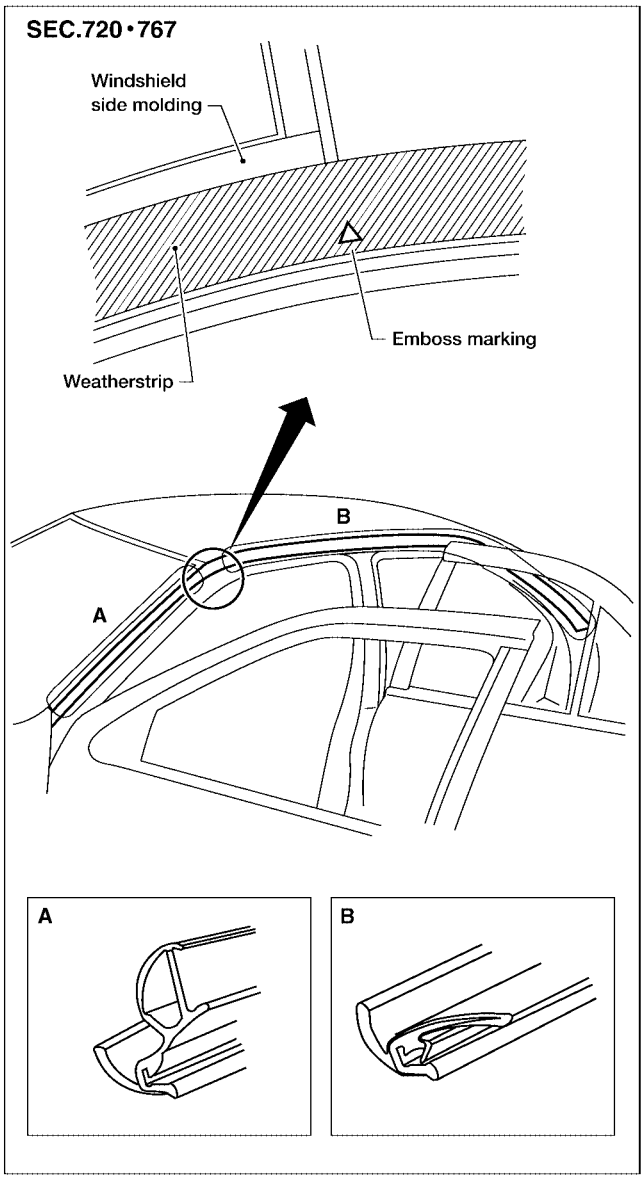




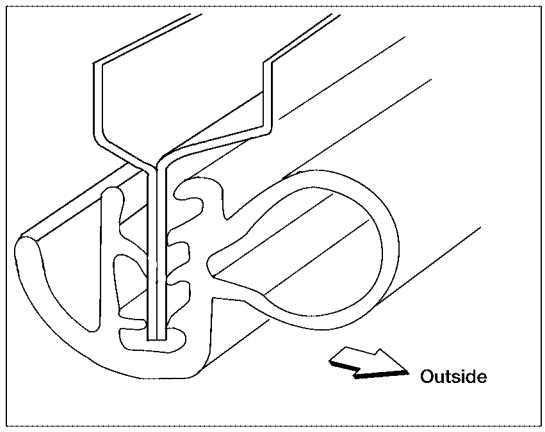


WBT113

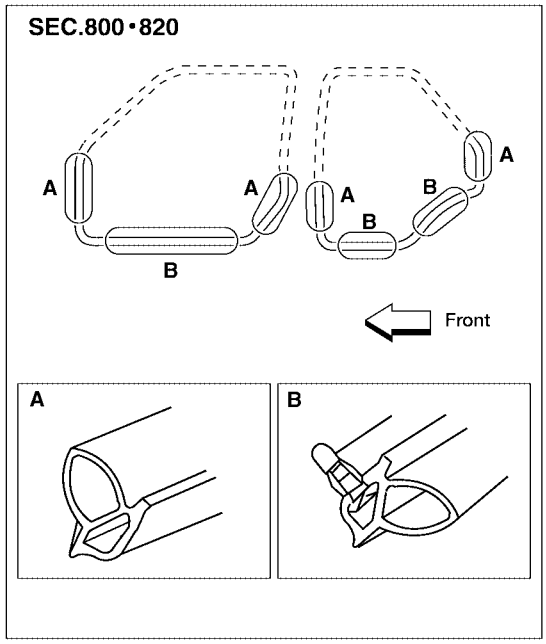
⑥ **Drip weatherstrip**



⑦ **Body side welt**

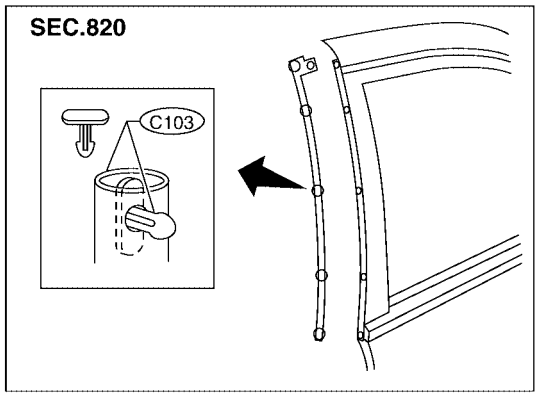


⑧ **Door weatherstrip**

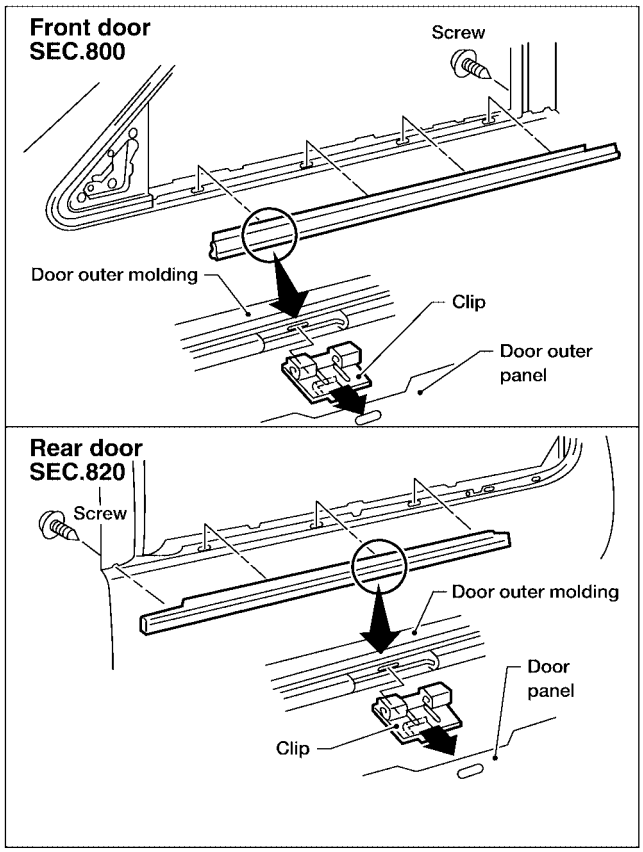


LIIA0009E

⑩ **Rear door parting seal**



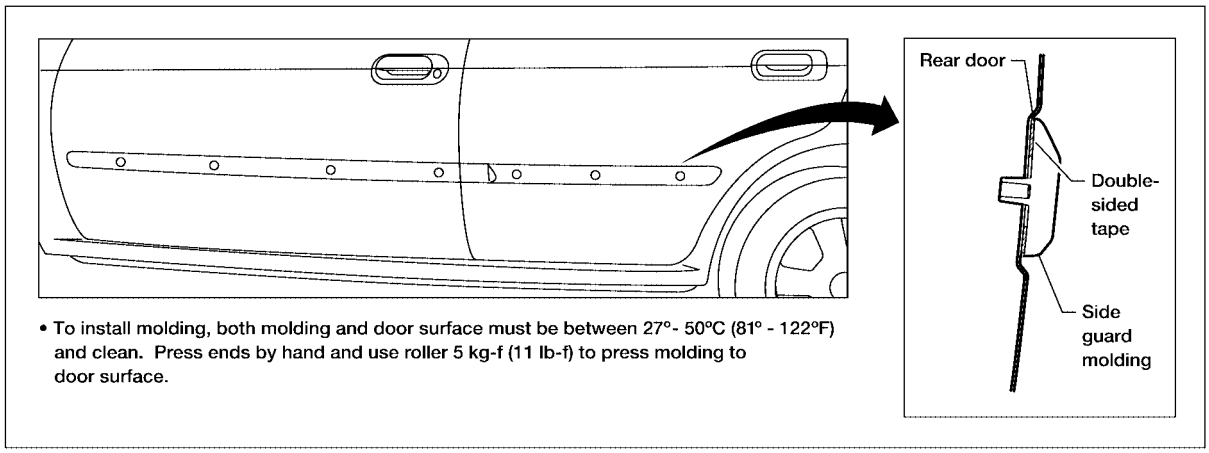
⑪ **Door outside molding**



⑫ **Sunroof lid weatherstrip**

Sunroof weatherstrip is part of the glass lid and must be replaced as an assembly.

⑬ **Side guard molding**

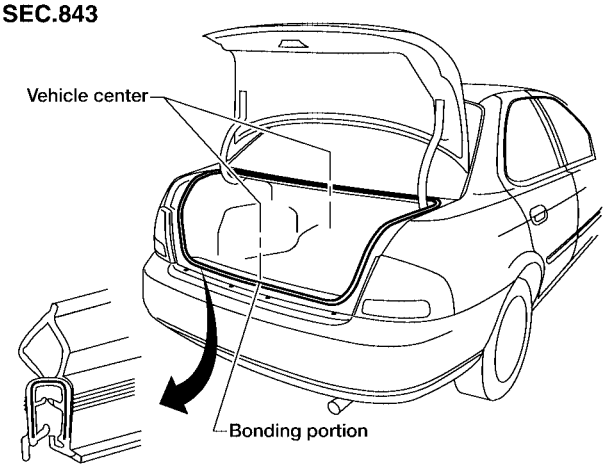


- To install molding, both molding and door surface must be between 27°- 50°C (81° - 122°F) and clean. Press ends by hand and use roller 5 kg-f (11 lb-f) to press molding to door surface.

LIIA0148E

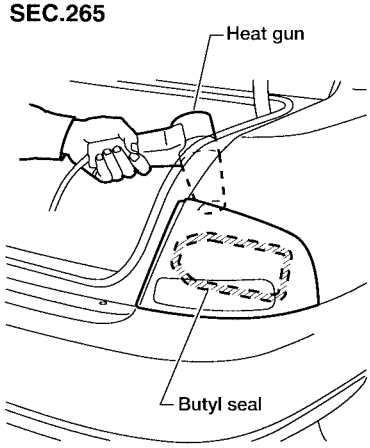
⑭ **Trunk lid weatherstrip**

SEC.843



⑮ **Rear combination lamp**

SEC.265

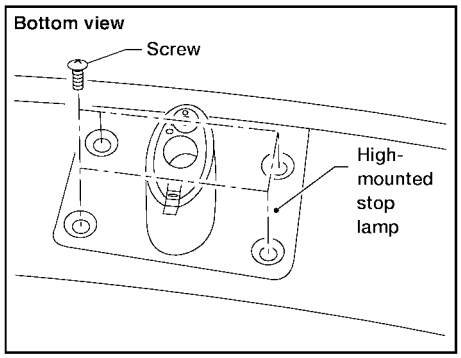


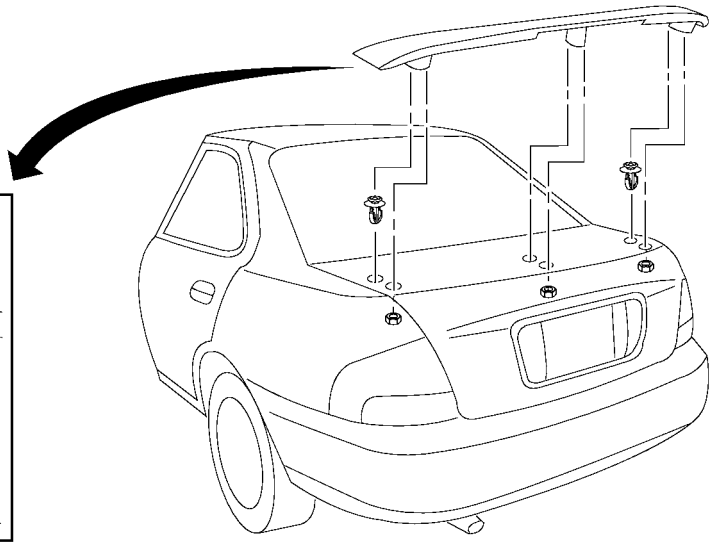
- Apply butyl seal evenly as it tends to become thin in the corners.
- Warm up lamp assembly area to a temperature of a little below 60°C (140°F).

LIIA0010E

SEC. 960

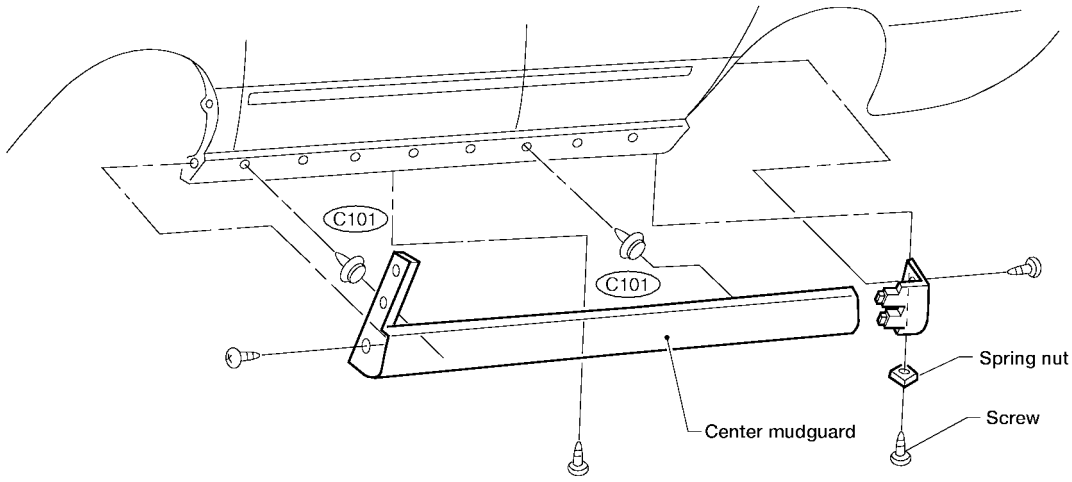
⑯ Rear air spoiler and high-mounted stop lamp
- When installing, make sure that there are no gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.





LBT065

⑰ Fender and center mudguard



LBT059

SIDE AND FLOOR TRIM

PFP:76913

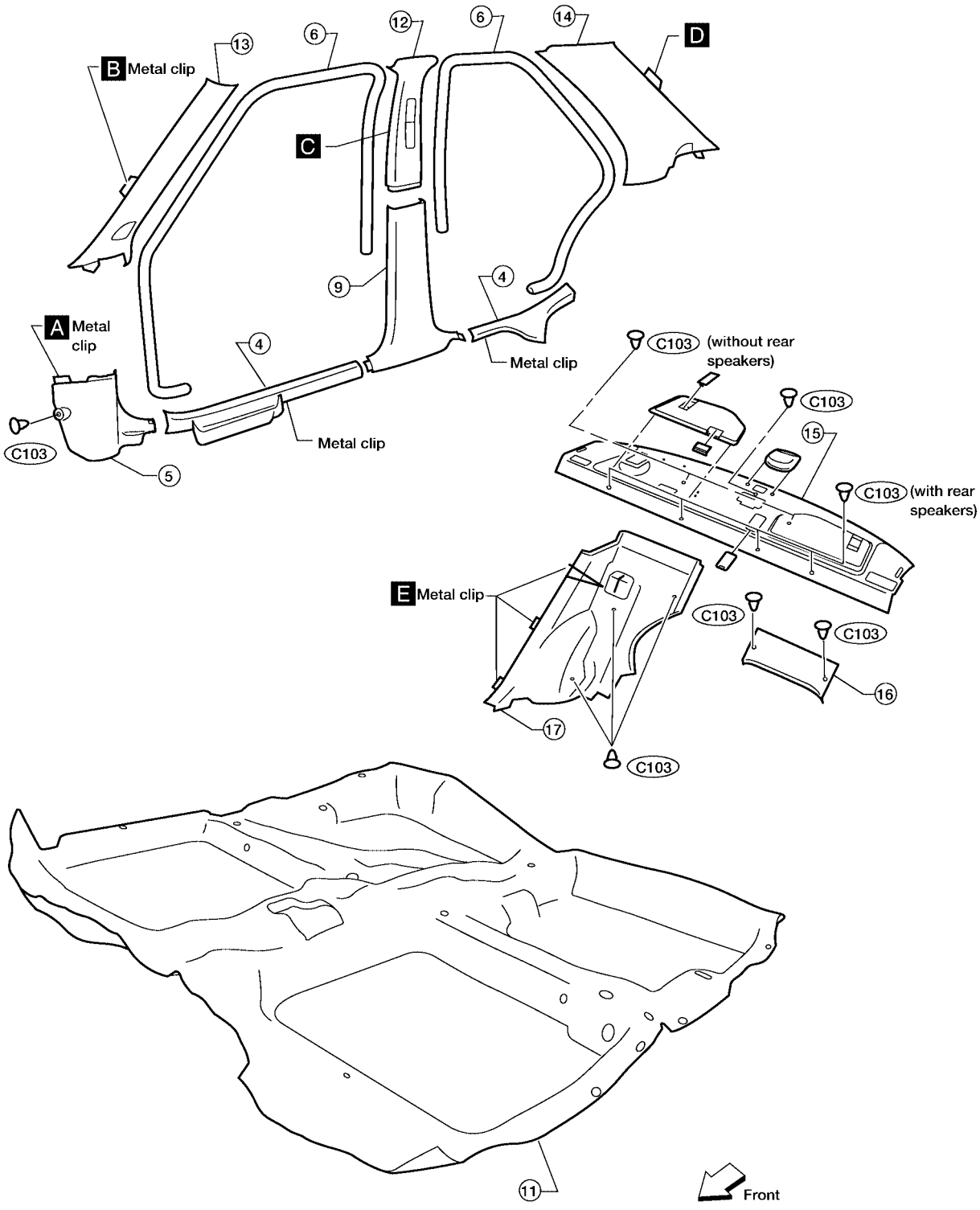
Removal and Installation

EIS00171

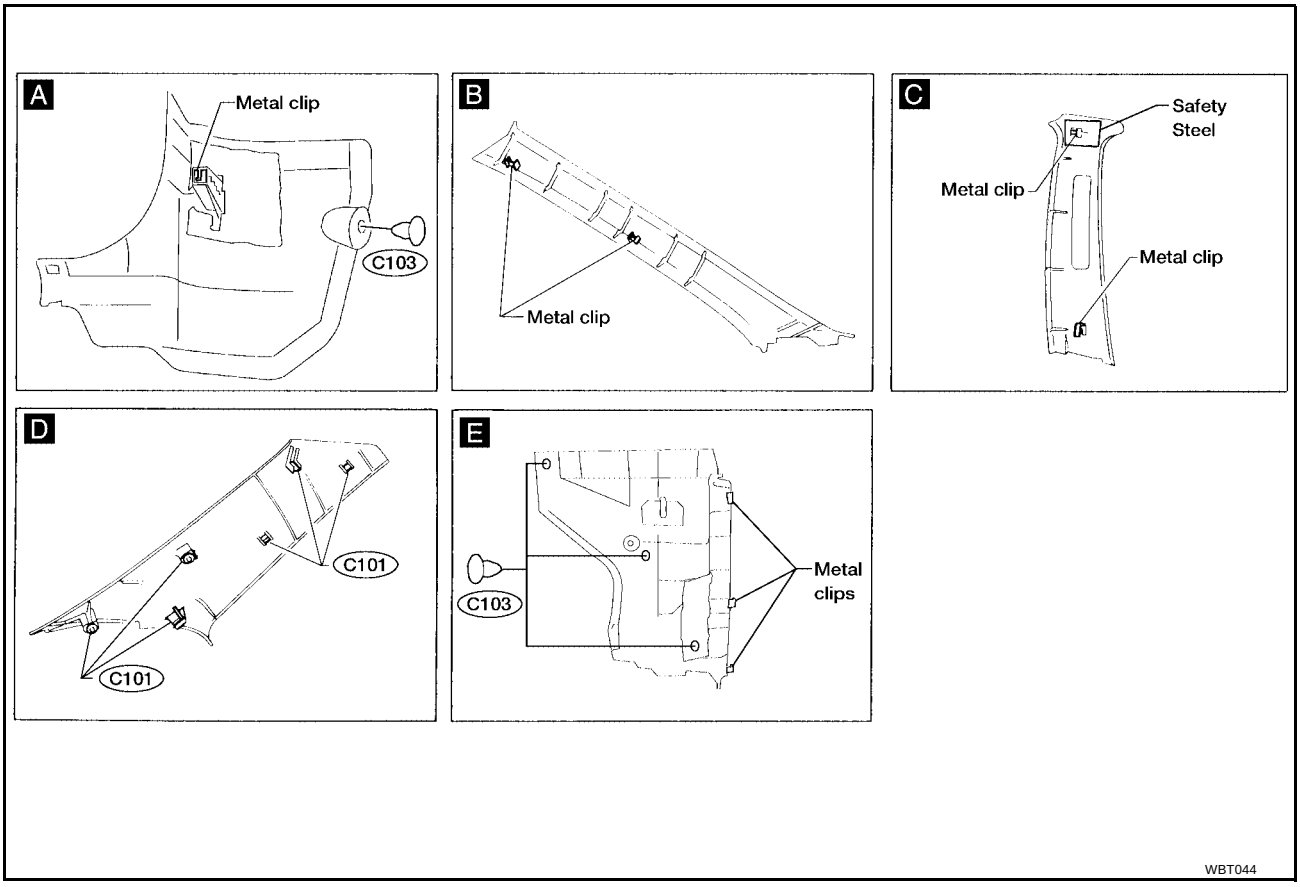
CAUTION:

- **Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.**

1. Remove A/T finisher or M/T shift lever boot. Refer to IP-10, "Removal and Installation" .
2. Remove the console. Refer to IP-10, "Removal and Installation" .
3. Remove front and rear seats. Refer to SE-3, "Removal and Installation" (front), or SE-5, "Removal and Installation" (rear).
4. Remove kick plates.
5. Remove dash side lower garnish. A
6. Remove body side welts.
7. Remove front seat belt floor anchor bolt. Refer to SB-3, "Removal and Installation" .
8. Remove rear seat belt floor anchor bolt. Refer to SB-5, "Removal and Installation" .
9. Remove center pillar lower garnish.
10. Remove adjuster cover and pillar shoulder bolt. Refer to SB-3, "Removal and Installation" .
11. Remove floor carpet.
12. Remove center pillar upper garnish. C
13. Remove front pillar garnish. B
14. Remove rear pillar garnish. D
15. Remove parcel shelf.
16. Remove center rear seat back finisher.
17. Remove side rear seat back finishers. E


B Metal clip
13
6
12
6
14
D
C
9
4
A Metal clip
4
Metal clip
C103
5
Metal clip
C103 (without rear speakers)
C103
15
C103 (with rear speakers)
E Metal clip
C103
C103
16
17
C103
11
Front

WBT128


A
Metal clip
C103
B
Metal clip
C
Safety Steel
Metal clip
Metal clip
D
C101
C101
E
C103
Metal clips
WBT044

DOOR FINISHER

PFP:80900

Removal and Installation

EIS00172

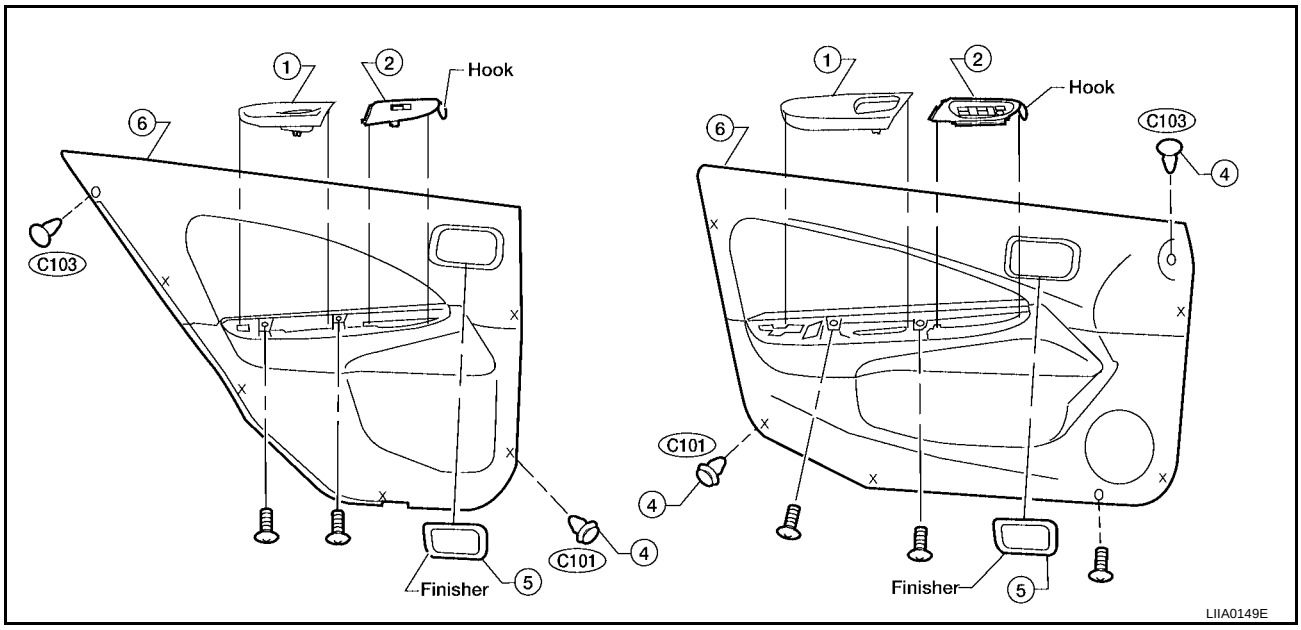
CAUTION:

Wrap the tip of a flat-bladed screwdriver with cloth when prying pawls from door trim.

1. Remove the door pull finisher(s).
2. Remove power window switch(es) finisher(s), then disconnect the connector(s) (models equipped with power windows).

- **Do not lift the front of the power window switch assembly.**

3. Remove window regulator handle (models without power windows).
4. Remove screws and disconnect clips C101 and clips C103 from door.
5. Reach behind and carefully pull door trim panel from inside handle until finisher pops off.
6. Lift out door trim.



ROOF TRIM

PFP:73910

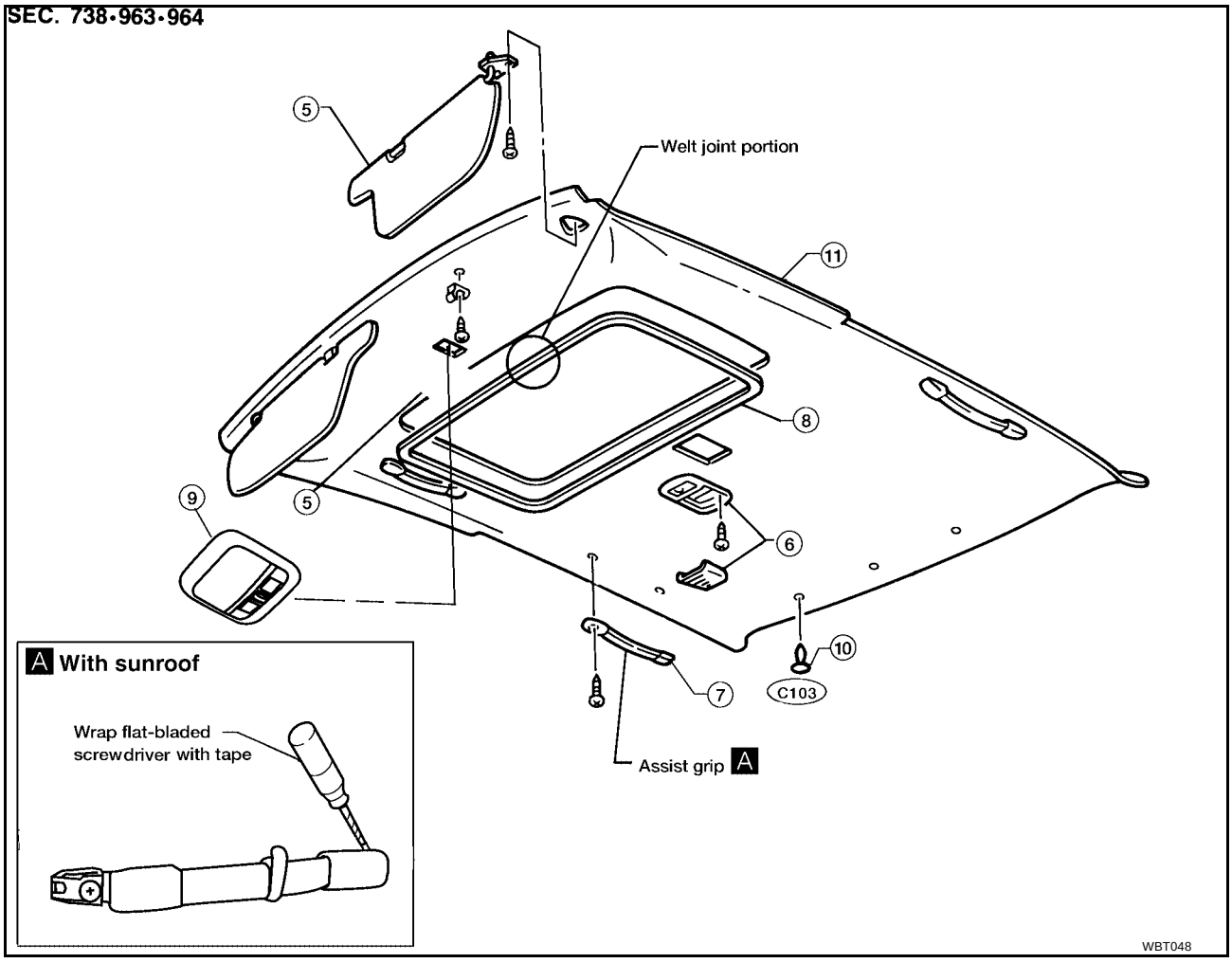
Removal and Installation

EIS00173

CAUTION:

Disconnect both terminals from battery in advance.

1. Remove driver air bag module and steering wheel. Refer to SRS-40, "Removal and Installation" and PS-11, "STEERING WHEEL" .
2. Fully tilt front right and left seat backs backward.
3. Remove front pillar garnish, front and rear kick plates. Refer to EI-28, "Removal and Installation" .
4. Remove center pillar lower and upper garnish, and rear pillar garnish. Refer to EI-28, "Removal and Installation" .
5. Remove sun visors.
6. Remove interior lamp.
7. Remove assist grips (if equipped). A
8. Remove sunroof welt (if equipped) and door welts.
9. Remove sunroof switch (if equipped) and map lamp assembly.
10. Remove clips attached to roof.
11. Take out headlining from the front passenger door.

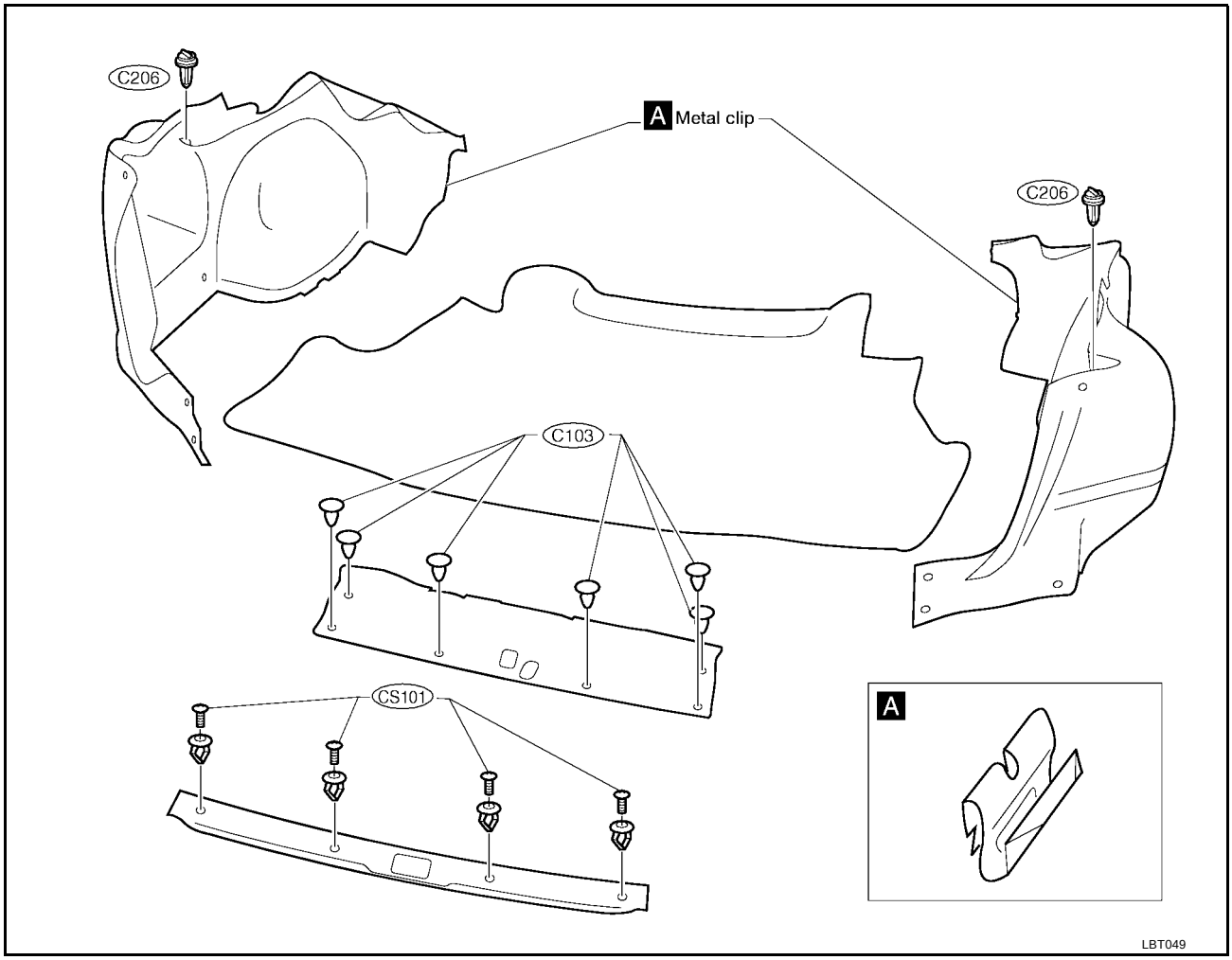


TRUNK ROOM TRIM

PFP:84920

Removal and Installation

EIS00174



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PRECAUTIONS

PFP:00001

Parts Requiring Angular Tightening

EBS00CE6

- Use an angle wrench for the final tightening of the following engine parts:
  - Cylinder head bolts
  - Main bearing cap bolts
  - Connecting rod cap nuts
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

Precautions for Liquid Gasket

EBS00EXN

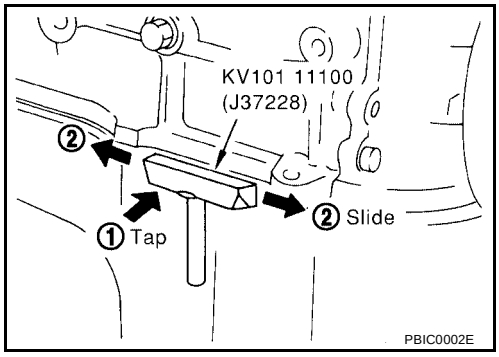
REMOVAL OF LIQUID GASKET SEALING

- After removing the mounting bolts and nuts, separate the mating surface using a seal cutter and remove the liquid gasket sealing.

CAUTION:

Be careful not to damage the mating surfaces.

- In areas where the cutter is difficult to use, use a plastic hammer to lightly tap (1) the cutter where the Silicone RTV Sealant is applied. Use a plastic hammer to slide the cutter (2) by tapping on the side.

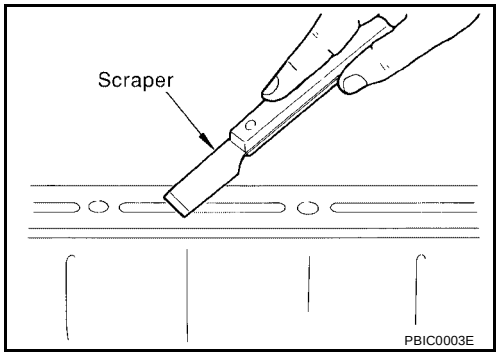


CAUTION:

If for some unavoidable reason a tool such as a flat-bladed screwdriver is used, be careful not to damage the mating surfaces.

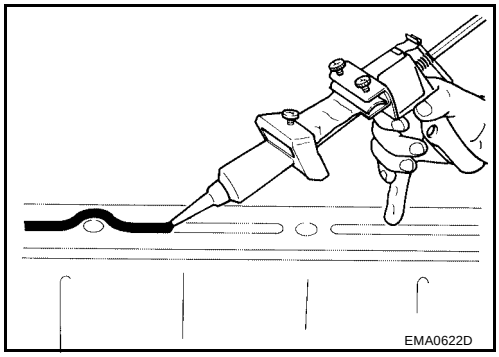
LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper, remove the old Silicone RTV Sealant adhering to the gasket application surface and the mating surface.
- Remove the sealant completely from the groove of the gasket application surface, mounting bolts, and bolt holes.
2. Thoroughly clean the gasket application surface and the mating surface and remove adhering moisture, grease and foreign materials.
3. Attach the sealant tube to the tube presser.
   Use Genuine Silicone RTV Sealant or equivalent. Refer to **GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"** .

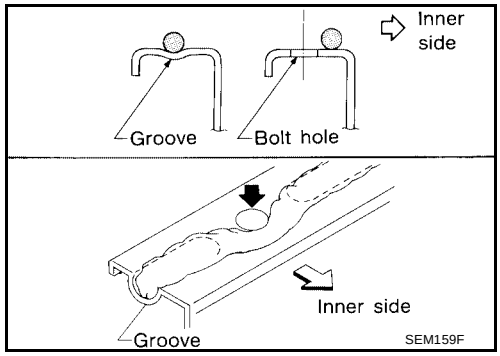


4. Apply the sealant using Tool without breaks to the specified location with the specified dimensions.

Tube presser	**WS39930000 (–)**



- If there is a groove for the sealant application, apply the sealant to the groove.
- As for the bolt holes, normally apply the sealant inside the holes. If specified, it should be applied outside the holes. Make sure to read the text of this manual.
- Within five minutes of the sealant application, install the mating component.
- If the sealant protrudes, wipe it off immediately.
- Do not retighten after the installation.
- After 30 minutes or more have passed from the installation, fill the engine with the specified oil and coolant. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .



CAUTION:
Follow all specific instructions in this manual.

Rocker Cover Bolts

EBS00EWP

NOTE:
Remove and install rocker cover bolts with a socket or wrench only.

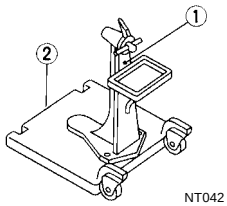
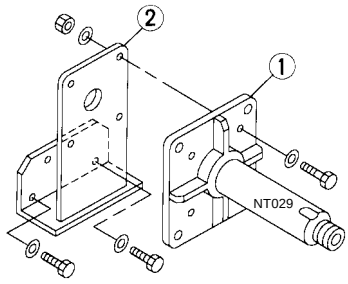
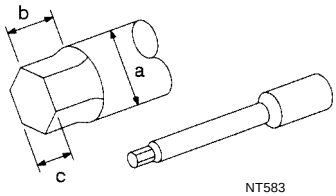
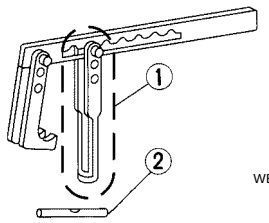
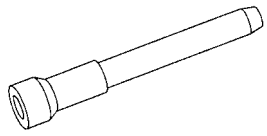
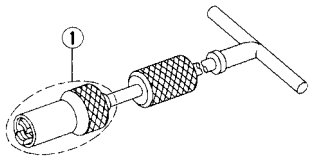
PREPARATION

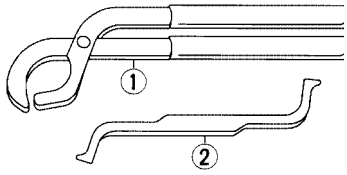
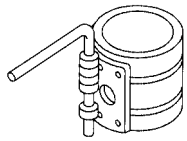
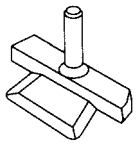
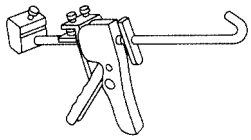
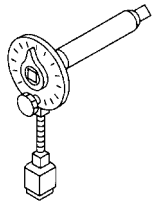
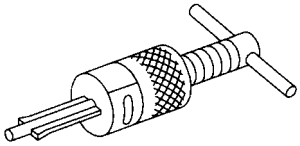
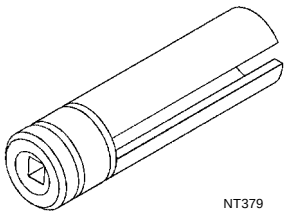
PFP:00002

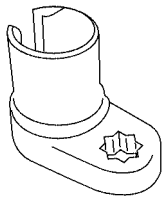
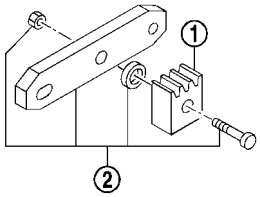
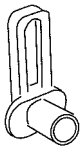
Special Service Tools

EBS00CE8

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

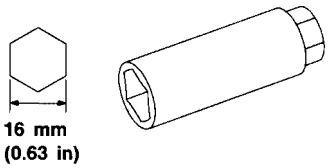
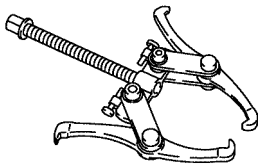
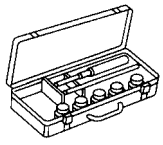
Tool number (Kent-Moore No.) Tool name		Description
ST0501S000 (—) Engine stand assembly 1. ST05011000 (—) Engine stand 2. ST05012000 (—) Base	 NT042	Disassembling and assembling
Engine attachment assembly 1. KV10106500 (—) Engine attachment 2. KV10113300 (—) Sub-attachment	 NT029	Overhauling engine
ST10120000 (J24239-O1) Cylinder head bolt wrench	 NT583	Loosening and tightening cylinder head bolt **a: 13 mm (0.51 in) dia.** **b: 12 mm (0.47 in)** **c: 10 mm (0.39 in)**
KV10116200 (J26336-B) Valve spring compressor 1. KV10115900 (J26336-20) Attachment 2. KV10109220 (—) Adapter	 WEM044	Disassembling valve mechanism
KV10115600 (J38958) Valve oil seal drift	 NT024	Installing valve oil seal
KV10107902 (J38959) Valve oil seal puller 1. KV10116100 Valve oil seal puller adapter	 NT605	Displacing valve lip seal

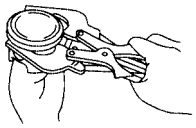
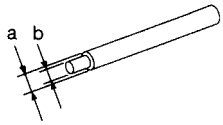
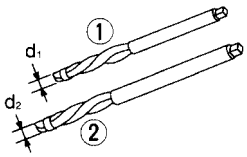
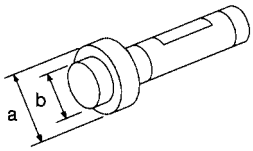
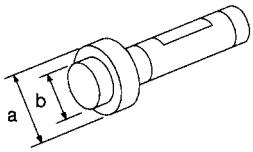
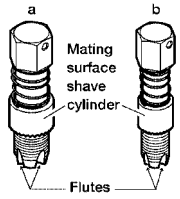
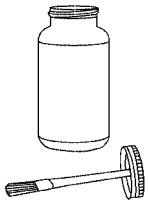
Tool number (Kent-Moore No.) Tool name	Description
KV101151S0 (J38972) Lifter stopper set 1. KV10115110 Camshaft pliers 2. KV10115120 Lifter stopper  NT041	Changing shims
EM03470000 (J8037) Piston ring compressor  NT044	Installing piston assembly into cylinder bore
KV10111100 (J37228) Seal cutter  NT046	Removing oil pan
WS39930000 (—) Tube presser  NT052	Pressing the tube of liquid gasket
KV10112100 (BT-8653-A) Angle wrench  NT014	Tightening bolts for bearing cap, cylinder head, etc. in angle.
ST16610001 (J23907) Pilot bushing puller  NT045	Removing pilot bushing
KV1017100 (J36471-A) Front (heated) oxygen sensor wrench  NT379	Loosening or tightening heated oxygen sensor with 22 m (0.87 in) hexagon nut

Tool number (Kent-Moore No.) Tool name	Description
(J44626) Air fuel ratio (A/F) sensor wrench  LEM054	Loosening or tightening air fuel ratio (A/F) sensor 1
KV101056S0 (—) Rear gear stopper 1. KV10105620 (—) Adapter 2. KV10105610 (—) Plate assembly  NT773	Preventing crankshaft from rotating
J-45488 Quick connector release  PBIC0198E	Removing fuel tube quick connectors in engine room

Commercial Service Tools

EBS00CE9

Tool name Kent-Moore No.	Description
Spark plug wrench  16 mm (0.63 in) NT047	Removing and installing spark plug
Crankshaft pulley puller  PBIC0887E	Removing crankshaft pulley
Valve seat cutter set  NT048	Finishing valve seat dimensions

Tool name Kent-Moore No.	Description
Piston ring expander  NT030	Removing and installing piston ring
Valve guide drift  NT015	Removing and installing valve guide **Intake & Exhaust:** **a: 9.5 mm (0.374 in) dia.** **b: 5.5 mm (0.217 in) dia.**
Valve guide reamer  NT016	Reaming valve guide **1** or hole for oversize valve guide **2** **Intake & Exhaust:** **d_1 : 5.5 mm (0.217 in) dia.** **d_2 : 9.685 mm (0.3813 in) dia.**
Front oil seal drift  NT049	Installing front oil seal **a: 52 mm (2.05 in) dia.** **b: 40 mm (1.57 in) dia.**
Rear oil seal drift  NT049	Installing rear oil seal **a: 103 mm (4.06 in) dia.** **b: 84 mm (3.31 in) dia.**
Oxygen sensor thread cleaner J-43897-18 J-43897-12  AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor (Use with anti-seize lubricant shown below.) **a: J-43897-18 [18 mm dia.] for zirconium oxygen sensor** **b: J-43897-12 [12 mm dia.] for titania oxygen sensor**
Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907)  AEM489	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

Noise, Vibration and Harshness (NVH) Troubleshooting

EBS00CEA

NVH TROUBLESHOOTING — ENGINE NOISE

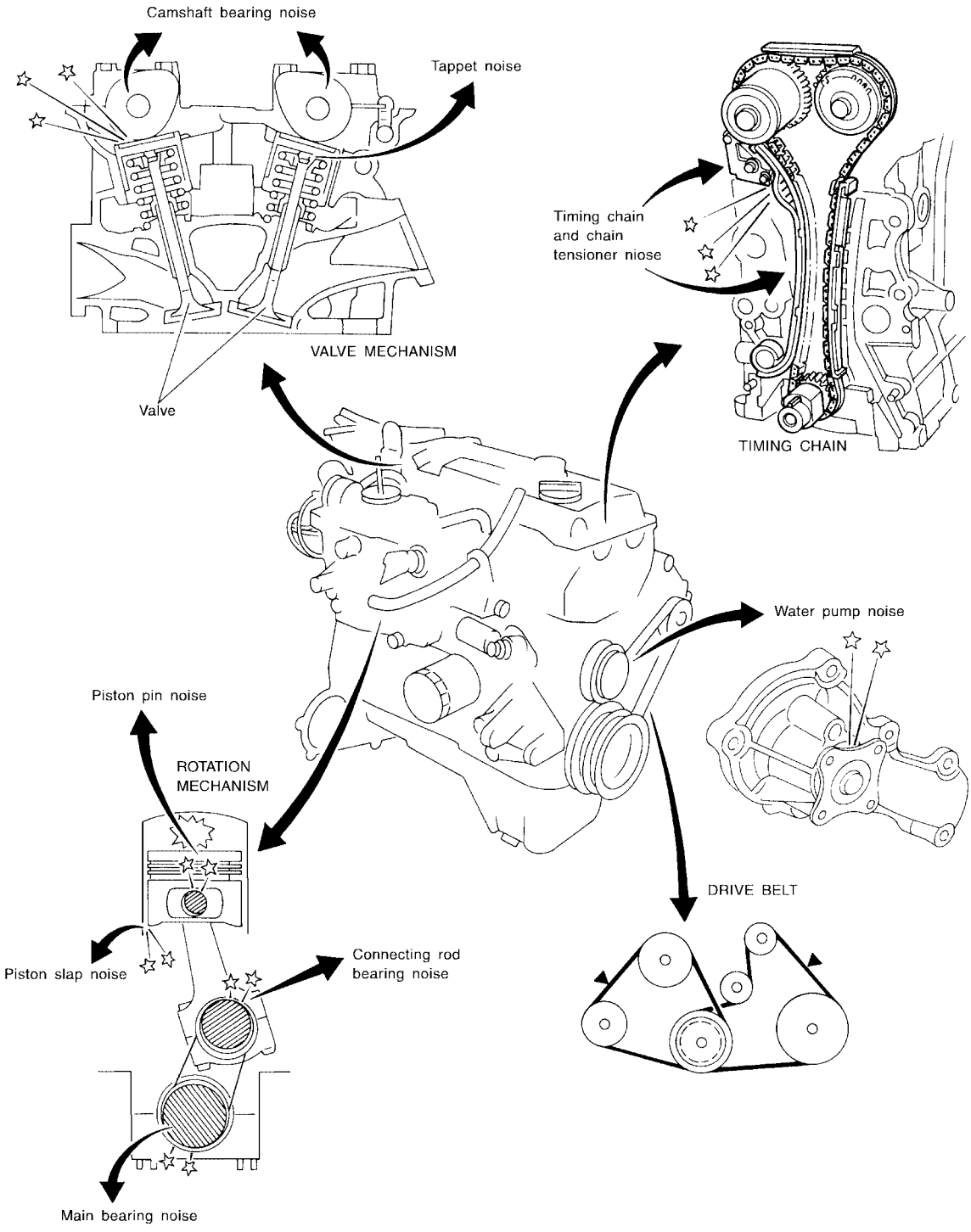
Use the chart below to help you find the cause of the symptom.

1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.
4. Check specified noise source.

If necessary, repair or replace these parts.

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When start-ing	When idling	When racing	While driv-ing			
Top of Engine Rocker Cover Cyl-inder Head	Ticking or click	C	A	—	A	B	—	Tappet noise	Valve clearance	EM-35
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft journal clear-ance Camshaft runout	EM-33 , EM-34
Crank-shaft Pul-ley Cylinder Block (Side of Engine) Oil pan	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston and piston pin clear-ance Connecting rod bushing clearance	EM-69 , EM-76
	Slap or rap	A	—	—	B	B	A	Piston slap noise	Piston-to-bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion	EM-69, EM-70 , EM-70 ,EM-70
	Knock	A	B	C	B	B	B	Connect-ing rod bearing noise	Connecting rod bearing clearance (Big end) Connecting rod bushing clearance (Small end)	EM-75 , EM-76
	Knock	A	B	—	A	B	C	Main bear-ing noise	Main bearing oil clearance Crankshaft runout	EM-73 , EM-72
Front of Engine Timing Chain Cover	Tapping or ticking	A	A	—	B	B	B	Timing chain and chain ten-sioner noise	Timing chain cracks and wear Timing chain tensioner operation	EM-45
Front of Engine	Squeak or fizzing	A	B	—	B	—	C	Drive belts (sticking or slipping)	Drive belts deflection	MA-16
	Creaking	A	B	A	B	A	B	Drive belts (slipping)	Idler pulley bearing opera-tion	
	Squall or creak	A	B	—	B	A	B	Water pump noise	Water pump operation	CO-10

A: Closely related B: Related C: Sometimes related —: Not related


Camshaft bearing noise
Tappet noise
VALVE MECHANISM
Valve
Timing chain
and chain
tensioner niose
TIMING CHAIN
Water pump noise
Piston pin noise
ROTATION
MECHANISM
DRIVE BELT
Piston slap noise
Connecting rod
bearing noise
Main bearing noise

WBIA0061E

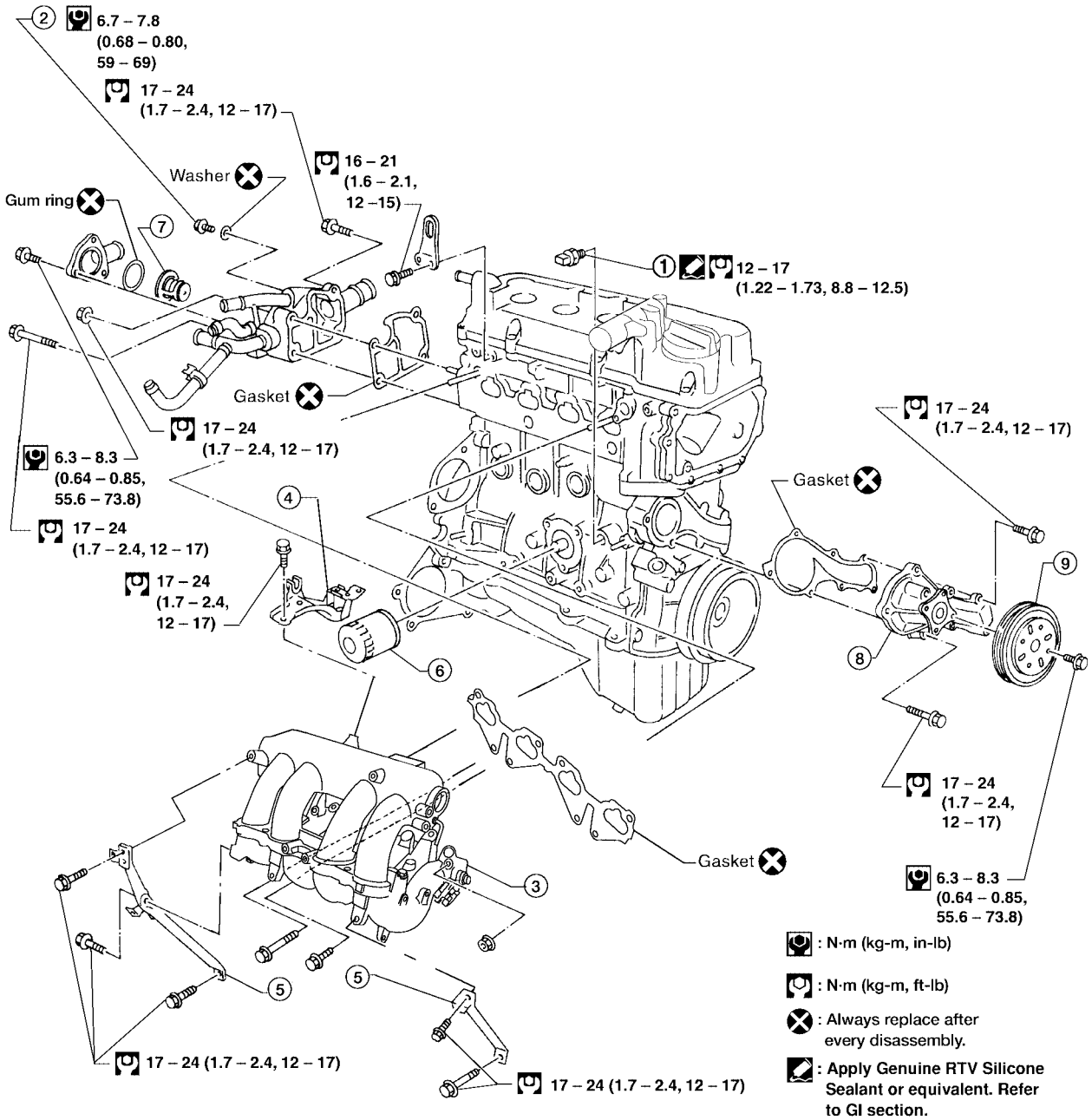
OUTER COMPONENT PARTS

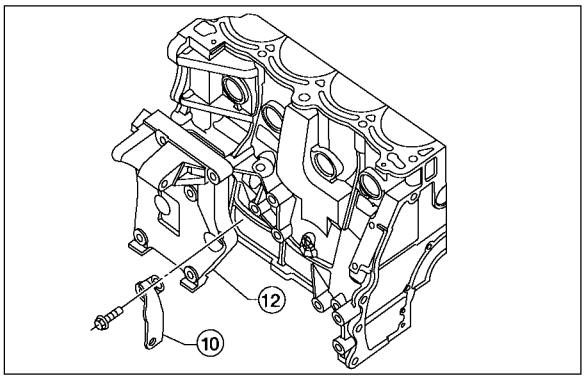
PFP:00100

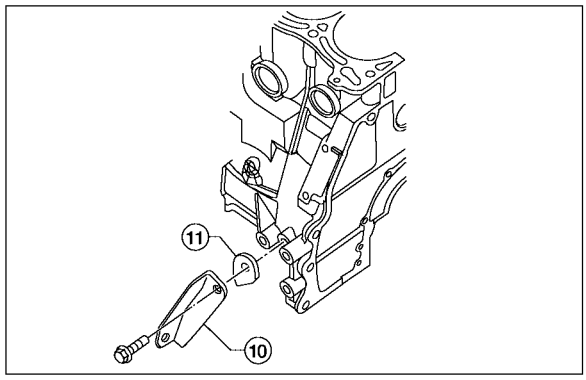
Removal and Installation

EBS00CEC

SEC. 140 • 147 • 150 • 210

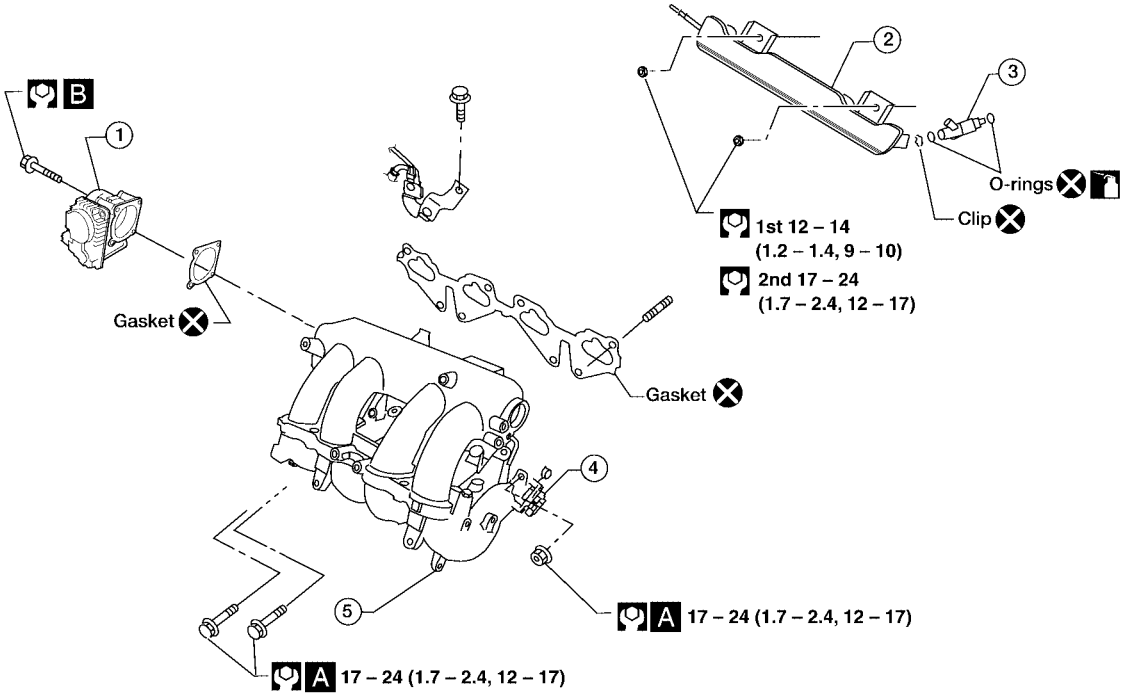




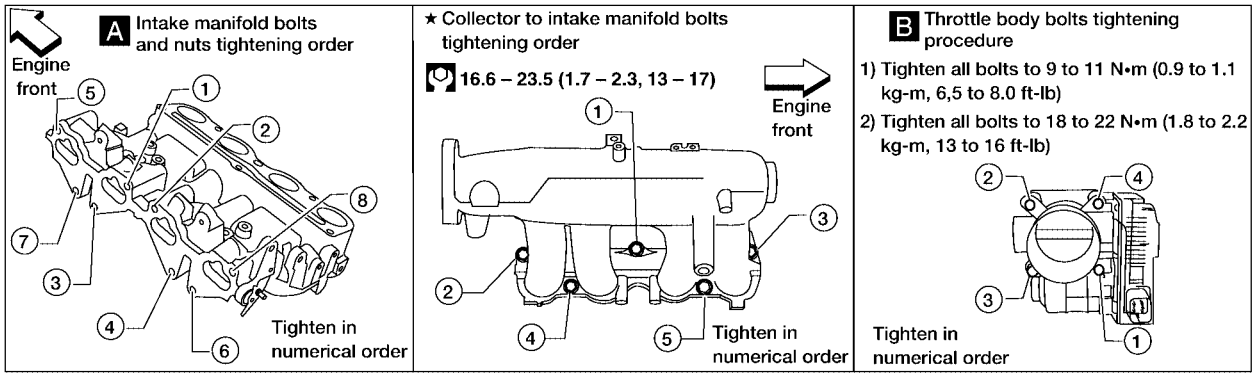


WBIA0112E

1. Oil pressure switch
2. Air relief plug
3. Intake manifold
4. Intake manifold upper support
5. Intake manifold rear supports
6. Oil filter
7. Thermostat
8. Water pump
9. Water pump pulley
10. Support container
11. Transmission gusset
12. Component bracket



: Lubricate with new engine oil
: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)
: Always replace after every disassembly.



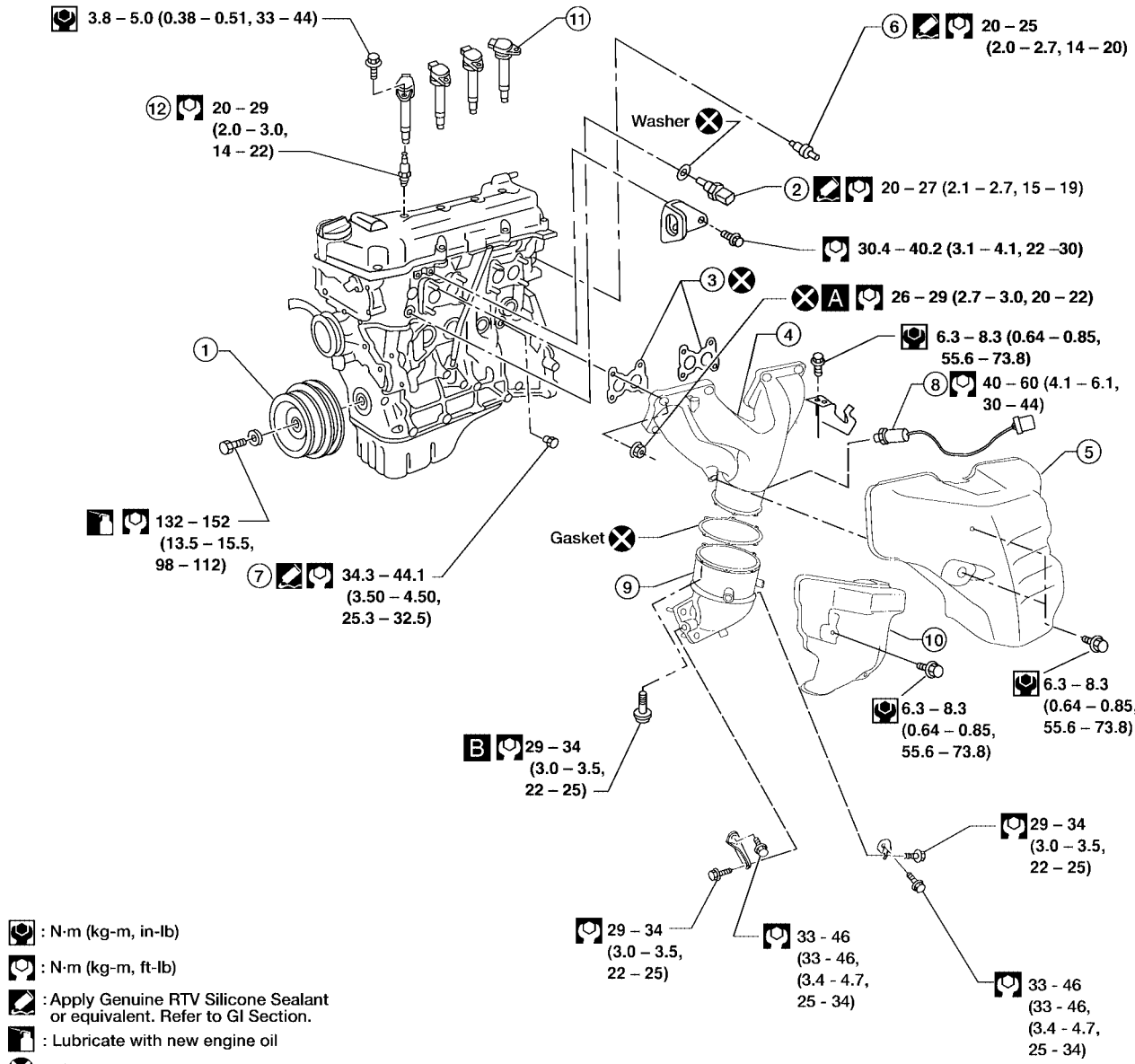
WBIA0113E

1. Throttle body
2. Fuel rail
3. Injector
4. Swirl control position sensor (SULEV only)
5. Intake manifold

CAUTION:

- **Perform "Throttle Valve Closed Position Learning" when harness connector of electronic throttle control actuator is disconnected. Refer to EC-53, "Throttle Valve Closed Position Learning" for QG18DE (ULEV) or EC-634, "Throttle Valve Closed Position Learning" for QG18DE (SULEV).**

- **Perform "Idle Air Volume Learning" when harness connector of electronic throttle control actuator is replaced. Refer to EC-53, "Idle Air Volume Learning" for QG18DE (ULEV) or EC-635, "Idle Air Volume Learning" for QG18DE (SULEV).**



1. Crankshaft pulley
2. Engine coolant temperature sensor
3. Gasket
4. Exhaust manifold
5. Exhaust manifold cover
6. Thermal transmitter

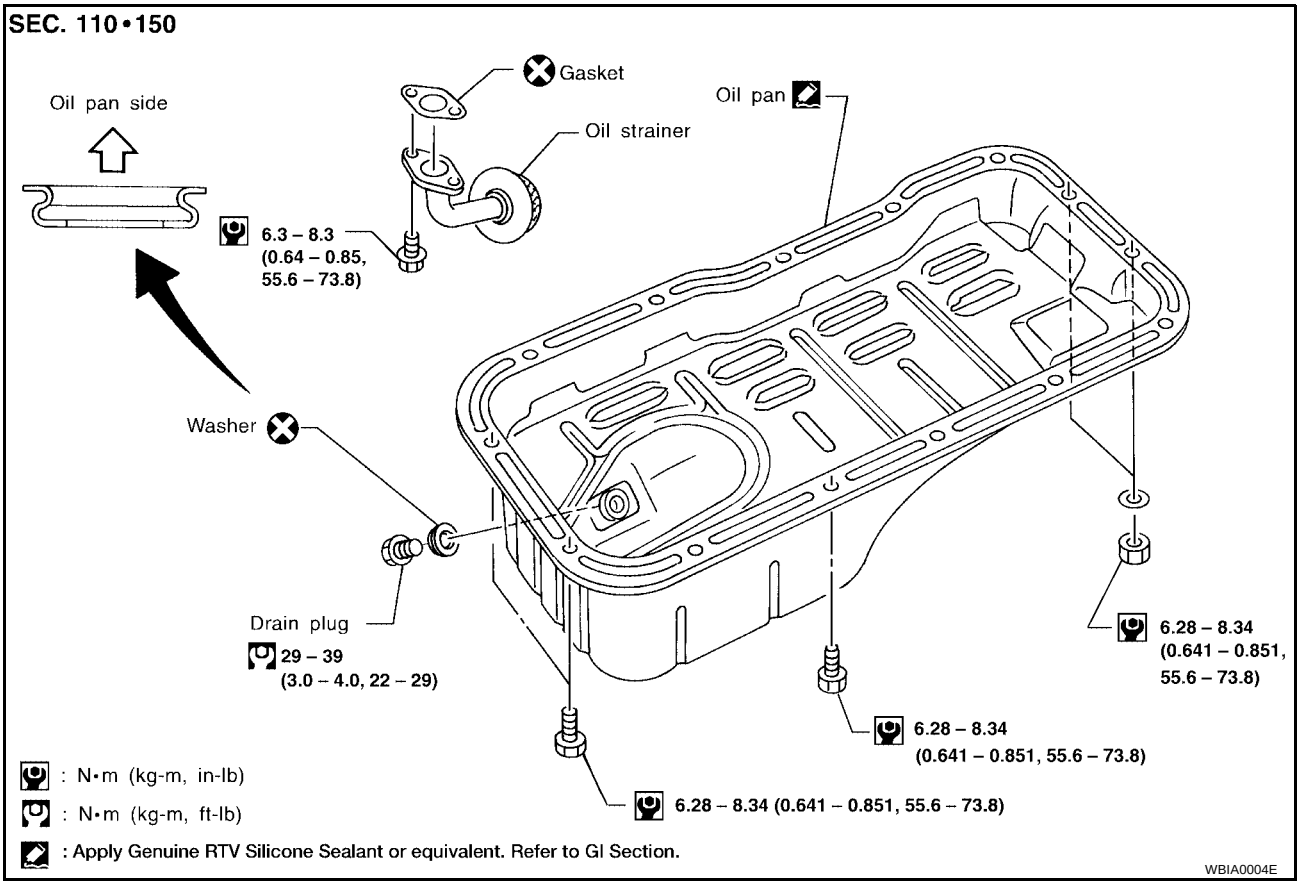
7. Drain plug
8. Heated oxygen sensor (ULEV) Air fuel ratio (A/F) sensor (SULEV only)
9. TWC (manifold)
10. TWC cover
11. Ignition coil
12. Spark plug

OIL PAN

PFP:11110

Components

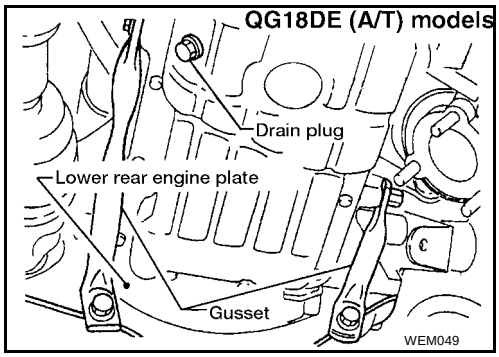
EBS00CED

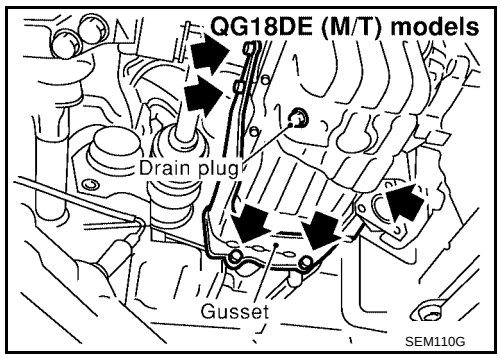


Removal

EBS00CEE

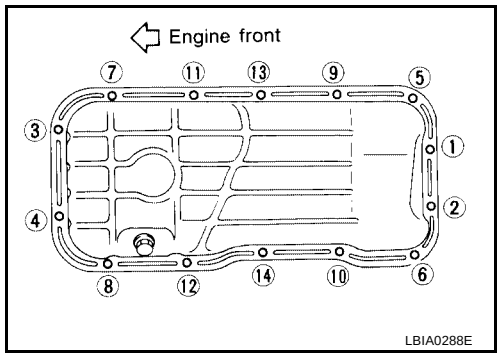
1. Remove engine RH side undercover splash shield.
2. Drain engine oil.
3. Remove front exhaust tube.
   Refer to EX-3, "Removal and Installation" .
4. Remove the exhaust manifold support.
5. Remove the engine gusset.





6. Remove rear plate cover (lower) (A/T models).
7. Remove oil pan.

a. Loosen and remove nuts and bolts of oil pan in order shown.

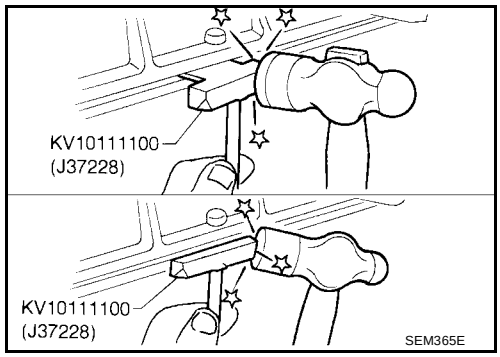


b. Insert Tool between cylinder block and oil pan.

CAUTION:

- **Be careful not to damage aluminum mating face.**
- **Do not insert screwdriver, or oil pan flange will be damaged.**

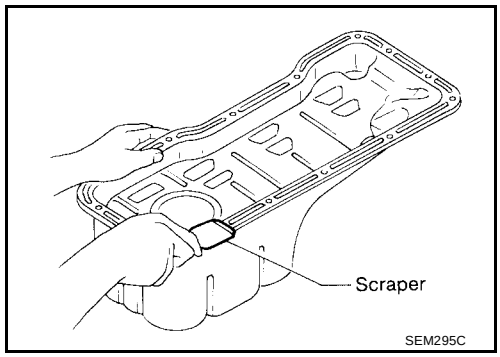
c. Slide Tool by tapping on the side of the Tool with a hammer.



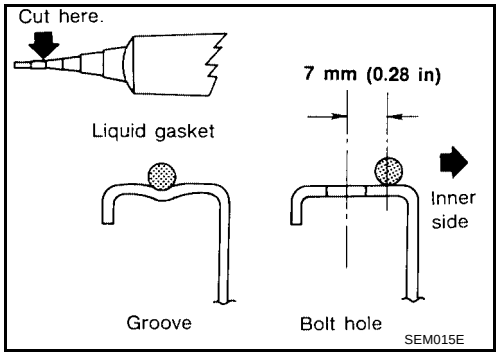
Installation

EBS00CEF

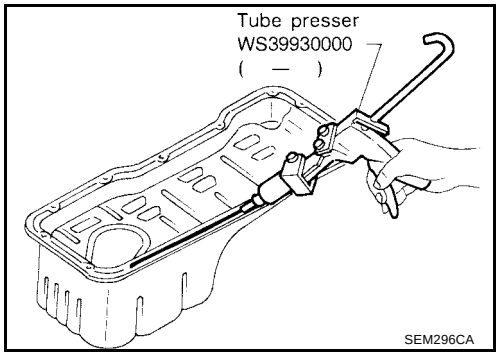
1. Use a scraper to remove old RTV Silicone Sealant from mating surface of oil pan.
   - **Also remove old RTV Silicone Sealant from mating surface of cylinder block.**



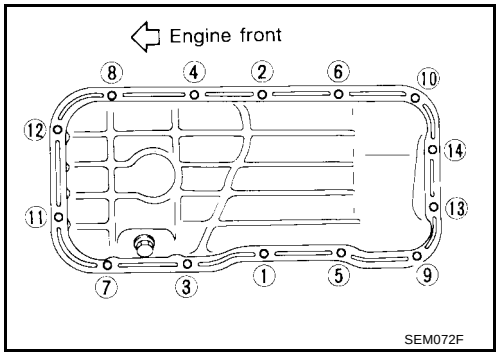
2. Apply a continuous bead of RTV Silicone Sealant to mating surface of oil pan.
   - **Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .**
   - **Apply to groove on mating surface.**
   - **Allow 7 mm (0.28 in) clearance around bolt holes.**



   - **Be sure RTV Silicone Sealant diameter is 3.5 to 4.5 mm (0.138 to 0.177 in).**
   - **Installation should be done within 5 minutes after applying sealant.**



3. Install oil pan.
   - **Tighten oil pan nuts and bolts in the numerical order.**
   - **Wait at least 30 minutes before refilling engine oil.**
4. Install the remaining parts in the reverse order of removal.

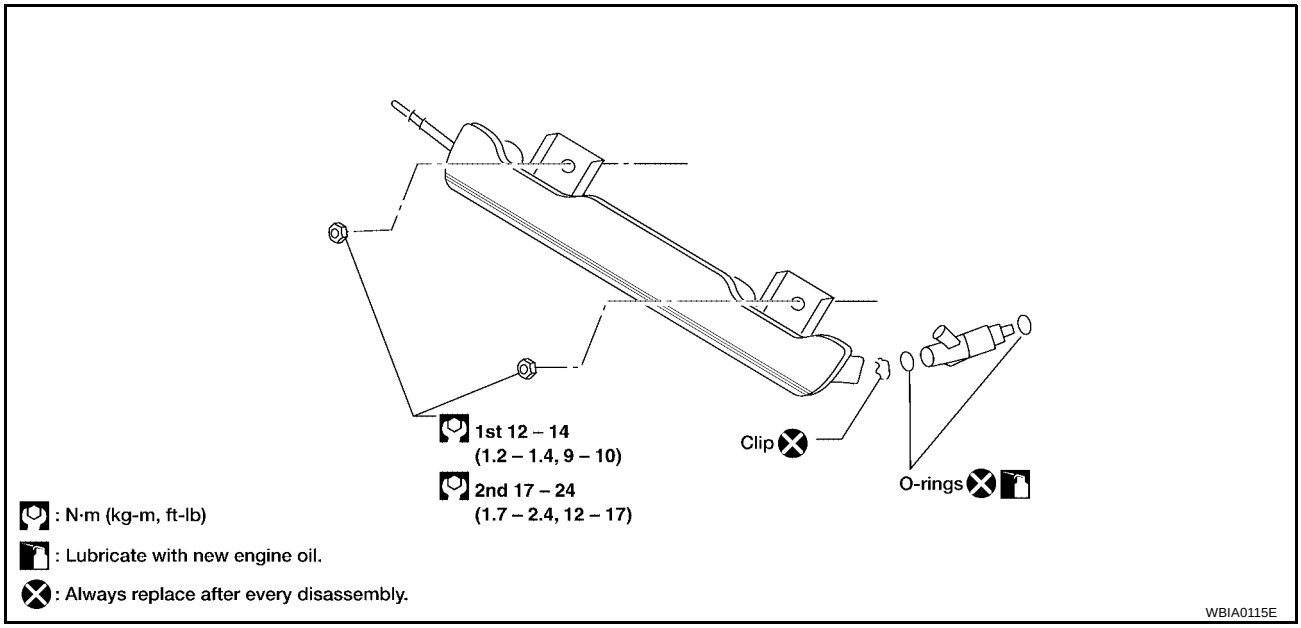


FUEL INJECTOR AND FUEL TUBE

PFP:16600

Removal and Installation

EBS00CEG

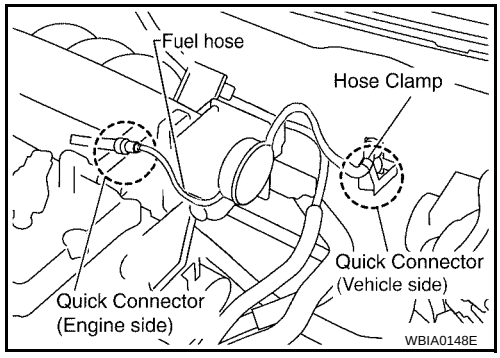


CAUTION:

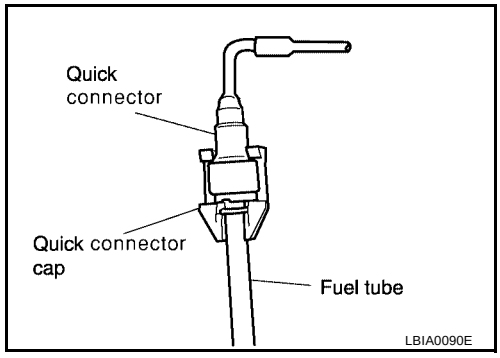
- **Apply new engine oil when installing the parts that specified to do so in the figure.**
- **Do not remove or disassemble parts unless instructed as shown above.**

REMOVAL

1. Release the fuel pressure. Refer to EC-56, "FUEL PRESSURE RELEASE" (ULEV), EC-637, "FUEL PRESSURE RELEASE" (SULEV).
2. Disconnect the intake manifold bracket.
3. Remove the PCV hose and bracket.
4. Disconnect the sub-harness for the fuel injectors.
5. Disconnect the fuel quick connector on the engine side.
   - Using the quick connector release tool (hereinafter called “release tool”), perform the following steps to disconnect quick connector.



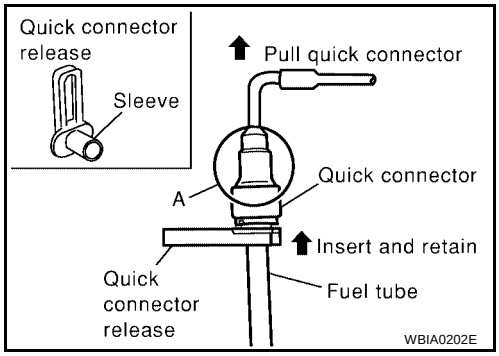
a. Remove quick connector cap.



b. With the sleeve side of release facing quick connector, install release tool onto fuel tube.

c. Insert release tool into quick connector until sleeve contacts and goes no further. Hold the release tool on that position.

CAUTION:
Inserting the release tool hard will not disconnect quick connector. Hold release tool where it contacts and goes no further.



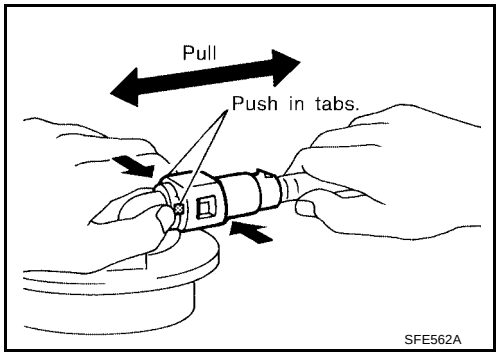
d. Pull the quick connector straight out from the fuel tube.

CAUTION:
- **Pull quick connector holding it at the "A" position, as shown in illustration.**
- **Do not pull with lateral force applied. O-ring inside quick connector may be damaged.**
- **Prepare container and cloth beforehand as fuel will leak out.**
- **Avoid fire and sparks.**
- **Be sure to cover openings of disconnected pipes with plug or plastic bag to avoid fuel leakage and entry of foreign materials.**

6. When removing fuel hose quick connector at vehicle piping side, perform as follows.

a. Remove quick connector cap.

b. Hold the sides of the connector, push in tabs and pull out the tube. (The figure is shown for reference only.)
- If the connector and the tube are stuck together, push and pull several times until they start to move. Then disconnect them by pulling.



CAUTION:
- **The tube can be removed when the tabs are completely depressed. Do not twist it more than necessary.**
- **Do not use any tools to remove the quick connector.**
- **Keep the resin tube away from heat. Be especially careful when welding near the tube.**
- **Prevent acid liquid such as battery electrolyte etc. from getting on the resin tube.**
- **Do not bend or twist the tube during installation and removal.**
- **Do not remove the remaining retainer on tube.**
- **When the tube is replaced, also replace the retainer with a new one.**
  Retainer color: Green.
- **To keep clean the connecting portion and to avoid damage and foreign materials, cover them completely with plastic bags or something similar.**

7. Remove the fuel injectors from the fuel tube, as follows:

a. Release the clip, and remove the fuel injector.

b. Pull the fuel injector straight out of the fuel tube.

CAUTION:
- **Be careful not to damage the nozzle.**
- **Avoid any impact, such as dropping the fuel injector.**
- **Do not disassemble or adjust the fuel injector.**

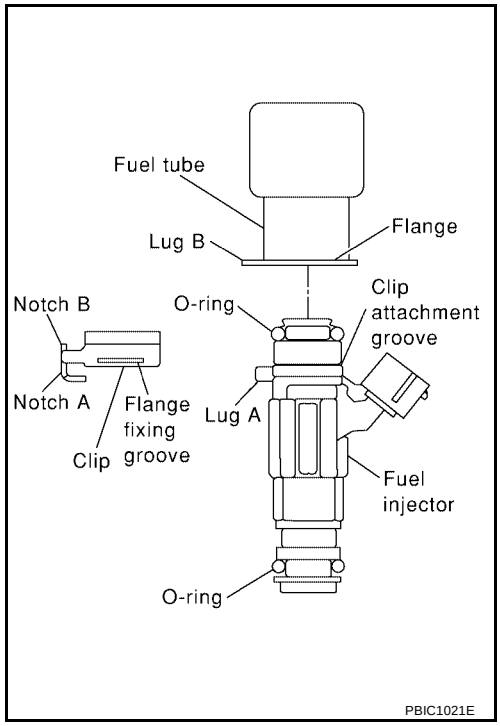
INSTALLATION

1. Installation is in the reverse order of removal.
- **Install new O-rings on the fuel injectors.**
- **Lubricate the new O-rings lightly with new engine oil.**
- **Be careful not to scratch the injector during installation. Also be careful not to twist or stretch the O-ring. If the O-ring was stretched while it was installed, do not insert it into the fuel tube immediately.**

a. Install the fuel injector into the fuel tube with the following procedure:
   - Do not reuse the clip, replace it with a new one.
   - Insert the clip into the clip mounting groove on the fuel injector.
   - Insert clip so that projection A of fuel injector matches notch A of the clip.

b. Insert fuel injector into fuel tube with clip attached.
   - Insert it while matching it to the axial center.
   - Insert fuel injector so that projection B of fuel injector matches notch B of the clip.
   - Make sure that fuel tube flange is securely fixed in flange fixing groove on the clip.
   - Make sure that installation is complete by checking that fuel injector does not rotate or come off.

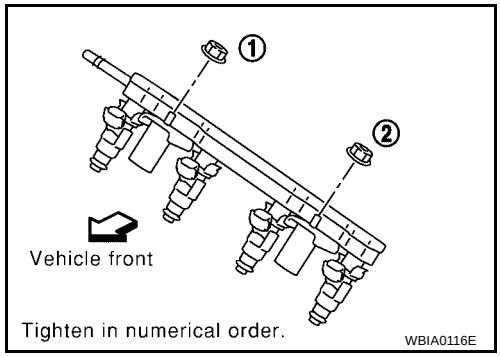
c. Install the fuel tube assembly with the following procedure:
   - Insert the tip of each fuel injector into the intake manifold.



- Tighten the fuel tube mounting bolts in two stages in the numerical order shown.

Stage 1 : 12 - 14 N·m (1.2 - 1.4 kg-m, 9 - 10 ft-lb)
Stage 2 : 17 - 24 N·m (1.7 - 2.4 kg-m, 12 - 17 ft-lb)

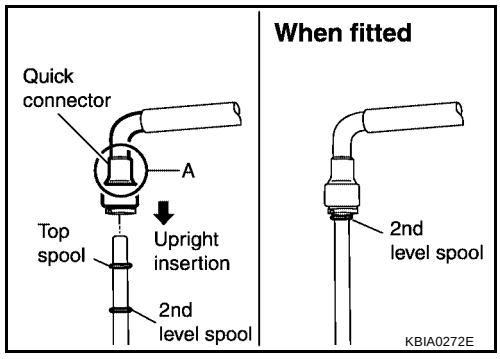
CAUTION:
- **After properly connecting fuel tube assembly to injector and fuel hose, check connection for fuel leakage.**



CONNECTING QUICK CONNECTOR ON THE FUEL HOSE (ENGINE SIDE)

1. Make sure no foreign substances are deposited in and around the fuel tube and quick connector, and there is no damage to them.
2. Thinly apply new engine oil around the fuel tube tip end.
3. Align center to insert quick connector straight into fuel tube.
   - Insert fuel tube into quick connector until the top spool on fuel tubes is inserted completely and the second level spool is positioned slightly below the quick connector bottom end.

   CAUTION:
   - **Hold at position "A" as shown, when inserting the fuel tube into the quick connector.**
   - **Carefully align to center to avoid inclined insertion to prevent damage to the O-ring inside the quick connector.**
   - **Insert the fuel tube until you hear a “click” sound and actually feel the engagement.**
   - **To avoid misidentification of engagement with a similar sound, be sure to perform the next step.**

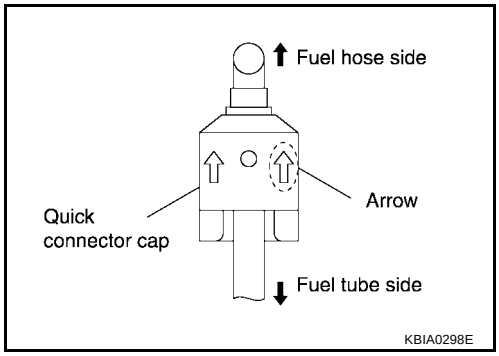


4. Before clamping the fuel hose with the hose clamp, pull the quick connector hard by hand, holding at the "A" position, as shown. Make sure it is completely engaged (connected) so that it does not come off of the fuel tube.

   NOTE:
   Recommended pulling force is 50 N (5.1 kg, 11.2 lb).
5. Install quick connector cap on quick connector joint.

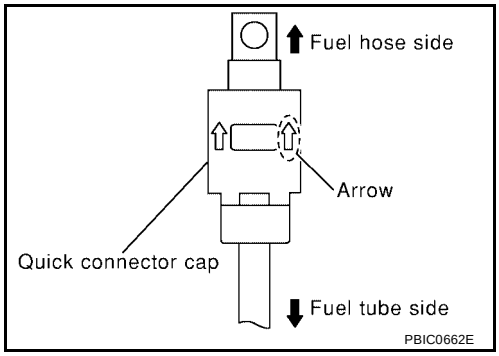
- Direct arrow mark on quick connector cap to upper side (fuel hose side).

6. Install fuel hose to hose clamp.



CONNECTING QUICK CONNECTOR ON THE FUEL HOSE (VEHICLE PIPING SIDE)

1. Make sure no foreign substances are deposited in and around the fuel tube and quick connector, and there is no damage to them.
2. Align center to insert quick connector straight into fuel tube.
   - Insert fuel tube until a click is heard.
   - Install quick connector cap on quick connector joint. Direct arrow mark on quick connector cap upper side.
   - Install fuel hose to hose clamp.



INSPECTION AFTER INSTALLATION

Make sure there is no fuel leakage at connections as follows:

1. Apply fuel pressure to fuel lines by turning ignition ON (with engine stopped). Then check for fuel leaks at connections.
2. Start the engine and rev it up and check for fuel leaks at connections.

   NOTE:
   Use mirrors for checking on hard to see points of the fuel system.

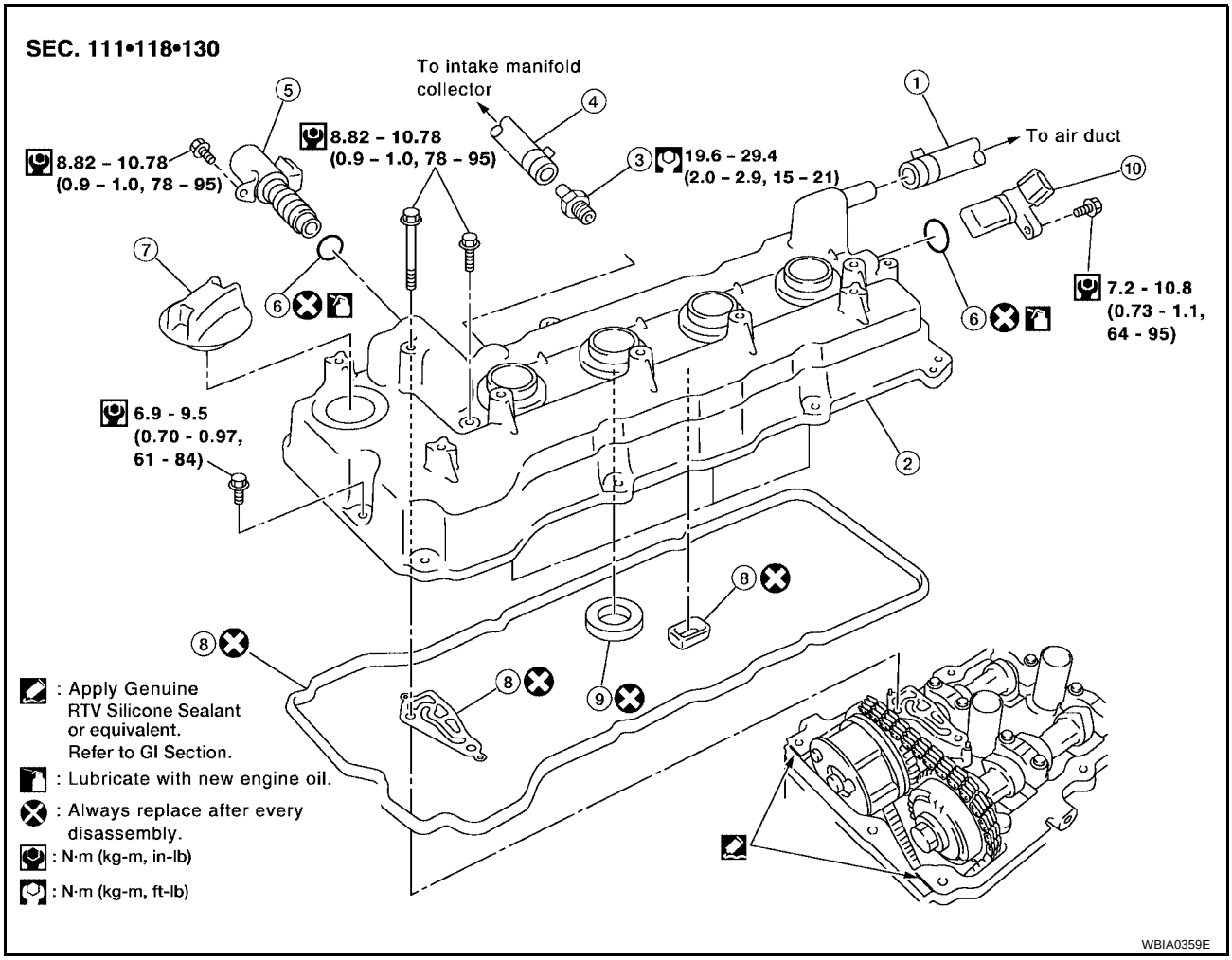
   CAUTION:
   Do not touch the engine immediately after stopping, as the engine becomes extremely hot.

ROCKER COVER

PFP:13264

Removal and Installation

EBS00EWR



1. Blowby hose
2. Rocker cover
3. PCV control valve
4. PCV hose
5. Intake valve timing control solenoid valve
6. O-ring
7. Oil filter cap
8. Gasket
9. Rocker cover oil seal
10. Camshaft position sensor (PHASE)

REMOVAL

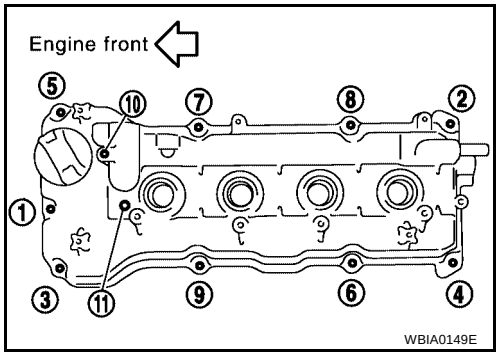
1. Move the harnesses on top surface and right side of rocker cover aside.
2. Remove the ignition coils.
3. Disconnect the PCV hoses from the rocker cover.
4. If necessary, remove the PCV control valve.
5. Disconnect the intake valve timing control solenoid valve and camshaft position sensor (PHASE).
6. If necessary, remove the intake valve timing control solenoid valve and camshaft position sensor (PHASE).

CAUTION:

- **Do not shock it.**
- **Do not disassemble it.**
- **The tip of the camshaft position sensor (PHASE) generates a strong magnetic field. Keep it away from metallic particles or objects affected by magnetic fields.**

7. Loosen the bolts in the numerical order as shown.
8. If replacement is necessary, remove the rocker cover oil seal using a flat-head screwdriver.

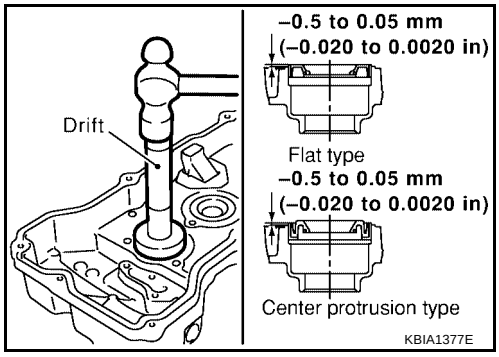
CAUTION:
Be careful not to damage the rocker cover.



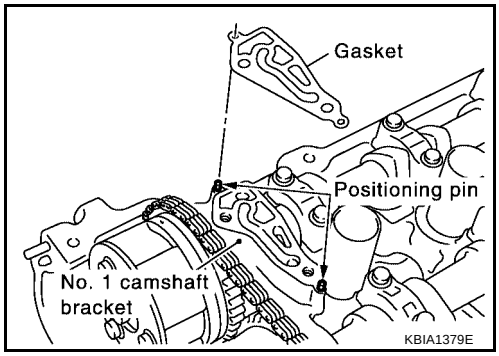
INSTALLATION

1. Install the rocker cover oil seal.
   - Using a drift with outer diameter 97 mm (3.82 in) and inner diameter 83 mm (3.27 in) to 88 mm (3.46 in), press in oil seal.

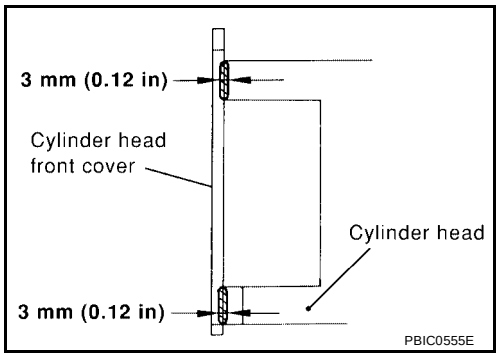
     NOTE:
     There are two types of oil seal. If oil seal with flat bottom surface is pressed in, drift with any inner diameter can be used.
   - Press oil seal in until it is flush with installation surface.



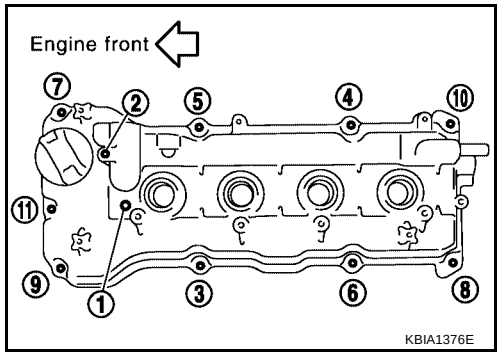
2. Install the gasket on top of No. 1 camshaft bracket.
   - Position the gasket aligning its shape with camshaft bracket side. Align positioning stopper pin with hole gasket, and install.
3. Install the gasket (for circumference, square type) to installation groove of rocker cover.



4. Apply sealant to the positions shown, then install rocker cover.
   - Use Genuine RTV Silicone Sealant, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .



5. Tighten the rocker cover bolts to specified torque in two steps, in the numerical order as shown.



Bolt length:	Bolt position	Torque
25 mm (0.98 in)	: 1	: 6.9 - 9.5 N-m (0.70 - 0.97 kg-m, 61 - 84 in-lb)
65 mm (2.56 in)	: 2	: 6.9 - 9.5 N-m (0.70 - 0.97 kg-m, 61 - 84 in-lb)
20 mm (0.79 in)	Except the above (all circumference)	: 6.9 - 9.5 N-m (0.70 - 0.97 kg-m, 61 - 84 in-lb)

6. Install the intake valve timing control solenoid valve and camshaft position sensor (PHASE).
   - Tighten bolts after fully inserting into rocker cover.

Intake valve timing control solenoid valve bolt	: 8.82 - 10.78 N·m (0.9 - 1.0 kg-m, 78 - 95 in-lb)
Camshaft position sensor (PHASE) bolt	: 7.2 - 10.8 N·m (0.73 - 1.1, 64 - 95 in-lb)

7. Install the PCV control valve.

PCV control valve	: 19.6 - 29.4 N·m (2.0 - 2.9 kg-m, 15 - 21 ft-lb)

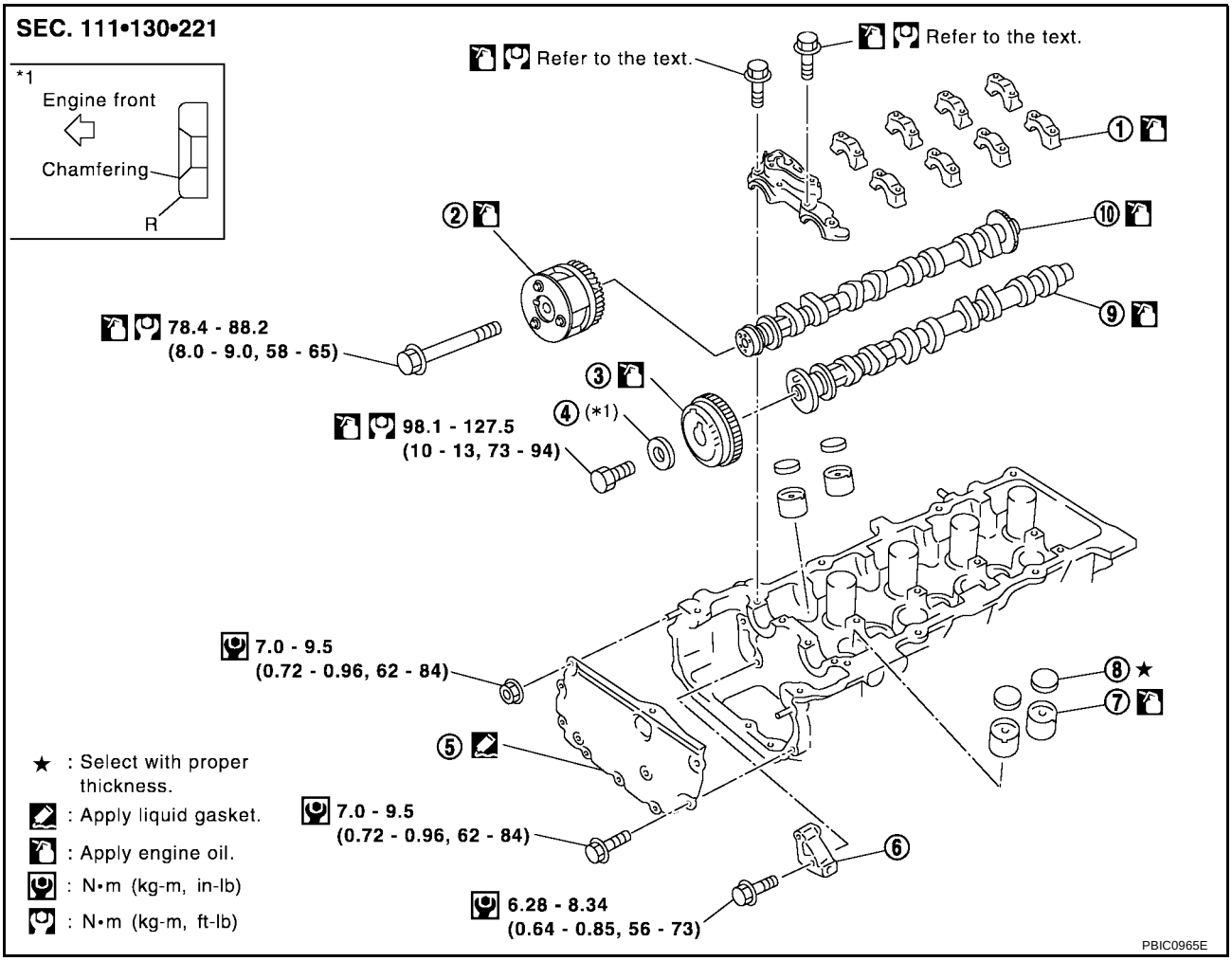
8. Install the remaining components in the reverse order of removal.

CAMSHAFT

PFP:13001

Removal and Installation

EBS00EWS



1. Camshaft brackets
2. Camshaft sprocket (INT)
3. Camshaft sprocket (EXH)
4. Washer
5. Cylinder head front cover
6. Chain tensioner
7. Valve lifter
8. Adjusting shim (if equipped)
9. Camshaft (EXH)
10. Camshaft (INT)

CAUTION:

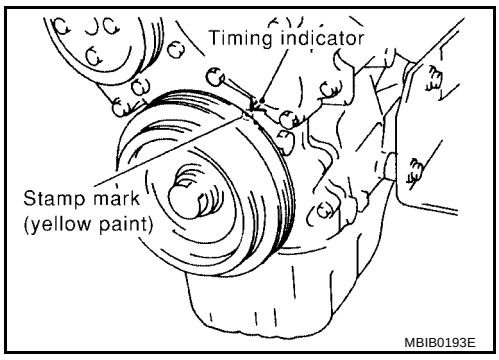
Prior to installation, apply engine oil to the parts marked in the figure.

REMOVAL

1. Remove the rocker cover. Refer to EM-23, "ROCKER COVER" .
2. Remove the cylinder head front cover.
   - Move harness secured to the front surface beforehand.
3. Set No. 1 cylinder at TDC of its compression stroke.

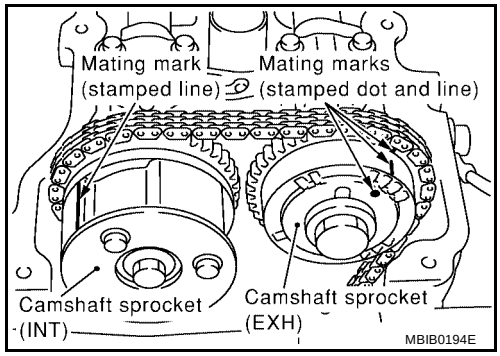
a. Remove the RH splash cover.

b. Rotate crankshaft pulley clockwise and align the yellow paint mark with the timing indicator.



c. Confirm mating marks stamped on intake and exhaust sprockets are located as shown.
   - If not, rotate crankshaft pulley as shown and align them.

d. Referring to mating marks on the intake and exhaust camshaft sprockets, put paint mating marks on timing chain links.

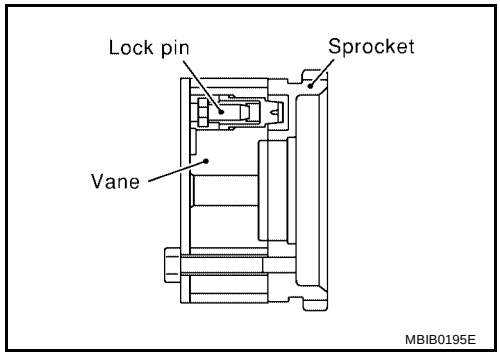


4. Set the intake camshaft sprocket to the most advanced position.

CAUTION:

Removal and installation of the intake camshaft sprocket is required to maintain the most advanced position because of the following reasons. Therefore, follow the procedure exactly.

- **Sprocket and vane (camshaft in front) rotate and become offset within the specific angle range.**
- **When engine is stationary, the vane is located at the most retarded position. The vane is fixed to the sprocket by an internal lock pin. Therefore, it does not rotate.**



- **If the camshaft sprocket mounting bolts are turned under the above circumstance, the lock pin will be damaged by lateral load (shear stress). It may cause non-standard operation.**

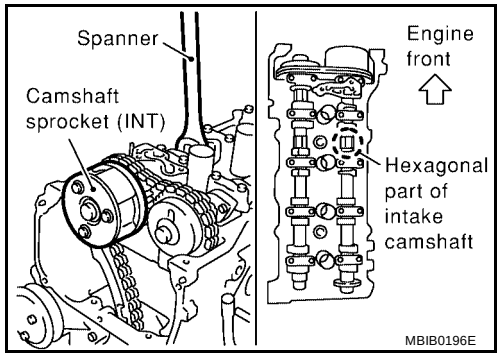
NOTE:

"Rotating direction" means direction viewed from the engine front side.

CAUTION:

Do not remove the chain tensioner before performing this step.

a. Using a wrench, hold the hexagonal part so that the intake camshaft does not move.



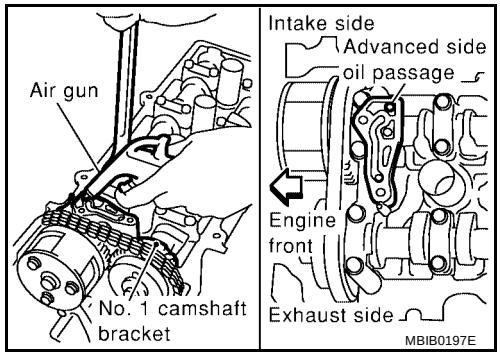
b. Using an air gun, apply air pressure to the intake valve timing control solenoid valve advance side oil passage on the top surface of the No. 1 camshaft bracket.

Compressed air pressure : 300 kPa (3.06 kg/cm2, 43.5 psi) or more

- Keep applying air pressure until step "d" is completed.

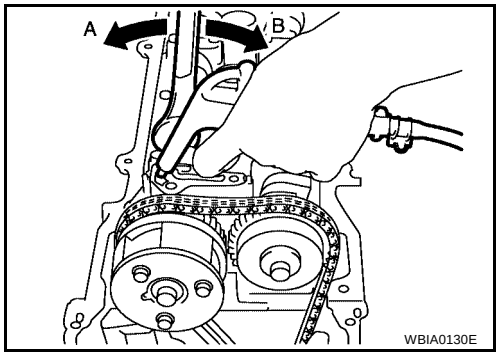
CAUTION:

- **Be careful not to damage the oil passage from interference of the air gun tip.**
- **Thoroughly wipe off the oil before applying air pressure. When applying air pressure, cover around the air gun using a rag. Wear protective glasses if necessary.**



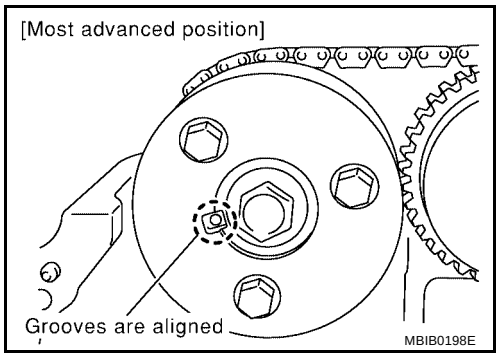
c. Slowly turn the intake camshaft in direction A (counterclockwise: intake manifold side).
   - Perform while applying air pressure.

   CAUTION:
   Be careful not to dislocate the camshaft retaining spanner.



d. During the above step, an operating click (a sound indicating internal lock pin is disengaged) is heard from the inside of the intake camshaft sprocket. After hearing it, slowly turn intake camshaft in direction B (clockwise: exhaust manifold side), and set to most advanced position.
   - Perform while applying air pressure.
   - When the vane rotates solely against sprocket, lock pin is disengaged even if operating click is not heard.
   - If the lock pin is not disengaged, jiggle the camshaft with a wrench.
   - If the lock pin is not disengaged with the above step, tap the intake camshaft in front with a plastic hammer.

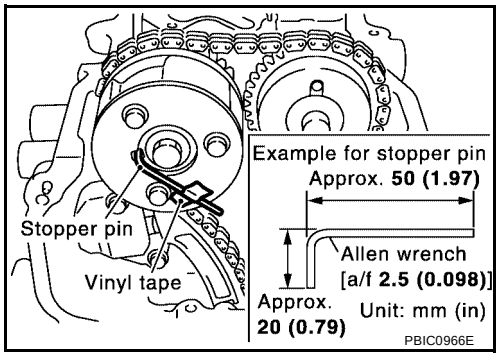
e. The following status indicates that the most advanced position is achieved: vane starts rotating on it own, then the sprocket also starts rotating when camshaft is turned. When above status is achieved, this step is complete.
   - The most advanced position is confirmed when the stopper pin groove and lock pin breathing groove are aligned.



f. Stop the air and insert stopper pin [approximately 3 mm (0.12 in) dia., length of inserted part is approximately 15 mm (0.59 in)] into pinhole on camshaft sprocket to fix the most advanced position.

   NOTE:
   In the figure, an Allen wrench [a/f 2.5 mm (0.091 in), short part: approximately 20 mm (0.79 in), long part: approximately 50 mm (1.97 in)] is used for stopper pin as an example.

   CAUTION:
   Load (spring reaction force) is not applied to stopper pin. Pin is easily detached. Therefore, secure it with vinyl tape to prevent detachment.



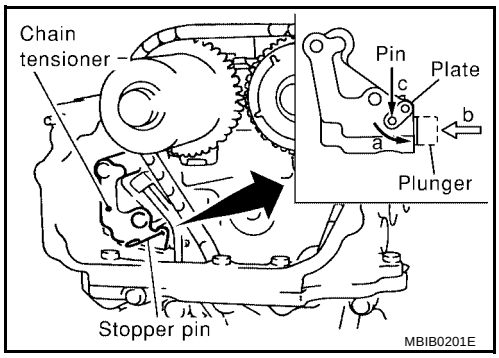
5. Remove the chain tensioner.

a. Press the plate down and release the stopper tab.

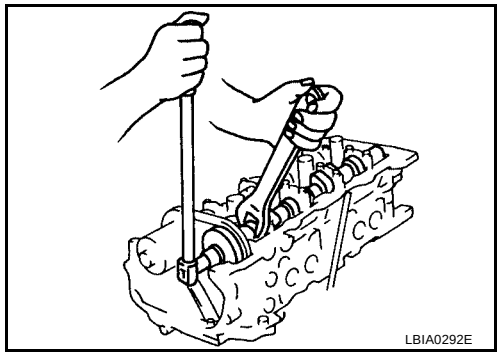
b. Insert the plunger into the tensioner body until it stops.

c. Secure the plate by passing the stopper pin (such as a hard wire) through the plate hole and body hole. (Plunger is also secured.)

d. Remove the mounting bolts and remove the chain tensioner.

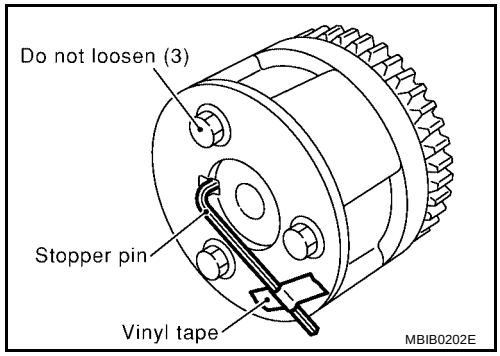


6. While holding the hexagonal part of the camshaft with a wrench, loosen the mounting bolts and remove the intake and exhaust camshaft sprockets.



CAUTION:
- **Avoid securing the camshaft at other than the hexagonal part and loosening mounting bolts by utilizing tension of timing chain.**
- **After this step is completed, do not rotate crankshaft and camshaft separately in order to prevent interference between the valves and pistons.**

7. Handle the intake camshaft sprocket as follows.



CAUTION:
- **Secure the stopper pin with vinyl tape to prevent detachment.**
- **Avoid dropping it or subjecting it to impact.**
- **Do not disassemble. (Do not loosen the 3 bolts on front surface.)**

NOTE:
If stopper pin is detached and the lock pin is engaged at the most retarded position during removal, recover as follows.

a. Reinstall the stopper pin to intake camshaft, and tighten the intake camshaft sprocket mounting bolts so that air does not leak.

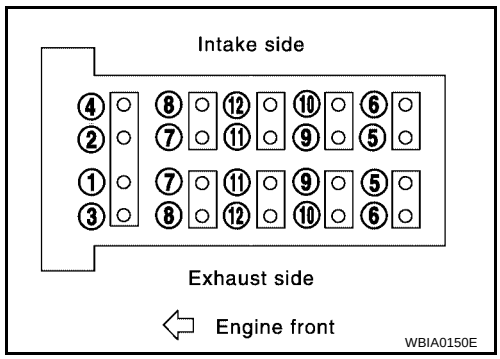
CAUTION:
Tightening torque for the mounting bolts must be minimum so that air does not leak, preventing damage to the internal lock pin.

b. Apply air pressure to disengage the lock pin, and turn the vane to the most advanced position. (This step can be performed with the timing chain removed.)

c. Reinstall stopper pin.

d. Remove intake camshaft sprocket from the camshaft.

8. Loosen the camshaft bracket bolts in the order shown, and remove the camshaft brackets and camshafts.



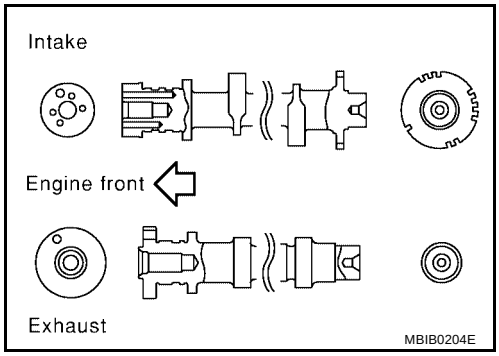
CAUTION:
Be careful not to damage signal plate on rear end of intake camshaft.

9. Remove adjusting shims and valve lifters.
   - Check mounting positions, and set them aside in the order removed.

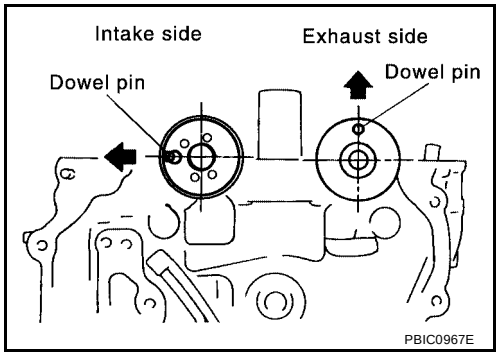
INSTALLATION

1. Install the valve lifter and adjusting shims.
   - Install them in the same position from which they were removed.
   - Install adjusting shim with its stamped mark facing down (valve lifter side).

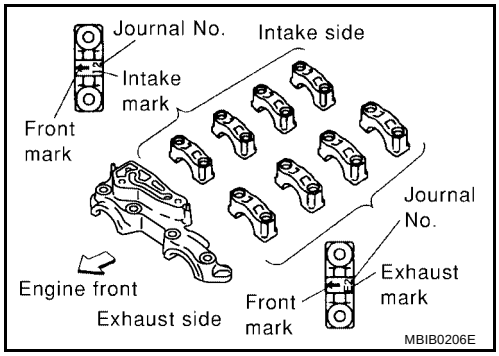
2. Install the camshafts.
   - Intake and exhaust camshafts are distinguished by checking difference between front and rear end shapes.



- Install camshafts so that the dowel pins on the front side are positioned as shown.



3. Install camshaft brackets.
- Completely remove any foreign material on mounting surfaces of camshaft brackets and mounting surface of cylinder head.
- Referring to marks on top surfaces of camshaft brackets, install them to their original positions and in their original directions.



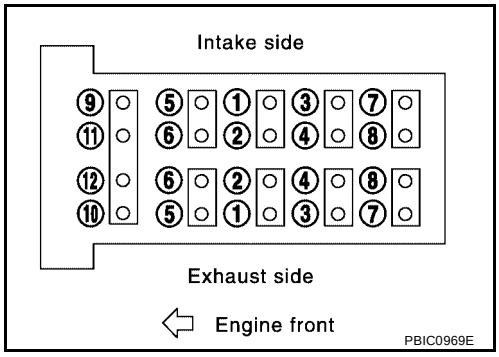
4. Tighten camshaft bracket mounting bolts as follows.
   - Different bolts are used depending on installation location. Refer to following for proper bolt locations.

Bolt color:

1 to 10 in figure	**: black (reamer bolt)**
11 and 12 in figure	**: gold**

Camshaft bracket bolt

Step 1 (bolts 9 - 12)	**: 2.0 N-m (0.2 kg-m, 18 in-lb)**
Step 2 (bolts 1 - 8)	**: 2.0 N-m (0.2 kg-m, 18 in-lb)**
Step 3	**: 5.9 N-m (0.6 kg-m, 52 in-lb)**
Step 4	**: 9.0 - 11.8 N-m (0.92 - 1.2 kg-m, 80 - 104in-lb)**

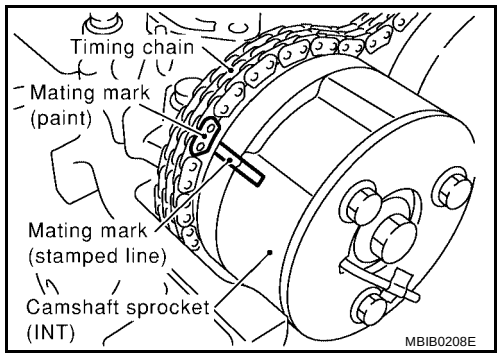


5. Install intake camshaft sprocket as follows.
   - Before installation, make sure that stopper pin is inserted in intake camshaft sprocket.

NOTE:
Service parts are provided with pin inserted.

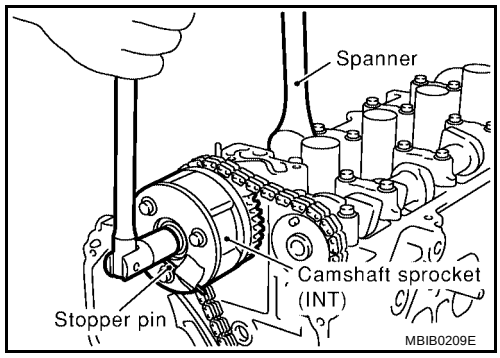
CAUTION:
Stopper pin is easily detached. Secure it with vinyl tape to prevent detachment.

a. Install timing chain by aligning the mating mark (marked when timing chain is removed) with mark on camshaft sprocket.
- Align dowel pin on camshaft front surface and pinhole on sprocket backside, then install.



b. While holding the hexagonal part of camshaft with a wrench, tighten intake camshaft sprocket bolt to specification.
- Make sure that stopper pin is not detached.

Intake camshaft sprocket bolt	**: 78.4 - 88.2 N·m (8.0 - 9.0 kg-m, 58 - 65 ft-lb)**



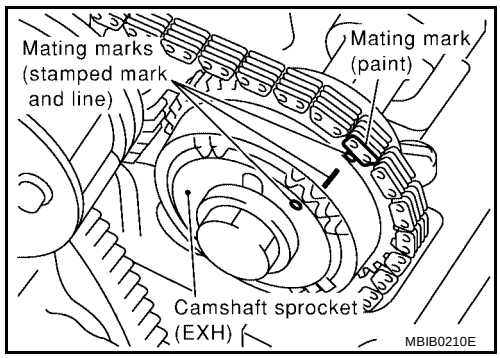
6. Install exhaust camshaft sprocket as follows.

a. Install timing chain by aligning the mating mark (marked when timing chain is removed) with mark on camshaft sprocket.
- Align dowel pin on camshaft front surface and pinhole on sprocket, then install.

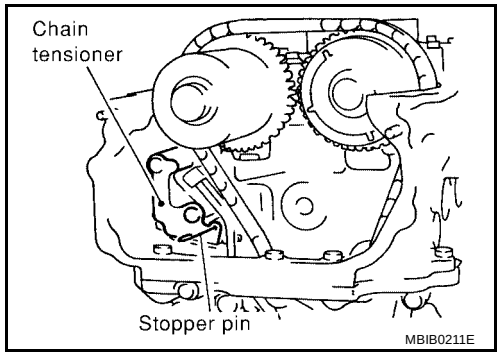
b. While holding the hexagonal part of the camshaft with a wrench, tighten exhaust camshaft sprocket bolt to specification.

Exhaust camshaft sprocket bolt	**: 98.1 - 127.5 N-m (10 - 13 kg-m, 73 - 94 ft-lb)**

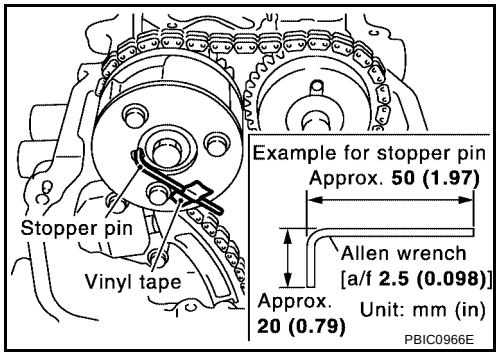
c. Make sure that mating marks on intake/exhaust camshaft sprockets and mating mark on timing chain are aligned.



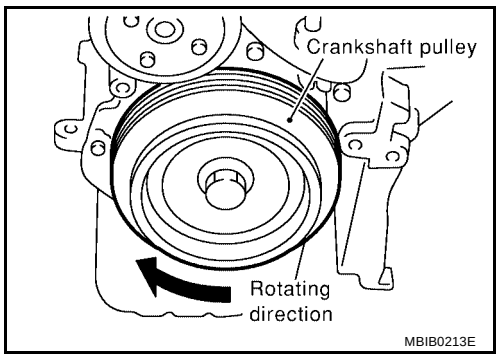
7. Install chain tensioner.
- Hold plate and plunger with a stopper pin, then install them.
- After installation, remove stopper pin and release plunger.
- Make sure again that mating marks on intake/exhaust camshaft sprockets and mating mark on timing chain are aligned.



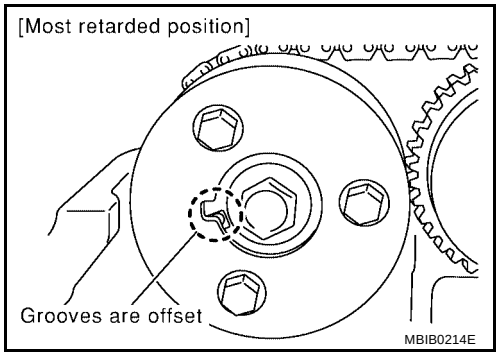
8. Remove stopper pin from intake camshaft sprocket.



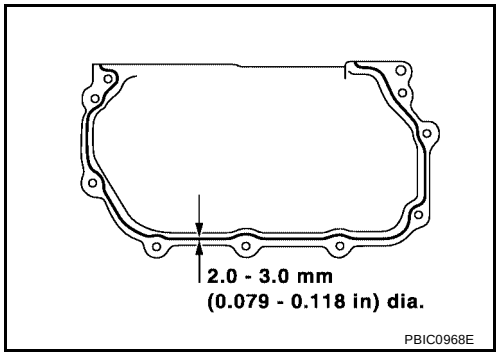
9. Slowly turn crankshaft pulley clockwise to set intake camshaft sprocket to most retarded position.



- The sprocket begins turning after the crankshaft does. Once sprocket starts turning, keep turning crankshaft until the vane (camshaft) also begins turning. The most retarded position should now be achieved.
- The most retarded position is confirmed when stopper pin groove is at a clockwise offset from lock pin breathing groove.
- While turning crankshaft slightly more counterclockwise, confirm that the lock pin is engaged when vane and sprocket turn together.



10. Install cylinder head front cover.
    - Apply Genuine Anaerobic Liquid Gasket or equivalent as shown in the figure. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .
    - Install it by aligning the dowel pin on the cylinder head.
11. Check and adjust valve clearance. Refer to EM-35, "Valve Clearance" .
12. Install the remaining components in the reverse order of removal.



INSPECTION AFTER REMOVAL

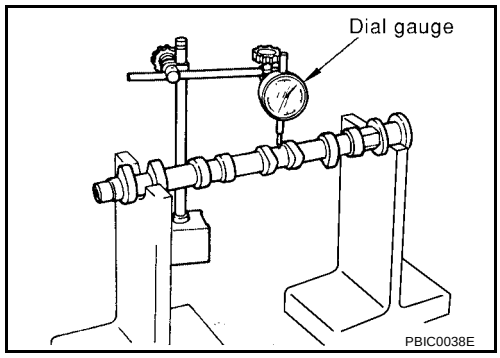
Check camshaft for scratches, seizure and wear.

Camshaft Runout

1. Put the camshaft on a V-block supporting the No.2 and No.5 journals.
2. Set the dial gauge vertically on the No.3 journal.
3. Turn camshaft in one direction by hand, and measure the camshaft runout on the dial gauge total indicator reading.

Standard : Less than 0.02 mm (0.0008 in)
Limit : 0.1 mm (0.004 in)

4. If it exceeds the limit, replace camshaft.

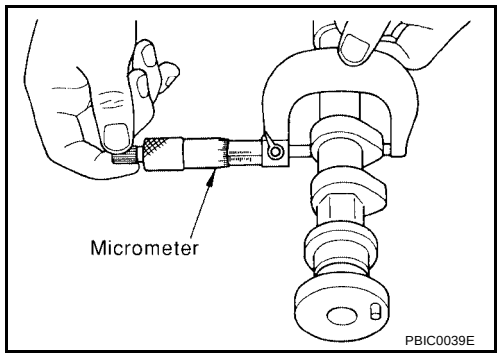


Camshaft Cam Height

1. Measure the camshaft cam height.

Standard intake cam height : 40.61 - 40.8 mm (1.599 - 1.606 in)
Standard exhaust cam height : 38.965 - 39.155 mm (1.534 - 1.542 in)
Cam wear limit : 0.20 mm (0.0079 in)

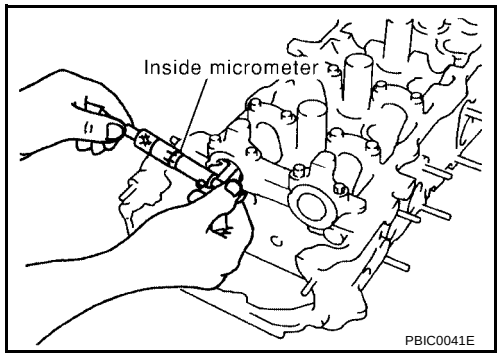
2. If wear is beyond the limit, replace the camshaft.



Camshaft Journal Clearance

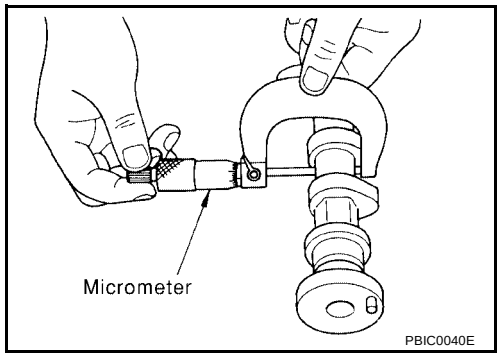
1. Install the camshaft brackets and tighten the bolts to specified torque.
2. Using inside micrometer, measure inner diameter of camshaft bracket.

Standard No. 1 Intake and exhaust : 28.000 - 28.021 mm (1.1024 - 1.1032 in)
Standard No.2, 3, 4, 5
Intake : 23.985 - 24.006 mm (0.9443 - 0.9451 in)
Exhaust : 24.000 - 24.021 mm (0.9449 - 0.9457 in)



3. Measure the outer diameter of the camshaft journal.

Standard No.1 : 27.935 - 27.955 mm (1.0998 - 1.1006 in)
Standard No. 2, 3, 4, 5 : 23.935 - 23.955 mm (0.9423 - 0.9431 in)



4. If the journal clearance exceeds the limit, replace camshaft and/or cylinder head.
   - (Camshaft journal clearance) = (inner diameter of camshaft bracket) – (outer diameter of camshaft journal)

Camshaft journal clearance

Standard

Intake	**: 0.030 - 0.071 mm (0.0012 - 0.0028 in)**
Exhaust	**: 0.045 - 0.086 mm (0.0018 - 0.0034 in)**

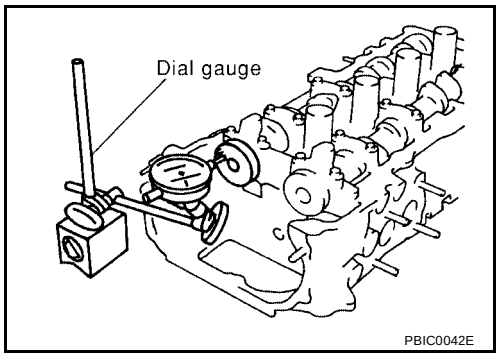
Limit

Intake	**: 0.135 mm (0.0053 in)**
Exhaust	**: 0.150 mm (0.0059 in)**

NOTE:
Inner diameter of the camshaft bracket is manufactured together with the cylinder head. If the camshaft bracket is out of specification, replace the entire cylinder head assembly.

Camshaft End Play

1. Install camshaft in cylinder head. Refer to EM-29, "INSTALLATION"
2. Install a dial gauge in the thrust direction on the front end of the camshaft. Measure the end play with the dial gauge while moving the camshaft forward and backward (in direction to axis).



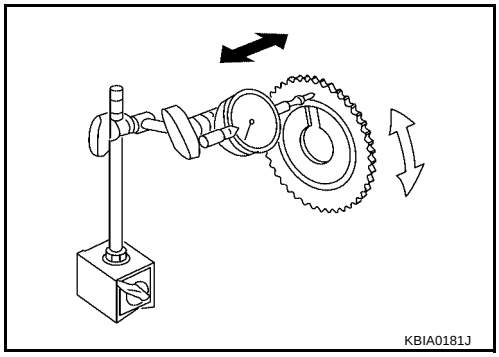
Camshaft end play

Standard	**: 0.115 - 0.188 mm (0.0045 - 0.0074 in)**
Limit	**: 0.20 mm (0.0079 in)**

3. If out of the specified range, replace with new camshaft and measure again.
4. If out of the specified range again, replace with new cylinder head assembly.

Camshaft Sprocket Runout

1. Install the camshaft sprocket on the camshaft.
2. Measure camshaft sprocket runout while turning the camshaft by hand.

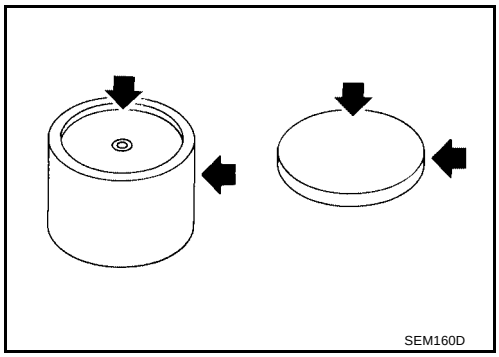


Runout (total indicator reading **: Less than 0.15 mm (0.0059 in)**

3. If it exceeds the specification, replace camshaft sprocket.

Valve Lifter and Valve Shim

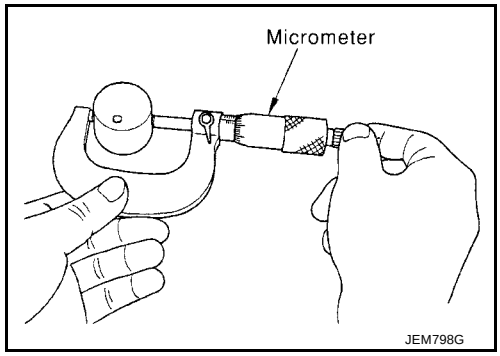
1. Check contact and sliding surfaces for excessive wear or cracks, replace as necessary.



2. Measure the valve lifter outer diameter.

Valve lifter outer diameter : **29.960 - 29.975 mm (1.1795 - 1.1801 in)**

If out of the specified range, replace the valve lifter.

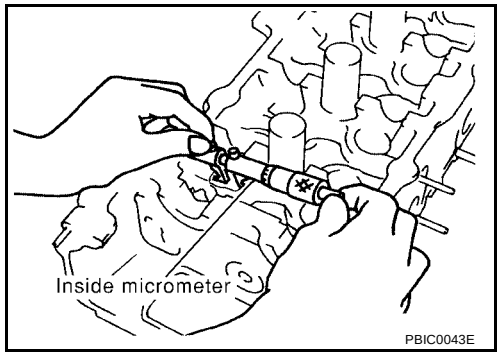


3. Measure the valve lifter guide bore.

Standard : **30.000 - 30.021 mm (1.1811 - 1.1819 in)**

4. Calculate valve lifter clearance. If out of specified range, replace valve lifter and/or cylinder head of whichever exceeds standard limit.
(Valve lifter clearance) = (valve lifter guide bore) – (outer diameter of valve lifter)

Valve lifter clearance : **0.025 - 0.065 mm (0.0010 - 0.0026 in)**



Valve Clearance

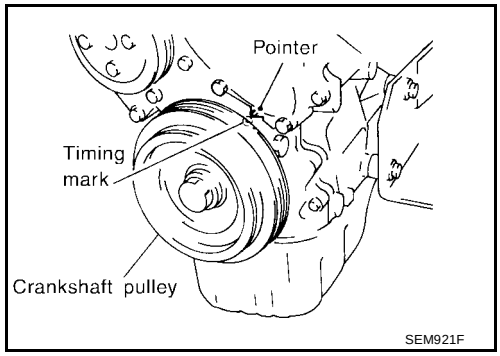
EBS00CES

INSPECTION

NOTE:
The following procedure is applicable when: components related to camshafts or valves are removed, installed, or replaced. Driveability concerns (poor starting, poor idling, noise) are caused by valve clearance aging.

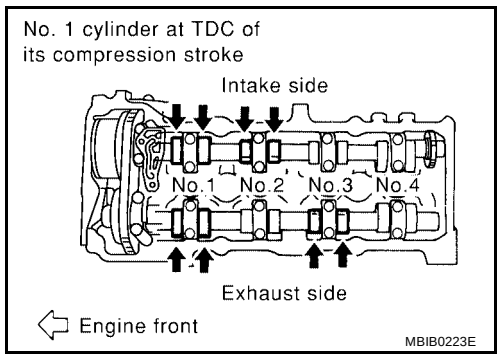
1. Warm engine and stop.
2. Remove RH splash cover.
3. Remove the rocker cover. Refer to EM-23, "ROCKER COVER" .
4. Remove all of the spark plugs.
5. Set No. 1 cylinder at TDC on its compression stroke.
   - Align pointer with TDC mark on crankshaft pulley.
   - Check that both intake and exhaust cam noses on No. 1 cylinder face outward.
   - If not, turn crankshaft one revolution (360°) and align as described above.

   NOTE:
   Or, valves to be checked when No. 4 cylinder is at TDC of its compression stroke can be checked first following step 8.

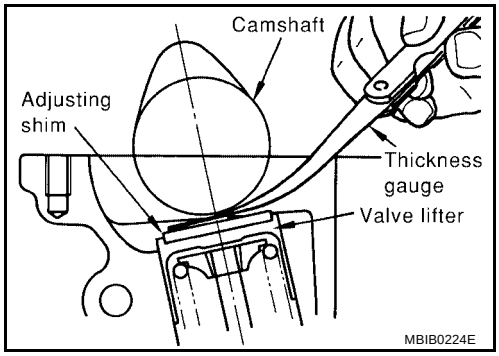


6. Referring to figure, measure valve clearances of valves with x in table below using a thickness gauge.

Cylinder	No. 1		No. 2		N0. 3		No. 4	
Valve	INT	EXH	INT	EXH	INT	EXH	INT	EXH
No. 1 cylinder at TDC of its compression stroke	X	X	X			X		

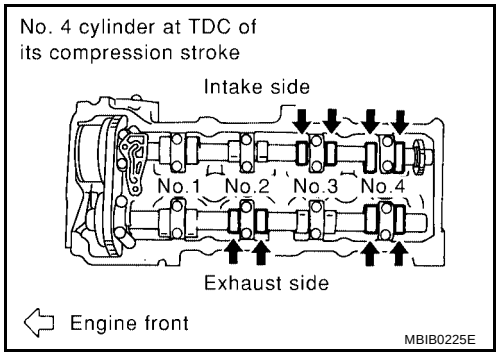


- Using a feeler gauge, measure clearance between valve lifter and camshaft.
- Record any valve clearance measurements which are out of specification. They will be used later to determine the required replacement adjusting shim.



Valve clearance standard:		
Hot	**Intake**	**: 0.32 - 0.40 mm (0.013 - 0.016 in)**
	Exhaust	**: 0.37 - 0.45 mm (0.015 - 0.018 in)**
Cold*	**Intake**	**: 0.25 - 0.33 mm (0.010 - 0.013 in)**
	Exhaust	**: 0.32 - 0.40 mm (0.013 - 0.016 in)**
***:Approximately 20°C (68°F) (Reference data)**		
If an adjustment is done with a cold engine, confirm reference values with hot engine are met.		
Limit values with hot engine (reference)	**Intake**	**: 0.21 - 0.47 mm (0.008 - 0.019 in)**
	Exhaust	**: 0.30 - 0.56 mm (0.012 - 0.022 in)**

7. Turn crankshaft one revolution (360°) to position No. 4 cylinder at TDC of its compression stroke.
8. Check only those valves shown in the figure and marked with an x in the table.



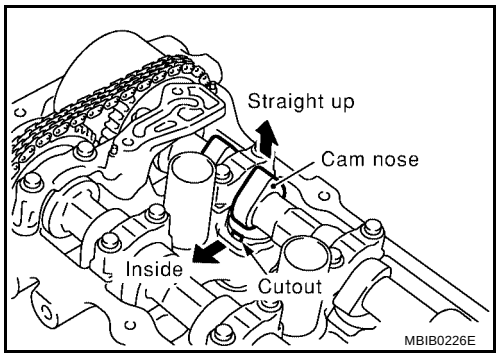
Cylinder	No. 1		No. 2		N0. 3		No. 4	
Valve	INT	EXH	INT	EXH	INT	EXH	INT	EXH
No. 4 cylinder at TDC of its compression stroke				X	X		X	X

9. If outside the standard, adjust applicable valves. Refer to EM-36, "ADJUSTING" .

ADJUSTING

Adjust valve clearance while engine is cold.

1. Turn crankshaft clockwise (viewed from front) to position cam lobe upward on camshaft for valve that must be adjusted.
2. Turn valve lifter and adjusting shim to removal direction.
   - Using a slotted screwdriver with an extra-thin tip, turn the valve lifter cutout in the direction shown by the arrow.

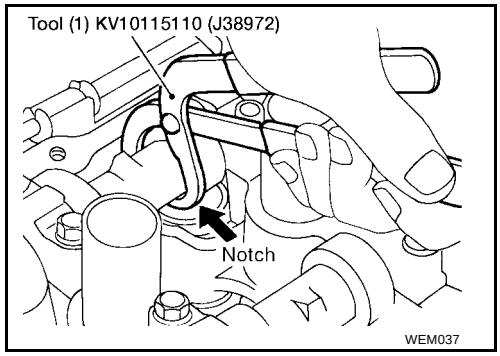


3. Place Tool (1) around camshaft as shown.

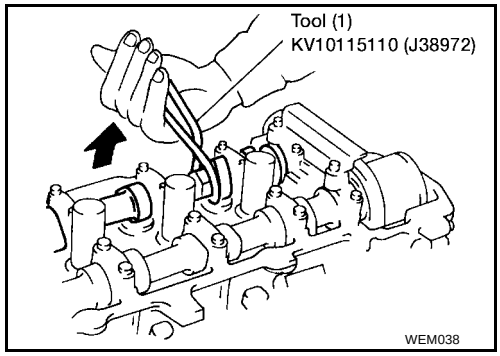
Before placing Tool (1), rotate notch toward center of cylinder head. This will simplify shim removal later.

CAUTION:

- **Be careful not to damage camshaft and cylinder head.**
- **Be careful not to damage surroundings of valve lifter.**



4. Rotate Tool (1) so that valve lifter is pushed down, compressing the spring.

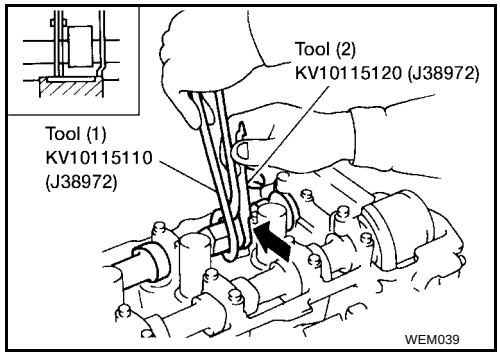


5. Place Tool (2) between camshaft and valve lifter to retain valve lifter.

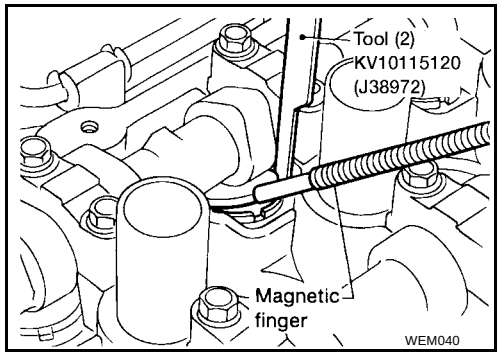
CAUTION:

- **If camshaft pliers are suddenly turned back, the lifter stopper may contact and damage the camshaft journals. Turn back the camshaft pliers carefully to remove.**
- **Tool (2) must be placed as close to camshaft bracket as possible.**
- **Be careful not to damage cam surface with Tool (2).**

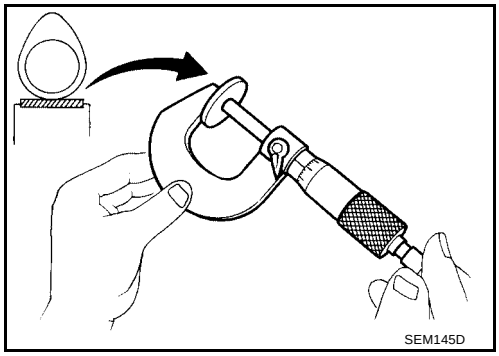
6. Remove Tool (1).



7. Keep adjusting shim slightly up from the valve lifter. Remove adjusting shim using Tool and a magnetic finger.



8. Determine replacement adjusting shim size using the following formula.
   - Use a micrometer to determine thickness (t1) of removed shim at camshaft contact face (around center).
   - Use t1 + (C1-C2) to calculate thickness of new adjusting shim so valve clearance comes within specified values.
     t1 = Thickness of removed shim
     C1 = Measured valve clearance
     C2 = Standard valve clearance



Hot engine:

Intake : 0.32 - 0.40 mm (0.013 - 0.016 in)

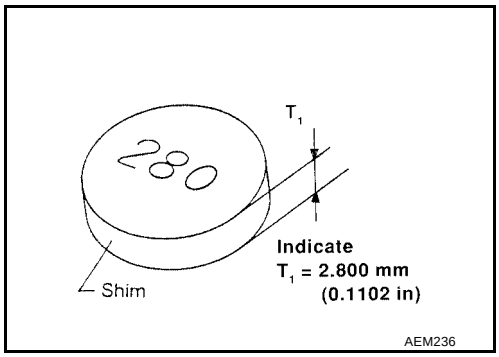
Exhaust : 0.37 - 0.45 mm (0.015 - 0.018 in)

Reference values with cold engine:

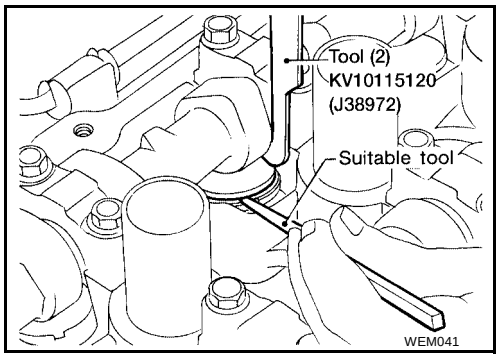
Intake : 0.25 - 0.33 mm (0.010 - 0.013 in)

Exhaust : 0.32 - 0.40 mm (0.013 - 0.016 in)

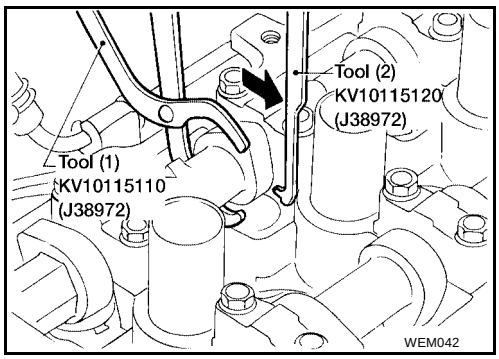
- Thickness of new adjusting shim is indicated with stamped mark on its back.
- **Shims are available in 50 sizes from 2.00 mm (0.0787 in) to 2.98 mm (0.1173 in), in steps of 0.02 mm (0.0008 in).**
- Select the closest size shim to the calculated thickness. Refer to EM-83, "Available Shims" .



9. Install new shim using a suitable tool.
   - **Install with the surface on which the thickness is stamped facing down.**



10. Place Tool (1) as explained in steps 4 and 5.
11. Remove Tool (2).
12. Remove Tool (1).
13. Turn the crankshaft a couple of times by hand.
14. Recheck the valve clearance.

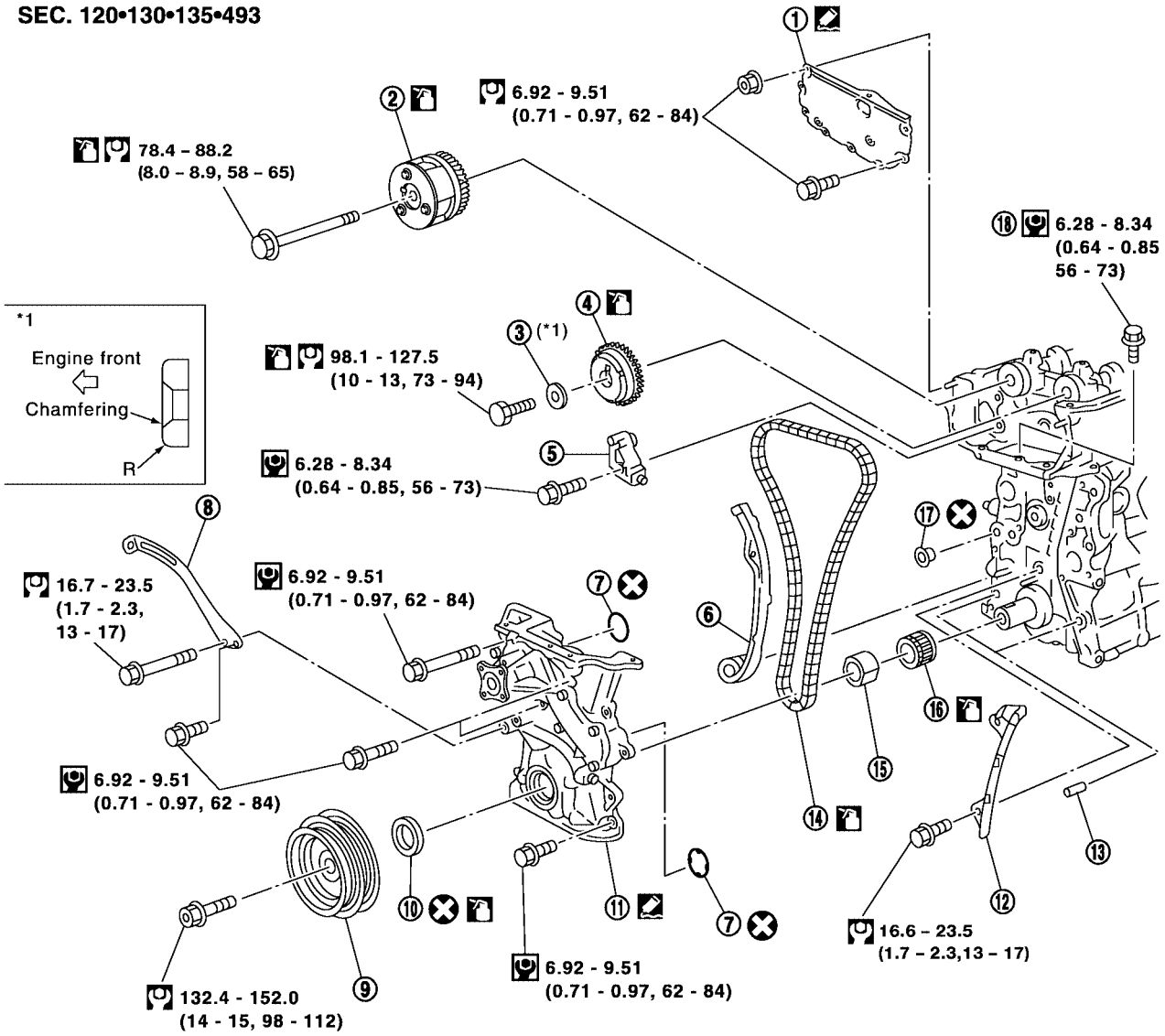


TIMING CHAIN

PFP:13028

Components

EBS00CEH



WBIA0298E

1. Cylinder head front cover	2. Camshaft sprocket (INT)	3. Washer
4. Camshaft sprocket (EXH)	5. Chain tensioner	6. Chain slack guide
7. O-ring	8. Power steering pump adjusting bar	9. Crankshaft pulley
10. Front oil seal	11. Front cover	12. Chain tensioner guide
13. Dowel pin	14. Timing chain	15. Oil pump drive spacer
16. Crankshaft sprocket	17. O-ring (with collar)	18. Auxiliary bolt of cylinder head

CAUTION:

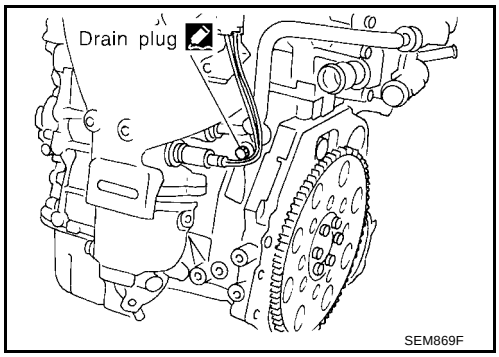
- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**
- **When installing chain tensioner, oil seats, or other sliding parts, lubricate contacting surfaces with new engine oil.**

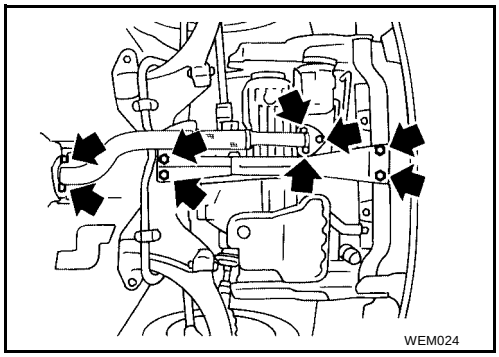
- **Apply new engine oil to bolt threads and seat surfaces when installing camshaft sprocket and crankshaft pulley.**

Removal

EBS00CEI

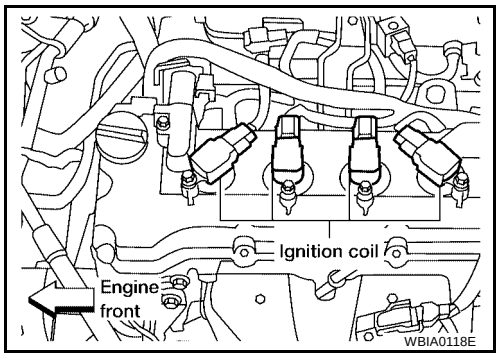
1. Disconnect battery ground cable.
2. Drain engine coolant. Refer to MA-16, "DRAINING ENGINE COOLANT" .
   Be careful not to spill coolant on drive belts.
3. Drain engine oil. Refer to MA-20, "Changing Engine Oil" .
4. Remove the following belts.
   - Power steering pump drive belt
   - Alternator drive belt
5. Remove power steering pump from adjusting bar.
6. Remove alternator. Refer to SC-31, "Removal" .
7. Remove front RH wheel. Refer to WT-4, "Removal" .
8. Remove front/right-side splash undercover.
9. Remove center member.
10. Remove front exhaust tube. Refer to EX-3, "Removal and Installation" .





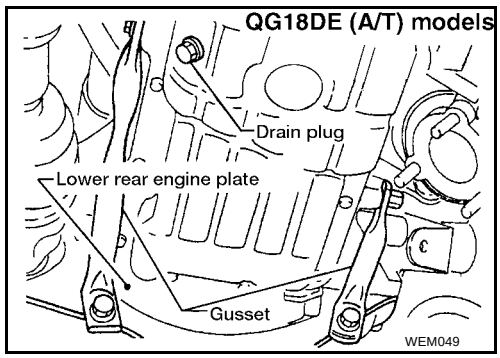
11. Disconnect vacuum hoses for:
    - EVAP canister
    - Brake power booster

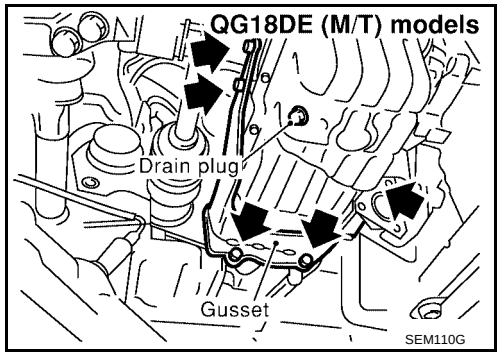
12. Remove ignition coils.
13. Remove spark plugs.



14. Remove rocker cover. Refer to EM-23, "REMOVAL"
15. Remove oil level gauge.

16. Remove gusset.





17. Remove rear plate (lower)(A/T models).
18. Remove oil pan and oil strainer. Refer to EM-16, "Removal" .
19. For safe operation, and to reduce load to mount insulator, install center member.
20. Remove RH engine mounting and RH engine mounting bracket. Refer to EM-63, "ENGINE ASSEMBLY" .

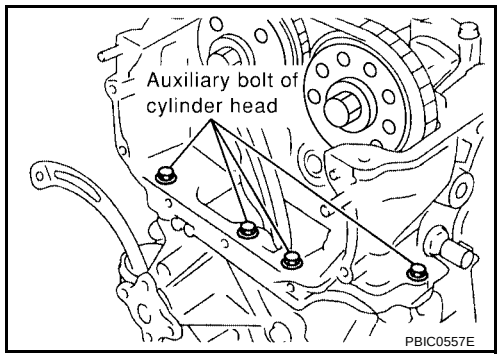
a. Remove any parts that make it difficult to remove RH mount.
b. Support cylinder block bottom surface with a transmission jack.

CAUTION:

- **When positioning jack, use a wooden block to avoid damage to the oil pan mounting surface.**

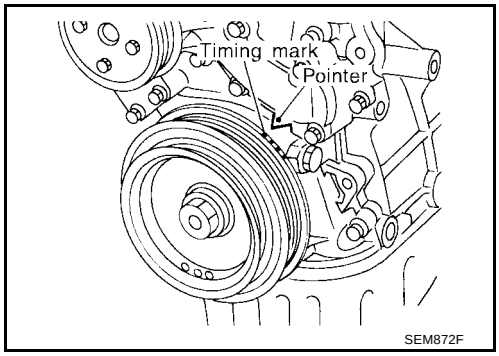
c. Separate and remove engine mounting bracket and engine mounting.

21. Remove cylinder head front cover.
22. Remove auxiliary bolts of cylinder head.

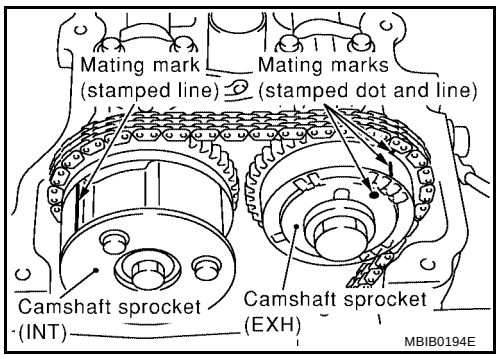


23. Set No. 1 piston at TDC on its compression stroke.

a. Turn the crankshaft pulley clockwise, and align the pointer to the timing mark on the pulley.



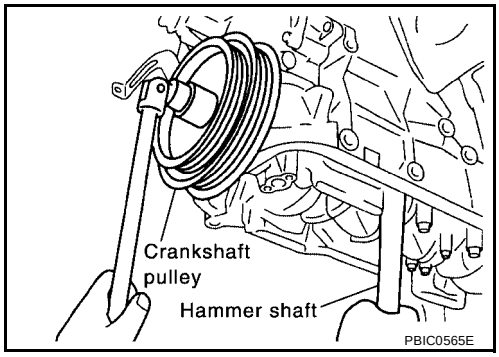
b. Make sure the camshaft sprocket mating mark is in the position shown in the figure.
   - If the mating mark is not in position, turn the crankshaft pulley once more and position it.



24. Remove crankshaft pulley as follows.

a. Secure crankshaft counterweight with the handle of a hammer, and loosen crankshaft pulley bolt.

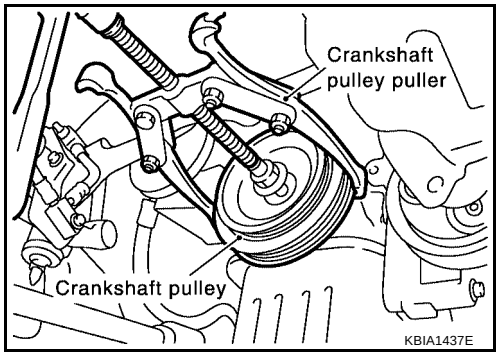
CAUTION:
Take care to prevent foreign material from entering the engine.



b. Remove crankshaft pulley using crankshaft pulley puller.

CAUTION:
- **Hook tab onto back of crankshaft pulley only.**
- **Do not remove crankshaft pulley bolt. Fully loosen, and then use it as support point.**

25. Remove water pump pulley and idler pulley bracket assembly.

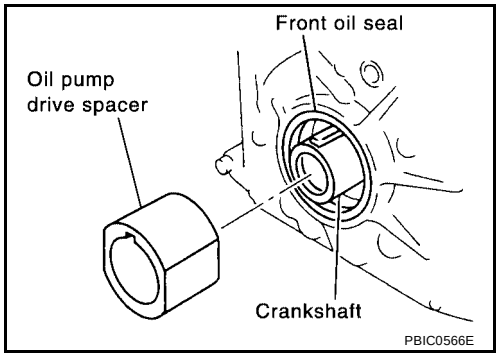


26. Remove front cover as follows.

a. To ease front cover removal, pull oil pump drive spacer out through front oil seal.
   - Pull it straight out using long nose pliers or two flat-bladed screwdrivers.

CAUTION:
Be careful not to damage side of oil pump drive spacer and front oil seal lip.

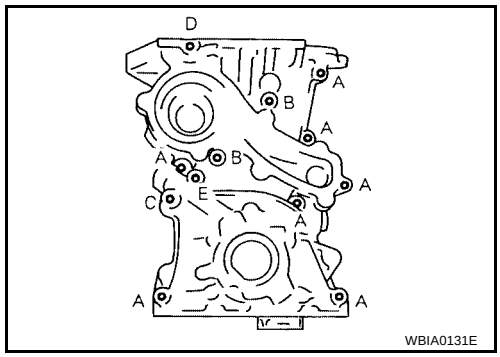
b. Remove power steering pump adjusting bar.



c. Remove front cover carefully.
- Remove mounting bolts A - E shown in figure.

NOTE:
Bolts C and E have been removed in step b.

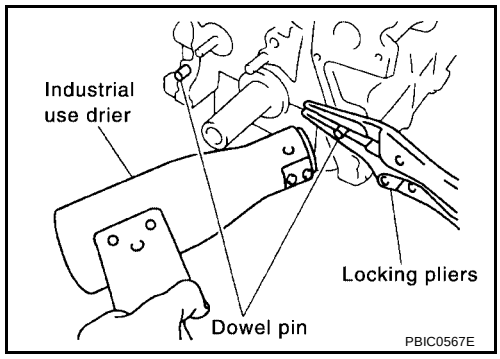
CAUTION:
- **When removing, be careful not to damage or bend front end of cylinder head gasket. Also after peeling off contact surface between front cover and gasket, their surfaces shall be smooth.**
- **If cylinder head gasket is damaged, replace it with a new one.**



WBIA0131E

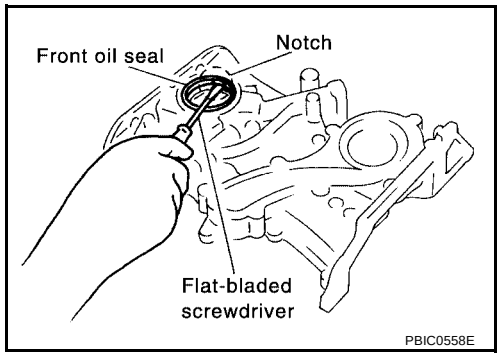
d. Remove O-rings from front cover and cylinder block.

27. Pull two dowel pins for front cover out of cylinder block.
- **Heat them sufficiently with industrial dryer, then pull them out using locking pliers.**



PBIC0567E

28. If front oil seal is to be replaced, remove it from the front cover.
- Insert a flat-bladed screwdriver in notch on oil seal mounting point, and pry out oil seal.

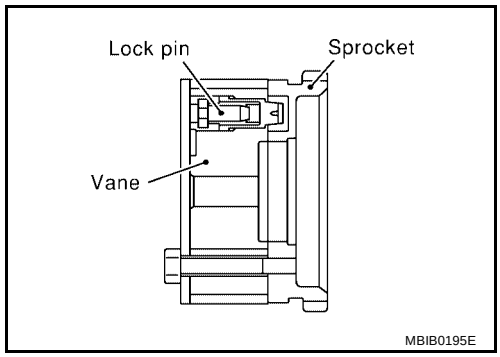


PBIC0558E

29. Set the intake camshaft sprocket to the most advanced position.

CAUTION:
Do not remove the chain tensioner before performing this step.

CAUTION:
Removal/installation of the intake camshaft sprocket is required to maintain the most advanced position because of the following reasons. Therefore, follow the procedure exactly.
- **Sprocket and vane (camshaft in front) rotate and become offset within the specific angle range.**

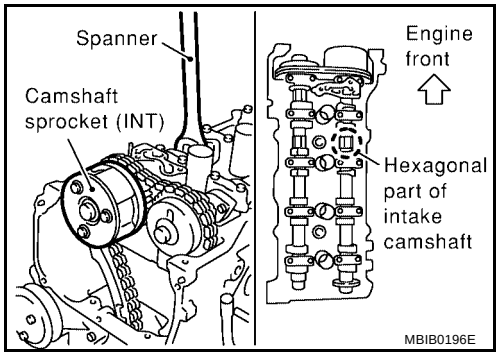


MBIB0195E

- **When engine is stationary, the vane is located at the most retarded position. The vane is fixed to the sprocket by an internal lock pin. Therefore, it does not rotate.**
- **If the camshaft sprocket mounting bolts are turned under the above circumstance, the lock pin will be damaged by lateral load (shear stress). It may cause non-standard operation.**

NOTE:
"Rotating direction" means direction viewed from the engine front side.

a. Using a wrench, hold the hexagonal part so that the intake camshaft does not move.



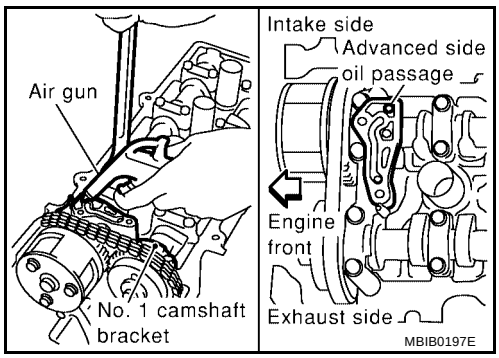
b. Using an air gun, apply air pressure to the intake valve timing control solenoid valve advance side oil passage on the top surface of the No. 1 camshaft bracket.

Compression pressure :300 kPa (3.06 kg/cm2, 43.5 psi) or more

- Keep applying air pressure until substep d is completed.

CAUTION:

- **Be careful not to damage the oil passage from interference of the air gun tip.**
- **Thoroughly wipe off the oil before applying air pressure. When applying air pressure, cover around the air gun using a rag. Wear protective glasses if necessary.**



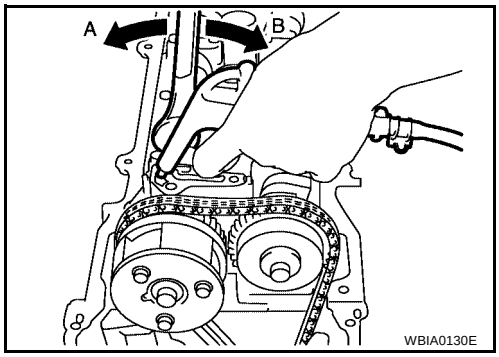
c. Slowly turn the intake camshaft in direction A (counterclockwise: intake manifold side).

CAUTION:

Be careful not to dislocate the camshaft retaining spanner.

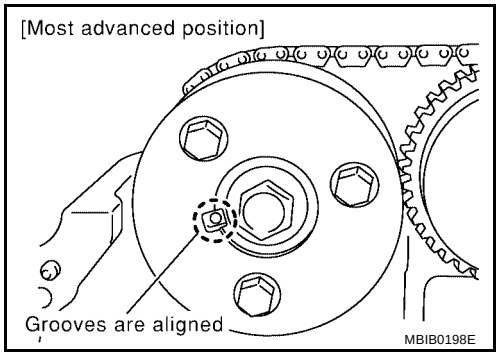
d. During the above step, an operating click (a sound indicating internal lock pin is disengaged) is heard from the inside of the intake camshaft sprocket. After hearing it, slowly turn intake camshaft in direction B (clockwise: exhaust manifold side), and set to most advanced position.

- Perform while applying air pressure.
- When the vane rotates solely against sprocket, lock pin is disengaged even if operating click is not heard.
- If the lock pin is not disengaged, jiggle the camshaft with a wrench.
- If the lock pin is not disengaged with the above step, tap the intake camshaft in front with a plastic hammer.



e. The following status indicates that the most advanced position is achieved: vane starts rotating on it own, then the sprocket also starts rotating when camshaft is turned. When above status is achieved, this step is complete.

- The most advanced position is confirmed when the stopper pin groove and lock pin breathing groove are aligned.



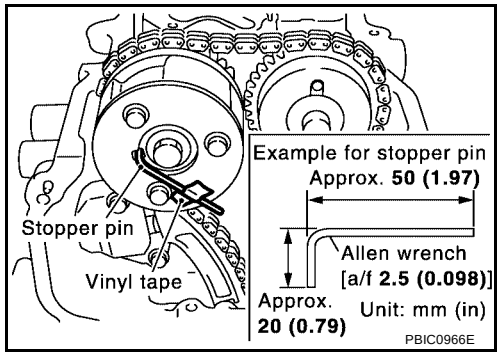
f. Stop the air and insert stopper pin [approximately 3 mm (0.12 in) dia., length of inserted part is approximately 15 mm (0.59 in)] into pinhole on camshaft sprocket to fix the most advanced position.

CAUTION:

Load (spring reaction force) is not applied to stopper pin. Pin is easily detached. Therefore, secure it with vinyl tape to prevent detachment.

NOTE:

In the figure, an Allen wrench [a/f 2.5 mm (0.098 in), short part: approximately 20 mm (0.79 in), long part: approximately 50 mm (1.97 in)] is used for stopper pin as an example.



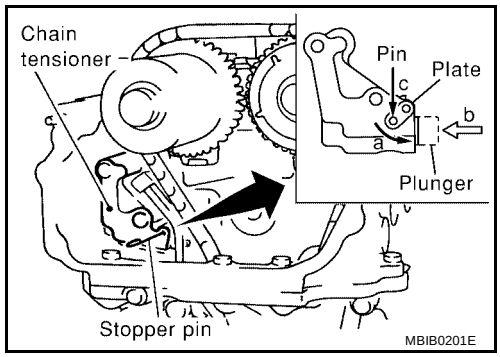
30. Remove the chain tensioner.
    - Remove in the following order.

a. Press the plate down and release the stopper tab.

b. Insert the plunger into the tensioner body until it stops.

c. Secure the plate by passing the stopper pin (such as a hard wire) through the plate hole and body hole. (Plunger is also secured.)

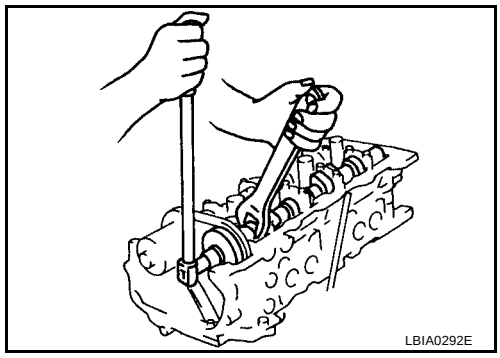
d. Remove the mounting bolts and remove the chain tensioner.



31. While holding the hexagonal part of the camshaft with a wrench, loosen the mounting bolts and remove the intake and exhaust camshaft sprockets.

CAUTION:

- **Avoid securing the camshaft at other than the hexagonal part and loosening mounting bolts by utilizing tension of timing chain.**
- **After this step is completed, do not rotate crankshaft and camshaft separately in order to prevent interference between the valves and pistons.**

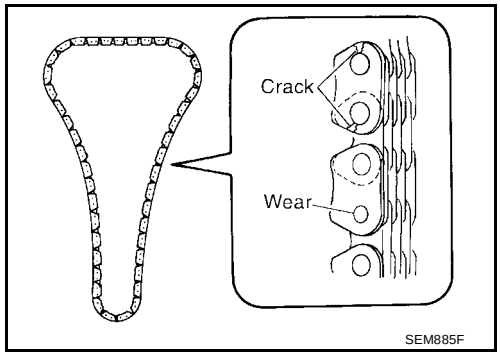


32. Remove the timing chain, timing chain slack guide and tension guide.
33. Remove crankshaft sprocket.

INSPECTION AFTER REMOVAL

EBS00CEJ

Check for cracks and excessive wear at roller links. Replace if necessary.



INSTALLATION

EBS00CEK

CAUTION:

- **Use a scraper to completely remove all liquid gasket adhering to mounting surface. De-grease and clean mounting surfaces.**
- **After installation, wipe off any protruding liquid gasket.**

1. Install timing chain and its related parts as follows.

- Refer to figure for proper alignment positions for the sprockets, timing chain and their related parts.
- Install each sprocket with its mating mark facing the engine front side.

a. Install timing chain and crankshaft sprocket.
- Make sure that the crankshaft key points straight up (No. 1 cylinder is at TDC).
- Hook timing chain on front end of camshaft so that it will not fall off.

b. Install timing chain slack guide and tension guide.

c. Install the camshaft sprocket. Refer to EM-29, "INSTALLATION" .

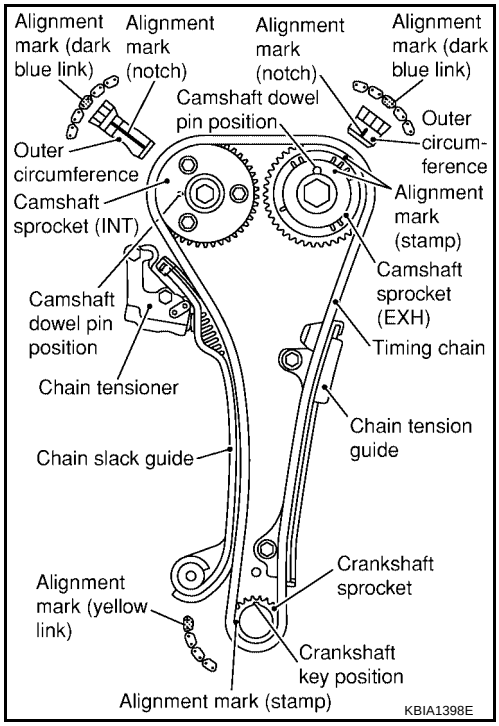
d. Install the chain tensioner. Refer to EM-29, "INSTALLATION" .

e. Make sure that mating marks are properly aligned.

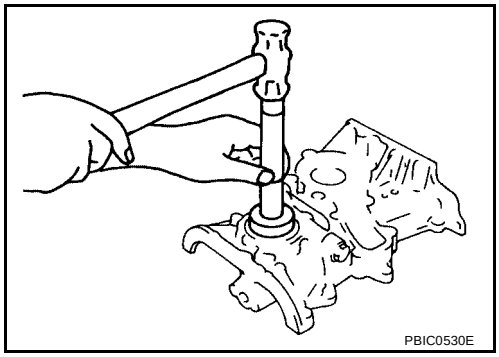
f. Temporarily install the oil pump drive spacer, crankshaft pulley and crankshaft pulley mounting bolt so that the crankshaft can be rotated.

g. Rotate crankshaft clockwise several times to make sure it rotates normally.

h. Remove parts installed in step f.



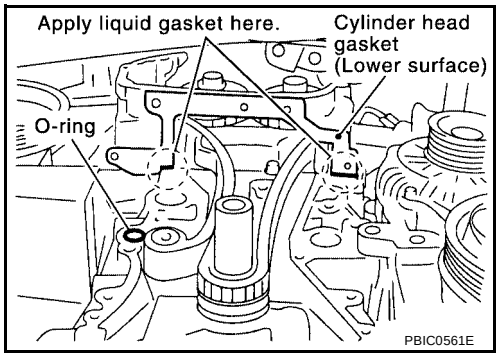
2. Install front oil seal to front cover.
- Install it so that identification letters on oil seal will face toward front side of the engine.
- Using an oil seal drift, press oil seal in until it is flush with end surface of mounting position.
- Make sure that oil seal outer circumference is free from damage and burrs.



3. Install front cover as follows.

a. Install O-ring to cylinder block.

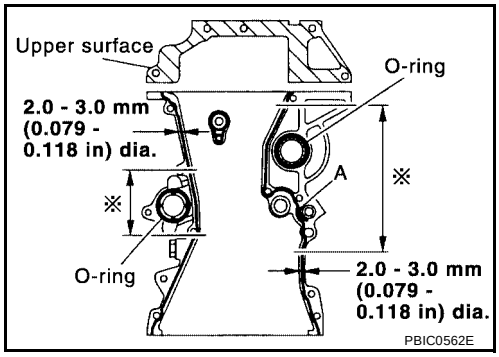
b. Apply a continuous bead of sealant to the positions shown in the figure between the cylinder head gasket lower surface and the cylinder block.
- **Use Genuine RTV Silicone Sealant, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .**



c. Apply a continuous bead of sealant to the back surface of the front cover as shown in the figure.
- **Use Genuine RTV Silicone Sealant, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .**

CAUTION:
- **Do not apply sealant to groove A shown in figure.**
- **Be especially careful of amount of sealant being applied in locations indicated with a * in the figure.**

d. Apply sealant to the top surface of front cover lightly and evenly.

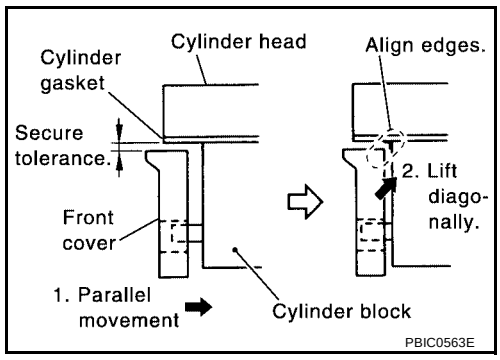


- **Use Genuine RTV Silicone Sealant, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .**

e. Install O-ring to back surface to front cover.

f. With socket oil pump inner rotor placed on crankshaft top surface (clearance between front cover top surface and cylinder head gasket lower surface is secured), move front cover close to cylinder block.

g. Lift front cover at an angle and install it to mounting position so that front cover will come in contact with both cylinder head gasket lower surface and cylinder block front surface at the same time.

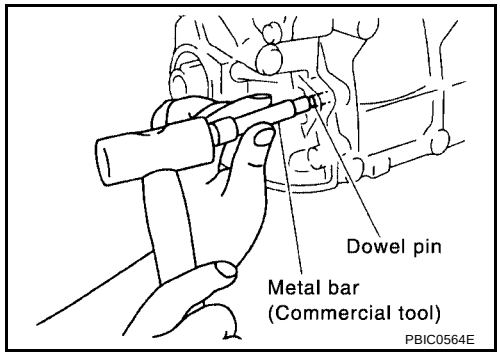


CAUTION:

- **Be careful not to damage cylinder head gasket.**
- **Make sure both sealing surfaces are contacted at the same time to ensure proper sealant adhesion and location.**

h. Install the front cover with mounting bolts temporarily so that front cover will not move.

i. Press fit the dowel pin into the cylinder block through the front cover.

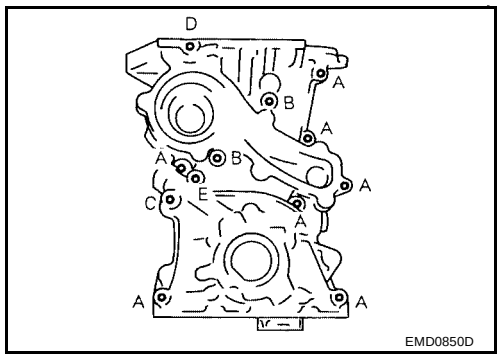


j. Tighten the front cover mounting bolts temporarily.

- A [M6 x 20 mm (0.79 in)], B [M6 x 40 mm (1.57 in)], C [M8 x 70 mm (2.76)], D [M6 x 73 mm (2.87 in)]
- Bolt C also secures the power steering pump adjusting bar.
- Bolt E [M6 x 12 mm (0.47 in)] is for installing power steering pump adjusting bar.

k. Tighten the cylinder head auxiliary bolts (M6) temporarily.

l. Tighten the front cover mounting bolts and cylinder head auxiliary bolts to specified torque.



4. Install oil pump drive spacer.

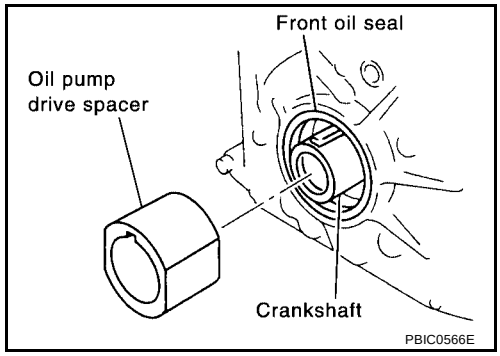
- When installing, align with flat of oil pump rotor.
- If they are not aligned, rotate inner rotor with a flat-bladed screwdriver to align them.

CAUTION:
Be careful not to damage oil seal lips.

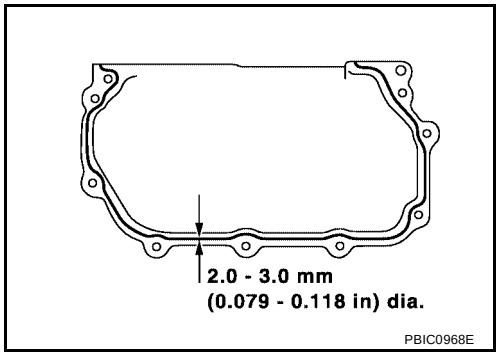
5. Install water pump pulley and idler pulley bracket assembly.

6. Install crankshaft pulley.

- When installing it, make sure that front oil seal lip is not inverted and garter spring is in position.
- Secure crankshaft counterweight with the handle of a hammer, and tighten crankshaft pulley bolt.



7. Install cylinder head front cover.
   - Apply Silicone RTV Sealant to cylinder head front cover in the specified thickness, as shown.
   - Use Genuine Silicone RTV Sealant or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .
8. Install engine front mounting bracket.



9. Installation of the remaining parts is in reverse order of removal.

INSPECTION AFTER INSTALLATION

EBS00EWU

- In order to allow sealant to cure, perform inspection at least 30 minutes after the last step involving sealant is installed.
- With engine warmed up, check each part for engine oil leakage.

OIL SEAL

PFP:00100

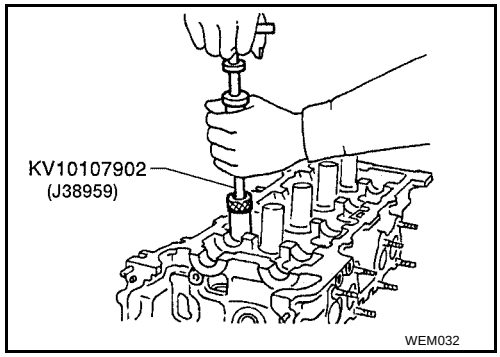
EBS00CEL

Replacement

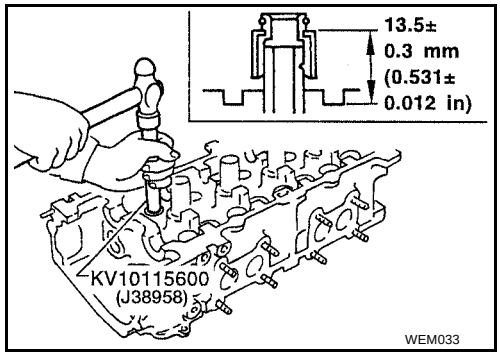
VALVE OIL SEAL

1. Remove rocker cover. Refer to EM-23, "Removal and Installation" .
2. Remove camshaft. Refer to EM-26, "Removal and Installation" .
3. Remove valve spring. Refer to EM-56, "DISASSEMBLY" .
4. Remove valve oil seal with Tool.

CAUTION:
Piston concerned should be set at TDC to prevent valve from falling into combustion chamber.

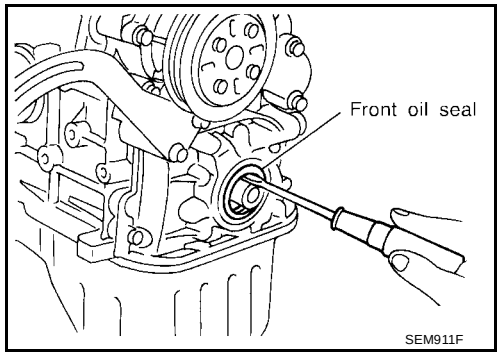


5. Apply new engine oil to new valve oil seal and install it with Tool.

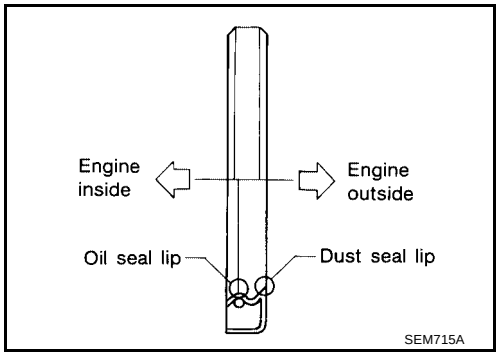


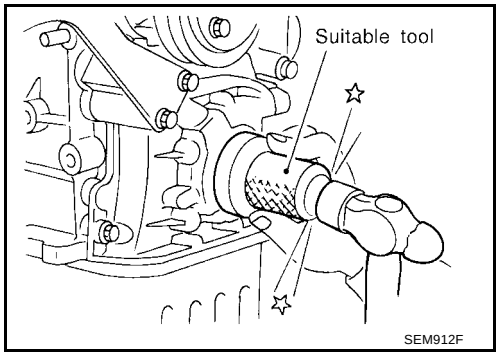
FRONT OIL SEAL

1. Remove the following parts:
   - Engine under cover
   - RH engine side cover
   - Generator and power steering drive belts
   - Crankshaft pulley
2. Remove front oil seal from front cover.
   - **Be careful not to scratch front cover.**



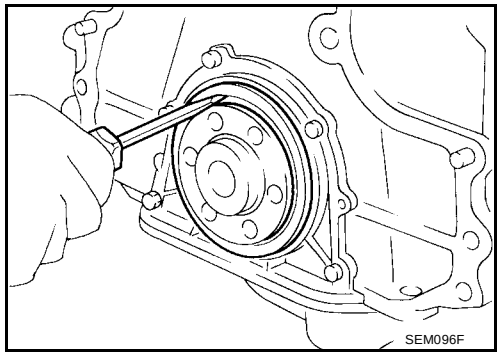
3. Apply new engine oil to new oil seal and install it using a suitable tool.
   - Install new oil seal in the direction shown.



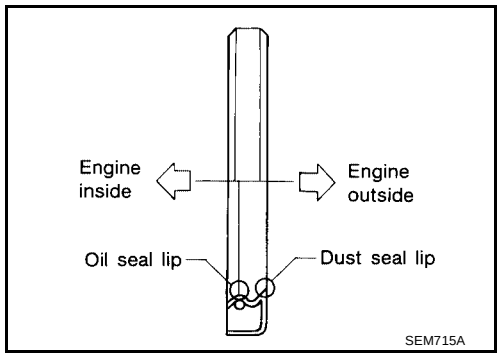


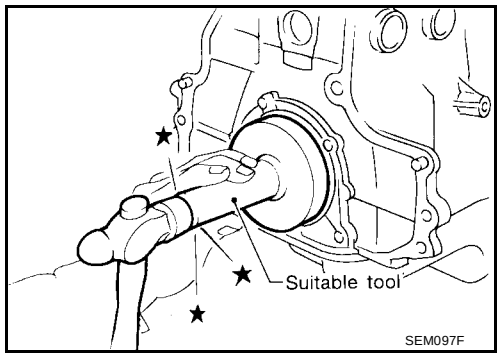
REAR OIL SEAL

1. Remove the transaxle. Refer to MT-16, "Removal and Installation" (RS5F70A), MT-82, "Removal and Installation" (RS5F51A), MT-143, "Removal and Installation" (RS6F51H), or AT-265, "REMOVAL AND INSTALLATION" (RE4F03B), AT-649, "REMOVAL AND INSTALLATION" (RE4F04B).
2. Remove flywheel (MT) or drive plate (AT).
3. Remove rear oil seal.
   - **Be careful not to scratch rear oil seal retainer.**



4. Apply new engine oil to new oil seal and install it using a suitable tool.
   - Install new oil seal in the direction shown.





CYLINDER HEAD

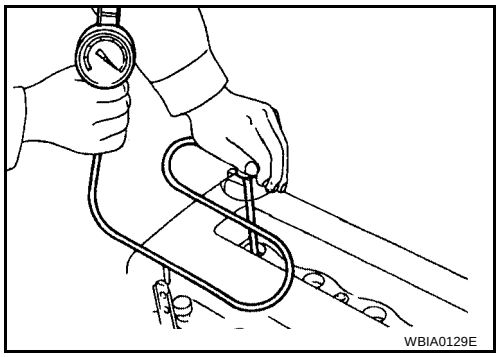
PFP:11041

On-Vehicle Service

EBS00EZ5

CHECKING COMPRESSION PRESSURE

1. Warm up the engine to full operating temperature.
2. Turn the ignition switch OFF.
3. Release the fuel pressure. Refer to EC-56, "FUEL PRESSURE RELEASE" [QG18DE (ULEV)], or EC-637, "FUEL PRESSURE RELEASE" [QG18DE (SULEV)].
4. Remove the ignition coils.
5. Remove the spark plugs.
   - Clean the area around the spark plug with compressed air before removing the spark plug.
6. Attach a compression tester to No. 1 cylinder.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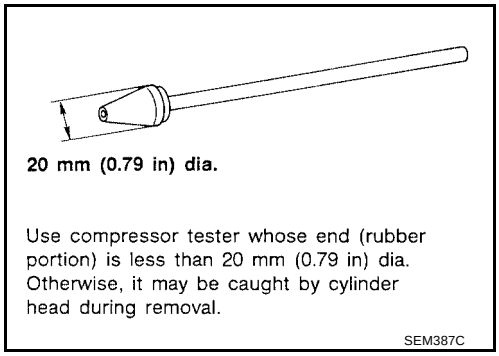


7. Depress the accelerator pedal fully to keep the throttle valve wide open.
8. Crank the engine and record highest gauge indication.
9. Repeat the measurement on each cylinder as shown above.
   - **Always use a fully-charged battery to obtain specified engine speed.**

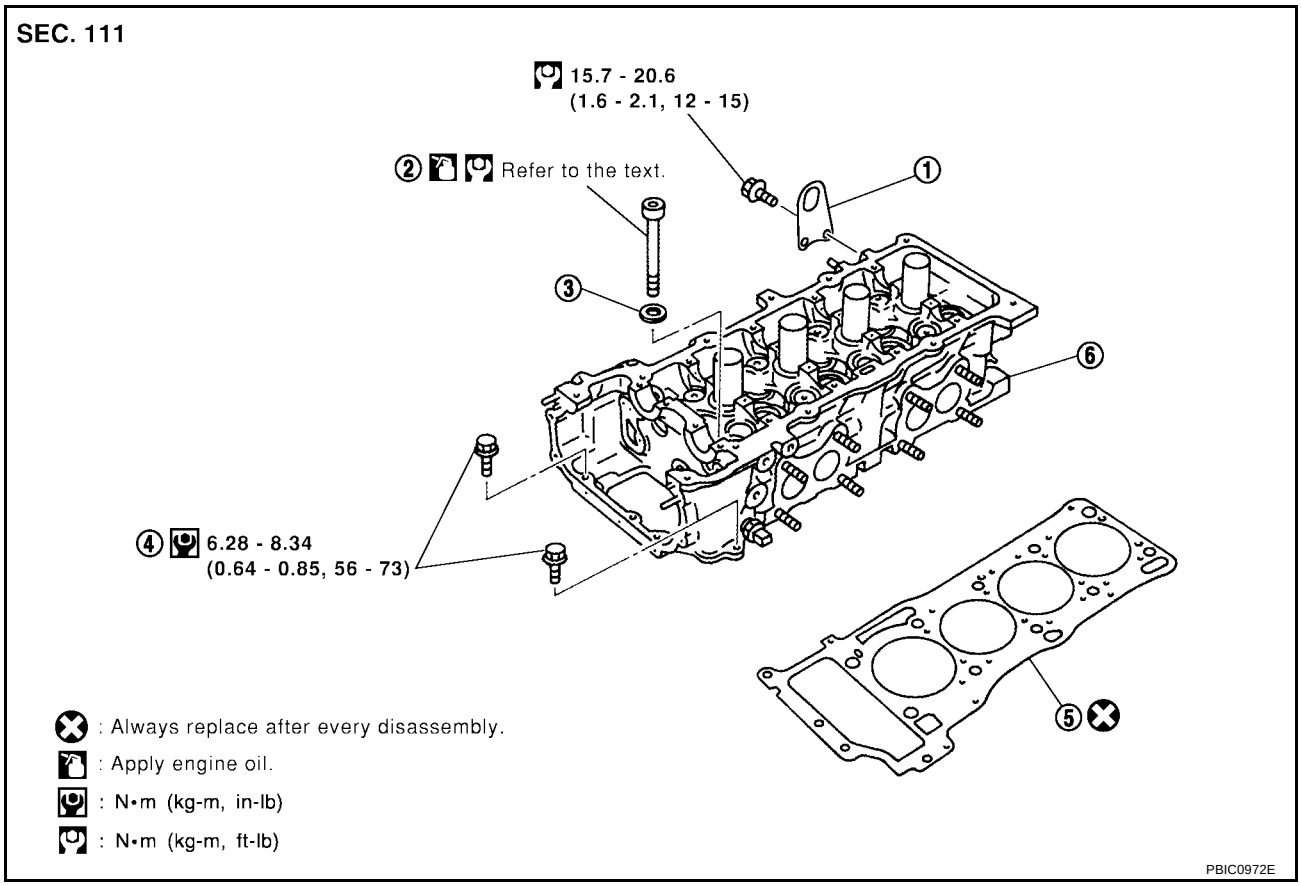
Compression pressure	**: kPa (kg/cm^2 , psi)/rpm**
Standard	**: 1,324 (13.5, 192)/350**
Minimum	**: 1,157 (11.5, 168)/350**
Maximum allowable difference between cylinders	**: 98 (1.0, 14)/350**

10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and retest compression.
    - **If adding oil improves cylinder compression, piston rings may be worn or damaged. If so, replace piston rings after checking the piston and cylinder walls.**
    - **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. Refer to EM-35, "INSPECTION" , EM-60, "VALVE SEATS" . If valve or valve seat is damaged excessively, replace them.**
    - If compression in any two adjacent cylinders is low and if adding oil does not improve compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.
11. Install spark plugs, ignition coils and fuel pump fuse.

12. Erase DTC if any DTC appears. Refer to EC-71, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" [QG18DE (ULEV)], or EC-651, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" [QG18DE (SULEV)].

Removal and Installation

EBS00CEN



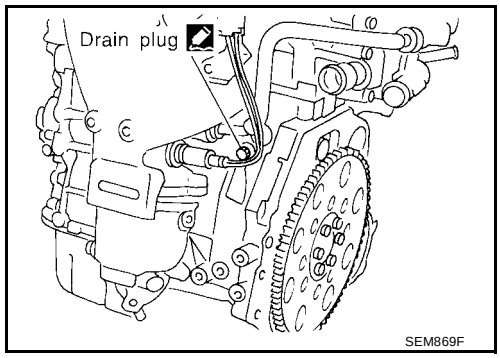
1. Rear engine slinger
2. Cylinder head bolt
3. Washer
4. Auxiliary bolt of cylinder head
5. Cylinder head gasket
6. Cylinder head assembly

CAUTION:

- **When installing camshaft and oil seal, lubricate contacting surfaces with new engine oil.**
- **When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, lubricate bolt threads and seat surfaces with new engine oil.**
- **Attach tags to valve lifters so as not to mix them up.**

REMOVAL

1. Drain engine coolant.
   Be careful not to spill coolant on drive belts.



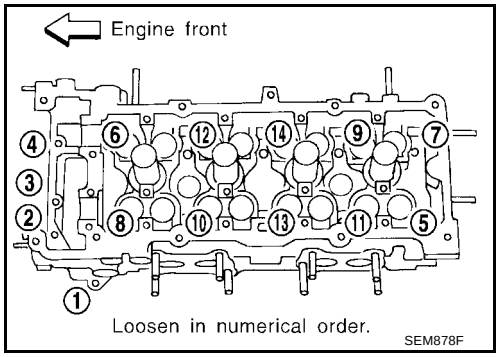
2. Release the fuel pressure. Refer to EC-56, "FUEL PRESSURE RELEASE" for [QG18DE (ULEV)], or EC-637, "FUEL PRESSURE RELEASE" for [QG18DE (SULEV)].
3. Remove the air duct to intake manifold collector.
4. Remove the engine drive belts.

5. Remove the front splash undercovers.
6. Remove the front exhaust tube.
7. Before removing the intake manifold collector from the engine, the following parts should be disconnected to remove the intake manifold collector:
   - Fuel injector tube quick connectors. Refer to EM-19, "FUEL INJECTOR AND FUEL TUBE" .
   - Ground harness

   Harness connectors for:
   - Electric throttle control actuator
   - Heated oxygen sensor (ULEV) or Air fuel ratio (A/F) sensor (SULEV only)
   - Swirl control position sensor (SULEV only)
   - Swirl control valve (SULEV only)
   - Water hoses from collector
   - Heater hoses
   - PCV hose

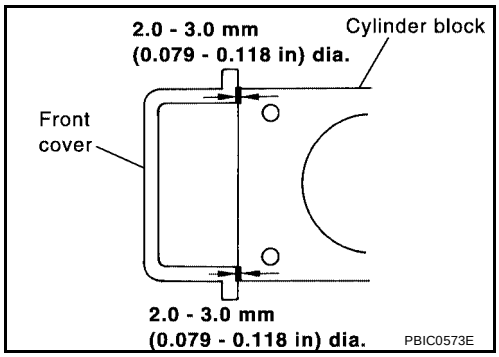
   Vacuum hoses for:
   - EVAP canister
   - Power brake booster
8. Remove the intake manifold rear supports.
9. Remove the exhaust manifold.
10. Remove the spark plugs.
11. Remove rocker cover. Refer to EM-23, "ROCKER COVER" .
12. Remove camshafts. Refer to EM-26, "CAMSHAFT" .
13. Remove cylinder head bolts.
    - Cylinder head bolts should be loosened in two or three steps.

    CAUTION:
    Head warping or cracking could result from removing the cylinder head bolts in incorrect order.
14. Remove cylinder head with intake manifold.



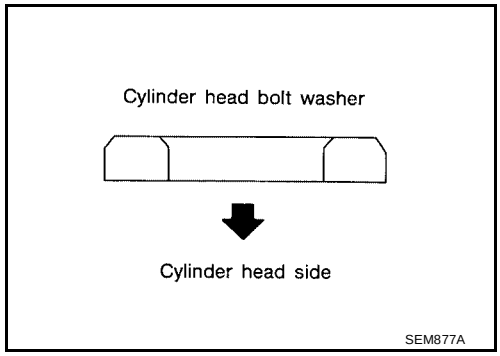
INSTALLATION

1. Before installing cylinder head gasket, apply a bead of Genuine RTV Silicone Sealant or equivalent, to mating surface of cylinder block as shown. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .
2. Install the cylinder head gasket.
   - **When installing the cylinder head with manifolds, use a new cylinder head gasket.**



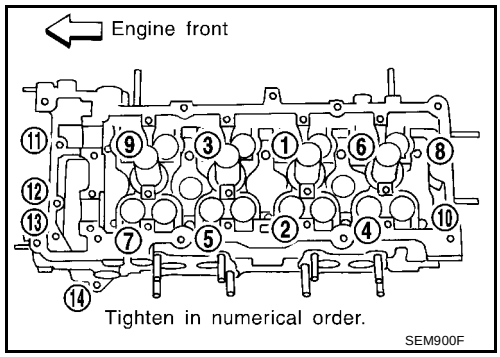
3. Install cylinder head assembly and cylinder head bolts with washers.
   - Apply new engine oil to threads and seating surface of mounting bolts.

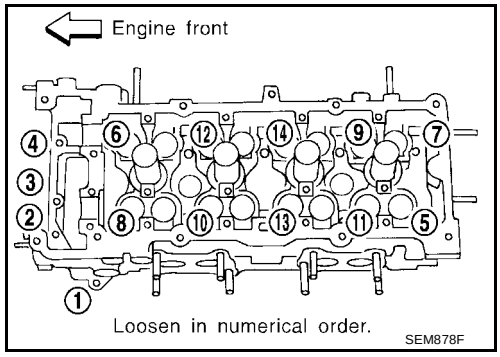
CAUTION:
- **Be sure to install washers between bolts and cylinder head with washer orientation as shown.**



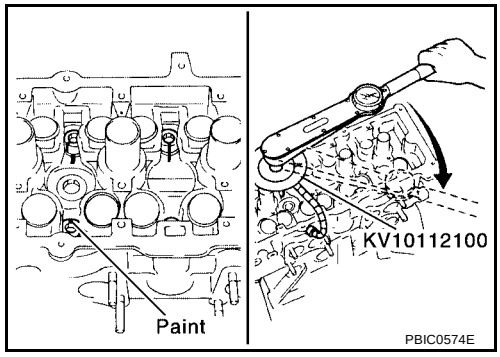
4. Tighten cylinder head bolts (1) to (10) in numerical order as shown in five stages.

Cylinder head bolts	
Stage 1	: 29.4 N-m (3.0 kg-m, 22 ft-lb)
Stage 2	: 58.8 N-m (6.0 kg-m, 43 ft-lb)
Stage 3	: 0 N-m (0 kg-m, 0 ft-lb) (loosen)
Stage 4	: 27.4 - 31.4 N-m (2.8 - 3.2 kg-m, 21 - 23 ft-lb)
Stage 5	: 50° - 55° (target 50°) clockwise

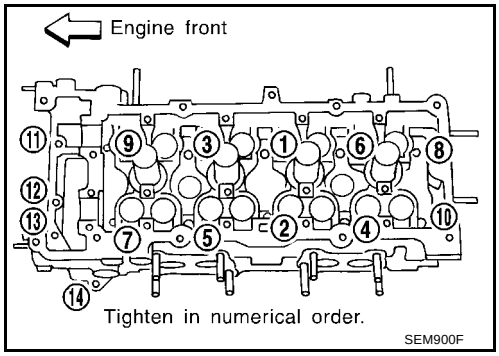




CAUTION:
Check and confirm the tightening angle by using angle wrench.

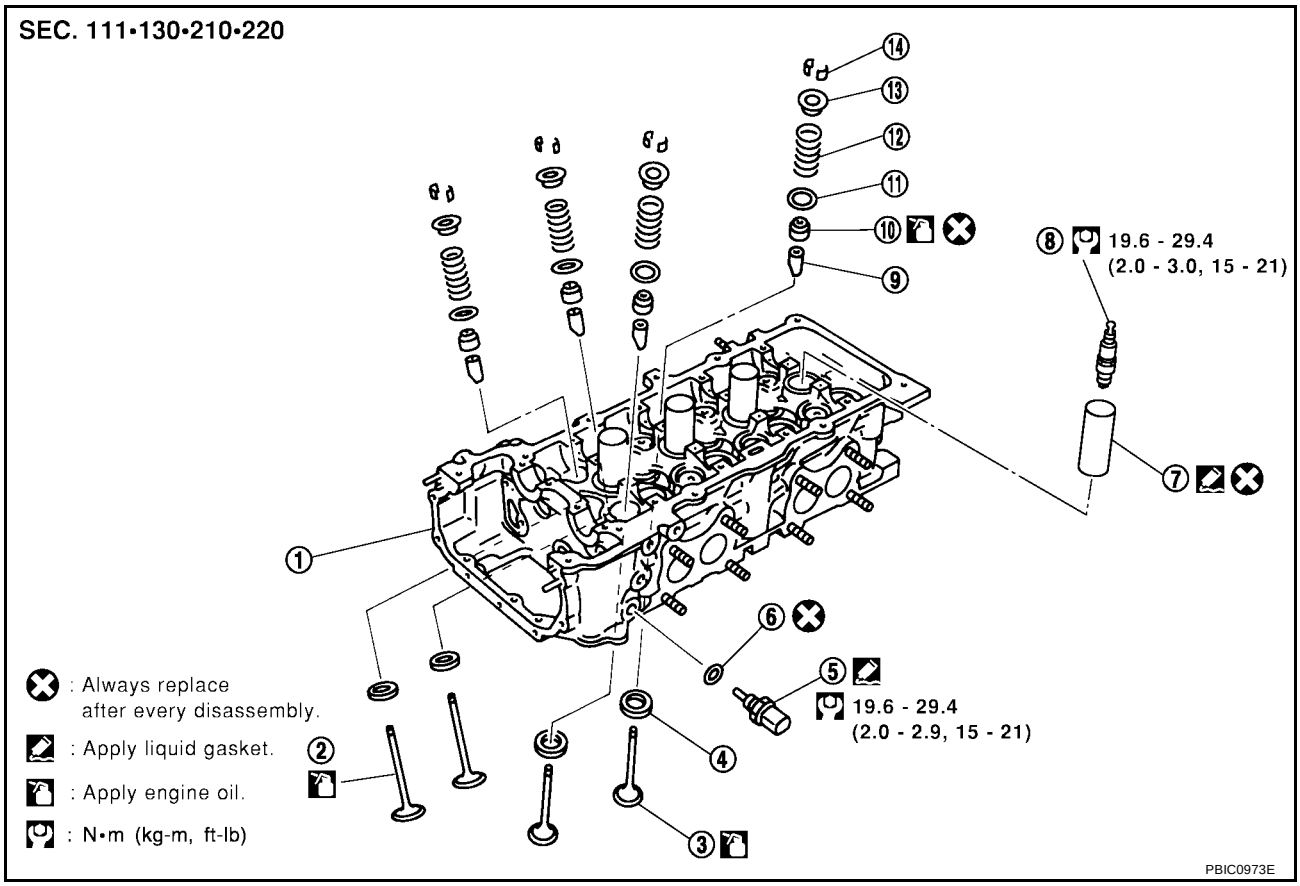


5. Tighten cylinder auxiliary bolts (11) to (14) in numerical order shown in figure.
   - Verify shank length under bolt head. [Bolt 11: 20 mm (0.79 in), bolts 12 - 14: 25 mm (0.98 in)]
6. Install the remaining components in the reverse order of removal.



Disassembly and Assembly

EBS00EWV



1. Cylinder head
2. Valve (INT)
3. Valve (EXH)
4. Valve seat
5. Engine coolant temperature sensor
6. Copper washer
7. Spark plug tube
8. Spark plug

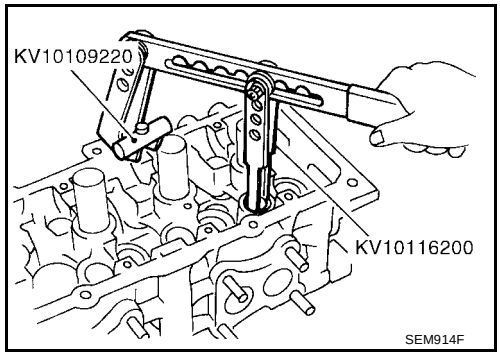
CAUTION:

- **When installing camshafts, chain tensioners, oil seals or other sliding parts, lubricate contacting surface with new engine oil.**
- **Apply new engine oil to threads and seat surface when installing cylinder head, camshaft sprocket, crankshaft pulley and camshaft bracket.**
- **Note valve lifter positions so as to ensure proper installation locations.**

DISASSEMBLY

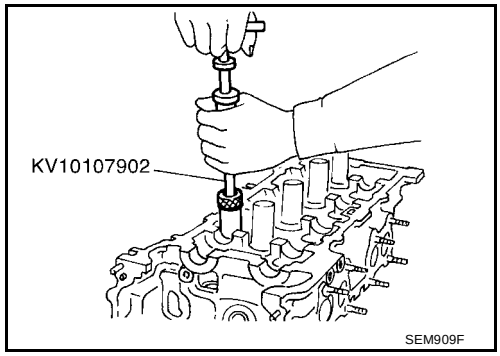
1. Remove intake manifold assembly.
2. Remove adjusting shims (if equipped) and valve lifters.
   - Note locations for installation.

3. Remove valve collet.
   - compress valve spring using Tool as shown. Remove valve collet with magnet.
4. Remove valve spring retainer and valve spring.
5. Push valve stem through the combustion chamber side, and remove valve.
   - Inspect valve guide clearance before removal. Refer to EM-58, "VALVE GUIDE CLEARANCE" .
   - Label components for installation in the same location.



6. Remove valve oil seal using Tool as shown.
7. Remove valve spring seat.
8. When valve seat must replaced, refer to EM-60, "REPLACING VALVE SEAT FOR SERVICE PARTS" .
9. When valve guide must be replaced, refer to EM-59, "VALVE GUIDE REPLACEMENT" .
10. Remove spark plugs.
11. Remove engine coolant temperature sensor.

CAUTION:
Do not shock it.

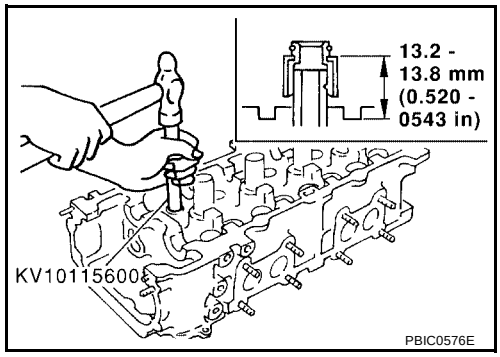


12. Remove spark plug tubes, as necessary.
    - Using a pair of pliers, pull spark plug tube out of cylinder head.

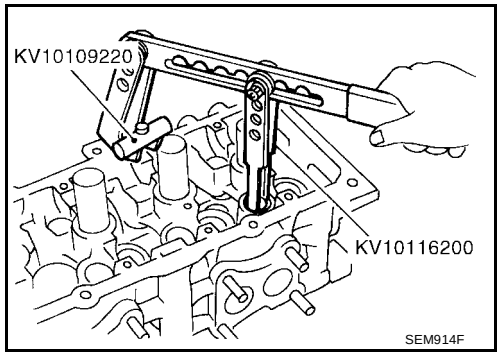
CAUTION:
- **Take care not to damage cylinder head.**
- **Spark plug tubes are deformed during removal and cannot be reused once removed. Do not remove unless necessary.**

ASSEMBLY

1. If removed, install valve seat, refer to EM-60, "REPLACING VALVE SEAT FOR SERVICE PARTS" .
2. If removed, install valve guide, refer to EM-59, "VALVE GUIDE REPLACEMENT" .
3. Install valve oil seal using Tool as shown.
4. Install valve spring seat.
5. Install valve.
   - Install large diameter to intake side.
6. Install valve spring.
7. Install valve spring retainer.



8. Install valve collet.
   - Compress valve spring using Tool as shown. Install valve collet with magnet.
   - Tap stem edge lightly with plastic hammer after installation to check if installed securely.
9. Install adjusting shim, if equipped, using Tool.
10. Apply sealant to engine coolant temperature sensor threads.
    - Use Genuine Anaerobic Liquid Gasket, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .
11. Install engine coolant temperature sensor.

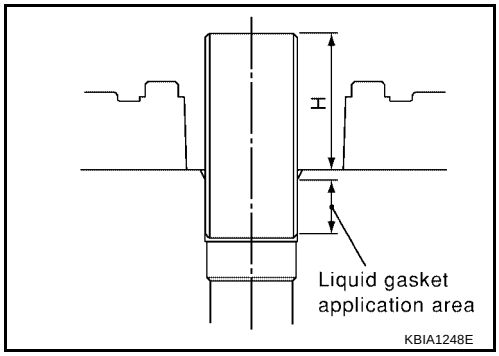


12. Install spark plug tube.
    - Press-fit spark tube as follows.

a. Remove old liquid gasket adhering to cylinder-head mounting hole.

b. Apply liquid gasket to area within approximately 15 mm (0.59 in) from edge of spark plug tube press-fit side as shown.
    - **Use Genuine Anaerobic Liquid Gasket, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .**

c. Using a drift, press-fit the spark plug tube so that its height "H" is as shown.



Standard press-fit height "H" : 41.0 - 42.0 mm (1.61 - 1.65 in)

CAUTION:
- **When press-fitting, take care not to deform spark plug tube.**
- **After press-fitting, wipe off liquid gasket protruding onto cylinder head upper surface.**

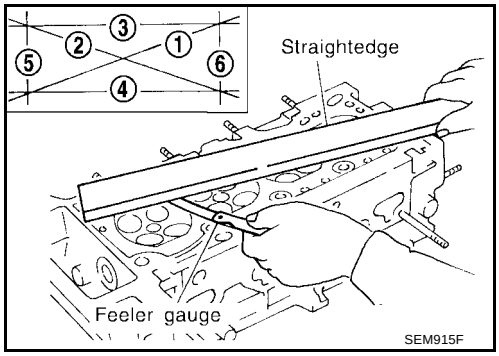
13. Install spark plugs. Refer to EM-12, "OUTER COMPONENT PARTS" .
14. Install intake manifold. Refer to EM-12, "OUTER COMPONENT PARTS" .

Inspection after Disassembly

EBS00CEP

CYLINDER HEAD DISTORTION

1. Clean surface of cylinder head.
2. Use a reliable straightedge and feeler gauge to check the flatness of cylinder head mating surface.
    - Check along six positions as shown.



Head surface flatness

Standard : Less than 0.03 mm (0.0012 in)

Limit : 0.1 mm (0.004 in)

If beyond the specified limit, replace or resurface it.

Resurfacing limit:

The limit for cylinder head resurfacing is determined by the amount of cylinder block resurfacing.

Amount of cylinder head resurfacing is “A”.

Amount of cylinder block resurfacing is “B”.

The maximum limit is as follows : A + B = 0.2 mm (0.008 in)

After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, replace cylinder head.

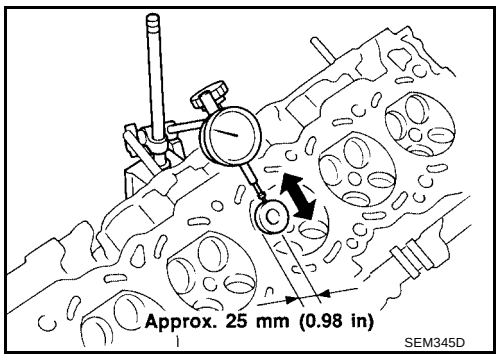
Nominal cylinder head height : 117.8 - 118.0 mm (4.638 - 4.646 in)

VALVE GUIDE CLEARANCE

1. Measure valve deflection as shown in figure. (Valve and valve guide wear the most in this direction.)

Valve deflection limit (dial gauge reading)

Intake & Exhaust : 0.2 mm (0.008 in)

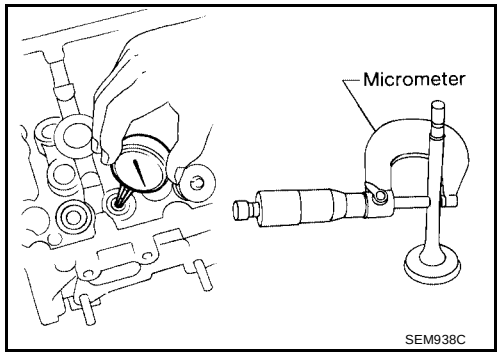


2. If it exceeds the limit, check valve to valve guide clearance.

a. Measure valve stem diameter and valve guide inner diameter.

b. Calculate valve to valve guide clearance.
Valve stem to valve guide clearance = valve guide inner diameter – valve stem diameter.

c. Check that clearance is within specification.



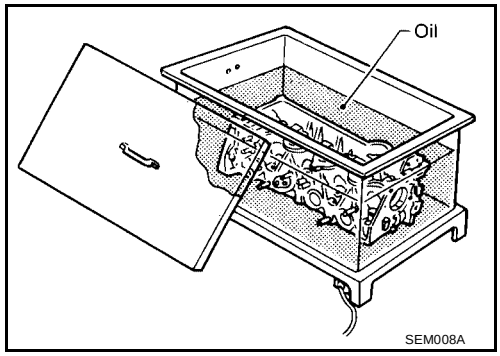
Unit: mm (in)

	Standard	Limit
Intake	0.020 - 0.050 (0.0008 - 0.0020)	0.1 (0.004)
Exhaust	0.040 - 0.070 (0.0016 - 0.0028)	0.1 (0.004)

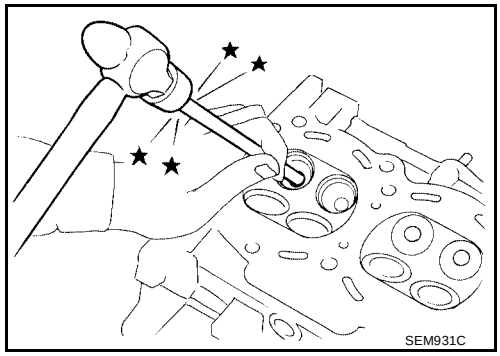
- If it exceeds the limit, replace valve and remeasure clearance.
- **If limit is still exceeded after replacing valve, replace valve guide.**

VALVE GUIDE REPLACEMENT

1. To remove valve guide, heat cylinder head to 110° to 130°C (230° to 266°F).



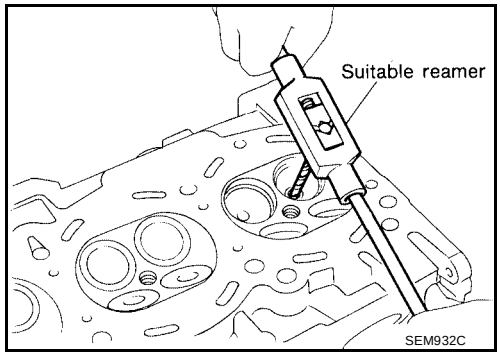
2. Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.



3. Ream cylinder head valve guide hole.

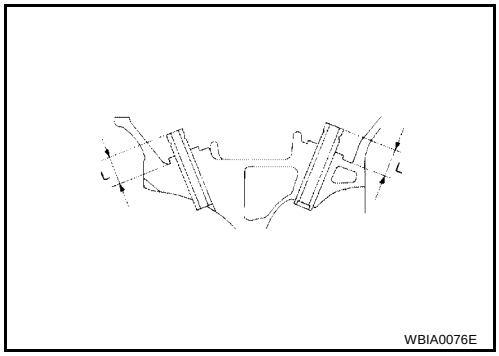
Valve guide hole diameter (for service parts)

Intake & Exhaust : 9.685 - 9.696 mm (0.3813 - 0.3817 in)



4. Heat cylinder head to 110° to 130°C (230° to 266°F) and press service valve guide into cylinder head at specified height.

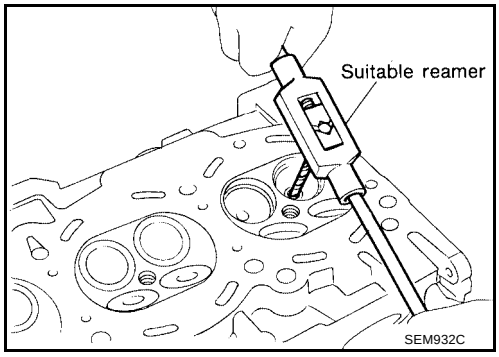
Projection "L" : 11.5 - 11.7 mm (0.453 - 0.461 in)



5. Ream the new valve guide to the specified inner diameter.

Inner diameter finished size

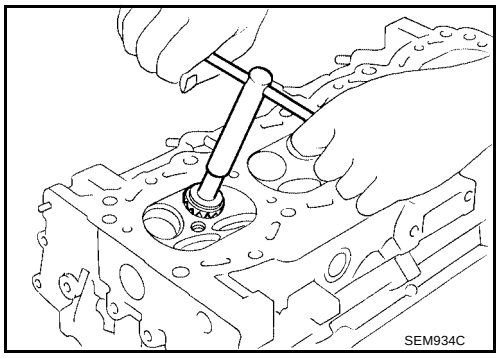
Intake & Exhaust : 5.500 - 5.515 mm (0.2165 - 0.2171 in)



VALVE SEATS

Check valve seats for pitting at contact surface. Resurface or replace if excessively worn.

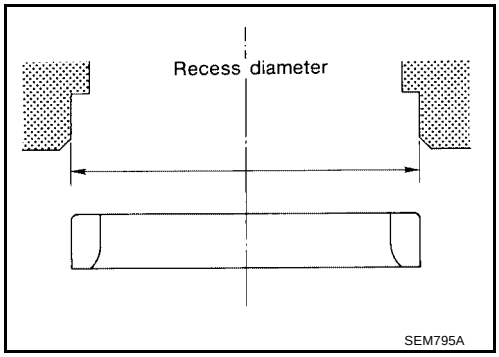
- **Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.**
- **Use both hands to cut uniformly.**



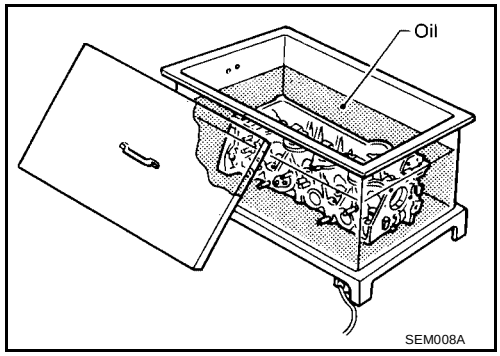
REPLACING VALVE SEAT FOR SERVICE PARTS

1. Bore out old seat until it collapses. Set machine depth stop so that boring cannot contact the bottom face of seat recess in cylinder head.
2. Ream cylinder head recess. Refer to EM-85, "Valve Seat" for the reaming bore for the service valve seat.

NOTE:
Use the valve guide center for reaming to ensure valve seat will have the correct fit.

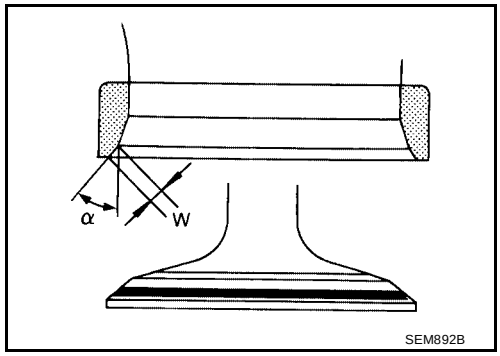


3. Heat cylinder head to 110° to 130°C (230° to 266°F).
4. Press fit valve seat until it seats on the bottom.
5. Cut or grind valve seat using suitable tool to the specified dimensions. Refer to EM-82, "Valve" .
6. After cutting, lap valve seat with abrasive compound.



7. Check valve seating condition.

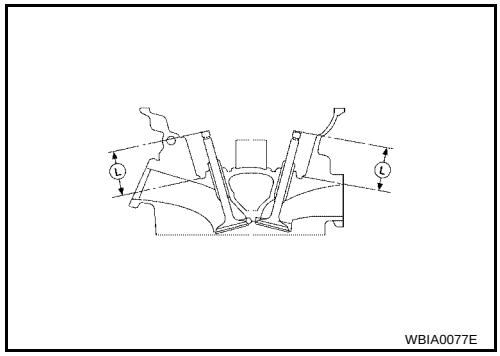
Seat face angle “α”	**: 44°53′ - 45°07′**
Contacting width “W”	
Intake	**: 1.06 - 1.34 mm (0.0417 - 0.0528 in)**
Exhaust	**: 1.34 - 1.63 mm (0.0528 - 0.0642 in)**



8. Use a depth gauge to measure the distance “L” between the mounting surface of the cylinder head spring seat and the valve stem end. If the distance is shorter than specified, repeat step 5 above to correct it. If the distance is longer, replace the valve seat.

Valve seat resurface limit

Intake	**: 35.95 - 36.55 mm (1.4154 - 1.4390 in)**
Exhaust	**: 35.92 - 36.52 mm (1.4142 - 1.4378 in)**



VALVE DIMENSIONS

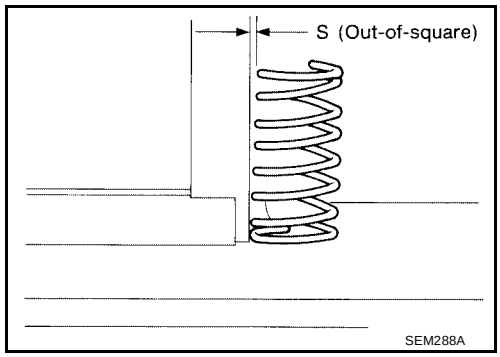
Check dimensions of each valve. Refer to EM-82, "Valve" .

VALVE SPRING

Squareness

1. Measure dimension “S”.

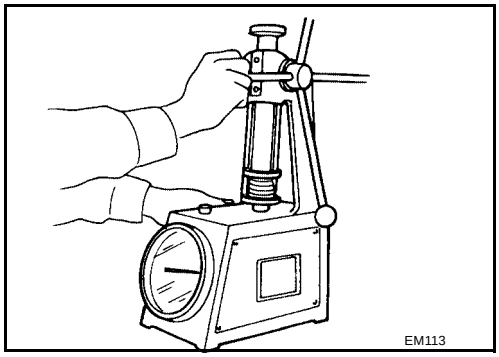
Out-of-square “S”	**: Less than 1.75 mm (0.0689 in)**



2. If it exceeds the limit, replace the spring.

Pressure

Check valve spring pressure at specified spring height.



Pressure

Standard : **370.0 N (37.73 kg, 83.19 lb) at 23.64 mm (0.9307 in)**

Limit : **More than 347.8 N (35.46 kg, 78.19 lb) at 23.64 mm (0.9307 in)**

If not within specification, replace the spring.

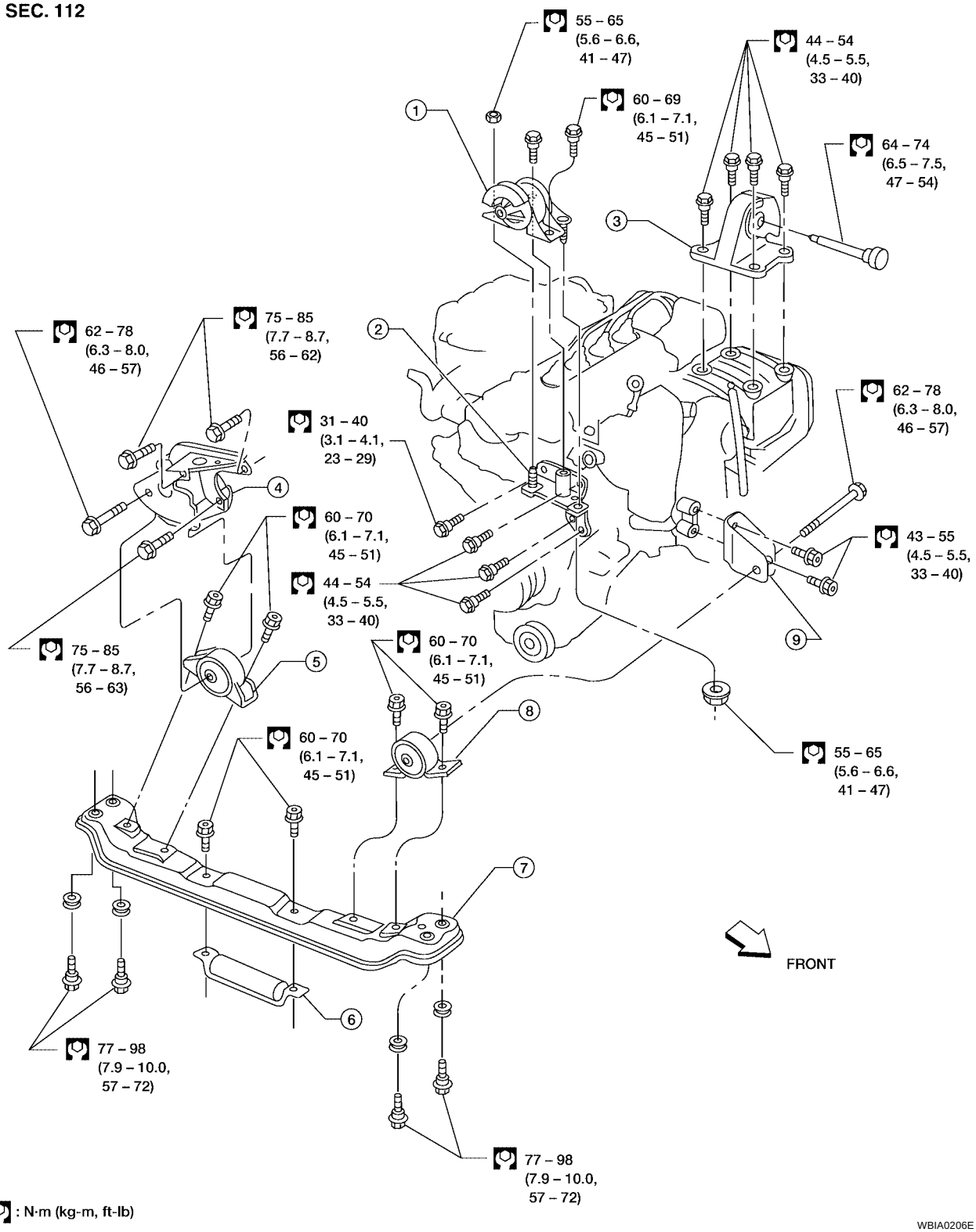
ENGINE ASSEMBLY

PFP:10001

Removal and Installation

EBS00CET

SEC. 112



: N·m (kg-m, ft-lb)

WBIA0206E

1. RH engine mounting
2. RH engine mounting bracket
3. LH engine mounting
4. Rear engine mounting bracket
5. Rear engine mounting
6. Dynamic damper
7. Center member
8. Front engine mounting
9. Front engine mounting bracket

WARNING:

- **Position vehicle on a flat and solid surface.**
- **Place chocks at front and back of rear wheels.**
- **Do not remove engine until exhaust system has completely cooled off, otherwise, you may burn yourself and/or fire may break out in fuel line.**
- **Before disconnecting fuel hose, release pressure.**
  Refer to EC-56, "FUEL PRESSURE RELEASE" [QG18DE (ULEV)], or EC-637, "FUEL PRESSURE RELEASE" [QG18DE (SULEV)].
- **Be sure to lift engine and transaxle in a safe manner.**
- **For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.**

CAUTION:

- **When lifting engine, be sure to clear surrounding parts. Use special care near accelerator wire casing, brake lines and brake master cylinder.**
- **When lifting the engine, always use engine slingers in a safe manner.**
- **When removing drive shaft, be careful not to damage grease seal of transaxle.**
- **Before separating engine and transaxle, remove crankshaft position sensor (POS) from the cylinder block assembly.**
- **Always be extra careful not to damage edge of crankshaft position sensor (POS), or signal plate teeth.**

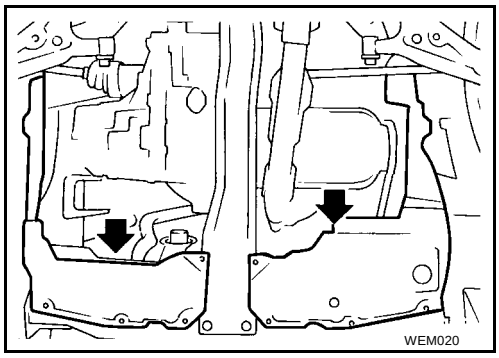
Engine cannot be removed separately from transaxle. Remove engine with transaxle as an assembly.

REMOVAL

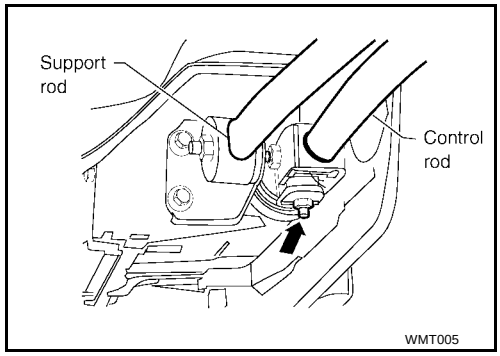
1. Refer to EC-56, "FUEL PRESSURE RELEASE" [QG18DE (ULEV)], or EC-637, "FUEL PRESSURE RELEASE" [QG18DE (SULEV)].
2. Drain coolant from radiator and cylinder block. Refer to MA-16, "DRAINING ENGINE COOLANT" .
3. Remove coolant reservoir tank.
4. Drain engine oil. Refer to MA-20, "Changing Engine Oil" .
5. Remove battery and battery tray. Refer to SC-4, "BATTERY" .
6. Remove air cleaner and air duct.
7. Remove drive belts.
8. Remove generator and air conditioner compressor from engine and position aside. Refer to SC-31, "Removal" , MTC-68, "Removal and Installation" .
9. Remove power steering oil pump from engine and position aside. Refer to PS-21, "COMPONENTS" .

   NOTE:
   Power steering oil pump does not need to be disconnected from power steering tubes.
10. Remove the following parts:
    - RH and LH front tires
    - Front splash undercovers
    - RH and LH drive shaft. Refer to FAX-14, "Removal" .

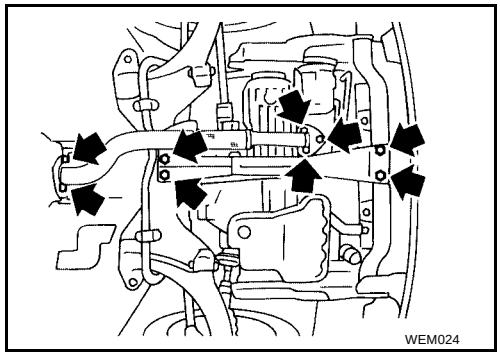
      CAUTION:
      When removing the drive shaft, be careful not to damage transaxle side grease seal.



- Disconnect control rod and support rod from transaxle (M/T models).
- Disconnect control cable from transaxle (A/T models). Refer to AT-263, "Control Cable Adjustment" .



- Center member
- Front exhaust tube. Refer to EX-3, "Removal and Installation" .
- Stabilizer bar. Refer to FSU-11, "Removal and Installation" .
- Radiator/Cooling fan. Refer to CO-13, "Removal" .
- Fuel injector tube quick connectors (Refer to EM-19, "FUEL INJECTOR AND FUEL TUBE" .)
- Ground harness



Harness connectors for:

- Electric throttle control actuator
- Swirl control valve (SULEV only)
- Swirl control position switch (SULEV only)
- Heated oxygen sensor (ULEV only) or Air fuel ratio (A/F) sensor SULEV only)
- Water hoses from collector
- Heater hoses
- PCV hose
- Intake valve timing control solenoid

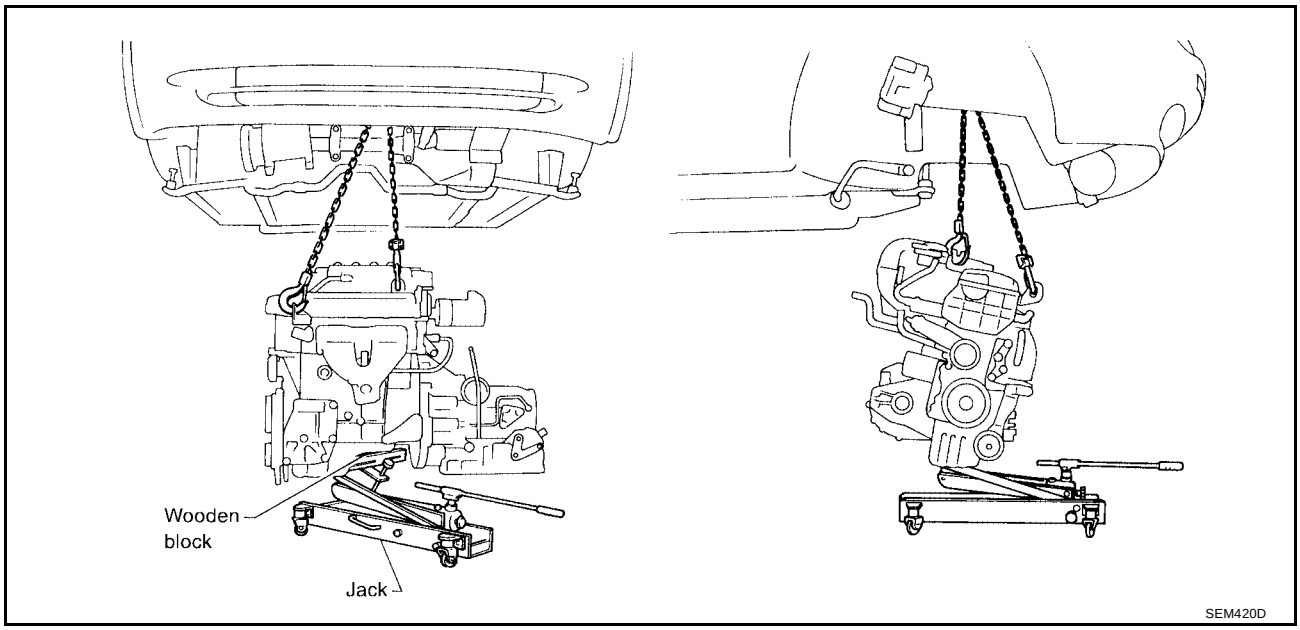
Vacuum hoses for:

- EVAP canister
- Power brake booster

11. If necessary, install engine slingers and support engine from above with a hoist.
12. Lift up engine slightly and disconnect or remove all engine mountings.

CAUTION:
When lifting engine, be sure to clear surrounding parts. Use special care near brake tubes and brake master cylinder.

13. Remove engine with transaxle as shown.



INSTALLATION

- Installation is in the reverse order of removal.

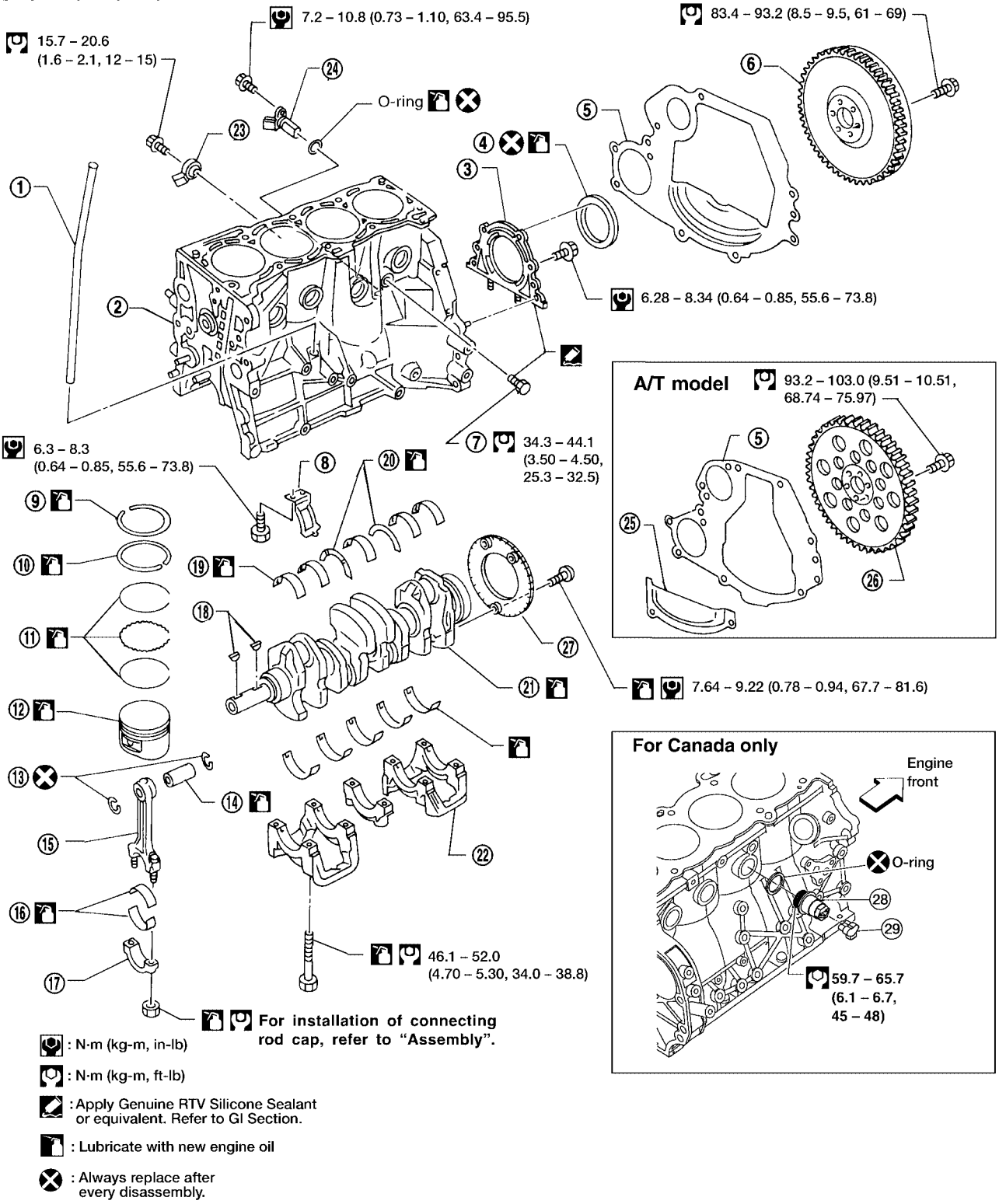
CYLINDER BLOCK

PFP:11010

Components

EBS00CEU

SEC. 110•120•226



WBIA0135E

1. Oil level gauge guide
2. Cylinder block
3. Rear oil seal retainer
4. Rear oil seal
5. Rear plate
6. Flywheel
7. Drain plug
8. Baffle plate
9. Top ring
10. 2nd ring
11. Oil ring
12. Piston

13. Snap ring
14. Piston pin
15. Connecting rod
16. Connecting rod bearing
17. Connecting rod cap
18. Key
19. Main bearing
20. Thrust bearing
21. Crankshaft
22. Main bearing cap
23. Knock sensor
24. Crankshaft position sensor (POS)
25. Rear lower plate
26. Drive plate
27. Signal plate
28. Block heater (Canada only)
29. Connector protective cap (Canada only)

Removal and Installation

EBS00CEV

CAUTION:

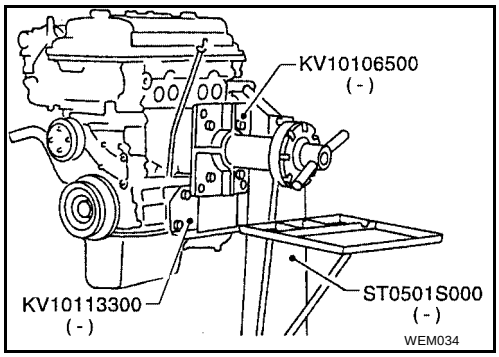
- **When installing sliding parts such as bearings and pistons, apply engine oil on the sliding surfaces.**
- **Place removed parts, such as bearings and bearing caps, in their proper order and direction.**
- **When installing connecting rod nuts and main bearing cap bolts, apply new engine oil to threads and seating surfaces.**
- **Do not allow any magnetic materials to contact the signal plate teeth of flywheel or drive plate, and rear plate.**
- **Remove the crankshaft position sensor (POS).**
- **Be careful not to damage sensor edges and signal plate teeth.**

Disassembly

EBS00CEW

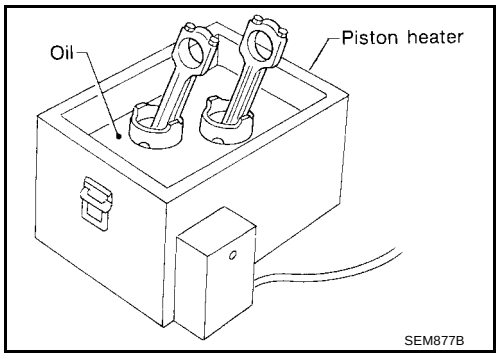
PISTON AND CRANKSHAFT

1. Place engine on a work stand.
2. Drain any remaining engine coolant and oil.
3. Remove timing chain. Refer to EM-40, "Removal" .

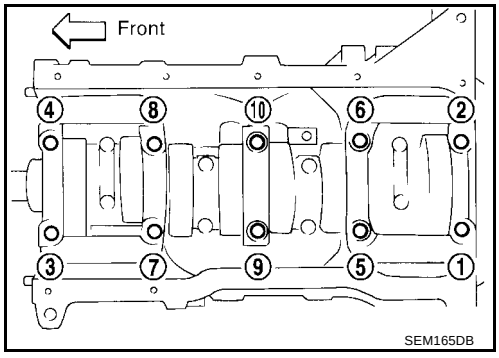


4. Remove pistons with connecting rod.
   - When disassembling piston and connecting rod, remove snap ring first. Then heat piston to 60° to 70°C (140° to 158°F) or use piston pin press stand at room temperature.

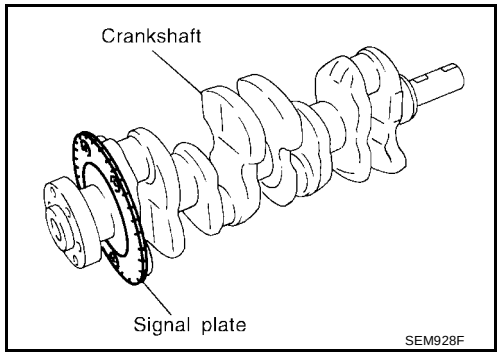
   CAUTION:
   - **When piston rings are not replaced, make sure that piston rings are mounted in their original positions.**
   - **When replacing piston rings, if there is no punch mark, install with either side up.**
5. Measure crankshaft end play. Refer to EM-72, "Crankshaft" .



6. Loosen main bearing caps in numerical order as shown in figure.
   - **Bolts should be loosened in two or three steps.**
7. Remove bearing caps, main bearings and crankshaft.



8. Remove signal plate from crankshaft.



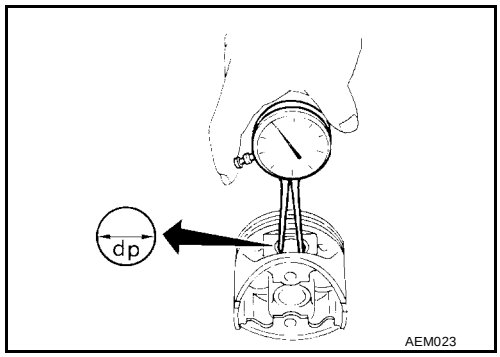
Inspection

PISTON AND PISTON PIN CLEARANCE

EBS00CEX

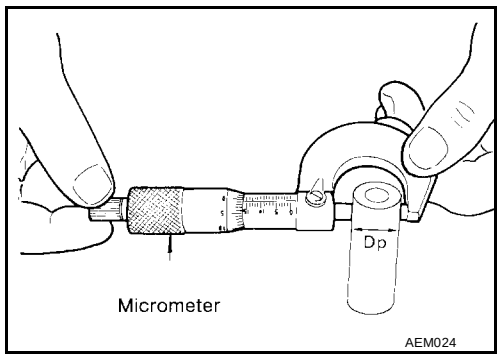
1. Measure inner diameter of piston pin hole “dp”.

Standard diameter “dp” :18.993 - 19.005 mm (0.7478 - 0.7482 in)



2. Measure outer diameter of piston pin “Dp”.

Standard diameter “Dp” :18.989 - 19.001 mm (0.7476 - 0.7481 in)



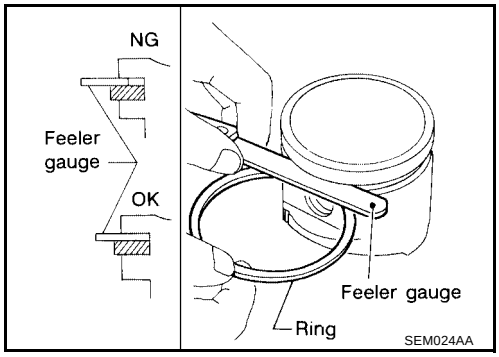
3. Calculate piston pin clearance Dp – dp.

Piston pin to piston clearance : 0.002 - 0.006 mm (0.0001 - 0.0002 in)

If it exceeds the above value, replace piston assembly with pin.

PISTON RING SIDE CLEARANCE

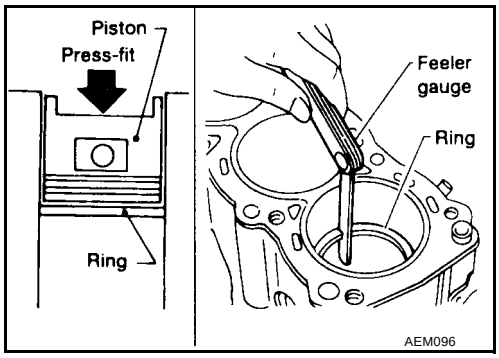
Side clearance	
Top ring	**: 0.045 - 0.080 mm (0.0018 - 0.0031 in)**
2nd ring	**: 0.030 - 0.070 mm (0.0012 - 0.0028 in)**
Oil ring	**: 0.065 - 0.135 mm (0.0026 - 0.0053 in)**
Limit	**: 0.2 mm (0.008 in)**



If out of specification, replace piston and/or piston ring assembly.

PISTON RING END GAP

End gap	
Top ring	**: 0.20 - 0.39 mm (0.0079 - 0.0154 in)**
2nd ring	**: 0.32 - 0.56 mm (0.0126 - 0.0220 in)**
Oil ring	**: 0.20 - 0.69 mm (0.0079 - 0.0272 in)**
Limit of end gap	
Top ring	**: 0.49 mm (0.0193 in)**
2nd ring	**: 0.64 mm (0.0252 in)**
Oil ring	**: 1.09 mm (0.0429 in)**

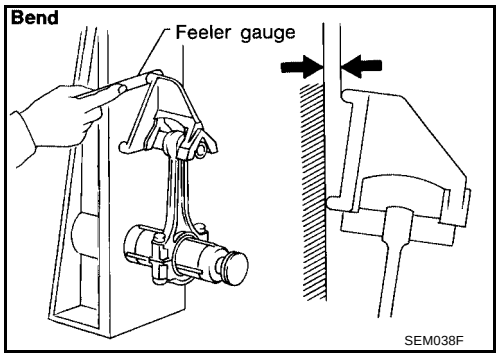


If out of specification, replace piston ring. If gap exceeds maximum limit with a new ring, rebore cylinder and use oversized piston and piston rings.
Refer to **EM-87, "Piston, Piston Ring and Piston Pin"** .

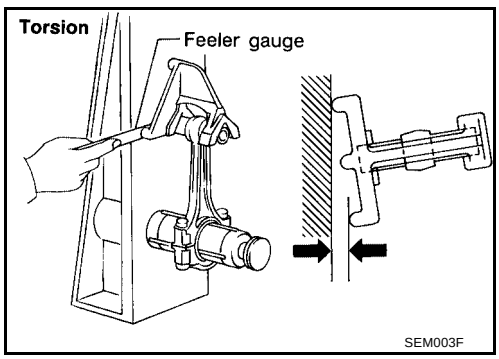
- When replacing the piston, check the cylinder block surface for scratches or seizure. If scratches or seizure is found, hone or replace the cylinder block.

CONNECTING ROD BEND AND TORSION

Bend Limit	**: 0.15 mm (0.0059 in) per 100 mm (3.94 in) length**
Torsion Limit	**: 0.3 mm (0.012 in) per 100 mm (3.94 in) length**



If it exceeds the limit, replace connecting rod assembly.



CYLINDER BLOCK DISTORTION AND WEAR

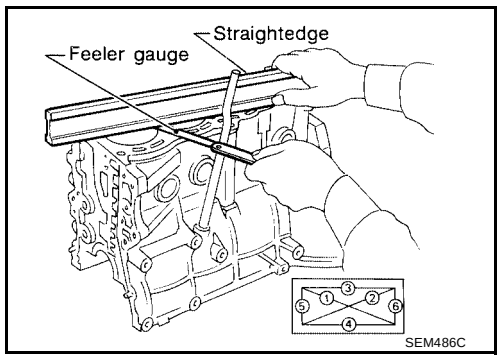
Clean upper surface of cylinder block.
Use a reliable straightedge and feeler gauge to check the flatness of cylinder block surface. Check along six positions shown in figure.

Block surface flatness

Standard : Less than 0.03 mm (0.0012 in)

Limit : 0.1 mm (0.004 in)

If out of specification, resurface it.

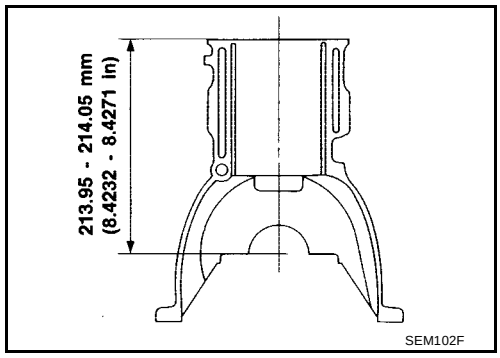


The limit for cylinder block resurfacing is determined by the amount of cylinder head resurfacing.
Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".

The maximum limit is as follows A + B : 0.2 mm (0.008 in)

Nominal cylinder block height from crankshaft center 213.95 - 214.05 mm (8.4232 - 8.4271 in)

If necessary, replace cylinder block.



PISTON-TO-BORE CLEARANCE

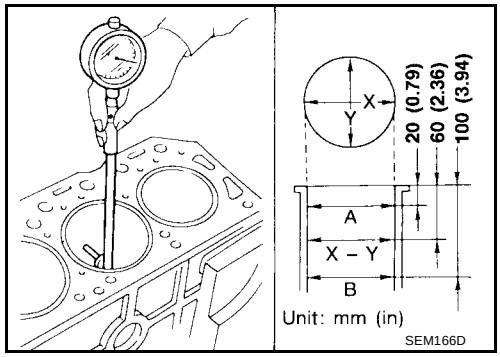
1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper. The Y axis is in the longitudinal direction of the engine.

Standard inner diameter (Grade No. 1) :80.000 - 80.010 mm (3.1496 - 3.1500 in)

Wear limit :0.2 mm (0.008 in)

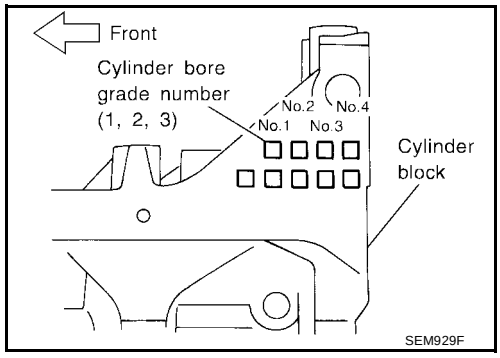
Out-of-round (X – Y) standard :Less than 0.015 mm (0.0006 in)

Taper (B – A) standard :Less than 0.01 mm (0.0004 in)

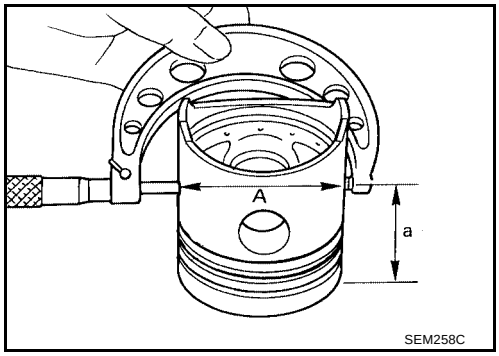


If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

2. Check for score and seizure. If seizure is found, hone it.
   - **If cylinder block or piston is replaced, match piston grade with grade number on cylinder block lower surface.**



3. Measure piston skirt diameter.



Piston diameter "A" **:Refer to EM-87, "Piston, Piston Ring and Piston Pin" .**

Measuring point "a" (Distance from the top) **:42.3 mm (1.665 in)**

4. Check that piston-to-bore clearance is within specification.

Piston-to-bore clearance = cylinder bore measurement "B" – Piston diameter "A" **:0.025 - 0.045 mm (0.0010 - 0.0018 in)**

5. Determine piston oversize according to amount of cylinder wear.
   - **Oversize pistons are available for service. Refer to EM-87, "Piston, Piston Ring and Piston Pin" .**
6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".

Rebored size calculation

D = A + B – C

where:

D **: Bored diameter**

A **: Piston diameter as measured**

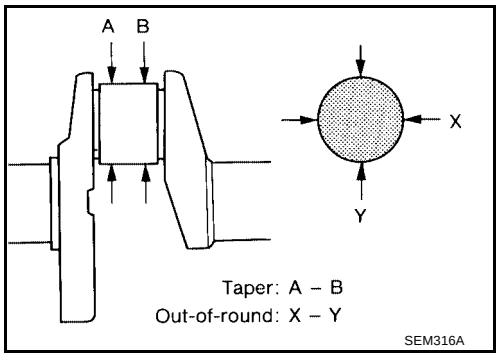
B **: Piston-to-bore clearance**

C **: Honing allowance 0.02 mm (0.0008 in)**

7. Install main bearing caps and tighten bolts to the specified torque. This will prevent distortion of cylinder bores.
8. Cut cylinder bores.
   - **When any cylinder needs boring, all other cylinders must also be bored.**
   - **Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so at a time.**
9. Hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.
    - **Measurement should be done after cylinder bore cools down.**

CRANKSHAFT

1. Check crankshaft main and pin journals for score, wear or cracks.



2. With a micrometer, measure journals for taper and out-of-round.

Out-of-round, (X – Y)

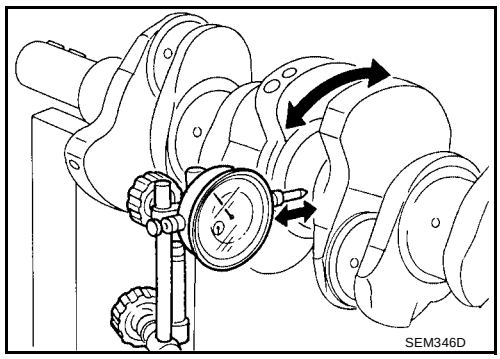
Standard	**: Less than 0.003 mm (0.0001 in)**
Limit	**: Less than 0.005 mm (0.0002 in)**

Taper, (A – B)

Standard	**: Less than 0.004 mm (0.0002 in)**
Limit	**: Less than 0.005 mm (0.0002 in)**

3. Measure crankshaft runout.

Runout, Standard (Total indicator reading)	**:Less than 0.04 mm (0.0016 in)**
Limit	**: Less than 0.05 mm (0.0020 in)**



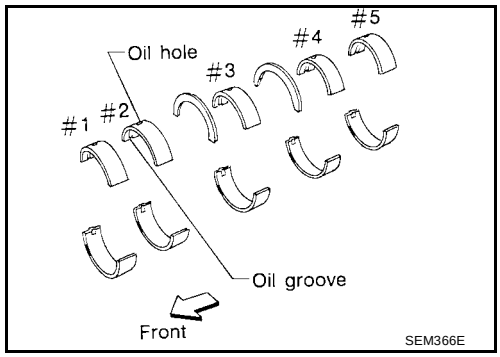
BEARING CLEARANCE

Use Method A or Method B. Method A is preferred because it is more accurate.

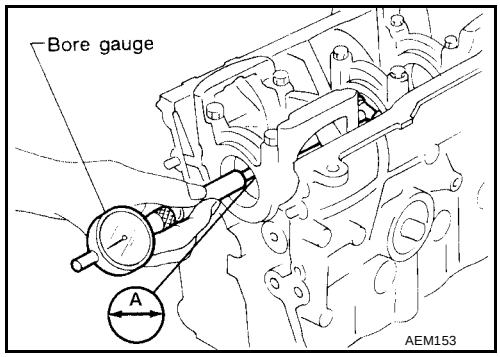
Method A (Using bore gauge and micrometer)

Main bearing

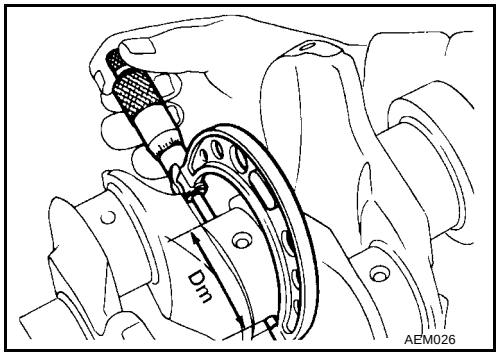
1. Set main bearings in their proper positions on cylinder block and main bearing cap.
2. Install main bearing cap to cylinder block.
   Tighten all bolts in correct order in two or three stages. Refer to EM-77, "Assembly" .



3. Measure inner diameter “A” of each main bearing.



4. Measure outer diameter “Dm” of each main journal in crankshaft.



5. Calculate main bearing clearance.

Main bearing clearance = A – Dm

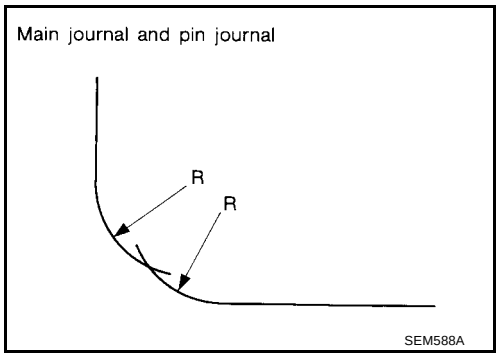
Standard : 0.018 - 0.042 mm (0.0007 - 0.0017 in)

Limit : 0.1 mm (0.004 in)

If it exceeds the limit, replace bearing.
If clearance cannot be adjusted within standard of any bearing, grind crankshaft journal and use undersized bearing.
When grinding crank pin and crank journal:

- **Grind until clearance is within specified standard bearing clearance.**
- **Fillets should be finished as shown in the figure. R: 2.3 - 2.5 mm (0.091 - 0.098 in)**

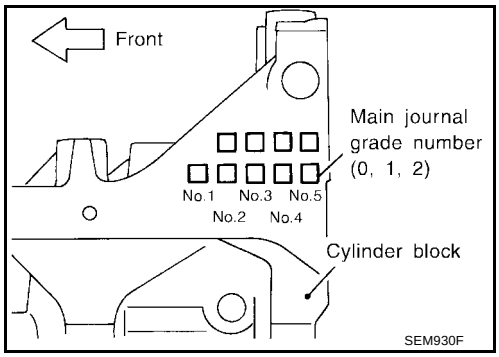
Refer to EM-90, "Bearing Clearance" for standard bearing clearance and available spare parts.

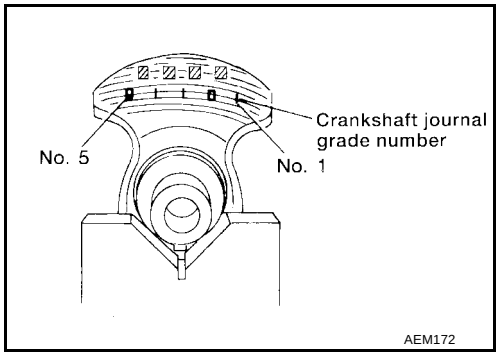


6. If the crankshaft is replaced, select thickness of main bearings as follows:

a. Grade number of each cylinder block main journal is punched on the respective cylinder block. These numbers are punched in either Arabic or Roman numerals.

b. Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.

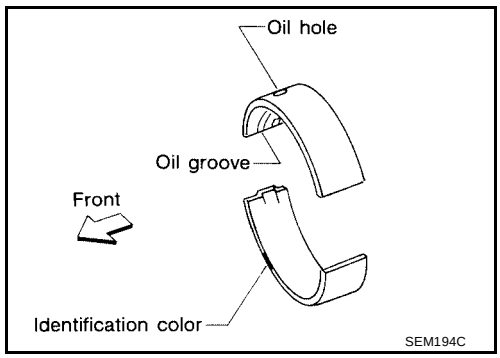




c. Select main bearing with suitable thickness according to the following table.

Main bearing grade color:

Crankshaft main journal grade number	Cylinder block main journal grade number		
	0	1 or I	2 or II
0	0 (Black)	1 (Brown)	2 (Green)
1 or I	1 (Brown)	2 (Green)	3 (Yellow)
2 or II	2 (Green)	3 (Yellow)	4 (Blue)



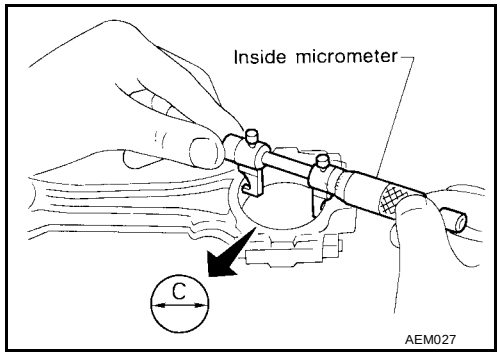
For example:
Cylinder block main journal grade number: 1
Crankshaft main journal grade number: 2
Main bearing grade number = 1 + 2 = 3 (Yellow)

Connecting Rod Bearing (Big End)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Tighten bolts to the specified torque.

3. Measure inner diameter “C” of each bearing.



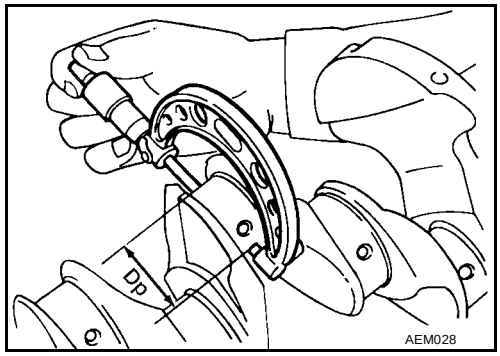
4. Measure outer diameter “Dp” of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

Connecting rod bearing clearance = C – Dp

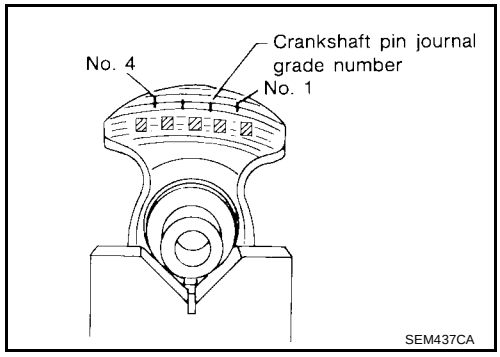
Standard : 0.014 - 0.039 mm (0.0006 - 0.0015 in)

Limit : 0.1 mm (0.004 in)

If it exceeds the limit, replace bearing.
If clearance cannot be adjusted using any standard bearing grade, grind crankshaft journal and use undersized bearing. Refer to EM-90, "Bearing Clearance" .



- If a new bearing, crankshaft or connecting rod is replaced, select connecting rod bearing according to the following table.



Connecting rod bearing grade number:
These numbers are punched in either Arabic or Roman numerals.

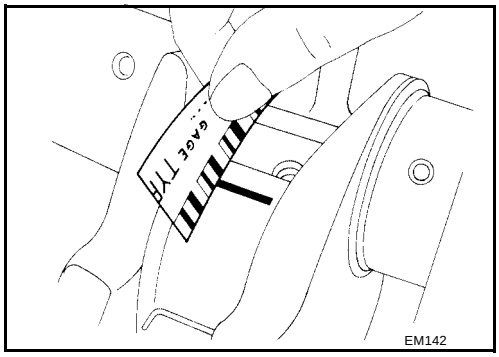
Crankshaft pin journal grade number	Connecting rod bearing grade color
0	—

Crankshaft pin journal grade number	Connecting rod bearing grade color
1or I	Brown
2 or II	Green

Method B (Using Plastigage)

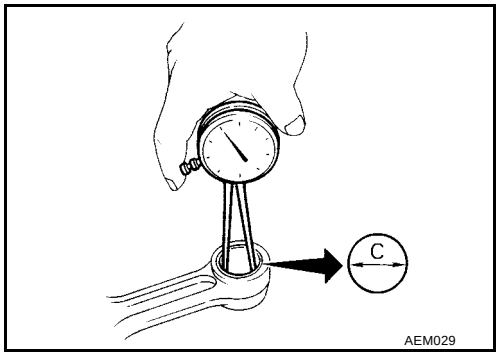
CAUTION:

- **Do not turn crankshaft or connecting rod while Plastigage is being inserted.**
- **If incorrect bearing clearance exists, use a thicker or under-sized main bearing to ensure specified clearance.**



CONNECTING ROD BUSHING CLEARANCE (SMALL END)

1. Measure inner diameter “C” of bushing.

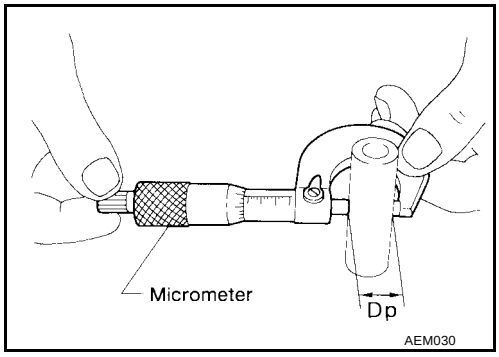


2. Measure outer diameter “Dp” of piston pin.
3. Calculate piston pin to connecting rod bushing clearance.

Piston pin to connecting rod bushing clearance = C – Dp

Standard :0.005 - 0.017 mm (0.0002 - 0.0007 in)
Limit :0.023 mm (0.0009 in)

If it exceeds the limit, replace connecting rod assembly or connecting rod bushing and/or piston pin.



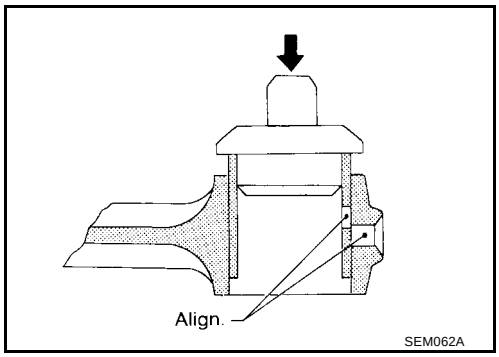
REPLACEMENT OF CONNECTING ROD BUSHING (SMALL END)

1. Drive in small end bushing until it is flush with end surface of rod.

Be sure to align the oil holes.

2. Ream the bushing so that clearance with piston pin is within specification.

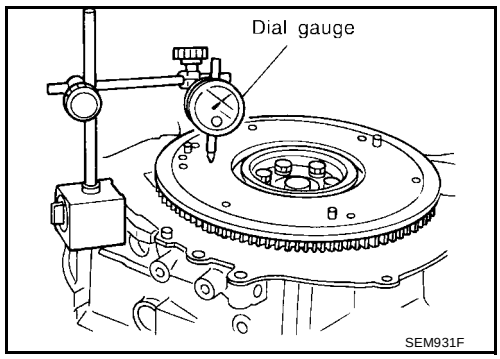
Piston pin to connecting rod bushing clearance
Standard : 0.005 - 0.017 mm (0.0002 - 0.0007 in)
Limit : 0.023 mm (0.0009 in)



FLYWHEEL RUNOUT

Runout (Total indicator reading)

Flywheel (M/T models) :Less than 0.15 mm (0.0059 in)



CAUTION:

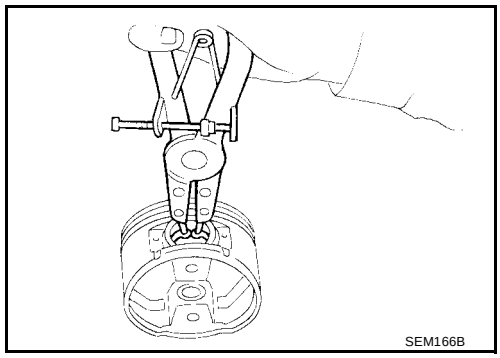
- **Do not allow any magnetic materials to contact the ring gear teeth and rear plate.**
- **Do not resurface flywheel. Replace as necessary.**

Assembly

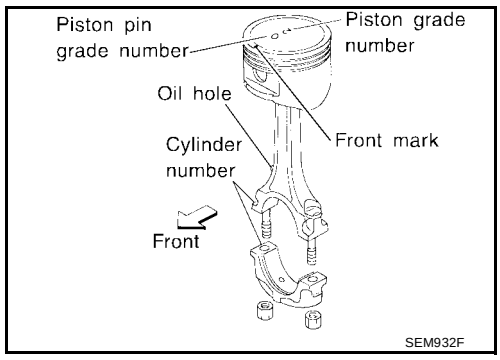
EBS00CEY

PISTON

1. Install new snap ring on one side of piston pin hole.

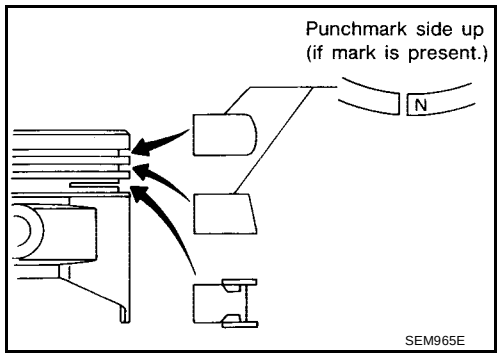


2. Heat piston to 60° to 70°C (140° to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.
   - **Align the direction of piston and connecting rod.**
   - **Numbers stamped on connecting rod and cap correspond to each cylinder.**
   - **After assembly, make sure connecting rod swings smoothly.**

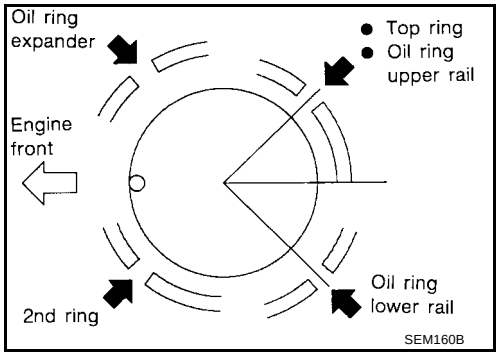


3. Set piston rings as shown.

   CAUTION:
   - **When piston rings are not replaced, make sure that piston rings are mounted in their original position.**
   - **Install new piston rings either side up if there is no punch mark.**



- **Align piston rings so that end gaps are positioned as shown.**

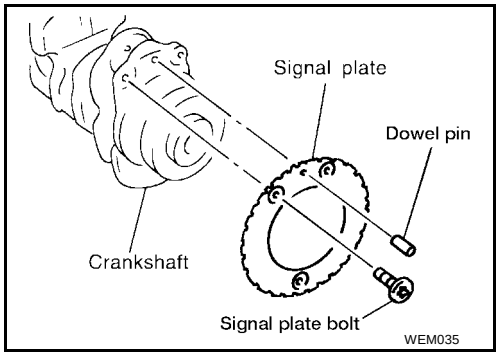


CRANKSHAFT

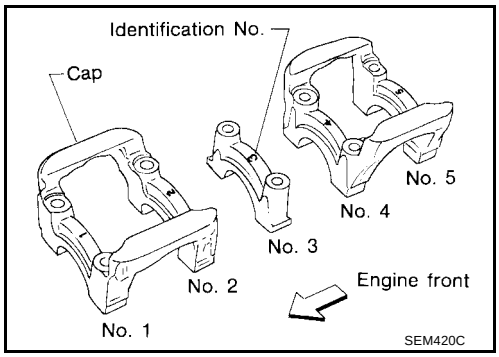
1. Install signal plate to crankshaft using dowel pin to properly position the signal plate. Remove the dowel pin after the signal plate bolts are tightened. Tighten the signal plate bolts.

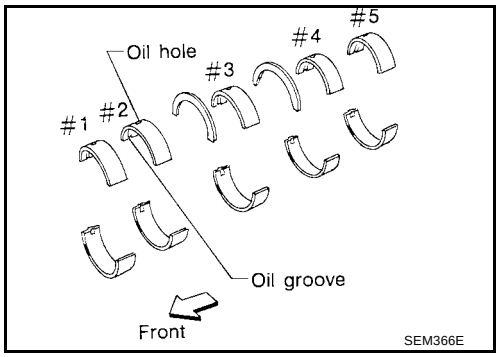
Signal plate bolts : 7.64 - 9.22 N·m (0.78 - 0.94 kg-m, 67.7 - 81.6 in-lb

Dowel pin diameter : 6 mm (0.24 in)

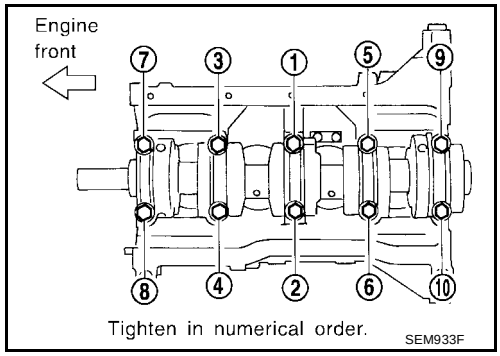


2. Set main bearings in their proper positions on cylinder block and main bearing cap.
   - **Confirm that correct main bearings are selected by using Method A or Method B. Refer to EM-90, "Bearing Clearance" .**
   - **Apply new engine oil to bearing surfaces.**





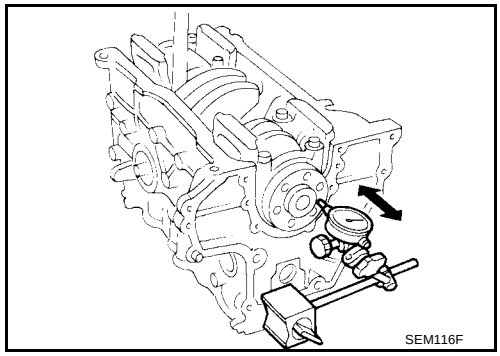
3. Install crankshaft and main bearing caps and tighten bolts to the specified torque.
   - **Apply new engine oil to the bolt thread and seat surface.**
   - **Prior to tightening bearing cap bolts, shift crankshaft back and forth to properly seat the bearing caps.**
   - **Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward as shown in figure.**
   - **After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.**



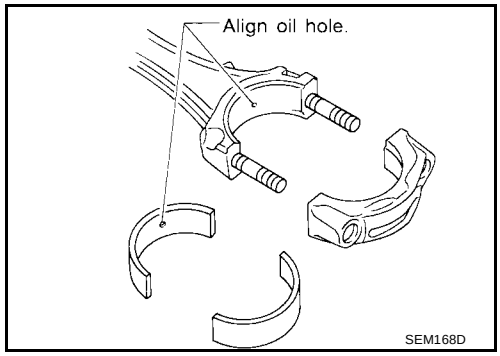
4. Measure crankshaft free end play.

Crankshaft free end play	
Standard	0.060 - 0.220 mm (0.0024 - 0.0087 in)
Limit	0.3 mm (0.012 in)

If beyond the limit, replace thrust bearing with new ones.

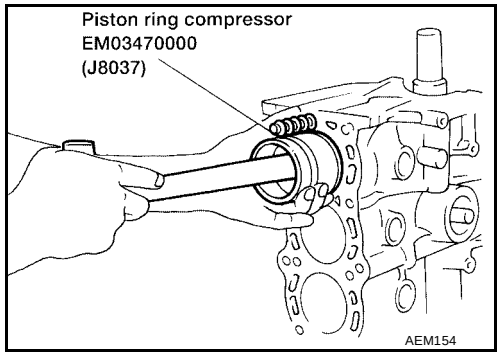


5. Install connecting rod bearings in connecting rods and connecting rod caps.
   - **Confirm that correct bearings are used. Refer to EM-90, "Connecting Rod Bearing" .**
   - **Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.**
   - **Apply new engine oil to bolt threads and bearing surfaces.**



6. Install pistons with connecting rods.

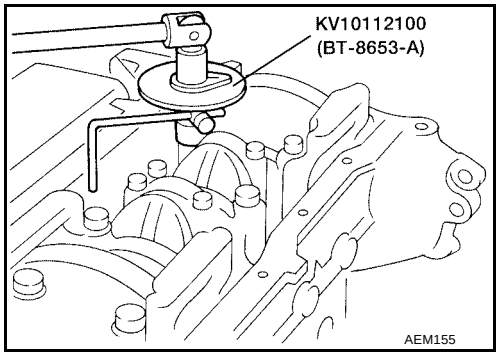
a. Install them into corresponding cylinders with Tool.
   - **Make sure connecting rod does not scratch cylinder wall.**
   - **Make sure connecting rod bolts do not scratch crankshaft pin journals.**
   - **Arrange so that front mark on piston head faces engine.**
   - **Apply new engine oil to piston rings and sliding surface of piston.**



b. Install connecting rod caps.
Apply new engine oil to bolt threads and nut seating surfaces.
Tighten connecting rod cap nuts in two stages:

Stage 1 : 13.72 - 15.68 N·m (1.399 - 1.599 kg-m, 10.120 - 11.566 ft-lb)

Stage 2 : 35 - 40 degrees clockwise, or 23 - 28 N·m (2.3 - 2.9 kg-m, 17 - 21 ft-lb)



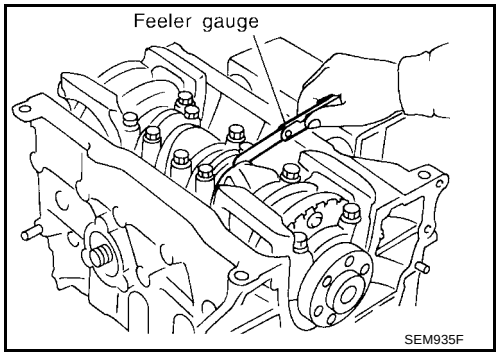
7. Measure connecting rod side clearance.

Connecting rod side clearance

Standard :0.200 - 0.470 mm (0.0079 - 0.0185 in)

Limit :0.52 mm (0.0205 in)

If beyond the limit, replace connecting rod and/or crankshaft.

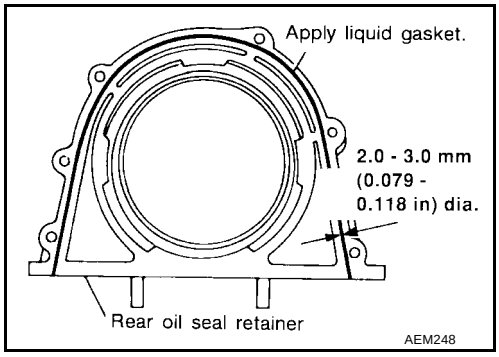


8. Install rear oil seal retainer.

a. Before installing rear oil seal retainer, remove old Silicone RTV Sealant from cylinder block and retainer.

b. Apply a continuous bead of Silicone RTV Sealant to rear oil seal retainer.

- **Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .**
- **Apply around inner side of bolt holes.**

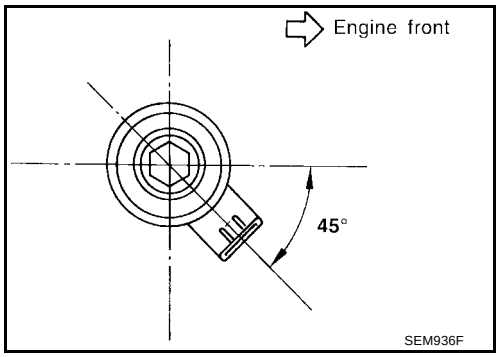


9. Install crankshaft position sensor (POS).

Crankshaft position sensor bolt : 7.2 - 10.8 N·m (0.73 - 1.10 kg-m, 63.4 - 95.5 in-lb)

10. Install knock sensor at correct angle.

Knock sensor bolt : 15.7 - 20.6 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)



SERVICE DATA AND SPECIFICATIONS (SDS)

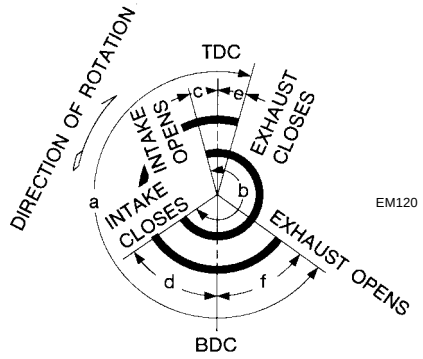
PFP:00030

General Specifications

EBS00CEZ

Engine		QG18DE
Classification		Gasoline
Cylinder arrangement		4, in-line
Displacement cm^3 (cu in)		1,769 (107.94)
Bore × stroke mm (in)		80.0 x 88.0 (3.150 x 3.465)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		5
Compression ratio		9.5

Valve timing
(Intake valve timing control - OFF)



EM120

Unit: degree

a	b	c	d	e	f
204	236	5	51	-2	26

Compression Pressure

EBS00CF0

Unit: kPa (kg/cm^2 , psi)/350 rpm

Standard	1,324 (13.5, 192)
Minimum	1,157 (11.5, 168)
Difference limit between cylinders	98 (1.0, 14)

Cylinder Head

EBS00CF1

Unit: mm (in)

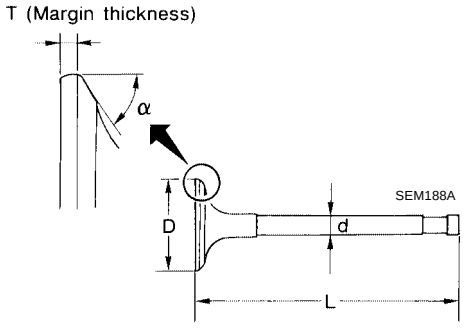
	Standard	Limit
Head surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Nominal height	117.8 - 118.0 (4.638 - 4.646)	—

Valve

EBS00CF2

VALVE

Unit: mm (in)



Valve head diameter “D”	Intake	29.9 - 30.2 (1.177 - 1.189)
	Exhaust	24.9 - 25.2 (0.980 - 0.992)
Valve length “L”	Intake	92.00 - 92.50 (3.6220 - 3.6417)
	Exhaust	92.37 - 92.87 (3.6366 - 3.6563)
Valve stem diameter “d”	Intake	5.465 - 5.480 (0.2152 - 0.2157)
	Exhaust	5.445 - 5.460 (0.2144 - 0.2150)
Valve face angle “α”		45°15′ - 45°45′
Valve face contact width	Intake	1.06 - 1.34 (0.0417 - 0.0528)
	Exhaust	1.34 - 1.63 (0.0528 - 0.0642)
Valve margin “T” limit		1.05 - 1.35 (0.0413 - 0.0531)
Valve stem end surface grinding limit		0.2 (0.008)

VALVE SPRING

Free height mm (in)		41.19 (1.622)
Pressure N (kg, lb) at height mm (in)	Standard	370.0 (37.73, 83.19) at 23.64 (0.9307)
	Limit	More than 347.8 (35.46, 78.19) at 23.64 (0.9307)
Out-of-square mm (in)		Less than 1.75 (0.0689)

VALVE LIFTER

Unit: mm (in)

Valve lifter outer diameter	29.960 - 29.975 (1.1795 - 1.1801)
Valve lifter guide bore	30.000 - 30.021 (1.1811 - 1.1819)
Clearance between valve lifter and valve lifter guide	0.025 - 0.065 (0.0010 - 0.0026)

VALVE CLEARANCE

Unit: mm (in)

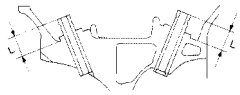
	For adjusting (Standard)		For checking (Reference)
	Hot	Cold* (reference data)	Hot
Intake	0.32 - 0.40 (0.013 - 0.016)	0.25 - 0.33 (0.010 - 0.013)	0.21 - 0.47 (0.008 - 0.019)
Exhaust	0.37 - 0.45 (0.015 - 0.018)	0.32 - 0.40 (0.013 - 0.016)	0.30 - 0.56 (0.012 - 0.022)

*: At a temperature of approximately 20°C (68°F)

Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

VALVE GUIDE

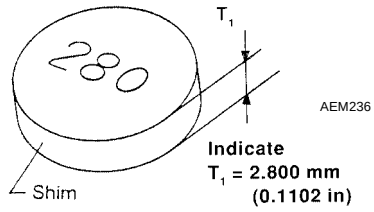
Unit: mm (in)



MEM096A

		Intake		Exhaust	
		Standard	Service	Standard	Service
Valve guide	Outer diameter	9.523 - 9.534 (0.3749 - 0.3754)	9.723 - 9.734 (0.3828 - 0.3832)	9.523 - 9.534 (0.3749 - 0.3754)	9.723 - 9.734 (0.3828 - 0.3832)
	Inner diameter [Finished size]	5.500 - 5.515 (0.2165 - 0.2171)		5.500 - 5.515 (0.2165 - 0.2171)	
Cylinder head valve guide hole diameter		9.475 - 9.496 (0.3730 - 0.3739)	9.685 - 9.696 (0.3813 - 0.3817)	9.475 - 9.496 (0.3730 - 0.3739)	9.685 - 9.696 (0.3813 - 0.3817)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)
Stem to guide clearance		0.020 - 0.050 (0.0008 - 0.0020)		0.040 - 0.070 (0.0016 - 0.0028)	
Stem to guide clearance limit		0.1 (0.004)		0.1 (0.004)	
Valve deflection limit (Dial gauge reading)		0.2 (0.008)			
Projection length “L”		11.5 - 11.7 (0.453 - 0.461)			

AVAILABLE SHIMS



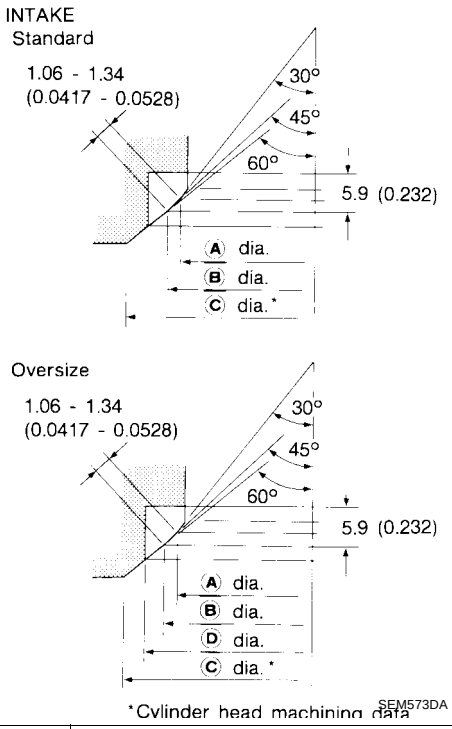
Thickness mm (in)	Identification mark
2.00 (0.0787)	200
2.02 (0.0795)	202
2.04 (0.0803)	204
2.06 (0.0811)	206
2.08 (0.0819)	208
2.10 (0.0827)	210
2.12 (0.0835)	212
2.14 (0.0843)	214
2.16 (0.0850)	216
2.18 (0.0858)	218
2.20 (0.0866)	220

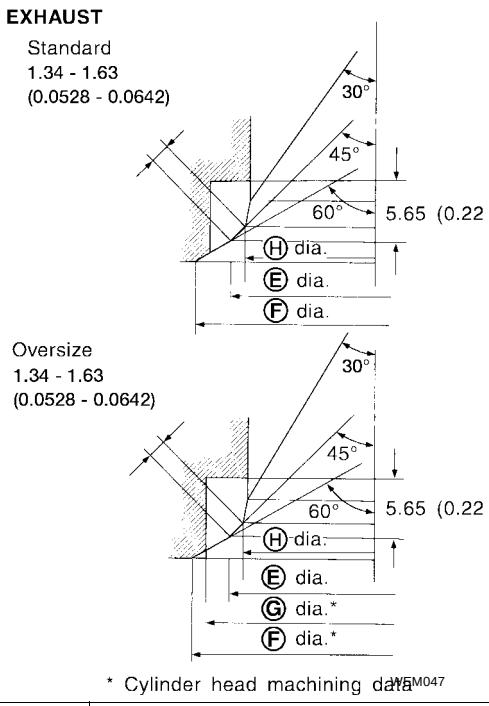
2.21 (0.0870)	221
2.22 (0.0874)	222
2.23 (0.0877)	223
2.24 (0.0882)	224
2.25 (0.0885)	225
2.26 (0.0890)	226
2.27 (0.0893)	227
2.28 (0.0898)	228
2.29 (0.0901)	229
2.30 (0.0906)	230
2.31 (0.0909)	231
2.32 (0.0913)	232
2.33 (0.0917)	233
2.34 (0.0921)	234
2.35 (0.0925)	235
2.36 (0.0929)	236
2.37 (0.0933)	237
2.38 (0.0937)	238
2.39 (0.0940)	239
2.40 (0.0945)	240
2.41 (0.0948)	241
2.42 (0.0953)	242
2.43 (0.0956)	243
2.44 (0.0961)	244
2.45 (0.0964)	245
2.46 (0.0969)	246
2.47 (0.0972)	247
2.48 (0.0976)	248
2.49 (0.0980)	249
2.50 (0.0984)	250
2.51 (0.0988)	251
2.52 (0.0992)	252
2.53 (0.0996)	253
2.54 (0.1000)	254
2.55 (0.1003)	255
2.56 (0.1008)	256
2.57 (0.1011)	257
2.58 (0.1016)	258
2.59 (0.1019)	259
2.60 (0.1024)	260
2.61 (0.1027)	261
2.62 (0.1031)	262
2.63 (0.1035)	263
2.64 (0.1039)	264
2.65 (0.1043)	265

2.66 (0.1047)	266
2.68 (0.1055)	268
2.70 (0.1063)	270
2.72 (0.1071)	272
2.74 (0.1079)	274
2.76 (0.1087)	276
2.78 (0.1094)	278
2.80 (0.1102)	280
2.82 (0.1110)	282
2.84 (0.1118)	284
2.86 (0.1126)	286
2.88 (0.1134)	288
2.90 (0.1142)	290
2.92 (0.1150)	292
2.94 (0.1157)	294
2.96 (0.1165)	296
2.98 (0.1173)	298

VALVE SEAT

Unit: mm (in)

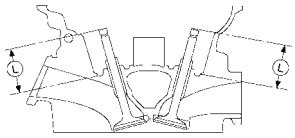




Dia.	Specification	Dia.	Specification
A	27.8 - 28.0 (1.094 - 1.102)	E	24.5 - 24.7 (0.965 - 0.972)
B	29.5 - 29.7 (1.161 - 1.169)	F	26.500 - 26.516 (1.0433 - 1.0439)
C	31.9 - 32.1 (1.256 - 1.264)	G	26.2 - 26.4 (1.031 - 1.039)
D	31.500 - 31.516 (1.2402 - 1.2408)	H	22.4 - 22.6 (0.8819 - 0.8898)

VALVE SEAT RESURFACE LIMIT

Unit: mm (in)



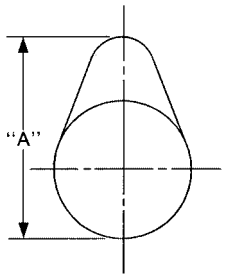
AEM343

Depth (L)	Intake	35.95 - 36.55 (1.4154 - 1.4390)
	Exhaust	35.92 - 36.52 (1.4142 - 1.4378)

Camshaft and Camshaft Bearing

EBS00CF3

Unit: mm (in)



SEM671

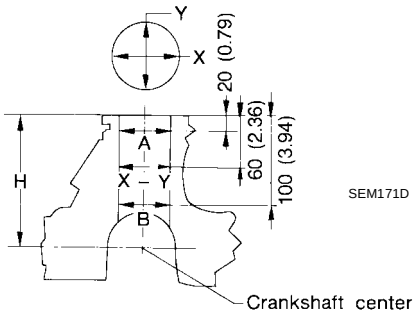
Cam height "A"	Intake	40.61 - 40.80 (1.599 - 1.606)	
	Exhaust	38.965 - 39.155 (1.534 - 1.542)	
Cam wear limit		0.20 (0.0079)	
		Standard	Limit
Camshaft journal clearance		Intake: 0.030 - 0.071 (0.0012 - 0.0028) Exhaust: 0.045 - 0.086 (0.0018 - 0.0034)	Intake: 0.135 (0.0053) Exhaust: 0.150 (0.0059)
Inner diameter of camshaft bracket	No. 1	28.000 - 28.021 (1.1024 - 1.1032)	—
	No. 2, 3, 4, 5	Intake: 23.985 - 24.006 (0.9443 - 0.9451) Exhaust: 24.000 - 24.021 (0.9449 - 0.9457)	
Outer diameter of camshaft journal	No. 1	27.935 - 27.955 (1.0998 - 1.1006)	—
	No. 2, 3, 4, 5	23.935 - 23.955 (0.9423 - 0.9431)	
Camshaft runout [TIR*]		Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft sprocket runout [TIR*]		Less than 0.15 (0.0059)	
Camshaft end play		0.115 - 0.188 (0.0045 - 0.0074)	0.20 (0.0079)

*Total indicator reading

Cylinder Block

EBS00CF4

Unit: mm (in)



SEM171D

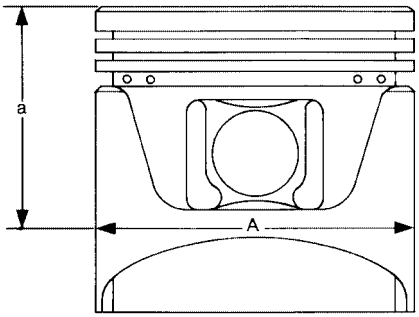
			Standard	Limit
Surface flatness			Less than 0.03 (0.0012)	0.1 (0.004)
Height “H” (nominal)			213.95 - 214.05 (8.4232 - 8.4271)	—
Cylinder bore inner diameter	Standard	Grade No. 1	80.000 - 80.010 (3.1496 - 3.1500)	0.2 (0.008)
		Grade No. 2	80.010 - 80.020 (3.1500 - 3.1504)	
		Grade No. 3	80.020 - 80.030 (3.1504 - 3.1508)	
	Out-of-round (X – Y)		Less than 0.015 (0.0006)	—
	Taper (B – A)		Less than 0.01 (0.0004)	—
	Difference in inner diameter between cylinders		0.05 (0.0020)	0.2 (0.008)

Piston, Piston Ring and Piston Pin

PISTON

EBS00CF5

Unit: mm (in)



SEM882E

Piston skirt diameter “A”	Standard	Grade No. 1	79.965 - 79.975 (3.1482 - 3.1486)
		Grade No. 2	79.975 - 79.985 (3.1486 - 3.1490)
		Grade No. 3	79.985 - 79.995 (3.1490 - 3.1494)
	0.25 (0.0098) oversize (service)		80.215 - 80.245 (3.1581 - 3.1592)
	0.5 (0.020) oversize (service)		80.465 - 80.495 (3.1679 - 3.1691)
“a” distance from the top			42.3 (1.665)
Piston pin hole inner diameter			18.993 - 19.005 (0.7478 - 0.7482)
Piston-to-bore clearance			0.025 - 0.045 (0.0010 - 0.0018)

PISTON RING

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.045 - 0.080 (0.0018 - 0.0031)	0.2 (0.008)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	
	Oil	0.065 - 0.135 (0.0026 - 0.0053)	
End gap	Top	0.20 - 0.39 (0.0079 - 0.0154)	0.49 (0.0193)
	2nd	0.32 - 0.56 (0.0126 - 0.0220)	0.64 (0.0252)
	Oil	0.20 - 0.69 (0.0079 - 0.0272)	1.09 (0.0429)

PISTON PIN

Unit: mm (in)

Piston pin outer diameter		18.989 - 19.001 (0.7476 - 0.7481)
Piston pin to piston clearance		0.002 - 0.006 (0.0001 - 0.0002)
Piston pin to connecting rod bushing clearance (small end)	Standard	0.005 - 0.017 (0.0002 - 0.0007)
	Limit	0.023 (0.0009)

Connecting Rod

EBS00CF6

Unit: mm (in)

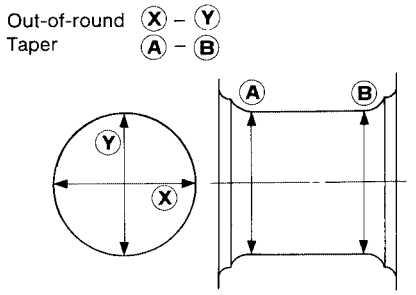
Center distance		140.45 - 140.55 (5.5295 - 5.5335)
Bend limit [per 100 (3.94) length]		0.15 (0.0059)
Torsion limit [per 100 (3.94) length]		0.3 (0.012)
Connecting rod bushing inner diameter* (small end)		19.000 - 19.012 (0.7480 - 0.7485)
Connecting rod big end inner diameter		43.000 - 43.013 (1.6929 - 1.6934)
Side clearance	Standard	0.200 - 0.470 (0.0079 - 0.0185)
	Limit	0.52 (0.0205)

*After installing in connecting rod

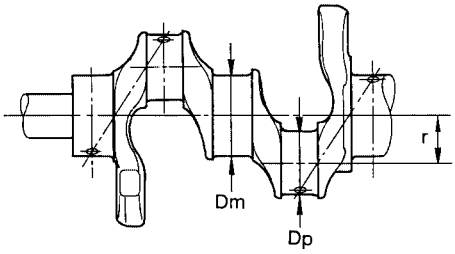
Crankshaft

EBS00CF7

Unit: mm (in)



SEM715



SEM645

Main journal dia. “Dm”	Grade No. 0	49.956 - 49.964 (1.9668 - 1.9671)
	Grade No. 1	49.948 - 49.956 (1.9665 - 1.9668)
	Grade No. 2	49.940 - 49.948 (1.9661 - 1.9665)
Pin journal dia. “Dp”	Grade No. 0	39.968 - 39.974 (1.5735 - 1.5738)
	Grade No. 1	39.962 - 39.968 (1.5733 - 1.5735)
	Grade No. 2	39.956 - 39.962 (1.5731 - 1.5733)
Center distance “r”		43.95 - 44.05 (1.7303 - 1.7342)
Out-of-round (X – Y)	Standard	Less than 0.003 (0.0001)
	Limit	Less than 0.005 (0.0002)
Taper (A – B)	Standard	Less than 0.004 (0.0002)
	Limit	Less than 0.005 (0.0002)
Runout [TIR*]	Standard	Less than 0.04 (0.0016)
	Limit	Less than 0.05 (0.0020)
Free end play	Standard	0.060 - 0.220 (0.0024 - 0.0087)
	Limit	0.3 (0.012)

*: Total indicator reading

Main Bearing

EBS00CF8

STANDARD

Grade No.	Thickness “T” mm (in)	Identification color
0	1.827 - 1.831 (0.0719 - 0.0720)	Black
1	1.831 - 1.835 (0.0720 - 0.0722)	Brown
2	1.835 - 1.839 (0.0722 - 0.0724)	Green
3	1.839 - 1.843 (0.0724 - 0.0725)	Yellow
4	1.843 - 1.847 (0.0725 - 0.0727)	Blue

UNDERSIZE

Unit: mm (in)

	Thickness “T”
0.25 (0.0098)	1.960 - 1.964 (0.0772 - 0.0773)
0.50 (0.0197)	2.085 - 2.089 (0.0821 - 0.0822)

Connecting Rod Bearing

EBS00CF9

STANDARD SIZE

Unit: mm (in)

Grade No.	Thickness	Identification color or number
0	1.503 - 1.506 (0.0592 - 0.0593)	—
1	1.506 - 1.509 (0.0593 - 0.0594)	Brown
2	1.509 - 1.512 (0.0594 - 0.0595)	Green

UNDERSIZE

Unit: mm (in)

Grade No.	Thickness	Identification color or number
0.08 (0.0031)	1.542 - 1.546 (0.0607 - 0.0609)	—
0.12 (0.0047)	1.562 - 1.566 (0.0615 - 0.0617)	—
0.25 (0.0098)	1.627 - 1.631 (0.0641 - 0.0642)	—

Bearing Clearance

EBS00CFA

Unit: mm (in)

Main bearing clearance	Standard	0.018 - 0.042 (0.0007 - 0.0017)
	Limit	0.1 (0.004)
Connecting rod bearing clearance	Standard	0.014 - 0.039 (0.0006 - 0.0015)
	Limit	0.1 (0.004)

Miscellaneous Components

EBS00CFB

Unit: mm (in)

Flywheel runout [TIR*]	Less than 0.15 (0.0059)
Camshaft sprocket runout [TIR*]	Less than 0.15 (0.0059)

*: Total indicator reading at measuring point 115 mm (4.53 in) from crankshaft center.

PRECAUTIONS

PFP:00001

Precautions for Draining Coolant

EBS00CFC

- Drain coolant when engine is cooled.

Precautions for Disconnecting Fuel Piping

EBS00CFD

- Before starting work, make sure no fire or spark producing items are in the work area.
- Release fuel pressure before any removal or disassembly.
- After disconnecting pipes, plug openings to stop fuel leakage.

Precautions for Removal and Disassembly

EBS00CFE

- When instructed to use special service tools, use the specified tools. Always be careful to work safely, avoid forceful operations.
- Use maximum care to avoid damage to mating or sliding surfaces.
- Cover openings of engine system with tape or equivalent, if necessary, to seal out foreign materials.
- Mark and arrange disassembly parts in an organized way for easy troubleshooting and assembly.
- When loosening nuts and bolts, as a basic rule, start with the one furthest outside, then the one diagonally opposite, and so on. If the order of loosening is specified, follow the specifications.

Precautions for Inspection, Repair and Replacement

EBS00CFF

- Before repairing or replacing, thoroughly inspect parts. Inspect new replacement parts in the same way, and replace if necessary.

Precautions for Assembly and Installation

EBS00CFG

- Use torque wrench to tighten bolts or nuts.
- When tightening nuts and bolts, as a basic rule, equally tighten in several different steps starting with the ones in center, then ones on inside and outside diagonally in this order. If the order of tightening is specified, follow the specifications.
- Always replace the old with a new gasket, packing, oil seal or O-ring.
- Thoroughly wash, clean, and air-blow each part. Carefully check oil or coolant passages for any restriction and blockage.
- Avoid damaging sliding or mating surfaces. Completely remove foreign materials such as cloth lint or dust. Before assembly, oil sliding surfaces well.
- Bleed the air trapped within the system after draining the coolant.
- Before starting engine, apply fuel pressure to fuel lines with turning ignition switch ON (with engine stopped). Then make sure that there are no leaks at fuel line connections.
- After repairing, start engine and increase engine speed to check coolant, fuel, oil, and exhaust systems for leakage or rattles.

Parts Requiring Angular Tightening

EBS00CFH

- Use an angle wrench for the final tightening of the following engine parts.
  - Cylinder head bolts
  - Lower cylinder block bolts
  - Connecting rod cap bolts
  - Crankshaft pulley bolt (No angle wrench is required as the bolt flange is provided with notches for angular tightening)
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.

Precautions for Liquid Gasket

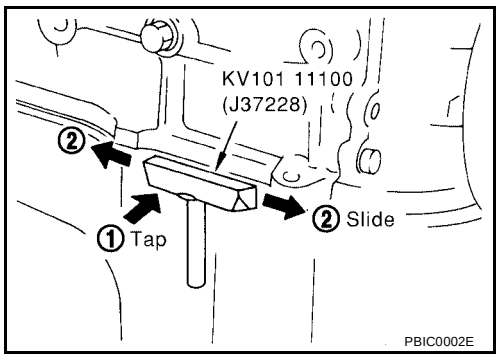
EBS00EZ4

REMOVAL OF LIQUID GASKET SEALING

- After removing the mounting bolts and nuts, separate the mating surface using a seal cutter and remove the liquid gasket sealing.

CAUTION:
Be careful not to damage the mating surfaces.

- In areas where the cutter is difficult to use, use a plastic hammer to lightly tap (1) the cutter where the Silicone RTV Sealant is applied. Use a plastic hammer to slide the cutter (2) by tapping on the side.



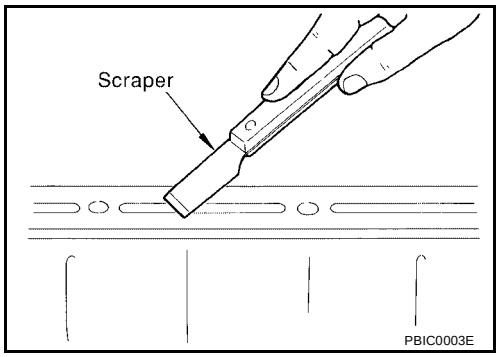
CAUTION:
If for some unavoidable reason a tool such as a flat-bladed screwdriver is used, be careful not to damage the mating surfaces.

LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper, remove the old Silicone RTV Sealant adhering to the gasket application surface and the mating surface.

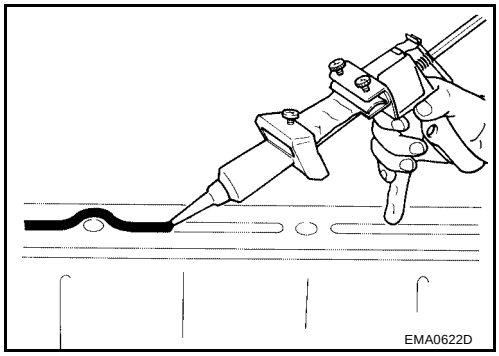
- Remove the sealant completely from the groove of the gasket application surface, mounting bolts, and bolt holes.

2. Thoroughly clean the gasket application surface and the mating surface and remove adhering moisture, grease and foreign materials.
3. Attach the sealant tube to the tube presser.
   Use Genuine Silicone RTV Sealant or equivalent. Refer to **GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"** .

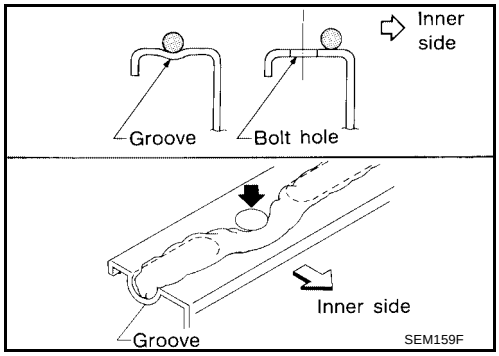


4. Apply the sealant using Tool without breaks to the specified location with the specified dimensions.

Tube presser	**WS39930000 (–)**



- If there is a groove for the sealant application, apply the sealant to the groove.
- As for the bolt holes, normally apply the sealant inside the holes. If specified, it should be applied outside the holes. Make sure to read the text of this manual.
- Within five minutes of the sealant application, install the mating component.
- If the sealant protrudes, wipe it off immediately.
- Do not retighten after the installation.
- After 30 minutes or more have passed from the installation, fill the engine with the specified oil and coolant. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .



CAUTION:
Follow all specific instructions in this manual.

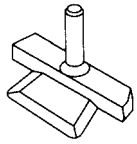
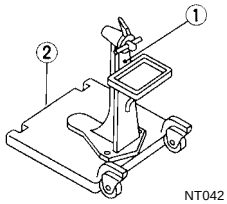
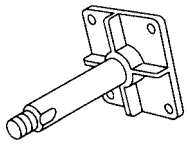
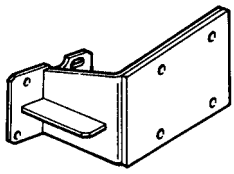
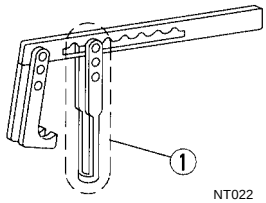
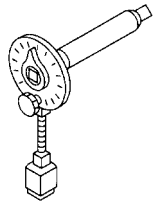
PREPARATION

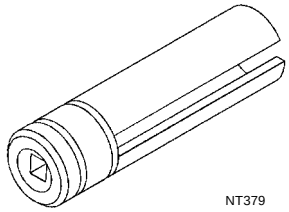
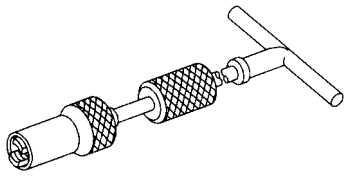
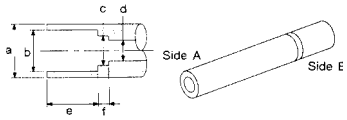
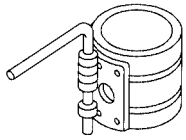
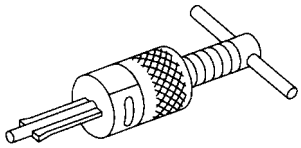
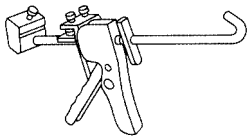
PFP:00002

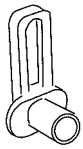
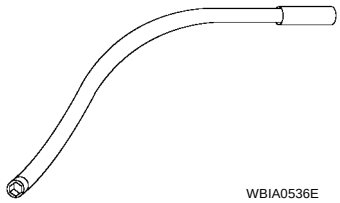
Special Service Tools

EBS00CFJ

The actual shapes of the Kent-Moore tools may differ from those of the special service tools illustrated here.

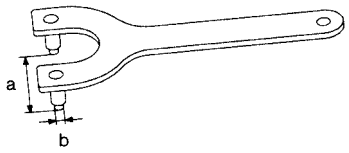
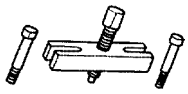
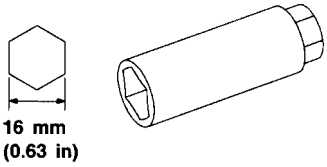
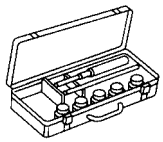
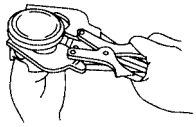
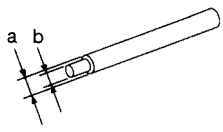
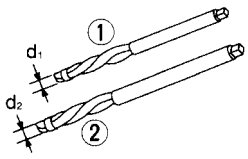
Tool number (Kent-Moore No.) Tool name		Description
KV10111100 (J-37228) Seal cutter	 S-NT046	Removing oil pan and timing chain case
ST0501S000 Engine stand assembly 1. ST05011000 (—) Engine stand 2. ST05012000 (—) Base	 NT042	Disassembling and assembling
KV10106500 (—) Engine stand shaft	 NT028	Disassembling and assembling
KV10115300 (—) Engine sub-attachment	 ZZA1078D	Disassembling and assembling
KV10116200 (J-26336-B) Valve spring compressor 1. KV10115900 (J-26336-20) Attachment 2. KV10109220 (—) Adapter	 NT022	Disassembling valve mechanism
KV10112100 (BT-8653-A) Angle wrench	 S-NT014	Tightening bolts for bearing cap, cylinder head, etc. in angle.

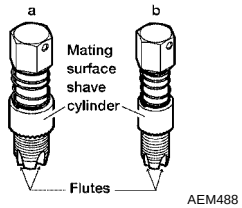
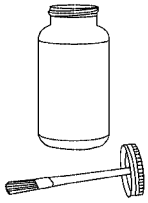
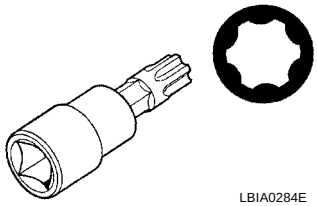
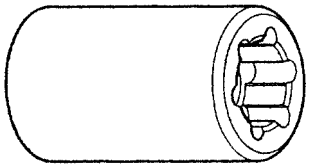
Tool number (Kent-Moore No.) Tool name	Description
KV10117100 (J-36471-A) Heated oxygen sensor wrench  NT379	Loosening or tightening heated oxygen sensors with 22 mm (80.87 in) hexagon nut
KV10107902 (J-38959) Valve oil seal puller  S-NT011	Removing valve oil seal
KV10115600 (J-38958) Valve oil seal drift  S-NT603	Installing valve oil seal **Use side A.** **a: 20 (0.79) dia.** **d: 8 (0.31) dia.** **b: 13 (0.51) dia.** **e: 10.7 (0.421) dia.** **c: 10.3 (0.406) dia.** **f: 5 (0.20) dia.** Unit: mm (in)
EM03470000 (J-8037) Piston ring compressor  S-NT044	Installing piston assembly into cylinder bore
ST16610001 (J-23907) Pilot bushing puller  S-NT045	Removing crankshaft pilot bushing
WS39930000 (—) Tube presser  S-NT052	Pressing the tube of liquid gasket

Tool number (Kent-Moore No.) Tool name	Description
— (J-45488) Quick connector release  PBIC0198E	Removing fuel tube quick connectors in engine room
— (J-46535) Drive belt tension releaser  WBIA0536E	Releasing drive belt tension

Commercial Service Tools

EBS00CFK

(Kent-Moore No.) Tool name	Description
Pulley holder  NT628	Crankshaft pulley removing and installing **a: 68 mm (2.68 in) dia.** **b: 8mm (0.31 in) dia.**
Crank puller  ZZA0010D	Crankshaft pulley removing
Spark plug wrench  S-NT047	Removing and installing spark plug
Valve seat cutter set  S-NT048	Finishing valve seat dimensions
Piston ring expander  S-NT030	Removing and installing piston ring
Valve guide drift  S-NT015	Removing and installing valve guide **Intake & Exhaust:** **a: 9.5 mm (0.374 in) dia.** **b: 5.5 mm (0.217 in) dia.**
Valve guide reamer  S-NT016	1: Reaming valve guide inner hole 2: Reaming hole for oversize valve guide **Intake & Exhaust:** **d_1 : 6.0 mm (0.236 in) dia.** **d_2 : 10.2 mm (0.402 in) dia.**

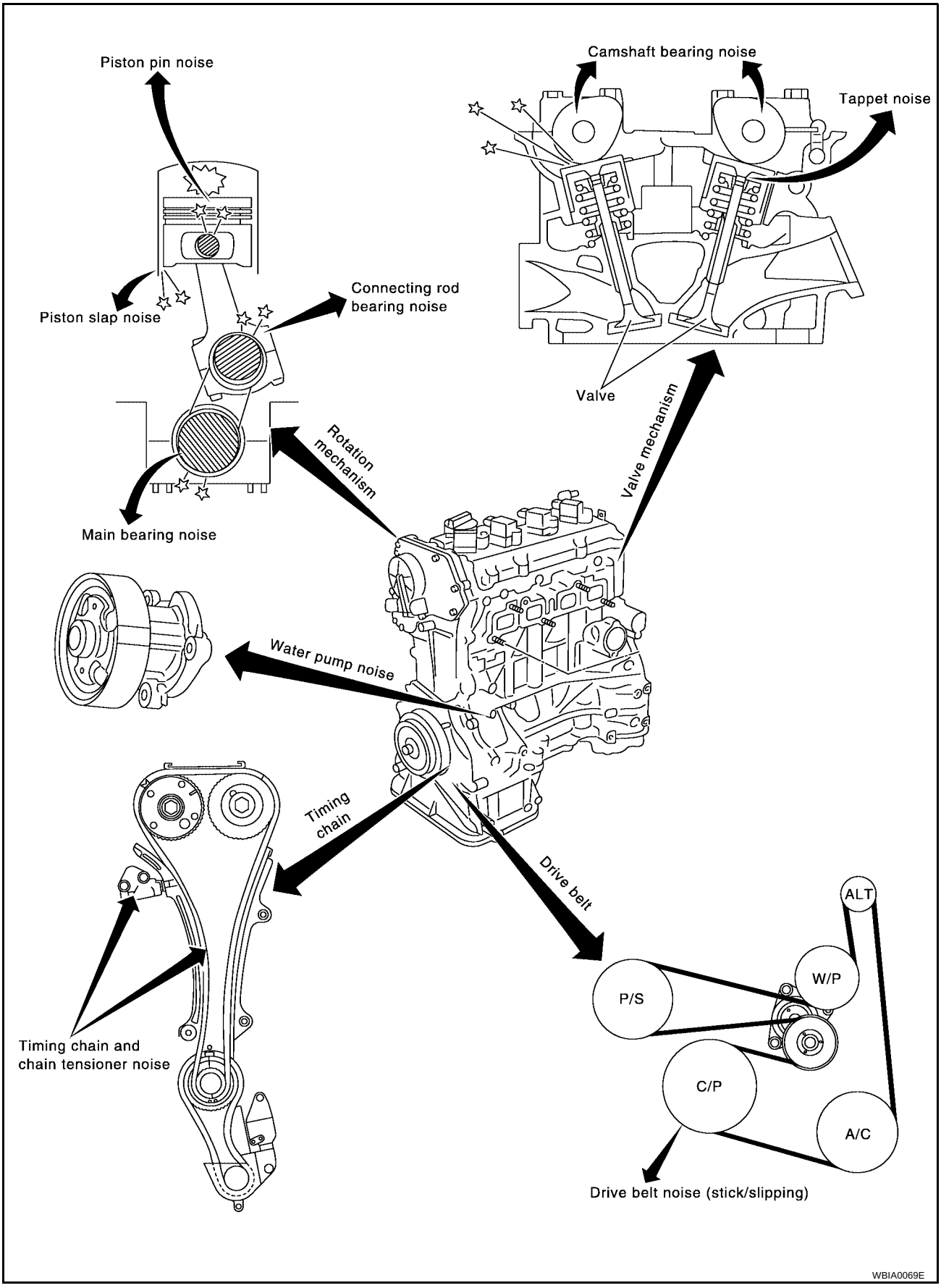
(Kent-Moore No.) Tool name		Description
Oxygen sensor thread cleaner a: (J-43897-18) b: (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor (Use with anti-seize lubricant shown below.) **a: (18 mm 0.71in) for zirconia oxygen sensor** **b: (12 mm 0.47 in) for titania oxygen sensor**
Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907)	 AEM489	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads
TP50 Torx plus Bit (J-45737)	 LBIA0284E	Removing and installing M/T flywheel bolts (QR25DE M/T)
E20 Torx Socket (J-45816)	 LBIA0285E	Removing and installing A/T drive plate bolts (QR25DE A/T)

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting —Engine Noise

EBS00CFL



Use the Chart Below to Help You Find the Cause of the Symptom.

EBS00CFM

1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.
4. Check specified noise source.

If necessary, repair or replace these parts.

Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When racing	While driving			
Top of engine Rocker cover Cylinder head	Ticking or clicking	C	A	—	A	B	—	Tappet noise	Valve clearance	EM-130
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft journal clearance Camshaft runout	EM-126 EM-125
Crankshaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston and piston pin clearance Connecting rod bushing clearance	EM-178 EM-178
	Slap or rap	A	—	—	B	B	A	Piston slap noise	Piston-to-bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion	EM-177 EM-177 EM-177 EM-177
	Knock	A	B	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing clearance (Small end) Connecting rod bearing clearance (Big end)	EM-178 EM-178
	Knock	A	B	—	A	B	C	Main bearing noise	Main bearing oil clearance Crankshaft runout	EM-183 EM-182
Front of engine Timing chain cover	Tapping or ticking	A	A	—	B	B	B	Timing chain and chain tensioner noise	Timing chain cracks and wear Timing chain tensioner operation	EM-134
Front of engine	Squeaking or fizzing	A	B	—	B	—	B	Drive belts (Sticking or slipping)	Drive belts deflection	EM-100
	Creaking	A	B	A	B	A	B	Drive belts (Slipping)	Idler pulley bearing operation	
	Squall Creak	A	B	—	B	A	B	Water pump noise	Water pump operation	CO-23

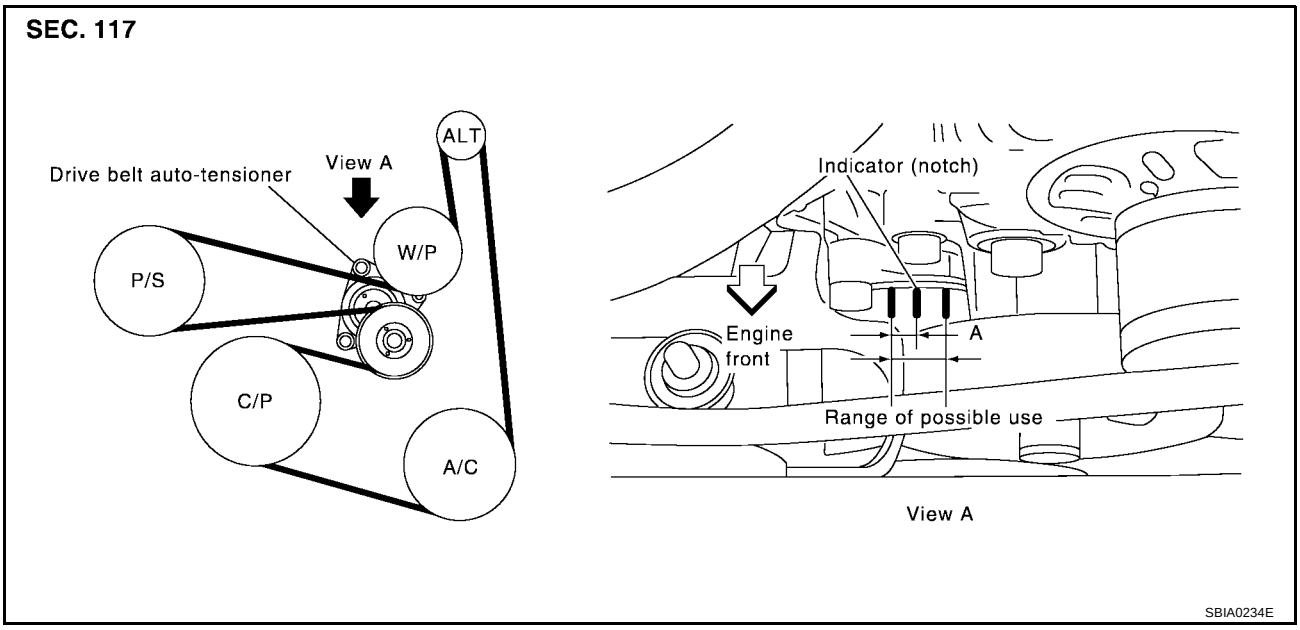
A: Closely related B: Related C: Sometimes related —: Not related

DRIVE BELTS

PFP:02117

Checking Drive Belts

EBS00KBL



NOTE:
On vehicles not equipped with A/C, there is an idler pulley in the position for the drive belt routing.

WARNING:
Inspect the drive belt only when the engine is stopped.

- Make sure that the stamp mark of drive belt auto-tensioner is within the usable range.

  NOTE:
  - Check the drive belt auto-tensioner indication when the engine is cold.
  - When the new drive belt is installed, the range should be A.
  - Visually check entire belt for wear, damage or cracks.
  - If the indicator is out of allowable use range or belt is damaged, replace the belt.

Tension Adjustment

EBS00KBM

Belt tension is not manually adjustable, it is automatically adjusted by the drive belt auto-tensioner.

Removal and Installation

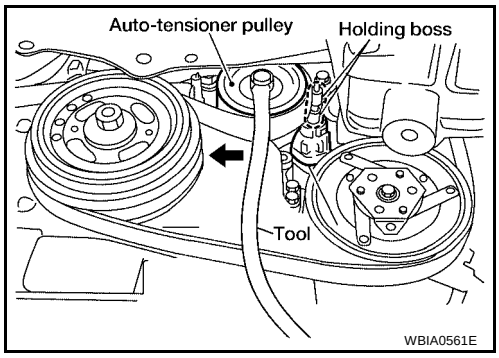
EBS00KBN

REMOVAL

1. Remove front RH engine side cover.
2. While securely holding the hexagonal part in pulley center of drive belt auto-tensioner, move in the direction of arrow (loosening direction of tensioner) using Tool.

   Tool number : — (J-46535)

   CAUTION:
   - **Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.**
   - **Do not loosen the auto-tensioner pulley bolt. (Do not turn it counterclockwise.) If turned counterclockwise, the complete auto-tensioner must be replaced as a unit, including pulley.**



3. Insert a rod approximately 6 mm (0.24 in) in diameter through the rear of tensioner into retaining boss to lock tensioner pulley.

   NOTE:
   Leave tensioner pulley arm locked until belt is installed again.
4. Loosen auxiliary drive belt from water pump pulley in sequence, and remove it.

INSTALLATION

Installation is in the reverse order of removal.

CAUTION:

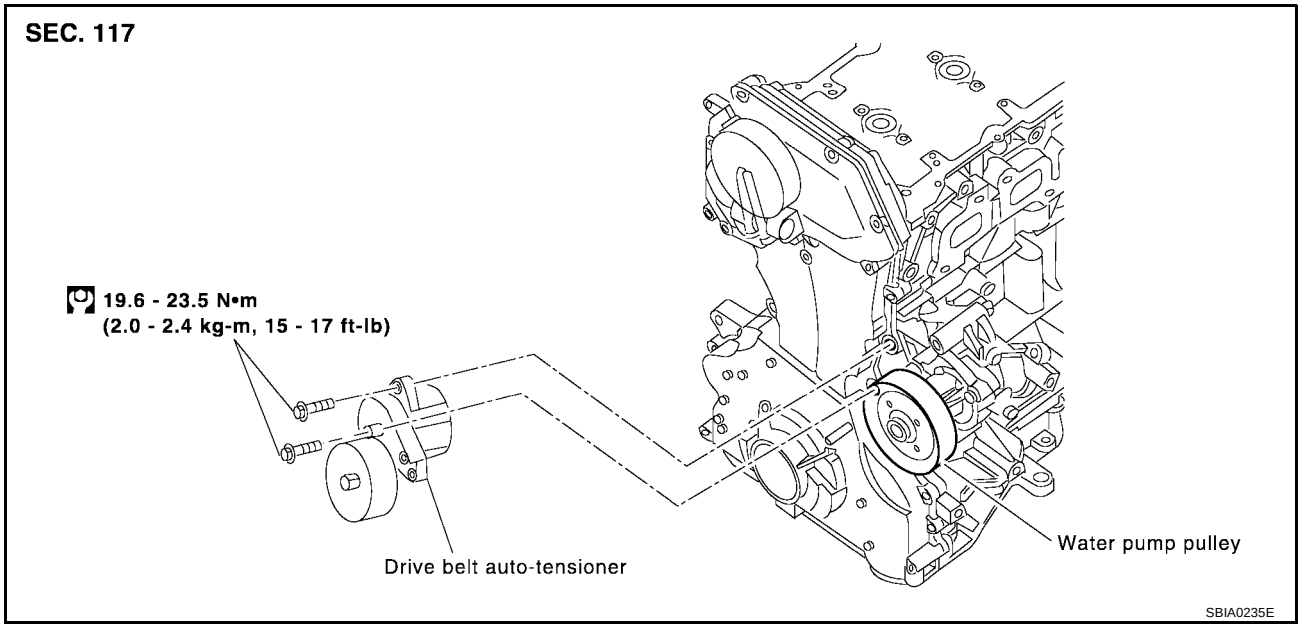
- **Do not loosen the auto-tensioner pulley bolt. (Do not turn it counterclockwise.) If turned counterclockwise, the complete auto-tensioner must be replaced as a unit, including pulley.**
- **Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.**
- **Confirm belts are completely set on the pulleys.**

NOTE:

- Turn crankshaft pulley clockwise several times to equalize tension between each pulley.
- Confirm tension of drive belt at indicator (notch on fixed side) is within the possible use range. Refer to EM-100 .

Removal and Installation of Drive Belt Auto-tensioner

EBS00KBO



CAUTION:

The complete auto-tensioner must be replaced as a unit, including the pulley.

REMOVAL

1. Remove the front RH engine side cover.
2. Remove the drive belt. Refer to EM-100, "REMOVAL" .
3. Remove the alternator. Refer to SC-32, "Removal" .
4. Remove the drive belt auto-tensioner, using power tool.

CAUTION:

Do not loosen the auto-tensioner pulley bolt. (Do not turn it counterclockwise.) If turned counterclockwise, the complete auto-tensioner must be replaced as a unit, including pulley.

INSTALLATION

1. Install drive belt auto-tensioner.
2. While securely holding the hexagonal part in pulley center of drive belt auto-tensioner, move in the direction of arrow (loosening direction of tensioner) using Tool.

Tool number : — (J-46535)

CAUTION:

- **Avoid placing hand in a location where pinching may occur if the holding tool accidentally comes off.**

- **Do not loosen the auto-tensioner pulley bolt. (Do not turn it counterclockwise.) If turned counterclockwise, the complete auto-tensioner must be replaced as a unit, including pulley.**

3. Insert a rod approximately 6 mm (0.24 in) in diameter through the rear of tensioner into retaining boss to lock tensioner pulley.

   NOTE:
   Leave tensioner pulley arm locked until belt is installed.

CAUTION:

- **Install the drive belt auto-tensioner carefully so not to damage the water pump pulley.**
- **If there is damage greater than peeled paint, replace the drive belt auto-tensioner.**
- **Do not swap the pulley between the new and old auto-tensioner unit.**

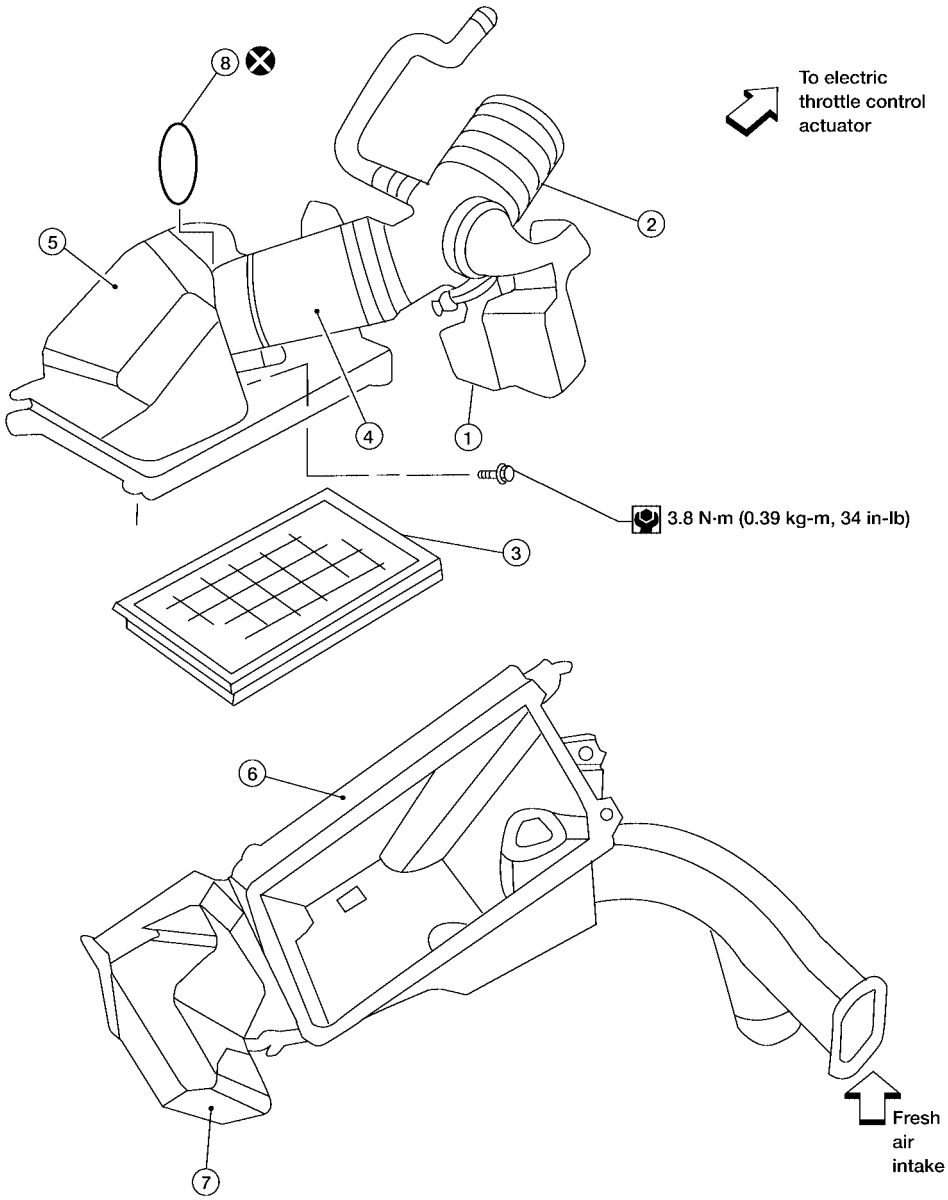
4. Installation of the remaining components is in the reverse order of removal.

AIR CLEANER AND AIR DUCT

PFP:16500

Removal and Installation

EBS00CFR



: Always replace after every disassembly.

WBIA0201E

1. Resonator
2. Air cleaner to electric throttle control actuator tube
3. Air cleaner element
4. Mass air flow sensor
5. Air cleaner case (upper)
6. Air cleaner case (lower)
7. Resonator
8. O-ring

REMOVAL

1. Disconnect the mass air flow sensor electrical connector.
2. Disconnect the tube clamp at the electric throttle control actuator.
3. Remove air cleaner to electric throttle control actuator tube and air cleaner case (upper) with the mass air flow sensor attached.
4. Remove mass air flow sensor from air cleaner case (upper), as necessary.

CAUTION:
Handle the mass air flow sensor with care:

- **Do not shock it.**
- **Do not disassemble it.**
- **Do not touch the internal sensor.**

5. Remove the air cleaner element, as necessary and replace it with a new element.
6. Remove the air cleaner case (lower).

INSTALLATION

Installation is in the reverse order of removal.

- Attach each joint according to the alignment marks made during removal. Screw all clamps firmly.

CHANGING THE AIR CLEANER ELEMENT

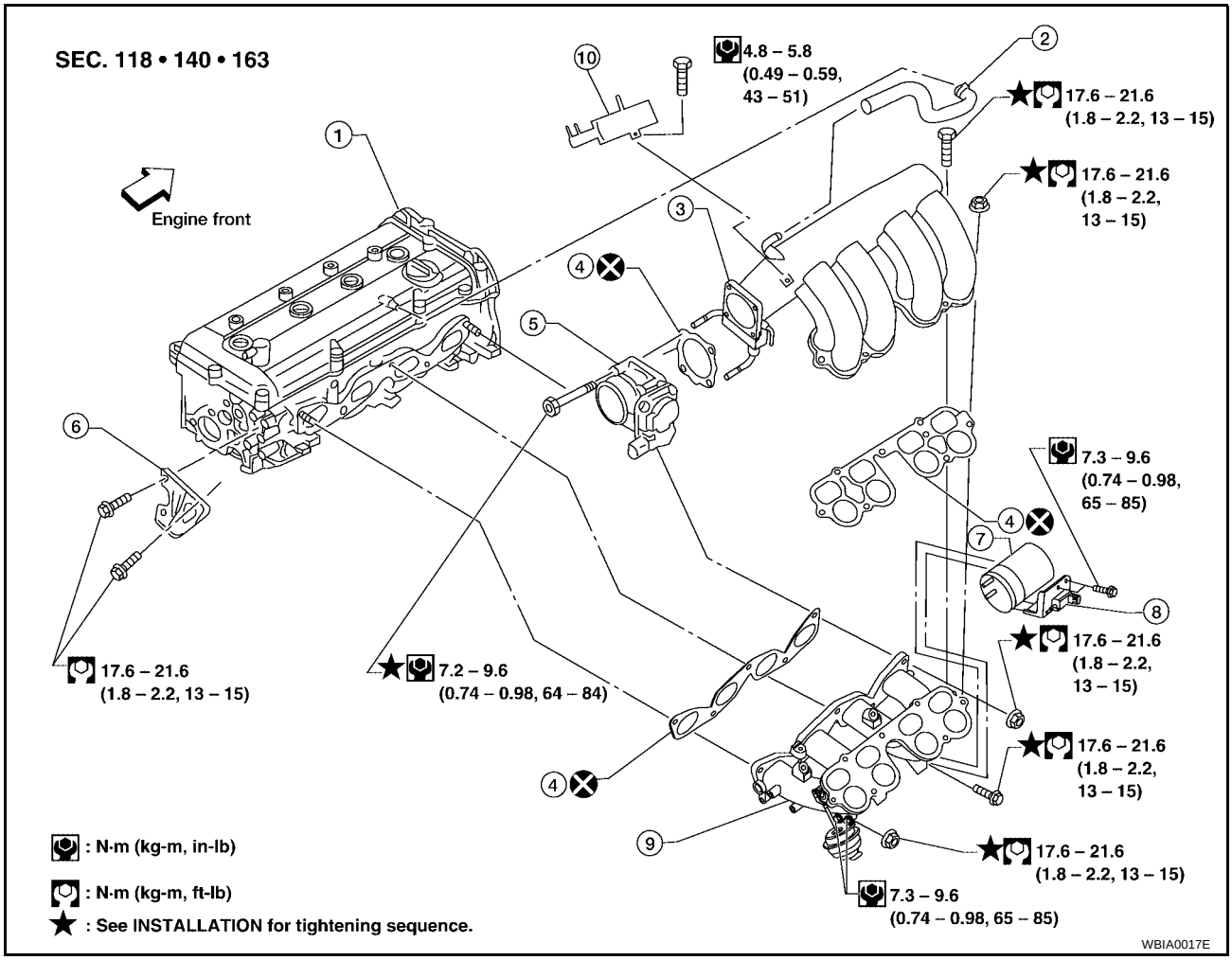
1. Unhook the air cleaner case side clips and raise the air cleaner case (upper).
2. Remove the air cleaner element.
3. Replace the air cleaner element with a new element and install the air cleaner case (upper).

INTAKE MANIFOLD

PFP:14003

Removal and Installation

EBS00CFS



1. Cylinder head assembly
2. PCV hose
3. Intake manifold collector
4. Gasket
5. Electric throttle control actuator
6. Intake manifold support
7. Vacuum reservoir tank
8. VIAS control solenoid valve
9. Intake manifold
10. EVAP canister purge volume control solenoid

REMOVAL

WARNING:

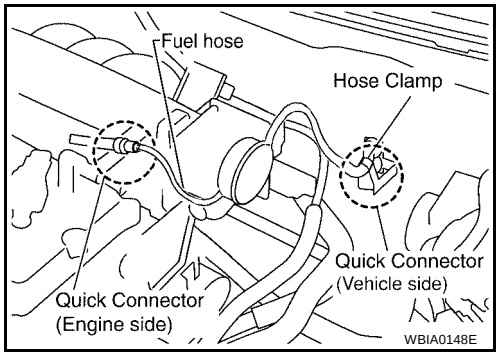
To avoid the danger of being scalded, never drain the coolant when the engine is hot.

1. Disconnect the negative battery terminal.
2. Release the fuel pressure.
   Refer to EC-1257, "FUEL PRESSURE RELEASE" .
3. Drain coolant when engine is cooled. Refer to MA-23, "DRAINING ENGINE COOLANT" .
4. Disconnect the MAF sensor electrical connector.
5. Remove air cleaner case and air duct assembly.
   Refer to EM-103, "Removal and Installation" .
6. Disconnect the following components at the intake side:

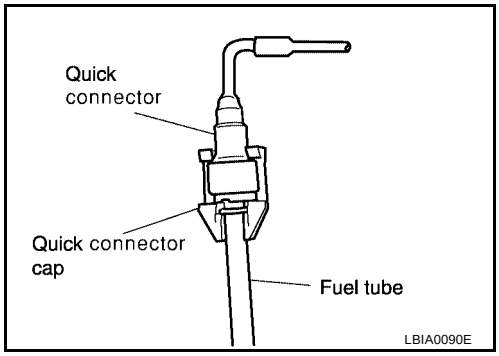
a. PCV hose
b. EVAP canister purge volume control solenoid
c. Electric throttle control actuator
d. Brake booster vacuum hose

7. Disconnect the fuel quick connector on the engine side.
   - Using Tool perform the following steps to disconnect the quick connector.

     Tool number : — (J-45488)



a. Remove quick connector cap.

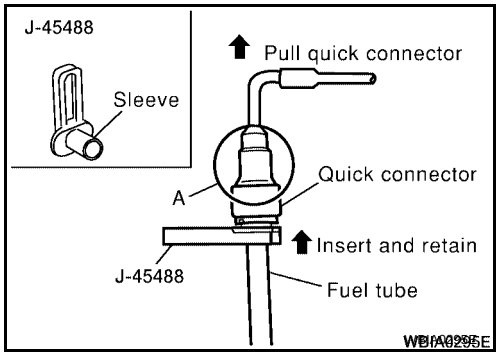


b. With the sleeve side of Tool facing quick connector, install Tool onto fuel tube.

c. Insert Tool into quick connector until sleeve contacts and goes no further. Hold the Tool on that position.

CAUTION:
Inserting the Tool hard will not disconnect quick connector. Hold Tool where it contacts and goes no further.

d. Pull the quick connector straight out from the fuel tube.

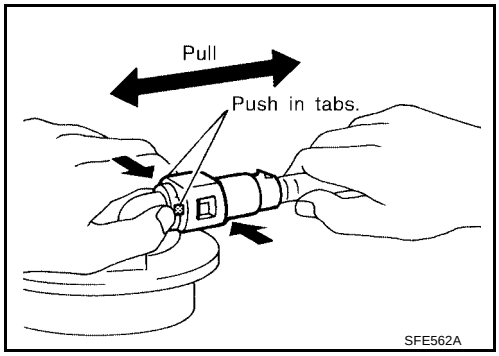


CAUTION:
- **Pull quick connector holding it at the "A" position, as shown.**
- **Do not pull with lateral force applied. O-ring inside quick connector may be damaged.**
- **Prepare container and cloth beforehand as fuel will leak out.**
- **Avoid fire and sparks.**
- **Be sure to cover openings of disconnected pipes with plug or plastic bag to avoid fuel leakage and entry of foreign materials.**

8. When removing fuel hose quick connector at vehicle piping side, perform as follows.

a. Remove quick connector cap.

b. Hold the sides of the connector, push in tabs and pull out the tube. (The figure is shown for reference only.)
   - If the connector and the tube are stuck together, push and pull several times until they start to move. Then disconnect them by pulling.



CAUTION:
- **The tube can be removed when the tabs are completely depressed. Do not twist it more than necessary.**
- **Do not use any tools to remove the quick connector.**
- **Keep the resin tube away from heat. Be especially careful when welding near the tube.**
- **Prevent acid liquid such as battery electrolyte etc. from getting on the resin tube.**
- **Do not bend or twist the tube during installation and removal.**
- **Do not remove the remaining retainer on tube.**

- **When the tube is replaced, also replace the retainer with a new one.**
  Retainer color: Green.
- **To keep clean the connecting portion and to avoid damage and foreign materials, cover them completely with plastic bags or something similar.**

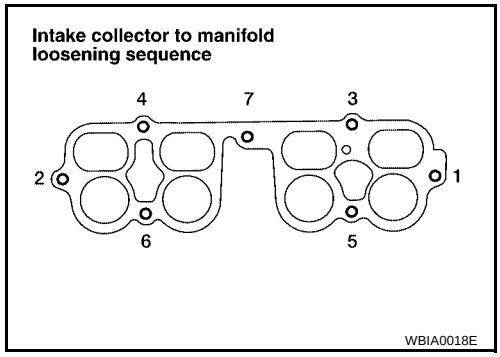
9. Loosen mounting bolts diagonally, and remove the electric throttle control actuator.

CAUTION:
Handle carefully to avoid any damage.

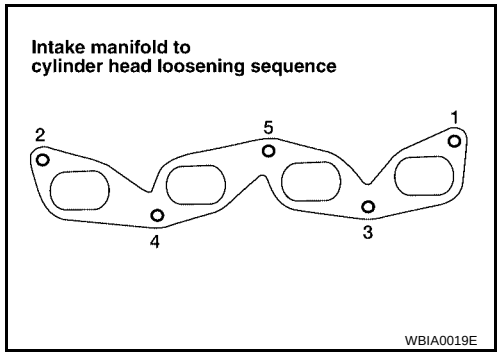
10. Disconnect intake manifold collector harness, and vacuum hose.

CAUTION:
Cover engine openings to avoid entry of foreign materials.

11. Remove intake manifold collector mounting bolts on the support.
12. Loosen the mounting bolts and nuts in the order shown to remove the intake manifold collector.



13. Loosen the bolts in the order shown to remove the intake manifold assembly.

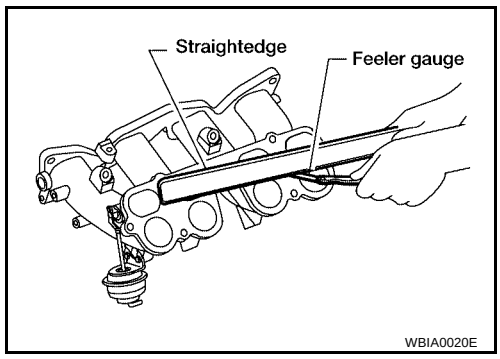


INSPECTION AFTER REMOVAL

Surface Distortion

- Using straightedge and feeler gauge, inspect surface distortion of intake manifold collector and intake manifold surface.

Standard : 0.1 mm (0.004 in)



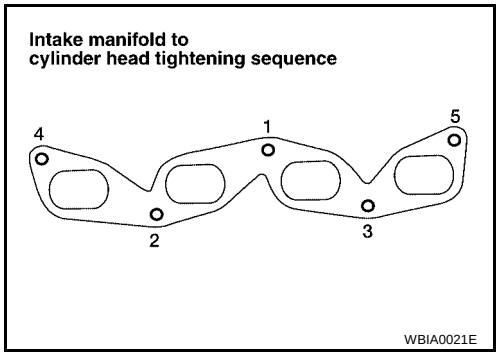
INSTALLATION

Installation is in the reverse order of removal.

Tightening Intake Manifold Bolts and Nuts

- Install the intake manifold bolts and nuts in the numerical order of the tightening sequence as shown.

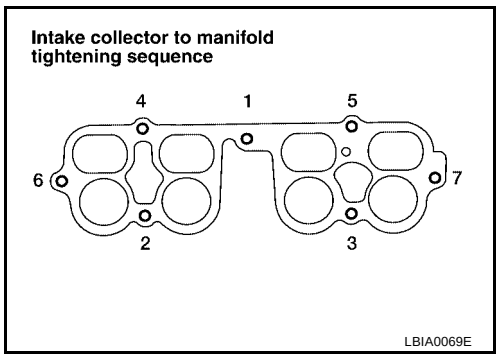
CAUTION:
After tightening No.5, retighten the No.1 mounting bolt to specification.



Tightening Intake Manifold Collector Bolts and Nuts

- Tighten in numerical order as shown.

CAUTION:
After tightening No.7, retighten the No.1 mounting bolt to specification.



Installation of Electric Throttle Control Actuator:

- Tighten the mounting bolts of electric throttle control actuator equally and diagonally in several steps.

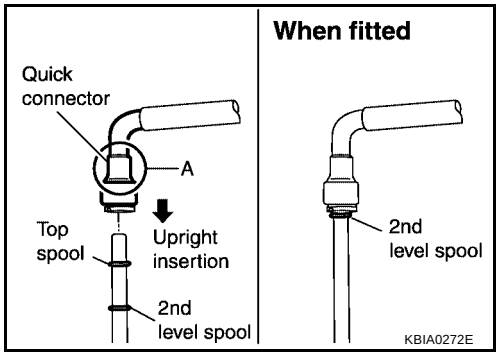
Electric throttle control actuator mounting bolts	**: 7.2 - 9.6 N·m (0.74 - 0.98 kg-m, 64 - 84 in-lb)**

- After installation perform procedure in EM-109, "INSPECTION AFTER INSTALLATION" .

CONNECTING QUICK CONNECTOR ON THE FUEL HOSE (ENGINE SIDE)

1. Make sure no foreign substances are deposited in and around the fuel tube and quick connector, and there is no damage to them.
2. Thinly apply new engine oil around the fuel tube tip end.
3. Align center to insert quick connector straight into fuel tube.
   - Insert fuel tube into quick connector until the top spool on fuel tubes is inserted completely and the second level spool is positioned slightly below the quick connector bottom end.

   CAUTION:
   - **Hold at position "A" as shown, when inserting the fuel tube into the quick connector.**
   - **Carefully align to center to avoid inclined insertion to prevent damage to the O-ring inside the quick connector.**
   - **Insert the fuel tube until you hear a “click” sound and actually feel the engagement.**
   - **To avoid misidentification of engagement with a similar sound, be sure to perform the next step.**

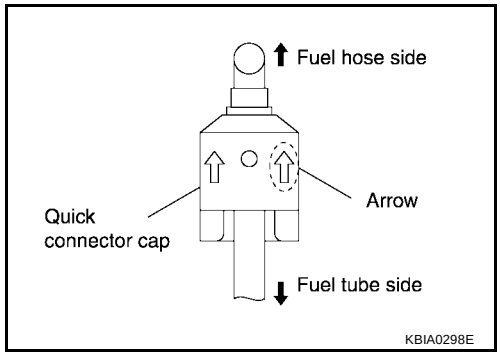


4. Before clamping the fuel hose with the hose clamp, pull the quick connector hard by hand, holding at the "A" position, as shown. Make sure it is completely engaged (connected) so that it does not come off of the fuel tube.

   NOTE:
   Recommended pulling force is 50 N (5.1 kg, 11.2 lb).
5. Install quick connector cap on quick connector joint.

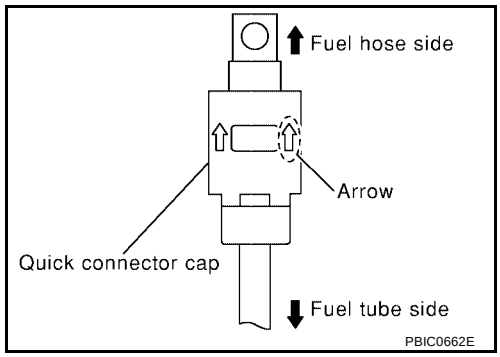
- Direct arrow mark on quick connector cap to upper side (fuel hose side).

6. Install fuel hose to hose clamp.



CONNECTING QUICK CONNECTOR ON THE FUEL HOSE (VEHICLE PIPING SIDE)

1. Make sure no foreign substances are deposited in and around the fuel tube and quick connector, and there is no damage to them.
2. Align center to insert quick connector straight into fuel tube.
   - Insert fuel tube until a click is heard.
   - Install quick connector cap on quick connector joint. Direct arrow mark on quick connector cap upper side.
   - Install fuel hose to hose clamp.



INSPECTION AFTER INSTALLATION

Make sure there is no fuel leakage at connections as follows:

1. Apply fuel pressure to fuel lines by turning ignition switch ON (with engine stopped). Then check for fuel leaks at connections.
2. Start the engine and rev it up and check for fuel leaks at connections.

   NOTE:
   Use mirrors for checking on connections out of the direct line of sight.

   CAUTION:
   Do not touch engine immediately after stopping as engine is extremely hot.

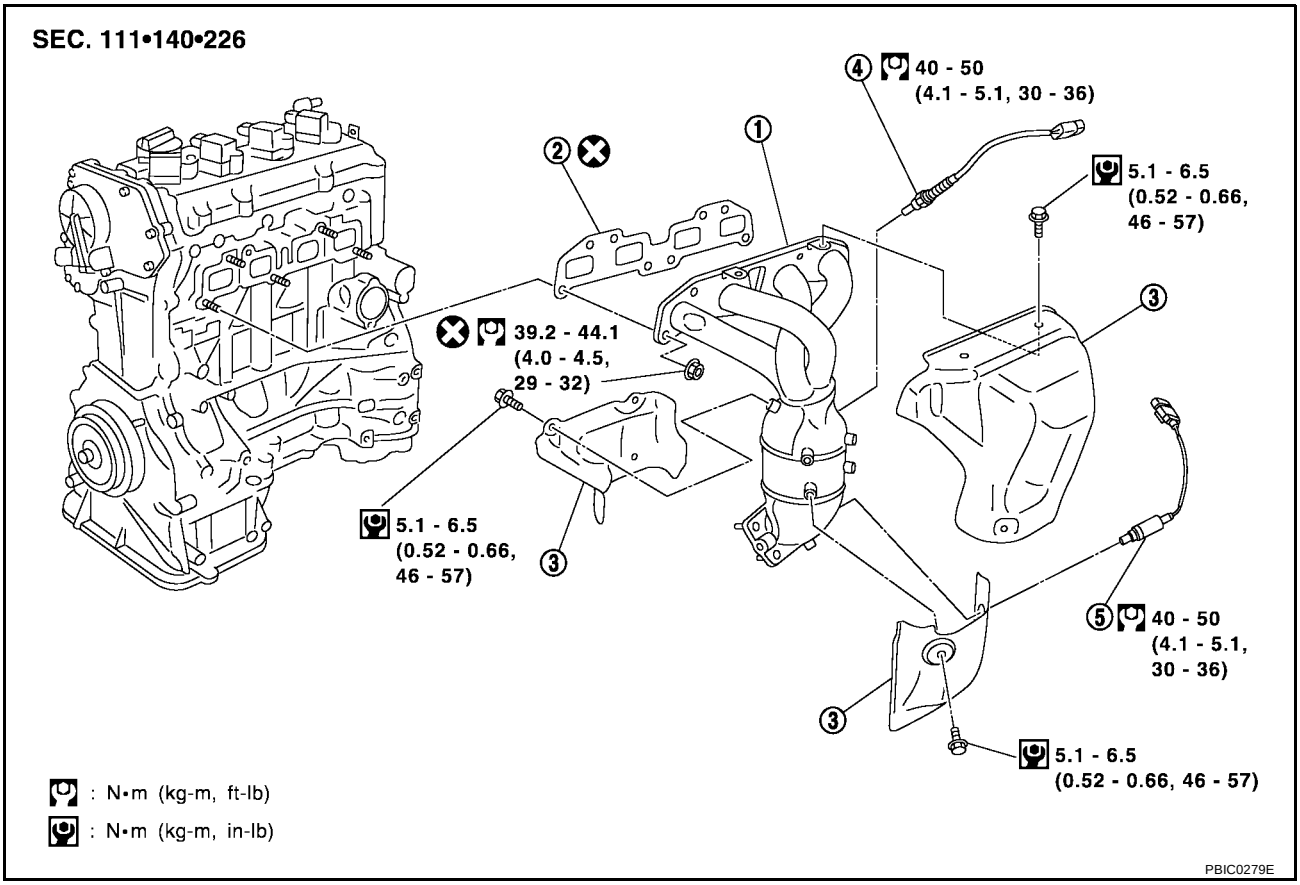
   - Perform procedures for “Throttle Valve Closed Position Learning” after finishing repairs. Refer to EC-1255, "Throttle Valve Closed Position Learning" .
   - If electric throttle control actuator is replaced, perform procedures for “Idle Air Volume Learning” after finishing repairs. Refer to EC-1255, "Idle Air Volume Learning" .

EXHAUST MANIFOLD AND THREE WAY CATALYST

PFP:14004

Removal and Installation

EBS00CFT

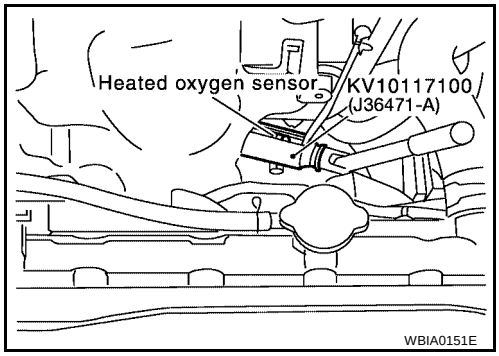


1. Exhaust manifold and three way catalyst assembly
2. Exhaust manifold gasket
3. Exhaust manifold covers (upper and lowers)
4. Heated oxygen sensor 1
5. Heated oxygen sensor 2

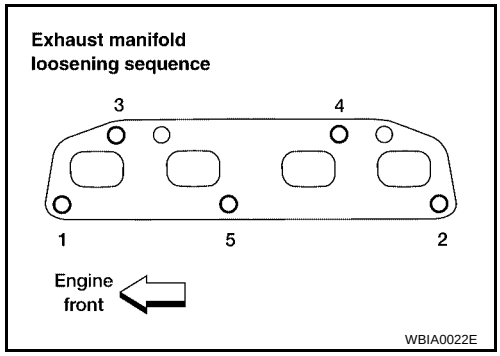
REMOVAL

1. Remove the engine undercover.
2. Disconnect the electrical connector of each heated oxygen sensor, and unhook the harness from the bracket and middle clamp on the cover.
3. Remove the heated oxygen sensors with Tool.

   CAUTION:
   - **Be careful not to damage heated oxygen sensor.**
   - **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
4. Remove the lower exhaust manifold covers.
5. Remove the exhaust front tube. Refer to EX-3, "Removal and Installation" .
6. Remove the upper exhaust manifold cover.



7. Loosen the nuts in the sequence shown, on the exhaust manifold and three way catalyst.
8. Remove the exhaust manifold and three way catalyst assembly and gasket. Discard the gasket.

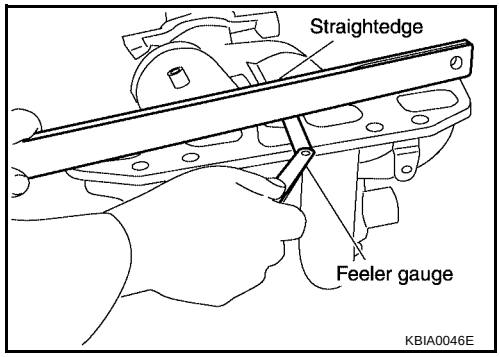


INSPECTION AFTER REMOVAL

Surface Distortion

- Use a reliable straightedge and feeler gauge to check the flatness of exhaust manifold fitting surface.

Standard : 0.3 mm (0.012 in)

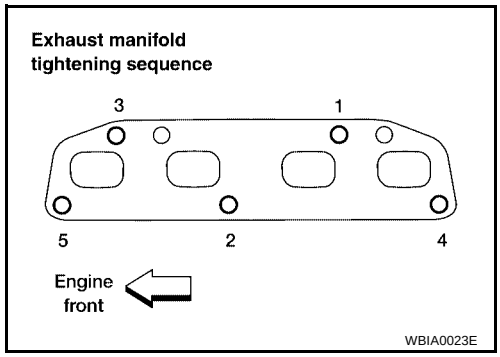


INSTALLATION

Installation is in the reverse order of removal. Pay attention to the following.

Tightening Exhaust Manifold Nuts

- Tighten the nuts in the numerical order shown, to specification. After tightening No.5, retighten No.1 and then No.3 to specification.



Installation of Heated Oxygen Sensors

Clean the heated oxygen sensor threads with the Tool, then apply the anti-seize lubricant to the threads before installing the heated oxygen sensors.

CAUTION:

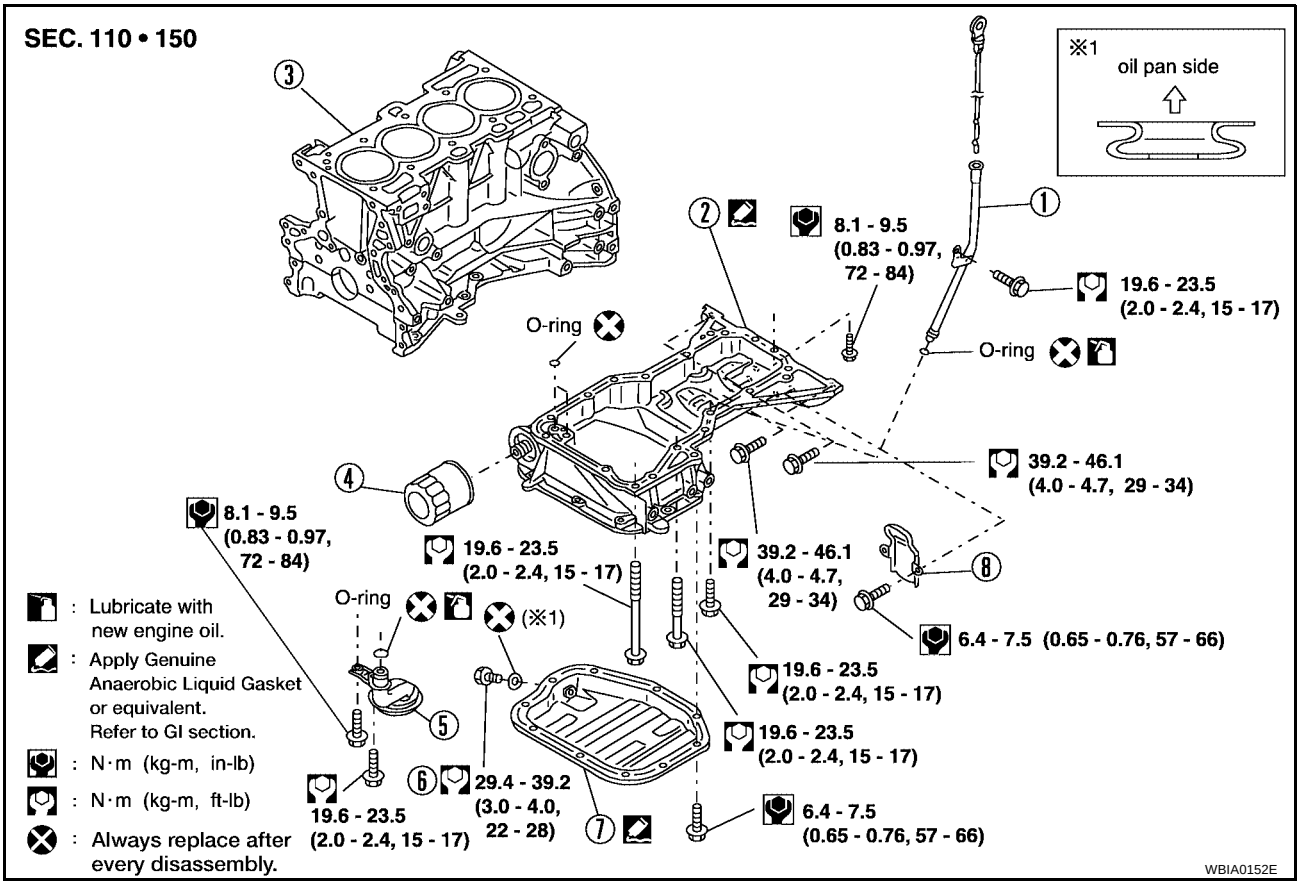
Do not over-tighten the heated oxygen sensors. Doing so may cause damage to the heated oxygen sensors, resulting in a malfunction and the MIL coming on.

OIL PAN AND OIL STRAINER

PFP:11110

Removal and Installation

EBS00CFU



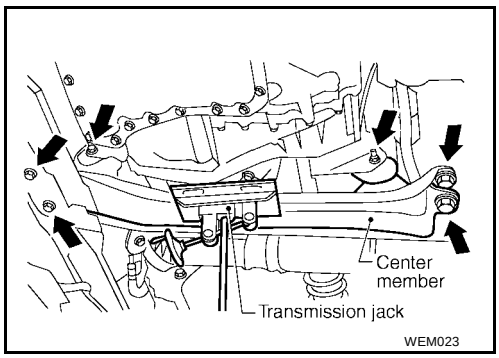
1. Oil level gauge tube
2. Oil pan, upper
3. Cylinder block
4. Oil filter
5. Oil pickup screen
6. Drain plug
7. Oil pan, lower
8. Rear plate cover

REMOVAL

WARNING:

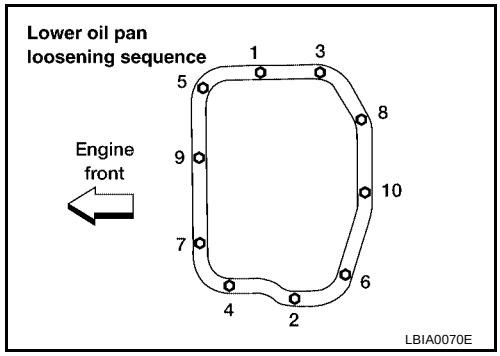
To avoid the danger of being scalded, never drain the engine oil when the engine is hot.

1. Remove the engine under covers on both sides.
2. Drain engine oil. Refer to LU-17, "Changing Engine Oil" .
3. Remove the front exhaust tube. Refer to EX-3, "Removal and Installation" .
4. Set a suitable transmission jack under the transaxle. Lift the engine slightly from above by the engine slingers.
5. Remove the center member.
   - Remove the front and rear engine mount through bolts and center member bolts.

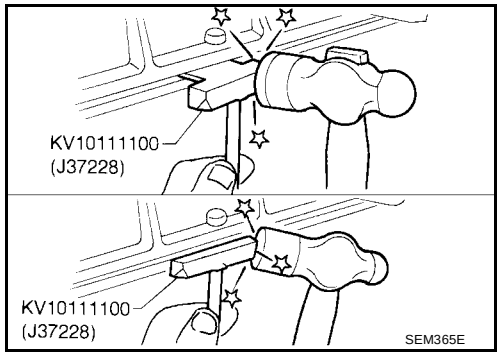


6. Disconnect the A/C compressor with piping connected from the mounting bracket and suspend with a strong wire. Refer to MTC-68, "Removal and Installation" .

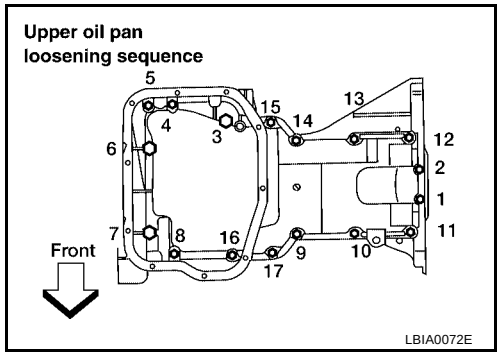
7. Remove the lower oil pan bolts. Loosen the bolts in the order shown.



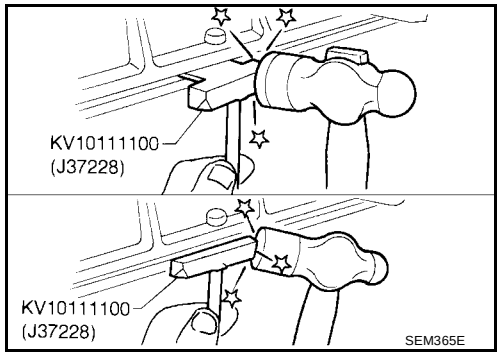
8. Insert the Tool (Seal cutter) between lower oil pan and the upper oil pan to separate them. Tap gently on the side to move the Tool around the pan; do not damage the mating surface.
9. Remove the lower oil pan.
10. Remove the oil pickup screen.
11. Remove rear plate cover, and four engine to transaxle bolts.



12. Loosen the upper oil pan bolts in the numerical order shown to remove the upper oil pan.



13. Insert the Tool (Seal cutter) between the upper oil pan and the cylinder block to separate them. Tap gently on the side to move the Tool around the pan; do not damage the mating surface.



14. Remove the upper oil pan.

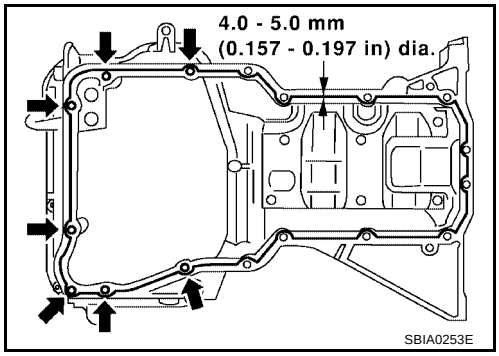
INSPECTION AFTER REMOVAL

- Clean the oil pickup screen to remove any foreign material.

INSTALLATION

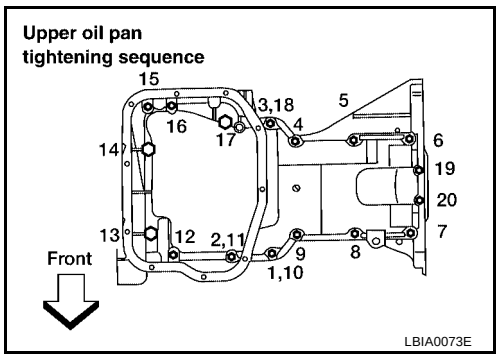
1. Installation is in the reverse order of removal. Pay attention to the following.

a. Apply Genuine Silicone RTV Sealant, or equivalent, to the upper oil pan. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" , and EM-92, "Precautions for Liquid Gasket" .
   - Install the two new O-rings in the upper oil pan.

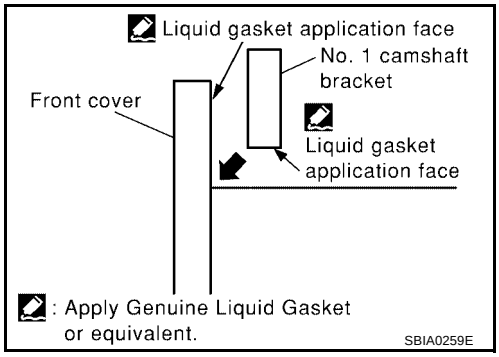


b. Tighten the upper oil pan bolts in the order as shown.
   - Bolt No.10,11,18 indicate a double tightening in the sequence of bolt No.s 1, 2, 3.

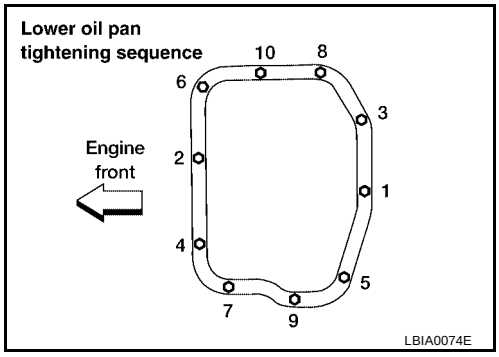
   NOTE:
   Refer below for specified bolt sizes:
   M6 × 20 mm (0.79 in): No.19, 20
   M8 × 25 mm (0.98 in): No.1, 3, 4, 9
   M8 x 45 mm (1.77 in): No.2, 5, 6, 7, 8, 17
   M8 x100 mm (3.97 in): No.12, 13, 14, 15, 16



c. Apply Genuine Silicone RTV Sealant, or equivalent to the lower oil pan. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" , and EM-92, "Precautions for Liquid Gasket" .



d. Tighten the lower oil pan bolts in the numerical order shown.
   - Wait at least 30 minutes after the oil pans are installed before filling the engine with oil.



INSPECTION AFTER INSTALLATION

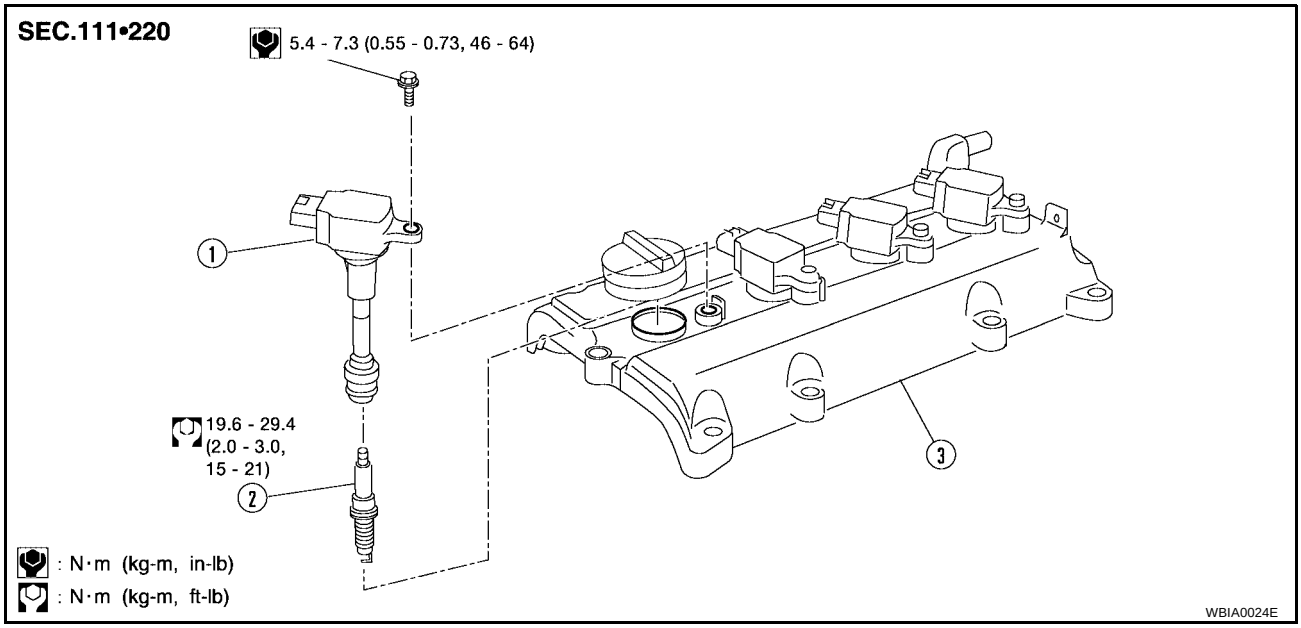
- Check for any engine oil leaks with the engine at full operating temperature and running at idle.

IGNITION COIL

PFP:22448

Removal and Installation

EBS00CFV



1. Ignition coil
2. Spark plug
3. Rocker cover

REMOVAL

1. Remove the engine cover.
2. Disconnect the harness connector from the ignition coil.
3. Remove the ignition coil.

CAUTION:
Do not drop or shock it.

INSTALLATION

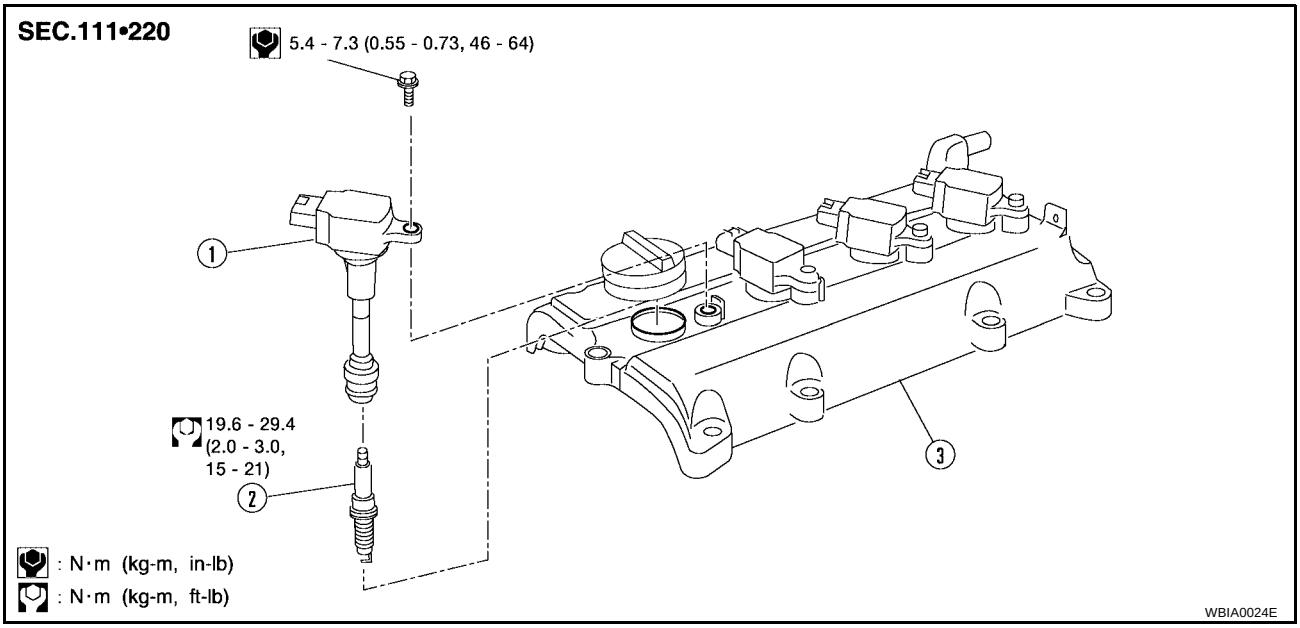
Installation is in the reverse order of removal.

SPARK PLUG

PFP:22401

Removal and Installation

EBS00CFW

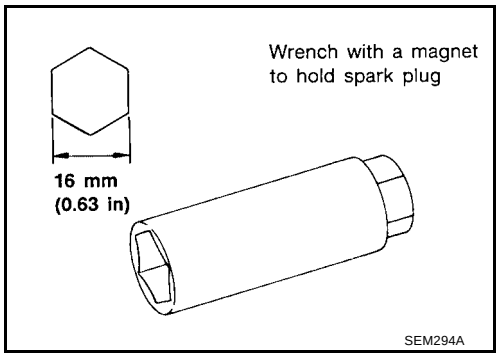


1. Ignition coil
2. Spark plug
3. Rocker cover

REMOVAL

1. Remove the ignition coil. Refer to EM-115, "Removal and Installation" .
2. Remove the spark plug with a suitable spark plug wrench.

Temperature range	NGK
Standard type	PLFR5A-11 (Platinum tipped)
Hot type	PLFR4A-11(Platinum tipped)
Cold type	PLFR6A-11(Platinum tipped)



INSPECTION AFTER REMOVAL

- **Use standard type spark plug for normal conditions.**

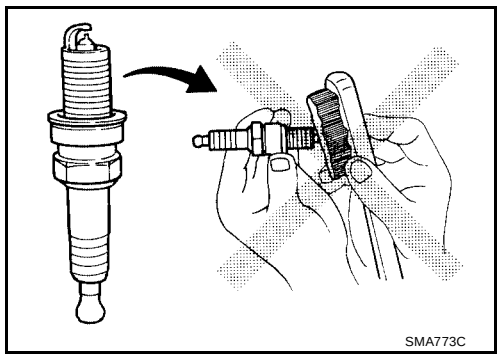
The hot type spark plug is suitable when fouling occurs with the standard type spark plug under conditions such as:

- Frequent engine starts.
- Low ambient temperatures.

The cold type spark plug is suitable when spark plug knock occurs with the standard type spark plug under conditions such as:

- Extended highway driving.
- Frequent high engine revolution.

Do not use a wire brush for cleaning the spark plugs. Replace as necessary.



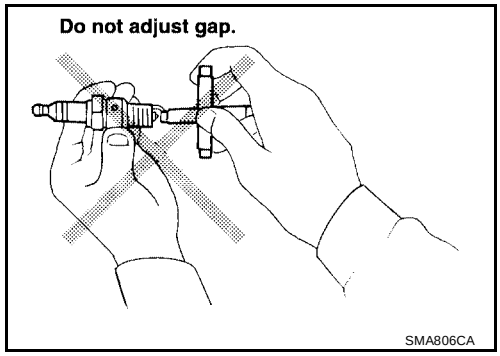
If plug is covered with carbon, a spark cleaner may be used.

Cleaner air pressure : less than 588 kPa (6kg/cm2, 85 psi)

Cleaning time : less than 20 seconds

Checking and adjusting plug gap is not required between change intervals.

Gap nominal : 1.1 mm (0.043 in)



INSTALLATION

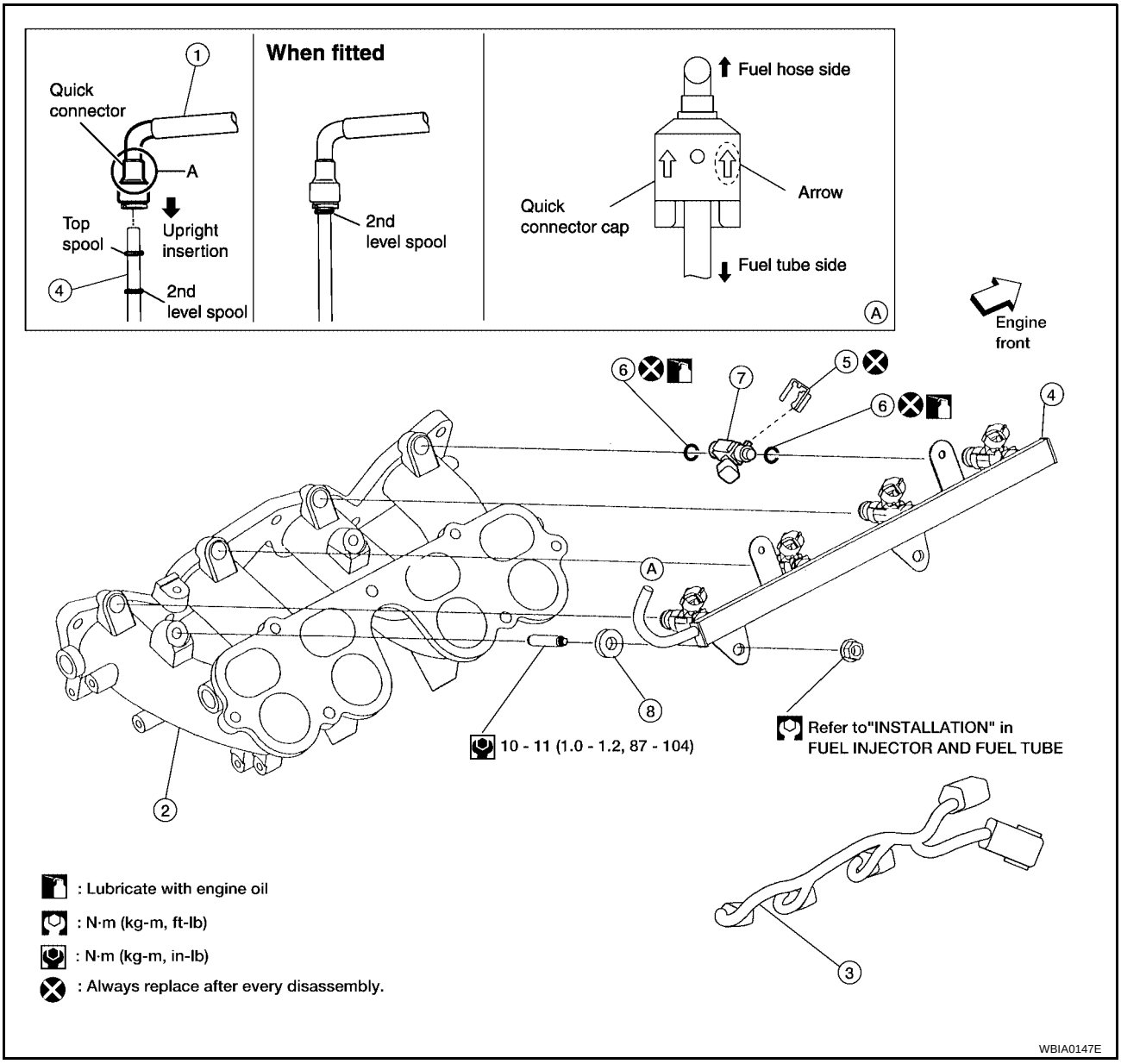
- Installation is in the reverse order of removal.

FUEL INJECTOR AND FUEL TUBE

PFP:16600

Removal and Installation

EBS00CFX



1. Fuel hose
2. Intake manifold
3. Sub-harness
4. Fuel tube
5. Clip
6. O-ring
7. Fuel injector
8. Insulator

CAUTION:

- **Apply new engine oil to parts before installing the parts, as shown above.**
- **Do not remove or disassemble parts unless instructed as shown in the figure.**

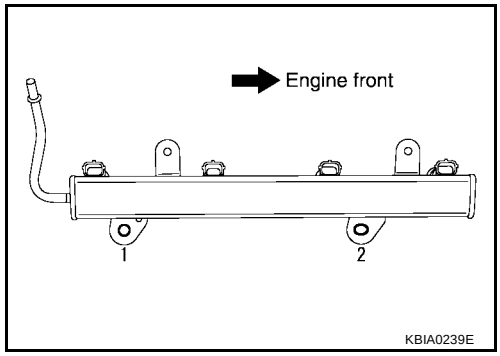
REMOVAL

1. Release the fuel pressure. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Remove the intake air duct. Refer to EM-103, "Removal and Installation" .
3. Partially drain the engine coolant. Refer to MA-23, "DRAINING ENGINE COOLANT" .
4. Remove the intake collector. Refer to EM-105, "INTAKE MANIFOLD" .
5. Disconnect the fuel hose quick connector at the fuel tube side.
   - For how to disconnect and connect the quick connector, refer to EM-105, "INTAKE MANIFOLD" .

CAUTION:

- **Prepare a container and cloth for catching any spilled fuel.**
- **This operation should be performed in a place that is free from any open flames.**
- **While hoses are disconnected seal their openings with vinyl bag or similar material to prevent foreign material from entering them.**

6. Disconnect sub-harness for injector at engine front side, and remove it from bracket.
7. Loosen the mounting bolts in the order as shown, then remove fuel tube and fuel injectors as an assembly.
8. Remove the fuel injectors from the fuel tube.

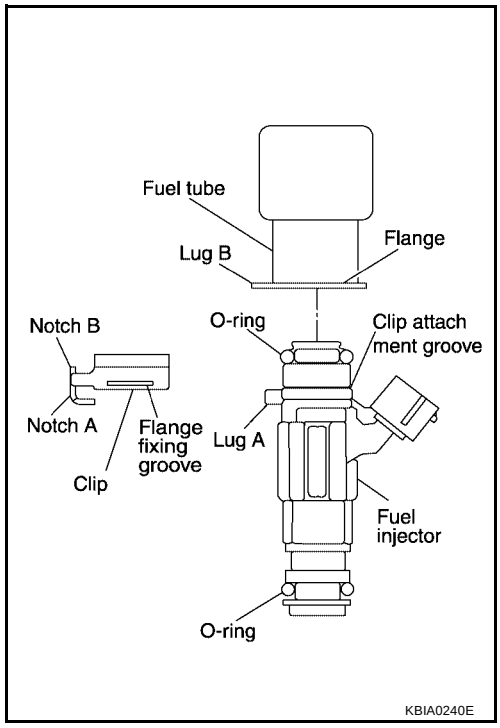


- Release the clip and remove the fuel injector.
- Pull fuel injector straight out of the fuel tube.
- Be careful not to damage the nozzle.
- Avoid any impact, such as dropping the fuel injector.
- Do not disassemble or adjust the fuel injector.

INSTALLATION

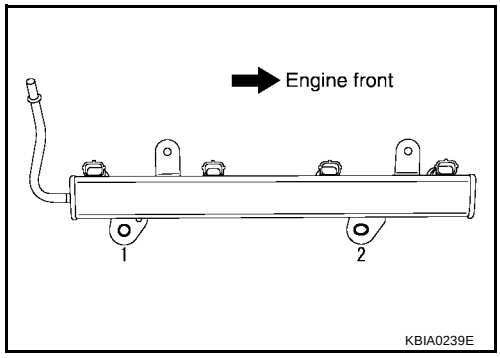
1. Install new O-rings on the fuel injector.
   - **Lubricate the O-rings lightly with new engine oil.**
   - **Be careful not to scratch it during installation. Also be careful not to twist or stretch the O-ring. If the O-ring was stretched while it is attached, do not insert it into the fuel tube immediately.**
2. Install the fuel injector into the fuel tube with the following procedure:
   - Do not reuse the clip, replace it with a new one.
   - Insert the new clip into the clip mounting groove on fuel injector.
   - Insert the clip so that the projection on "Lug A" of fuel injector matches notch "A" of the clip.
3. Insert fuel injector into fuel tube with clip attached.
   - Insert it while matching it to the axial center.
   - Insert fuel injector so that the projection on "Lug B" of fuel injector matches notch "B" of the clip.
   - Make sure that fuel tube flange is securely fixed in flange fixing groove on the clip.
   - Make sure that installation is complete by checking that fuel injector does not rotate or come off.
4. Install fuel tube assembly.

a. Insert the tip of each fuel injector into intake manifold.



b. Tighten the mounting bolts in two steps in the numerical order shown.

Fuel tube bolt tightening 1st step	**: 9.3 - 10.8 N·m (0.95 - 1.1 kg-m, 83 - 95 in-lb)**
Fuel tube bolt tightening 2nd step	**: 20.6 - 26.5 N·m (2.1 - 2.7 kg-m, 16 - 19 ft-lb)**



CAUTION:

- **After properly connecting fuel tube assembly to injector and fuel hose, check connection for fuel leakage.**

5. Connect the fuel hose quick connector. Refer to EM-105, "INTAKE MANIFOLD" .
6. Install the intake collector. Refer to EM-105, "INTAKE MANIFOLD" .
7. Installation of the remaining components is in the reverse order of removal.

INSPECTION AFTER INSTALLATION

Make sure there is no fuel leakage at connections as follows:

1. Apply fuel pressure to fuel lines by turning ignition switch ON (with engine stopped). Then check for fuel leaks at connections.
2. Start the engine and rev it up and check for fuel leaks at connections.

   NOTE:
   Use mirrors for checking on connections out of the direct line of sight.

   CAUTION:
   Do not touch engine immediately after stopping as engine is extremely hot.

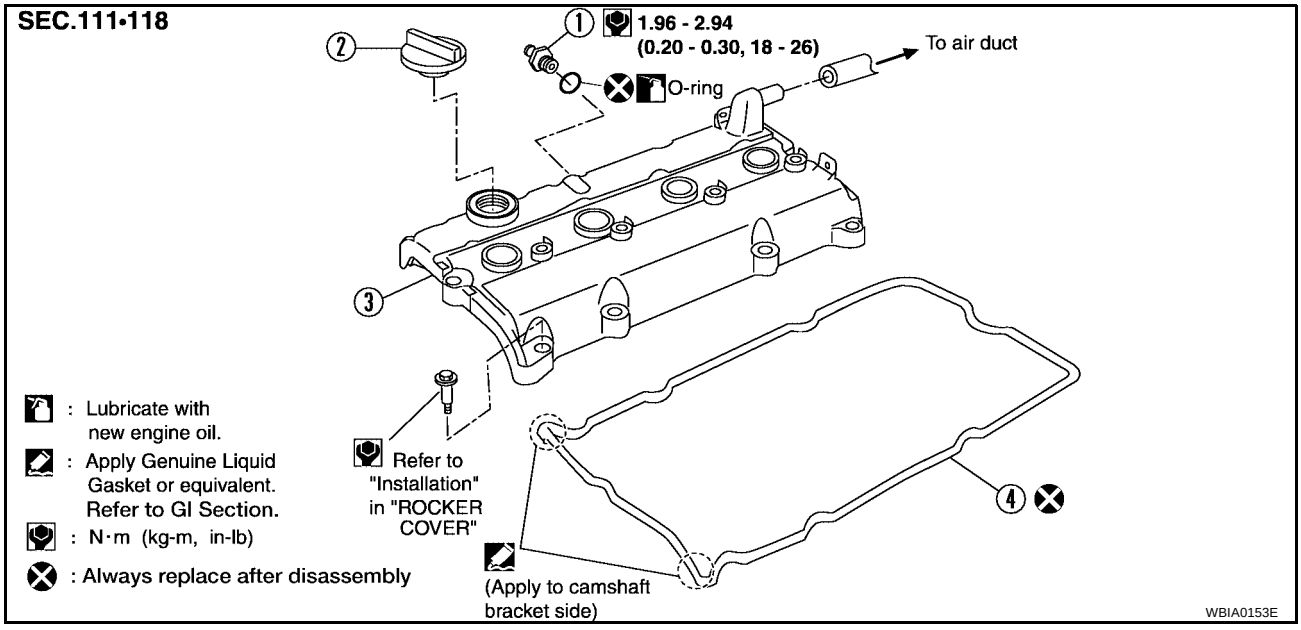
   - Perform procedures for “Throttle Valve Closed Position Learning” after finishing repairs. Refer to EC-1255, "Throttle Valve Closed Position Learning" .
   - If electric throttle control actuator is replaced, perform procedures for “Idle Air Volume Learning” after finishing repairs. Refer to EC-1255, "Idle Air Volume Learning" .

ROCKER COVER

PFP:13264

Removal and Installation

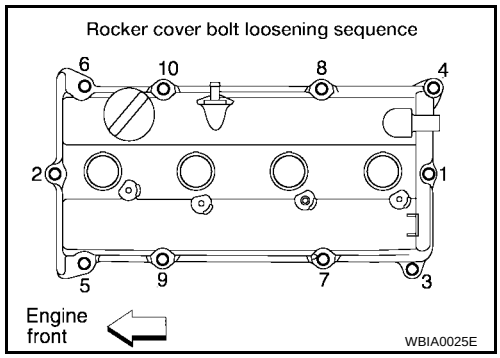
EBS00CFY



1. PCV valve
2. Oil filler cap
3. Rocker cover
4. Rocker cover gasket

REMOVAL

1. Remove the ignition coils. Refer to EM-115, "Removal and Installation" .
2. Disconnect the PCV hose and breather hose from the rocker cover.
3. Loosen the bolts in the numerical order as shown.
4. Remove the rocker cover. Remove the oil filler cap and PCV valve if necessary, to transfer to the new rocker cover.



INSTALLATION

1. Apply Silicone RTV Sealant to the joint part of the cylinder head and camshaft bracket following the steps below:

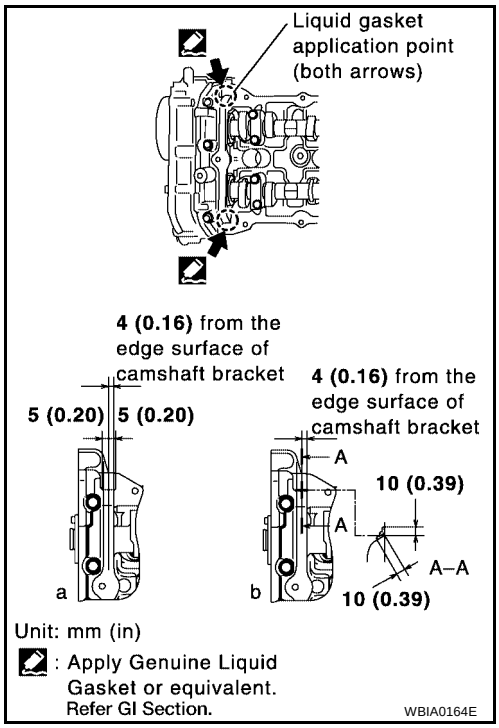
a. Refer to illustration “a” to apply sealant to joint part of No.1 camshaft bracket and cylinder head.

b. Refer to illustration “b” to apply sealant in a 90° degree angle to the illustration “a”.

- **Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .**

2. Install the rocker cover.

- The rocker cover gasket must be securely installed in the groove in the rocker cover.

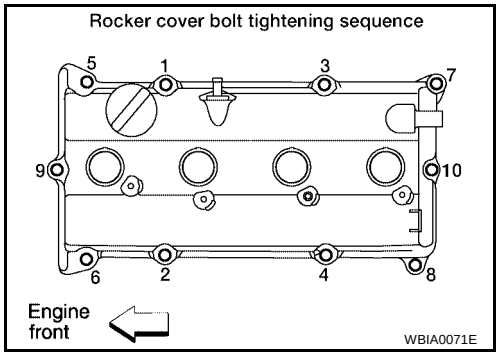


3. Tighten the rocker cover bolts in two steps, in the numerical order as shown.

Rocker cover bolt tightening 1st step	**: 1.0 - 2.9 N·m (0.1 - 0.3 kg-m, 9 - 26 in-lb)**
Rocker cover bolt tightening 2nd step	**: 7.4 - 9.3 N·m (0.75 - 0.95 kg-m, 65 - 82 in-lb)**

4. Connect the PCV hose and breather hose to the rocker cover. If necessary, install the oil filler cap and PCV valve and lubricate the PCV valve O-ring with new engine oil.

5. Install the ignition coils. Refer to EM-115, "Removal and Installation" .

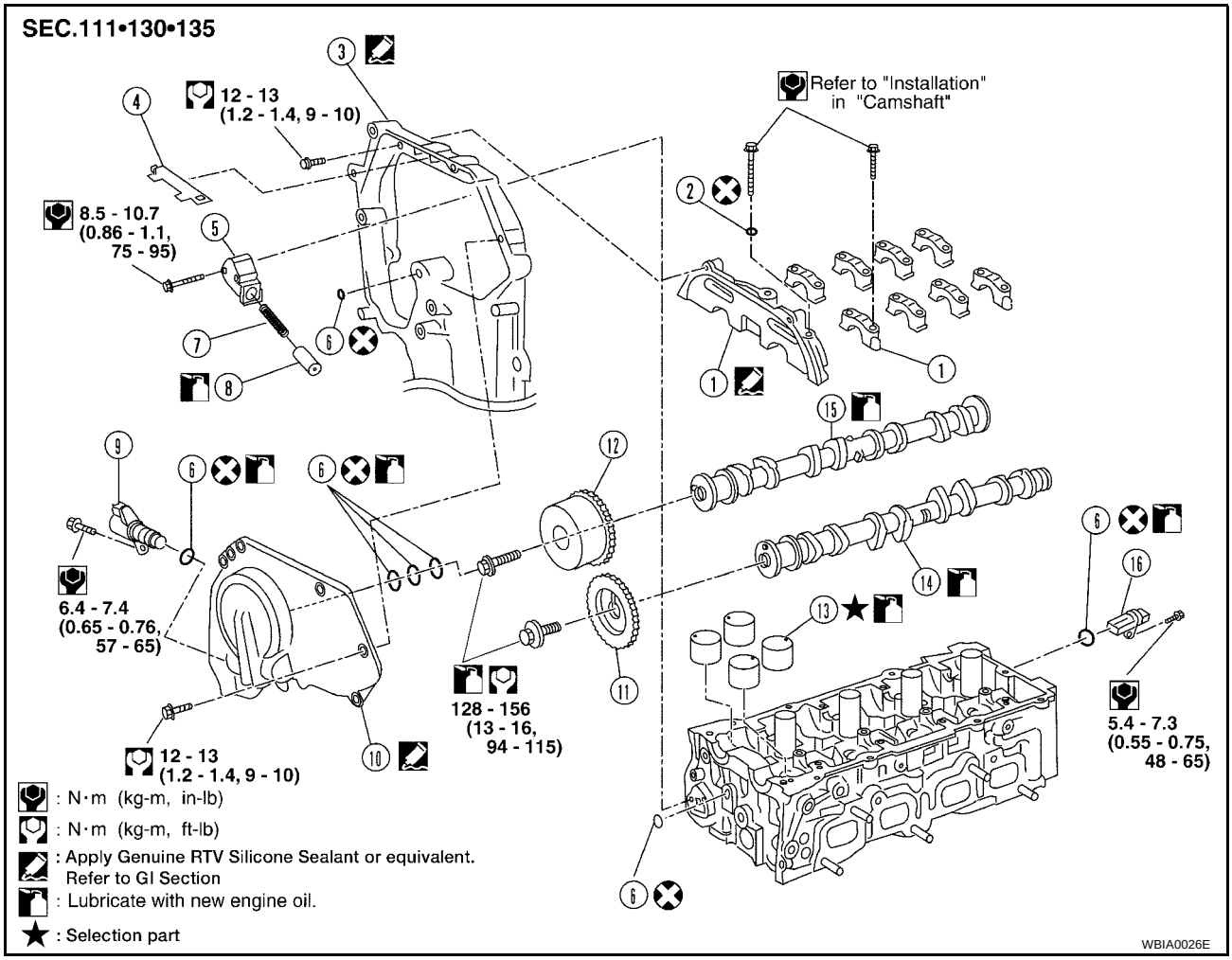


CAMSHAFT

PFP:13001

Removal and Installation

EBS00CFZ

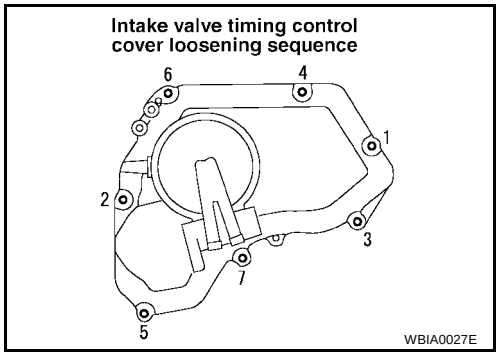


1. Camshaft brackets (1 - 5)
2. Washer
3. Front cover (partial view)
4. Chain guide
5. Chain tensioner
6. O-ring(s)
7. Chain tensioner spring
8. Chain tensioner plunger
9. IVT control solenoid valve
10. IVT control cover
11. Camshaft sprocket (EXH)
12. Camshaft sprocket (INT)
13. Valve lifter
14. Camshaft (EXH)
15. Camshaft (INT)
16. Camshaft position sensor (PHASE)

REMOVAL

1. Remove the rocker cover. Refer to EM-121, "Removal and Installation" .
2. Remove the front right side tire and wheel. Refer to WT-4, "Removal" .
3. Remove the RH splash shield.
4. Remove the drive belt. Refer to EM-100, "REMOVAL" .
5. Remove the coolant overflow reservoir tank.
6. Disconnect the camshaft electrical connector.
7. Disconnect the ground electrical connections from the front cover.

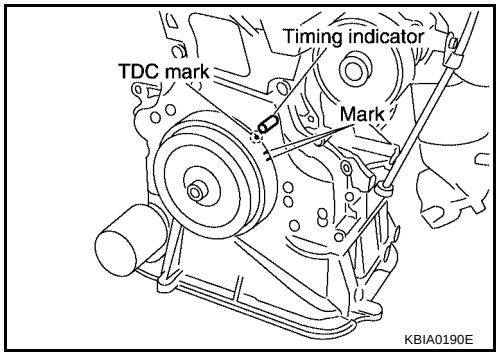
8. Remove the IVT control (intake valve timing control) cover by cutting the sealant using Tool.
   - Loosen the bolts in the order shown.



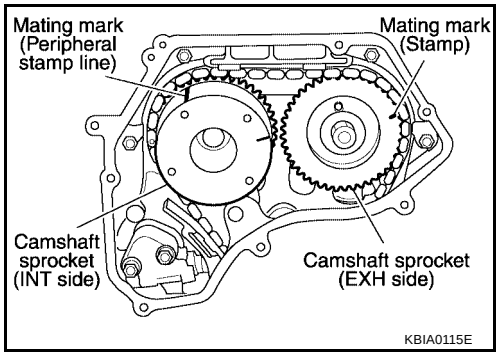
9. Set the No.1 cylinder at TDC on its compression stroke with the following procedure:

a. Open the access cover on RH undercover.

b. Rotate crankshaft pulley clockwise, and align mating marks for TDC with timing indicator on front cover, as shown.



c. At the same time, make sure that the mating marks on camshaft sprockets are lined up with the yellow links in the timing chain, as shown.
   - If not, rotate crankshaft pulley one more turn to line up the mating marks to the yellow links, as shown.



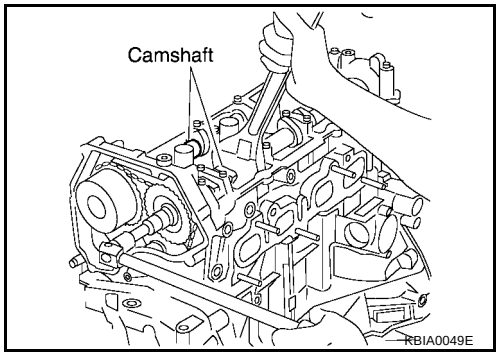
10. Pull the timing chain guide out between the camshaft sprockets through front cover.

11. Remove camshaft sprockets with the following procedure.

CAUTION:
- **Do not rotate the crankshaft or camshaft while the timing chain is removed. It causes interference between valve and piston.**

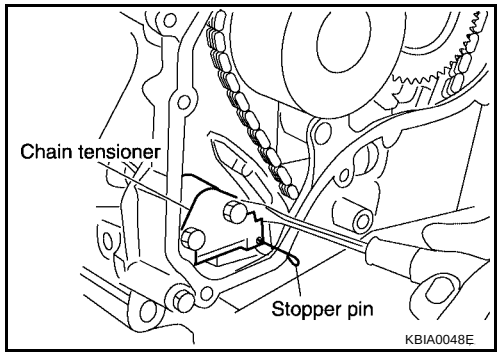
NOTE:
- Chain tension holding work is not necessary. Crank sprocket and timing chain do not disconnect structurally while front cover is attached.

a. Line up the mating marks on camshaft sprockets with the yellow links in the timing chain, and paint an indelible mating mark on the sprocket and timing chain link plate.

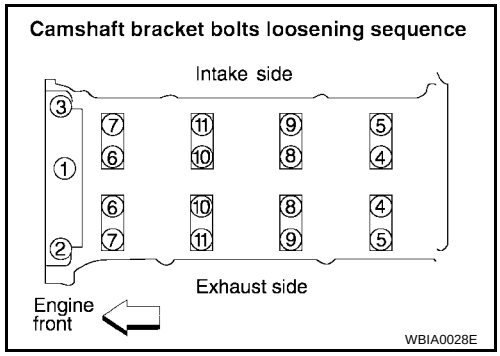


b. Push in the tensioner plunger and hold. Insert a stopper pin into the hole on tensioner body to hold the chain tensioner. Remove the timing chain tensioner.
   - Use a wire with 0.5 mm (0.02 in) diameter for a stopper pin.

c. Secure the hexagonal part of camshaft with a suitable tool. Loosen the camshaft sprocket mounting bolts and remove the camshaft sprockets.



12. Loosen the camshaft bracket bolts in the order shown, and remove the camshaft brackets and camshafts.
    - Remove No.1 camshaft bracket by slightly tapping it with a rubber mallet.
13. Remove the valve lifters.
    - Check mounting positions, and set them aside in the order removed.

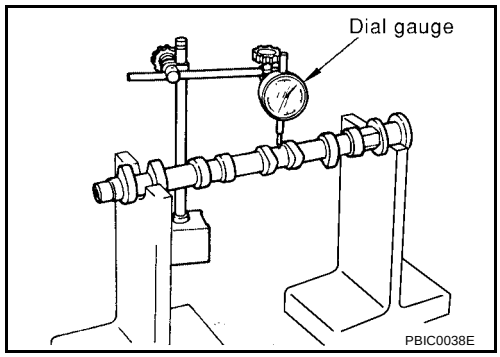


INSPECTION AFTER REMOVAL

Camshaft Runout

1. Put the camshaft on a V-block supporting the No.2 and No.5 journals.
2. Set the dial gauge vertically on the No.3 journal.
3. Turn camshaft in one direction by hand, and measure the camshaft runout on the dial gauge total indicator reading.

Standard : Less than 0.04 mm (0.0016 in)



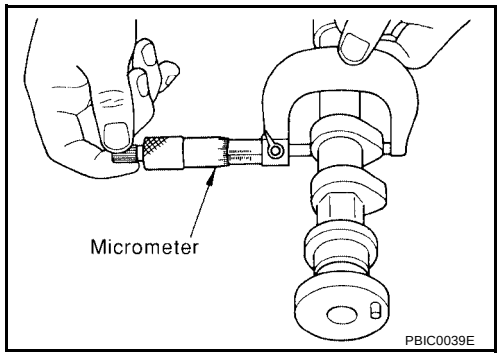
Camshaft Cam Height

1. Measure the camshaft cam height.

Standard intake cam height : 45.665 - 45.855 mm (1.7978 - 1.8053 in)

Standard exhaust cam height : 43.975 - 44.165 mm (1.7313 - 1.7388 in)

2. If wear is beyond the limit, replace the camshaft.

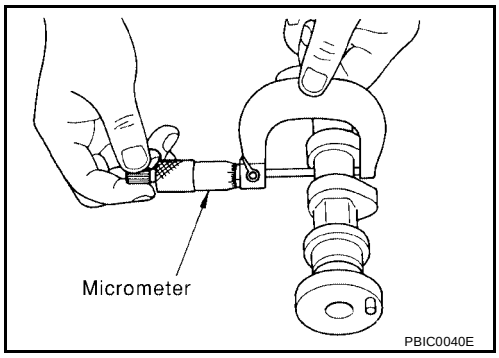


Camshaft Journal Clearance

Outer Diameter of Camshaft Journal

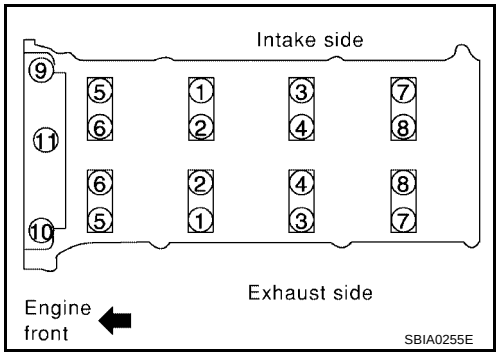
- Measure the outer diameter of the camshaft journal.

Standard No.1 outer diameter	**: 27.935 - 27.955 mm (1.0998 - 1.1006 in)**
Standard No.2, 3, 4, 5, outer diameter	**: 23.435 - 23.455 mm (0.9226 - 0.9234 in)**



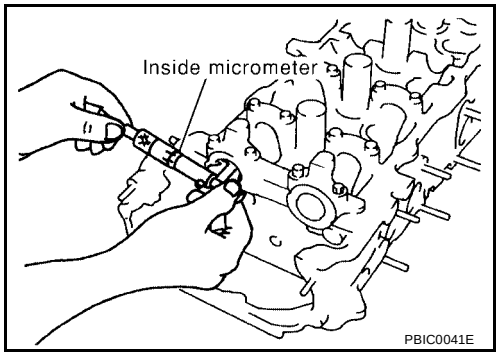
Inner Diameter of Camshaft Bracket

- Tighten the camshaft bracket bolts to the specified torque following the tightening pattern as shown. Refer to EM-128, "INSTALLATION" .



- Using inside micrometer, measure inner diameter of camshaft bracket.

Standard No.1	**: 28.000 - 28.021 mm (1.1024 - 1.1032 in)**
Standard No.2, 3, 4, 5	**: 23.500 - 23.521 mm (0.9252 - 0.9260 in)**



Calculation of Camshaft Journal Clearance

- (Journal clearance) = (inner diameter of camshaft bracket) – (outer diameter of camshaft journal)

Standard : 0.045 - 0.086 mm (0.0018 - 0.0034 in)

- When out of the specified range above, replace either or both the camshaft and the cylinder head assembly.

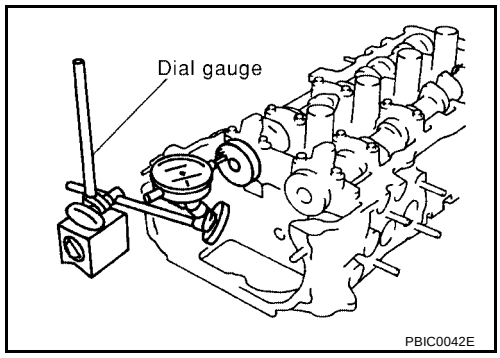
NOTE:
Inner diameter of the camshaft bracket is manufactured together with the cylinder head. If the camshaft bracket is out of specification, replace the entire cylinder head assembly.

Camshaft End Play

1. Install a dial gauge in the thrust direction on the front end of the camshaft. Measure the end play with the dial gauge while moving the camshaft forward and backward (in direction to axis).

   Standard end play : 0.115 - 0.188 mm (0.0045 - 0.0074 in)

2. If out of the specified range, replace with new camshaft and measure again.
3. If out of the specified range again, replace with new cylinder head assembly.

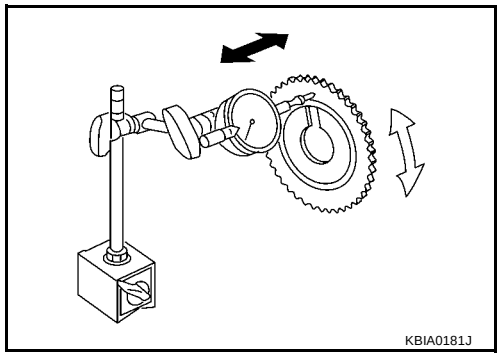


Camshaft Sprocket Runout

1. Install the camshaft in the cylinder head.
2. Install the camshaft sprocket on the camshaft.
3. Measure camshaft sprocket runout while turning the camshaft by hand.

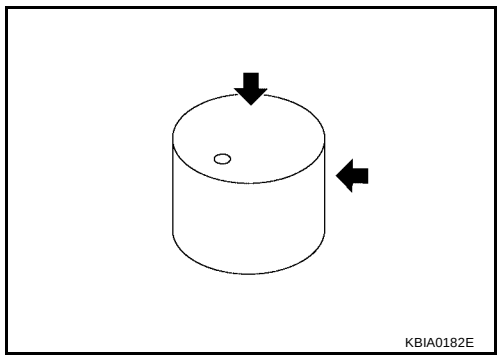
   Runout : Less than 0.15 mm (0.0059 in)

4. If it exceeds the specification, replace camshaft sprocket.



Valve Lifter

- Check if the surface of the valve lifter has any excessive wear or cracks, replace as necessary.



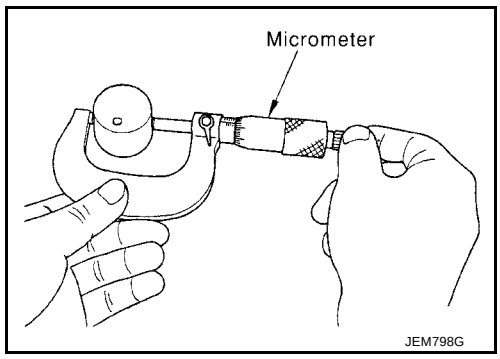
Valve Lifter Clearance

Outer Diameter of Valve Lifter

- Measure the valve lifter outer diameter.

  Valve lifter outer diameter : 33.965 - 33.980 mm (1.3372 - 1.3378 in)

- If out of the specified range, replace the valve lifter.

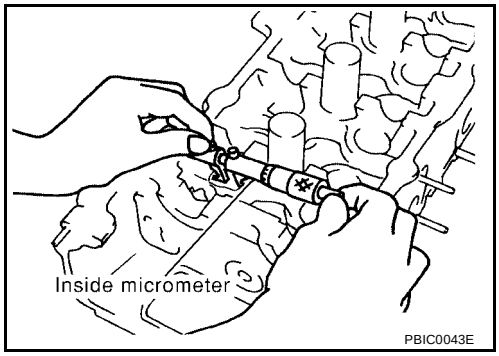


Valve Lifter Hole Diameter

- Using inside micrometer, measure valve lifter guide bore diameter of cylinder head.

Standard : 34.000 - 34.021 mm (1.3386 - 1.3394 in)

- If out of the specified range, replace the cylinder head assembly.



Calculation of Valve Lifter Clearance

- (Valve lifter clearance) = (valve lifter bore diameter) – (valve lifter outer diameter)

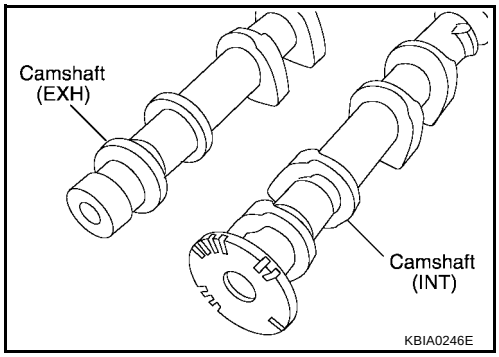
Standard : 0.020 - 0.056 mm (0.0008 - 0.0022 in)

- If out of specified range, replace either or both valve lifter and cylinder head assembly.

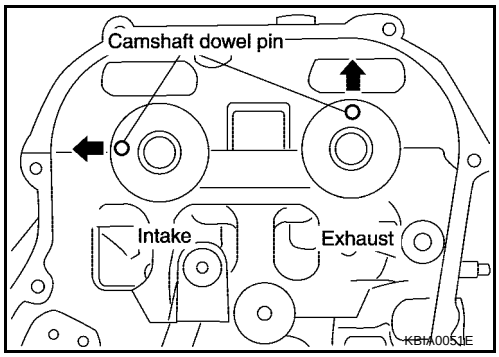
INSTALLATION

1. Install the valve lifter.
   - Install them in the same position from which they were removed.
2. Install the camshafts.
   - The distinction between the intake and exhaust camshafts is in a difference of shapes of the back end:

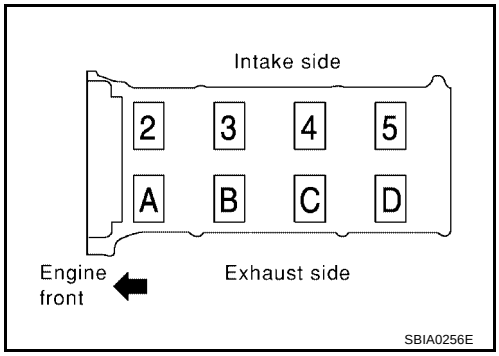
     Intake: Signal plate for the camshaft position sensor (PHASE)
     Exhaust: Cone end shape



- Install camshafts so that the dowel pins on the front side are positioned as shown.



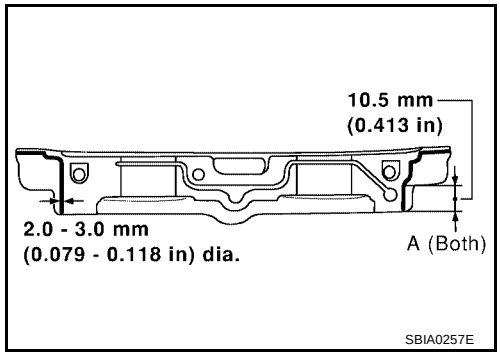
3. Install camshaft brackets.
   - Install by referring to identification mark on upper surface mark.
   - Install so that identification mark can be correctly read when viewed from the exhaust side.
   - Install No. 1 camshaft bracket as follows.
   - Apply sealant to No.1 camshaft bracket as shown.



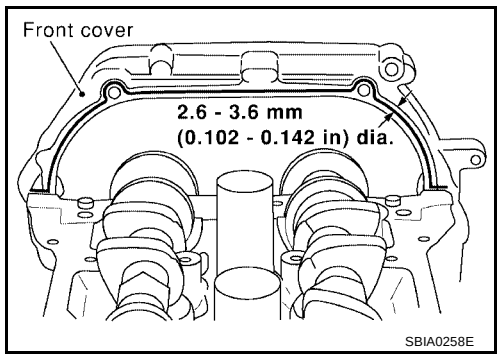
- **Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .**

CAUTION:

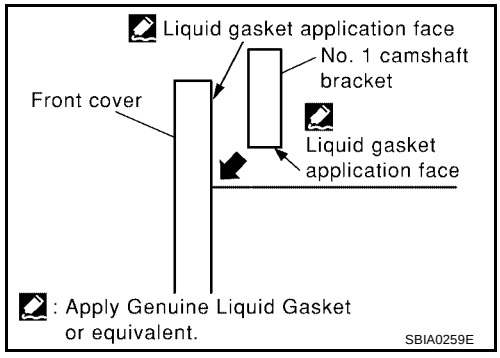
- **After installation, be sure to wipe off any excessive sealant leaking from part "A" (both on right and left sides).**



- Apply sealant to camshaft bracket contact surface on the front cover backside.
- Apply sealant to the outside of bolt hole on front cover.



- Position the No.1 camshaft bracket near the mounting position, and install it without disturbing the sealant applied to the surfaces.



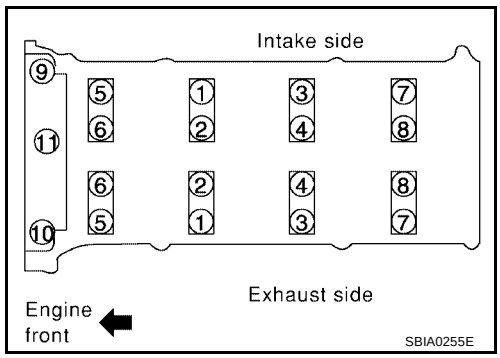
4. Tighten camshaft bracket bolts in four steps in the order shown.

a. Tighten in the order from 9 to 11 with tightening torque 2.0 N·m (0.2 kg-m, 17 in-lb).

b. Tighten in the order from 1 to 8 with tightening torque 2.0 N·m (0.2 kg-m, 17 in-lb)

c. Tighten all bolts in specific order with tightening torque 5.9 N·m (0.5 kg-m, 52 in-lb).

d. Tighten in the order from 1 to 11 with tightening torque 9.0 to 11.8 N·m (0.92 to 1.2 kg-m, 80 to 104 in-lb).



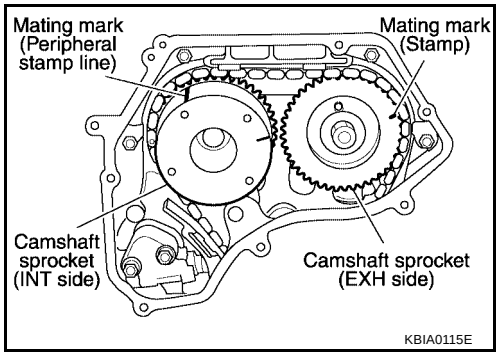
CAUTION:

After tightening camshaft bracket bolts, be sure to wipe off excessive sealant from the parts listed below.

- **Mating surface of rocker cover.**
- **Mating surface of front cover, when installed without the front cover.**

5. Install camshaft sprockets.
   - Install them by lining up the mating marks on each camshaft sprocket with the ones painted on the timing chain during removal.
   - Before installation of chain tensioner, it is possible to re-match the marks on timing chain with the ones on each sprocket.

   CAUTION:
   - **Aligned mating marks could slip. Therefore, after matching them, hold the timing chain in place by hand.**
   - **Before and after installing chain tensioner, check again to make sure that mating marks have not slipped.**



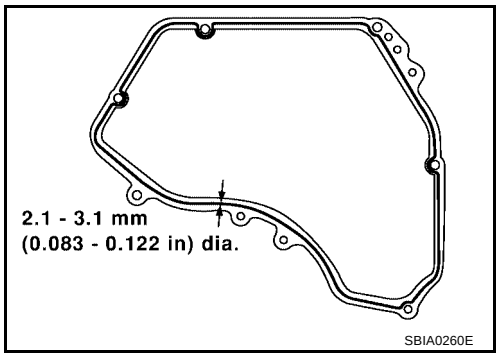
6. Install chain tensioner.

   CAUTION:
   After installation, pull the stopper pin off completely, and make sure that the tensioner is fully released.
7. Install chain guide.
8. Install IVT control (intake valve timing control) cover with the following procedure.

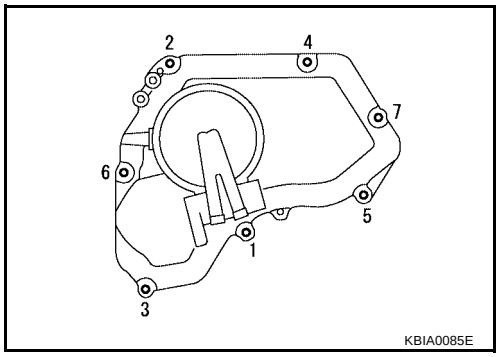
a. Install IVT control solenoid valve to intake valve timing control cover.

b. Install O-ring to front cover side.

c. Apply Genuine Silicone RTV Sealant to the positions shown in the figure. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .



d. Install IVT control cover.
   - Tighten the bolts in the numerical order as shown.
9. Check and adjust valve clearances. Refer to EM-130, "Valve Clearance" .
10. Install the remaining components in the reverse order of removal.



Valve Clearance

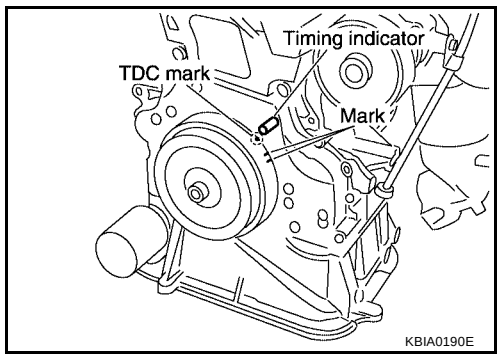
EBS00CG0

INSPECTION

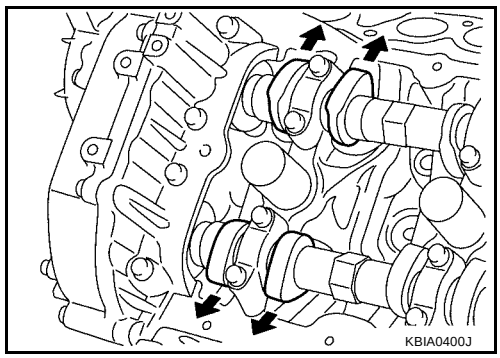
- Perform this inspection as follows after removal, installation, or replacement of the camshaft or any valve-related parts, or if there are any unusual engine conditions due to changes in valve clearance over time (starting, idling, and/or noise).

1. Warm up the engine, then stop it.
2. Remove front RH engine undercover.
3. Remove the rocker cover.
   Refer to EM-121, "Removal and Installation" .

4. Turn crankshaft pulley in normal direction (clockwise when viewed from front) to align TDC identification mark (without paint mark) with timing indicator.

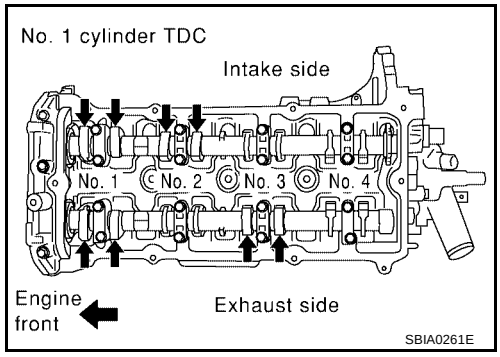


5. At this time, check that both the intake and exhaust cam noses of No. 1 cylinder face outside.
   - If they do not face outside, turn crankshaft pulley once more.



6. By referring to the figure, measure valve clearances at locations marked X as shown in the table below (locations indicated with black arrow in figure) with a feeler gauge.
   - No.1 cylinder compression TDC.

Cylinder	No.1		No.2		No.3		No.4	
Valve	INT	EXH	INT	EXH	INT	EXH	INT	EXH
Measurable	×	×	×			x		

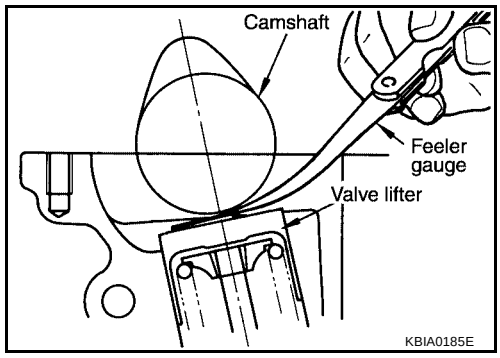


   - Use a feeler gauge, measure clearance between valve and camshaft.

Valve clearance standard:

Hot	**Intake**	**: 0.32 - 0.40 mm (0.013 - 0.016 in)**
	Exhaust	**: 0.33 - 0.41 mm (0.013 - 0.016 in)**
Cold*	**Intake**	**: 0.24 - 0.32 mm (0.009 - 0.013 in)**
	Exhaust	**: 0.26 - 0.34 mm (0.010 - 0.013 in)**

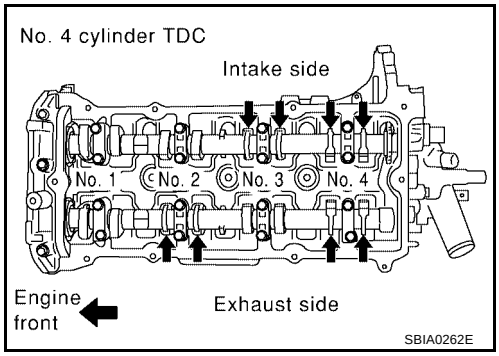
*Reference data at approximately 20°C (68°F)



CAUTION:
If inspection was carried out with cold engine, check that values with fully warmed up engine are still within specifications.

7. Turn crankshaft one complete revolution (360°) and align mark on crankshaft pulley with pointer.

8. By referring to the figure, measure valve clearances at locations marked X as shown in the table below (locations indicated with black arrow in figure).
   - No.4 cylinder compression TDC.



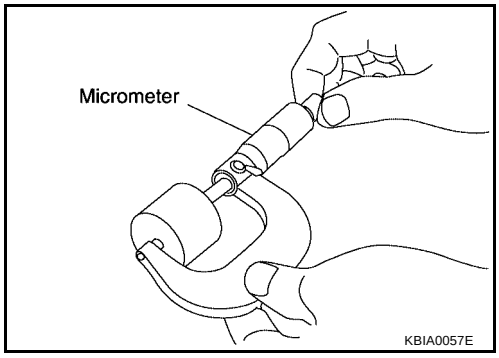
Cylinder	No.1		No.2		No.3		No.4	
Valve	INT	EXH	INT	EXH	INT	EXH	INT	EXH
Measurable				x	×		x	×

9. If out of specifications, adjust as follows.

VALVE ADJUSTMENT

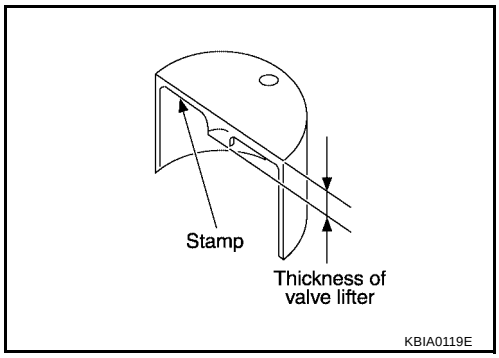
- Perform adjustment depending on selected head thickness of valve lifter.
- The specified valve lifter thickness is the dimension at normal temperatures. Ignore dimensional differences caused by temperature. Use the specifications for hot engine condition to adjust.

1. Remove camshaft. Refer to EM-123, "Removal and Installation" .
2. Remove the valve lifters at the locations that are outside the standard.
3. Measure the center thickness of the removed valve lifters with a micrometer.



4. Use the equation below to calculate valve lifter thickness for replacement.

- Valve lifter thickness calculation.
  t = t1 + (C1 - C2)
  t = Thickness of replacement valve lifter.
  t1 = Thickness of removed valve lifter.
  C1 = Measured valve clearance.
  C2 = Standard valve clearance.
- Thickness of a new valve lifter can be identified by stamp marks on the reverse side (inside the cylinder).
  Stamp mark 696 indicates a thickness of 6.96 mm (0.2740 in)
  Available thickness of valve lifter: 26 sizes with a range of 6.96 to 7.46 mm (0.2740 to 0.2937 in), in steps of 0.02 mm (0.0008 in), when assembled at the factory.



5. Install the selected valve lifter.
6. Install camshaft.
7. Manually turn crankshaft pulley a few turns.
8. Check that valve clearances for cold engine are within specifications, by referring to the specified values.
9. After completing the repair, check valve clearances again with the specifications for warmed engine. Use a feeler gauge to measure the clearance between the valve and camshaft. Make sure the values are within specifications.

Valve clearance:

Unit: mm (in)

	Cold* (reference data)	Hot
Intake	0.24 - 0.32 (0.009 - 0.013)	0.304 - 0.416 (0.012 - 0.016)
Exhaust	0.26 - 0.34 (0.010 - 0.013)	0.308 - 0.432 (0.012 - 0.017)

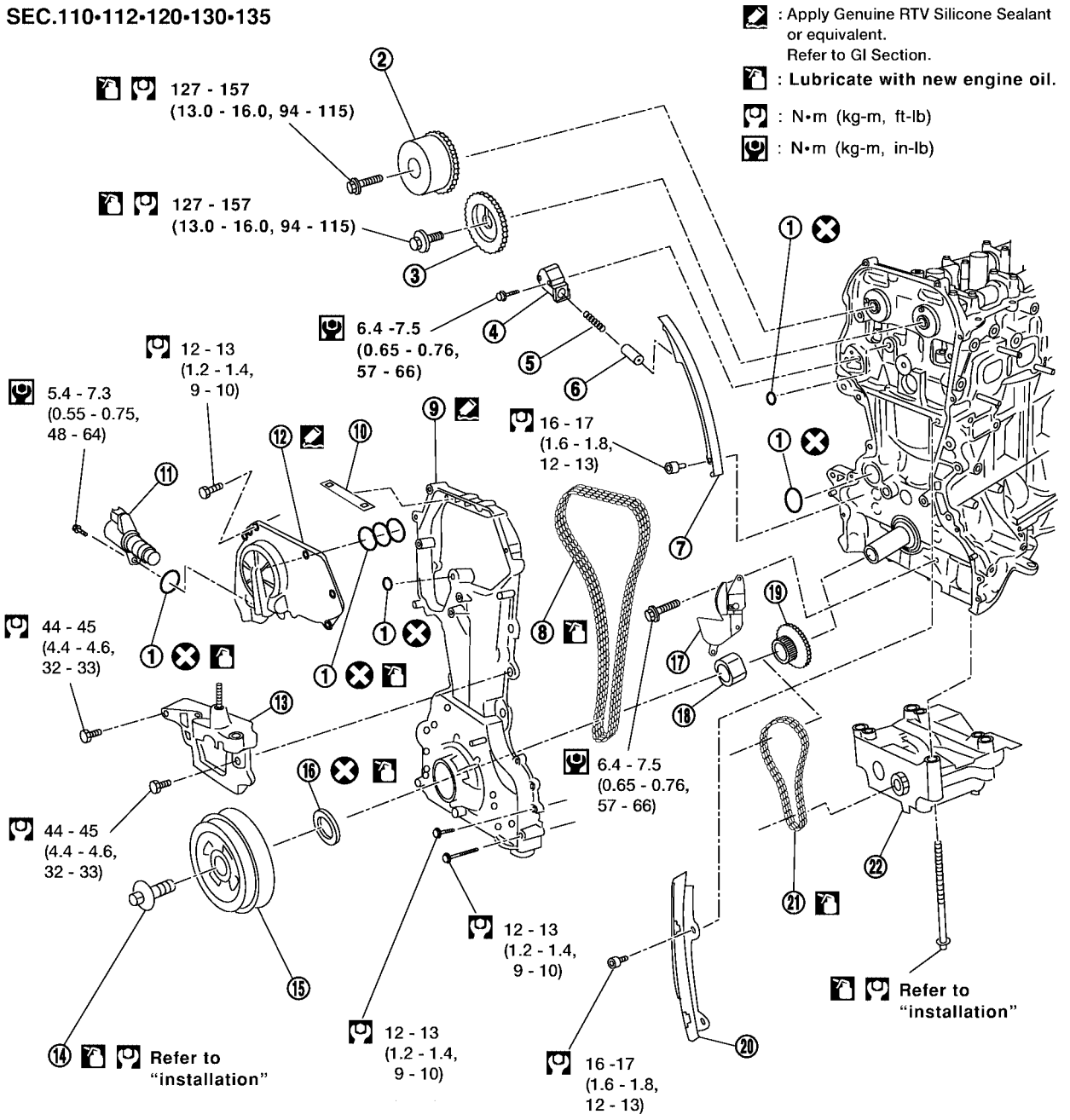
*: Reference data at approximately 20°C (68°F)

TIMING CHAIN

PFP:13028

Removal and Installation

EBS00CG1



WBIA0031E

1. Oil rings	2. Camshaft sprocket (INT)	3. Camshaft sprocket (EXH)
4. Chain tensioner	5. Spring	6. Chain tensioner plunger
7. Timing chain slack guide	8. Timing chain	9. Front cover
10. Chain guide	11. IVT control solenoid valve	12. IVT control cover
13. Engine mounting bracket	14. Crankshaft pulley bolt	15. Crankshaft pulley
16. Front oil seal	17. Balancer unit timing chain tensioner	18. Oil pump drive spacer
19. Crankshaft sprocket	20. Timing chain tension guide	21. Balancer unit timing chain
22. Balancer unit		

CAUTION:

Apply new engine oil to parts marked in illustration before installation.

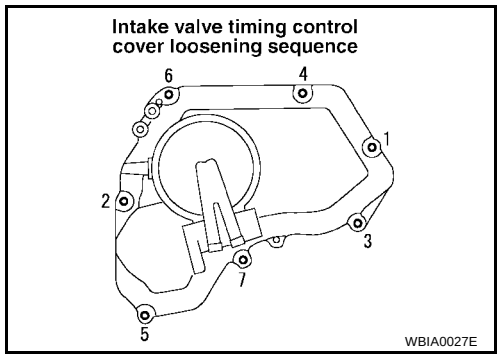
REMOVAL

1. Release the fuel pressure. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Remove the air cleaner and air duct assembly. Refer to EM-103, "Removal and Installation" .
3. Remove the spark plugs. Refer to EM-116, "Removal and Installation" .
4. Remove the rocker cover. Refer to EM-121, "Removal and Installation" .
5. Remove the coolant overflow reservoir tank.
6. Remove the auxiliary drive belt auto-tensioner. Refer to EM-101, "Removal and Installation of Drive Belt Auto-tensioner" .
7. Remove the alternator. Refer to SC-31, "Removal and Installation" .
8. Remove the strut tower brace.
9. Dismount and position aside the A/C compressor with the piping attached.
10. Dismount and position aside the power steering pump and reservoir tank with the piping attached.
11. Remove the upper and lower oil pan, and oil strainer. Refer to EM-112, "Removal and Installation" .
12. Remove the IVT control (intake valve timing control) cover.

a. Loosen bolts in the numerical order as shown.

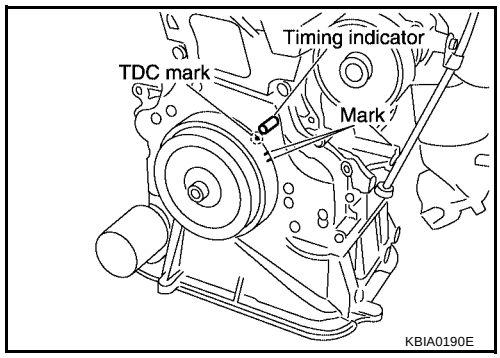
b. Remove the cover with suitable tool to cut the sealant.

13. Pull chain guide between camshaft sprockets out through front cover.



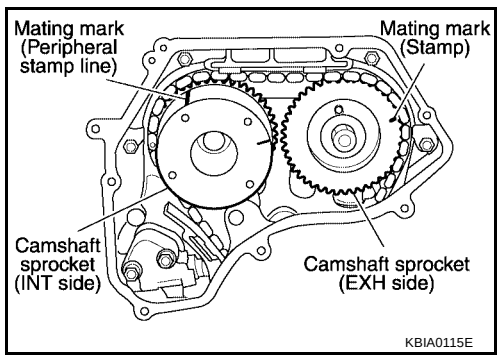
14. Set the No.1 cylinder at TDC on the compression stroke with the following procedure:

a. Rotate the crankshaft pulley clockwise and align the mating marks to the timing indicator on the front cover.



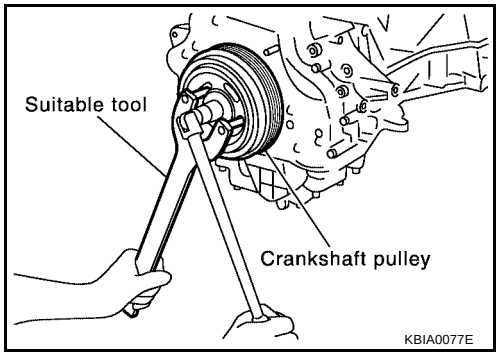
b. At the same time, make sure that the mating marks on the camshaft sprockets are lined up as shown.

- If not lined up, rotate the crankshaft pulley one more turn to line up the mating marks to the positions as shown.

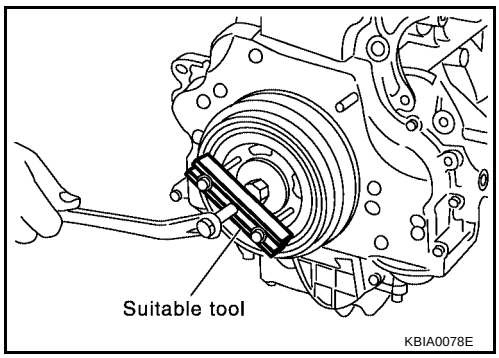


15. Remove crankshaft pulley with the following procedure:

a. Hold the crankshaft pulley with a suitable tool, then loosen the crankshaft pulley mounting bolt, and pull the pulley out about 10 mm (0.39 in). Remove the crankshaft pulley mounting bolt.



b. Attach a pulley puller in the M 6 (0.24 in diameter) thread hole on crankshaft pulley, and remove crankshaft pulley.



16. Remove the front cover with the following procedure:

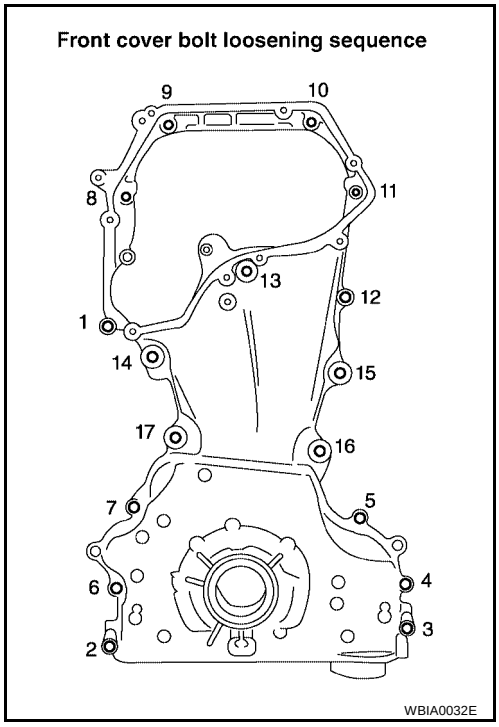
a. Loosen the mounting bolts in the numerical order as shown, and remove them.

b. Remove the front cover.

CAUTION:

- **Be careful not to damage the mounting surface.**

17. If the front oil seal needs to be replaced, lift it out with a screwdriver to remove it.

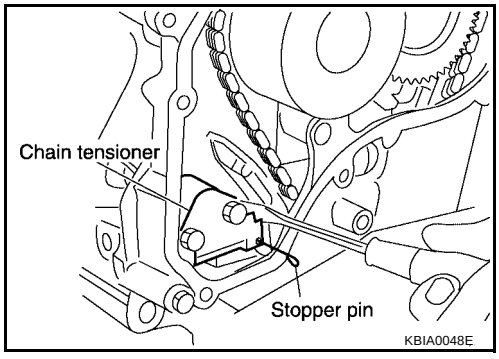


18. Remove timing chain with the following procedure:

a. Push in the tensioner plunger. Insert a stopper pin into the hole on the tensioner body to hold the chain tensioner.

- Use a wire of 0.5 mm (0.02 in) diameter as a stopper pin.

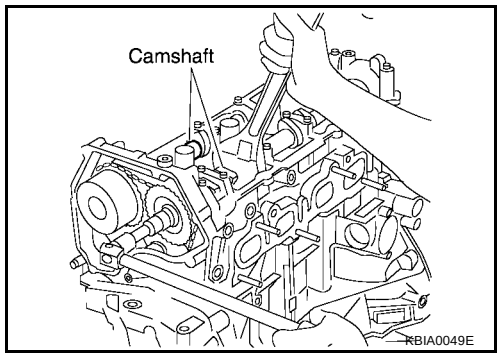
b. Remove the chain tensioner.



c. Secure hexagonal part of the camshaft with a wrench and loosen the camshaft sprocket mounting bolt and remove the camshaft sprocket for both camshafts.

CAUTION:

- **Do not rotate the crankshaft or camshafts while the timing chain is removed. It can cause damage to the valve and piston.**



19. Remove the chain slack guide, tension guide, timing chain, and oil pump drive spacer.

20. Remove the timing chain tensioner for the balancer unit with the following procedure:

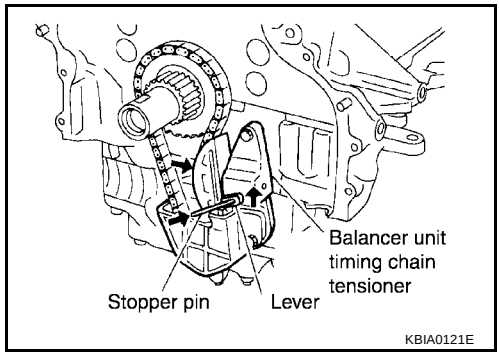
a. Lift the tensioner lever up, and release the ratchet claw.

b. Push tensioner sleeve in, and hold it.

c. Matching the hole on lever with the one on body, insert a stopper pin to secure tensioner sleeve.

d. Remove the timing chain tensioner for the balancer unit.

21. Remove timing chain for balancer unit and crankshaft sprocket.

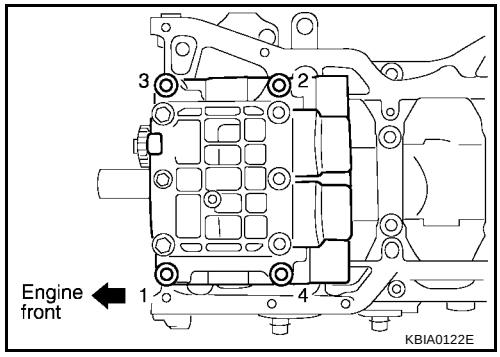


22. Loosen mounting bolts in reverse order shown in the figure, and remove balancer unit.

- Use Torx socket (size E14)

CAUTION:

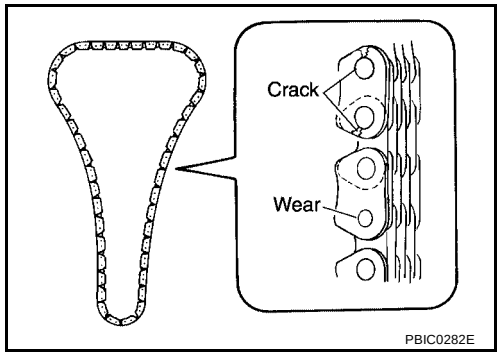
- **Do not disassemble balancer unit.**



INSPECTION AFTER REMOVAL

Timing Chain

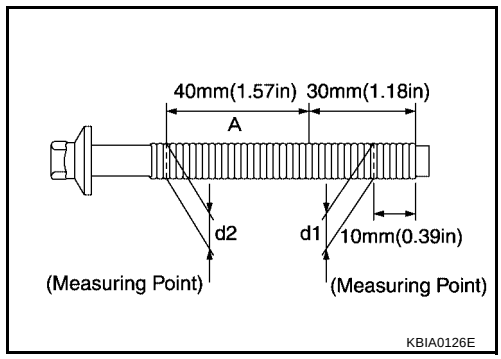
Check the timing chain for cracks or serious wear. If a defect is detected, replace it.



Balancer Unit Mounting Bolt Outer Diameter

- Measure outer diameters (d1, d2) at the two positions shown in the figure.
- Measure d2 within the range A.
- If the value difference (d1 - d2) exceeds the limit (a dimension difference is large), replace it with a new one.

Limit : 0.15 mm (0. 0059 in) or more



INSTALLATION

NOTE:

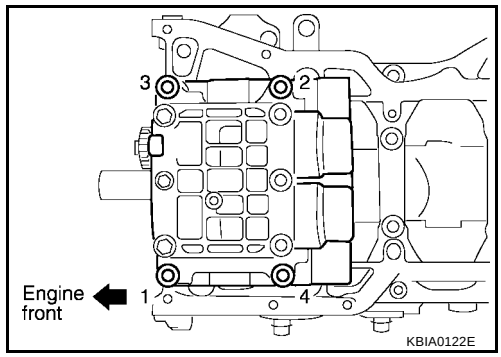
- There may be two color variations of the link marks (link colors) on the timing chain.
- There are 26 links between the gold/yellow mating marks on the timing chain; and 64 links between the camshaft sprocket gold/yellow link and the crankshaft sprocket orange/blue link, on the timing chain side without the tensioner.

1. Make sure the crankshaft key points straight up.
2. Install the balancer unit and tighten the mounting bolts in the numerical order shown with the following procedure:

CAUTION:

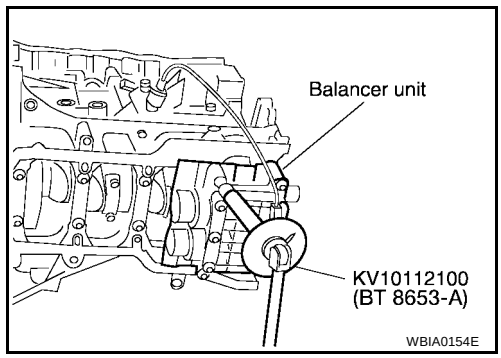
- **When reusing a mounting bolt, check its outer diameter before installation. Refer to EM-138, "Balancer Unit Mounting Bolt Outer Diameter" .**

a. Apply new engine oil to threads and seating surfaces of mounting bolts.
b. Tighten them to 45.2 - 51.0 N·m (4.6 - 5.2 kg-m, 34 - 37 ft-lb).
c. Turn them another 90° - 95° degrees (Target: 90° degrees).
d. Fully loosen in the reverse order of tightening to 0 N·m (0 kg-m, 0 ft-lb).
e. Tighten them to 45.2 - 51.0 N·m (4.6 - 5.2 kg-m, 34 - 37 ft-lb).
f. Turn them another 90° - 95° degrees (Target: 90° degrees).

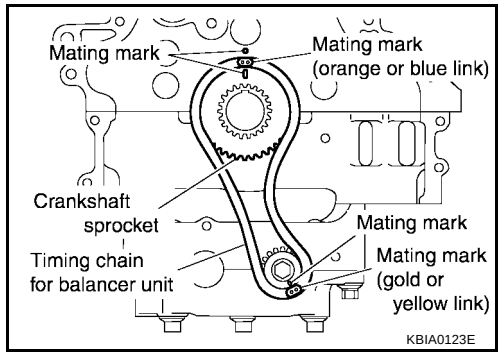


CAUTION:

- **Check tightening angle with an angle wrench or a protractor. Do not make judgment by visual check alone.**



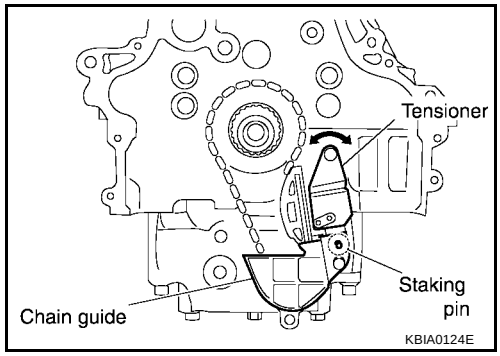
3. Install the crankshaft sprocket and timing chain for the balancer unit.
   - Make sure that the crankshaft sprocket is positioned with mating marks on the block and sprocket meeting at the top.
   - Install it by lining up mating marks on each sprocket and timing chain.



4. Install timing chain tensioner for balancer unit.

NOTE:
Chain guide and tensioner move freely with the caulking pin as the axle. Therefore, bolt hole position of the three points could be changed during removal. If points change, temporarily fix the two mounting bolts on the chain guide and move the tensioner to match the bolt holes.

- Be careful not to let mating marks of each sprocket and timing chain slip.
- After installation, make sure the mating marks have not slipped, then remove stopper pin and release tensioner.

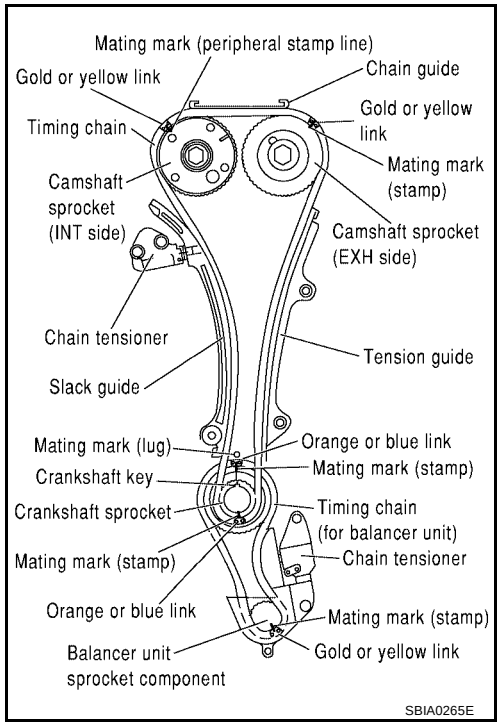


5. Install timing chain and related parts.
   - Install by lining up mating marks on each sprocket and timing chain as shown.

NOTE:
Before installing chain tensioner, it is possible to change the position of mating mark on timing chain for that of each sprocket for alignment.

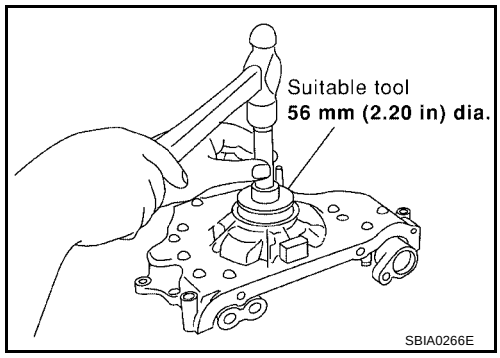
CAUTION:
For the above reason, after the mating marks are aligned, keep them aligned by holding them with a hand.

- Before and after installing chain tensioner, check again to make sure that mating marks have not slipped.
- After installing chain tensioner, remove stopper pin, and make sure the tensioner moves freely.
- To avoid skipped teeth, do not move crankshaft and camshaft until front cover is installed.



6. Install front oil seal to front cover.
   - Using a drift of 56 mm (2.20 in) diameter, press oil seal in until it is flush with front end surface of front cover.

CAUTION:
- **Be careful not to cause damage to circumference of oil seal.**



7. Install front cover with the following procedure:

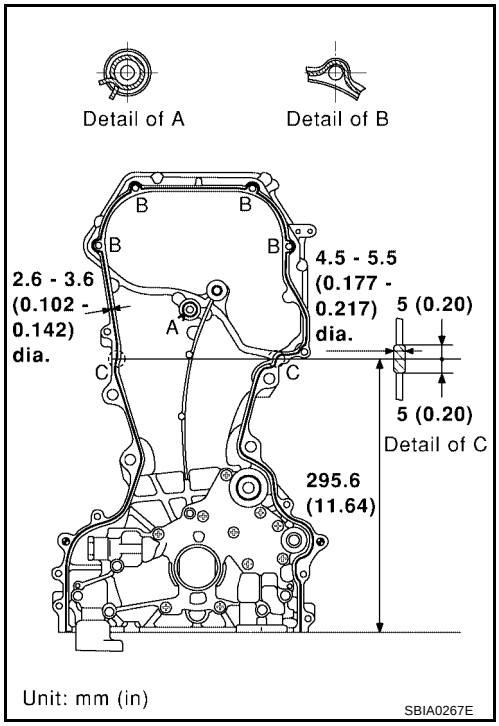
a. Install O-rings to cylinder head and cylinder block.

b. Apply Genuine Silicone RTV Sealant or equivalent, to positions specified in the figure. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

c. Make sure the mating marks on the timing chain and each sprocket are still aligned. Then install the front cover.

CAUTION:

- **Be careful not to damage the front oil seal during installation with the front end of the crankshaft.**



d. Tighten mounting bolts in the numerical order as shown.

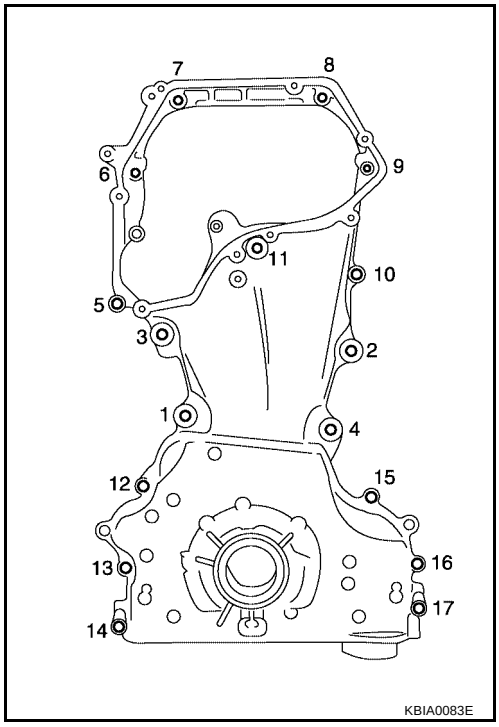
e. After all bolts are tightened, retighten them to the specified torque.

Front cover bolts : 12 - 13 N·m (1.2 - 1.4 kg-m, 9 - 10 ft-lb)

CAUTION:

Wipe off any excess sealant leaking at the surface for installing the oil pan.

8. Install the chain guide between the camshaft sprockets.



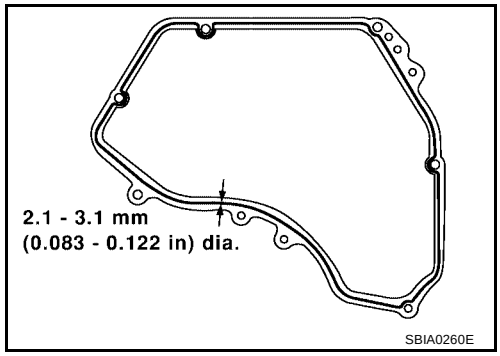
9. Install IVT control cover with the following procedure:

a. Install IVT control solenoid valves to IVT control cover.

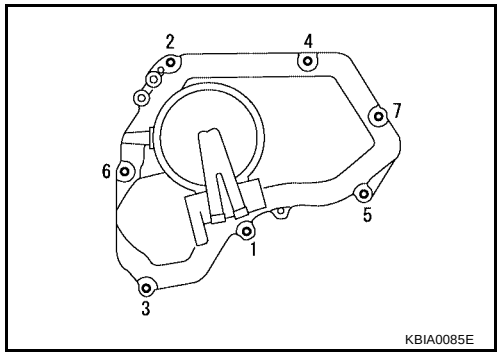
b. Install oil rings to the intake camshaft sprocket insertion points on IVT control backside cover.

c. Install O-ring to front cover.

d. Apply Silicone RTV Sealant to the positions as shown.



e. Tighten the mounting bolts in the numerical order as shown.



10. Insert crankshaft pulley by aligning with crankshaft key.
    - Tap its center with a plastic hammer to insert.
11. Tighten crankshaft pulley mounting bolts.
    - Secure crankshaft pulley with a pulley holder to tighten the bolt.
    - Perform angle tightening with the following procedure:

a. Apply new engine oil to threads and seat surfaces of mounting bolts.

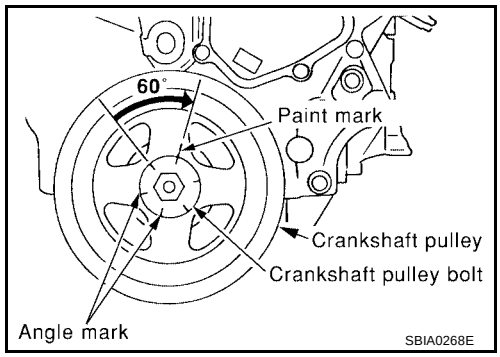
b. Tighten to initial specifications:·

Crankshaft pulley bolt initial tightening	**: 37.3 - 47.1 N·m (3.8 - 4.8 kg-m, 28 - 34 ft-lb)**

c. Apply a paint mark on the front cover, mating with any one of six easy to recognize stamp marks on bolt flange.

d. Turn crankshaft pulley bolt another 60° to 66° degrees [Target: 60° degrees].
    - Check vertical mounting angle with movement of one stamp mark.

12. Installation of the remaining parts is in reverse order of removal.



OIL SEAL

PFP:00100

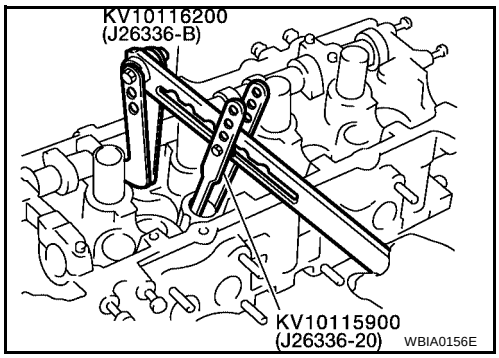
Removal and installation of Valve Oil Seal

EBS00EX1

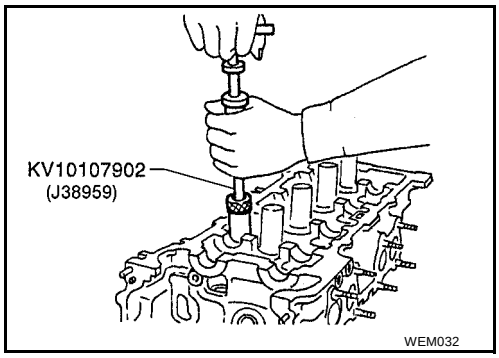
REMOVAL

1. Remove camshaft. Refer to EM-123, "REMOVAL"
2. Remove valve lifter. Refer to EM-123, "REMOVAL" .
3. Rotate crankshaft, and set piston whose oil seal is to removed to top dead center. This prevents valve from dropping inside cylinder.

   CAUTION:
   When rotating crankshaft, be careful to avoid scarring the front cover with the timing chain.
4. Remove valve collet, valve spring retainer and valve spring with Tool.



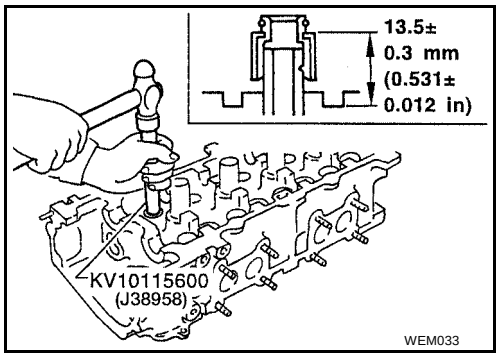
5. Remove valve oil seal with Tool.



6. Installation of the remaining components is in reverse order of removal.

INSTALLATION

1. Apply new engine oil to new valve oil seal joint surface and seal lip.
2. Press in valve oil seal to the position shown with Tool.



Removal and Installation of Front Oil Seal

EBS00EX2

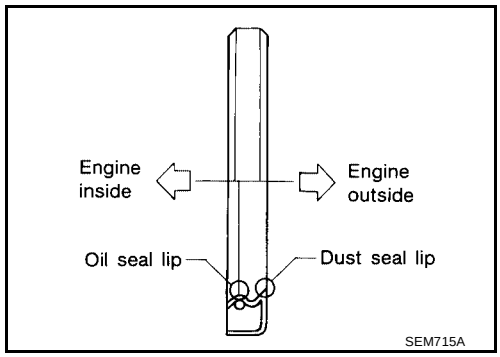
REMOVAL

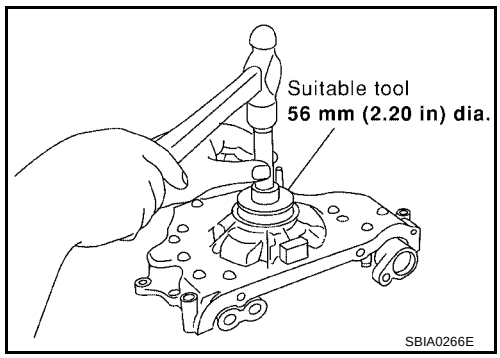
1. Remove the following parts:
   - Engine under cover
   - Drive belts. Refer to EM-100, "REMOVAL" .
   - Crankshaft pulley. Refer to EM-134, "TIMING CHAIN"
2. Remove front oil seal from front cover.

CAUTION:
Be careful not to scratch front cover.

INSTALLATION

1. Apply new engine oil to new oil seal and install it using a suitable tool.
   - Install new oil seal in the direction shown.





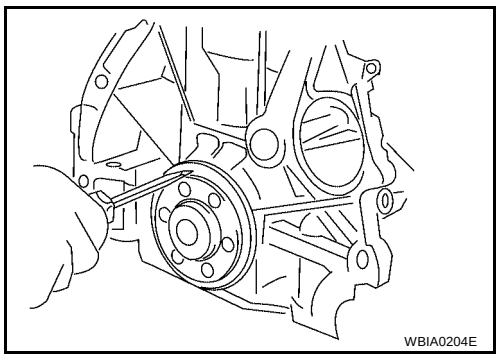
2. Installation of the remaining components is in reverse order of removal.

Removal and Installation of Rear Oil Seal

EBS00EX3

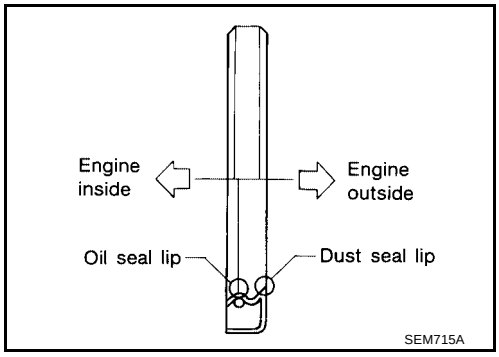
REMOVAL

1. Remove the transaxle. Refer to MT-16, "Removal and Installation" (RS5F70A), MT-82, "Removal and Installation" (RS5F51A), MT-143, "Removal and Installation" (RS6F51H), or AT-265, "REMOVAL AND INSTALLATION" (RE4F03B), AT-649, "REMOVAL AND INSTALLATION" (RE4F04B).
2. Remove flywheel (MT) or drive plate (AT).
3. Remove rear oil seal.
   - **Be careful not to damage crankshaft and/or cylinder block.**



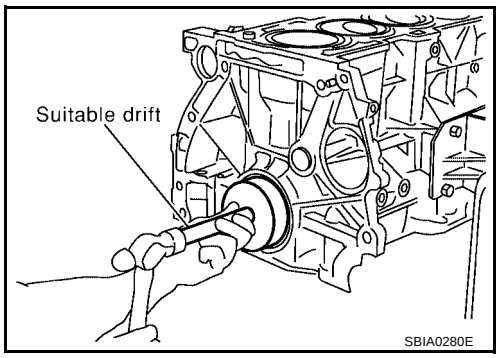
INSTALLATION

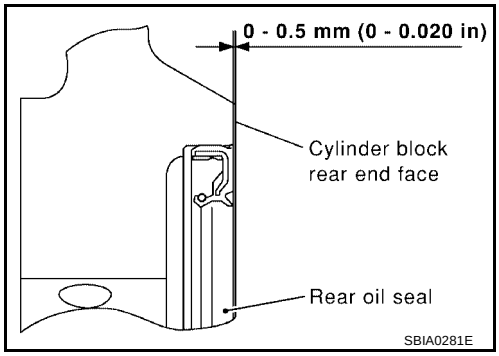
1. Apply new engine oil to new oil seal and install it using a suitable tool.
   - Install new oil seal in the direction shown.



2. Install rear oil seal with a suitable drift.

   CAUTION:
   - **Do not touch grease applied onto oil seal lip.**
   - **Be careful not to damage crankshaft and/or cylinder block.**
   - **Press fit oil seal straight to avoid causing burrs or tilting.**





3. Installation of the remaining components is in reverse order of removal.

CYLINDER HEAD

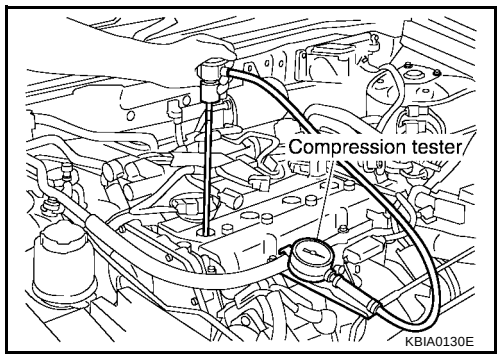
PFP:11041

On-Vehicle Service

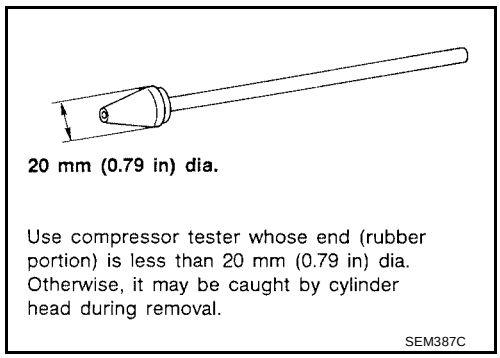
EBS00CG2

CHECKING COMPRESSION PRESSURE

1. Warm up the engine to full operating temperature.
2. Turn ignition switch OFF.
3. Release the fuel pressure. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
4. Remove the ignition coil and spark plug from each cylinder.
   Refer to EM-116, "Removal and Installation" .
5. Connect engine tachometer (not required in use of CONSULT-II).
6. Disconnect the fuel injector harness connector to avoid any residual fuel injection during the measurement.
7. Install the compression tester with the adapter into the spark plug hole.



- Use compression gauge whose picking up end inserted to spark plug hole is smaller than 20 mm (0.79 in) in diameter. Otherwise, it may be caught by cylinder head during removal.



8. With the accelerator pedal fully depressed, turn the ignition switch to the “START” position to crank over the engine. When the gauge pointer stabilizes, read the compression pressure and engine rpm. Perform these steps to check each cylinder.

Unit: kPa (kg/cm^2 , psi) / rpm

Standard	Minimum	Difference limit between cylinders
1,250 (12.8, 181.3) / 250	1,060 (10.8, 153.7) / 250	100 (1.0, 14) / 250

CAUTION:

Always use a fully charged battery to obtain specified engine cranking speed.

- If the engine speed is out of specified rpm range, check the battery. Check engine speed again with a fully charged battery.
- If compression pressure is below minimum value, check valve clearances and parts associated with combustion chamber (valve, valve seat, piston, piston ring, cylinder bore, cylinder head, cylinder head gasket). After the checking, measure compression pressure again.
- If some cylinders have low compression pressure, pour small amount of engine oil into the spark plug hole of the cylinder to re-check it for compression.
  - If the added engine oil improves the compression, the piston rings may be worn or damaged. Check the piston rings and replace if necessary.

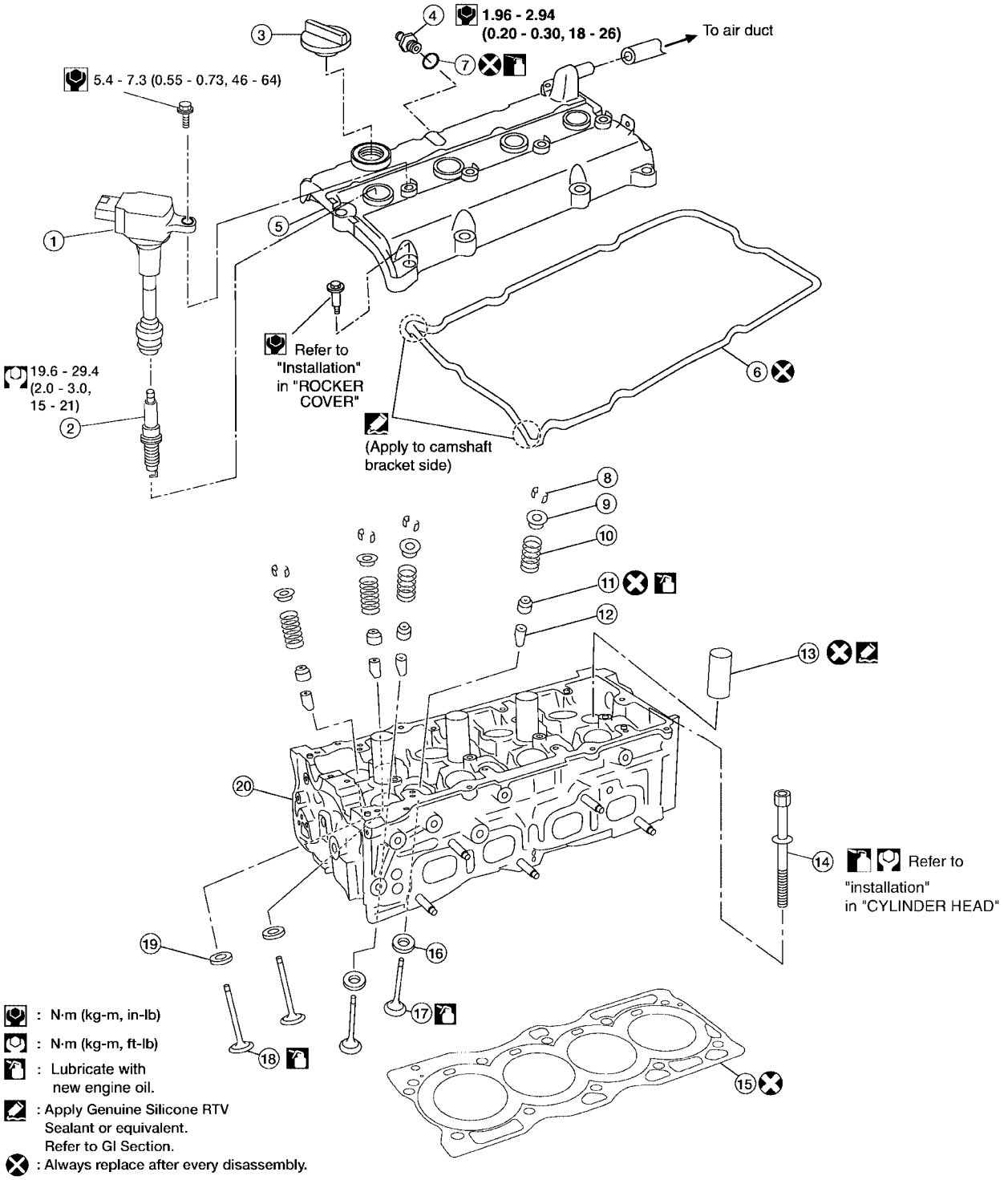
- If the compression pressure remains at low level despite the addition of engine oil, the valves may be malfunctioning. Check the valves for damage. Replace the valve or valve seat accordingly.

- If two adjacent cylinders have respectively low compression pressure and their compression remains low even after the addition of engine oil, the head gasket is leaking. In such a case, replace the cylinder head gasket.

9. Install spark plug, ignition coil and harness connectors.

Removal and Installation

EBS00CG3



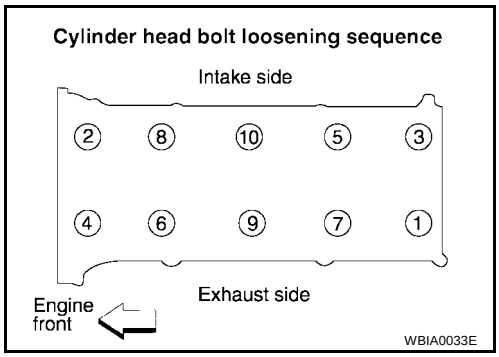
WBIA0225E

1. Ignition coil
2. Spark plug
3. Oil filler cap
4. PCV valve
5. Rocker cover
6. Rocker cover gasket
7. O-ring
8. Valve collet
9. Valve spring retainer
10. Valve spring
11. Valve oil seal
12. Valve guide
13. Spark plug tube
14. Cylinder head bolt
15. Cylinder head gasket

16. Valve seat (EXH)
17. Valve (EXH)
18. Valve (INT)
19. Valve seat (INT)
20. Cylinder head

REMOVAL

1. Release fuel pressure. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Remove the strut tower brace.
3. Drain engine coolant and engine oil. Refer to MA-16, "DRAINING ENGINE COOLANT" , MA-20, "Changing Engine Oil" .
4. Remove the engine undercovers.
5. Remove the timing chain. Refer to EM-134, "Removal and Installation" .
6. Remove the camshafts. Refer to EM-123, "CAMSHAFT" .
7. Remove the exhaust manifold. Refer to EM-110, "REMOVAL" .
8. Support the engine with suitable hoist and floor jack.
9. Remove cylinder head loosening bolts in the numerical order as shown.
10. If necessary to transfer to new cylinder head or remove for reconditioning, remove the intake manifold collector, intake manifold, and fuel tube assembly. Refer to EM-105, "Removal and Installation" .



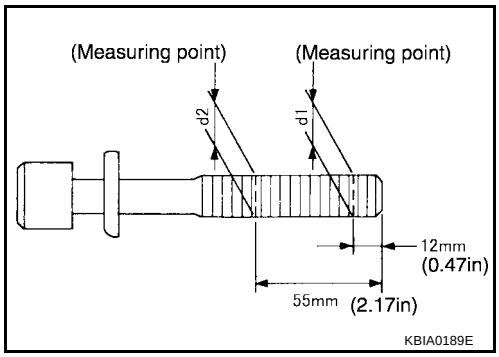
INSPECTION AFTER REMOVAL

Outer Diameter of Cylinder Head Bolts

- Cylinder head bolts are tightened by plastic zone tightening method. Whenever the size difference between d1 and d2 exceeds the limit, replace the bolts with new ones.

  Limit (d1 - d2) : 0.23 mm (0.0091 in) or less

- If reduction of outer diameter appears in a position other than d2, use it as d2 point.



INSTALLATION

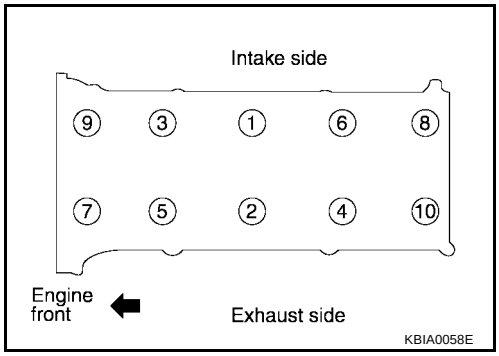
1. Install a new cylinder head gasket.
2. Follow the steps below to tighten the cylinder head bolts in the numerical order as shown.

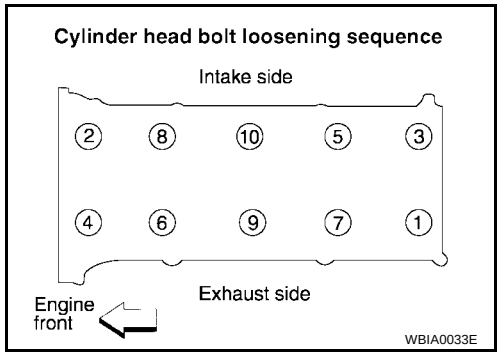
CAUTION:

- **If cylinder head bolts are re-used, check their outer diameters before installation. Refer to EM-148, "Outer Diameter of Cylinder Head Bolts" .**
- Apply new engine oil to the threads and the seating surfaces of mounting bolts.

Cylinder head bolts

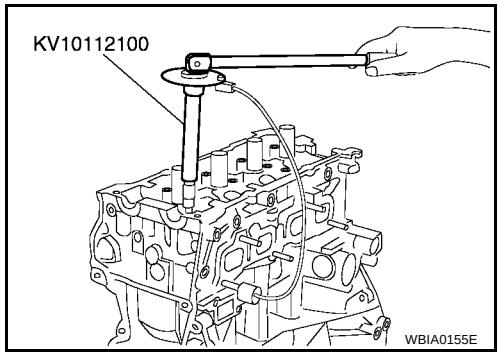
Step 1	**: 98.1 N·m (10 kg-m, 72 ft-lb)**
Step 2	**: 0 N·m (0 kg-m, 0 ft-lb) (loosen)**
Step 3	**: 34.3 - 44.1 N·m (3.5 - 4.4 kg-m, 26 - 32 ft-lb)**
Step 4	**: 75° - 80° (target: 75°) clockwise**
Phase 5	**: 75° - 80° (target: 75°) clockwise**





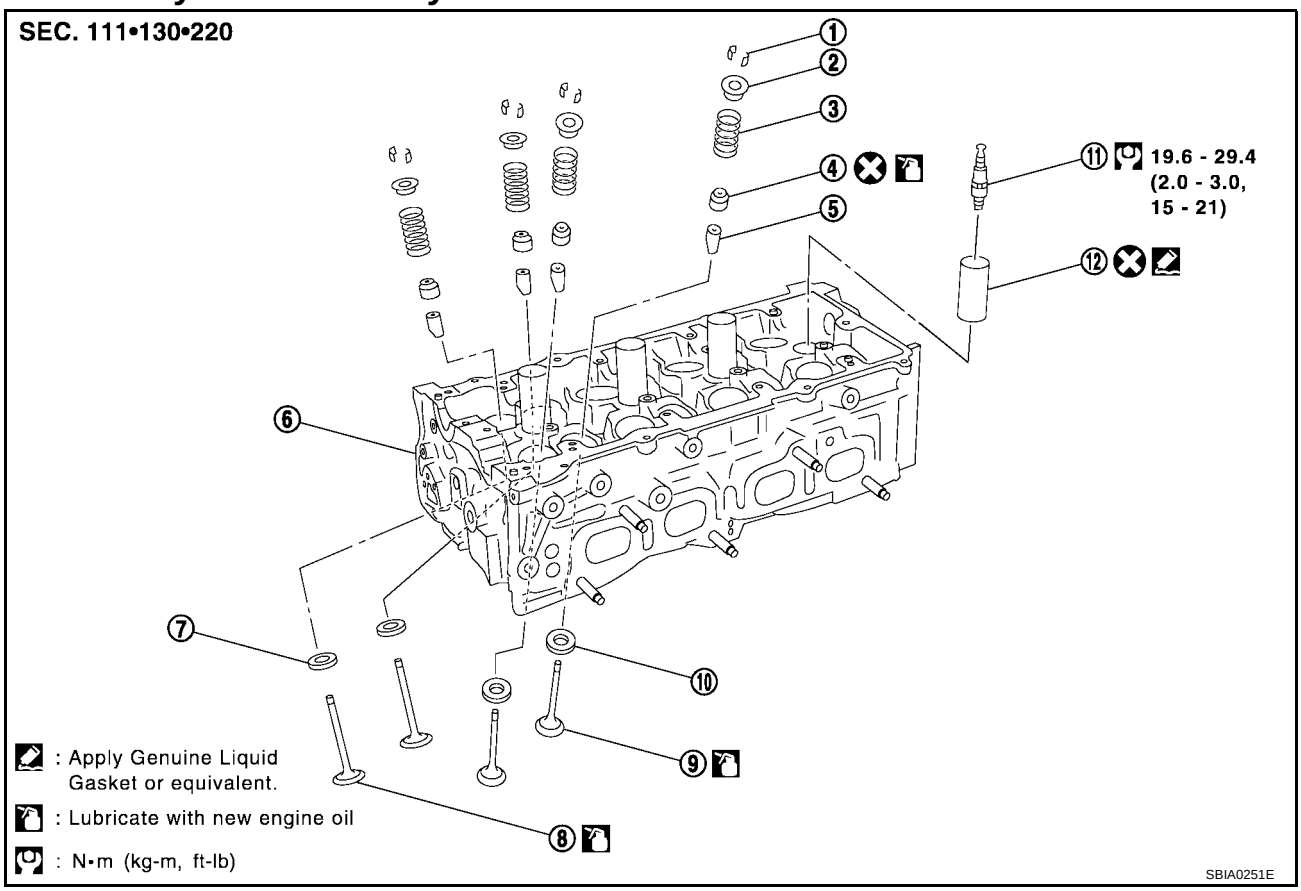
CAUTION:
Check and confirm the tightening angle by using an angle wrench or protractor. Avoid judgement by visual inspection without the tool.

3. Installation of the remaining components is in reverse order of removal.



Disassembly and Assembly

EBS00CG4



1. Valve collet
2. Valve spring retainer
3. Valve spring (with valve spring seat)
4. Valve oil seal
5. Valve guide
6. Cylinder head
7. Valve seat (INT)
8. Valve (INT)
9. Valve (EXH)
10. Valve seat (EXH)
11. Spark plug
12. Spark plug tube

CAUTION:

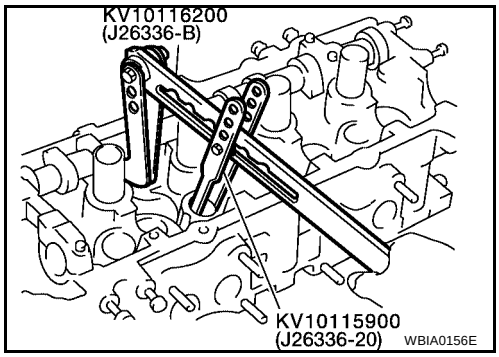
- **When installing camshafts, chain tensioners, oil seals or other sliding parts, lubricate contacting surfaces with new engine oil.**
- **Apply new engine oil to threads and seat surfaces when installing the cylinder head, camshaft sprocket, crankshaft pulley and camshaft bracket.**
- **Attach tags to valve lifters so all parts are assembled in their original position.**

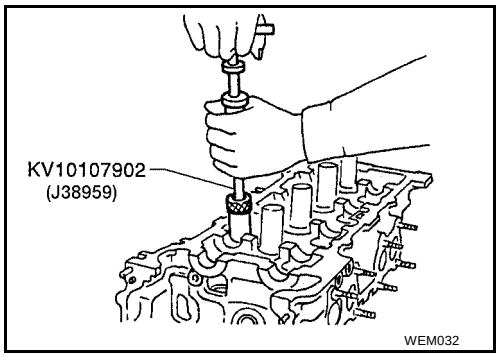
DISASSEMBLY

1. Remove the valve lifter.
   - Note installation point.
2. Remove the valve collet.
   - Compress valve spring with valve spring compressor. Remove valve collet with magnet driver.
3. Remove valve spring retainer and valve spring.

   CAUTION:
   Do not remove valve spring seat from valve spring.
4. Push valve stem to combustion chamber side, and remove valve.
   - Inspect valve guide clearance before removal. Refer to EM-152, "VALVE GUIDE CLEARANCE" .
   - Note installation point.
5. Remove valve oil seal with valve oil seal puller.
6. When valve seat must be replaced, refer to EM-153, "VALVE SEAT REPLACEMENT" .
7. When valve guide must be replaced, refer to EM-152, "VALVE GUIDE REPLACEMENT" .
8. Remove spark plug with spark plug wrench.
9. Remove spark plug tube, if necessary using pliers.

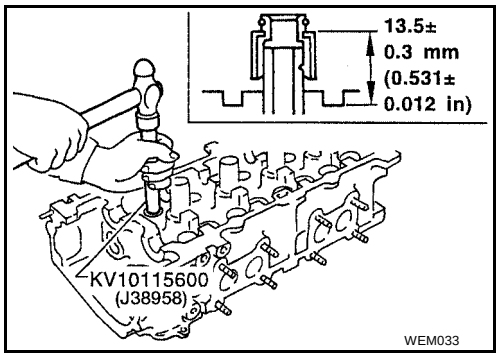
   CAUTION:
   - **Be careful not to damage cylinder head.**
   - **Do not remove spark plug tube if not necessary. Once removed, the spark plug tube cannot be reused because of deformation.**



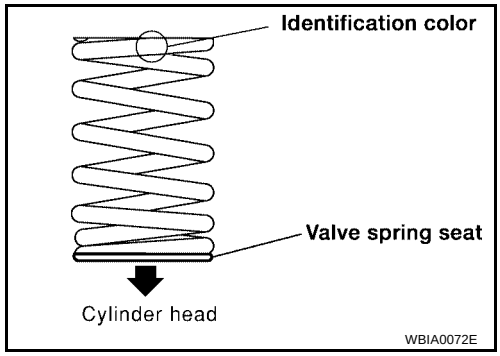


ASSEMBLY

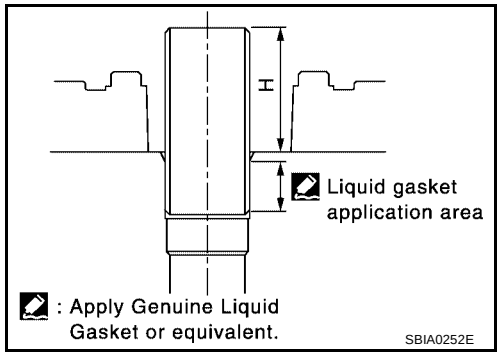
1. Install valve guide. Refer to EM-152, "VALVE GUIDE REPLACEMENT" .
2. Install valve seat. Refer to EM-153, "VALVE SEAT REPLACEMENT" .
3. Install valve oil seal.
   - Install with valve oil seal drift to match dimension in illustration.
4. Install valve.
   - Install larger diameter to intake side.



5. Install valve spring.
   - Install smaller pitch (valve spring seat side) to cylinder head side.
   - Note the identification color of the valve spring:
     Intake: blue
     Exhaust: yellow
6. Install valve spring retainer.
7. Install valve collet.
   - Compress valve spring with valve spring compressor. Install valve collet with magnet wand.
   - Tap stem edge lightly with plastic hammer after installation to check its installed condition.
8. Install valve lifter.
9. Install spark plug tube.



a. Remove old liquid gasket from cylinder head side mounting hole.
b. Apply liquid gasket all around on spark plug tube with a 12 mm (0.47 in) width from edge of spark plug tube on the press fit side.
   - Use Genuine Anaerobic Liquid Gasket or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .
c. Press fit spark plug tube so that height is to "H" as shown.



Press fit height "H" standard value : 38.55 - 38.65 mm (1.518 - 1.522 in)

CAUTION:
- **When press fitting be careful not to deform spark plug tube.**
- **After press fitting, wipe off any protruding liquid gasket on top surface of cylinder head.**

10. Install spark plug.

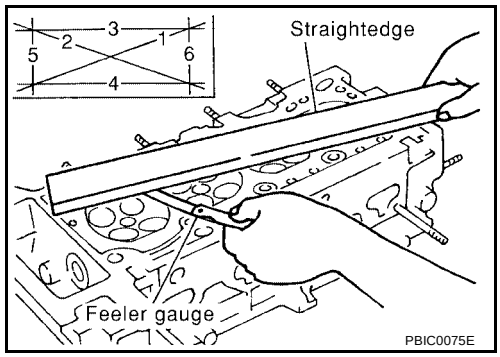
Inspection After Disassembly

EBS00CG5

CYLINDER HEAD DISTORTION

1. Wipe off oil and remove water scale deposits, old gasket, old sealer, and carbon with a scraper.

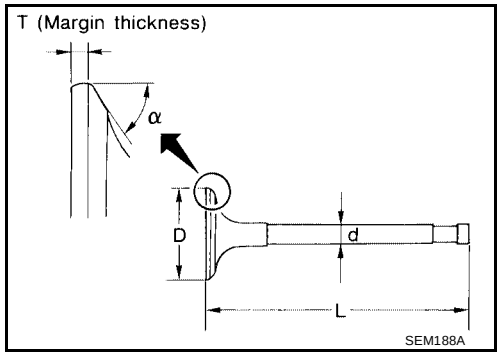
   CAUTION:
   Use care not to allow gasket debris to enter passages for oil or water.
2. At each of several locations on bottom surface of cylinder head, measure distortion in six directions.



Standard : 0.1 mm (0.004 in) or less

VALVE DIMENSIONS

Check dimensions of each valve. Refer to EM-187, "VALVE" .



VALVE GUIDE CLEARANCE

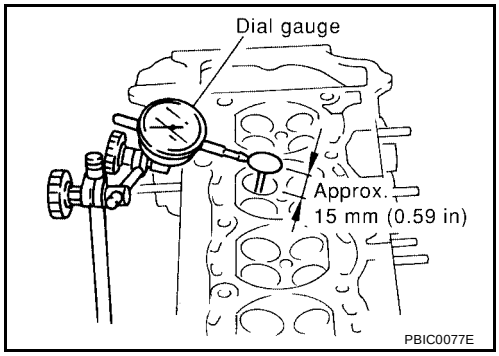
Perform this inspection before removing the valve guide.

1. Make sure that the valve stem diameter is within the specification.
2. Push the valve out by approximately 15 mm (0.59 in) toward the combustion chamber side to measure the valve's run-out volume (in the direction of dial gauge) with dial gauge.
3. Half of the run-out volume accounts for the valve guide clearance.

Valve to guide clearance

Intake : 0.020 - 0.053 mm (0.0008 - 0.0021 in)

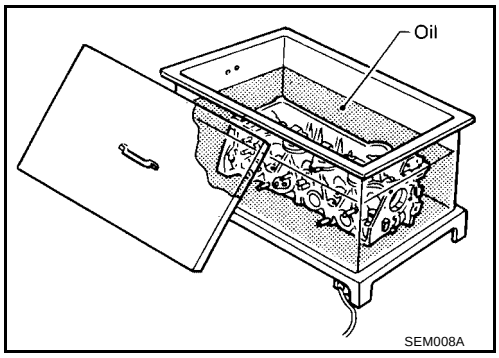
Exhaust : 0.030 - 0.063 mm (0.0012 - 0.0025 in)



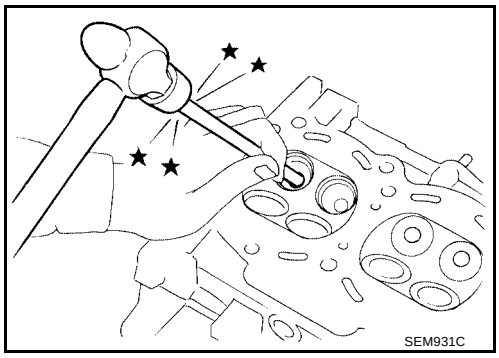
VALVE GUIDE REPLACEMENT

When valve guide is removed, replace with oversized (0.2 mm, 0.008 in) valve guide.

1. To remove valve guide, heat cylinder head to 110° to 130°C (230° to 266°F) by soaking in heated oil.



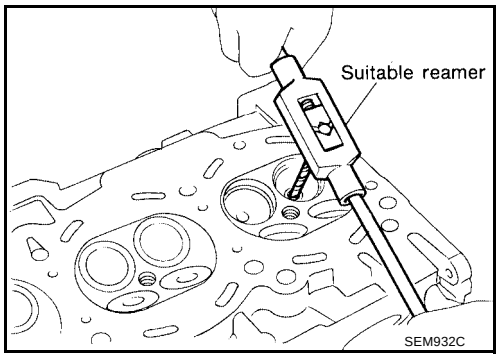
2. Drive out valve guide with a press [under a 20 kN (2.2 ton-force) pressure] or hammer and suitable tool.



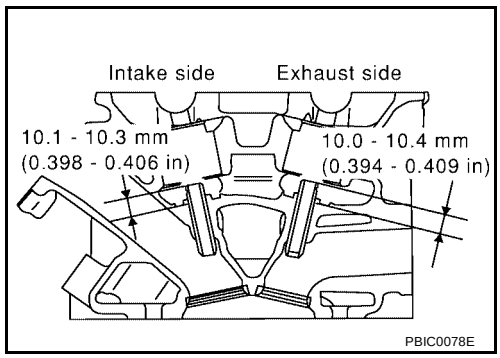
3. Ream cylinder head valve guide hole.

Valve guide hole diameter for intake and exhaust : 10.175 - 10.196 mm (0.4006 - 0.4014 in)

4. Heat cylinder head to 110° to 130°C (230° to 266°F) by soaking in heated oil.

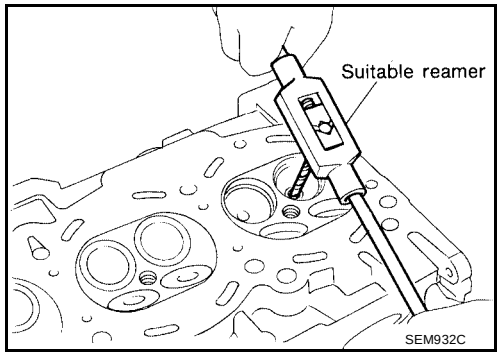


5. Press valve guide from camshaft side to dimensions as in illustration.



6. Using valve guide reamer, apply reamer finish to valve guide.

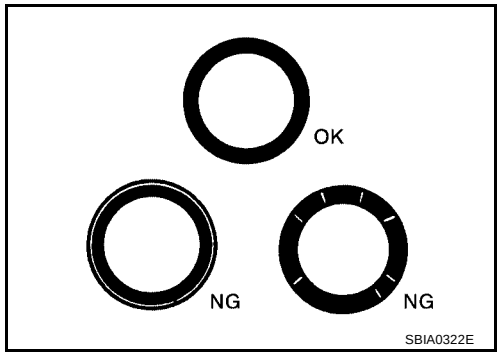
Intake and exhaust : 6.000 - 6.018 mm (0.2362 - 0.2369 in)



VALVE SEAT CONTACT

After confirming that the dimensions of valve guides and valves are within specifications, perform this procedure:

- Apply prussian blue (or white lead) onto contacting surface of valve seat to check the condition of the valve contact on the seat surface.
- Check if the contact area band is continuous all around the circumference.
- If not, grind to adjust valve fitting and check again. If the contacting surface still has NG conditions even after the re-check, replace the valve seat.



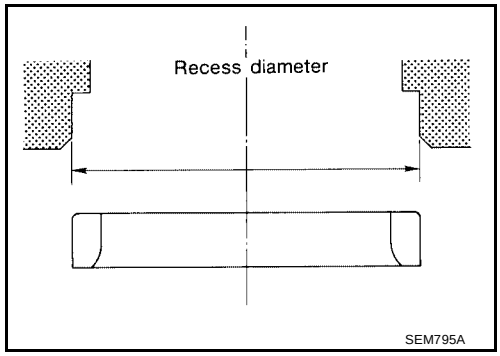
VALVE SEAT REPLACEMENT

When valve seat is removed, replace with an oversized [0.5 mm, (0.020 in)] valve seat.

1. Bore out old seat until it collapses. Boring should not continue beyond the bottom face of the seat recess in the cylinder head. Set the machine depth stop to ensure this.
2. Ream cylinder head recess diameter for service valve seat.

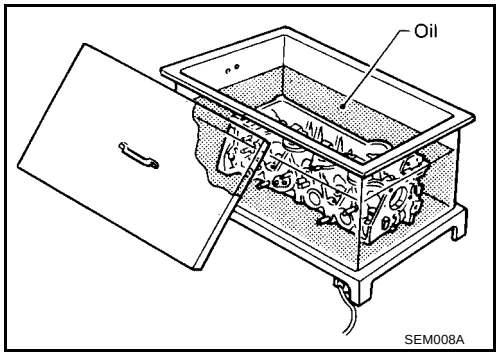
Intake : 37.000 - 37.016 mm (1.4567 - 1.4573 in)
Exhaust : 32.000 - 32.016 mm (1.2598 - 1.2605 in)

- Be sure to ream in circles concentric to the valve guide center. This will enable the valve seat to fit correctly.



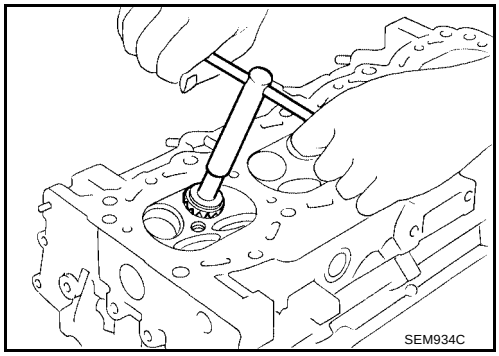
3. Heat cylinder head to 110° to 130°C (230° to 266°F) by soaking in heated oil.
4. Provide valve seats cooled well with dry ice. Force fit valve seat into cylinder head.

CAUTION:
Avoid directly touching the cold valve seats.



5. Using a valve seat cutter set or a valve seat grinder, finish the seat to the specified dimensions.

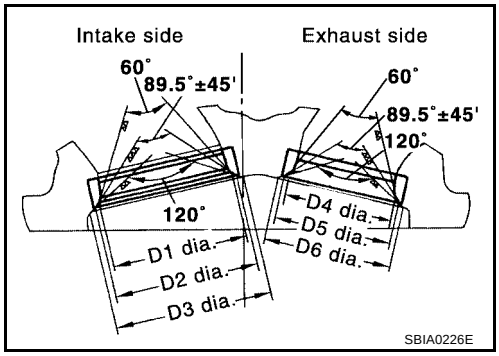
CAUTION:
When using valve seat cutter, firmly grip the cutter handle with both hands. Then, press on the contacting surface all around the circumference to cut in a single drive. Improper pressure on the cutter or cutting many different times may result in a defective valve seat.



Grind to obtain the dimensions indicated as shown.

Standard

D1 dia.	**: 33.5 mm (1.3189 in)**
D2 dia.	**: 35.1 - 35.3 mm (1.382 - 1.390 in)**
D3 dia.	**: 39.0 - 39.2 mm (1.535 - 1.543 in)**
D4 dia.	**: 28 mm (1.10 in)**
D5 dia.	**: 29.9 - 30.1 mm (1.177- 1.185 in)**
D6 dia.	**: 33.5 - 33.7 mm (1.319 - 1.327 in)**

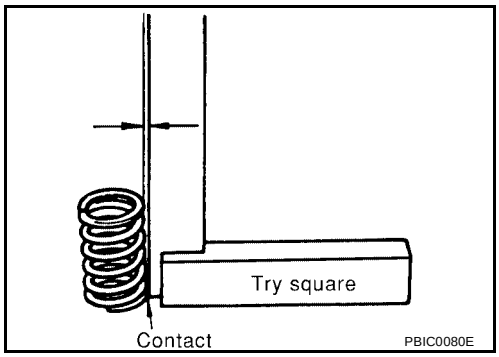


6. Using compound, grind to adjust valve fitting.
7. Check again for normal contact.

VALVE SPRING SQUARENESS

Set try square along the side of the valve spring and rotate the spring. Measure the maximum clearance between the top face of the spring and the try square.

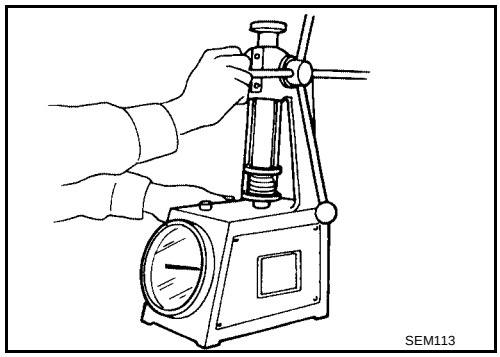
Limit : 1.9 mm (0.0748 in)



VALVE SPRING DIMENSIONS AND VALVE SPRING PRESSURE LOAD

Check valve spring pressure with valve spring seat installed at specified spring height. Replace if not within specifications.

CAUTION:
Do not remove the valve spring seat.



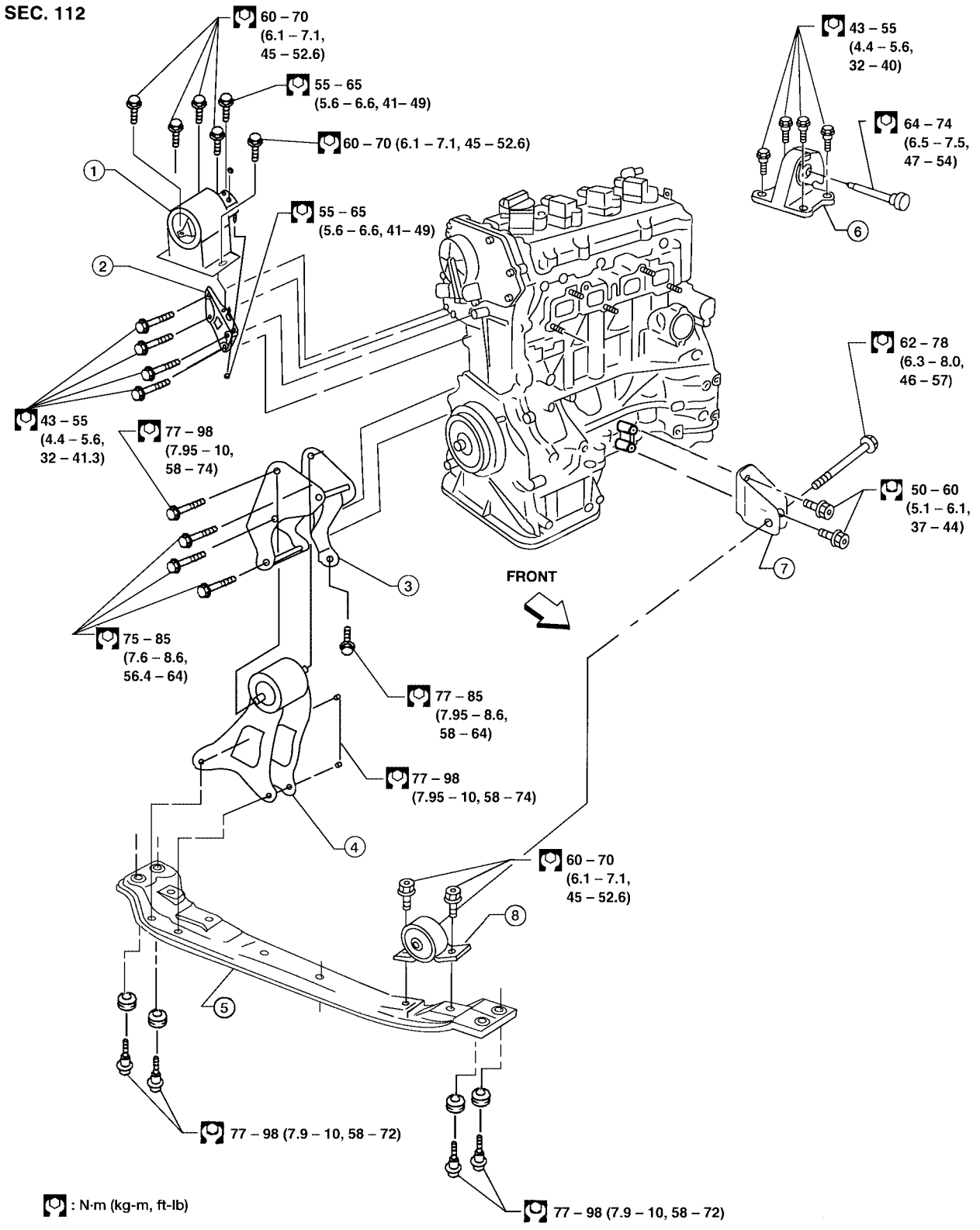
STANDARD	INTAKE (identification color: blue)	EXHAUST (identification color: yellow)
Free height	44.84 - 45.34 mm (1.7654 - 1.7850 in)	45.28 - 45.78 mm (1.7827 - 1.8024 in)
Installation height	35.30 mm (1.390 in)	35.30 mm (1.390 in)
Installation load	151 - 175 N (15.4 - 17.8 kg-force, 34 - 39 lb-force)	151 - 175 N (15.4 - 17.8 kg-force, 34 - 39 lb-force)
Height during valve open	24.94 mm (0.9819 in)	26.39 mm (1.0390 in)
Load with valve open	358 - 408 N (36.5 - 41.6 kg-force, 80 - 92 lb-force)	325 - 371 N (33.1 - 37.8 kg-force, 73 - 83 lb-force)

ENGINE ASSEMBLY

PFP:10001

Removal and Installation

EBS00CG6



1. RH engine mount
2. RH engine mounting bracket
3. Rear engine mounting bracket
4. Rear engine mount
5. Center member
6. LH engine mount
7. Front engine mount
8. Front engine mounting bracket

WARNING:

- **Place chocks at the front and back of the rear wheels.**
- **For engines not equipped with slingers, attach proper slingers and bolts as described in the Parts Catalog.**

CAUTION:

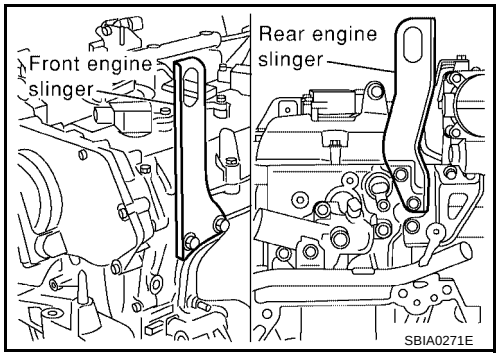
- **Do not start working until the exhaust system and coolant are cool.**
- **If items or work required are not covered by the engine main body section, refer to the applicable sections.**
- **Use the correct supporting points for lifting and jacking. Refer to GI-39, "Lifting Points and Tow Truck Towing" .**
- **In removing the drive shaft, be careful not to damage the grease seals on the transaxle.**
- **Before separating the engine and transaxle, remove the crankshaft position sensor (POS) from the assembly.**
- **Be sure not to damage the edge of the crankshaft position sensor (POS) or the ring gear teeth.**

REMOVAL

1. Release fuel pressure. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Disconnect the fuel rail at the fuel hose quick connector (engine side). Refer to EM-105, "INTAKE MANIFOLD" .
3. Drain the engine oil. Refer to LU-17, "Changing Engine Oil" .
4. Drain the engine coolant. Refer to MA-23, "DRAINING ENGINE COOLANT" .
5. Remove the engine hood assembly. Refer to EI-13, "Removal and Installation" .
6. Remove the battery, battery hold downs, and battery tray. Refer to SC-4, "BATTERY" .
7. Disconnect the MAF sensor electrical connector.
8. Remove the air duct and air cleaner case assembly. Refer to EM-103, "Removal and Installation" .
9. Disconnect the heater hoses.
10. Remove the radiator and radiator fan assembly. Refer to CO-30, "Removal and Installation" .
11. Remove the alternator. Refer to SC-32, "Removal" .
12. Remove the left and right drive shafts. Refer to FAX-14, "Removal" .
13. Remove the engine undercovers.
14. Dismount the A/C compressor with piping connected and secure with wire to the radiator support.
15. Disconnect the transaxle shift control cables, if equipped (A/T only).
16. Disconnect the brake power booster vacuum hose.
17. Disconnect the following engine compartment electrical harness connectors:
    - Heated oxygen sensors
    - Starter assembly
    - Coolant temperature sensor
    - Camshaft position sensor (PHASE)
    - EVAP canister purge volume control solenoid
    - Backup lamp switch
    - Vehicle speed sensor
    - Electric throttle control actuator
    - Ignition coils
    - Fuel injector harness
    - Engine ground straps
    - Intake valve timing control solenoid
    - Transaxle sensors (A/T only)
    - Crankshaft position sensor (POS)
    - Knock sensor
    - Oil pressure switch
    - Swirl control valve

- Power steering pressure switch

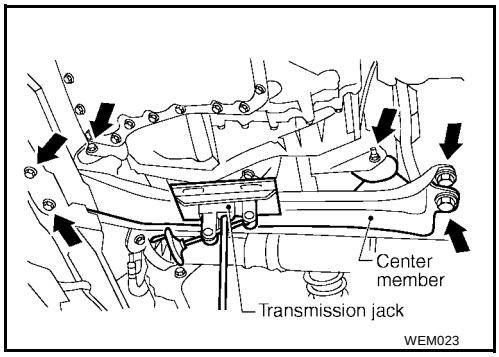
18. Remove clutch operating cylinder from transaxle, and move it aside (M/T models).
19. Remove engine coolant reservoir tank.
20. Remove front exhaust tube. Refer to EX-3, "Removal and Installation" .
21. Dismount the power steering pump with piping connected and position it aside with wire.
22. Install engine slingers into front left cylinder head and rear right cylinder head.
    - Use alternator bracket mounting bolt holes for the front slinger.
    - Use the proper slingers and bolts as described in the Parts Catalog.



Slinger bolts - front : 51.0 - 64.7 N·m (5.2 - 6.5 kg-m, 38 - 47 ft-lb)

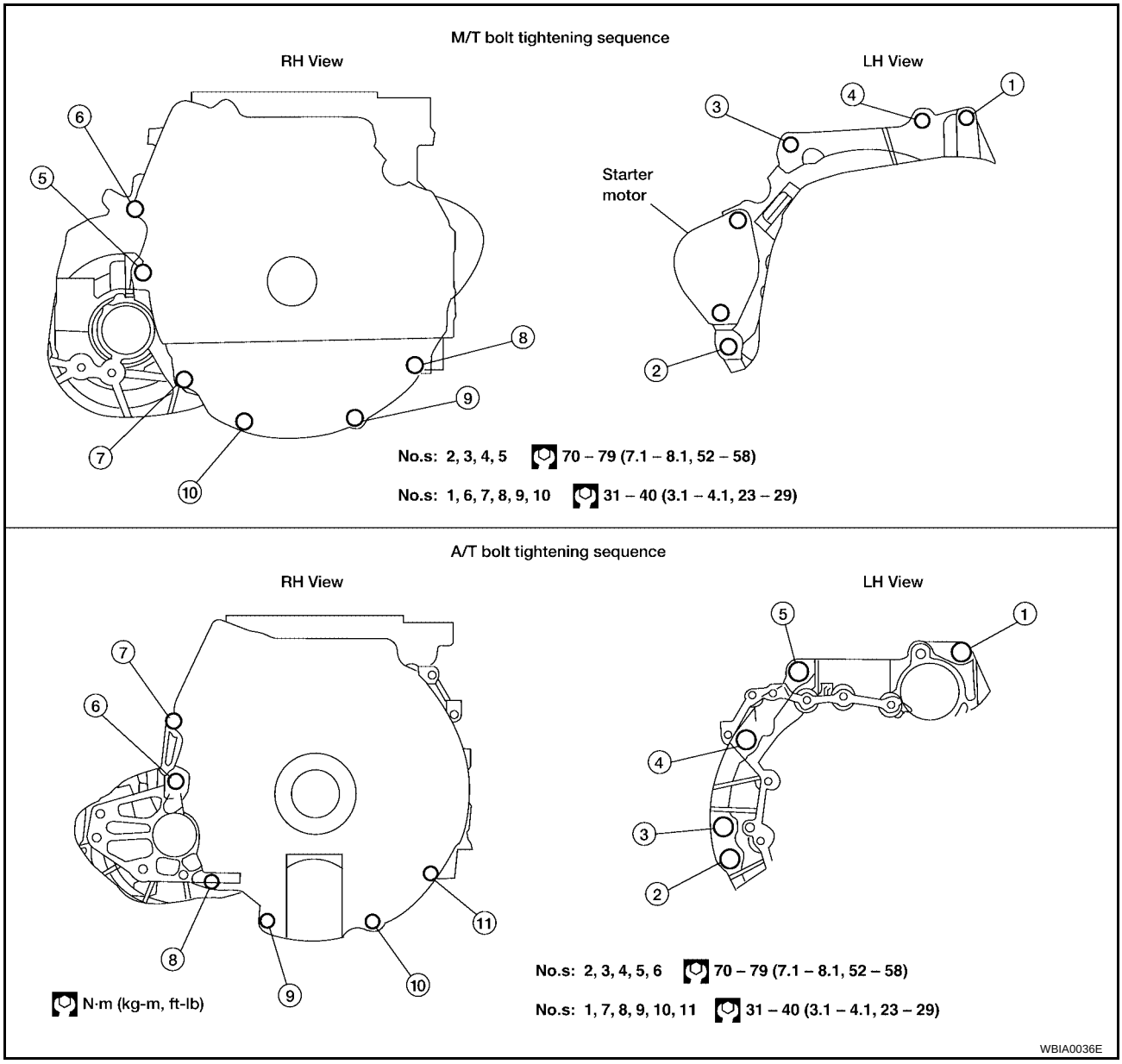
Slinger bolts - rear : 24.5 - 31.4 N·m (2.5 - 3.2 kg-m, 18 - 23 ft-lb)

23. Support the engine/transaxle assembly with engine lifting equipment from the top and a suitable transmission jack under the engine/transaxle assembly, with the vehicle raised on a hoist.
24. Remove the center member.
    - Remove front and rear engine mounting insulator through-bolt and the center member bolts.
25. Remove RH engine mounting insulator.
26. Remove LH transaxle mounting insulator through-bolts.
27. Lower the engine/transaxle assembly from the engine compartment on the platform jack, steady it safely with the lifting equipment.
28. Remove the starter motor. Refer to SC-21, "Removal" .
29. Separate the engine and transaxle.



INSTALLATION

Installation is in the reverse order of removal.



- Do not allow oil to get on mounting insulators. Be careful not to damage mounting insulators.
- If parts have a direction mark (arrow) this indicates front of the vehicle, and the parts must be installed according to the identification mark.

INSPECTION AFTER INSTALLATION

- Before starting engine, check the levels of engine coolant, lubricants, engine oil. If less than required quantity, fill to the specified level.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to make sure there is no leakage of coolant, lubricants, oil, fuel, and exhaust gas.
- Bleed air from passages in pipes and tubes of applicable lines.

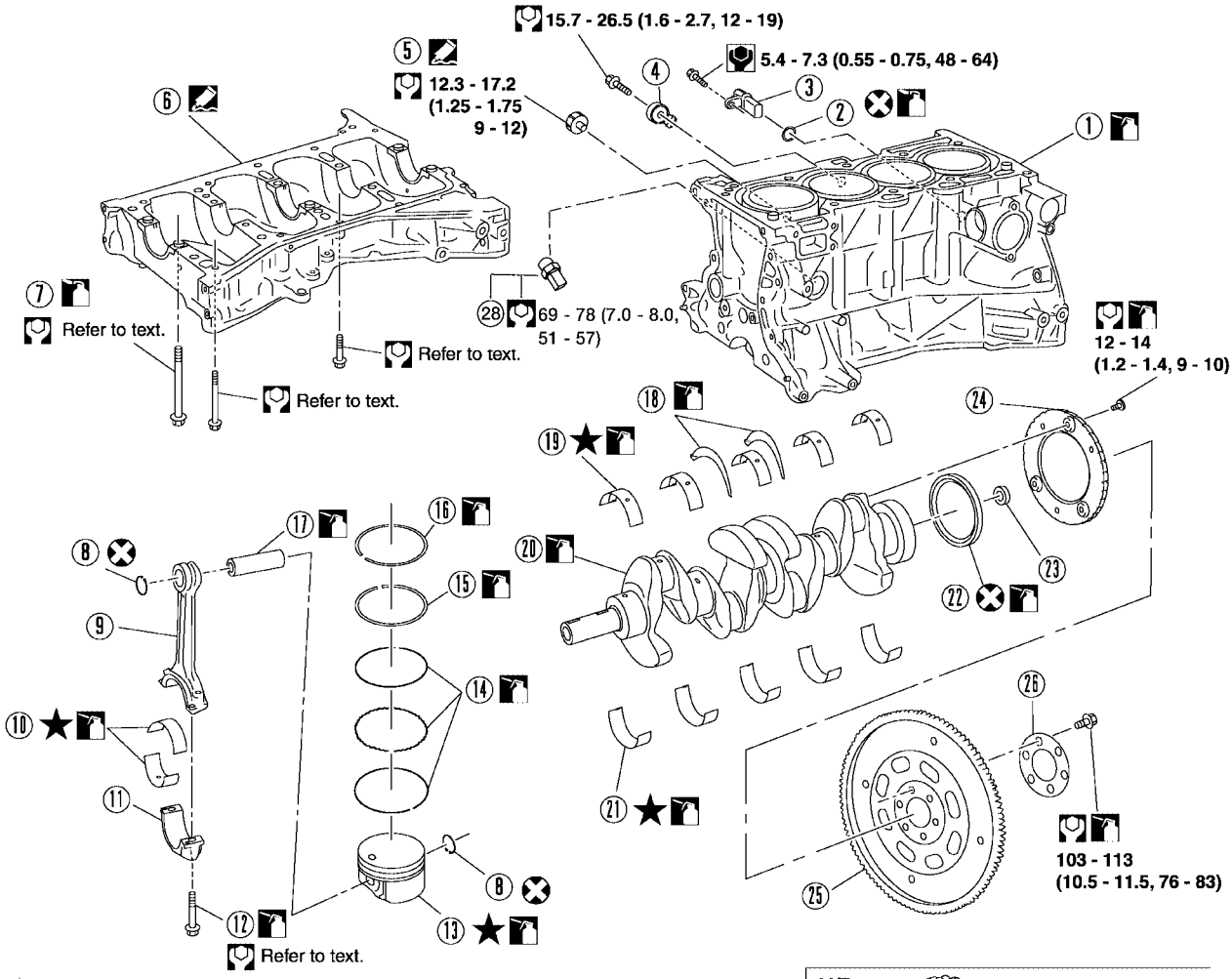
CYLINDER BLOCK

PFP:11010

Disassembly and Assembly

EBS00CG7

SEC.110 • 120 • 221 • 226



★ : Select with proper clearance.
: Apply engine oil.
: Apply Genuine RTV Silicone Sealant or equivalent. Refer to GI Section.
: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)

WBIA0073E

1. Cylinder block
2. O-ring
3. Crankshaft position sensor (POS)
4. Knock sensor
5. Oil pressure switch
6. Lower cylinder block
7. Lower cylinder block bolt
8. Snap ring
9. Connecting rod
10. Connecting rod bearing
11. Connecting rod bearing cap
12. Connecting rod bearing cap bolt
13. Piston
14. Oil ring
15. Second ring
16. Top ring
17. Piston pin
18. Main thrust bearing
19. Main bearing upper
20. Crankshaft
21. Main bearing lower
22. Crankshaft rear oil seal
23. Pilot converter (A/T only)
24. Crankshaft signal plate
25. Drive plate
26. Reinforcement plate
27. Flywheel
28. Cylinder block heater (if equipped)

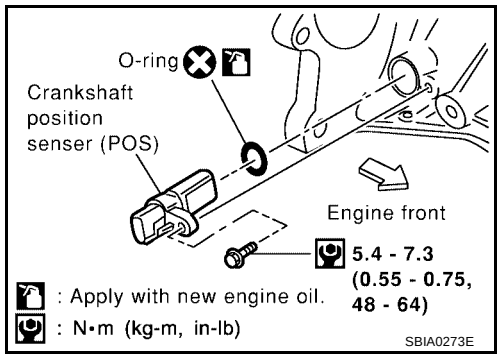
CAUTION:
Apply new engine oil to parts marked in illustration before installation.

DISASSEMBLY

1. Remove the engine and transaxle as an assembly from the vehicle, and separate the transaxle from the engine. Refer to EM-156, "Removal and Installation" .
2. Mount the engine on a suitable engine stand.
3. Drain any remaining engine oil and coolant from the engine.
4. Remove the following components and associated parts.
   - Exhaust manifold and three way catalyst assembly. Refer to EM-110, "Removal and Installation" .
   - Intake manifold collector. Refer to EM-105, "Removal and Installation" .
   - Intake manifold and fuel tube assembly. Refer to EM-105, "Removal and Installation" .
   - Ignition coils. Refer to EM-115, "Removal and Installation" .
   - Rocker cover. Refer to EM-121, "Removal and Installation" .
   - Front cover, timing chain, and balancer unit. Refer to EM-134, "Removal and Installation" .
   - Cylinder head. Refer to EM-147, "Removal and Installation" .
5. Remove the cylinder block heater, if equipped.
6. Remove the knock sensor.

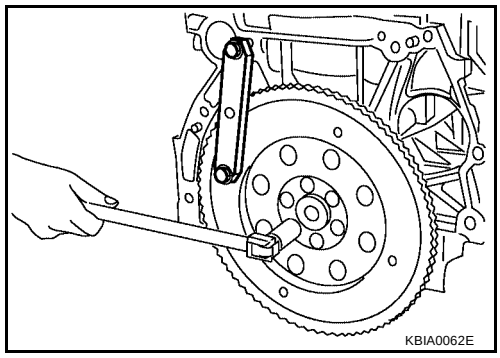
   CAUTION:
   Carefully handle the sensor and do not drop the sensor.
7. Remove crankshaft position sensor (POS).

   CAUTION:
   - **Avoid impacts such as a dropping.**
   - **Do not disassemble.**
   - **Keep it away from metal particles.**
   - **Do not place sensor close to magnetic materials.**



8. Remove the flywheel (M/T models) or drive plate (A/T models). Hold the crankshaft with a stopper plate and remove the mounting bolts using Tool.

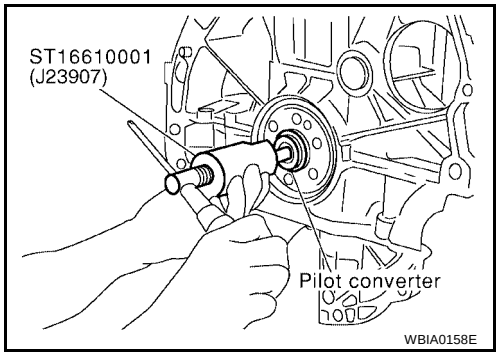
   Tool numbers
   For Flywheel bolt : J-45737
   For Drive plate bolt : J-45816



   CAUTION:
   - **Be careful not to damage the flywheel contact surface for the clutch disc.**

   NOTE:
   - The flywheel two-block construction allows movement in response to transmission side pressure, or when twisted in its rotational direction, therefore, some amount of noise is normal.

9. Remove pilot converter using Tool (A/T models).



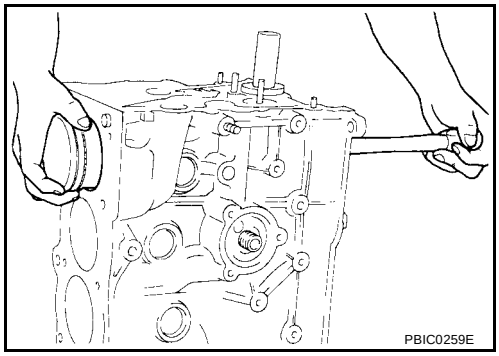
10. Remove the piston and connecting rod assemblies.

a. Position the crankshaft and corresponding connecting rod, to be removed, to the bottom dead center stroke.

b. Remove the connecting rod cap. Number the cap so it can be assembled in the same position.

c. Using a hammer handle or similar tool, push the piston and connecting rod assembly out of the top of the cylinder block. Number the piston and rod so it can be assembled in the same position.

- Before removing the piston and connecting rod assembly, check the connecting rod side clearance. Refer to EM-176, "CONNECTING ROD SIDE CLEARANCE" .



11. Remove the connecting rod bearings. If reusing, number them so they can be assembled in the same position and direction.

CAUTION:

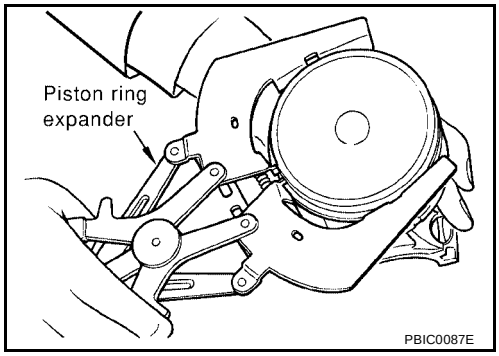
- **When removing them, note the installation position. Keep them in the correct order.**

12. Remove the piston rings from the piston.

- Use a piston ring expander.

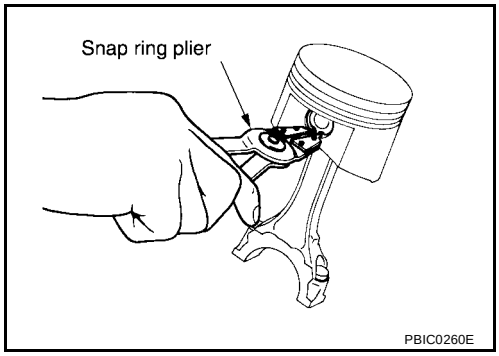
CAUTION:

- **When removing the piston rings, be careful not to damage the piston.**
- **Be careful not to damage piston rings by expanding them excessively, if reusing them.**
- Before removing the piston rings, check the piston ring side clearance. Refer to EM-177, "PISTON RING SIDE CLEARANCE" .

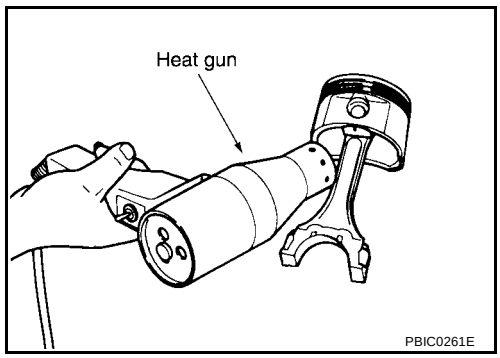


13. Remove the piston from the connecting rod as follows.

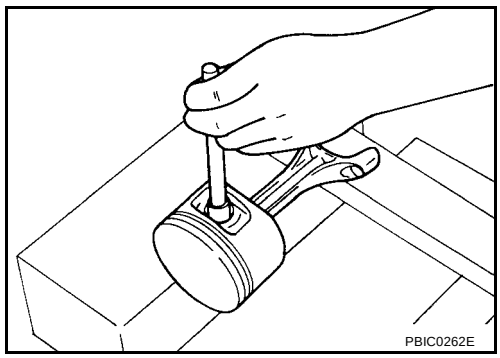
a. Using a snap ring pliers, remove the two snap rings.



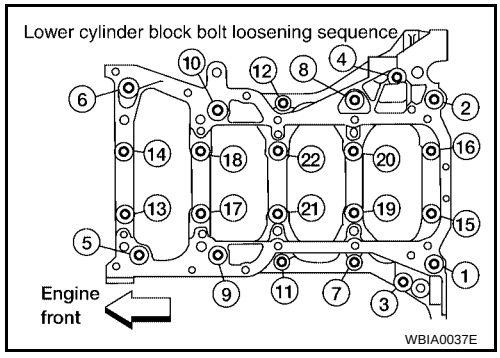
b. Heat the piston to 60° - 70°C (140° - 158°F) with a heat gun, or equivalent.



c. Push out piston pin with a punch of an outer diameter of approximately 19 mm (0.75 in).

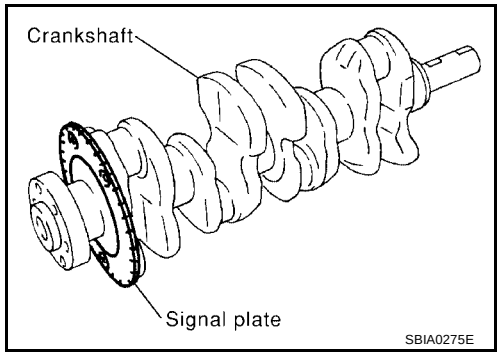


14. Remove the lower cylinder block mounting bolts.
    - Before loosening the lower cylinder block mounting bolts, measure the crankshaft side clearance. Refer to EM-175, "CRANKSHAFT SIDE CLEARANCE" .
    - Loosen them in the order shown to remove them.



15. Remove the lower cylinder block.
    - Using Tool (seal cutter) cut the Silicone RTV Sealant and remove the lower cylinder block from the cylinder block.

    CAUTION:
    Be careful not to damage the mounting surface.



16. Remove the crankshaft.

    CAUTION:
    - **Do not damage or deform the signal plate while mounted on the crankshaft.**
    - **When setting the crankshaft on a flat surface, use a block of wood to avoid interference between the signal plate and the surface.**
    - **Do not remove signal plate unless it is necessary.**

17. Pull the rear oil seal out of the rear end of the crankshaft.

    CAUTION:
    Do not to damage the crankshaft or cylinder block when removing the rear oil seal.

NOTE:
When replacing the rear oil seal without removing the cylinder block, use a screwdriver to pull it out from between crankshaft and block.

18. Remove the main bearings and thrust bearings from the cylinder block and lower cylinder block.

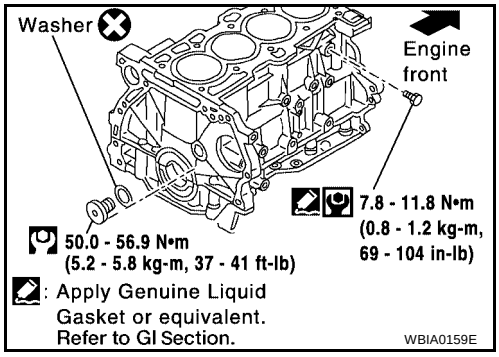
CAUTION:
Identify and number the bearings, if reusing them, so that they are assembled in the same position and direction.

ASSEMBLY

1. Using compressed air, clean out the coolant and oil passages in the cylinder block, the cylinder bore and the crankcase to remove any foreign material.

CAUTION:
Use approved safety glasses to protect your eyes.

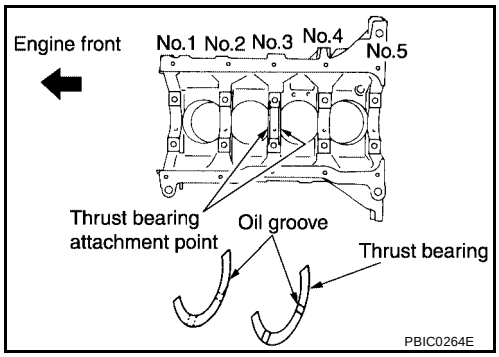
2. Install the drain plugs on the cylinder block.
   - Apply Silicone RTV Sealant.
     Use Genuine Silicone RTV Sealant, or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .
   - Replace the copper washers with new ones.



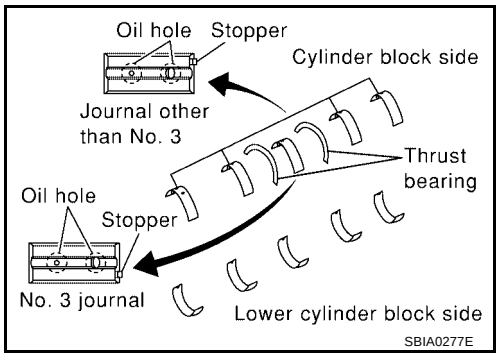
3. Install the main bearings and the thrust bearings.

a. Remove dust, dirt, and oil from the bearing mating surfaces of the cylinder block and lower cylinder block.

b. Install the thrust bearings to both sides of the No. 3 main bearing journal on the cylinder block.
   - Install the thrust bearings with the oil groove facing the crankshaft arm (outside).

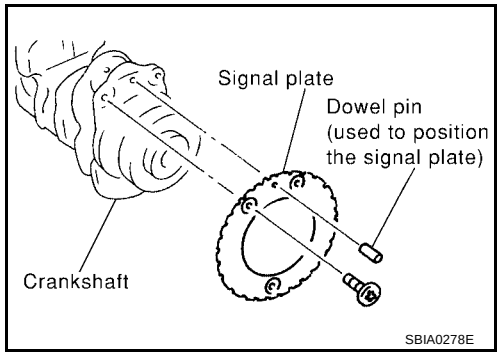


c. Install the main bearings paying attention to their position and direction.
   - The main bearing with an oil hole and groove goes on the cylinder block. The one without them goes on the lower cylinder block.
   - Only the main bearing (on the cylinder block) for No. 3 journal has different specifications.
   - Before installing the bearings, apply engine oil to the bearing friction surface (inside). Do not apply oil to the back surface, but thoroughly clean it.
   - When installing, align the bearing stopper to the notch.
   - Make sure that the oil holes on the cylinder block and those on the corresponding bearing are aligned.



4. Install the signal plate to the crankshaft.

Signal plate bolts : 12 - 14 N·m (1.22 - 1.43 kg-m, 9 - 10 ft-lb)



a. Position the crankshaft and signal plate using a positioning dowel pin, and tighten the mounting bolts to specification.

b. Remove the dowel pin.

CAUTION:
Be sure to remove dowel pin before installing the crankshaft.

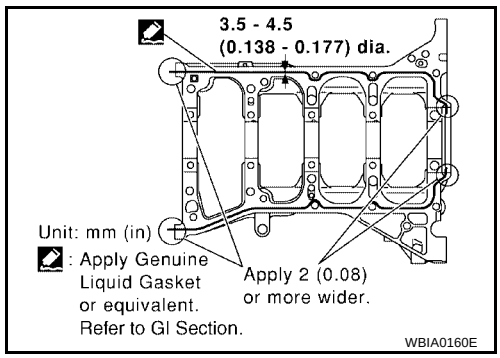
NOTE:
Dowel pins for the crankshaft and signal plate are supplied as a set for each.

5. Install the crankshaft onto the cylinder block.
   - While turning the crankshaft by hand, check that it turns smoothly.

6. Install the lower cylinder block.
   - Apply Silicone RTV Sealant to positions shown in the figure.

NOTE:
Cylinder block and lower cylinder block are machined together. Neither of them can be replaced separately.

CAUTION:
After the Silicone RTV Sealant is applied, the lower cylinder block installation must be finished within 5 minutes.



7. Tighten lower cylinder block mounting bolts in the numerical order shown and according to the following steps:

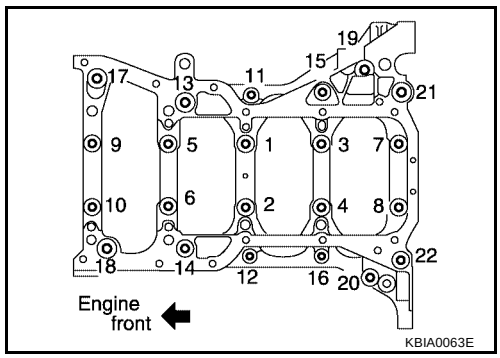
NOTE:
Apply new engine oil to threads and seat surfaces of the mounting bolts.

Lower cylinder block mounting bolts

Step 1 (bolts 11 - 22) : 22.6 - 27.5 N·m (2.3 - 2.8 kg-m, 17 - 20 ft-lb)

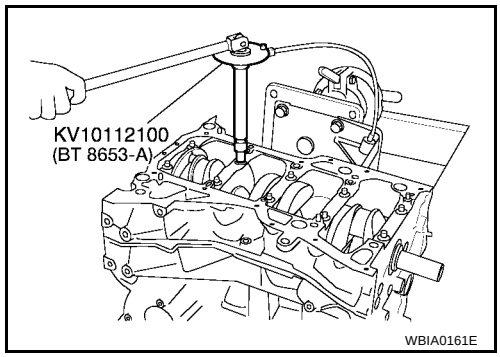
Step 2 (bolts 1 - 10) : 36.3 - 42.2 N·m (3.7 - 4.3 kg-m, 27 - 31 ft-lb)

Step 3 (bolts 1 - 10) : 60° - 65° (target: 60°)



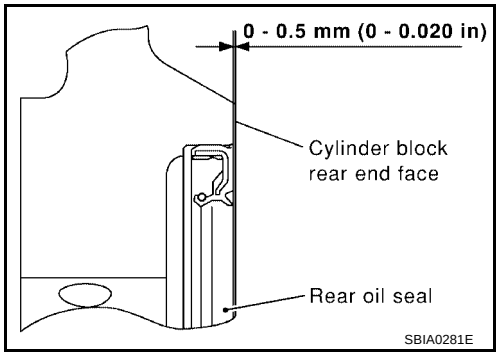
CAUTION:
Use an angle wrench (special service tool) or protractor to check tightening angle. Do not tighten by visual inspection.

- Wipe off completely any protruding Silicone RTV Sealant on the exterior of engine.
- Check crankshaft side clearance. Refer to EM-175, "CRANKSHAFT SIDE CLEARANCE" .
- After installing the mounting bolts, make sure that the crankshaft can be rotated smoothly by hand.

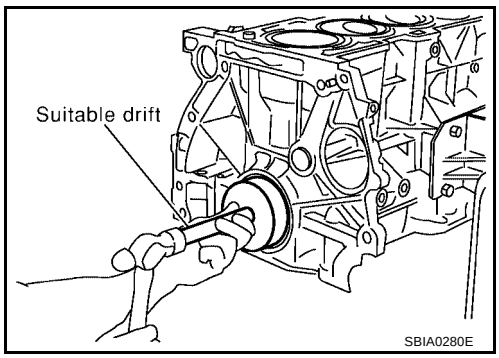


8. Install the rear oil seal.

- Press in rear oil seal to the position shown in the figure.



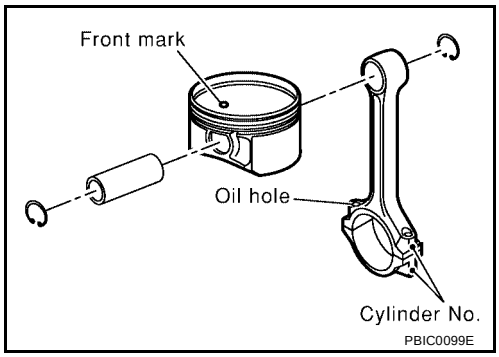
- Press the oil seal between cylinder block and crankshaft with a suitable drift.
- Be careful not to touch the grease on the oil seal lip.
- Be careful not to cause scratches or burrs when pressing in the rear oil seal.



9. Install the piston to the connecting rod. Assemble the components in their original positions.

a. Using a snap ring pliers, install the snap ring into the grooves of the piston's rear side.
   - Insert the piston pin snap ring fully into groove.

b. Install the piston to the connecting rod.
   - Using a heat gun, heat the piston [approximately 60° - 70° C (140° - 158° F)] until the piston pin can be pushed in by hand without excessive force. From the front to the rear, insert the piston pin into the piston and the connecting rod.
   - Assemble so that the front mark on the piston crown and the oil holes and the cylinder No. on the connecting rod are positioned as shown in the figure.



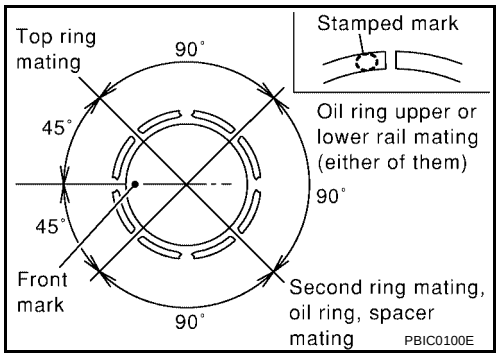
c. Install the piston pin snap ring into the front of the piston.
   - Check that the connecting rod moves smoothly.

10. Using a piston ring expander, install the piston rings. Assemble the components in their original positions.

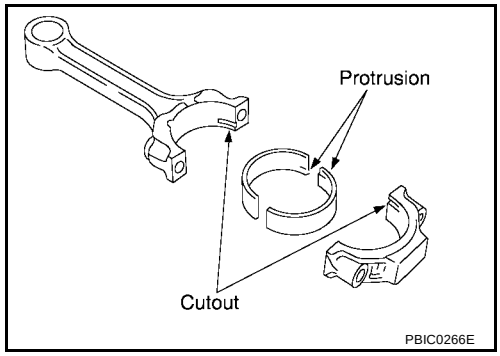
CAUTION:
Be careful not to damage the piston.

- Position each ring with the gap as shown in the figure, referencing the piston front mark as the starting point.
- Install the top ring and the second ring with the stamped surface facing upward.

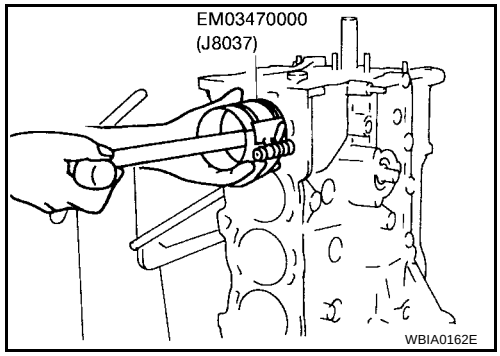
Stamped mark : A (top ring)
: 2A (second ring)



11. Install the connecting rod bearings to the connecting rod and the connecting rod cap. Assemble the components in their original positions.
    - When installing the connecting rod bearings, apply engine oil to the bearing friction surface (inside). Do not apply oil to the back surface, but thoroughly clean the back.
    - When installing, align the connecting rod bearing stopper protrusion with the notch of the connecting rod to install.
    - Check the oil holes on the connecting rod and those on the corresponding bearing are aligned.

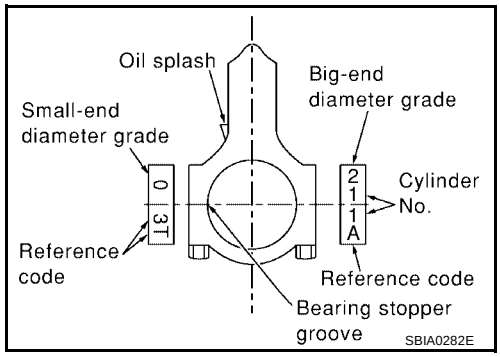


12. Install the piston and connecting rod assembly to the crankshaft. Assemble the components in their original positions.
    - Rotate the crankshaft so the pin corresponding to the connecting rod to be installed is at the bottom dead center position.
    - Apply engine oil sufficiently to the cylinder bore, piston, and crankshaft pin.
    - Match the cylinder position number with the cylinder No. on the connecting rod for installation.
    - Using a piston ring compressor, install the piston with the front mark on the piston crown facing the front of the engine.



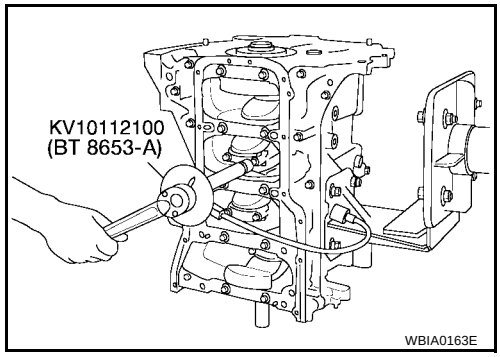
CAUTION:
Be careful not to damage the crankshaft pin, resulting from an interference of the connecting rod big end.

13. Install the connecting rod caps. Assemble the components in their original positions.
    - Match the stamped cylinder number marks on the connecting rod with those on the cap to install.



14. Tighten the connecting rod bolt as follows:
    Apply engine oil to the threads and seats of the connecting rod bolts.

CAUTION:
Always use either an angle wrench or protractor. Avoid tightening based on visual check alone.

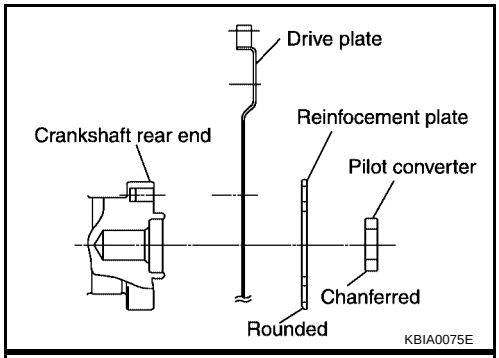


Step 1 : 18.6 - 20.6 N·m (1.9 - 2.1 kg-m, 14 - 15 ft-lb)
Step 2 : 85° - 95° (target 90° degrees)

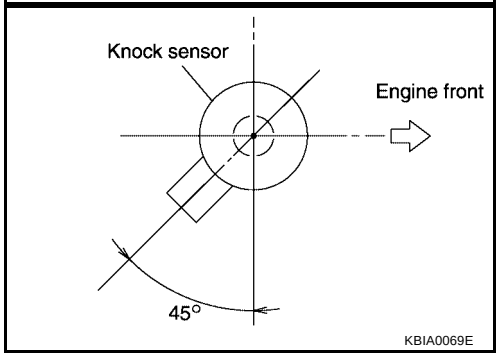
- Check the connecting rod side clearance. Refer to EM-176, "CONNECTING ROD SIDE CLEARANCE".
- After tightening the bolts, make sure that the crankshaft rotates smoothly.

15. Install flywheel (M/T Models), or drive plate (A/T Models).
    - Install drive plate, reinforcement plate and pilot converter as shown in figure.
    - Using a drift with 33 mm (1.30 in) diameter, push pilot converter into the end of the crankshaft.
16. Install the cylinder block heater.

Cylinder block heater : 69 - 78 N·m (7.0 - 8.0 kg-m, 51 - 57 ft-lb)



17. Install the knock sensor.
    - Make sure that there is no foreign material on the cylinder block mating surface and the back surface of the knock sensor.
    - Install the knock sensor with the connector facing lower left by 45° as shown.
    - Do not tighten the mounting bolts while holding the connector.
    - Make sure that the knock sensor does not interfere with other parts.



Knock sensor bolt : 15.7 - 26.5 N·m (1.6 - 2.7 kg-m, 12 - 19 ft-lb)

CAUTION:
If the knock sensor is dropped, replace it with new one.

18. Install the crankshaft position sensor (POS).

Crankshaft position sensor bolt : 5.4 - 7.3 N·m (0.55 - 0.75 kg-m, 48 - 65 in-lb)

19. Installation of remaining components is in the reverse order of removal.

How to Select Piston and Bearing

EBS00CG8

DESCRIPTION

Selection points	Selection parts	Selection items	Selection methods
Between cylinder block to crankshaft	Main bearing	Main bearing grade (bearing thickness)	Determined by match of cylinder block bearing housing grade (inner diameter of housing) and crankshaft journal grade (outer diameter of journal)
Between crankshaft to connecting rod	Connecting rod bearing	Connecting rod bearing grade (bearing thickness)	Combining service grades for connecting rod big end inner diameter and crankshaft pin outer diameter determine connecting rod bearing selection
Between cylinder block to piston	Piston and piston pin assembly (The piston is available together with piston pin as an assembly)	Piston grade (piston outer diameter)	Piston grade = cylinder bore grade (inner diameter of bore)
*Between piston to connecting rod	—	—	—

*For the service parts, the grade for fitting cannot be selected between a piston pin and a connecting rod. (Only 0 grade is available.) The information at the shipment from the plant is described as a reference.

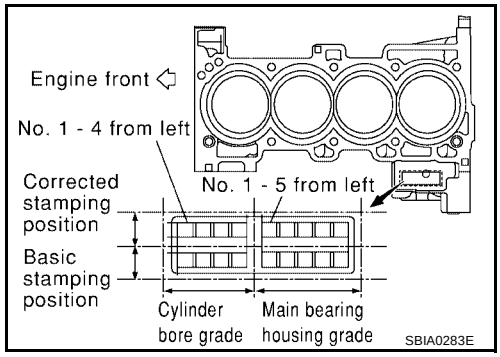
- The identification grade stamped on each part is the grade for the dimension measured in new condition. This grade cannot apply to reused parts.

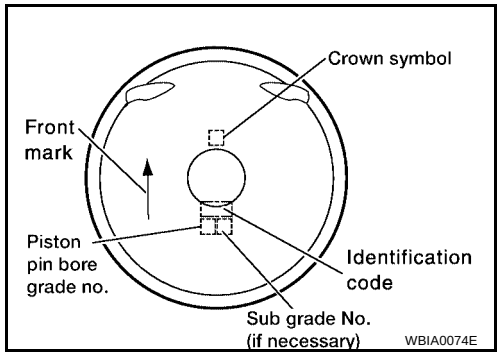
- For reused or repaired parts, measure the dimension accurately. Determine the grade by comparing the measurement with the values of each selection table.
- For details of the measurement method of each part, the reuse standards, and the selection method of the selective fitting parts, refer to the text.

HOW TO SELECT A PISTON

When New Cylinder Block is Used:

- Check the cylinder bore grade on rear left side of cylinder block, and select a piston of the same grade.
- If there is a corrected stamp mark on the cylinder block, use it as a correct reference.





When a Cylinder Block is Reused:

1. Measure the cylinder block bore inner diameter.
2. Determine the bore grade by comparing the measurement with the values under the cylinder bore inner diameter of the "Piston Selection Table". Select the piston of the same grade.

Piston Selection Table

Unit: mm (in)

Grade number (Mark)	1	2 (or no mark)	3
Inner diameter of cylinder bore	89.000-89.010 (3.5039-3.5043)	89.010-89.020 (3.5043-3.5047)	89.020-89.030 (3.5047-3.5051)
Outer diameter of piston	88.980-88.990 (3.5031-3.5035)	88.990-89.000 (3.5035-3.5039)	89.000-89.010 (3.5039-3.5043)

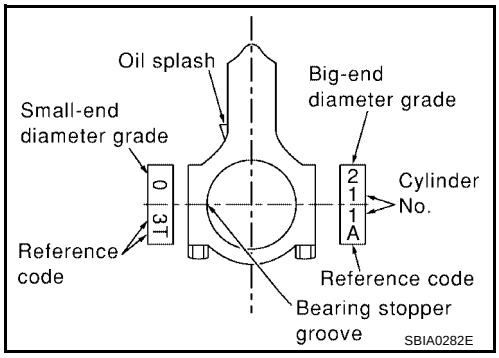
NOTE:

- The piston is available together with piston pin as an assembly.
- The piston pin (piston pin bore) grade is provided only for the parts installed at the plant. For service parts, no grades can be selected. Only 0 grade is available.

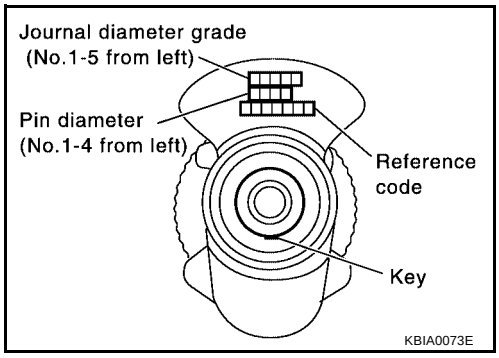
HOW TO SELECT A CONNECTING ROD BEARING

When New Connecting Rod and Crankshaft are Used:

1. Apply big end inside diameter grade stamped on connecting rod side face to the row in the "Connecting Rod Bearing Selection Table".



2. Apply pin diameter grade stamped on crankshaft front side to the column in the "Connecting Rod Bearing Selection Table".
3. Read the symbol at the cross point of selected row and column in the "Connecting Rod Bearing Selection Table".
4. Apply the symbol obtained to connecting rod bearing grade table to select.



When Crankshaft and Connecting Rod are Reused:

1. Measure dimensions of the big end inner diameter of connecting rod and outer diameter of crankshaft pin individually.
2. Apply the dimension measured to the "Connecting Rod Bearing Selection Table" below.

Connecting Rod Bearing Selection Table

Crankshaft pin outer diameter: Mark	Crankshaft pin outer diameter: Outer diameter Unit: mm (in)	Connecting rod big end. inner diameter: Mark: 0	1	2	3	4	5	6	7	8	9	A	B	C
	Inner diameter Unit: mm (in)	48.000 – 48.001 (1.8898 – 1.8898)	48.001 – 48.002 (1.8898 – 1.8898)	48.002 – 48.003 (1.8898 – 1.8899)	48.003 – 48.004 (1.8899 – 1.8899)	48.004 – 48.005 (1.8899 – 1.8900)	48.005 – 48.006 (1.8900 – 1.8900)	48.006 – 48.007 (1.8900 – 1.8900)	48.007 – 48.008 (1.8900 – 1.8901)	48.008 – 48.009 (1.8901 – 1.8901)	48.009 – 48.010 (1.8901 – 1.8902)	48.010 – 48.011 (1.8902 – 1.8902)	48.011 – 48.012 (1.8902 – 1.8902)	48.012 – 48.013 (1.8902 – 1.8903)
A	44.974 – 44.973 (1.7706 – 1.7706)	0	0	0	0	0	0	0	0	1	1	1	1	1
B	44.973 – 44.972 (1.7706 – 1.7705)	0	0	0	0	0	0	0	1	1	1	1	1	1
C	44.972 – 44.971 (1.7705 – 1.7705)	0	0	0	0	0	0	1	1	1	1	1	1	1
D	44.971 – 44.970 (1.7705 – 1.7705)	0	0	0	0	0	1	1	1	1	1	1	1	1
E	44.970 – 44.969 (1.7705 – 1.7704)	0	0	0	0	1	1	1	1	1	1	1	1	2
F	44.969 – 44.968 (1.7704 – 1.7704)	0	0	0	1	1	1	1	1	1	1	1	2	2
G	44.968 – 44.967 (1.7704 – 1.7704)	0	0	1	1	1	1	1	1	1	1	2	2	2
H	44.967 – 44.966 (1.7704 – 1.7703)	0	1	1	1	1	1	1	1	1	2	2	2	2
J	44.966 – 44.965 (1.7703 – 1.7703)	1	1	1	1	1	1	1	1	2	2	2	2	2
K	44.965 – 44.964 (1.7703 – 1.7702)	1	1	1	1	1	1	1	2	2	2	2	2	2
L	44.964 – 44.963 (1.7702 – 1.7702)	1	1	1	1	1	1	2	2	2	2	2	2	2
M	44.963 – 44.962 (1.7702 – 1.7702)	1	1	1	1	1	2	2	2	2	2	2	2	2
N	44.962 – 44.961 (1.7702 – 1.7701)	1	1	1	1	2	2	2	2	2	2	2	2	3
P	44.961 – 44.960 (1.7701 – 1.7701)	1	1	1	2	2	2	2	2	2	2	2	3	3
R	44.960 – 44.959 (1.7701 – 1.7700)	1	1	2	2	2	2	2	2	2	2	3	3	3
S	44.959 – 44.958 (1.7700 – 1.7700)	1	2	2	2	2	2	2	2	2	3	3	3	3
T	44.958 – 44.957 (1.7700 – 1.7700)	2	2	2	2	2	2	2	2	3	3	3	3	3
U	44.957 – 44.956 (1.7700 – 1.7699)	2	2	2	2	2	2	2	3	3	3	3	3	3

KBIA0147E

Connecting Rod Bearing Grade Table

Grade	0	1	2	3
Upper / Lower thickness mm (in)	1.499 / 1.495 (0.0590/0.0589)	1.503 / 1.499 (0.0592 / 0.0590)	1.507 / 1.503 (0.0593 / 0.0592)	1.511 / 1.507 (0.0595 / 0.0593)
Identification color	Black	Brown	Green	Yellow

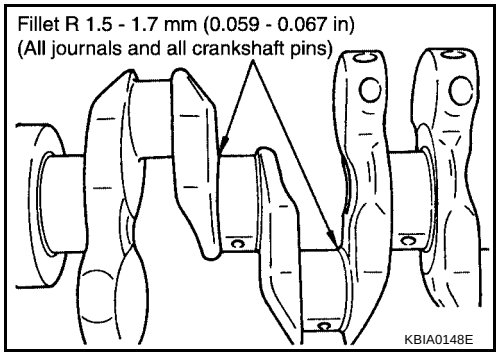
Undersize Bearing Usage Guide

- When the specified oil clearance is not obtained with standard size connecting rod bearing, use undersize (U.S.) bearing.
- When using undersize bearing, measure the bearing inner diameter with bearing installed, and grind the crankshaft pin so that the oil clearance satisfies the standard.

Bearing Undersize Table

Unit: mm (in)

Size U.S.	Thickness
0.25 (0.0098)	1.624 - 1.632 (0.0639 - 0.0643)

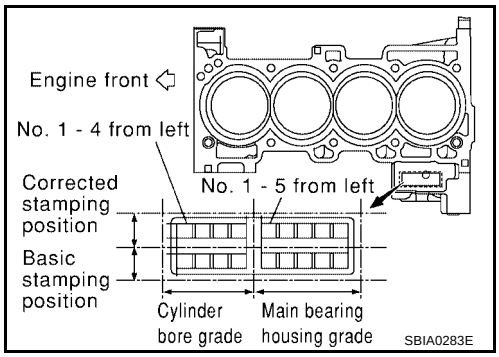


CAUTION:
In grinding the crankshaft pin to use undersize bearings, do not damage the fillet R (All crankshaft pins).

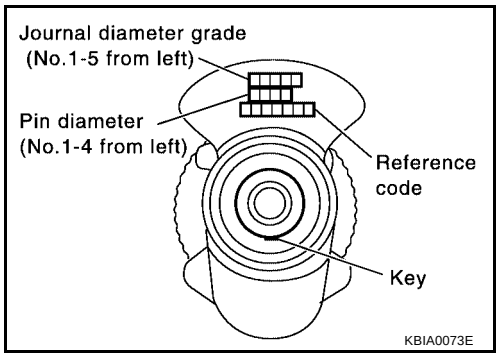
HOW TO SELECT A MAIN BEARING

When New Cylinder Block and Crankshaft are Used:

1. "Main Bearing Selection Table" rows correspond to bearing housing grade on rear left side of cylinder block.
   - If there is a corrected stamp mark on the cylinder block, use it as a correct reference.



2. Apply journal diameter grade stamped on crankshaft front side to column in "Main Bearing Selection Table".



3. Find value at crossing of row and column in "Main Bearing Selection Table".

   CAUTION:
   - **There are two main bearing selection tables. One is for odd-numbered journals (1, 3, and 5) and the other is for even-numbered journals (2 and 4). Make certain to use the appropriate table. This is due to differences in the specified clearances.**

4. Apply the symbol obtained to "Main Bearing Grade Table" to select.

   NOTE:
   - Service parts are available as a set of both upper and lower.

When Cylinder Block and Crankshaft are Reused:

1. Measure inner diameter of cylinder block main bearing housing and outer diameter of crankshaft journal.
2. Apply measurement in above step 1 to the "Main Bearing Selection Table".
3. Follow steps 3 and 4 in “When New Cylinder Block and Crankshaft are Used”.

Main Bearing Selection Table (No.1, 3, and 5 journals)

Cylinder block main bearing housing inner diameter / Crankshaft journal outer diameter	Mark	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7
Mark	Outer diameter Unit: mm (in)	Inner diameter Unit: mm (in)																							
		58.944 – 58.945 (2.3206 – 2.3207)	58.945 – 58.946 (2.3207 – 2.3207)	58.946 – 58.947 (2.3207 – 2.3207)	58.947 – 58.948 (2.3207 – 2.3208)	58.948 – 58.949 (2.3208 – 2.3208)	58.949 – 58.950 (2.3208 – 2.3209)	58.950 – 58.951 (2.3209 – 2.3209)	58.951 – 58.952 (2.3209 – 2.3209)	58.952 – 58.953 (2.3209 – 2.3210)	58.953 – 58.954 (2.3210 – 2.3210)	58.954 – 58.955 (2.3210 – 2.3211)	58.955 – 58.956 (2.3211 – 2.3211)	58.956 – 58.957 (2.3211 – 2.3211)	58.957 – 58.958 (2.3211 – 2.3212)	58.958 – 58.959 (2.3212 – 2.3212)	58.959 – 58.960 (2.3212 – 2.3213)	58.960 – 58.961 (2.3213 – 2.3213)	58.961 – 58.962 (2.3213 – 2.3213)	58.962 – 58.963 (2.3213 – 2.3214)	58.963 – 58.964 (2.3214 – 2.3214)	58.964 – 58.965 (2.3214 – 2.3215)	58.965 – 58.966 (2.3215 – 2.3215)	58.966 – 58.967 (2.3215 – 2.3215)	58.967 – 58.968 (2.3215 – 2.3216)
A	54.979 – 54.978 (2.1645 – 2.1645)	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4
B	54.978 – 54.977 (2.1645 – 2.1644)	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4
C	54.977 – 54.976 (2.1644 – 2.1644)	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4
D	54.976 – 54.975 (2.1644 – 2.1644)	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45
E	54.975 – 54.974 (2.1644 – 2.1643)	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45
F	54.974 – 54.973 (2.1643 – 2.1643)	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45
G	54.973 – 54.972 (2.1643 – 2.1642)	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5
H	54.972 – 54.971 (2.1642 – 2.1642)	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5
J	54.971 – 54.970 (2.1642 – 2.1642)	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5
K	54.970 – 54.969 (2.1642 – 2.1641)	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56
L	54.969 – 54.968 (2.1641 – 2.1641)	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56
M	54.968 – 54.967 (2.1641 – 2.1641)	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56
N	54.967 – 54.966 (2.1641 – 2.1640)	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6
P	54.966 – 54.965 (2.1640 – 2.1640)	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6
R	54.965 – 54.964 (2.1640 – 2.1639)	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6
S	54.964 – 54.963 (2.1639 – 2.1639)	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67
T	54.963 – 54.962 (2.1639 – 2.1639)	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67
U	54.962 – 54.961 (2.1639 – 2.1638)	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67
V	54.961 – 54.960 (2.1638 – 2.1638)	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7
W	54.960 – 54.959 (2.1638 – 2.1637)	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7
X	54.959 – 54.958 (2.1637 – 2.1637)	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7
Y	54.958 – 54.957 (2.1637 – 2.1637)	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7	7
4	54.957 – 54.956 (2.1637 – 2.1636)	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7	7	7
7	54.956 – 54.955 (2.1636 – 2.1636)	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67	7	7	7	7	7	7

WBIA0095E

Main Bearing Selection Table (No.2 and 4 journals)

Cylinder block main bearing housing inner diameter / Crankshaft journal outer diameter	Mark	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	4	7
Mark	Outer diameter Unit: mm (in)	Inner diameter Unit: mm (in)																							
		58.944 – 58.945 (2.3206 – 2.3207)	58.945 – 58.946 (2.3207 – 2.3207)	58.946 – 58.947 (2.3207 – 2.3207)	58.947 – 58.948 (2.3207 – 2.3208)	58.948 – 58.949 (2.3208 – 2.3208)	58.949 – 58.950 (2.3208 – 2.3209)	58.950 – 58.951 (2.3209 – 2.3209)	58.951 – 58.952 (2.3209 – 2.3209)	58.952 – 58.953 (2.3209 – 2.3210)	58.953 – 58.954 (2.3210 – 2.3210)	58.954 – 58.955 (2.3210 – 2.3211)	58.955 – 58.956 (2.3211 – 2.3211)	58.956 – 58.957 (2.3211 – 2.3211)	58.957 – 58.958 (2.3211 – 2.3212)	58.958 – 58.959 (2.3212 – 2.3212)	58.959 – 58.960 (2.3212 – 2.3213)	58.960 – 58.961 (2.3213 – 2.3213)	58.961 – 58.962 (2.3213 – 2.3213)	58.962 – 58.963 (2.3213 – 2.3214)	58.963 – 58.964 (2.3214 – 2.3214)	58.964 – 58.965 (2.3214 – 2.3215)	58.965 – 58.966 (2.3215 – 2.3215)	58.966 – 58.967 (2.3215 – 2.3215)	58.967 – 58.968 (2.3215 – 2.3216)
A	54.979 – 54.978 (2.1645 – 2.1645)	0	0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3
B	54.978 – 54.977 (2.1645 – 2.1644)	0	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3
C	54.977 – 54.976 (2.1644 – 2.1644)	0	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3
D	54.976 – 54.975 (2.1644 – 2.1644)	0	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34
E	54.975 – 54.974 (2.1644 – 2.1643)	0	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34
F	54.974 – 54.973 (2.1643 – 2.1643)	0	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34
G	54.973 – 54.972 (2.1643 – 2.1642)	0	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4
H	54.972 – 54.971 (2.1642 – 2.1642)	0	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4
J	54.971 – 54.970 (2.1642 – 2.1642)	01	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4
K	54.970 – 54.969 (2.1642 – 2.1641)	01	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45
L	54.969 – 54.968 (2.1641 – 2.1641)	01	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45
M	54.968 – 54.967 (2.1641 – 2.1641)	1	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45
N	54.967 – 54.966 (2.1641 – 2.1640)	1	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5
P	54.966 – 54.965 (2.1640 – 2.1640)	1	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5
R	54.965 – 54.964 (2.1640 – 2.1639)	12	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5
S	54.964 – 54.963 (2.1639 – 2.1639)	12	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56
T	54.963 – 54.962 (2.1639 – 2.1639)	12	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56
U	54.962 – 54.961 (2.1639 – 2.1638)	2	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56
V	54.961 – 54.960 (2.1638 – 2.1638)	2	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6
W	54.960 – 54.959 (2.1638 – 2.1637)	2	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6
X	54.959 – 54.958 (2.1637 – 2.1637)	23	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6
Y	54.958 – 54.957 (2.1637 – 2.1637)	23	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67
4	54.957 – 54.956 (2.1637 – 2.1636)	23	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67
7	54.956 – 54.955 (2.1636 – 2.1636)	3	3	3	34	34	34	4	4	4	45	45	45	5	5	5	56	56	56	6	6	6	67	67	67

WBIA0096E

Main Bearing Grade Table (All Journals)

Unit: mm (in)

Grade number	Thickness	Identification color (UPR / LWR)	Remarks
0	1.973 - 1.976 (0.0777 - 0.0778)	Black	Grade and color are the same for upper and lower bearings.
1	1.976 - 1.979 (0.0778 - 0.0779)	Red	
2	1.979 - 1.982 (0.0779- 0.0780)	Green	
3	1.982 - 1.985 (0.0780 - 0.0781)	Yellow	
4	1.985 - 1.988 (0.0781 - 0.0783)	Blue	
5	1.988 - 1.991 (0.0783 - 0.0784)	Pink	
6	1.991 - 1.994 (0.0784 - 0.0785)	Purple	
7	1.994 - 1.997 (0.0785 - 0.0786)	Orange	

01	UPR	1.973 - 1.976 (0.0777 - 0.0778)	Black / Red	Grade and color are different for upper and lower bearings.
	LWR	1.976 - 1.979 (0.0778 - 0.0779)		
12	UPR	1.976 - 1.979 (0.0778 - 0.0779)	Red / Green	
	LWR	1.979 - 1.982 (0.0779 - 0.0780)		
23	UPR	1.979 - 1.982 (0.0779 - 0.0780)	Green / Yellow	
	LWR	1.982 - 1.985 (0.0780 - 0.0781)		
34	UPR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow / Blue	
	LWR	1.985 - 1.988 (0.0781 - 0.0783)		
45	UPR	1.985 - 1.988 (0.0781 - 0.0783)	Blue / Pink	
	LWR	1.988 - 1.991 (0.0783 - 0.0784)		
56	UPR	1.988 - 1.991 (0.0783 - 0.0784)	Pink / Purple	
	LWR	1.991 - 1.994 (0.0784 - 0.0785)		
67	UPR	1.991 - 1.994 (0.0784 - 0.0785)	Purple / Orange	
	LWR	1.994 - 1.997 (0.0785 - 0.0786)		

Use Undersize Bearing Usage Guide

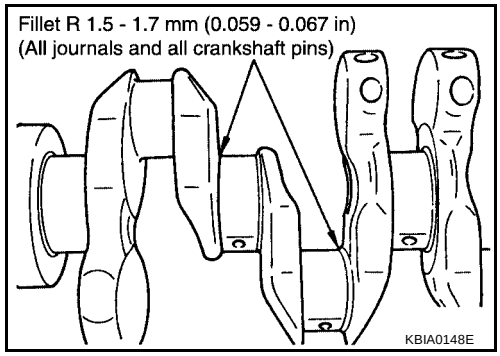
- Use undersize (U.S.) bearing when oil clearance with standard size main bearing is not within specification.
- When using undersize (U.S.) bearing, measure the bearing inner diameter with the bearing installed and grind journal until oil clearance falls within specification.

Bearing Undersize Table

Unit: mm (in)

Size U.S.	Thickness
0.25 (0.0098)	2.106 - 2.114 (0.0829 - 0.0832)

CAUTION:
Do not damage fillet R when grinding crankshaft journal in order to use an undersize bearing (all journals).



Inspection After Disassembly

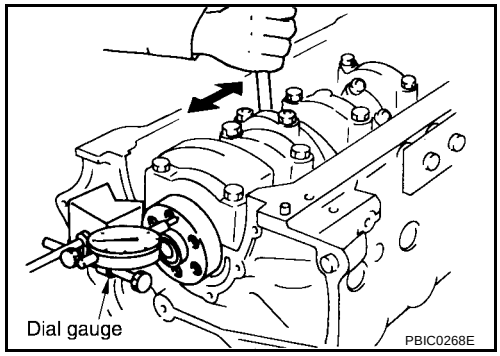
EBS00CG9

CRANKSHAFT SIDE CLEARANCE

- Using a dial gauge, measure the clearance between the thrust bearings and the crankshaft arm when the crankshaft is moved fully forward or backward.

  Standard : 0.10 - 0.26 mm (0.0039 - 0.0102 in)
  Limit : 0.30 mm (0.0118 in)

- If the measured value exceeds the limit, replace the thrust bearings, and measure again. If it still exceeds the limit, replace the crankshaft.

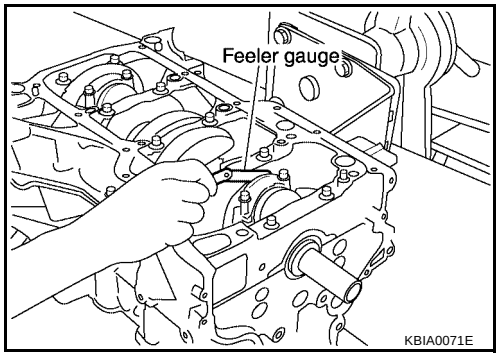


CONNECTING ROD SIDE CLEARANCE

- Measure side clearance between connecting rod and crankshaft arm with feeler gauge.

Standard : 0.20 - 0.35 mm (0.0079 - 0.0138 in)
Limit : 0.50 mm (0.0197 in)

- If the measured value exceeds the limit, replace the connecting rod bearings, and measure again. If it still exceeds the limit, replace the crankshaft also.

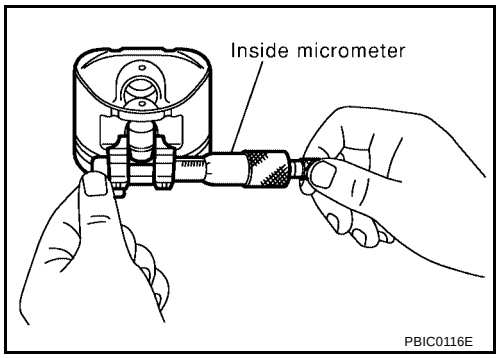


PISTON AND PISTON PIN CLEARANCE

Piston Pin Bore Diameter

- Measure the piston pin bore diameter with an inside micrometer.
- Service parts apply only to grade 0.

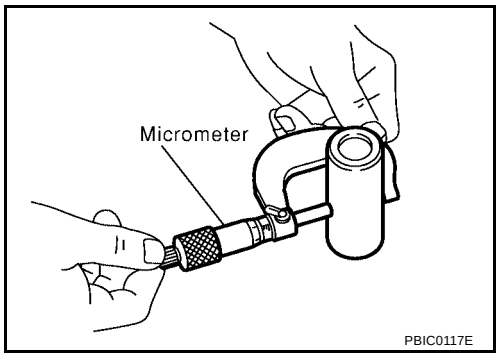
Piston pin bore diameter
Grade No. 0 : 19.993 - 19.999 mm (0.7871 - 0.7874 in)
Grade No. 1 : 19.999 - 20.005 mm (0.7874 - 0.7876 in)



Outer Diameter of Piston Pin

- Measure outer diameter of piston pin with a micrometer.

Piston pin outer diameter
Grade No. 0 : 19.989 - 19.995 mm (0.7870 - 0.7872 in)
Grade No. 1 : 19.995 - 20.001 mm (0.7872 - 0.7874 in)

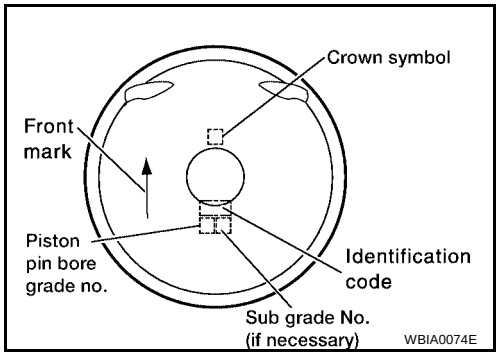


Piston to Piston Pin Clearance

(Piston to piston pin clearance) = (Piston pin bore diameter) – (Outer diameter of piston pin)

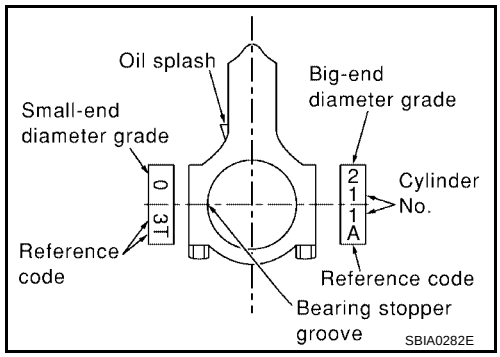
Standard : 0.002 - 0.006 mm (0.0001 - 0.0002 in)

- If clearance exceeds specification, replace either or both of piston/piston pin assembly and connecting rod assembly with reference to specification of each parts.
- Refer to piston selection table to replace piston/piston pin assembly. Refer to EM-169, "HOW TO SELECT A PISTON" .
- Refer to connecting rod bearing selection table to replace connecting rod. Refer to EM-170, "HOW TO SELECT A CONNECTING ROD BEARING" .



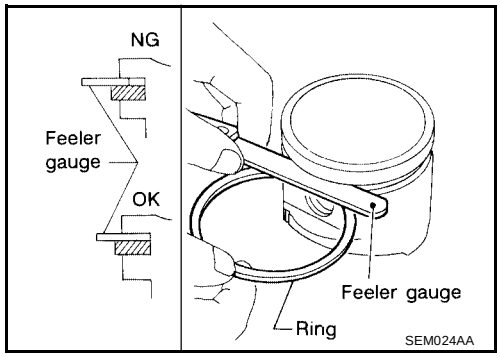
NOTE:

- The connecting rod small end grade and piston pin hole (piston pin) grade are provided only for the parts installed at the plant. For service parts, no grades can be selected. Only 0 grade is available.
- Refer to EM-178, "CONNECTING ROD BUSHING OIL CLEARANCE (SMALL END)" for the values for each grade at the plant.
- Regarding marks on piston head, refer to EM-169, "HOW TO SELECT A PISTON" .



PISTON RING SIDE CLEARANCE

- Measure side clearance of piston ring and piston ring groove with feeler gauge.



Standard

Top ring	**: 0.045 - 0.080 mm (0.0018 - 0.0031 in)**
2nd ring	**: 0.030 - 0.070 mm (0.0012 - 0.0028 in)**
Oil ring	**: 0.065 - 0.135 mm (0.0026 - 0.0053 in)**

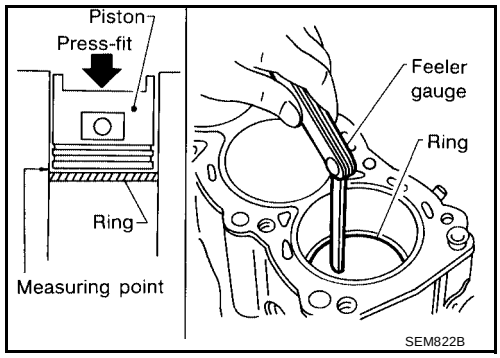
Limit

Top ring	**: 0.11 mm (0.0043 in)**
2nd ring	**: 0.10 mm (0.004 in)**
Oil ring	**: —**

- If out of specification, replace piston and/or piston ring assembly.

PISTON RING END GAP

- Check if inner diameter of cylinder bore is within specification. Refer to EM-180, "PISTON TO CYLINDER BORE CLEARANCE" .
- Insert piston ring until middle of cylinder with piston, and measure gap.



Standard

Top ring	**: 0.21 - 0.31 mm (0.0083 - 0.0122 in)**
2nd ring	**: 0.32 - 0.47 mm (0.0126 - 0.0185 in)**
Oil ring	**: 0.20 - 0.60 mm (0.0079 - 0.0236 in)**

Limit

Top ring	**: 0.54 mm (0.0213 in)**
2nd ring	**: 0.67 mm (0.0264 in)**
Oil ring	**: 0.95 mm (0.0374 in)**

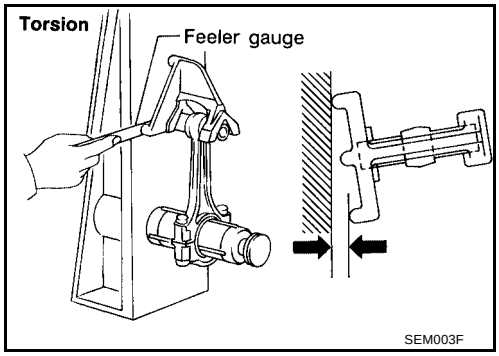
- If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, re-bore cylinder and use oversized piston and piston ring.

CONNECTING ROD BEND AND TORSION

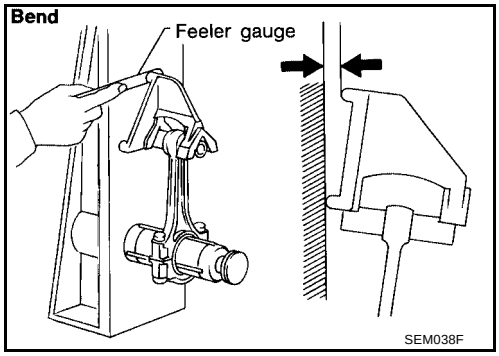
- Check with connecting rod aligner.

Bend limit : 0.15 mm (0.0059 in) per 100 mm (3.94 in) length

Torsion limit : 0.30 mm (0.0118 in) per 100 mm (3.94 in) length



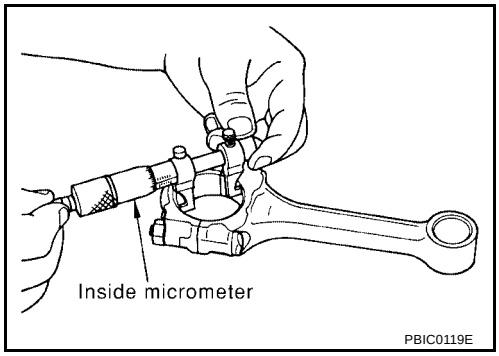
- If it exceeds the limit, replace connecting rod assembly.



CONNECTING ROD BEARING (BIG END)

- Install the connecting rod cap without the connecting rod bearing installed. After tightening the connecting rod bolt to the specified torque, measure the connecting rod big end inner diameter using an inside micrometer.

Standard : 48.000 - 48.013 mm (1.8898 - 1.8903 in)



CONNECTING ROD BUSHING OIL CLEARANCE (SMALL END)

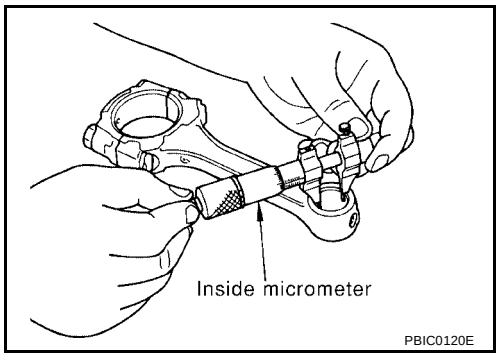
Inner Diameter of Connecting Rod (Small End)

- Measure inner diameter of bushing.

Connecting rod small end inner diameter

Grade No. 0 : 20.000 - 20.006 mm (0.7874 - 0.7876 in)

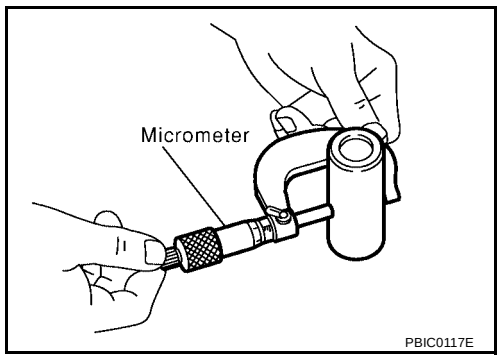
Grade No. 1 : 20.006 - 20.012 mm (0.7876 - 0.7879 in)



Outer Diameter of Piston Pin

- Measure outer diameter of piston pin.

Piston pin outer diameter
Grade No. 0 : 19.989 - 19.995 mm (0.7870 - 0.7872 in)
Grade No. 1 : 19.995 - 20.001 mm (0.7872 - 0.7874 in)

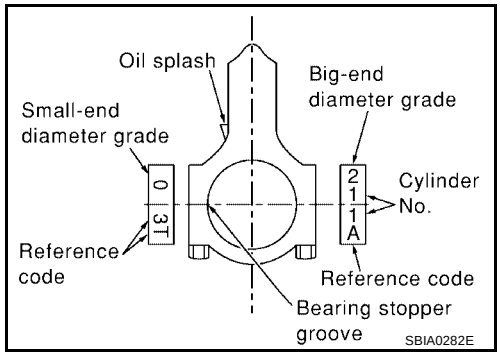


Connecting Rod Oil Clearance (Small End)

(Connecting rod small end oil clearance) = (Inner diameter of connecting rod small end) – (Outer diameter of piston pin)

Standard : 0.005 - 0.017 mm (0.0002 - 0.0007 in)

- If the measured value exceeds the standard, replace the connecting rod assembly and/or piston and piston pin assembly.
- If replacing the piston and piston pin assembly, refer to the "Piston Selection Table" to select the piston corresponding to the applicable bore grade of the cylinder block to be used. Refer to EM-169, "HOW TO SELECT A PISTON" .

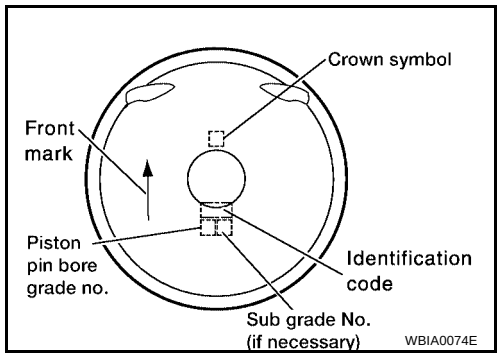


Factory Installed Parts Grading:

- Service parts apply only to grade 0.

Unit: mm (in)

Grade	0	1
Connecting rod small end inner diameter	20.000 - 20.006 (0.7874 - 0.7876)	20.006 - 20.012 (0.7876 - 0.7879)
Piston pin outer diameter	19.989 - 19.995 (0.7870 - 0.7872)	19.995 - 20. 001 (0.7872 - 0.7874)
Piston pin bore diameter	19.993 - 19.999 (0.7871- 0.7874)	19.999 - 20.005 (0.7874 - 0.7876)



CYLINDER BLOCK DISTORTION

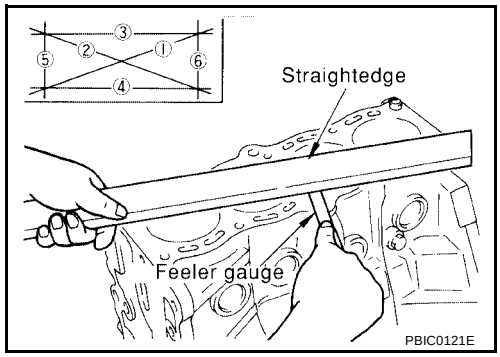
- Using a scraper, remove gasket on the cylinder block surface, and also remove oil, scale, carbon, or other contamination.

CAUTION:
Be careful not to allow gasket debris to enter the oil or coolant passages.

- Measure the distortion on the block upper face at some different points in 6 directions.

Limit : 0.1 mm (0.004 in)

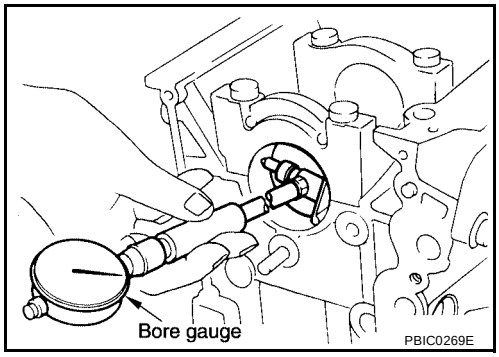
- If out of the distortion limit, replace the cylinder block.



INNER DIAMETER OF MAIN BEARING HOUSING

- Install the main bearing caps with the main bearings removed and tighten the mounting bolts to the specified torque. Refer to EM-164, "ASSEMBLY" .
- Using a bore gauge, measure the inner diameter of the main bearing housing. Refer to EM-190, "CYLINDER BLOCK" .
- If out of the standard, replace the cylinder block and lower cylinder block assembly.

NOTE:
These components cannot be replaced as a single unit because they were processed together.

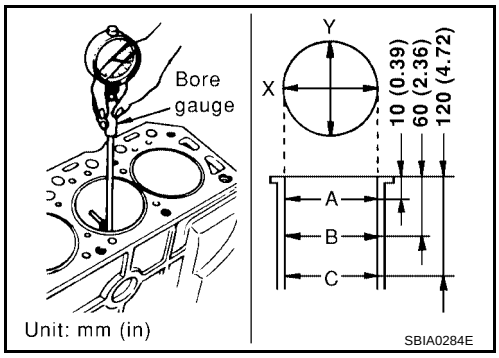


PISTON TO CYLINDER BORE CLEARANCE

Inner Diameter of Cylinder Bore

- Using a bore gauge, measure cylinder bore for wear, out-of-round and taper at 6 different points on each cylinder. (X and Y directions at A, B and C). The Y axis is in the longitudinal direction of the engine.

NOTE:
When determining cylinder bore grade, measure cylinder bore at B position.



Cylinder bore inner diameter

Grade No. 1	**: 89.000 - 89.010 mm (3.5039 - 3.5043 in)**
Grade No. 2	**: 89.010 - 89.020 mm (3.5043 - 3.5047 in)**
Grade No. 3	**: 89.020 - 89.030 mm (3.5047 - 3.5051 in)**
Wear limit:	**0.2 mm (0.008 in)**
Out-of-round (difference between, X – Y):	**0.015 mm (0.0006 in)**
Taper limit (difference between, C – A):	**0.01 mm (0.0004 in)**

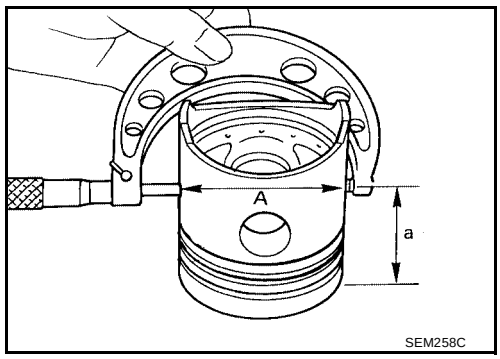
- If the measured value rebore exceeds the limit, or if there are scratches and/or seizure on the cylinder inner wall, hone the inner wall.
- An oversize piston is provided. When using an oversize piston, rebore the cylinder so that the clearance of the piston cylinder satisfies the standard.

Piston oversize (OS)

Clearance	**: 0.2 mm (0.008 in)**
Diameter	**: 89.180 - 89.210 mm (3.5110 - 3.5122 in)**

Outer Diameter of Piston

- Measure piston skirt diameter (A).



Piston skirt diameter

Grade No. 1	**: 88.980 - 88.990 mm (3.5031 - 3.5035 in)**
Grade No. 2	**: 88.990 - 89.000 mm (3.5035 - 3.5039 in)**
Grade No. 3	**: 89.000 - 89.010 mm (3.5039 - 3.5043 in)**
Oversize clearance	**0.20 mm (0.0079 in)**

- Measure point (a) (distance from the top): 42 mm (1.65 in)

Piston to Cylinder Bore Clearance

- Calculate by outer diameter of piston skirt and inner diameter of cylinder (direction X, position B).

(Clearance) = (Inner diameter of cylinder) – (Outer diameter of piston skirt).

Standard	**: 0.010 - 0.030 mm (0.0004 - 0.0012 in)**
Limit	**: 0.08 mm (0.0031 in)**

- If it exceeds the limit, replace piston/piston pin assembly.

Reboring Cylinder Bore

1. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter “A”.

Rebored size calculation: D = A + B - C

D: Bored diameter
A: Piston diameter as measured
B: Piston-to-bore clearance (standard value)
C: Honing allowance 0.02 mm (0.0008 in)

2. Install main bearing caps, and tighten to the specified torque. Otherwise, cylinder bores may be distorted in final assembly.
3. Cut cylinder bores.

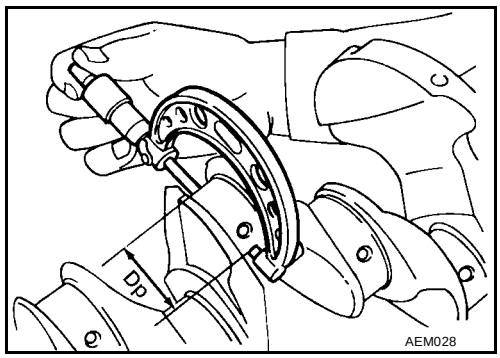
- **When any cylinder needs boring, all other cylinders must also be bored.**
- **Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**

4. Hone cylinders to obtain specified piston-to-bore clearance.
5. Measure finished cylinder bore for out-of-round and taper.

- **Measurement should be done after cylinder bore cools down.**

OUTER DIAMETER OF CRANKSHAFT MAIN JOURNAL

- Measure outer diameter of crankshaft main journals "Dm".

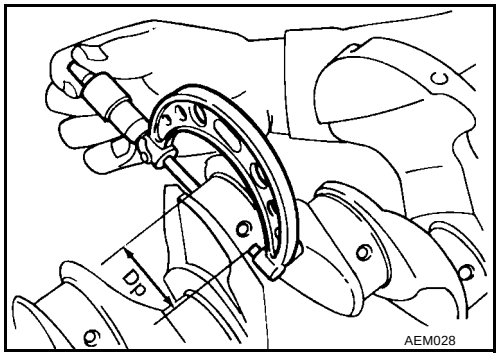


Standard "Dm" **: 54.955 - 54.979 mm (2.1636 - 2.1645 in)**

OUTER DIAMETER OF CRANKSHAFT PIN JOURNAL

- Measure outer diameter of crankshaft pin journals.

Standard : 44.956 - 44.974 mm (1.7699 - 1.7706 in)
"Dp"



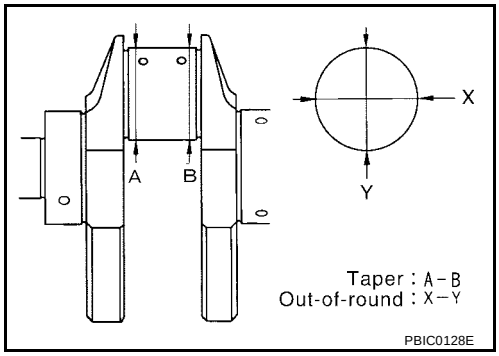
OUT-OF-ROUND AND TAPER OF CRANKSHAFT

- Using a micrometer, measure the dimensions at four different points shown in the figure on each journal and pin.
- Out-of-round is indicated by the difference in dimensions between "X" and "Y" at "A" and "B".
- Taper is indicated by the difference in dimension between "A"and "B" at "X" and "Y".

Limit

Out-of-round (X - Y) : 0.005 mm (0.0002 in)

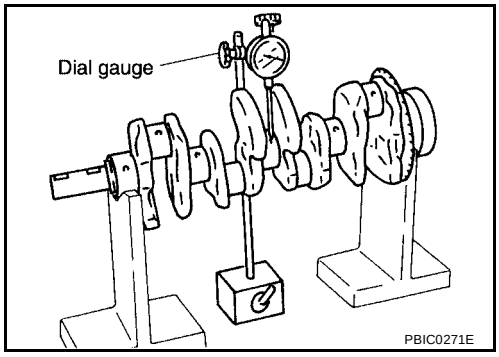
Taper (A - B) : 0.005 mm (0.0002 in)



CRANKSHAFT RUNOUT

- Place a V-block on a precise flat table to support the journals on both ends of the crankshaft.
- Place a dial gauge straight up on the No. 3 journal.
- While rotating the crankshaft, read the movement of the pointer on the dial gauge, the total indicator reading.

Limit : 0.05 mm (0.002 in)



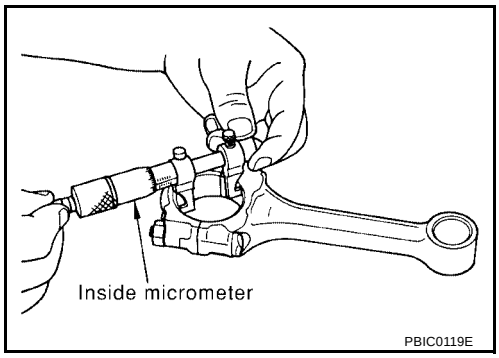
OIL CLEARANCE OF CONNECTING ROD BEARING

Method of Measurement

- Install the connecting rod bearings to the connecting rod and the cap, and tighten the connecting rod bolts to the specified torque. Using an inside micrometer measure the inner diameter of connecting rod bearing.
(Oil clearance) = (Inner diameter of connecting rod bearing) – (Outer diameter of crankshaft pin)

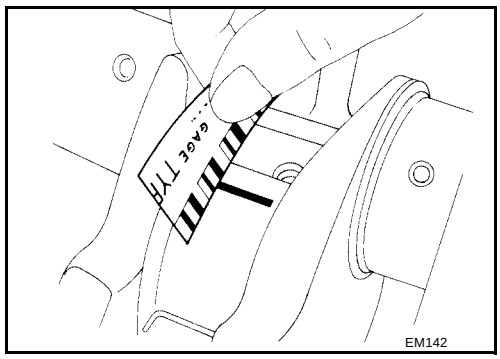
Standard : 0.028 - 0.045 mm (0.0011 - 0.0018 in)

Limit : 0.10 mm (0.0039 in)



- If clearance cannot be adjusted within the standard, grind crankshaft pin and use undersized bearing. Refer to EM-170, "HOW TO SELECT A CONNECTING ROD BEARING" .

Method of Using Plastigage



- Remove oil and dust on the crankshaft pin and the surfaces of each bearing completely.
- Cut the Plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Install the connecting rod bearings to the connecting rod cap, and tighten the connecting rod bolts to the specified torque.

  CAUTION:
  Never rotate the crankshaft.
- Remove the connecting rod cap and bearings, and using the scale on the Plastigage bag, measure the Plastigage width.

  NOTE:
  The procedure when the measured value exceeds the limit is same as that described in the method by calculation.

OIL CLEARANCE OF MAIN BEARING

Method of Measurement

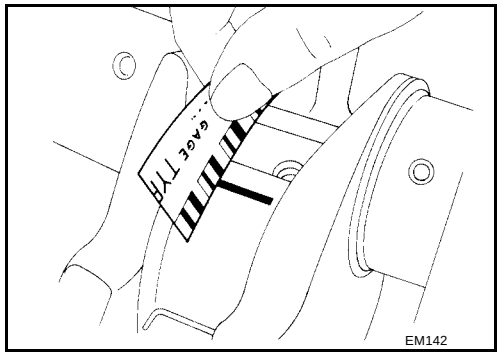
- Install the main bearings to the cylinder block and bearing cap. Measure the main bearing inner diameter with the bearing cap bolt tightened to the specified torque.
  (Oil clearance) = (Inner diameter of main bearing) – (Outer diameter of crankshaft journal)

  Standard:

No. 1, 3, and 5 journals	**: 0.012 - 0.022 mm (0.0005 - 0.0009 in)**
No. 2 and 4 journals	**: 0.018 - 0.028 mm (0.0007 - 0.0011 in)**
Limit	**: 0.1 mm (0.004 in)**

- If the measured value exceeds the limit, select main bearings referring to the main bearing inner diameter and crankshaft journal outer diameter, so that the oil clearance satisfies the standard. Refer to EM-172, "HOW TO SELECT A MAIN BEARING" .

Method of Using Plastigage

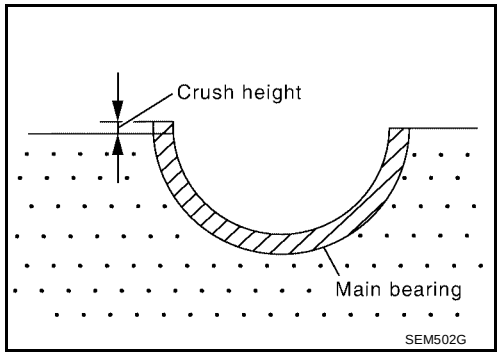


- Remove oil and dust on the crankshaft journal and the surfaces of each bearing completely.
- Cut the Plastigage slightly shorter than the bearing width, and place it in crankshaft axial direction, avoiding oil holes.
- Tighten the main bearing bolts to the specified torque.

  CAUTION:
  Never rotate the crankshaft.
- Remove the bearing cap and bearings, and using the scale on the Plastigage bag, measure the Plastigage width.

  NOTE:
  The procedure when the measured value exceeds the limit is same as that described in the "Method by Calculation".

CRUSH HEIGHT OF MAIN BEARING



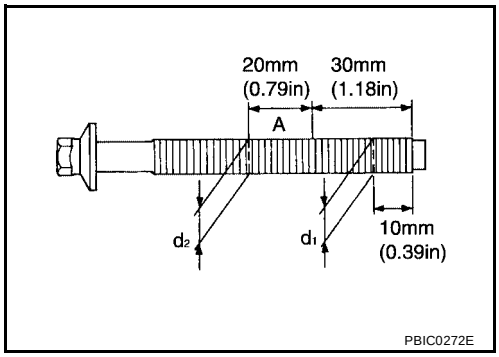
- When the bearing cap is removed after being tightened to the specified torque with main bearings installed, the tip end of bearing must protrude.

  Standard : There must be crush height.
- If the standard is not met, replace main bearings.

OUTER DIAMETER OF LOWER CYLINDER BLOCK MOUNTING BOLT

- Perform only with M10 (0.39 in) bolts.
- Measure outer diameters (d1, d2) at two positions as shown.
- Measure d2 at a point within block A.
- When the value of d1- d2 exceeds the limit (a large difference in dimensions), replace the bolt with a new one.

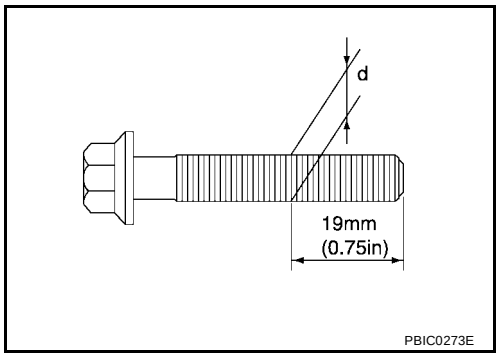
Limit : 0.13 mm (0.0051 in) or more



OUTER DIAMETER OF CONNECTING ROD BOLT

- Measure outer diameter (d) at position shown in the figure.
- When “d” exceeds the limit (when it becomes thinner), replace the bolt with a new one.

Limit : 7.75 mm (0.3051 in) or less



MOVEMENT AMOUNT OF FLYWHEEL (M/T MODEL)

NOTE:

- Inspection for double mass flywheel only.
- Do not disassemble double mass flywheel.

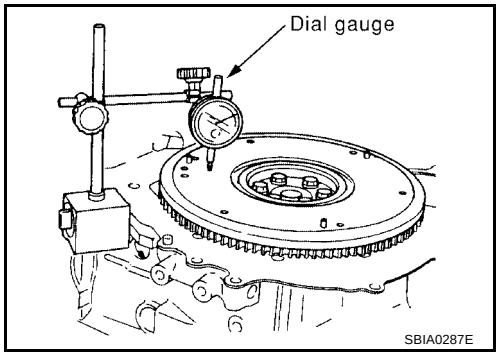
Flywheel Runout

- Measure runout of flywheel contact surface to the clutch with a dial gauge.
- Measure runout at 210 mm (8.27 in) dia.

Standard : 0.45 mm (0.0177 in) or less

Limit : 1.3 mm (0.051 in) or less

- When measured value exceeds the limit, replace the flywheel with a new one.



Movement Amount in Rotation Direction

- Check the movement amount in the following procedure.

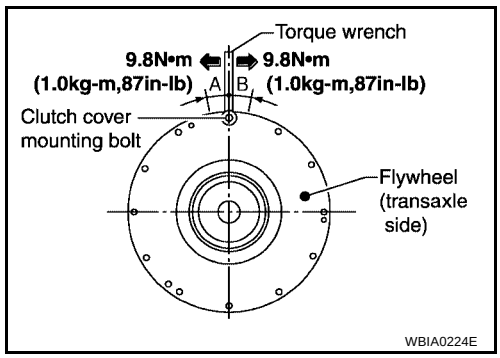
1. Install a bolt to clutch cover mounting hole, and place a torque wrench on the extended line of the flywheel center line.

- Tighten bolt to keep it from loosening at a force of 9.8 N·m (1 kg-m, 87 in-lb).

2. Put a mating mark on circumferences of the two flywheel masses without applying any load (measurement standard points).
3. Apply a force of 9.8 N·m (1 kg-m, 87 in-lb) in each direction, and mark the movement amount on the mass on the transaxle side.
4. Measure dimensions of movement amounts A and B on circumference of the flywheel on the transaxle side.

Standard : 28.3 mm (1.114 in) or less

- When measured value is outside the standard, replace flywheel.



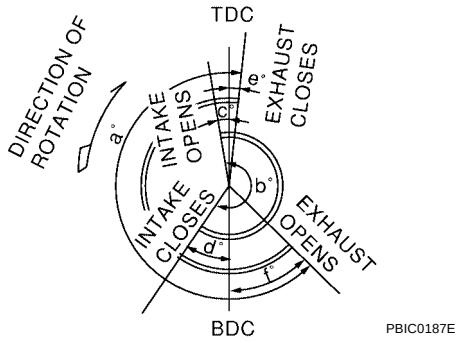
SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Standard and Limit

EBS00CGA

GENERAL SPECIFICATIONS

Cylinder arrangement		In-line 4
Displacement cm^3 (cu in)		2,488 (151.82)
Bore and stroke mm (in)		89.0 x 100 (3.50 - 3.94)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Compression ratio		9.5
Compression pressure kPa (kg/cm^2 , psi) / 250 rpm	Standard	1,250 (12.8, 181.3)
	Minimum	1,060 (10.8, 153.7)
	Differential limit between cylinders	100 (1.0, 14)
Valve timing		

PBIC0187E

Unit: degree

a	b	c	d	e	f
224	244	0	64	3	41

DRIVE BELTS

Tension of drive belts	Auto adjustment by auto-tensioner

INTAKE MANIFOLD AND EXHAUST MANIFOLD

Unit: mm (in)

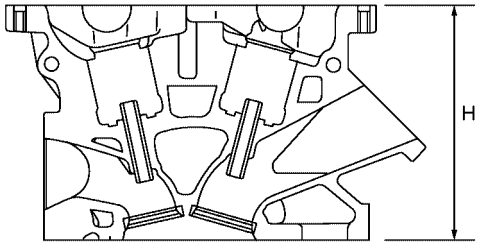
		Limit
Surface distortion	Intake manifold collector	0.1 (0.004)
	Intake manifold	0.1 (0.004)
	Exhaust manifold	0.3 (0.012)

SPARK PLUG

Make	NGK
Standard type	PLFR5A-11 (Platinum type)
Hot type	PLFR4A-11 (Platinum type)
Cold type	PLFR6A-11 (Platinum type)
Gap (nominal)	1.1 mm (0.043 in)

CYLINDER HEAD

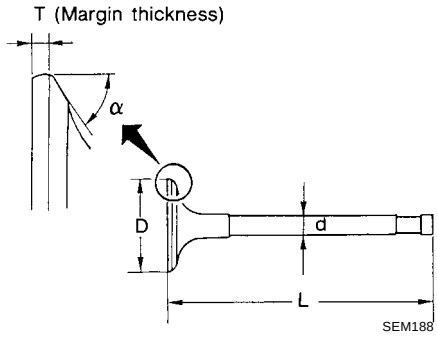
Unit: mm (in)

	Limit
 Nominal cylinder head height: H = 129.4 mm (5.09 in) PBIC0283E	
Head surface distortion	0.1 (0.004)

VALVE

Valve Dimensions

Unit: mm (in)



Valve head diameter “D”	Intake	35.5 - 35.8 (1.398 - 1.409)
	Exhaust	30.5 - 30.8 (1.201 - 1.213)
Valve length “L”	Intake	97.16 (3.8252)
	Exhaust	98.82 (3.8905)
Valve stem diameter “d”	Intake	5.965 - 5.980 (0.2348 - 0.2354)
	Exhaust	5.955 - 5.970 (0.2344 - 0.2350)
Valve seat angle “α”	Intake	45°15′ - 45°45′
	Exhaust	
Valve margin “T”	Intake	1.1 (0.043)
	Exhaust	1.3 (0.051)

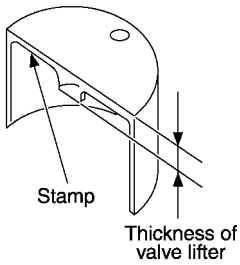
Valve Clearance

Unit: mm (in)

	Cold* (reference data)	Hot
Intake	0.24 - 0.32 (0.009 - 0.013)	0.32 - 0.40 (0.013 - 0.016)
Exhaust	0.26 - 0.34 (0.010 - 0.013)	0.33 - 0.41 (0.013 - 0.016)

*: Approximately 20°C (68 °F)

Available Valve Lifter



KBIA0119E

Thickness mm (in)	Identification mark
6.96 (0.2740)	696
6.98 (0.2748)	698
7.00 (0.2756)	700
7.02 (0.2764)	702
7.04 (0.2772)	704
7.06 (0.2780)	706
7.08 (0.2787)	708
7.10 (02795)	710
7.12 (0.2803)	712
7.14 (0.2811)	714
7.16 (0.2819)	716
7.18 (0.2827)	718
7.20 (0.2835)	720
7.22 (0.2843)	722
7.24(0.2850)	724
7.26 (0.2858)	726
7.28 (0.2866)	728
7.30(0.2874)	730
7.32 (0.2882)	732
7.34 (0.2890)	734
7.36 (0.2898)	736
7.38 (0.2906)	738
7.40 (0.2913)	740
7.42 (0.2921)	742
744 (0.2929)	744
7.46 (0.2937)	746

Valve Spring

Free height standard mm (in)	Intake (blue)	44.84 - 45.34 (1.7654 - 1.7850)
	Exhaust (yellow)	45.28 - 45.78 (1.7827 - 1.8024)
Pressure standard N (kg-force, lb-force) at height mm (in)	Intake (blue) and Exhaust (yellow)	151 - 175 (15.4 - 17.8, 34 - 39) at 35.30 (1.390)
Out-of-square mm (in)		1.9 (0.0748)
Installation height mm (in)	Intake (blue) and Exhaust (yellow)	35.30 (1.390)

Height during valve open mm (in)	Intake (blue)	24.94 (0.9819)
	Exhaust (yellow)	26.39 (1.0390)
Load with valve open N (kg-force, lb-force)	Intake (blue)	358 - 408 (36.5 - 41.6, 80 - 92)
	Exhaust (yellow)	325 - 371 (33.1 - 37.8, 73 - 83)

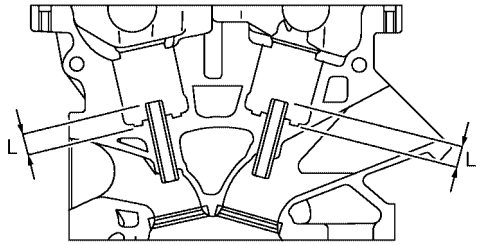
Valve Lifter

Unit: mm (in)

	Standard
Valve lifter outer diameter	33.965 - 33.980 (1.3372 - 1.3378)
Valve lifter guide bore diameter	34.000 - 34.021 (1.3386 - 1.3394)
Clearance between lifter and lifter guide bore	0.020 - 0.056 (0.0008 - 0.0022)

Valve Guide

Unit: mm (in)

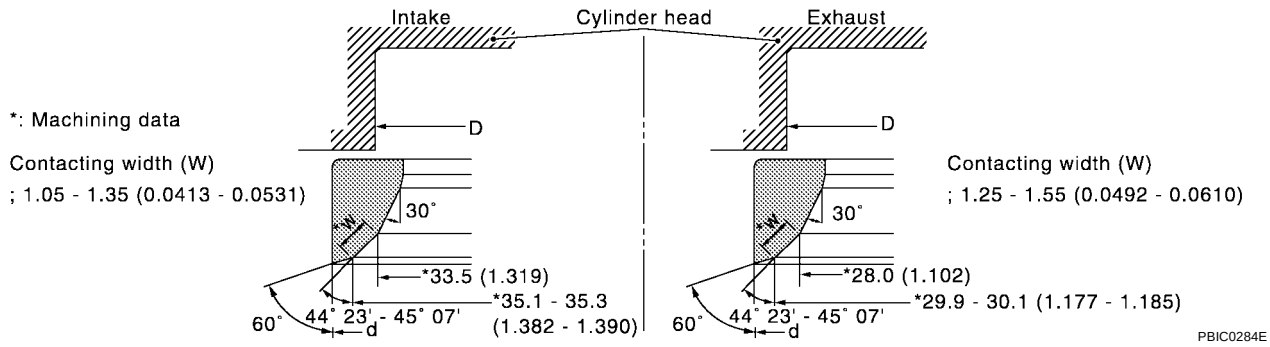


PBIC0184E

		Standard	Service
Valve guide	Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Inner diameter (Finished size)	6.000 - 6.018 (0.2362 - 0.2369)	
Valve guide bore diameter		9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	
		Standard	
Valve to guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	
	Exhaust	0.030 - 0.063 (0.0012 - 0.0025)	
Projection length “L”	Intake	10.1 - 10.3 (0.398 - 0.406)	
	Exhaust	10.0 - 10.4 (0.394 - 0.409)	

Valve Seat

Unit: mm (in)



PBIC0284E

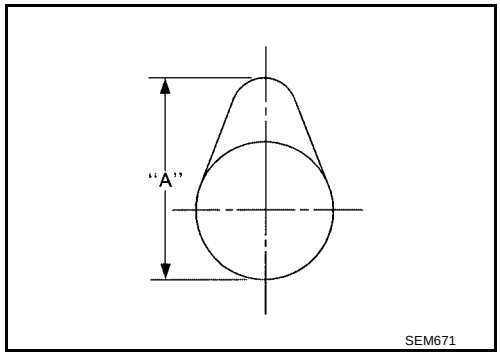
	Standard	Service

Cylinder head seat recess diameter (D)	Intake	36.500 - 36.516 (1.4370 - 1.4376)	37.000 - 37.016 (1.4567 - 1.4573)
	Exhaust	31.500 - 31.516 (1.2402 - 1.2408)	32.000 - 32.016 (1.2598 - 1.2605)
Valve seat interference fit	Intake	0.081 - 0.113 (0.0032 - 0.0044)	
	Exhaust	0.084 - 0.116 (0.0033 - 0.0046)	
Valve seat outer diameter (d)	Intake	36.597 - 36.613 (1.4408 - 1.4415)	37.097 - 37.113 (1.4605 - 1.4611)
	Exhaust	31.600 - 31.616 (1.2441 - 1.2447)	32.100 - 32.116 (1.2638 - 1.2644)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

		Standard
Camshaft runout [TIR*]		Less than 0.04 (0.0016)

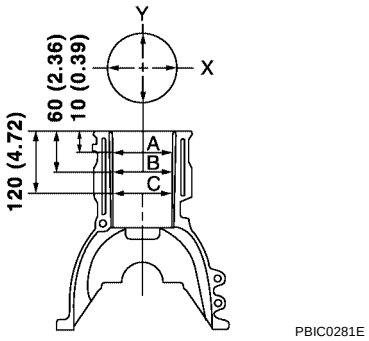


Cam height "A"	Intake	45.665 - 45.855 (1.7978 - 1.8053)
	Exhaust	43.975 - 44.165 (1.7313 - 1.7388)
Outer diameter of camshaft journal		No. 1 27.935 - 27.955 (1.0998 - 1.1006) No. 2, 3, 4, 5 23.435 - 23.455 (0.9226 - 0.9234)
Inner diameter of camshaft bracket		No .1 28.000 - 28.021 (1.1024 - 1.1032) No.2, 3, 4, 5 23.500 - 23.521 (0.9252 - 0.9260)
Camshaft journal clearance		0.045 - 0.086 (0.0018 - 0.0034)
Camshaft end play		0.115 - 0.188 (0.0045 - 0.0074)
Camshaft sprocket runout [TIR*]		Less than 0.15 (0.0059)

*: Total indicator reading

CYLINDER BLOCK

Unit: mm (in)



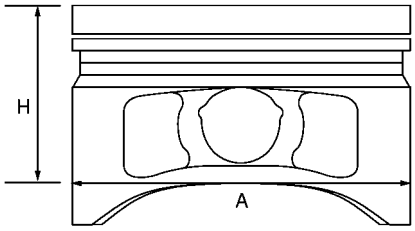
Surface distortion	Limit	0.1 (0.004)

Cylinder bore	Inner diameter	Standard	Grade No. 1	89.000 - 89.010 (3.5039 - 3.5043)
			Grade No. 2	89.010 - 89.020 (3.5043 - 3.5047)
			Grade No. 3	89.020 - 89.030 (3.5047 - 3.5051)
		Wear limit		0.2 (0.008)
Out-of-round (X – Y)				Less than 0.015 (0.0006)
Taper (C – A)				Less than 0.01 (0.0004)
Main journal inner diameter grade (Without bearing)	Grade No. A			58.944 - 58.945 (2.3206 - 2.3207)
	Grade No. B			58.945 - 58.946 (2.3207 - 2.3207)
	Grade No. C			58.946 - 58.947 (2.3207 - 2.3207)
	Grade No. D			58.947 - 58.948 (2.3207 - 2.3208)
	Grade No. E			58.948 - 58.949 (2.3208 - 2.3208)
	Grade No. F			58.949 - 58.950 (2.3208 - 2.3209)
	Grade No. G			58.950 - 58.951 (2.3209 - 2.3209)
	Grade No. H			58.951 - 58.952 (2.3209 - 2.3209)
	Grade No. J			58.952 - 58.953 (2.3209 - 2.3210)
	Grade No. K			58.953 - 58.954 (2.3210 - 2.3210)
	Grade No. L			58.954 - 58.955 (2.3210 - 2.3211)
	Grade No. M			58.955 - 58.956 (2.3211 - 2.3211)
	Grade No. N			58.956 - 58.957 (2.3211 - 2.3211)
	Grade No. P			58.957 - 58.958 (2.3211 - 2.3212)
	Grade No. R			58.958 - 58.959 (2.3212 - 2.3212)
	Grade No. S			58.959 - 58.960 (2.3212 - 2.3213)
	Grade No. T			58.960 - 58.961 (2.3213 - 2.3213)
	Grade No. U			58.961 - 58.962 (2.3213 - 2.3213)
	Grade No. V			58.962 - 58.963 (2.3213 - 2.3214)
	Grade No. W			58.963 - 58.964 (2.3214 - 2.3214)
	Grade No. X			58.964 - 58.965 (2.3214 - 2.3215)
	Grade No. Y			58.965 - 58.966 (2.3215 - 2.3215)
	Grade No. 4			58.966 - 58.967 (2.3215 - 2.3215)
	Grade No. 7			58.967 - 58.968 (2.3215 - 2.3216)
Difference in inner diameter between cylinders	Standard			Less than 0.03 (0.0012)

PISTON, PISTON RING, AND PISTON PIN

Available Piston

Unit: mm (in)



PBIC0188E

Piston skirt diameter “A”	Standard	Grade No. 1	88.980 - 88.990 (3.5031 - 3.5035)
		Grade No. 2	88.990 - 89.000 (3.5035 - 3.5039)
		Grade No. 3	89.000 - 89.010 (3.5039 - 3.5043)
		0.20 (0.0079) oversize clearance (service)	89.180 - 89.210 (3.5110 - 3.5122)
“H” dimension			42 (1.65)
Piston pin bore diameter		Grade No. 0	19.993 - 19.999 (0.7871 - 0.7874)
		Grade No. 1	19.999 - 20.005 (0.7874 - 0.7876)

Piston to cylinder bore clearance	Standard	0.010 - 0.030 (0.0004 - 0.0012)
	Limit	0.08 (0.0031)

Piston Ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.045 - 0.080 (0.0018 - 0.0031)	0.11 (0.0043)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	0.10 (0.004)
	Oil ring	0.065 - 0.135 (0.0026 - 0.0053)	—
End gap	Top	0.21- 0.31 (0.0083 - 0.0122)	0.54 (0.0213)
	2nd	0.32 - 0.47 (0.0126 - 0.0185)	0.67 (0.0264)
	Oil (rail ring)	0.20 - 0.60 (0.0079 - 0.0236)	0.95 (0.0374)

Piston Pin

Unit: mm (in)

Piston pin outer diameter	Grade No.0	19.989 - 19.995 (0.7870 - 0.7872)
	Grade No.1	19.995 - 20.001 (0.7872 - 0.7874)
Piston pin to piston clearance		0.002 - 0.006 (0.0001 - 0.0002)
Piston pin to connecting rod oil clearance	Standard	0.005 - 0.017 (0.0002 - 0.0007)

CONNECTING ROD

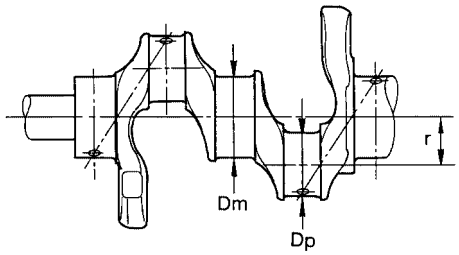
Unit: mm (in)

Center distance		143.00 - 143.10 (5.63 - 5.63)
Bend [per 100 (3.94)]	Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	Limit	0.30 (0.0118)
Connecting rod small end inner diameter		22.000 - 22.012 (0.7874 - 0.7879)
Connecting rod small end inner diameter*	Grade No. 0	20.000 - 20.006 (0.7874 - 0.7876)
	Grade No. 1	20.006 - 20.012 (0.7876 - 0.7879)
Connecting rod big end inner diameter		48.000 - 48.013 (1.8898 - 1.8903)
Side clearance	Standard	0.20 - 0.35 (0.0079 - 0.0138)
	Limit	0.50 (0.0197)
Connecting rod bearing housing	Grade No. 0	48.000 - 48.001 (1.8898 - 1.8898)
	Grade No. 1	48.001 - 48.002 (1.8898 - 1.8898)
	Grade No. 2	48.002 - 48.003 (1.8898 - 1.8899)
	Grade No. 3	48.003 - 48.004 (1.8899 - 1.8899)
	Grade No. 4	48.004 - 48.005 (1.8899 - 1.8899)
	Grade No. 5	48.005 - 48.006 (1.8899 - 1.8900)
	Grade No. 6	48.006 - 48.007 (1.8900 - 1.8900)
	Grade No. 7	48.007 - 48.008 (1.8900 - 1.8901)
	Grade No. 8	48.008 - 48.009 (1.8901 - 1.8901)
	Grade No. 9	48.009 - 48.010 (1.8901 - 1.8902)
	Grade No. A	48.010 - 48.011 (1.8902 - 1.8902)
	Grade No. B	48.011 - 48.012 (1.8902 - 1.8902)
	Grade No. C	48.012 - 48.013 (1.8902 - 1.8903)

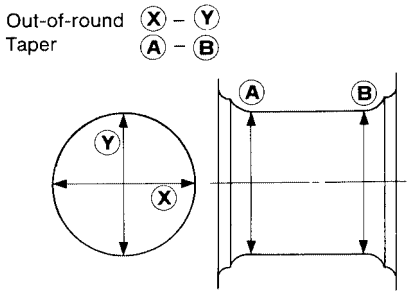
*: After installing in connecting rod

CRANKSHAFT

Unit: mm (in)



SEM645



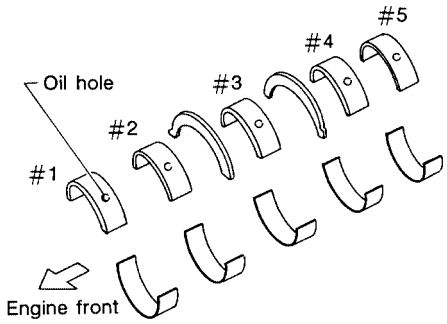
SEM715

Pin journal “DP” grade	Grade No. A	44.974 - 44.973 (1.7706 - 1.7706)
	Grade No. B	44.973 - 44.972 (1.7706 - 1.7705)
	Grade No. C	44.972 - 44.971 (1.7705 - 1.7705)
	Grade No. D	44.971 - 44.970 (1.7705 - 1.7705)
	Grade No. E	44.970 - 44.969 (1.7705 - 1.7704)
	Grade No. F	44.969 - 44.968 (1.7704 - 1.7704)
	Grade No. G	44.968 - 44.967 (1.7704 - 1.7704)
	Grade No. H	44.967 - 44.966 (1.7704 - 1.7703)
	Grade No. J	44.966 - 44.965 (1.7703 - 1.7703)
	Grade No. K	44.965 - 44.964 (1.7703 - 1.7702)
	Grade No. L	44.964 - 44.963 (1.7702 - 1.7702)
	Grade No. M	44.963 - 44.962 (1.7702 - 1.7702)
	Grade No. N	44.962 - 44.961 (1.7702 - 1.7701)
	Grade No. P	44.961 - 44.960 (1.7701 - 1.7701)
	Grade No. R	44.960 - 44.959 (1.7701 - 1.7700)
	Grade No. S	44.959 - 44.958 (1.7700 - 1.7700)
	Grade No. T	44.958 - 44.957 (1.7700 - 1.7700)
	Grade No. U	44.957 - 44.956 (1.7700 - 1.7699)
Main journal “Dm” grade	Grade No. A	54.979 - 54.978 (2.1645 - 2.1645)
	Grade No. B	54.978 - 54.977 (2.1645 - 2.1644)
	Grade No. C	54.977 - 54.976 (2.1644 - 2.1644)
	Grade No. D	54.976 - 54.975 (2.1644 - 2.1644)
	Grade No. E	54.975 - 54.974 (2.1644 - 2.1643)
	Grade No. F	54.974 - 54.973 (2.1643 - 2.1643)
	Grade No. G	54.973 - 54.972 (2.1643 - 2.1642)
	Grade No. H	54.972 - 54.971 (2.1642 - 2.1642)
	Grade No. J	54.971 - 54.970 (2.1642 - 2.1642)
	Grade No. K	54.970 - 54.969 (2.1642 - 2.1641)
	Grade No. L	54.969 - 54.968 (2.1641 - 2.1641)
	Grade No. M	54.968 - 54.967 (2.1641 - 2.1641)
	Grade No. N	54.967 - 54.966 (2.1641 - 2.1640)
	Grade No. P	54.966 - 54.965 (2.1640 - 2.1640)
	Grade No. R	54.965 - 54.964 (2.1640 - 2.1639)
	Grade No. S	54.964 - 54.963 (2.1639 - 2.1639)
	Grade No. T	54.963 - 54.962 (2.1639 - 2.1639)
	Grade No. U	54.962 - 54.961 (2.1639 - 2.1638)
	Grade No. V	54.961 - 54.960 (2.1638 - 2.1638)
	Grade No. W	54.960 - 54.959 (2.1638 - 2.1637)
	Grade No. X	54.959 - 54.958 (2.1637 - 2.1637)
	Grade No. Y	54.958 - 54.957 (2.1637 - 2.1637)
	Grade No. 4	54.957 - 54.956 (2.1637 - 2.1636)
	Grade No. 7	54.956 - 54.955 (2.1636 - 2.1636)
Center distance “r”		49.60 - 50.04 (1.9528 - 1.9701)
Out-of-round (X – Y)	Standard	Less than 0.005 (0.0002)
Taper (A – B)	Standard	Less than 0.005 (0.0002)
Runout [TIR*]	Limit	Less than 0.05 (0.002)
Free end play	Standard	0.10 - 0.26 (0.0039 - 0.0102)
	Limit	0.30 (0.0118)

*: Total indicator reading

MAIN BEARING

Unit: mm (in)



SEM685D

Grade number		Thickness	Identification color (UPR / LWR)	Remarks
0		1.973 - 1.976 (0.0777 - 0.0778)	Black	Grade and color are the same for upper and lower bearings.
1		1.976 - 1.979 (0.0778 - 0.0779)	Red	
2		1.979 - 1.982 (0.0779 - 0.0780)	Green	
3		1.982 - 1.985 (0.0780 - 0.0781)	Yellow	
4		1.985 - 1.988 (0.0781 - 0.0783)	Blue	
5		1.988 - 1.991 (0.0783 - 0.0784)	Pink	
6		1.991 - 1.994 (0.0784 - 0.0785)	Purple	
7		1.994 - 1.997 (0.0785 - 0.0786)	Orange	
01	UPR	1.973 - 1.976 (0.0777 - 0.0778)	Black / Red	Grade and color are different for upper and lower bearings.
	LWR	1.976 - 1.979 (0.0778 - 0.0779)		
12	UPR	1.976 - 1.979 (0.0778 - 0.0779)	Red / Green	
	LWR	1.979 - 1.982 (0.0779 - 0.0780)		
23	UPR	1.979 - 1.982 (0.0779 - 0.0780)	Green / Yellow	
	LWR	1.982 - 1.985 (0.0780 - 0.0781)		
34	UPR	1.982 - 1.985 (0.0780 - 0.0781)	Yellow / Blue	
	LWR	1.985 - 1.988 (0.0781 - 0.0783)		
45	UPR	1.985 - 1.988 (0.0781 - 0.0783)	Blue / Pink	
	LWR	1.988 - 1.991 (0.0783 - 0.0784)		
56	UPR	1.988 - 1.991 (0.0783 - 0.0784)	Pink / Purple	
	LWR	1.991 - 1.994 (0.0784 - 0.0785)		
67	UPR	1.991 - 1.994 (0.0784 - 0.0785)	Purple / Orange	
	LWR	1.994 - 1.997 (0.0785 - 0.0786)		

Undersize

Unit: mm (in)

Size U.S.	Thickness	Main journal diameter
0.25 (0.0098)	2.106 - 2.114 (0.0829 - 0.0832)	Grind so that bearing clearance is the specified value.

Bearing Oil Clearance

Unit: mm (in)

Main bearing oil clearance	Standard	No.1, 3, and 5	0.012 - 0.022 (0.0005 - 0.0009)
		No.2 and 4	0.018 - 0.028 (0.0007 - 0.0011)
	Limit		0.1 (0.004)

CONNECTING ROD BEARING

Grade number	Thickness mm (in)	Identification color (mark)
0	1.499 - 1.495 (0.0590 - 0.0589)	Black
1	1.503 - 1.499 (0.0592 - 0.0590)	Brown
2	1.507 - 1.503 (0.0593 - 0.0592)	Green
3	1.511 - 1.507 (0.0595 - 0.0593)	Yellow

Undersize

Unit: mm (in)

Size U.S.	Thickness	Crank pin journal diameter
0.25 (0.0098)	1.624 - 1.632 (0.0639 - 0.0643)	Grind so that bearing clearance is the specified value.

Bearing Oil Clearance

Unit: mm (in)

Connecting rod bearing oil clearance	Standard	0.028 - 0.045 (0.0011 - 0.0018)
	Limit	0.10 (0.0039)

Miscellaneous Components

EBS00EZ6

Unit: mm (in)

Flywheel runout [TIR*]	Less than 0.15 (0.0059)
Rotational movement 9.8 N.m (1.0 kg-m, 87 in-lb) force applied	Less than 28.3 mm (1.114 in)

*: Total indicator reading at measuring point 115 mm (4.53 in) from crankshaft center.

INDEX FOR DTC

PFP:00024

Alphabetical Index

UBS0026N

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1350, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

×: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
A/T 1ST GR FNCTN	P0731	0731	2	×	AT-512
A/T 2ND GR FNCTN	P0732	0732	2	×	AT-517
A/T 3RD GR FNCTN	P0733	0733	2	×	AT-522
A/T 4TH GR FNCTN	P0734	0734	2	×	AT-527
A/T TCC S/V FNCTN	P0744	0744	2	×	AT-539
APP SEN 1/CIRC	P2122	2122	1	×	EC-1751
APP SEN 1/CIRC	P2123	2123	1	×	EC-1751
APP SEN 2/CIRC	P2127	2127	1	×	EC-1757
APP SEN 2/CIRC	P2128	2128	1	×	EC-1757
APP SENSOR	P2138	2138	1	×	EC-1770
ASCD BRAKE SW	P1572	1572	1	—	EC-1730
ASCD SW	P1564	1564	1	—	EC-1723
ASCD VHL SPD SEN	P1574	1574	1	—	EC-1740
ATF TEMP SEN/CIRC	P0710	0710	2	×	AT-497
BRAKE SW/CIRCUIT	P1805	1805	2	—	EC-1746
CAN COMM CIRCUIT	U1000	1000*5	1	×	EC-1350
CAN COMM CIRCUIT	U1001	1001*5	2	—	EC-1350
CKP SEN/CIRCUIT	P0335	0335	2	×	EC-1490
CLOSED LOOP-B1	P1148	1148	1	×	EC-1649
CMP SEN/CIRC-B1	P0340	0340	2	×	EC-1496
CTP LEARNING	P1225	1225	2	—	EC-1664
CTP LEARNING	P1226	1226	2	—	EC-1666
CYL 1 MISFIRE	P0301	0301	2	×	EC-1481
CYL 2 MISFIRE	P0302	0302	2	×	EC-1481
CYL 3 MISFIRE	P0303	0303	2	×	EC-1481
CYL 4 MISFIRE	P0304	0304	2	×	EC-1481
ECM	P0605	0605	1 or 2	× or —	EC-1583
ECM BACK UP/CIRC	P1065	1065	2	×	EC-1590
ECT SEN/CIRCUIT	P0117	0117	1	×	EC-1386
ECT SEN/CIRCUIT	P0118	0118	1	×	EC-1386
ECT SENSOR	P0125	0125	1	×	EC-1398
ENG OVER TEMP	P0217	0217	1	×	EC-1461
ENG OVER TEMP	P1217	1217	1	×	EC-1651
ENGINE SPEED SIG	P0725	0725	2	×	AT-508
ETC ACTR	P1121	1121	1 or 2	×	EC-1604
ETC FUNCTION/CIRC	P1122	1122	1	×	EC-1606
ETC MOT	P1128	1128	1	×	EC-1618

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
ETC MOT PWR	P1124	1124	1	×	EC-1613
ETC MOT PWR	P1126	1126	1	×	EC-1613
EVAP GROSS LEAK	P0455	0455	2	×	EC-1547
EVAP PURG FLOW/MON	P0441	0441	2	×	EC-1507
EVAP SMALL LEAK	P0442	0442	2	×	EC-1513
EVAP SYS PRES SEN	P0452	0452	2	×	EC-1534
EVAP SYS PRES SEN	P0453	0453	2	×	EC-1540
EVAP VERY SML LEAK	P0456	0456	2	×	EC-1555
EVAP VERY SML LEAK	P1456	1456	2	×	EC-1695
FTT SEN/CIRCUIT	P0182	0182	2	×	EC-1457
FTT SEN/CIRCUIT	P0183	0183	2	×	EC-1457
FTT SENSOR	P0181	0181	2	×	EC-1455
FUEL LEV SEN SLOSH	P0460	0460	2	×	EC-1564
FUEL LEVEL SEN/CIRC	P1464	1464	2	×	EC-1704
FUEL LEVEL SENSOR	P0461	0461	2	×	EC-1569
FUEL LEVL SEN/CIRC	P0462	0462	2	×	EC-1571
FUEL LEVL SEN/CIRC	P0463	0463	2	×	EC-1571
FUEL SYS-LEAN-B1	P0171	0171	2	×	EC-1442
FUEL SYS-RICH-B1	P0172	0172	2	×	EC-1449
HO2S1 (B1)	P0132	0132	2	×	EC-1406
HO2S1 (B1)	P0133	0133	2	×	EC-1412
HO2S1 (B1)	P0134	0134	2	×	EC-1421
HO2S1 (B1)	P1143	1143	2	×	EC-1623
HO2S1 (B1)	P1144	1144	2	×	EC-1629
HO2S1 HTR (B1)	P0031	0031	2	×	EC-1356
HO2S1 HTR (B1)	P0032	0032	2	×	EC-1356
HO2S2 (B1)	P0138	0138	2	×	EC-1428
HO2S2 (B1)	P0139	0139	2	×	EC-1435
HO2S2 (B1)	P1146	1146	2	×	EC-1635
HO2S2 (B1)	P1147	1147	2	×	EC-1642
HO2S2 HTR (B1)	P0037	0037	2	×	EC-1362
HO2S2 HTR (B1)	P0038	0038	2	×	EC-1362
IAT SEN/CIRCUIT	P0112	0112	2	×	EC-1381
IAT SEN/CIRCUIT	P0113	0113	2	×	EC-1381
IAT SENSOR	P0127	0127	2	×	EC-1401
INT/V TIM CONT-B1	P0011	0011	2	×	EC-1353
INT/V TIM V/CIR-B1	P1111	1111	2	×	EC-1600
ISC SYSTEM	P0506	0506	2	×	EC-1579
ISC SYSTEM	P0507	0507	2	×	EC-1581
KNOCK SEN/CIRC-B1	P0327	0327	2	—	EC-1486
KNOCK SEN/CIRC-B1	P0328	0328	2	—	EC-1486
L/PRESS SOL/CIRC	P0745	0745	2	×	AT-547

Items (CONSULT-II screen terms)	DTC*1		Trip	MIL lighting up	Reference page
	CONSULT-II GST*2	ECM*3			
MAF SEN/CIRCUIT	P0101	0101	1	×	EC-1368
MAF SEN/CIRCUIT	P0102	0102	1	×	EC-1375
MAF SEN/CIRCUIT	P0103	0103	1	×	EC-1375
MAF SENSOR	P1102	1102	1	×	EC-1594
MIL/CIRC	P0650	0650	2	—	EC-1586
MULTI CYL MISFIRE	P0300	0300	2	×	EC-1481
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	2	—	EC-1275
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	—	Flashing*4	EC-1276
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	**—**
O/R CLTCH SOL/CIRC	P1760	1760	2	×	AT-568
P-N POS SW/CIRCUIT	P1706	1706	2	×	EC-1742
PNP SW/CIRC	P0705	0705	2	×	AT-491
PURG VOLUME CONT/V	P0444	0444	2	×	EC-1521
PURG VOLUME CONT/V	P0445	0445	2	×	EC-1521
PURG VOLUME CONT/V	P1444	1444	2	×	EC-1672
SENSOR POWER/CIRC	P1229	1229	1	×	EC-1668
SFT SOL A/CIRC	P0750	0750	1	×	AT-553
SFT SOL B/CIRC	P0755	0755	1	×	AT-558
TCC SOLENOID/CIRC	P0740	0740	2	×	AT-534
THERMSTAT FNCTN	P0128	0128	2	×	EC-1404
TP SEN 1/CIRC	P0222	0222	1	×	EC-1475
TP SEN 1/CIRC	P0223	0223	1	×	EC-1475
TP SEN 2/CIRC	P0122	0122	1	×	EC-1391
TP SEN 2/CIRC	P0123	0123	1	×	EC-1391
TP SENSOR	P2135	2135	1	×	EC-1763
TPV SEN/CIRC A/T	P1705	1705	1	×	AT-563
TW CATALYST SYS-B1	P0420	0420	2	×	EC-1502
VC CUT/V BYPASS/V	P1491	1491	2	×	EC-1714
VC/V BYPASS/V	P1490	1490	2	×	EC-1707
VEH SPD SEN/CIR AT*6	P0720	0720	2	×	AT-503
VEH SPEED SEN/CIRC*6	P0500	0500	2	×	EC-1575
VENT CONTROL VALVE	P0447	0447	2	×	EC-1527
VENT CONTROL VALVE	P1446	1446	2	×	EC-1680
VENT CONTROL VALVE	P1448	1448	2	×	EC-1687

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

DTC No. Index

UBS0026O

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1350, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

×: Applicable —: Not applicable

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	—	Flashing*4	EC-1276
U1000	1000*5	CAN COMM CIRCUIT	1	×	EC-1350
U1001	1001*5	CAN COMM CIRCUIT	2	—	EC-1350
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	—
P0011	0011	INT/V TIM CONT-B1	2	×	EC-1353
P0031	0031	HO2S1 HTR (B1)	2	×	EC-1356
P0032	0032	HO2S1 HTR (B1)	2	×	EC-1356
P0037	0037	HO2S2 HTR (B1)	2	×	EC-1362
P0038	0038	HO2S2 HTR (B1)	2	×	EC-1362
P0101	0101	MAF SEN/CIRCUIT	1	×	EC-1368
P0102	0102	MAF SEN/CIRCUIT	1	×	EC-1375
P0103	0103	MAF SEN/CIRCUIT	1	×	EC-1375
P0112	0112	IAT SEN/CIRCUIT	2	×	EC-1381
P0113	0113	IAT SEN/CIRCUIT	2	×	EC-1381
P0117	0117	ECT SEN/CIRCUIT	1	×	EC-1386
P0118	0118	ECT SEN/CIRCUIT	1	×	EC-1386
P0122	0122	TP SEN 2/CIRC	1	×	EC-1391
P0123	0123	TP SEN 2/CIRC	1	×	EC-1391
P0125	0125	ECT SENSOR	1	×	EC-1398
P0127	0127	IAT SENSOR	2	×	EC-1401
P0128	0128	THERMSTAT FNCTN	2	×	EC-1404
P0132	0132	HO2S1 (B1)	2	×	EC-1406
P0133	0133	HO2S1 (B1)	2	×	EC-1412
P0134	0134	HO2S1 (B1)	2	×	EC-1421
P0138	0138	HO2S2 (B1)	2	×	EC-1428
P0139	0139	HO2S2 (B1)	2	×	EC-1435
P0171	0171	FUEL SYS-LEAN-B1	2	×	EC-1442
P0172	0172	FUEL SYS-RICH-B1	2	×	EC-1449
P0181	0181	FTT SENSOR	2	×	EC-1455
P0182	0182	FTT SEN/CIRCUIT	2	×	EC-1457
P0183	0183	FTT SEN/CIRCUIT	2	×	EC-1457
P0217	0217	ENG OVER TEMP	1	×	EC-1461
P0222	0222	TP SEN 1/CIRC	1	×	EC-1475
P0223	0223	TP SEN 1/CIRC	1	×	EC-1475
P0300	0300	MULTI CYL MISFIRE	2	×	EC-1481

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P0301	0301	CYL 1 MISFIRE	2	×	EC-1481
P0302	0302	CYL 2 MISFIRE	2	×	EC-1481
P0303	0303	CYL 3 MISFIRE	2	×	EC-1481
P0304	0304	CYL 4 MISFIRE	2	×	EC-1481
P0327	0327	KNOCK SEN/CIRC-B1	2	—	EC-1486
P0328	0328	KNOCK SEN/CIRC-B1	2	—	EC-1486
P0335	0335	CKP SEN/CIRCUIT	2	×	EC-1490
P0340	0340	CMP SEN/CIRC-B1	2	×	EC-1496
P0420	0420	TW CATALYST SYS-B1	2	×	EC-1502
P0441	0441	EVAP PURG FLOW/MON	2	×	EC-1507
P0442	0442	EVAP SMALL LEAK	2	×	EC-1513
P0444	0444	PURG VOLUME CONT/V	2	×	EC-1521
P0445	0445	PURG VOLUME CONT/V	2	×	EC-1521
P0447	0447	VENT CONTROL VALVE	2	×	EC-1527
P0452	0452	EVAP SYS PRES SEN	2	×	EC-1534
P0453	0453	EVAP SYS PRES SEN	2	×	EC-1540
P0455	0455	EVAP GROSS LEAK	2	×	EC-1547
P0456	0456	EVAP VERY SML LEAK	2	×	EC-1555
P0460	0460	FUEL LEV SEN SLOSH	2	×	EC-1564
P0461	0461	FUEL LEVEL SENSOR	2	×	EC-1569
P0462	0462	FUEL LEVL SEN/CIRC	2	×	EC-1571
P0463	0463	FUEL LEVL SEN/CIRC	2	×	EC-1571
P0500	0500	VEH SPEED SEN/CIRC*6	2	×	EC-1575
P0506	0506	ISC SYSTEM	2	×	EC-1579
P0507	0507	ISC SYSTEM	2	×	EC-1581
P0605	0605	ECM	1 or 2	× or —	EC-1583
P0650	0650	MIL/CIRC	2	—	EC-1586
P0705	0705	PNP SW/CIRC	2	×	AT-491
P0710	0710	ATF TEMP SEN/CIRC	2	×	AT-497
P0720	0720	VEH SPD SEN/CIR AT*6	2	×	AT-503
P0725	0725	ENGINE SPEED SIG	2	×	AT-508
P0731	0731	A/T 1ST GR FNCTN	2	×	AT-512
P0732	0732	A/T 2ND GR FNCTN	2	×	AT-517
P0733	0733	A/T 3RD GR FNCTN	2	×	AT-522
P0734	0734	A/T 4TH GR FNCTN	2	×	AT-527
P0740	0740	TCC SOLENOID/CIRC	2	×	AT-534
P0744	0744	A/T TCC S/V FNCTN	2	×	AT-539
P0745	0745	L/PRESS SOL/CIRC	2	×	AT-547
P0750	0750	SFT SOL A/CIRC	1	×	AT-553
P0755	0755	SFT SOL B/CIRC	1	×	AT-558
P1065	1065	ECM BACK UP/CIRC	2	×	EC-1590
P1102	1102	MAF SENSOR	1	×	EC-1594

DTC*1		Items (CONSULT-II screen terms)	Trip	MIL lighting up	Reference page
CONSULT-II GST*2	ECM*3				
P1111	1111	INT/V TIM V/CIR-B1	2	×	EC-1600
P1121	1121	ETC ACTR	1 or 2	×	EC-1604
P1122	1122	ETC FUNCTION/CIRC	1	×	EC-1606
P1124	1124	ETC MOT PWR	1	×	EC-1613
P1126	1126	ETC MOT PWR	1	×	EC-1613
P1128	1128	ETC MOT	1	×	EC-1618
P1143	1143	HO2S1 (B1)	2	×	EC-1623
P1144	1144	HO2S1 (B1)	2	×	EC-1629
P1146	1146	HO2S2 (B1)	2	×	EC-1635
P1147	1147	HO2S2 (B1)	2	×	EC-1642
P1148	1148	CLOSED LOOP-B1	1	×	EC-1649
P1217	1217	ENG OVER TEMP	1	×	EC-1651
P1225	1225	CTP LEARNING	2	—	EC-1664
P1226	1226	CTP LEARNING	2	—	EC-1666
P1229	1229	SENSOR POWER/CIRC	1	×	EC-1668
P1444	1444	PURG VOLUME CONT/V	2	×	EC-1672
P1446	1446	VENT CONTROL VALVE	2	×	EC-1680
P1448	1448	VENT CONTROL VALVE	2	×	EC-1687
P1456	1456	EVAP VERY SML LEAK	2	×	EC-1695
P1464	1464	FUEL LEVEL SEN/CIRC	2	×	EC-1704
P1490	1490	VC/V BYPASS/V	2	×	EC-1707
P1491	1491	VC CUT/V BYPASS/V	2	×	EC-1714
P1564	1564	ASCD SW	1	—	EC-1723
P1572	1572	ASCD BRAKE SW	1	—	EC-1730
P1574	1574	ASCD VHL SPD SEN	1	—	EC-1740
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	2	—	EC-1275
P1705	1705	TPV SEN/CIRC A/T	1	×	AT-563
P1706	1706	P-N POS SW/CIRCUIT	2	×	EC-1742
P1760	1760	O/R CLTCH SOL/CIRC	2	×	AT-568
P1805	1805	BRAKE SW/CIRCUIT	2	—	EC-1746
P2122	2122	APP SEN 1/CIRC	1	×	EC-1751
P2123	2123	APP SEN 1/CIRC	1	×	EC-1751
P2127	2127	APP SEN 2/CIRC	1	×	EC-1757
P2128	2128	APP SEN 2/CIRC	1	×	EC-1757
P2135	2135	TP SENSOR	1	×	EC-1763
P2138	2138	APP SENSOR	1	×	EC-1770

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

UBS0026P

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

On Board Diagnostic (OBD) System of Engine and A/T

UBS0026Q

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MIL) to warn the driver of a malfunction causing emission deterioration.

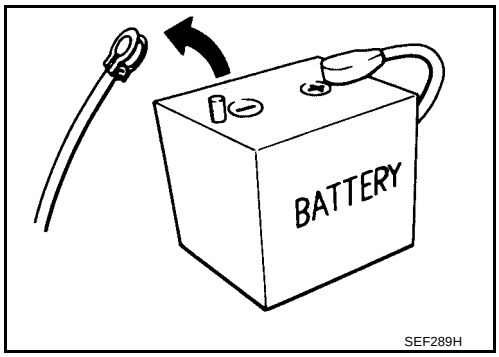
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-46, "HARNESS CONNECTOR" .**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

Precaution

UBS0026R

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**



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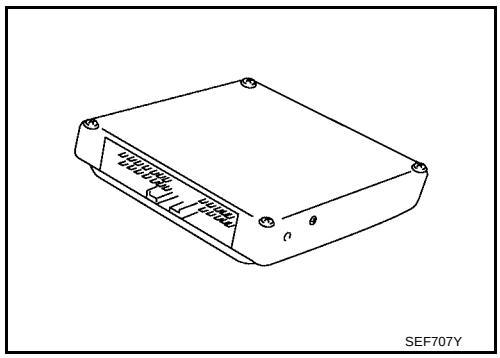
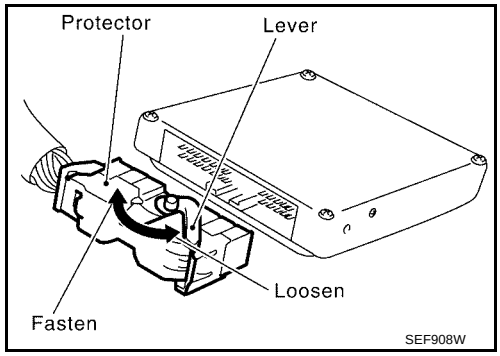
- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.

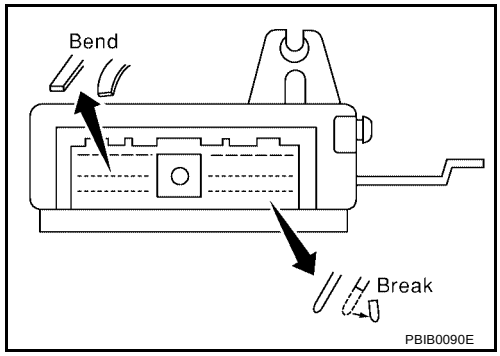

SEF707Y

- **When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown at right.**



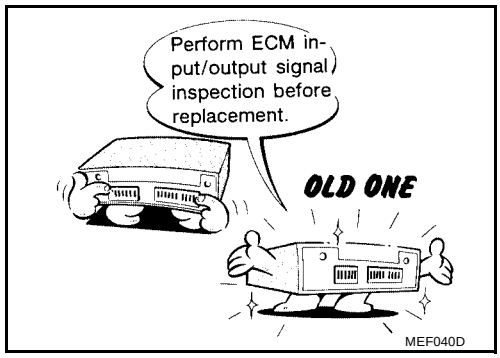
SEF908W

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



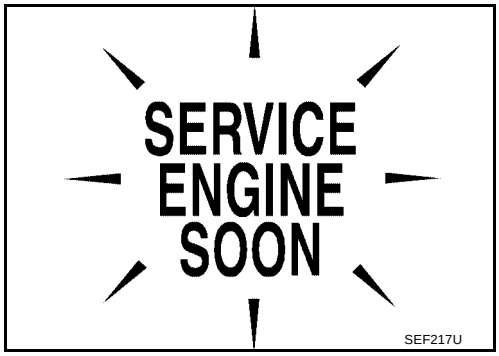
PBIB0090E

- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-1307 .**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

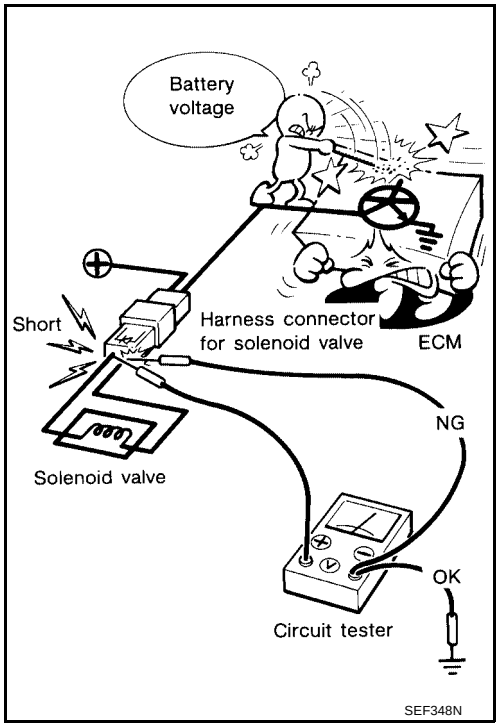


MEF040D

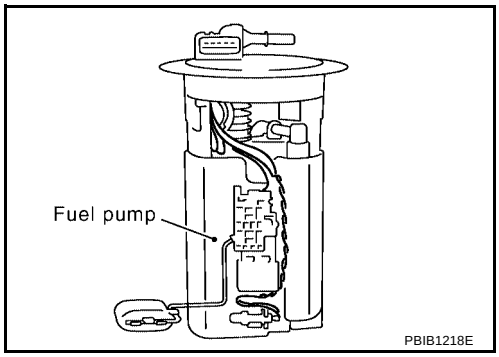
- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



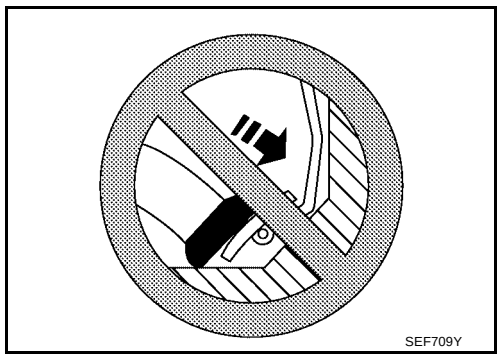
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**



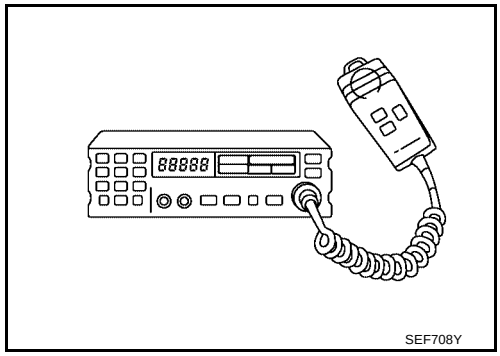
- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**


SEF708Y

Wiring Diagrams and Trouble Diagnosis

UBS0026S

When you read wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams"
- PG-2, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"

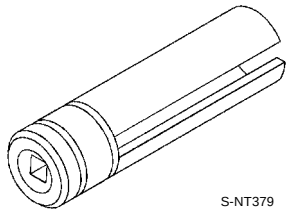
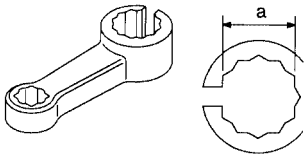
PREPARATION

PFP:00002

Special Service Tools

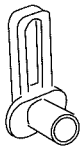
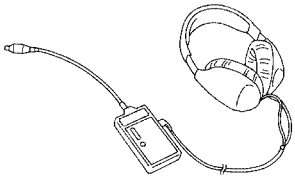
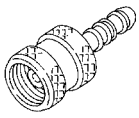
UBS0026T

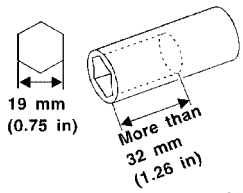
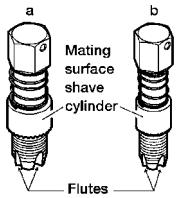
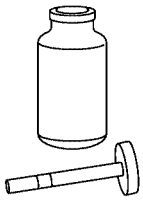
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number Tool name (Kent-Moore No.)	Description	
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensors **a: 22 mm (0.87 in)**
Fuel filler cap adapter (J-45356)	 S-NT815	Checking fuel tank vacuum relief valve opening pressure

Commercial Service Tools

UBS0026U

Tool name (Kent-Moore No.)	Description	
Quick connector release	 PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
Leak detector ie: (J41416)	 S-NT703	Locating the EVAP leak
EVAP service port adapter ie: (J41413-OBD)	 S-NT704	Applying positive pressure through EVAP service port

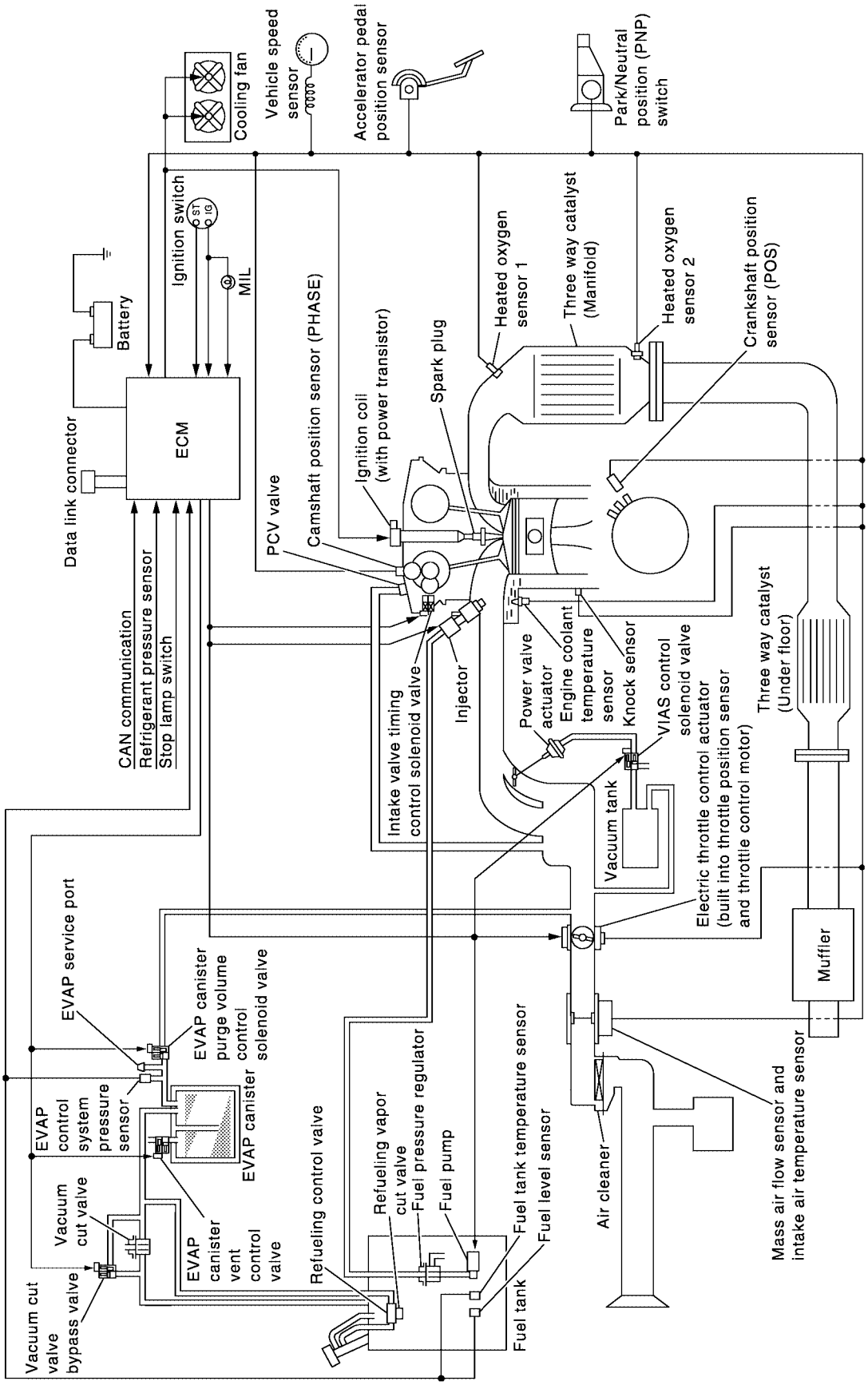
Tool name (Kent-Moore No.)	Description	
Socket wrench	 S-NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner ie: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant ie: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

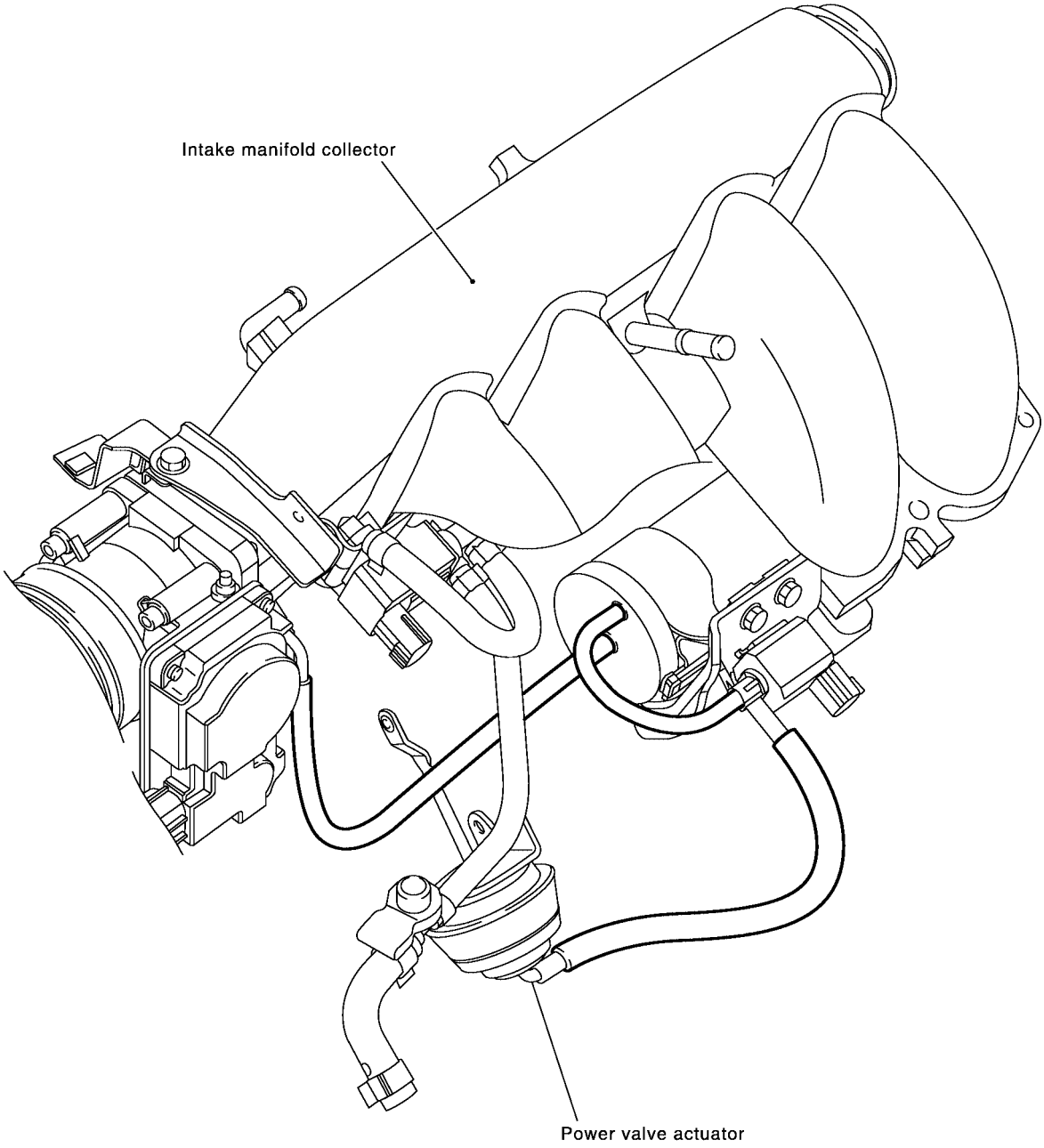
UBS0026V



PBIB1261E

Vacuum Hose Drawing

UBS0026W



PBIB1265E

Refer to EC-1236, "System Diagram" for Vacuum Control System.

System Chart

UBS0026X

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering oil pressure switch ● Ignition switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● Stop lamp switch ● ASCD steering switch ● ASCD brake switch ● ASCD clutch switch ● Fuel level sensor*1 ● EVAP control system pressure sensor ● Fuel tank temperature sensor*1 ● Heated oxygen sensor 2 *2 ● TCM (Transmission control module) *3 ● Air conditioner switch ● Vehicle speed sensor ● Electrical load signal	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	ASCD vehicle speed control	Electric throttle control actuator
	On board diagnostic system	MIL (On the instrument panel)
	Power valve control	VIAS control solenoid valve
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay
	Cooling fan control	Cooling fan relays
	ON BOARD DIAGNOSIS for EVAP system	● EVAP canister vent control valve ● Vacuum cut valve bypass valve

*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.
*2: This sensor is not used to control the engine system under normal conditions.
*3: The signal is sent to the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

UBS0026Y

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Fuel injection & mixture ratio control	Fuel injectors
Camshaft position sensor (PHASE)	Engine speed and piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Ignition switch	Start signal		
Knock sensor	Engine knocking condition		
Battery	Battery voltage		
Power steering oil pressure switch	Power steering operation		
Heated oxygen sensor 2 *	Density of oxygen in exhaust gas		
Vehicle speed sensor	Vehicle speed		
Air conditioner switch	Air conditioner operation		

*: Under normal conditions, this sensor is not for engine control operation.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the crankshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

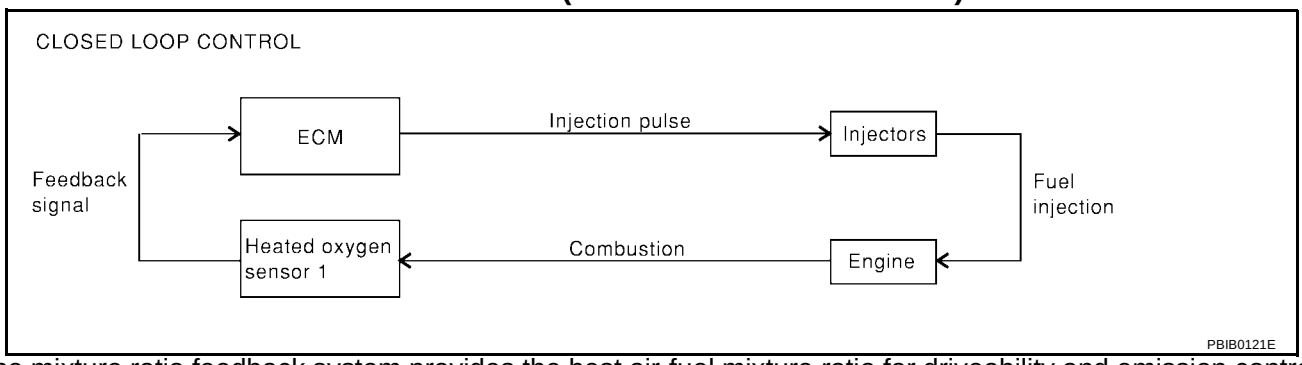
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (A/T models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-1406 . This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

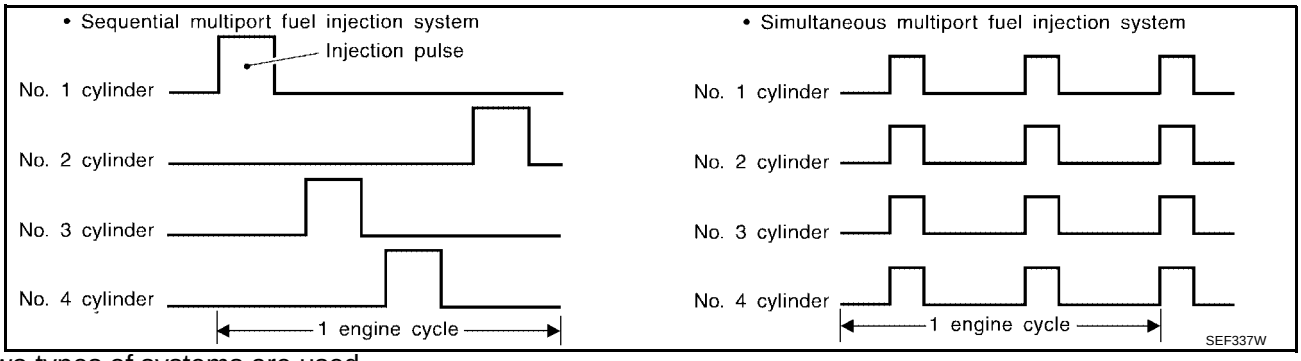
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (A/T models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

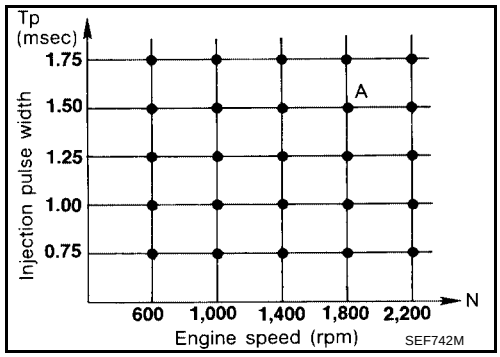
UBS0026Z

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Ignition timing control	Power transistor
Camshaft position sensor (PHASE)	Engine speed and piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Ignition switch	Start signal		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed		

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.



- At starting
- During warm-up
- At idle

- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

UBS00270

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle position		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering oil pressure switch	Power steering operation		
Vehicle speed sensor	Vehicle speed		

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Fuel Cut Control (at No Load and High Engine Speed)

UBS00271

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed sensor	Vehicle speed		

SYSTEM DESCRIPTION

If the engine speed is above 1,800 rpm with no load (for example, in neutral and engine speed over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

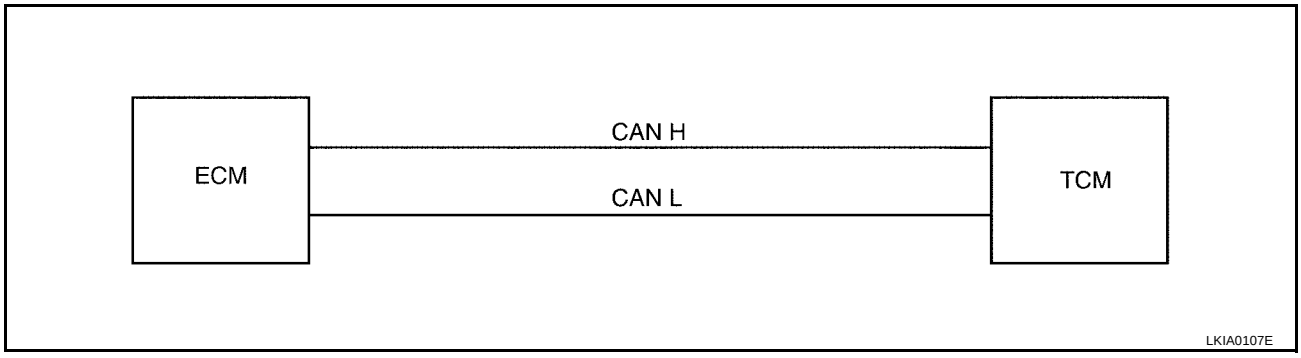
NOTE:
This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-1239 .

CAN communication

UBS00272

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	TCM
Accelerator pedal position signal	T	R
Output shaft revolution signal	R	T
A/T self-diagnosis signal	R	T
Wide open throttle position signal	T	R
Overdrive cancel signal	T	R

BASIC SERVICE PROCEDURE

PFP:00018

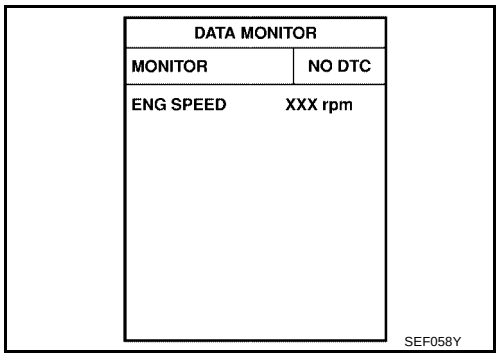
Idle Speed and Ignition Timing Check

UBS00273

IDLE SPEED

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.



With GST

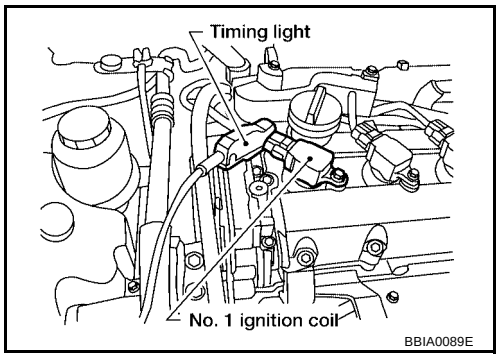
Check idle speed in “MODE 1” with GST.

IGNITION TIMING

Any of following two methods may be used.

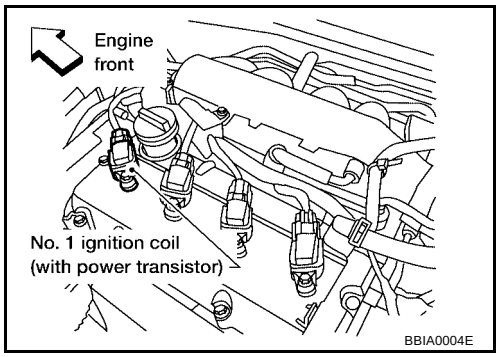
Method A

1. Slide the harness protector off ignition coil No. 1 to clear the wires.
2. Attach timing light to the wires as shown in the figure.
3. Check ignition timing.

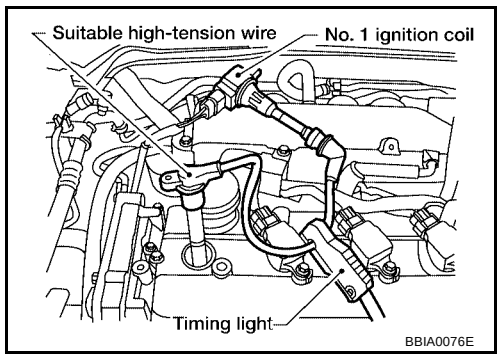


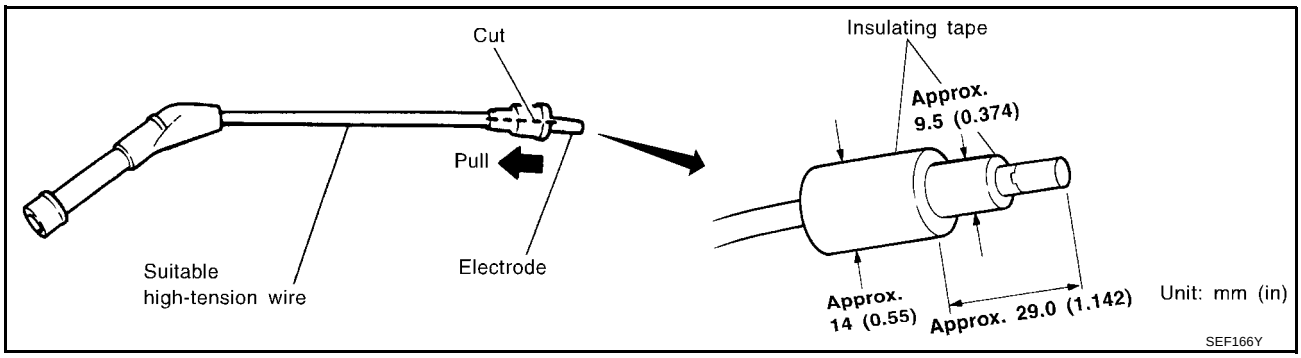
Method B

1. Remove No. 1 ignition coil.

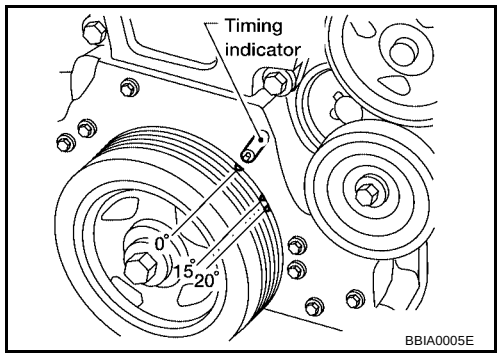


2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.



Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

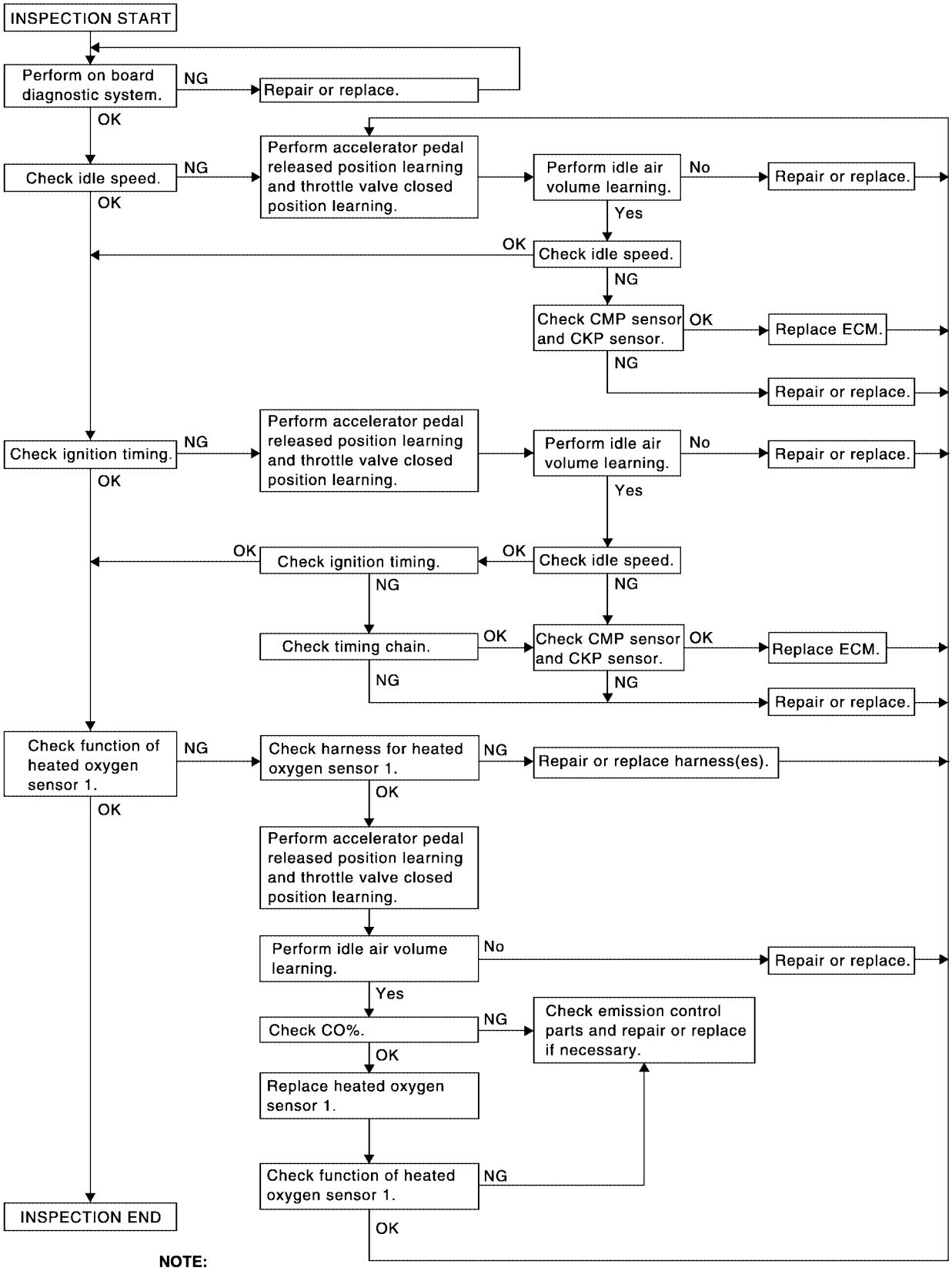
UBS00274

PREPARATION

1. Make sure that the following parts are in good order.
   - Battery
   - Ignition system
   - Engine oil and coolant levels
   - Fuses
   - ECM harness connector
   - Vacuum hoses
   - Air intake system
     (Oil filler cap, oil level gauge, etc.)
   - Fuel pressure
   - Engine compression
   - Throttle valve
   - Evaporative emission system
2. On air conditioner equipped models, checks should be carried out while the air conditioner is “OFF”.
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in “N” position.
4. When measuring “CO” percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear window defogger.

6. Keep front wheels pointed straight ahead.

OVERALL INSPECTION SEQUENCE



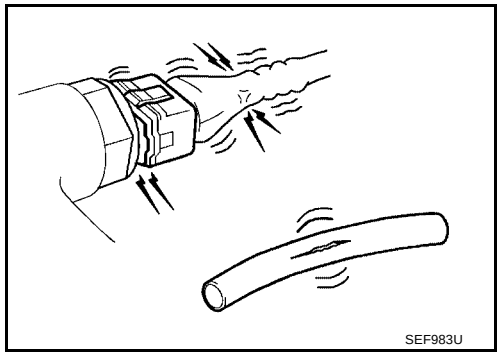
NOTE:
If a vehicle contains a part which is operating outside of design specifications with no MIL illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system cannot reasonably be expected to detect the resulting malfunction.

PBIB1054E

INSPECTION PROCEDURE

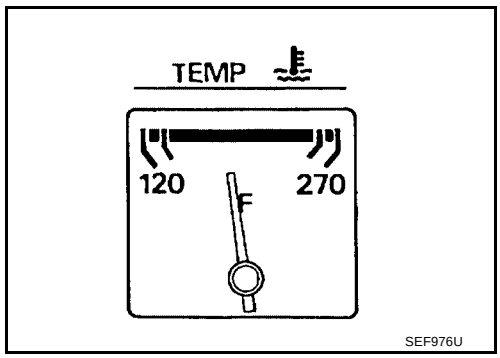
1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket


SEF983U

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.

4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.

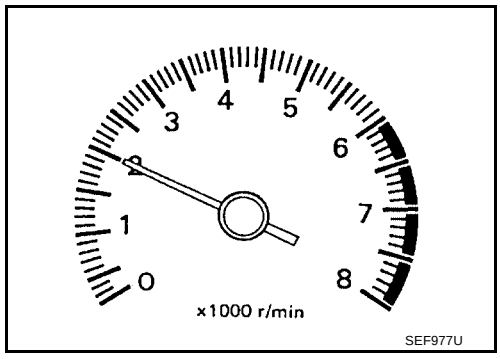


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

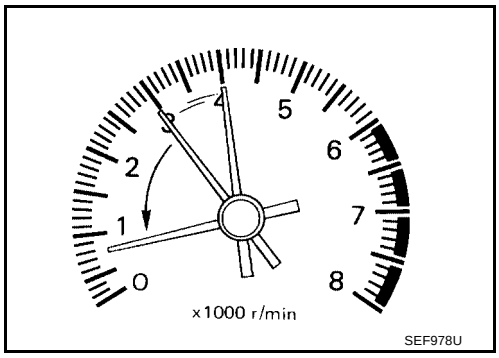
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

With CONSULT-II

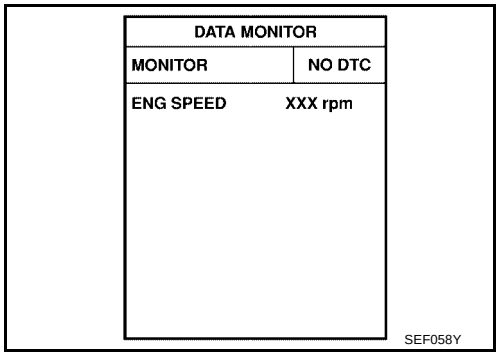
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm

A/T: 700 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 700 ± 50 rpm

A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-1255, "Idle Air Volume Learning" .
Is the ″Idle Air Volume Learning″ carried out successfully?
Yes or No

Yes >> GO TO 7.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1496 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1490 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 15 ± 5° BTDC

A/T: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK (With CONSULT-II)>>GO TO 19.
OK (Without CONSULT-II)>>GO TO 20.
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-1255, "Idle Air Volume Learning" .
Is the ″Idle Air Volume Learning″ carried out successfully?

Yes or No

Yes >> GO TO 14.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm

A/T: 700 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm

A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 15 ± 5° BTDC
A/T: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK (With CONSULT-II)>>GO TO 19.
OK (Without CONSULT-II)>>GO TO 20.
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-134, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1496 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1490 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

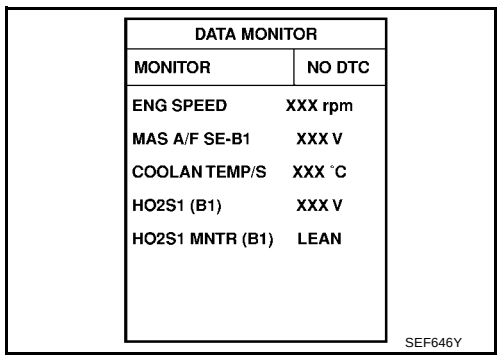
>> GO TO 4.

19. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.

1 time: RICH → LEAN → RICH
2 times: RICH → LEAN → RICH → LEAN → RICH



OK or NG

OK >> **INSPECTION END**
NG (Monitor does not fluctuate.)>>GO TO 21.
NG (Monitor fluctuates less than 5 times.)>>GO TO 28.

20. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

Without CONSULT-II

1. Stop engine and set ECM to Self-diagnostic mode II (Heated oxygen sensor 1 monitor). Refer to EC-1276, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
2. Start engine and run it at about 2,000 rpm for about 2 minutes under no-load.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the MIL comes on more than 5 times during 10 seconds.

OK or NG

OK >> **INDPECTION END**
NG (MIL does not come on)>>GO TO 21.
NG (MIL comes on less than 5 times)>>GO TO 28.

21. CHECK HEATED OXYGEN SENSOR 1 HARNESS

1. Turn ignition switch “OFF” and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect heated oxygen sensor 1 harness connector.
4. Check harness continuity between ECM terminal 92 and heated oxygen sensor 1 terminal 1. Refer to EC-1408, "Wiring Diagram" .

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 22.
NG >> 1. Repair or replace harness between ECM and heated oxygen sensor 1.
2. GO TO 4.

22. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Reconnect ECM harness connector.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 23.

23. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 24.

24. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1255, "Idle Air Volume Learning" .
Is the ″Idle Air Volume Learning″ carried out successfully?

Yes or No

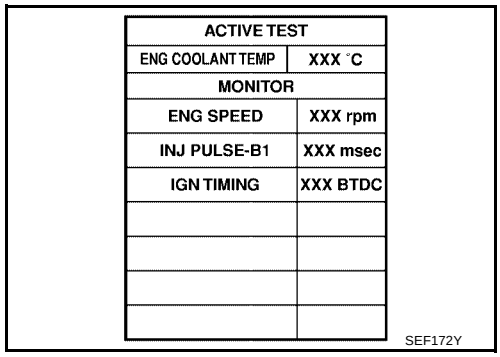
Yes (With CONSULT-II)>>GO TO 25.
Yes (Without CONSULT-II)>>GO TO 26.
No >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

25. CHECK “CO”%

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Select “ENG COOLANT TEMP” in “ACTIVE TEST” mode.
4. Set “ENG COOLANT TEMP” to 5°C (41°F) by touching “DWN” and “Qd”.
5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
6. Check “CO”%.

Idle CO: 0.3 – 9.5% and engine runs smoothly.



OK or NG

OK >> GO TO 28.
NG >> GO TO 27.

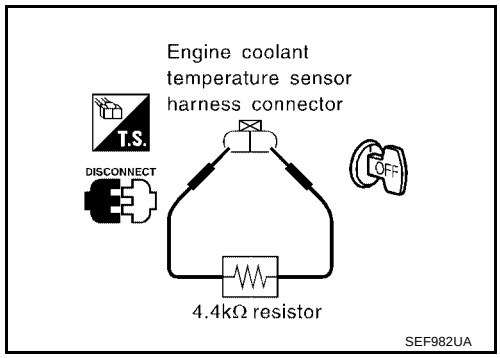
26. CHECK “CO”%

Without CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
2. Turn ignition switch “OFF”.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.
5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed.
6. Check “CO”%.

Idle CO: 0.3 – 9.5% and engine runs smoothly.

7. After checking “CO”%, turn ignition switch “OFF”, disconnect the resistor from the terminals of engine coolant temperature sensor harness connector, and then connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.



OK or NG

OK >> GO TO 28.
NG >> GO TO 27.

27. RECONNECT HEATED OXYGEN SENSOR 1 HARNESS CONNECTOR

1. Turn ignition switch “OFF”.
2. Reconnect heated oxygen sensor 1 harness connector.

>> GO TO 31.

28. REPLACE HEATED OXYGEN SENSOR 1

1. Stop engine.
2. Replace heated oxygen sensor 1.

With CONSULT-II>>GO TO 29.
Without CONSULT-II>>GO TO 30.

29. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

With CONSULT-II

1. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
2. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
3. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.

1 time: RICH → LEAN → RICH

2 times: RICH → LEAN → RICH → LEAN → RICH

OK or NG

OK >> GO TO 4.
NG >> GO TO 31.

30. CHECK HEATED OXYGEN SENSOR 1 SIGNAL

Without CONSULT-II

1. Set ECM to Self-diagnostic mode II (Heated oxygen sensor 1 monitor). Refer to EC-1277, "How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)" .
2. Running engine at 2,000 rpm under no-load (The engine is warmed up to normal operating temperature.), check that the MIL comes on more than 5 times during 10 seconds.

OK or NG

OK >> GO TO 4.
NG >> GO TO 31.

31. DETECT MALFUNCTIONING PART

Check the following.

- Check fuel pressure regulator and repair or replace if necessary. Refer to EC-1257, "Fuel Pressure Check" .
- Check mass air flow sensor and its circuit, and repair or replace if necessary. Refer to EC-1368 , EC-1375 and EC-1594 .
- Check injector and its circuit, and repair or replace if necessary. Refer to EC-1796 .
- Check engine coolant temperature sensor and its circuit, and repair or replace if necessary. Refer to EC-1386 and EC-1398 .

OK or NG

OK >> GO TO 33.
NG >> 1. Repair or replace.
2. GO TO 32.

32. ERASE UNNECESSARY DTC

After this inspection, unnecessary DTC might be displayed.
Erase the stored memory in ECM and TCM. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 4.

33. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

>> GO TO 4.

Accelerator Pedal Released Position Learning

UBS00275

DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

Throttle Valve Closed Position Learning

UBS00276

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

UBS00277

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

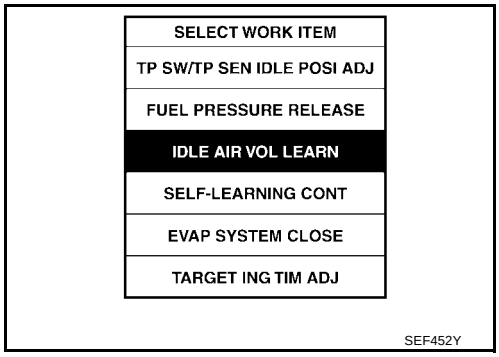
Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For A/T models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
  For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

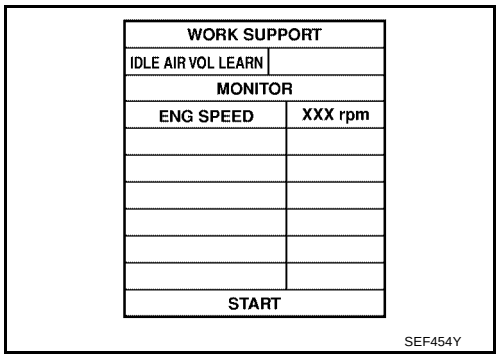
OPERATION PROCEDURE

With CONSULT-II

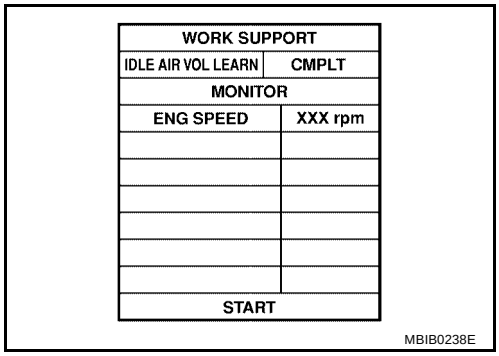
1. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.



6. Touch “START” and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “CMPLT” is not displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 700±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 15±5° BTDC A/T: 15±5° BTDC (in “P” or “N” position)

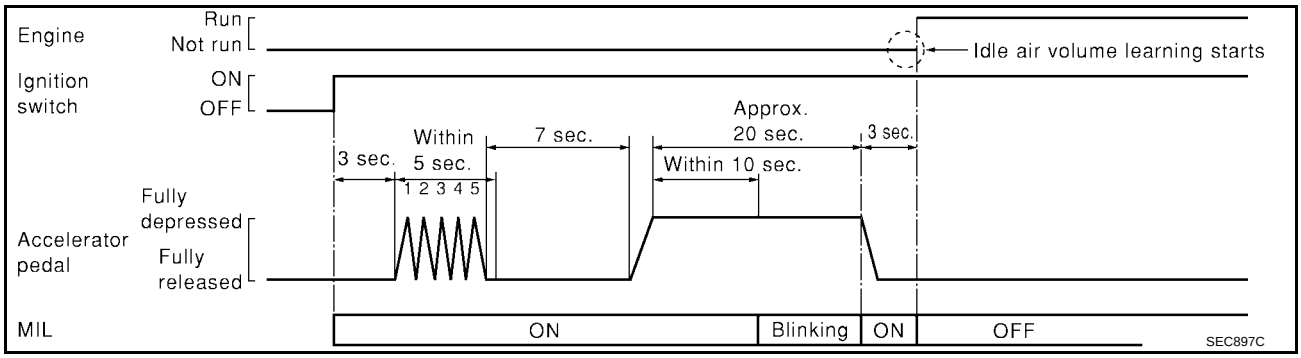
Without CONSULT-II

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PREPARATION” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.
8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MIL goes off.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 700±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 15±5° BTDC A/T: 15±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the incident by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.**
   It is useful to perform EC-1337, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform “Idle air volume learning” all over again:**

- **Engine stalls.**
- **Erroneous idle.**

Fuel Pressure Check

UBS00278

FUEL PRESSURE RELEASE

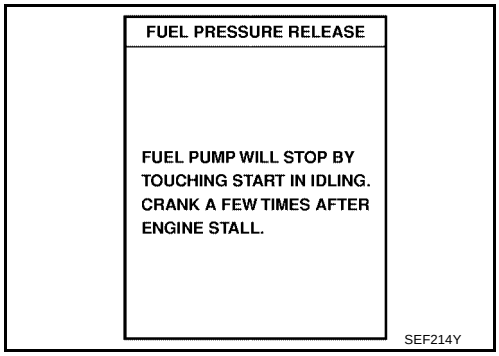
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because B15 models do not have fuel return system.

With CONSULT-II

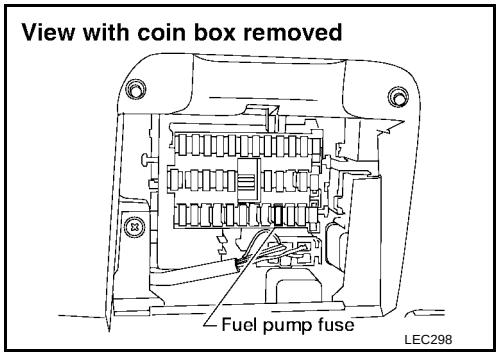
1. Turn ignition switch “ON”.

2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch “OFF”.



Without CONSULT-II

1. Remove fuel pump fuse.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch “OFF”.
5. Reinstall fuel pump fuse after servicing fuel system.

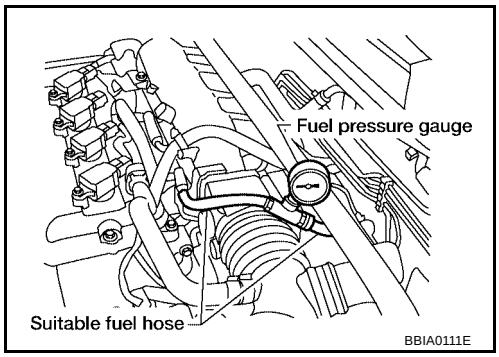


FUEL PRESSURE CHECK

CAUTION:

- **The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.**
- **Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains saleability with O-rings inside.**
- **Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C switch, etc.). Fuel pressure gauge may indicate false readings due to varying engine loads and changes in manifold vacuum.**

1. Release fuel pressure to zero. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Prepare fuel hose and fuel hose clamp for fuel pressure check, and connect fuel pressure gauge.
   - Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
   - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
   - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
   - Use fuel pressure gauge to check fuel pressure.
3. Remove fuel hose. Refer to EM-105, "INTAKE MANIFOLD" .
   - Do not twist or kink fuel hose because it is plastic hose.
   - Do not remove fuel hose from quick connector.
   - Keep the original fuel hose to be free from intrusion of dust or foreign substances with a suitable cover.
4. Install the fuel pressure gauge as shown in the figure.
   - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
   - Apply proper amount of gasoline between top of the fuel tube and No.1 spool.
   - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
   - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
   - When reconnecting fuel line, always use new clamps.
   - When reconnecting fuel hose, check the original fuel hose for damage and abnormality.

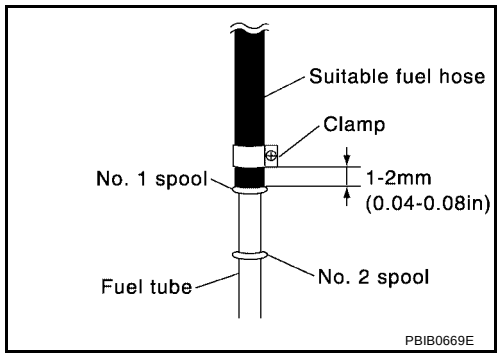


- Use a torque driver to tighten clamps.
- Install hose clamp to the position within 1 - 2 mm (0.04 - 0.08 in).

Tightening torque:

1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb.)

- Make sure that clamp screw does not contact adjacent parts.



5. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb.) to confirm fuel tube does not come off.
6. Turn ignition switch “ON”, and check for fuel leakage.
7. Start engine and check for fuel leakage.
8. Read the indication of fuel pressure gauge.
   - Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
   - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.

   At idling: Approximately 350 CPA (3.57 kg/cm^2 , 51 psi)
9. If result is unsatisfactory, go to next step.
10. Check the following.
    - Fuel hoses and fuel tubes for clogging
    - Fuel filter for clogging
    - Fuel pump
    - Fuel pressure regulator for clogging

    If OK, replace fuel pressure regulator.
    If NG, repair or replace.

ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

UBS00279

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information	SAE Mode
Diagnostic Trouble Code (DTC)	Mode 3 of SAE J1979
Freeze Frame data	Mode 2 of SAE J1979
System Readiness Test (SRT) code	Mode 1 of SAE J1979
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of SAE J1979
1st Trip Freeze Frame data	
Test values and Test limits	Mode 6 of SAE J1979
Calibration ID	Mode 9 of SAE J1979

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	×	×	×	×	×	—
GST	×	×*1	×	—	×	×
ECM	×	×*2	—	—	—	—

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.
*2: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-1290.)

Two Trip Detection Logic

UBS0027A

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up	Blinking	Lighting up				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnosis (refer to EC-1224, "INDEX FOR DTC")	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

Emission-related Diagnostic Information

UBS0027B

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
CAN COMM CIRCUIT	U1000	1000*5	—	—	—	EC-1350
CAN COMM CIRCUIT	U1001	1001*5	—	—	×	EC-1350
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	—	—
INT/V TIM CONT-B1	P0011	0011	—	—	×	EC-1353
HO2S1 HTR (B1)	P0031	0031	×	×	×*4	EC-1356
HO2S1 HTR (B1)	P0032	0032	×	×	×*4	EC-1356
HO2S2 HTR (B1)	P0037	0037	×	×	×*4	EC-1362
HO2S2 HTR (B1)	P0038	0038	×	×	×*4	EC-1362
MAF SEN/CIRCUIT	P0101	0101	—	—	×	EC-1368
MAF SEN/CIRCUIT	P0102	0102	—	—	—	EC-1375
MAF SEN/CIRCUIT	P0103	0103	—	—	—	EC-1375
IAT SEN/CIRCUIT	P0112	0112	—	—	×	EC-1381
IAT SEN/CIRCUIT	P0113	0113	—	—	×	EC-1381
ECT SEN/CIRCUIT	P0117	0117	—	—	—	EC-1386
ECT SEN/CIRCUIT	P0118	0118	—	—	—	EC-1386
TP SEN 2/CIRC	P0122	0122	—	—	—	EC-1391
TP SEN 2/CIRC	P0123	0123	—	—	—	EC-1391
ECT SENSOR	P0125	0125	—	—	—	EC-1398
IAT SENSOR	P0127	0127	—	—	×	EC-1401
THERMSTAT FNCTN	P0128	0128	—	—	×	EC-1404
HO2S1 (B1)	P0132	0132	×	×	×*4	EC-1406
HO2S1 (B1)	P0133	0133	×	×	×*4	EC-1412
HO2S1 (B1)	P0134	0134	×	×	×*4	EC-1421
HO2S2 (B1)	P0138	0138	×	×	×*4	EC-1428
HO2S2 (B1)	P0139	0139	×	×	×*4	EC-1435
FUEL SYS-LEAN-B1	P0171	0171	—	—	×	EC-1442
FUEL SYS-RICH-B1	P0172	0172	—	—	×	EC-1449
FTT SENSOR	P0181	0181	—	—	×	EC-1455
FTT SEN/CIRCUIT	P0182	0182	—	—	×	EC-1457
FTT SEN/CIRCUIT	P0183	0183	—	—	×	EC-1457
ENG OVER TEMP	P0217	0217	—	—	—	EC-1461
TP SEN 1/CIRC	P0222	0222	—	—	—	EC-1475
TP SEN 1/CIRC	P0223	0223	—	—	—	EC-1475
MULTI CYL MISFIRE	P0300	0300	—	—	×	EC-1481
CYL 1 MISFIRE	P0301	0301	—	—	×	EC-1481
CYL 2 MISFIRE	P0302	0302	—	—	×	EC-1481
CYL 3 MISFIRE	P0303	0303	—	—	×	EC-1481
CYL 4 MISFIRE	P0304	0304	—	—	×	EC-1481

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
KNOCK SEN/CIRC-B1	P0327	0327	—	—	×	EC-1486
KNOCK SEN/CIRC-B1	P0328	0328	—	—	×	EC-1486
CKP SEN/CIRCUIT	P0335	0335	—	—	×	EC-1490
CMP SEN/CIRC-B1	P0340	0340	—	—	×	EC-1496
TW CATALYST SYS-B1	P0420	0420	×	×	×*4	EC-1502
EVAP PURG FLOW/MON	P0441	0441	×	×	×*4	EC-1507
EVAP SMALL LEAK	P0442	0442	×	×	×*4	EC-1513
PURG VOLUME CONT/V	P0444	0444	—	—	×	EC-1521
PURG VOLUME CONT/V	P0445	0445	—	—	×	EC-1521
VENT CONTROL VALVE	P0447	0447	—	—	×	EC-1527
EVAP SYS PRES SEN	P0452	0452	—	—	×	EC-1534
EVAP SYS PRES SEN	P0453	0453	—	—	×	EC-1540
EVAP GROSS LEAK	P0455	0455	—	×	×*4	EC-1547
EVAP VERY SML LEAK	P0456	0456	×*3	×	×*4	EC-1555
FUEL LEV SEN SLOSH	P0460	0460	—	—	×	EC-1564
FUEL LEVEL SENSOR	P0461	0461	—	—	×	EC-1569
FUEL LEVL SEN/CIRC	P0462	0462	—	—	×	EC-1571
FUEL LEVL SEN/CIRC	P0463	0463	—	—	×	EC-1571
VEH SPEED SEN/CIRC*6	P0500	0500	—	—	×	EC-1575
ISC SYSTEM	P0506	0506	—	—	×	EC-1579
ISC SYSTEM	P0507	0507	—	—	×	EC-1581
ECM	P0605	0605	—	—	×	EC-1583
MIL/CIRC	P0650	0650	—	—	×	EC-1586
PNP SW/CIRC	P0705	0705	—	—	×	AT-491
ATF TEMP SEN/CIRC	P0710	0710	—	—	×	AT-497
VEH SPD SEN/CIR AT*6	P0720	0720	—	—	×	AT-503
ENGINE SPEED SIG	P0725	0725	—	—	×	AT-508
A/T 1ST GR FNCTN	P0731	0731	—	—	×	AT-512
A/T 2ND GR FNCTN	P0732	0732	—	—	×	AT-517
A/T 3RD GR FNCTN	P0733	0733	—	—	×	AT-522
A/T 4TH GR FNCTN	P0734	0734	—	—	×	AT-527
TCC SOLENOID/CIRC	P0740	0740	—	—	×	AT-534
A/T TCC S/V FNCTN	P0744	0744	—	—	×	AT-539
L/PRESS SOL/CIRC	P0745	0745	—	—	×	AT-547
SFT SOL A/CIRC	P0750	0750	—	—	—	AT-553
SFT SOL B/CIRC	P0755	0755	—	—	—	AT-558
ECM BACK UP/CIRC	P1065	1065	—	—	×	EC-1590
MAF SENSOR	P1102	1102	—	—	—	EC-1594
INT/V TIM V/CIR-B1	P1111	1111	—	—	×	EC-1600
ETC ACTR	P1121	1121	—	—	— or ×	EC-1604
ETC FUNCTION/CIRC	P1122	1122	—	—	—	EC-1606

Items (CONSULT-II screen terms)	DTC*1 *2		SRT code	Test value/ Test limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST	ECM				
ETC MOT PWR	P1124	1124	—	—	—	EC-1613
ETC MOT PWR	P1126	1126	—	—	—	EC-1613
ETC MOT	P1128	1128	—	—	—	EC-1618
HO2S1 (B1)	P1143	1143	×	×	×*4	EC-1623
HO2S1 (B1)	P1144	1144	×	×	×*4	EC-1629
HO2S2 (B1)	P1146	1146	×	×	×*4	EC-1635
HO2S2 (B1)	P1147	1147	×	×	×*4	EC-1642
CLOSED LOOP-B1	P1148	1148	—	—	—	EC-1649
ENG OVER TEMP	P1217	1217	—	—	—	EC-1651
CTP LEARNING	P1225	1225	—	—	×	EC-1664
CTP LEARNING	P1226	1226	—	—	×	EC-1666
SENSOR POWER/CIRC	P1229	1229	—	—	—	EC-1668
PURG VOLUME CONT/V	P1444	1444	—	—	×	EC-1672
VENT CONTROL VALVE	P1446	1446	—	—	×	EC-1680
VENT CONTROL VALVE	P1448	1448	—	—	×	EC-1687
EVAP VERY SML LEAK	P1456	1456	×*3	×	×*4	EC-1695
FUEL LEVEL SEN/CIRC	P1464	1464	—	—	×	EC-1704
VC/V BYPASS/V	P1490	1490	—	—	×	EC-1707
VC CUT/V BYPASS/V	P1491	1491	—	—	×	EC-1714
ASCD SW	P1564	1564	—	—	—	EC-1723
ASCD BRAKE SW	P1572	1572	—	—	—	EC-1730
ASCD VHL SPD SEN	P1574	1574	—	—	—	EC-1740
TPV SEN/CIRC A/T	P1705	1705	—	—	—	AT-563
P-N POS SW/CIRCUIT	P1706	1706	—	—	×	EC-1742
O/R CLTCH SOL/CIRC	P1760	1760	—	—	×	AT-568
BRAKE SW/CIRCUIT	P1805	1805	—	—	×	EC-1746
APP SEN 1/CIRC	P2122	2122	—	—	—	EC-1751
APP SEN 1/CIRC	P2123	2123	—	—	—	EC-1751
APP SEN 2/CIRC	P2127	2127	—	—	—	EC-1757
APP SEN 2/CIRC	P2128	2128	—	—	—	EC-1757
TP SENSOR	P2135	2135	—	—	—	EC-1763
APP SENSOR	P2138	2138	—	—	—	EC-1770

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by SAE J2012.
*3: SRT code will not be set if the self-diagnostic result is NG.
*4: These are not displayed with GST.
*5: The troubleshooting for this DTC needs CONSULT-II.
*6: When the fail-safe operations for both self-diagnoses occur at the same time, the MIL illuminates.

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required

driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
For malfunctions in which 1st trip DTCs are displayed, refer to EC-1261, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" . These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-II.
1st trip DTC is specified in Mode 7 of SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-1285, "WORK FLOW" . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

WITH CONSULT-II

WITH GST

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P1148, P1706, etc.
These DTCs are prescribed by SAE J2012.
(CONSULT-II also displays the malfunctioning component or system.)

NO TOOLS

The number of blinks of the MIL in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0340, 1148, 1706, etc.
These DTCs are controlled by NISSAN.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST or the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

PBIB0911E

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-1320, "Freeze Frame Data and 1st Trip Freeze Frame Data" .

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-1261, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" .

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:

The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If MIL is “ON” during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”) and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item (CONSULT-II indication)	Perfor-mance Priority*1	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
EVAP SYSTEM	1	EVAP control system	P0442
	2	EVAP control system	P0456, P1456
	2	EVAP control system purge flow monitoring	P0441
HO2S	2	Heated oxygen sensor 1	P0132
		Heated oxygen sensor 1	P0133
		Heated oxygen sensor 1	P0134
		Heated oxygen sensor 1	P1143
		Heated oxygen sensor 1	P1144
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139
		Heated oxygen sensor 2	P1146
		Heated oxygen sensor 2	P1147
HO2S HTR	2	Heated oxygen sensor 1 heater	P0031, P0032
		Heated oxygen sensor 2 heater	P0037, P0038

*1: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT-II.

SRT Set Timing

SRT is set as “CMPLT” after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON →	OFF	← ON →	OFF ← ON → OFF ← ON →
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MIL “ON”)
		SRT of EGR	“INCMP”	“INCMP”	“INCMP”	“CMPLT”

OK: Self-diagnosis is carried out and the result is OK.
NG: Self-diagnosis is carried out and the result is NG.
—: Self-diagnosis is not carried out.

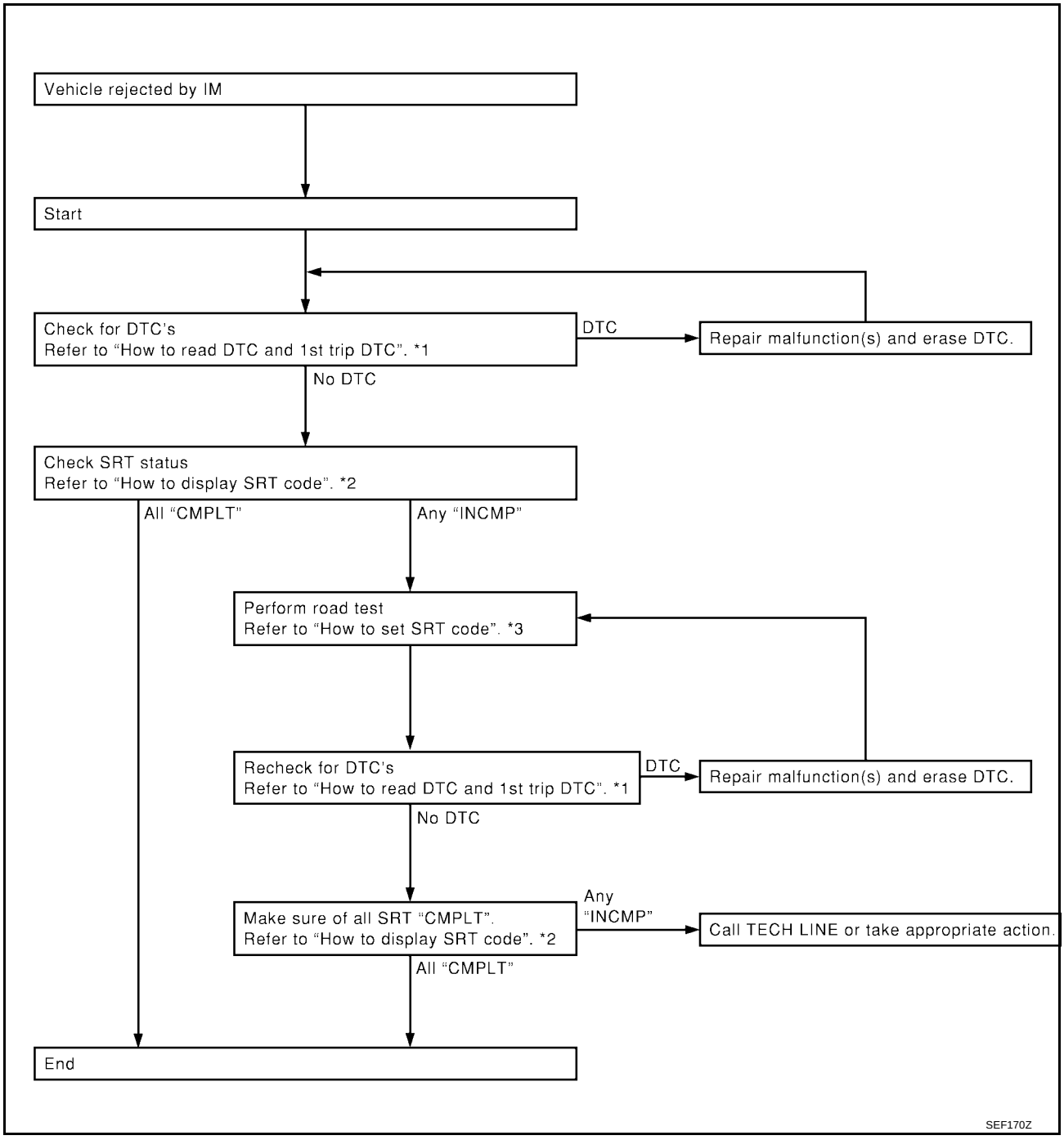
When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above
When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above
If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above
The table above shows that the minimum number of cycles for setting SRT as “INCMP” is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to “CMPLT” of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:
SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

SRT Service Procedure

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating “INCMP”, review the flowchart diagnostic sequence on the next page.



*1 EC-1264 *2 EC-1268 *3 EC-1269

How to Display SRT Code

WITH CONSULT-II

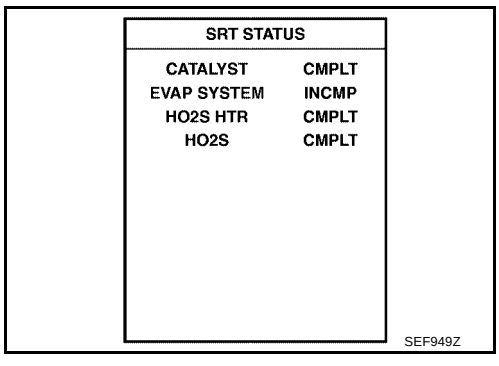
Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.

For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.

A sample of CONSULT-II display for SRT code is shown at right.

"INCMP" means the self-diagnosis is incomplete and SRT is not set.

"CMPLT" means the self-diagnosis is complete and SRT is set.



WITH GST

Selecting Mode 1 with GST (Generic Scan Tool)

How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

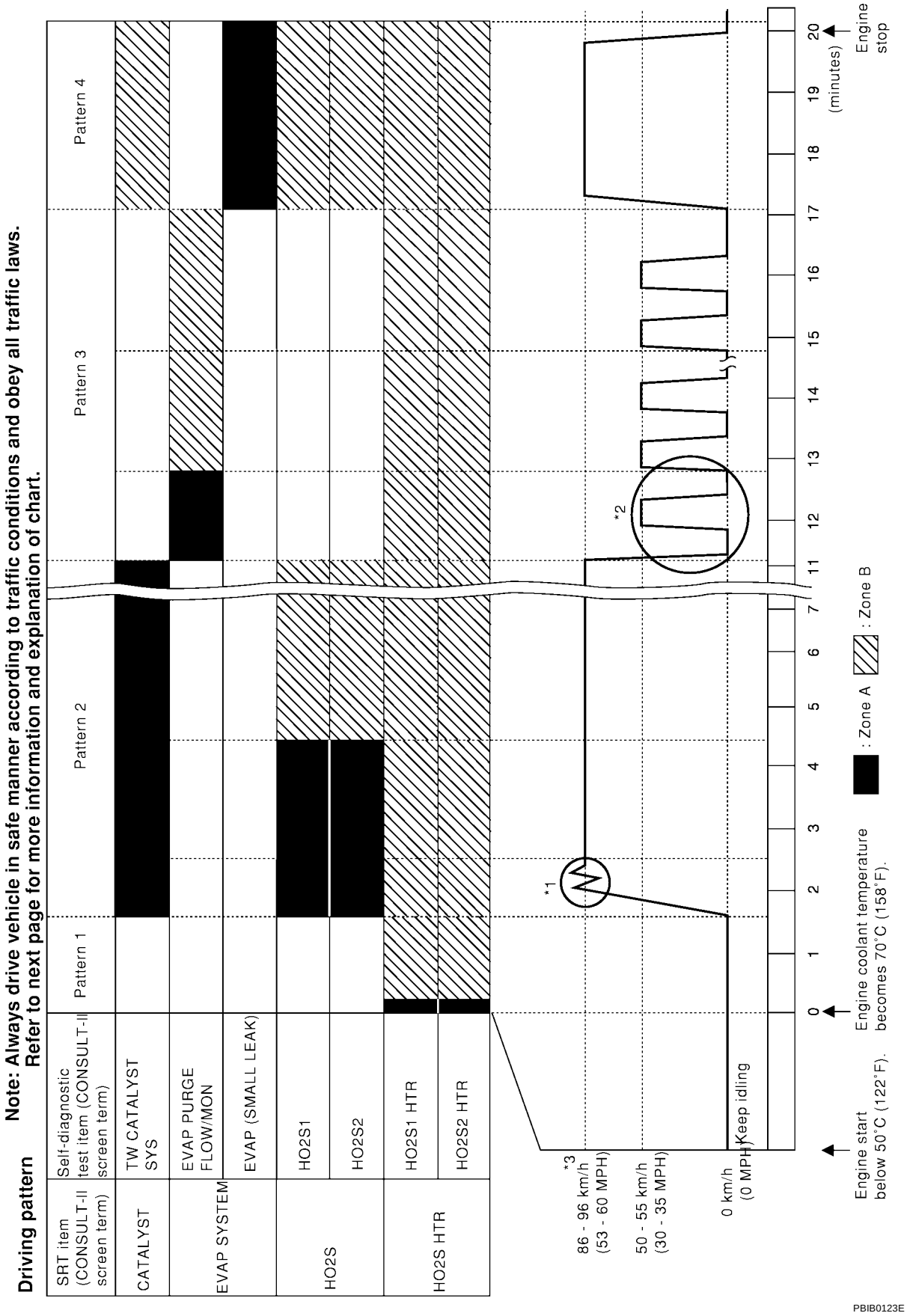
WITH CONSULT-II

Perform corresponding DTC Confirmation Procedure one by one based on “Performance Priority” in the table on EC-1266, "SRT Item" .

WITHOUT CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern



- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 93 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 93 and ground is lower than 1.4V).**
- **The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 70 and ground is less than 4.1V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

Pattern 3:

- The driving pattern outlined in *2 must be repeated at least 3 times.

Pattern 4:

- Tests are performed after the engine has been operated for at least 17 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.

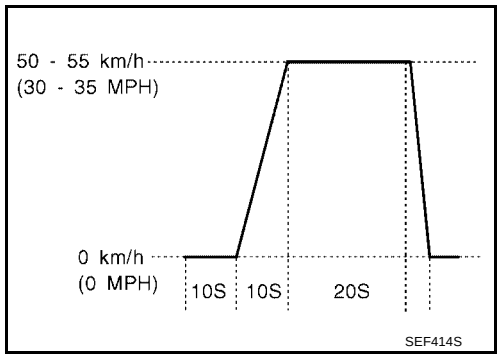
*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Operate the vehicle in the following driving pattern.

1. Decelerate vehicle to 0 km/h (0 MPH) and let engine idle.
2. Repeat driving pattern shown at right at least 10 times.

– **During acceleration, hold the accelerator pedal as steady as possible.**

*3: Checking the vehicle speed with GST is advised.



Suggested Transmission Gear Position for A/T Models

Set the selector lever in the “D” position with the overdrive switch turned ON.

Suggested Upshift Speeds for M/T Models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

Model with 5-speed

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:		For normal acceleration in high altitude areas [over 1,219 m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)	km/h (MPH)
1st to 2nd	24 (15)	24 (15)	24 (15)
2nd to 3rd	40 (25)	29 (18)	40 (25)
3rd to 4th	58 (36)	48 (30)	64 (40)
4th to 5th	64 (40)	62 (39)	72 (45)

Model with 6-speed

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:		For normal acceleration in high altitude areas [over 1,219 m (4,000 ft)]:	
Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)
1st to 2nd	26 (16)	16 (10)	26 (16)	24 (15)
2nd to 3rd	42 (26)	23 (14)	42 (26)	40 (25)
3rd to 4th	55 (34)	40 (25)	64 (40)	64 (40)
4th to 5th	66 (41)	60 (37)	72 (45)	72 (45)
5th to 6th	72 (45)	72 (45)	80 (50)	80 (50)

Suggested Maximum Speed in Each Gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.
Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted sped limits and drive according to the road conditions to ensure sage operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

Model with 5-speed

Gear	km/h (MPH)
1st	55 (35)
2nd	95 (60)
3rd	135 (85)
4th	—
5th	—

Model with 6-speed

Gear	km/h (MPH)
1st	45 (25)
2nd	80 (50)
3rd	130 (80)
4th	—
5th	—
6th	

TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-II)

The following is the information specified in Mode 6 of SAE J1979.
The test value is a parameter used to determine whether a system/circuit diagnostic test is “OK” or “NG” while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items (18 test items).

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

×: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function	01H	01H	Max.	×
		02H	81H	Min.	×
EVAP SYSTEM	EVAP control system (Small leak)	05H	03H	Max.	×
	EVAP control system purge flow monitoring	06H	83H	Min.	×
	EVAP control system (Very small leak)	07H	03H	Max.	×
HO2S	Heated oxygen sensor 1	09H	04H	Max.	×
		0AH	84H	Min.	×
		0BH	04H	Max.	×
		0CH	04H	Max.	×
		0DH	04H	Max.	×
	Heated oxygen sensor 2	19H	86H	Min.	×
		1AH	86H	Min.	×
		1BH	06H	Max.	×
		1CH	06H	Max.	×
HO2S HTR	Heated oxygen sensor 1 heater	29H	08H	Max.	×
		2AH	88H	Min.	×
	Heated oxygen sensor 2 heater	2DH	0AH	Max.	×
		2EH	8AH	Min.	×

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC (With CONSULT-II)

The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.
If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

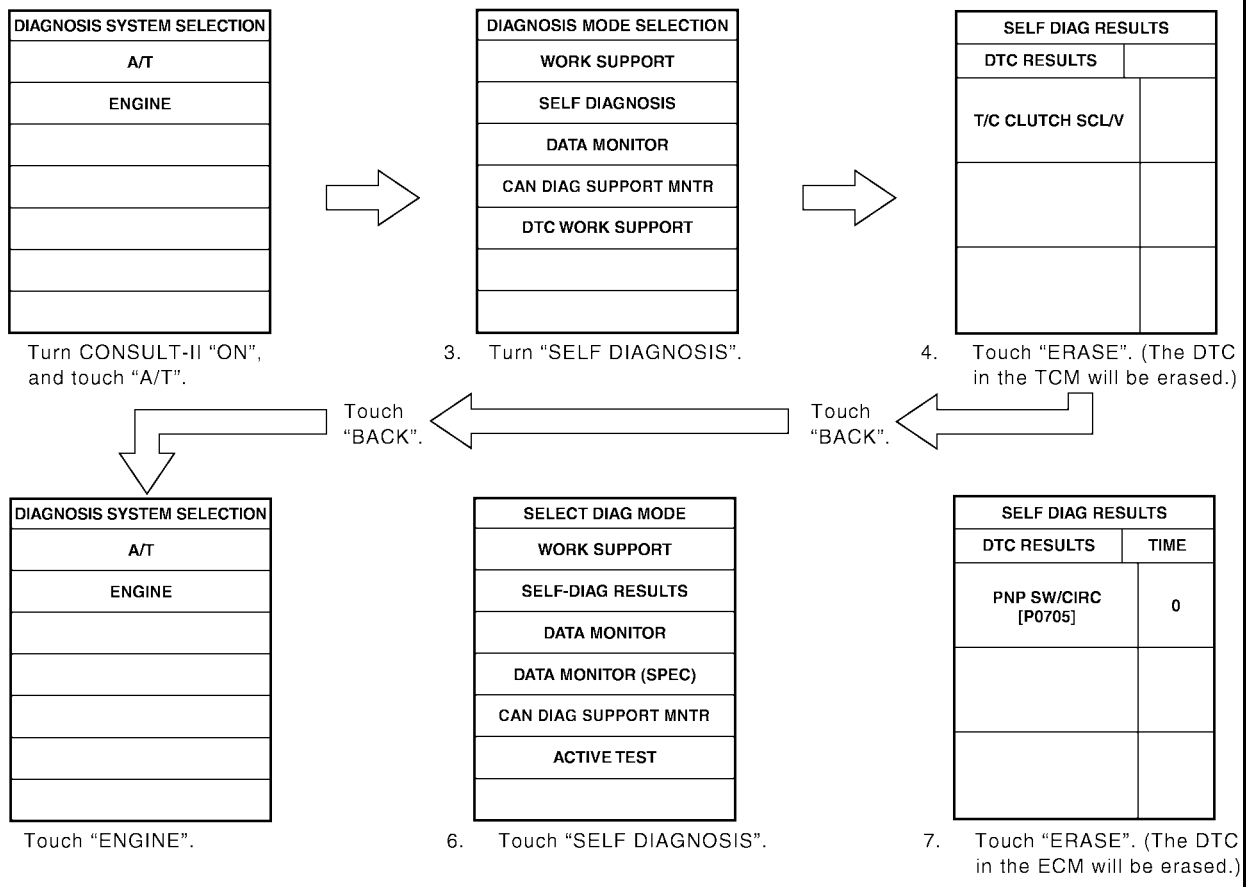
NOTE:
If the DTC is not for A/T related items (see EC-1224), skip steps 2 through 4.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “A/T”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. [The DTC in the TCM (Transmission control module) will be erased.] Then touch “BACK” twice.
5. Touch “ENGINE”.
6. Touch “SELF-DIAG RESULTS”.

7. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.



How to Erase DTC (With GST)

The emission related diagnostic information in the ECM can be erased by selecting Mode 4 with GST.

NOTE:
If the DTC is not for A/T related items (see EC-1224), skip step 2.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Perform “SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)” in AT section titled “TROUBLE DIAGNOSIS”, “Self-diagnosis”. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

How to Erase DTC (No Tools)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once.
2. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-1276, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

– Diagnostic trouble codes
– 1st trip diagnostic trouble codes
– Freeze frame data
– 1st trip freeze frame data

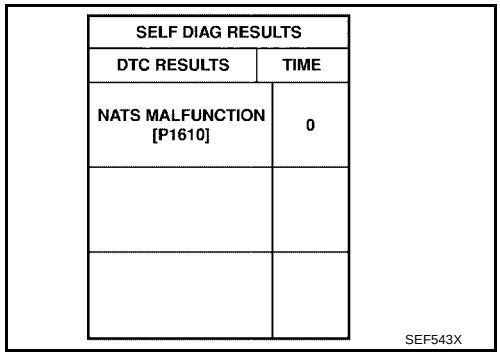
- System readiness test (SRT) codes
- Test values
- Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

NVIS (Nissan Vehicle Immobilizer System — NATS)

UBS0027C

- **If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to BL-95, "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)" .**
- **Confirm no self-diagnostic results of NVIS (NATS) is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NVIS (NATS) initialization and NVIS (NATS) ignition key ID registration, refer to CONSULT-II operation manual, IVIS/NVIS.



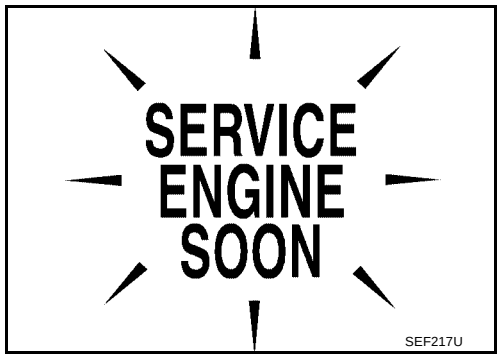
Malfunction Indicator Lamp (MIL)

UBS0027D

DESCRIPTION

The MIL is located on the instrument panel.

1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not light up, refer to DI-27, "WARNING LAMPS" , or see EC-1586 .
2. When the engine is started, the MIL should go off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.



ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position Engine stopped	BULB CHECK	This function checks the MIL bulb for damage (blown, open circuit, etc.). If the MIL does not come on, check MIL circuit.
	Engine running	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip. ● “Misfire (Possible three way catalyst damage)” ● One trip detection diagnosis
Mode II	Ignition switch in “ON” position Engine stopped	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

MIL Flashing Without DTC

If the ECM is in Diagnostic Test Mode II, MIL may flash when engine is running. In this case, check ECM diagnostic test mode. EC-1276, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later.EC-1276, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned “OFF”.**

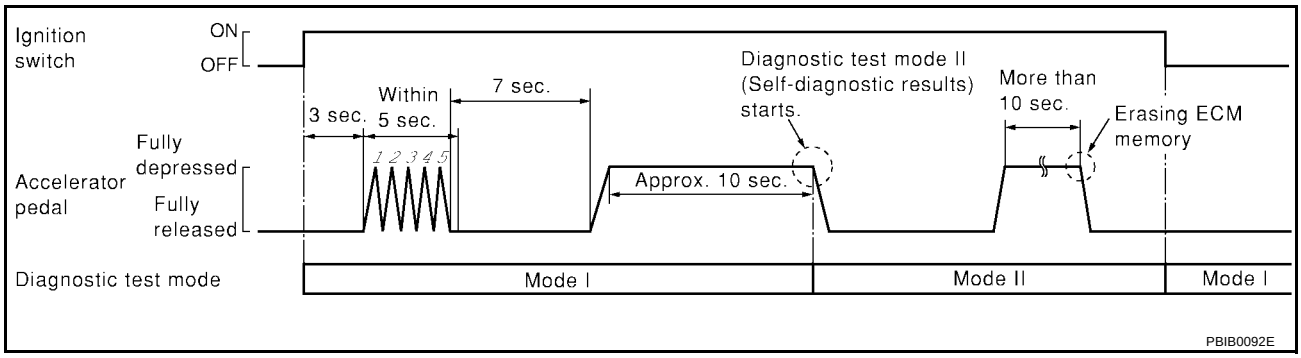
How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MIL starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-1277, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-1277, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-27, "WARNING LAMPS" or see EC-1586 .

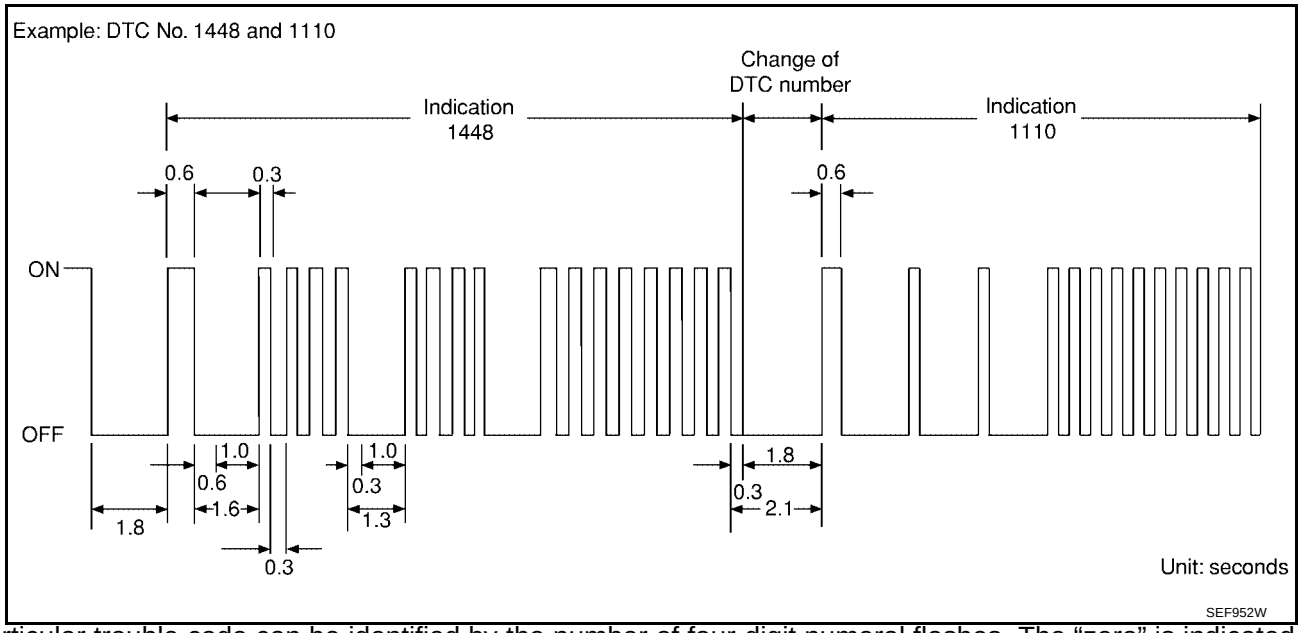
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MIL	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below.
The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-II or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-1224, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-1277, "How to Erase Diagnostic Test Mode II (Self-diagnostic Results)" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MIL displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MIL	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MIL comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

OBD System Operation Chart

UBS0027E

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to EC-1260, "Two Trip Detection Logic" .

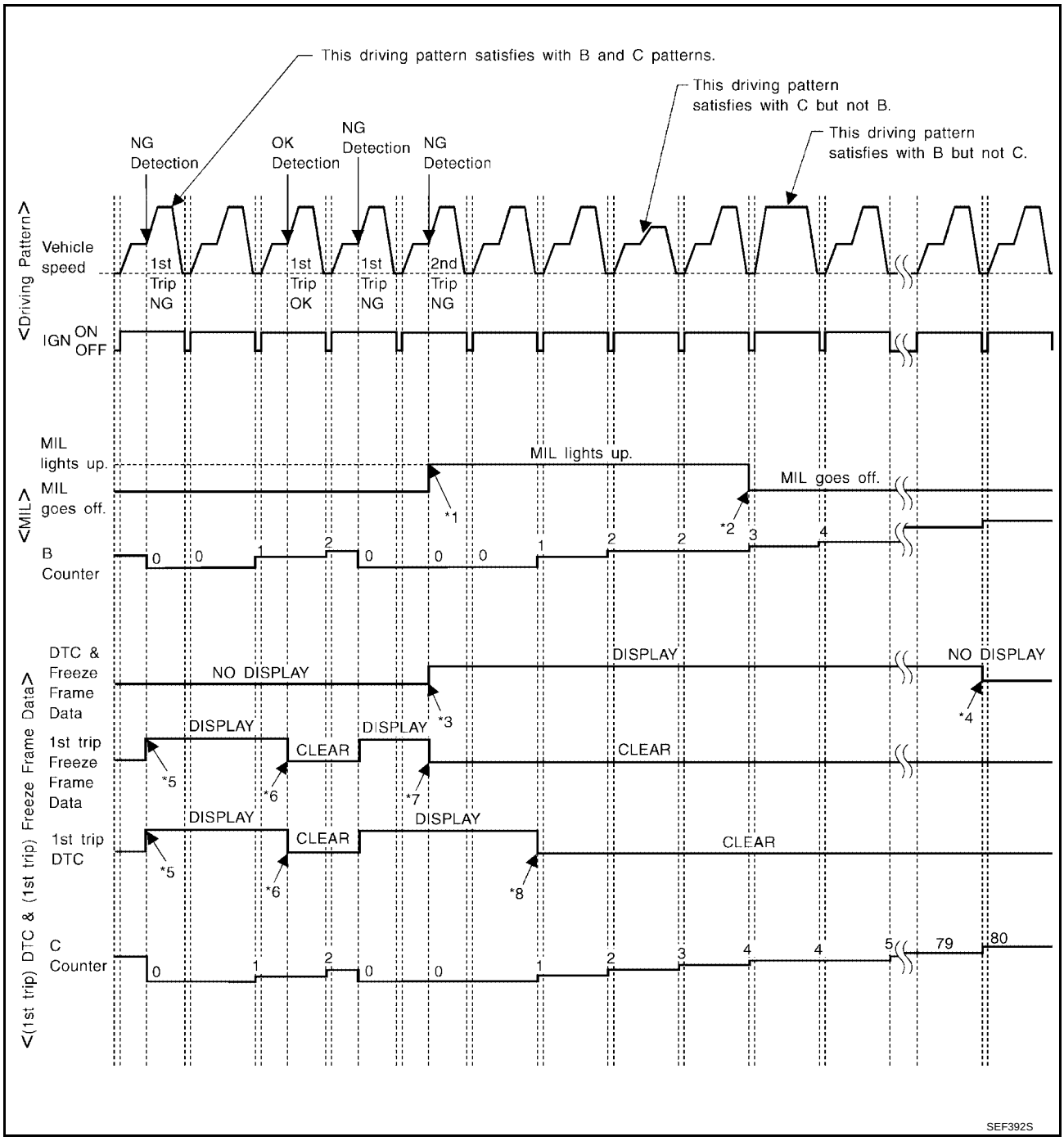
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in “OK” for the 2nd trip.

SUMMARY CHART

Items	Fuel Injection System	Misfire	Other
MIL (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

For details about patterns “B” and “C” under “Fuel Injection System” and “Misfire”, see EC-1281 .
For details about patterns “A” and “B” under “Other”, see EC-1283 .
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will go off when the B counter reaches 3. (*2 in “OBD SYSTEM OPERATION CHART”)

<Driving Pattern C>

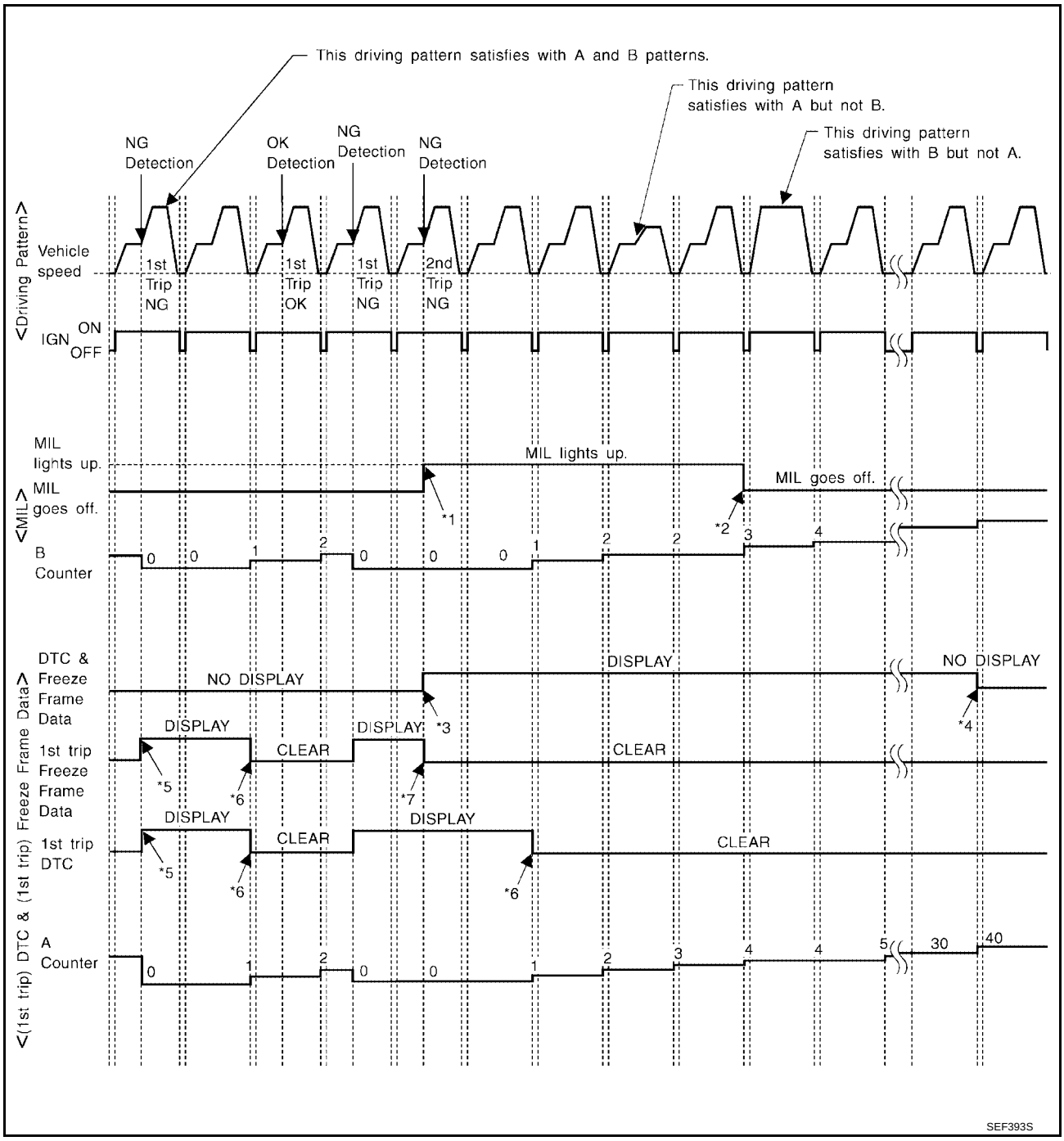
Driving pattern C means the vehicle operation as follows:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), “T” should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), “T” should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of the vehicle conditions described above.
- The C counter will be counted up when the vehicle conditions described above is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

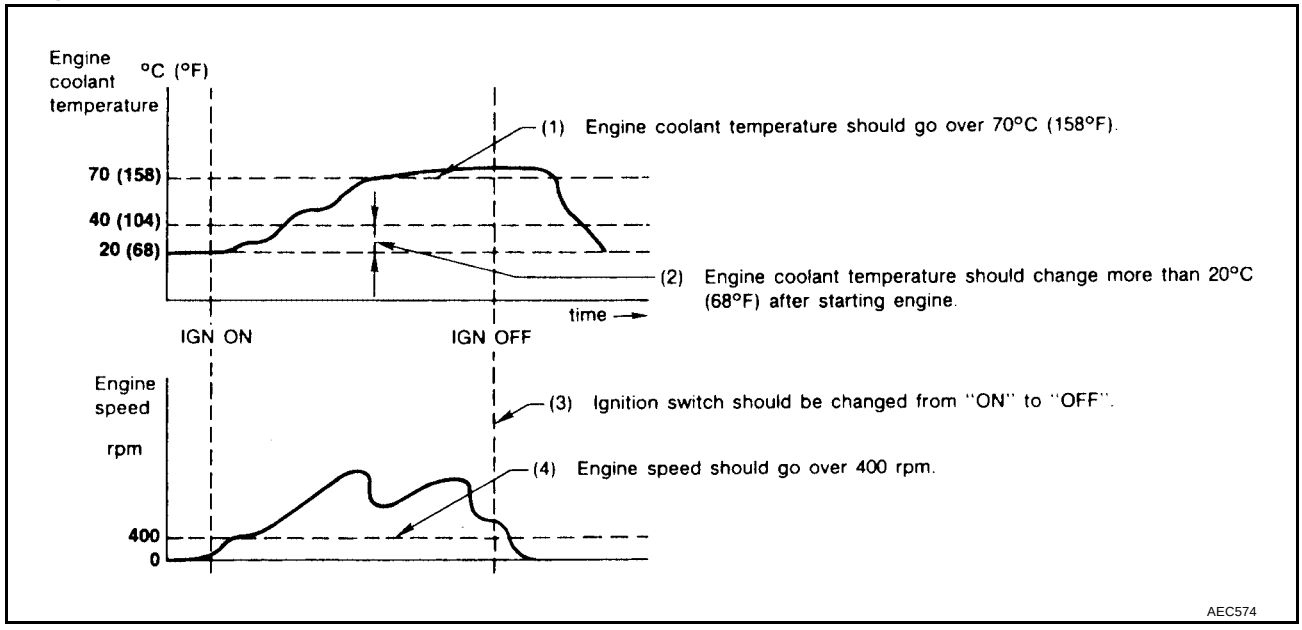
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").

TROUBLE DIAGNOSIS

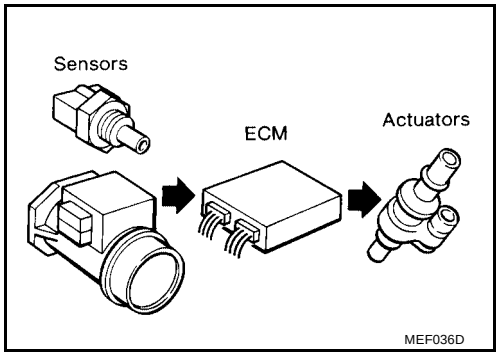
PFP:00004

Trouble Diagnosis Introduction

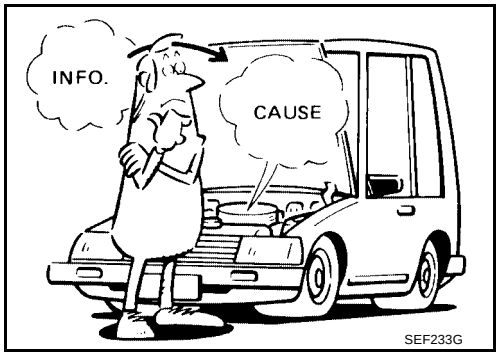
UBS0027F

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.



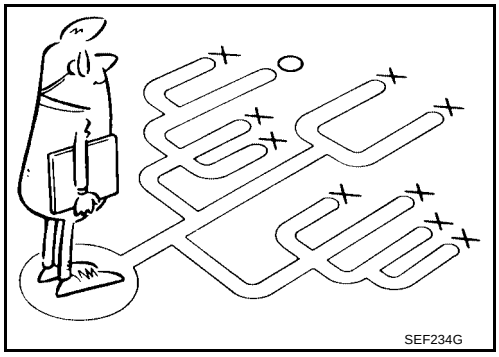
It is much more difficult to diagnose a incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



A visual check only may not find the cause of the incidents. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-1285 .

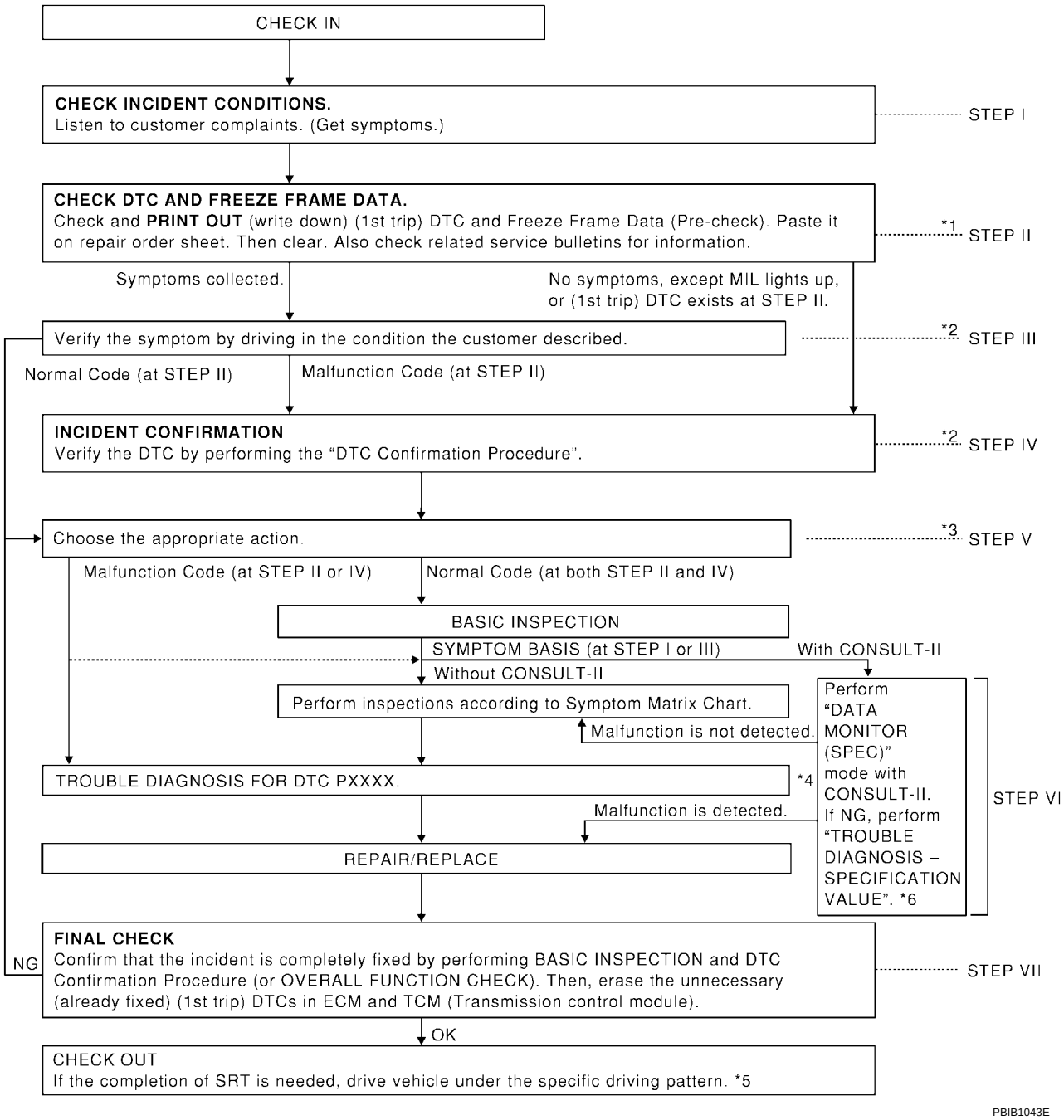
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-1288 should be used.

Start your diagnosis by looking for “conventional” incidents first. This will help troubleshoot driveability incidents on an electronically controlled engine vehicle.



WORK FLOW

Flow Chart



PBIB1043E

*1 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2 If the incident cannot be verified, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-1342, "POWER SUPPLY CIRCUIT FOR ECM" .

*4 If malfunctioning part cannot be detected, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5 EC-1270

*6 EC-1337

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-1287 .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or GST) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-1273 .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-1295 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-1291 .) If CONSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TROUBLE DIAGNOSIS – SPECIFICATION VALUE”. (Refer to EC-1337 .) (If malfunction is detected, proceed to “REPAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-1295 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-1307 , EC-1331 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to “Circuit Inspection” in GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" . Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and AT-430, "HOW TO ERASE DTC" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.
Some conditions may cause the MIL to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

UBS0027G

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-1350 .

Priority	Detected items (DTC)
1	● U1000 U1001 CAN communication line ● P0101 P0102 P0103 P1102 Mass air flow sensor ● P0112 P0113 P0127 Intake air temperature sensor ● P0117 P0118 P0125 Engine coolant temperature sensor ● P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor ● P0128 Thermostat function ● P0181 P0182 P0183 Fuel tank temperature sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0460 P0461 P0462 P0463 P1464 Fuel level sensor ● P0500 Vehicle speed sensor ● P0605 ECM ● P1229 Sensor power supply ● P1610-P1615 NATS ● P1706 Park/Neutral position (PNP) switch ● P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
2	● P0031 P0032 Heated oxygen sensor 1 heater ● P0037 P0038 Heated oxygen sensor 2 heater ● P0132 P0133 P0134 P1143 P1144 Heated oxygen sensor 1 ● P0138 P0139 P1146 P1147 Heated oxygen sensor 2 ● P0217 Coolant overtemperature enrichment protection ● P0441 EVAP control system purge flow monitoring ● P0444 P0445 P1444 EVAP canister purge volume control solenoid valve ● P0447 P1446 P1448 EVAP canister vent control valve ● P0452 P0453 EVAP control system pressure sensor ● P0506 P0507 Idle speed control system ● P0650 MIL ● P0705-P0725, P0740-P0755, P1705 P1760 A/T related sensors and solenoid valves ● P1065 ECM power supply ● P1111 Intake valve timing control solenoid valve ● P1122 Electric throttle control function ● P1124 P1126 Throttle control motor relay ● P1128 Electric throttle control actuator ● P1490 P1491 Vacuum cut valve bypass valve ● P1805 Brake switch
3	● P0011 Intake valve timing control ● P0171 P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0420 Three way catalyst function ● P0442 P0456 P1456 EVAP control system (SMALL LEAK, VERY SMALL LEAK) ● P0455 EVAP control system (GROSS LEAK) ● P0731 - P0734 A/T function ● P1121 Electric throttle control actuator ● P1148 Closed loop control ● P1217 Engine over temperature (OVERHEAT) ● P1564 ASCD steering switch ● P1572 ASCD brake switch ● P1574 ASCD vehicle speed sensor

Fail-safe Chart

UBS0027H

The ECM enters fail-safe mode, if any of the following malfunctions is detected. When the ECM enters the fail-safe mode, the MIL illuminates.

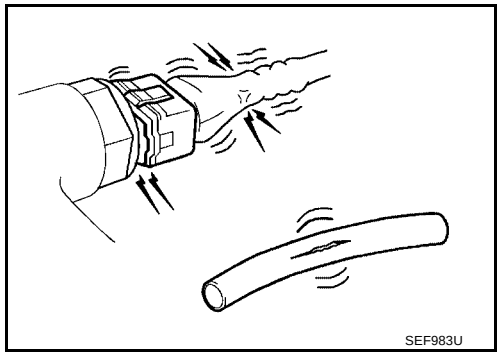
<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0102
P0103
P1102</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0122
P0123
P0222
P0223
P2135</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal operation.
So, the acceleration will be poor.</td></tr>
<tr><td>P1121</td><td>Electric throttle control actuator
(ECM detects the throttle valve is stuck open.)</td><td colspan="2">While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1122</td><td>Electric throttle control function</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1124
P1126</td><td>Throttle control motor relay</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1128</td><td>Throttle control motor</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1229</td><td>Sensor power supply</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P2122
P2123
P2127
P2128
P2138</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal operation.
So, the acceleration will be poor.</td></tr>
</table>

Basic Inspection

UBS0027I

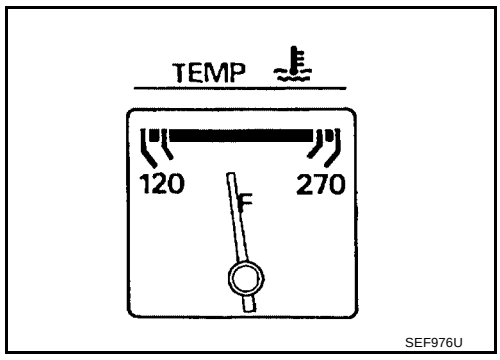
1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket


SEF983U

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.

4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.



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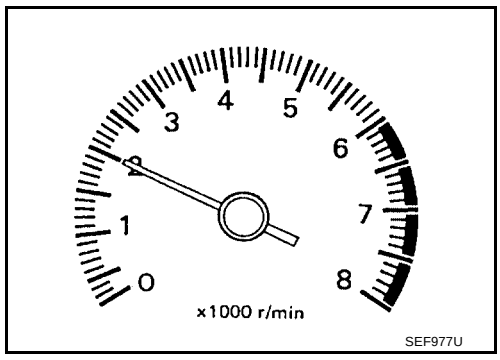
5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



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2. REPAIR OR REPLACE

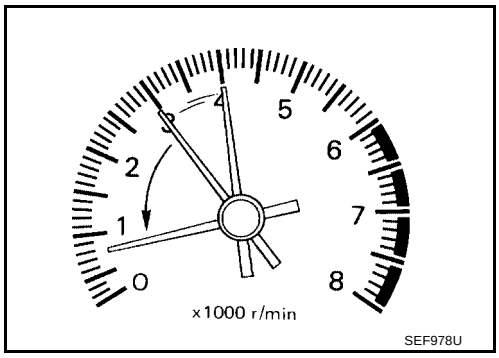
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

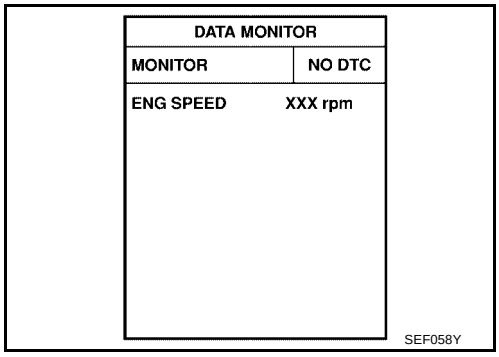
With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1255, "Idle Air Volume Learning" .
Is the Air Volume Learning carried out successfully?
Yes or No
Yes >> GO TO 7.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG
OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1496 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1490 .

OK or NG
OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 15 ± 5° BTDC
A/T: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG
OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1255, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1255, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1255, "Idle Air Volume Learning" .
Is the ″Idle Air Volume Learning″ carried out successfully?
Yes or No

Yes >> GO TO 14.
No >> 1. Follow the instruction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 700 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 15 ± 5° BTDC
A/T: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-134, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1496 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1490 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a incident, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .

>> GO TO 4.

Symptom Matrix Chart

UBS0027J

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-1806
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-1257
	Injector circuit	1	1	2	3	2		2	2			2			EC-1796
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-1846

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-1858
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-1291
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-1604, EC-1606 , EC-1613 , EC-1618
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-1291
	Ignition circuit	1	1	2	2	2		2	2			2			EC-1777
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-1342
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-1368, EC-1375 , EC-1594
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-1386, EC-1398
Throttle position sensor circuit			1	2		2	2	2	2	2		2			EC-1391, EC-1475 , EC-1664 , EC-1666 , EC-1668 , EC-1763
Accelerator pedal position sensor circuit				3	2	1	2			2					EC-1751, EC-1757 , EC-1770
Heated oxygen sensor 1 circuit			1	2	3	2		2	2			2			EC-1406, EC-1412 , EC-1421 , EC-1623 , EC-1629
Knock sensor circuit				2	2							3			EC-1486
Crankshaft position sensor (POS) circuit		2	2												EC-1490
Camshaft position sensor (PHASE) circuit		2	2												EC-1496
Vehicle speed signal circuit			2	3		3						3			EC-1575
Power steering oil pressure switch circuit			2				3	3	3	3					EC-1811
ECM		2	2	3	3	3	3	3	3	3	3	3			EC-1583, EC-1590
Intake valve timing control solenoid valve circuit		3	3	2		1	3	2	2	3		3			EC-1600

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
VIAS control solenoid valve circuit					1									EC-1788
PNP switch circuit			3		3	3	3	3	3		3			EC-1742
Start signal circuit	2													EC-1802
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-1816
Electrical load signal circuit						3	3	3	3					EC-1821
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	MTC-19

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-7
	Fuel piping			5	5	5		5	5			5			EM-118, FL-2
	Vapor lock		5												—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—

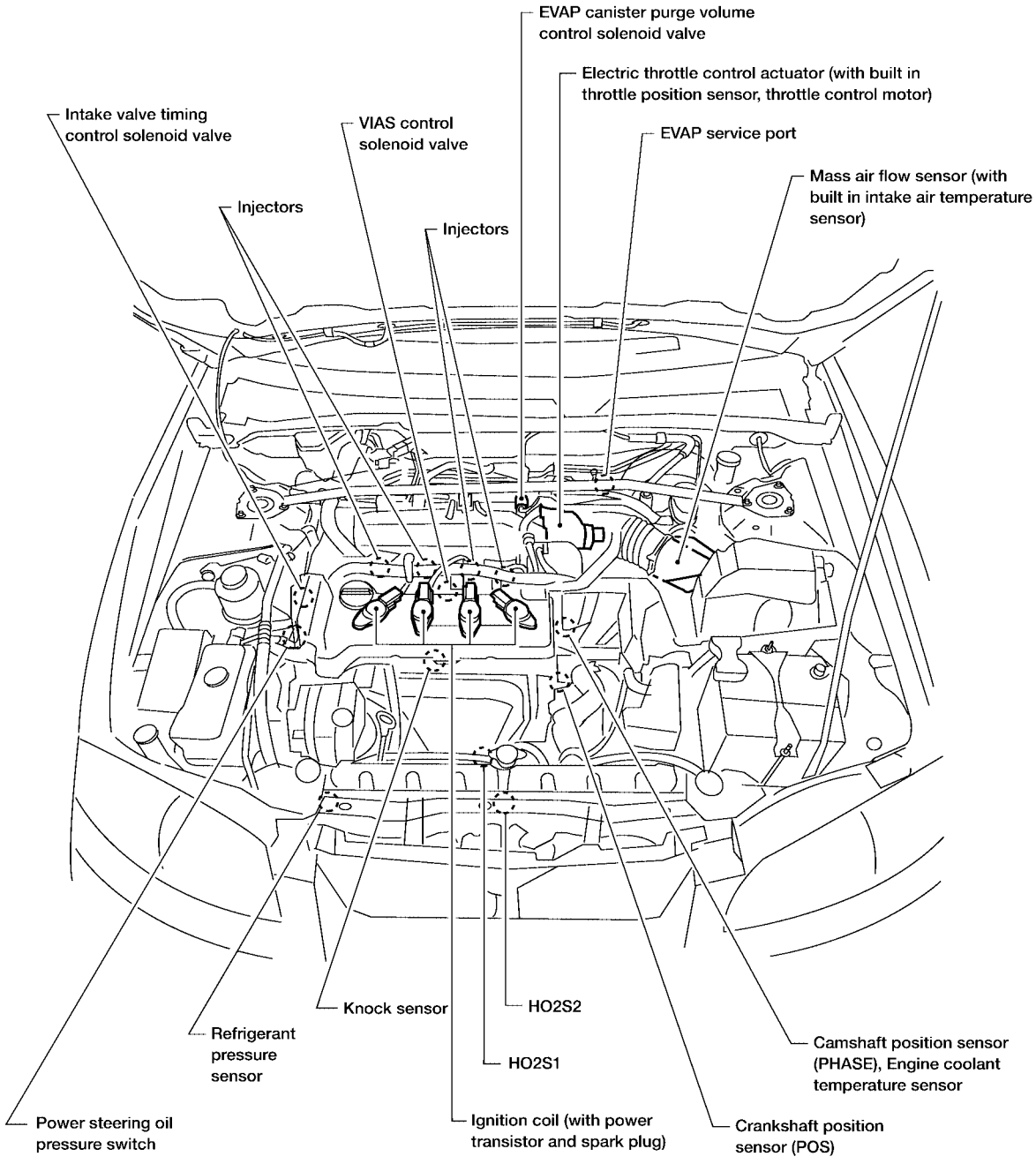
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Air duct		5	5		5		5	5			5			EM-103
	Air cleaner														EM-103
	Air leakage from air duct (Mass air flow sensor —electric throttle control actuator)	5			5		5			5					EM-103
	Electric throttle control actuator														EM-105
	Air leakage from intake manifold/ Collector/Gasket														EM-105
Cranking	Battery	1	1	1		1		1	1			1		1	SC-4
	Alternator circuit														SC-22
	Starter circuit	3													SC-9
	Signal plate/Flywheel/Drive plate	6													EM-160
	PNP switch	4													MT-78, MT-139 or AT-491
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-145
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-160
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-134
	Camshaft														EM-123
	Intake valve timing control														EM-134
	Intake valve												3		EM-145
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-110, EX-3
	Three way catalyst														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5	2		EM-112, LU-19 , LU-18
	Oil level (Low)/Filthy oil														LU-16
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		2	5			CO-30
	Thermostat									5					CO-28
	Water pump														CO-26
	Water gallery														CO-23
	Cooling fan									5					CO-36
	Coolant level (low)/Contaminated coolant														CO-24
NVIS (NISSAN Vehicle Immobilizer System — NATS)		1	1												EC-1275 or BL-95

1 - 6: The numbers refer to the order of inspection.

Engine Control Component Parts Location

UBS0027K



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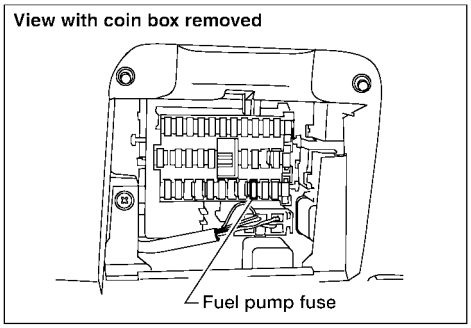
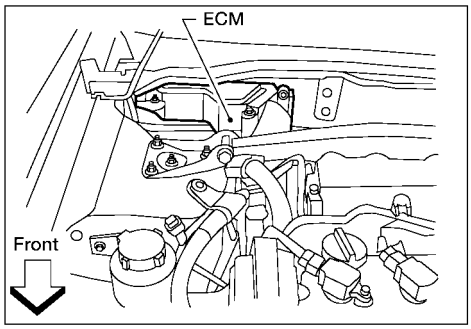
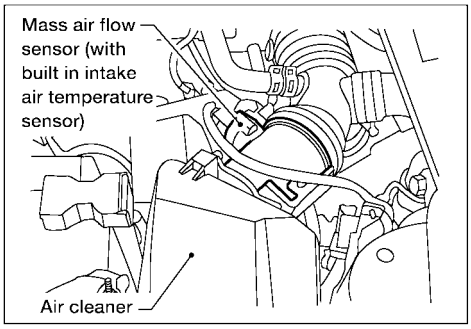
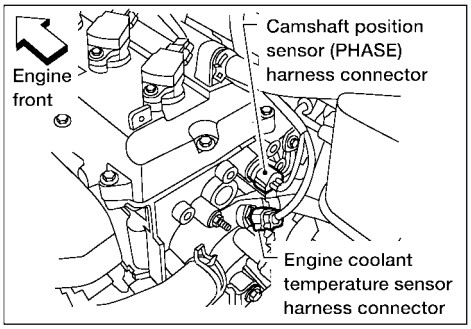
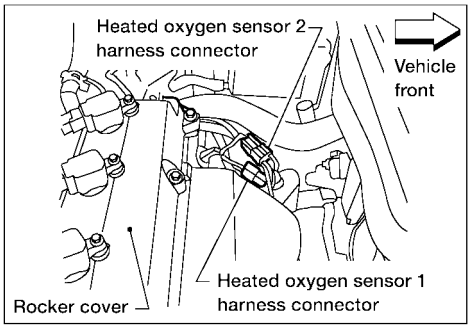
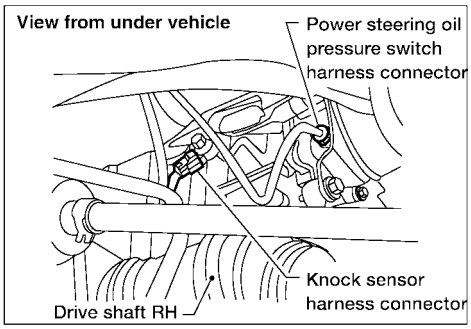

View with coin box removed
Fuel pump fuse

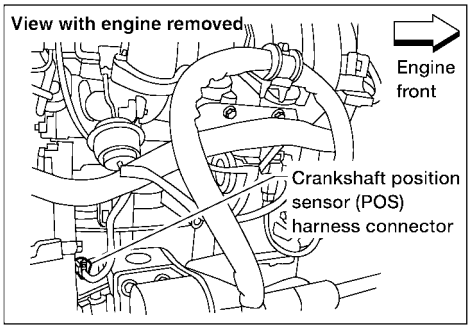

ECM
Front

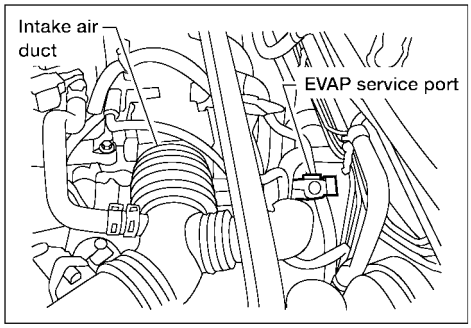

Mass air flow sensor (with built in intake air temperature sensor)
Air cleaner


Engine front
Camshaft position sensor (PHASE) harness connector
Engine coolant temperature sensor harness connector

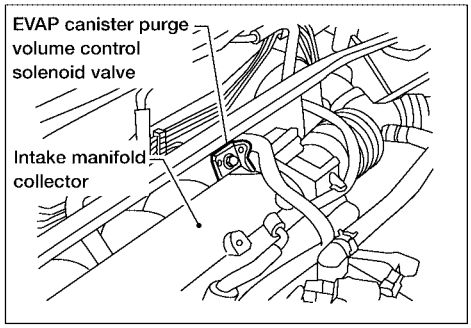

Heated oxygen sensor 2 harness connector
Vehicle front
Heated oxygen sensor 1 harness connector
Rocker cover

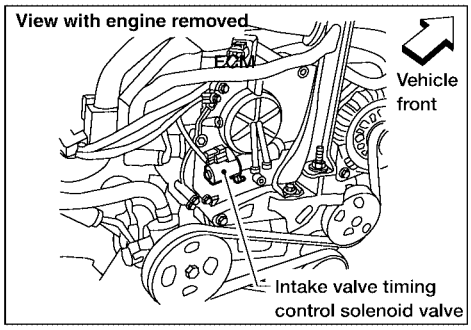

View from under vehicle
Power steering oil pressure switch harness connector
Knock sensor harness connector
Drive shaft RH

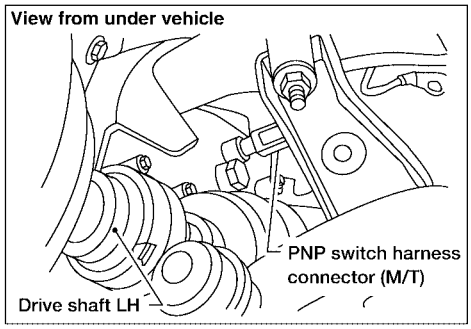

View with engine removed
Engine front
Crankshaft position sensor (POS) harness connector

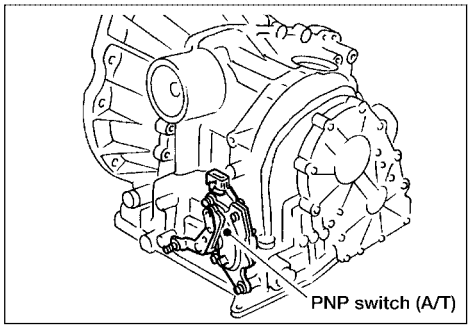

Intake air duct
EVAP service port

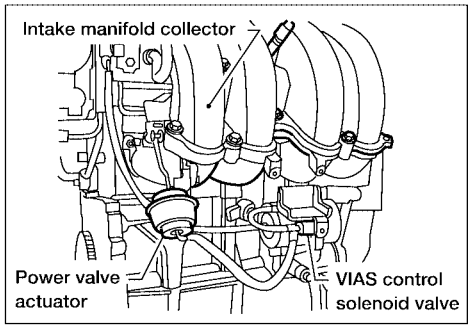
BBIA0127E

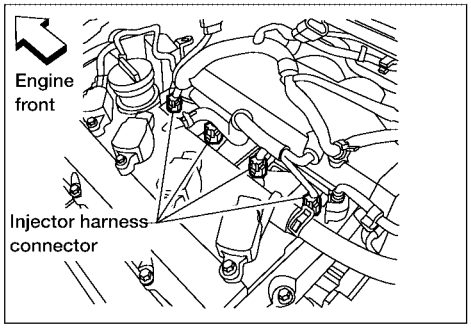

EVAP canister purge volume control solenoid valve
Intake manifold collector

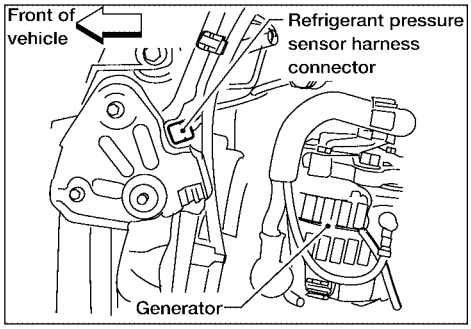

View with engine removed
ECM
Vehicle front
Intake valve timing control solenoid valve

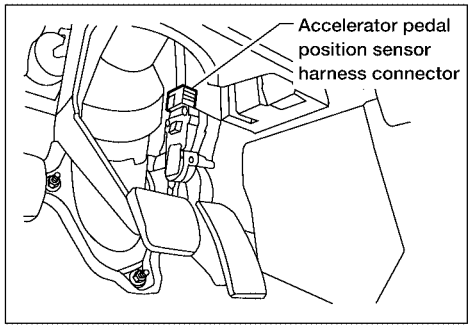

View from under vehicle
PNP switch harness connector (M/T)
Drive shaft LH


PNP switch (A/T)

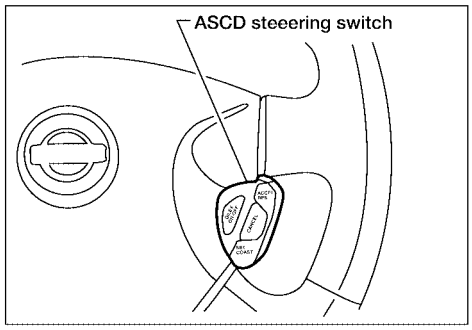

Intake manifold collector
Power valve actuator
VIAS control solenoid valve

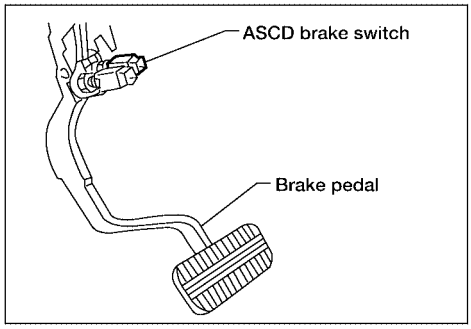

Engine front
Injector harness connector

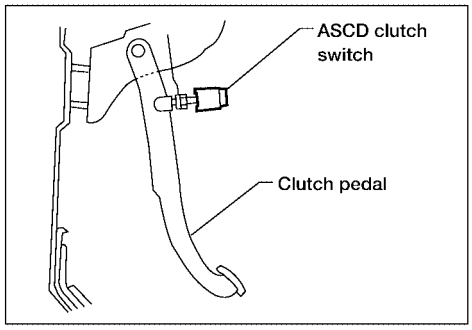

Front of vehicle
Refrigerant pressure sensor harness connector
Generator

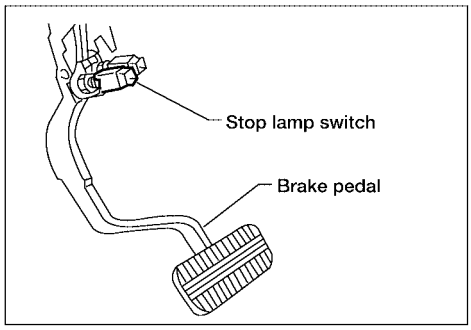

Accelerator pedal position sensor harness connector

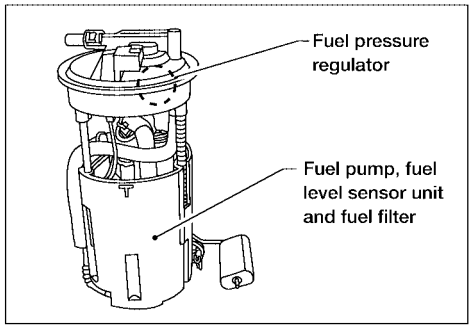
BBIA0128E

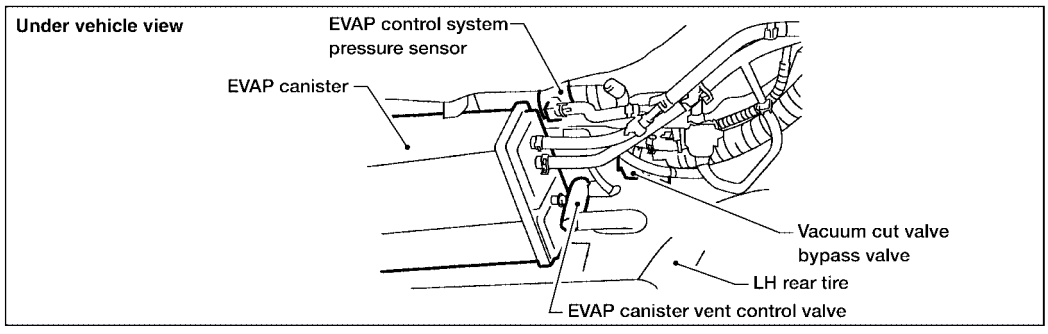

ASCD steeering switch


ASCD brake switch
Brake pedal

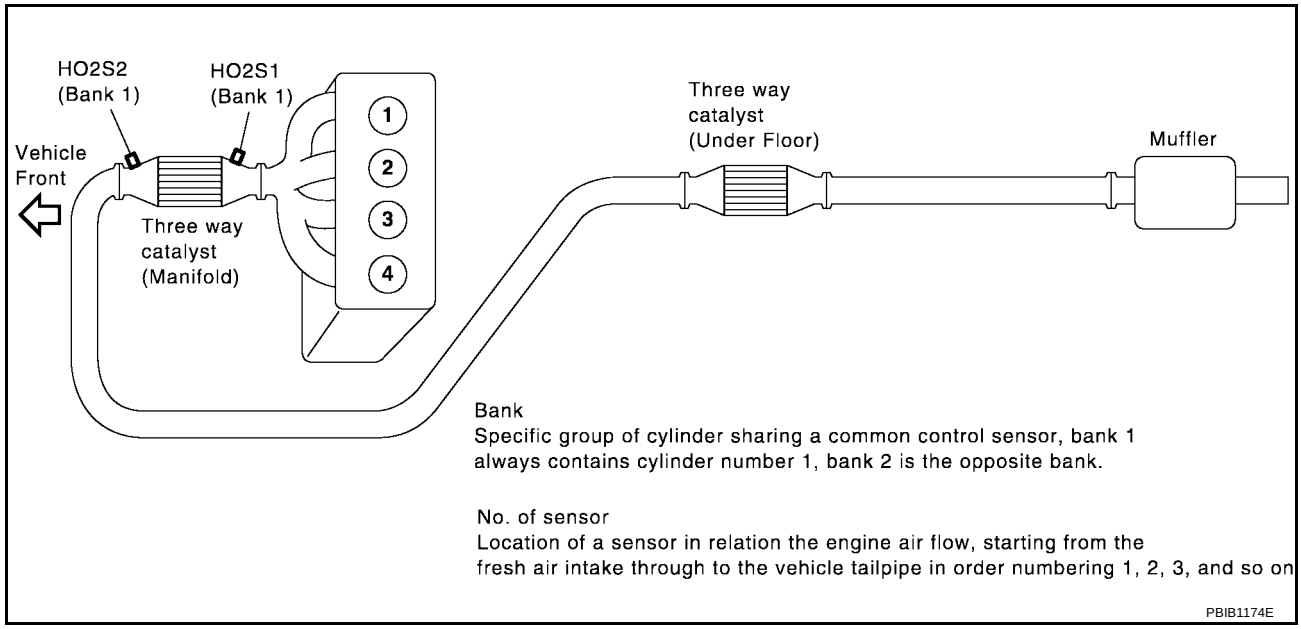

ASCD clutch switch
Clutch pedal

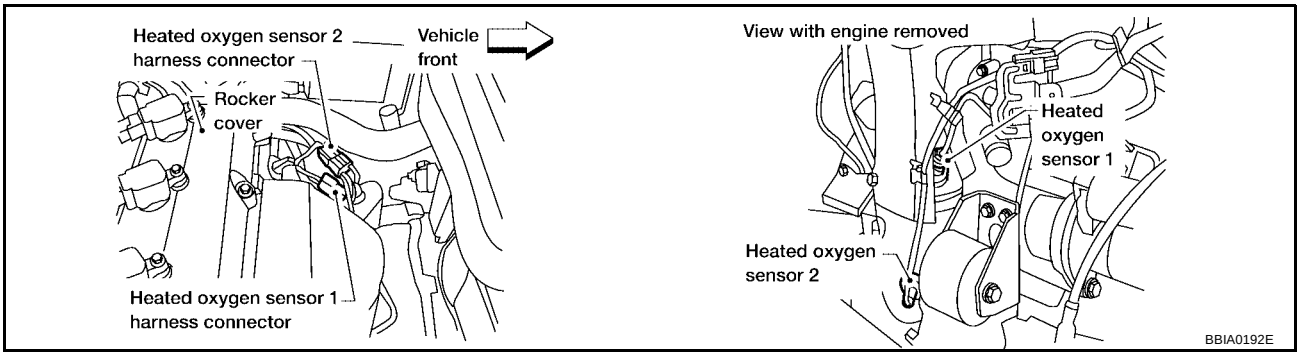

Stop lamp switch
Brake pedal


Fuel pressure regulator
Fuel pump, fuel level sensor unit and fuel filter


Under vehicle view
EVAP control system pressure sensor
EVAP canister
Vacuum cut valve bypass valve
LH rear tire
EVAP canister vent control valve

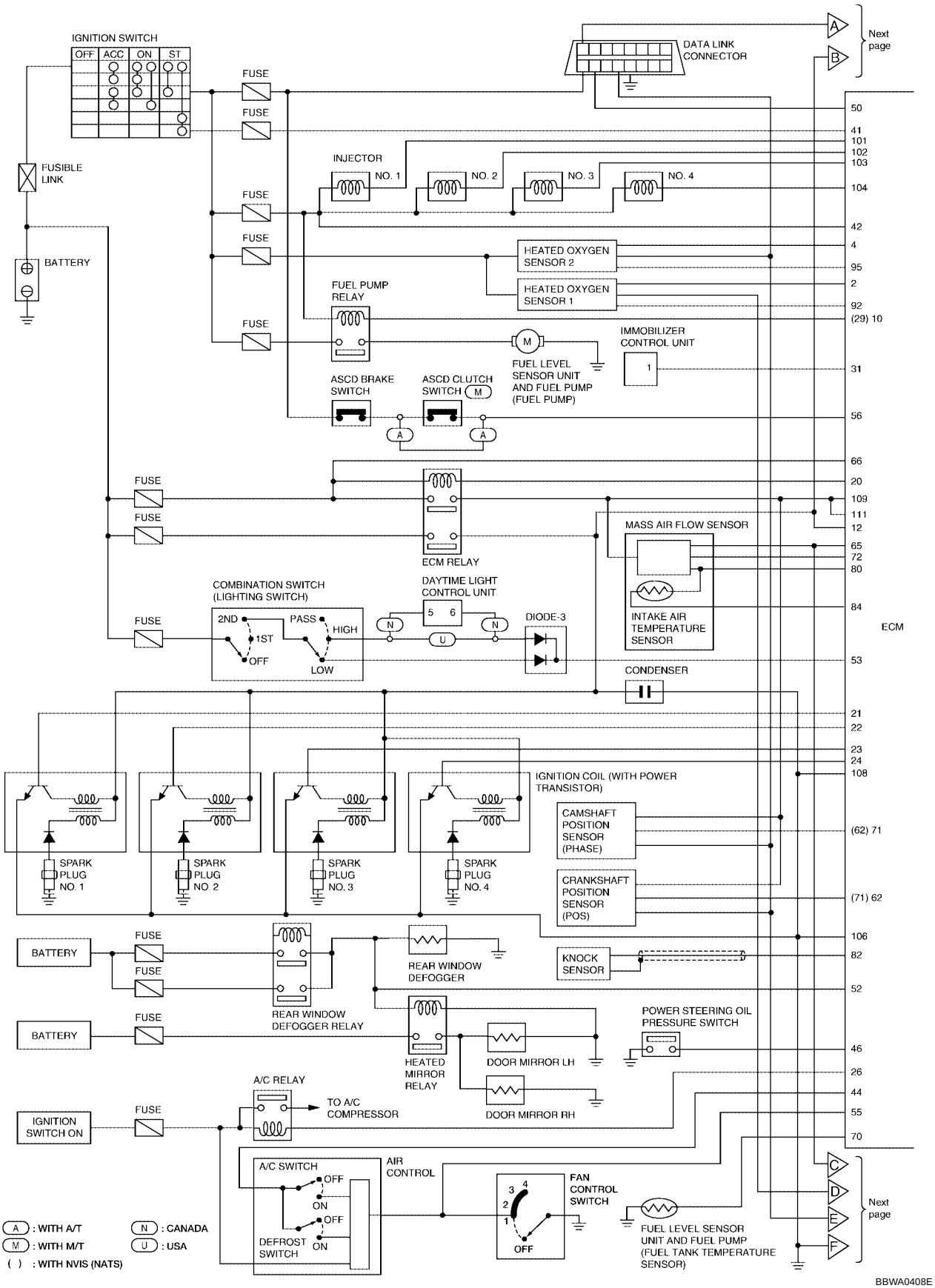
BBIA0123E

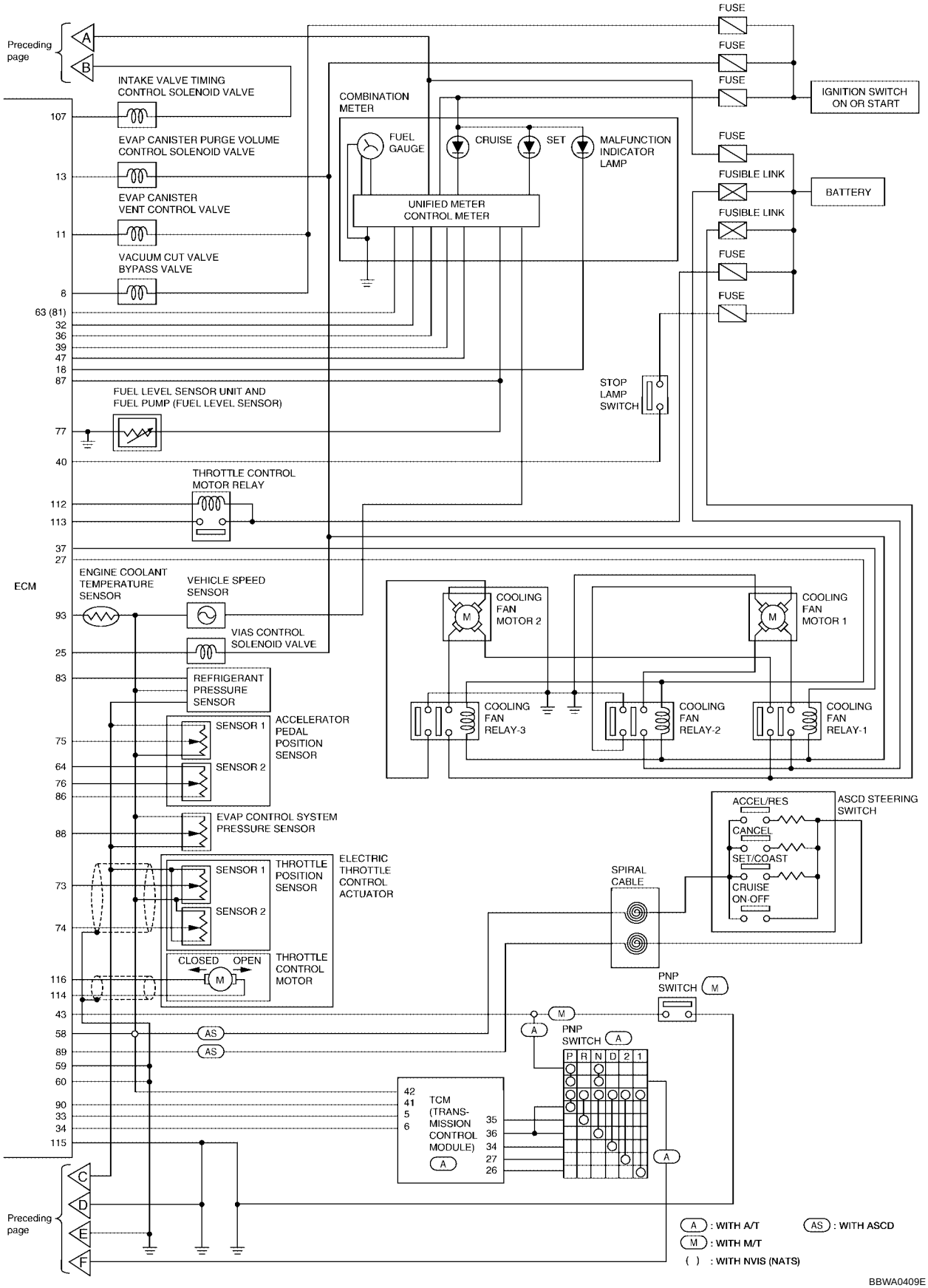

HO2S2
(Bank 1)
HO2S1
(Bank 1)
Vehicle
Front
Three way
catalyst
(Manifold)
1
2
3
4
Three way
catalyst
(Under Floor)
Muffler
Bank
Specific group of cylinder sharing a common control sensor, bank 1
always contains cylinder number 1, bank 2 is the opposite bank.
No. of sensor
Location of a sensor in relation the engine air flow, starting from the
fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on
PBIB1174E


Heated oxygen sensor 2
harness connector
Vehicle
front
Rocker
cover
Heated oxygen sensor 1
harness connector
View with engine removed
Heated
oxygen
sensor 1
Heated oxygen
sensor 2
BBIA0192E

Circuit Diagram

UBS0027L




Preceding page
A
B
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
107
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
13
EVAP CANISTER VENT CONTROL VALVE
11
VACUUM CUT VALVE BYPASS VALVE
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FUEL LEVEL SENSOR UNIT AND FUEL PUMP (FUEL LEVEL SENSOR)
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THROTTLE CONTROL MOTOR RELAY
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ECM
ENGINE COOLANT TEMPERATURE SENSOR
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VEHICLE SPEED SENSOR
VIAS CONTROL SOLENOID VALVE
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REFRIGERANT PRESSURE SENSOR
ACCELERATOR PEDAL POSITION SENSOR
SENSOR 1
SENSOR 2
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EVAP CONTROL SYSTEM PRESSURE SENSOR
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ELECTRIC THROTTLE CONTROL ACTUATOR
THROTTLE POSITION SENSOR
SENSOR 1
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THROTTLE CONTROL MOTOR
CLOSED
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34
115
AS
TCM (TRANS-MISSION CONTROL MODULE)
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36
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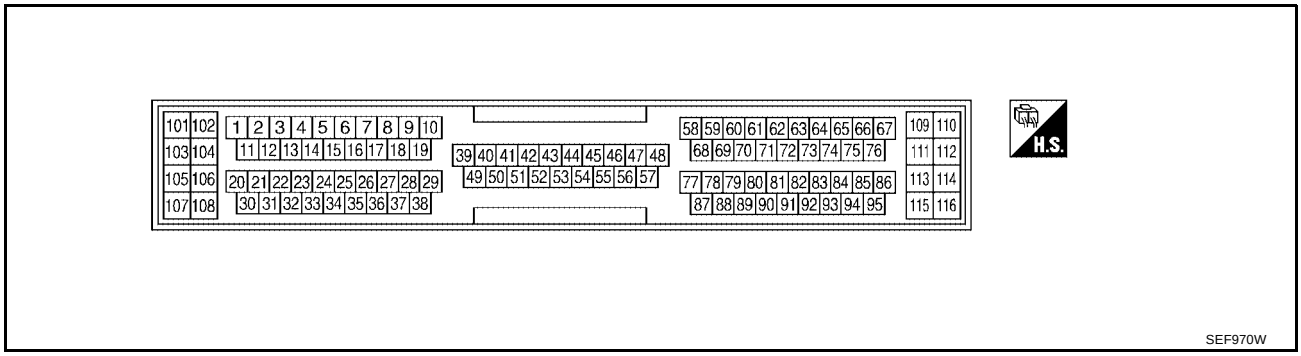
26
COMBINATION METER
FUEL GAUGE
CRUISE
SET
MALFUNCTION INDICATOR LAMP
UNIFIED METER CONTROL METER
FUSE
FUSIBLE LINK
IGNITION SWITCH ON OR START
BATTERY
STOP LAMP SWITCH
COOLING FAN MOTOR 2
COOLING FAN MOTOR 1
COOLING FAN RELAY-3
COOLING FAN RELAY-2
COOLING FAN RELAY-1
ACCEL/RES
CANCEL
SET/COAST
CRUISE ON-OFF
ASCD STEERING SWITCH
SPIRAL CABLE
PNP SWITCH
M
A
P R N D 2 1
C
D
E
F
Preceding page
A : WITH A/T
M : WITH M/T
( ) : WITH NVIS (NATS)
AS : WITH ASCD

BBWA0409E

ECM Harness Connector Terminal Layout

UBS0027M

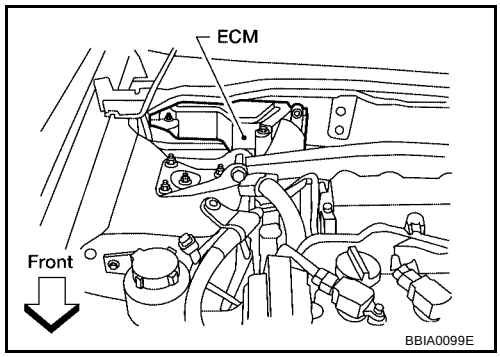


ECM Terminals and Reference Value

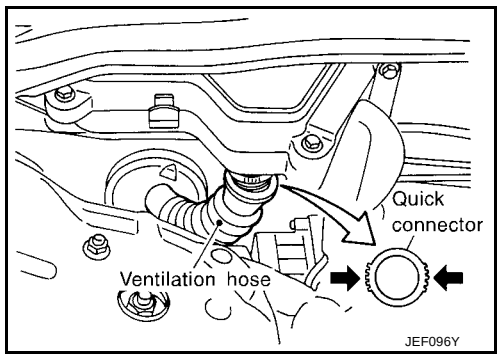
UBS0027N

PREPARATION

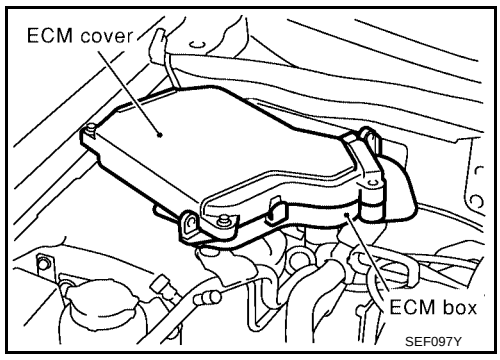
1. ECM is located in the right side of the cowl top (behind the strut tower).
   For this inspection:
   - Remove front strut tower bar. Refer to FSU-5, "FRONT SUSPENSION ASSEMBLY" .
   - Remove engine control harness bracket on the strut tower.



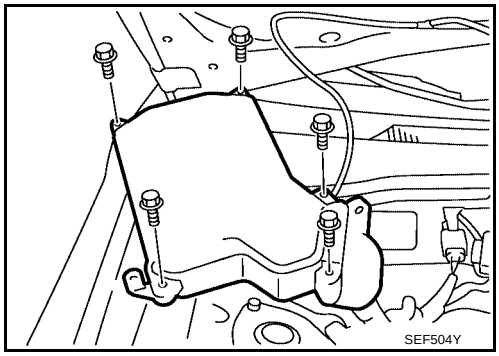
   - Remove quick connector on the ventilation hose.



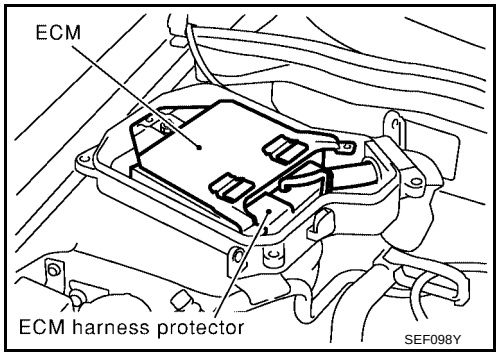
   - Remove ECM fixing bolts and pull it out all the way.



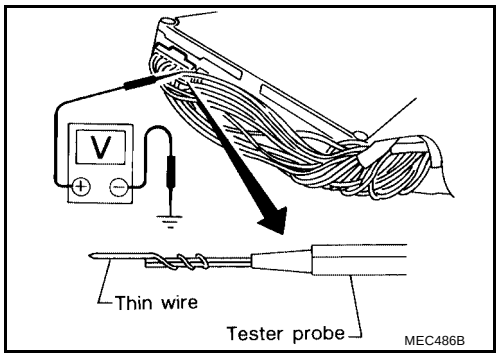
- Remove ECM cover fixing bolts.



- Remove ECM fixing bolts.
- Remove ECM with the harness from the cover.



2. Remove ECM harness protector.
3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
   - Open harness securing clip to make testing easier.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.

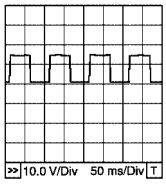


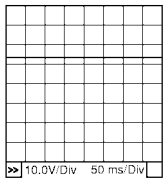
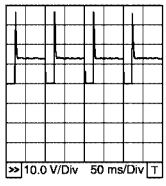
ECM INSPECTION TABLE

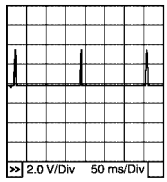
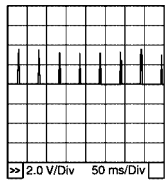
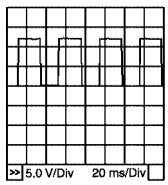
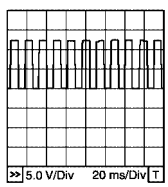
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

CAUTION:

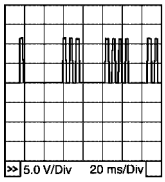
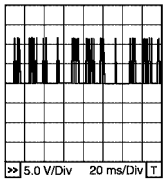
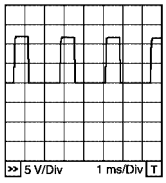
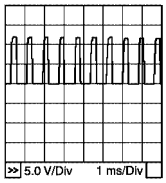
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

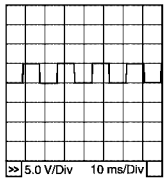
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/L	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	P/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - 1.0V
			[Ignition switch “ON”] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
8	L/B	Vacuum cut valve bypass valve	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
10 (Without NVIS) 29 (With NVIS)	B/P	Fuel pump relay	**[Ignition switch “ON”]** ● For 1 seconds after turning ignition switch “ON” **[Engine is running]**	0 - 1.0V
			[Ignition switch “ON”] ● More than 1 seconds after turning ignition switch “ON”.	BATTERY VOLTAGE (11 - 14V)
11	L/Y	EVAP canister vent control valve	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
12	R	Counter current return	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
13	PU/W	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E
18	OR/L	MIL	**[Ignition switch “ON”]**	0 - 1.0V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
20	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch “OFF”]** ● For 5 seconds after turning ignition switch “OFF”	0 - 1.0V
			[Ignition switch “OFF”] ● 5 seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)

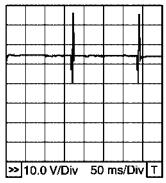
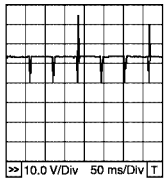
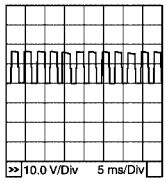
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22 23 24	BR PU L/R GY/R	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 3 Ignition signal No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E
25	Y/G	VIAS control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is above 5,000 rpm	0 - 1.0V
26	L/W	Air conditioner relay	**[Engine is running]** ● Both A/C switch and blower switch are “ON” (Compressor operates)	0 - 0.6V
			[Engine is running] ● A/C switch is “OFF”	BATTERY VOLTAGE (11 - 14V)
27	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is high speed operating	0 - 1.0V
33	L	CAN communication line	**[Ignition switch “ON”]**	Approximately 2.6 - 3.2V Output voltage varies with the communication status.
34	Y	CAN communication line	**[Ignition switch “ON”]**	Approximately 1.7 - 2.3V Output voltage varies with the communication status.
36	L/OR	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	6 - 7V★  PBIB0523E
			[Engine is running] ● Engine speed is 2,500 rpm	6 - 7V★  PBIB0524E

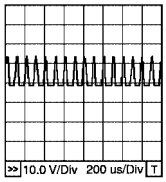
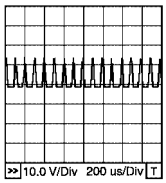
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
37	LG/R	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating.	0 - 1.0V
39	P/B	ASCD CRUISE lamp	**[Ignition switch "ON"]** ● CRUISE switch is depressed at first time → second time	Approximately 0V ↓ BATTERY VOLTAGE (11 - 14V)
40	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 14V
42	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
43	G/OR	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models), "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V
44	L/R	Air conditioner switch	**[Engine is running]** ● Both A/C switch and blower switch are "ON"	Approximately 0V
			[Engine is running] ● A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
46	G	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned	Approximately 0V
			[Engine is running] ● Steering wheel is not being turned	Approximately 5V
47	Y/B	ASCD SET lamp	**[Engine is running]** ● SET switch is "ON". ● ASCD control is operating.	Approximately 0V
			[Engine is running] ● ASCD control is not operating.	BATTERY VOLTAGE (11 - 14V)
50	L/G	Data link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	Approximately 5V
52	L/W	Electrical load signal (Rear window defogger signal)	**[Ignition switch "ON"]** ● Rear window defogger switch is "ON"	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Rear window defogger switch is "OFF"	Approximately 0V
53	R/W	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
55	LG/B	Heater fan switch	**[Engine is running]** ● Heater fan switch “ON”	Approximately 0V
			[Engine is running] ● Heater fan switch “OFF”	Approximately 5V
56	P/L	ASCD brake switch	**[Ignition switch “ON”]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch “ON”] ● Brake pedal is fully released ● Clutch pedal is fully released (M/T models)	BATTERY VOLTAGE (11 - 14V)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
59 60 106 108	B/R B B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
62 (With NVIS) 71 (Without NVIS)	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
62 (Without NVIS) 71 (With NVIS)	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63 (Without NVIS) 81 (With NVIS)	R/W	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● Vehicle speed is 40 km/h (25MPH)	Approximately 2.3V★  PBIB0531E
64	R/G	Accelerator pedal position sensor 2 power supply	**[Ignition switch “ON”]**	Approximately 2.5V
65	R	Sensor's power supply	**[Ignition switch “ON”]**	Approximately 5V
66	W/L	Power supply for ECM (Buck-up)	**[Ignition switch “OFF”]**	BATTERY VOLTAGE (11 - 14V)
70	G/OR	Fuel tank temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature.
72	OR/L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
73	W	Throttle position sensor 1	**[Ignition switch “ON”]** ● **Engine stopped** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch “ON”] ● **Engine stopped** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
74	G	Throttle position sensor 2	**[Ignition switch “ON”]** ● **Engine stopped** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch “ON”] ● **Engine stopped** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
75	W	Accelerator pedal position sensor 1	**[Ignition switch “ON”]** ● **Engine stopped** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch “ON”] ● **Engine stopped** ● Accelerator pedal fully depressed	More than 4.2V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
76	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● **Engine stopped** ● Accelerator pedal fully released	0.21 - 0.36V
			[Ignition switch "ON"] ● **Engine stopped** ● Accelerator pedal fully depressed	More than 2.1V
77	B/W	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V
80	W/L	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
83	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V
84	Y/G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
86	G	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V
87	G/R	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.
88	B/R	EVAP control system pressure sensor	**[Ignition switch "ON"]**	1.8 -4.8V
89	G	ASCD steering switch	**[Ignition switch "ON"]** ● ASCD steering switch is "OFF".	Approximately 4.0V
			[Ignition switch "ON"] ● CRUISE switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1.0V
			[Ignition switch "ON"] ● SET/COAST switch is "ON".	Approximately 2.0V
			[Ignition switch "ON"] ● ACCEL/RES switch is "ON".	Approximately 3.0V
90	W	Accelerator pedal position sensor signal output	**[Ignition switch "ON"]** ● **Engine stopped** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch "ON"] ● **Engine stopped** ● Accelerator pedal fully depressed	More than 4.2V
92	W/G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
93	Y	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600 rpm after the following conditions are met. – Engine: after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V
101 102 103 104	R/B R/W R/Y R/L	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
107	G	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 9V★  PBIB0532E
109 111	R/G R/G	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
112	OR	Throttle control motor relay	**[Ignition switch “OFF”]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch “ON”]	0 - 1.0V
113	R	Throttle control motor relay power supply	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
114	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
115	B	Throttle control motor ground	**[Engine is running]** ● Idle speed	Approximately 0V
116	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

CONSULT-II Function

UBS0027O

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
CAN diagnostic support monitor	The results of transmit/receive diagnosis of CAN communication can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECM part number	ECM part number can be read.

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	×			
		Camshaft position sensor (PHASE)		×		×	×			
		Mass air flow sensor		×		×	×			
		Engine coolant temperature sensor		×	×	×	×	×		
		Heated oxygen sensor 1		×		×	×		×	×
		Heated oxygen sensor 2		×		×	×		×	×
		Vehicle speed sensor		×	×	×	×			
		Accelerator pedal position sensor		×		×	×			
		Throttle position sensor		×		×	×			
		Fuel tank temperature sensor		×		×	×	×		
		EVAP control system pressure sensor		×		×	×			
		Intake air temperature sensor		×		×	×			
		Knock sensor		×						
		Refrigerant pressure sensor				×	×			
		Ignition switch (start signal)				×	×			
		Closed throttle position switch (accelerator pedal position sensor signal)				×	×			
		Air conditioner switch				×	×			
		Park/neutral position (PNP) switch		×		×	×			
		Stop lamp switch		×		×	×			
		Power steering oil pressure switch				×	×			
		Battery voltage				×	×			
		Load signal				×	×			
		Fuel level sensor		×		×	×			
		ASCD steering switch		×		×	×			
		ASCD brake switch		×		×	×			

Item			DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				×	×	×		
		Power transistor (Ignition timing)				×	×	×		
		Throttle control motor relay		×		×	×			
		Throttle control motor		×						
		EVAP canister purge volume control solenoid valve		×		×	×	×		×
		Air conditioner relay				×	×			
		Fuel pump relay	×			×	×	×		
		Cooling fan relay		×		×	×	×		
		Heated oxygen sensor 1 heater		×		×	×		×	
		Heated oxygen sensor 2 heater		×		×	×		×	
		EVAP canister vent control valve		×		×	×	×		
		Vacuum cut valve bypass valve		×		×	×	×		×
		Intake valve timing control solenoid valve		×		×	×	×		
		VIAS control solenoid valve				×	×	×		
		Calculated load value			×	×	×			

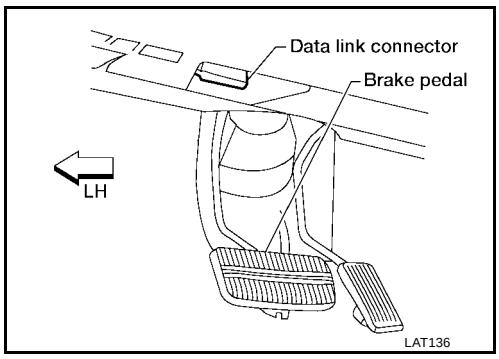
X: Applicable

*1: This item includes 1st trip DTCs.

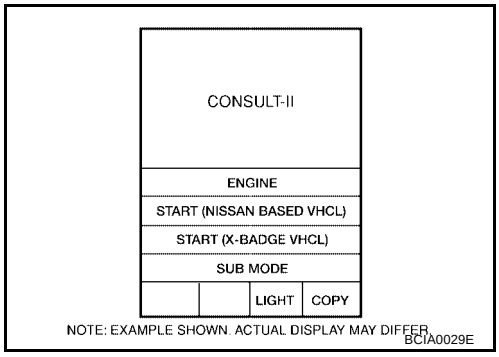
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-1264 .

CONSULT-II INSPECTION PROCEDURE

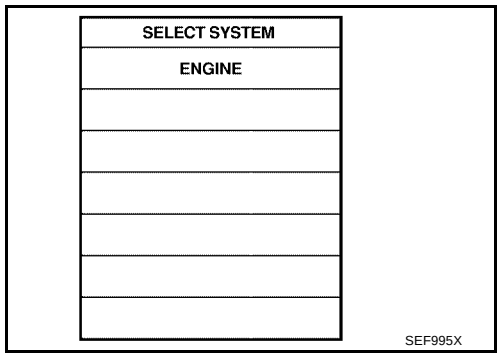
1. Turn ignition switch OFF.
2. Connect “CONSULT-II” and “CONSULT-II CONVERTER“ to data link connector, which is located under LH dash panel.
3. Turn ignition switch ON.



4. Touch “START (NISSAN BASED VHCL)”.

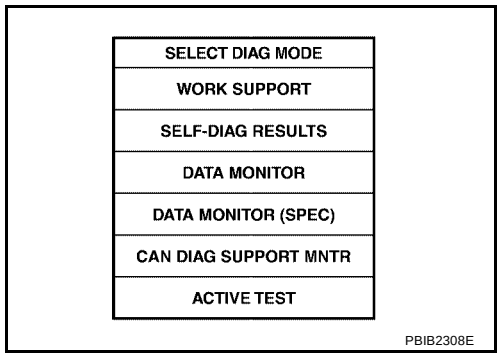


5. Touch “ENGINE”.
If “ENGINE“ is not indicated, go to EC-582, "DATA LINK CONNECTOR" .



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
EVAP SYSTEM CLOSE	OPEN THE VACUUM CUT VALVE BYPASS VALVE AND CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. ● IGN SW “ON” ● ENGINE NOT RUNNING ● AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). ● NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM ● FUEL TANK TEMP. IS MORE THAN 0°C (32°F). ● WITHIN 10 MINUTES AFTER STARTING “EVAP SYSTEM CLOSE” ● WHEN TRYING TO EXECUTE “EVAP SYSTEM CLOSE” UNDER THE CONDITION EXCEPT ABOVE, CONSULT-II WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. **NOTE:** **WHEN STARTING ENGINE, CONSULT-II MAY DISPLAY “BATTERY VOLTAGE IS LOW. CHARGE BATTERY”, EVEN IN USING CHARGED BATTERY.**	When detecting EVAP vapor leak point of EVAP system

WORK ITEM	CONDITION	USAGE
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to EC-1224, "INDEX FOR DTC" .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to EC-1224, "INDEX FOR DTC" .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE
Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×	● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	×	×	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×	● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1) [V]	×	×	● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	×	×	● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	×		● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	×	×	● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×	● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	×	×	● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×			
THRTL SEN 1 [V]	×	×	● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×			

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
FUEL T/TEMP SE [°C] or [°F]	×		● The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
INT/A TEMP SE [°C] or [°F]	×	×	● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
EVAP SYS PRES [V]	×		● The signal voltage of EVAP control system pressure sensor is displayed.	
ABSOL PRES/SE [V]	×		● The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE [V]	×		● The signal voltage of the fuel level sensor is displayed.	
START SIGNAL [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×	● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×	● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×	● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×	×	● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×		● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×		● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		×	● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]			● “Calculated load value” indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
PURG VOL C/V [%]			● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]			● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]			● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
VIAS S/V [ON/OFF]			● The control condition of the VIAS control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... VIAS control solenoid valve is operating. OFF ... VIAS control solenoid valve is not operating.	
AIR COND RLY [ON/OFF]		×	● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×	● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
VC/V BYPASS/V [ON/OFF]			● The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signals) is indicated. ON ... Open OFF ... Closed	
VENT CONT/V [ON/OFF]			● The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON ... Closed OFF ... Open	
THRTL RELAY [ON/OFF]			● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]			● Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI ... High speed operation LOW ... Low speed operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]			● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
IDL A/V LEARN [YET/CMPLT]			● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully.	
TRVL AFTER MIL [km] or [mile]			● Distance traveled while MIL is activated.	
O2SEN HTR DTY [%]			● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals.	
AC PRESS SEN [V]			● The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE [km/h] or [mph]			● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
SET VHCL SPD [km/h] or [mph]			● The preset vehicle speed is displayed.	
MAIN SW [ON/OFF]			● Indicates [ON/OFF] condition from CRUISE switch signal.	
CANCEL SW [ON/OFF]			● Indicates [ON/OFF] condition from CAN-CEL switch signal.	
RESUME/ACC SW [ON/OFF]			● Indicates [ON/OFF] condition from ACCEL/RES switch signal.	
SET SW [ON/OFF]			● Indicates [ON/OFF] condition from COAST/SET switch signal.	
BRAKE SW1 SW [ON/OFF]			● Indicates [ON/OFF] condition from ASCD brake switch signal, and ASCD clutch switch signal (M/T models).	
BRAKE SW2 SW [ON/OFF]			● Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT [NON/CUT]			● Indicates the vehicle cruise condition. NON ... Vehicle speed is maintained at the ASCD set speed. CUT ...Vehicle speed increased to excessively high compared with the ASCD set speed, and ASCD operation is cut off.	
LO SPEED CUT [NON/CUT]			● Indicates the vehicle cruise condition. NON ... Vehicle speed is maintained at the ASCD set speed. CUT ...Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off.	
AT OD MONITOR [ON/OFF]			● Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM.	
AT OD CANCEL [ON/OFF]			● Indicates [ON/OFF] condition of A/T O/D cancel signal sent from the TCM.	
CRUISE LAMP [ON/OFF]			● Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	Description	Remarks
SET LAMP [ON/OFF]			● Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.	
Voltage [V]			● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]				
DUTY-HI				
DUTY-LOW				
PLS WIDTH-HI				
PLS WIDTH-LOW				

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE
Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×		● Indicates the engine speed computed from the signal of the crankshaft position sensor (POS).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]			● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE
Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform "Idle Air Volume Learning".

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever “N” ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
VIAS SOL VALVE	● Ignition switch: ON ● Turn solenoid valve “ON” and “OFF” with CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connectors ● Solenoid valve
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
FUEL/T TEMP SEN	● Change the fuel tank temperature using CONSULT-II.		
VENT CONTROL/V	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve “ON” and “OFF” with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connectors ● Solenoid valve
VC/V BYPASS/V	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve “ON” and “OFF” with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to EC-1265, "SYSTEM READINESS TEST (SRT) CODE" .

SRT Work Support Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

DTC Work Support Mode

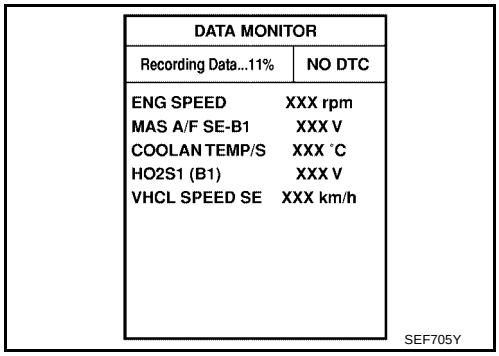
Test mode	Test item	Condition	Reference page
EVAP SYSTEM	PURGE FLOW P0441	Refer to corresponding trouble diagnosis for DTC.	EC-1507
	EVAP SML LEAK P0442/P1442		EC-1513
	EVAP V/S SML LEAK P0456/P1456		EC-1555, EC-1695
	PURG VOL CN/V P1444		EC-1672
	VC CUT/V BP/V P1491		EC-1714
HO2S1	HO2S1 (B1) P0133		EC-1412
	HO2S1 (B1) P0134		EC-1421
	HO2S1 (B1) P1143		EC-1623
	HO2S1 (B1) P1144		EC-1629
H02S2	HO2S2 (B1) P0139		EC-1435
	HO2S2 (B1) P1146		EC-1635
	HO2S2 (B1) P1147		EC-1642

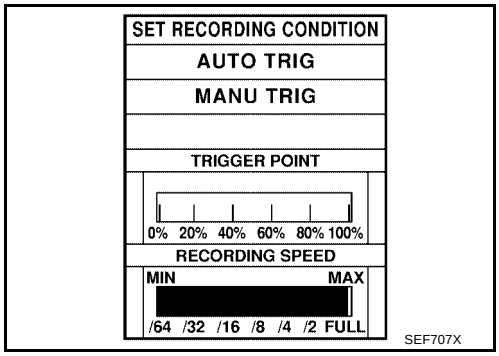
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

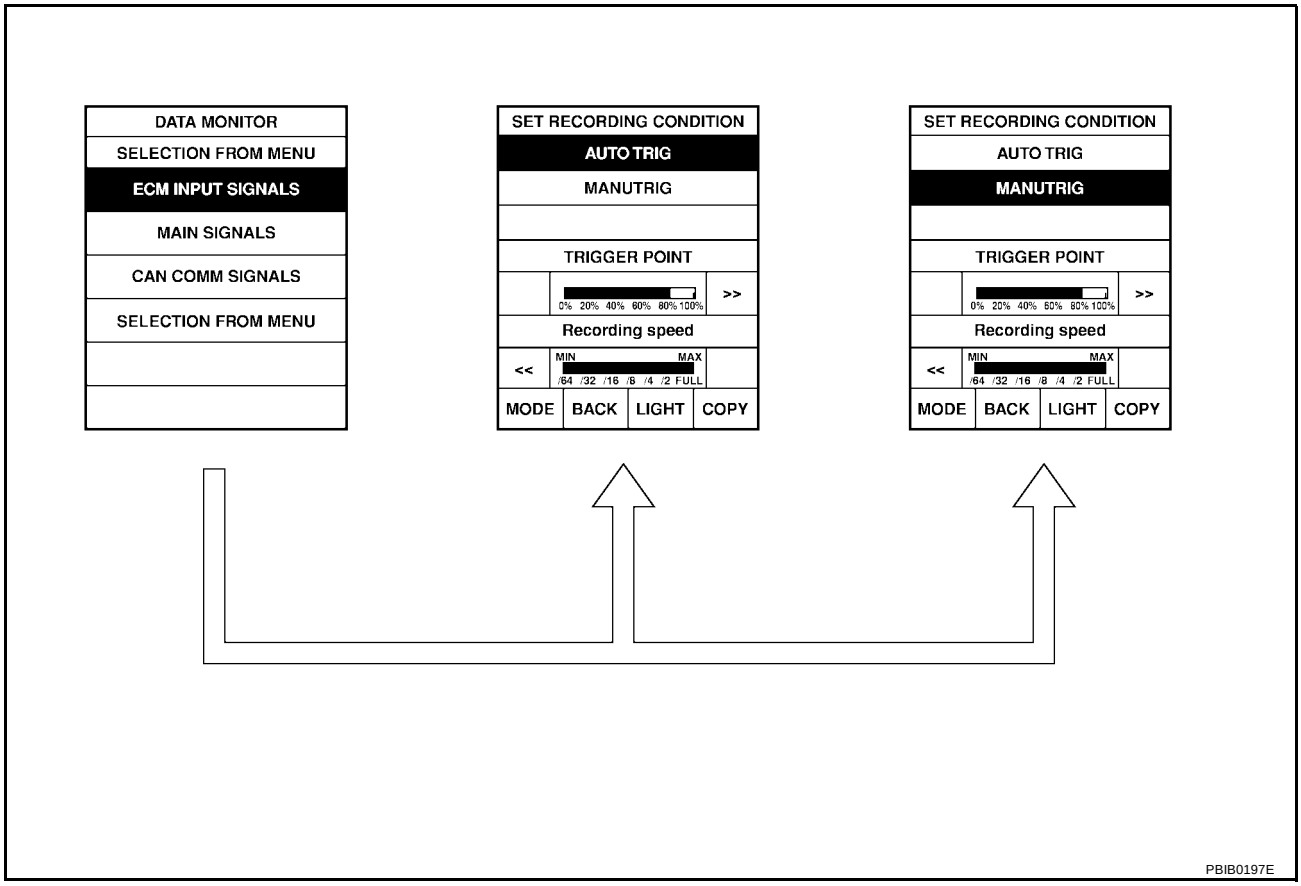
1. “AUTO TRIG” (Automatic trigger):
   - The malfunction will be identified on the CONSULT-II screen in real time.
     In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
     At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
     The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.
2. “MANU TRIG” (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.





Operation

1. “AUTO TRIG”
   - While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" .)
2. “MANU TRIG”
   - If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

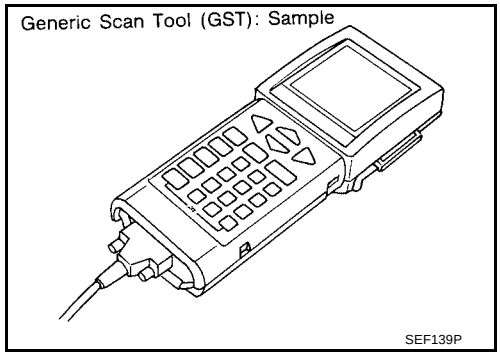


Generic Scan Tool (GST) Function

UBS0027P

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained below.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



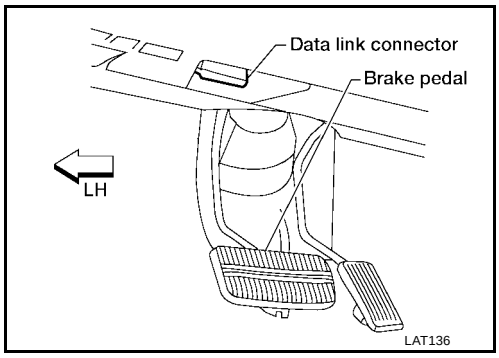
FUNCTION

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-1264, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.

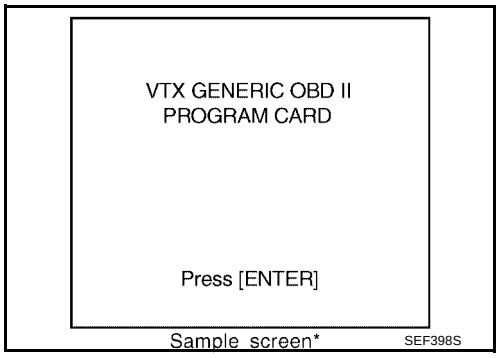
Diagnostic test mode		Function
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode can close EVAP system in ignition switch “ON” position (Engine stopped). When this mode is performed, the following parts can be opened or closed. ● EVAP canister vent control valve open ● Vacuum cut valve bypass valve closed In the following conditions, this mode cannot function. ● Low ambient temperature ● Low battery voltage ● Engine running ● Ignition switch “OFF” ● Low fuel temperature ● Too much pressure is applied to EVAP system
MODE 9	(CALIBRATION ID)	This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

GST INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect “GST” to data link connector, which is located under LH dash panel near the fuse box cover.
3. Turn ignition switch ON.

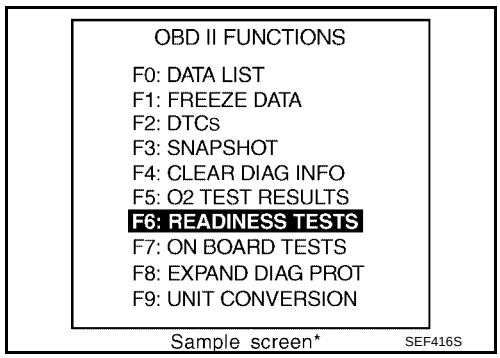


4. Enter the program according to instruction on the screen or in the operation manual.
   (*: Regarding GST screens in this section, sample screens are shown.)



5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.



CONSULT-II Reference Value in Data Monitor Mode

UBS0027Q

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.5 - 3.5 msec
		2,000 rpm	2.5 - 3.5 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	54% - 155%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 (B1)	● Warm-up condition ● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1)	● Engine: After warming up ● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1 ACCEL SEN2★	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2★	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
EVAP SYS PRES	● Ignition switch: ON		1.8 - 4.8V
ABSOL PRES/SE	● Ignition switch: ON		1.8 - 4.8V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10° - 20° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		2,000 rpm	Approx. 0° - 20°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 25% - 60%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
VIAS S/V	● Engine: After warming up	Idle	OFF
		More than 5,000 rpm	ON
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
VC/V BYPAS S/V	● Ignition switch: ON		OFF
VENT CONT/V	● Ignition switch: ON		OFF
THRTL RELAY	● Ignition switch: ON		ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm		ON
	● Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1)	● Engine speed: Below 3,600 rpm after the following conditions are met ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.		ON
	● Engine speed: Above 3,600 rpm		OFF
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MIL has turned ON.	0 - 65,535 km (0 - 40,723 mile)
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80°C (176°F) ● Engine speed: Below 3,600 rpm		Approx. 50%
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
SET VHCL SPD	● Engine: Running	ASCD: Operating	The preset vehicle speed is displayed.
MAIN SW	● Ignition switch: ON	CRUISE switch: Depressed	ON
		CRUISE switch: Released	OFF

MONITOR ITEM	CONDITION		SPECIFICATION
CANCEL SW	● Ignition switch: ON	CANCEL switch: Depressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	ACCEL/RES switch: Depressed	ON
		ACCEL/RES switch: Released	OFF
SET SW	● Ignition switch: ON	COAST/SET switch: Depressed	ON
		COAST/SET switch: Released	OFF
BRAKE SW1 (ASCD brake switch)	● Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2 (STOP lamp switch)	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
CRUISE LAMP	● Ignition switch: ON	CRUISE switch is depressed at first time → second time	ON → OFF
SET LAMP	● CRUISE switch: ON	SET switch pressed	ON
	● When vehicle is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD control is canceled.	OFF

★: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

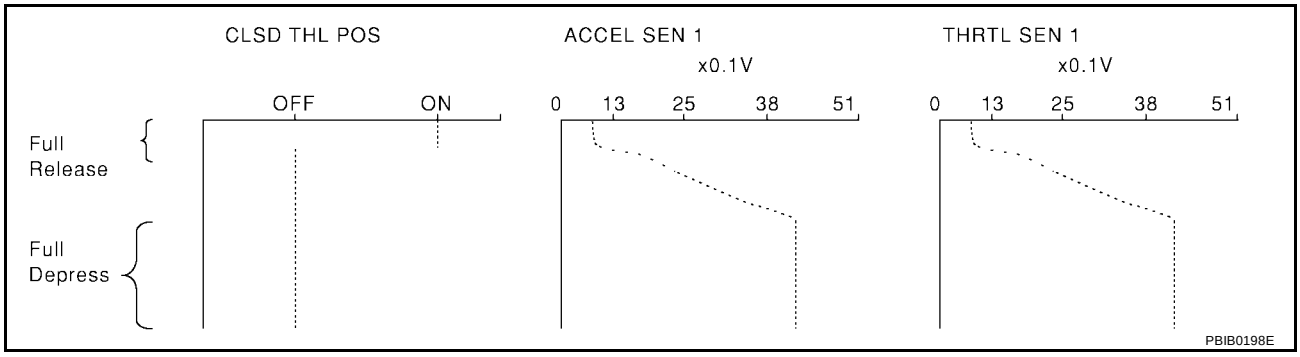
Major Sensor Reference Graph in Data Monitor Mode

UBS0027R

The following are the major sensor reference graphs in “DATA MONITOR” mode.

CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

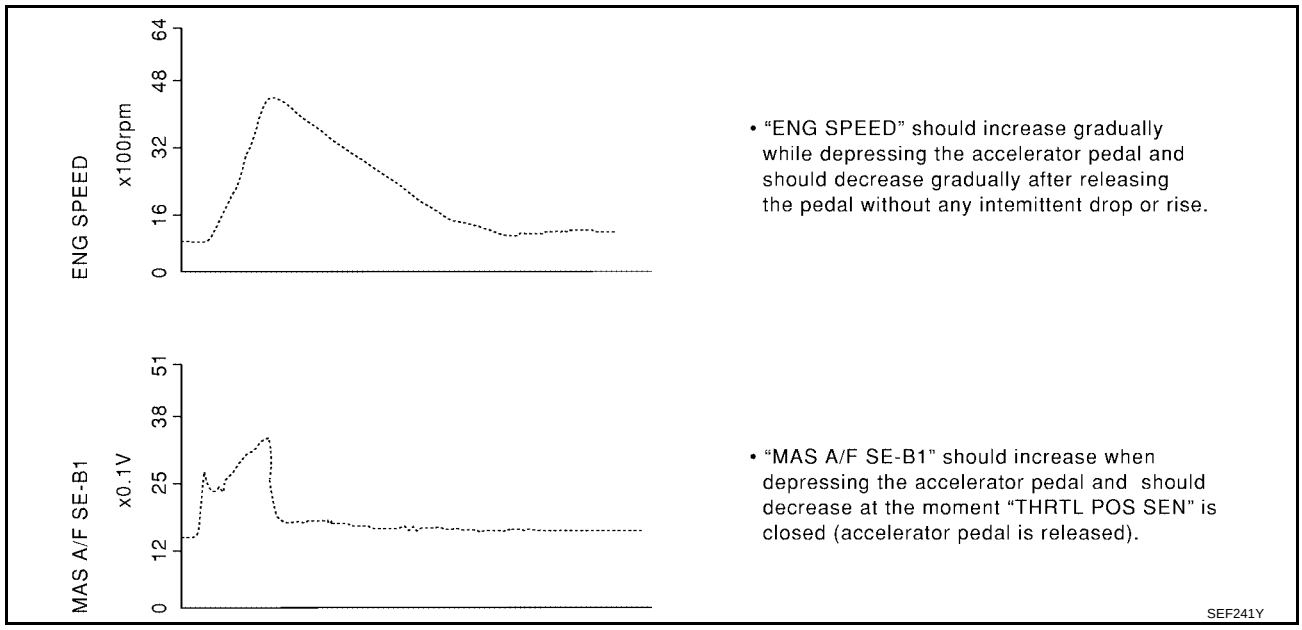
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position (A/T models) or with shift lever in “1st” position (M/T models).
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.

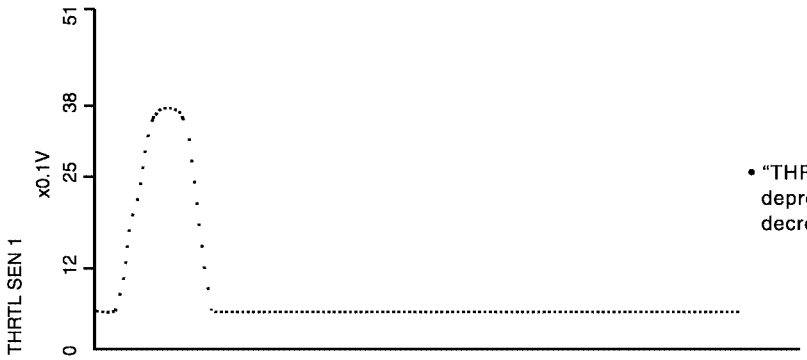


ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

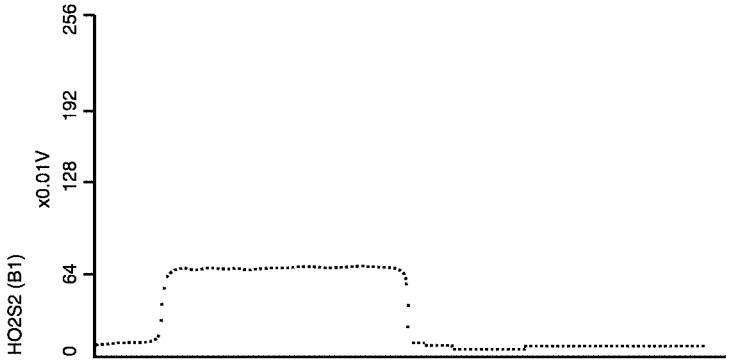
Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

Each value is for reference, the exact value may vary.

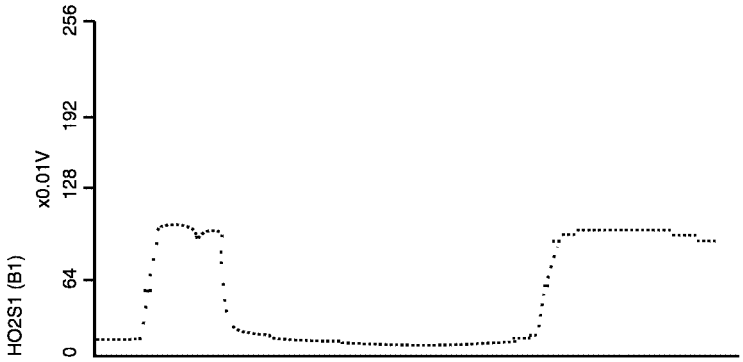




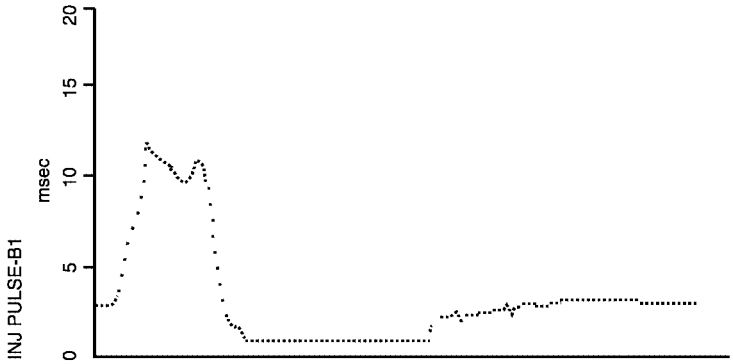
• "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

UBS0027S

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

UBS0027T

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

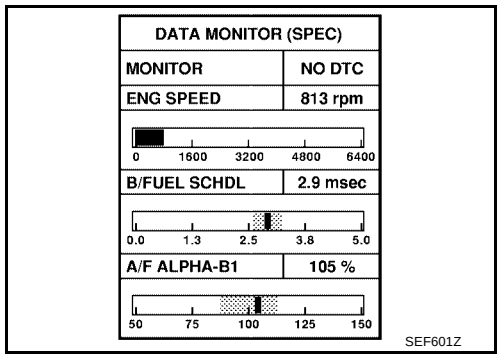
*1: For A/T models, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
For M/T models, after the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

Inspection Procedure

UBS0027U

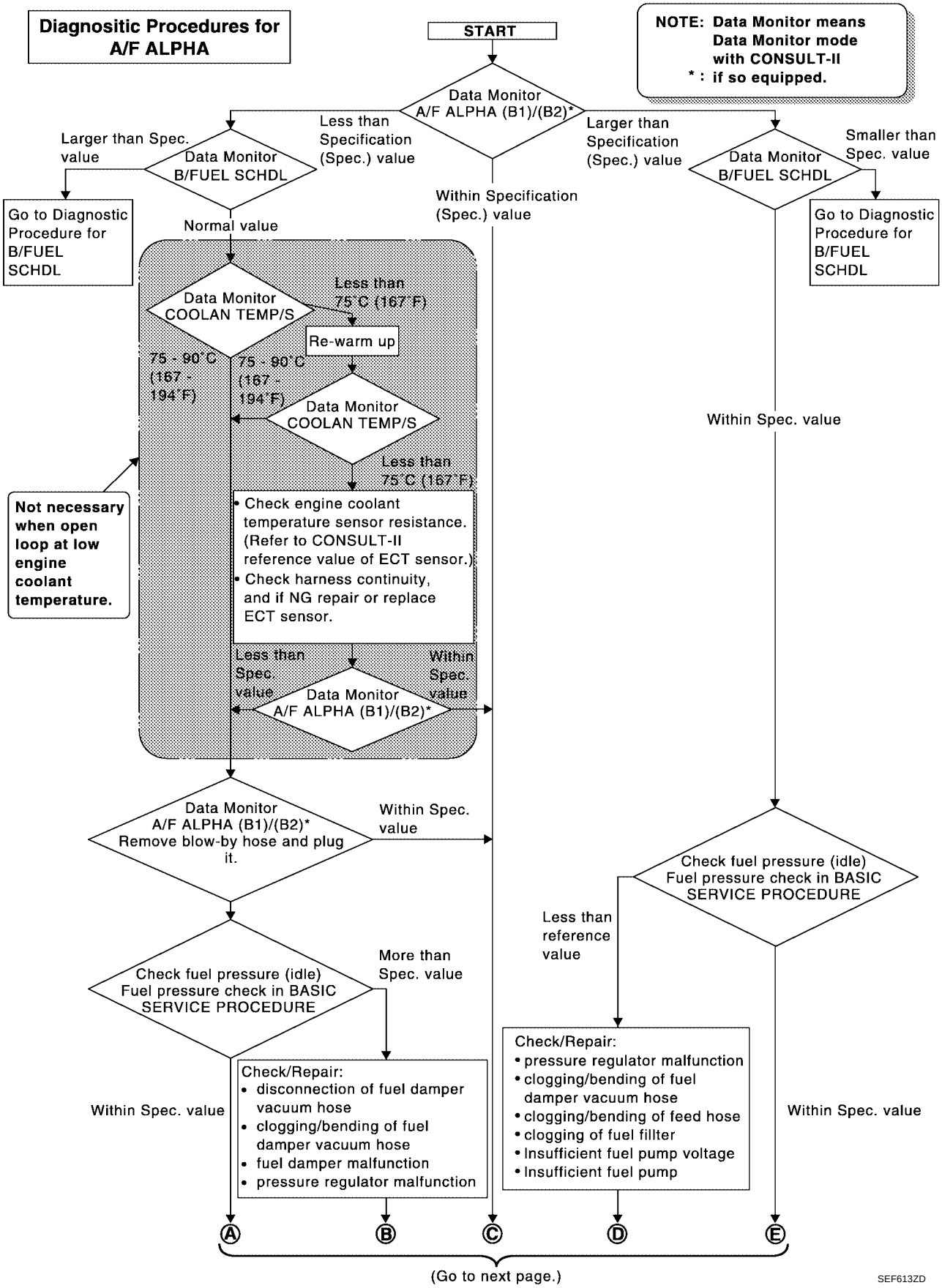
NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

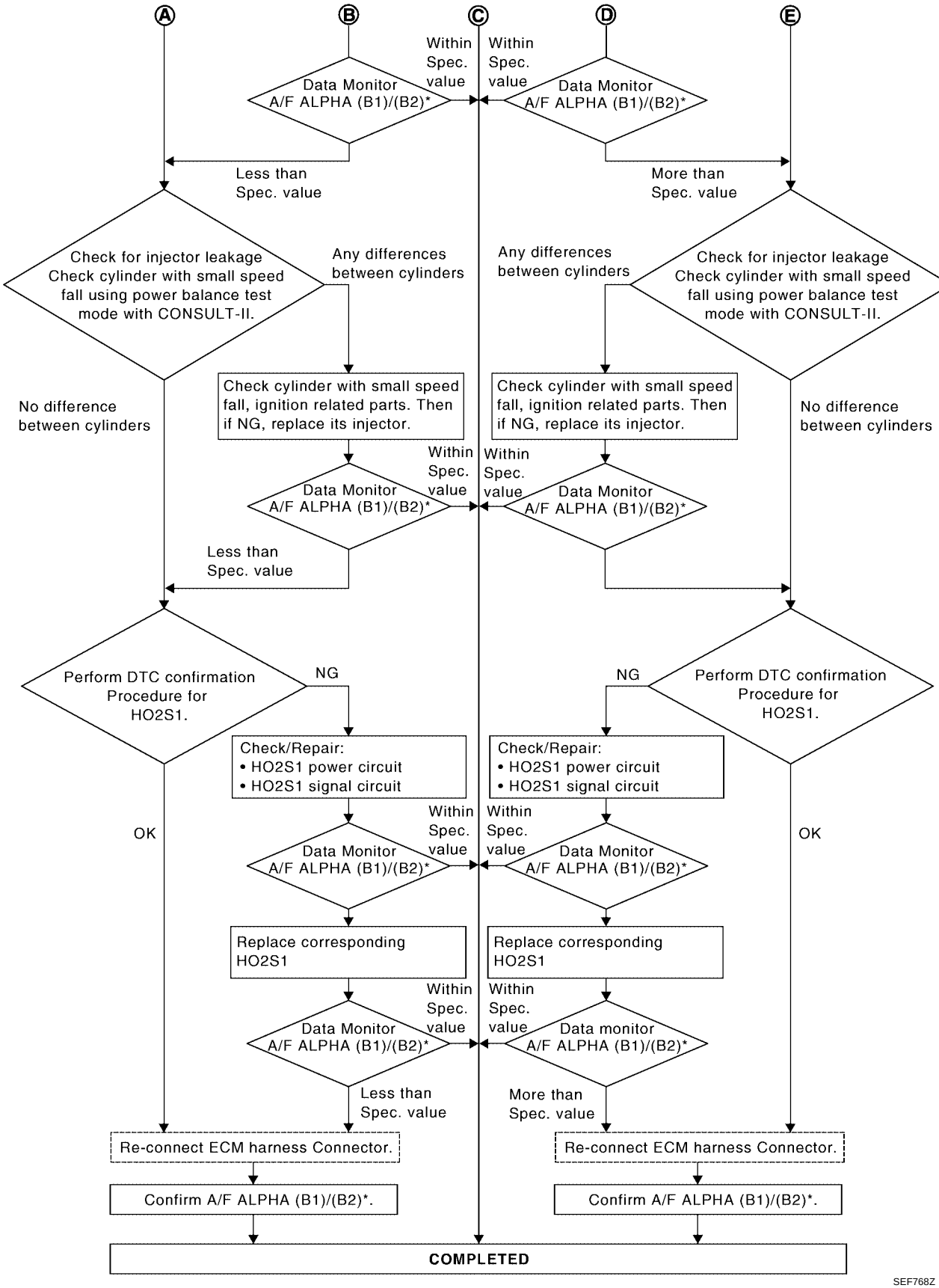
1. Perform EC-1291, "Basic Inspection" .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-1338, "Diagnostic Procedure" .

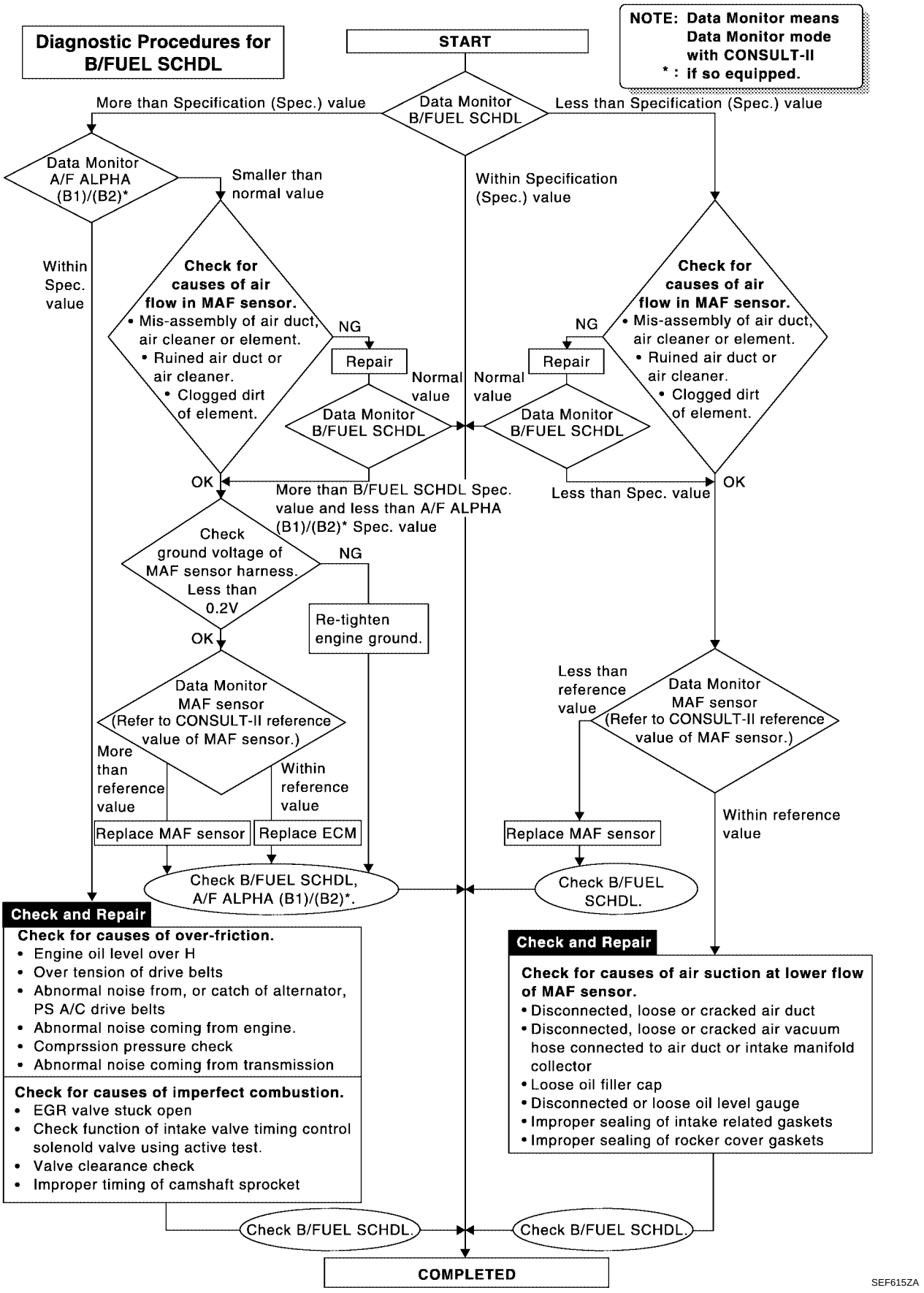


Diagnostic Procedure

UBS0027V




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair: • HO2S1 power circuit • HO2S1 signal circuit
Check/Repair: • HO2S1 power circuit • HO2S1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED
SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
Re-tighten engine ground.
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Less than reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check B/FUEL SCHDL.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

UBS0027W

Intermittent incidents (I/I) may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “[1t]”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the malfunctioning area.

Diagnostic Procedure

UBS0027X

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK CONNECTOR TERMINALS

Refer to GI-23, "How to Check Terminal" , “HOW TO PROBE CONNECTORS”, “How to Check Enlarged Contact Spring of Terminal”.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace connector.

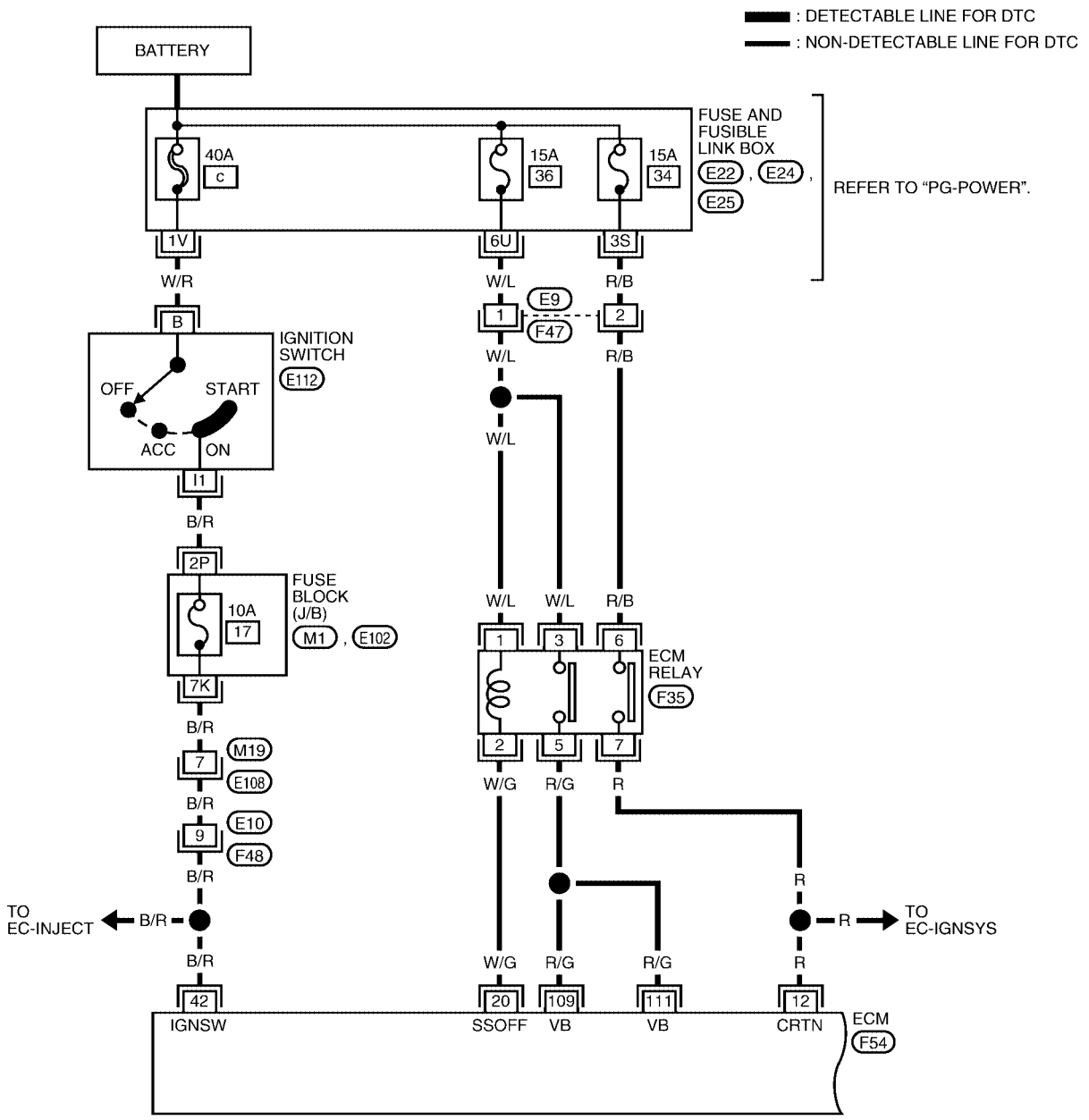
POWER SUPPLY CIRCUIT FOR ECM

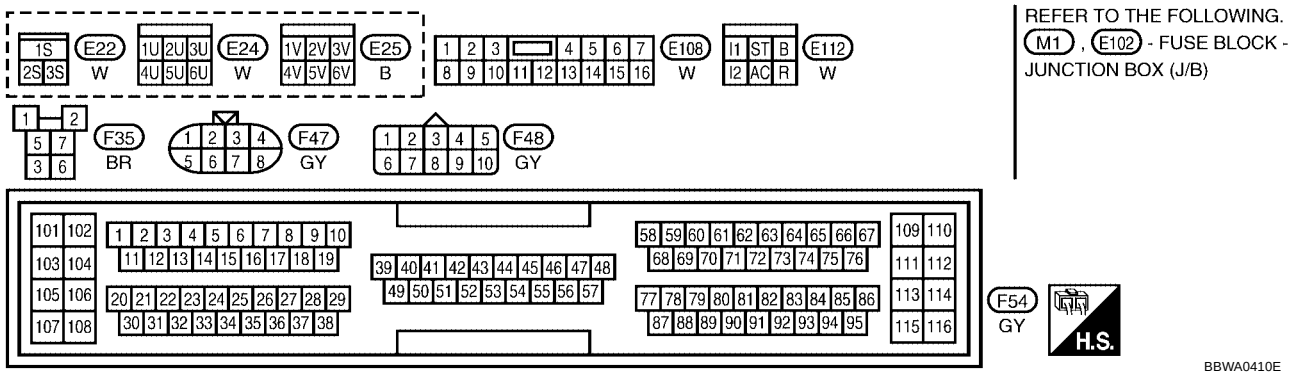
PFP:24110

Wiring Diagram

UBS0027Y

EC-MAIN-01





Specification data are reference values and are measured between each terminal and ground.

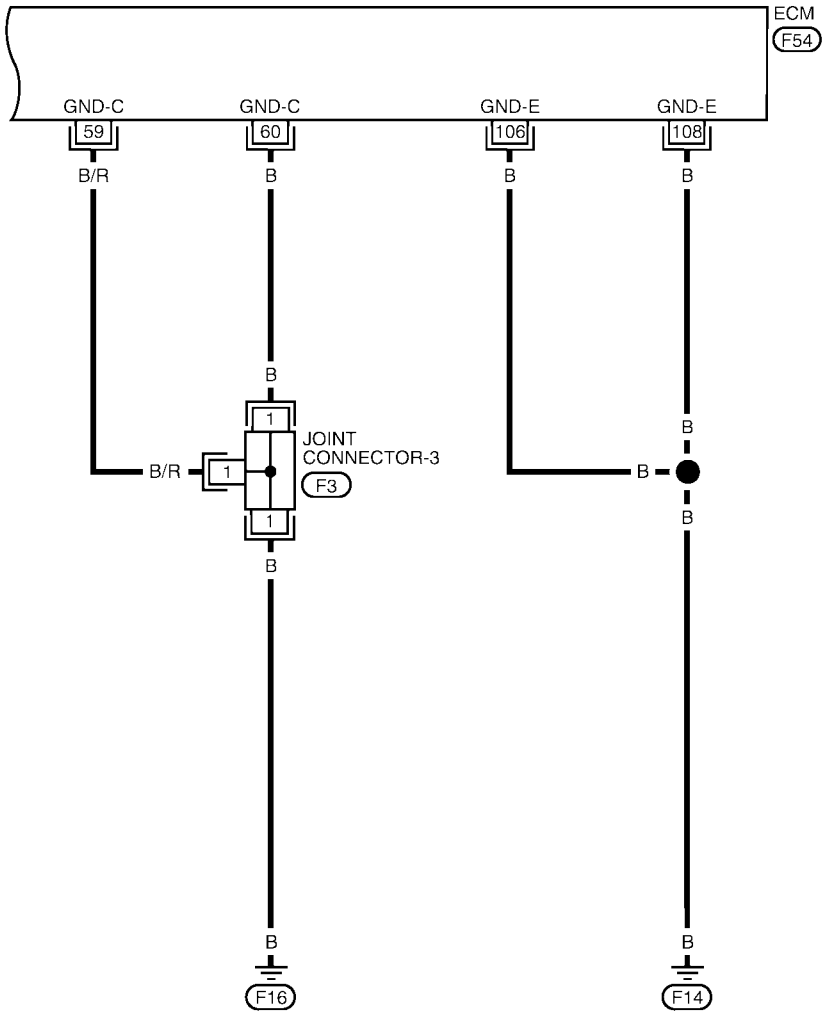
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

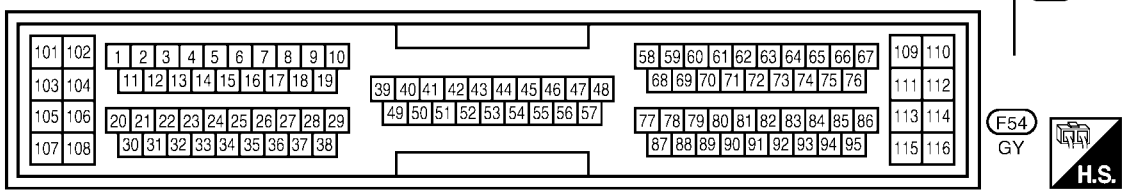
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	R	Counter current return	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
20	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● More than 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
42	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
109 111	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-MAIN-02

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC



REFER TO THE FOLLOWING.
F3 -JOINT CONNECTOR



BBWA0211E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
59 60 106 108	B/R B B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

Diagnostic Procedure

UBS0027Z

1. INSPECTION START

Start engine.

Is engine running?

Yes or No

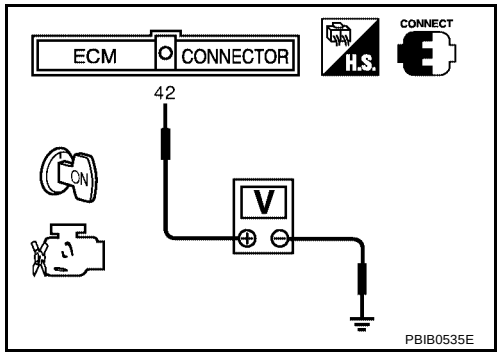
Yes >> GO TO 9.

No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “OFF” and then “ON”.
2. Check voltage between ECM terminal 42 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.

NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E10, F48
- Fuse block (J/B) connectors E102, M1
- 10A fuse
- Harness for open or short between ECM and fuse

>> Repair harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 59, 60, 106, 108 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

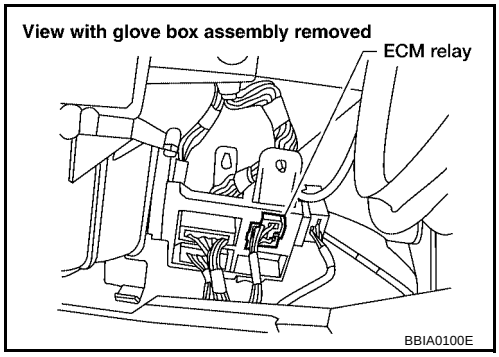
Check the following.

- Joint connector-3
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

6. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.

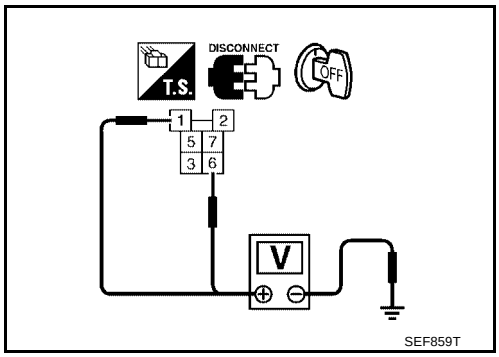


2. Check voltage between ECM relay terminals 1, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.



7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- 15A fuses
- Fuse and fusible link box connectors E22, E24
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 20 and ECM relay terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

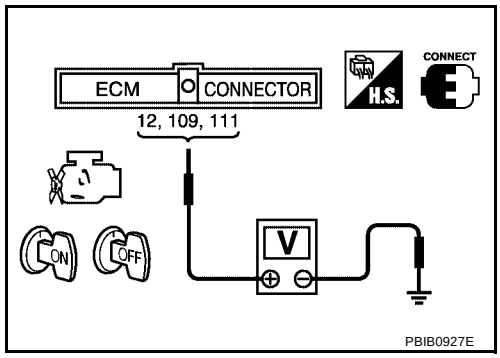
OK or NG

OK >> Go to EC-1777, "IGNITION SIGNAL" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Stop engine.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 12, 109, 111 and ground with CONSULT-II or tester.

Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

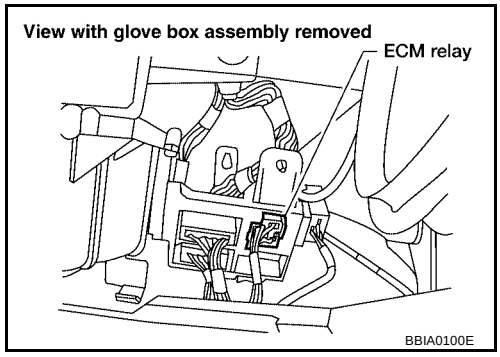


OK or NG

OK >> GO TO 14.
NG (Battery voltage does not exist.)>>GO TO 10.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 13.

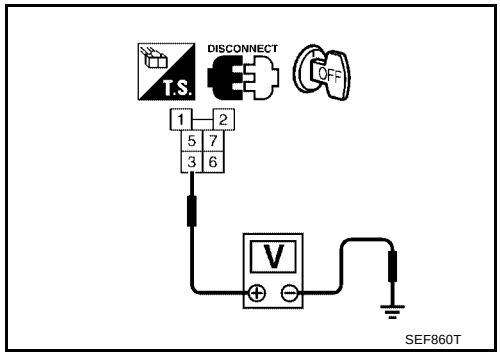
10. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness or connectors E9, F47
- Harness for open or short between ECM relay and 15A fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals and ECM relay terminals as follows. Refer to Wiring Diagram.

ECM terminal	ECM relay terminal
12	7
109, 111	5

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 13.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

13. CHECK ECM RELAY

Refer to EC-1349, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> Replace ECM relay.

14. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 59, 60, 106, 108 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

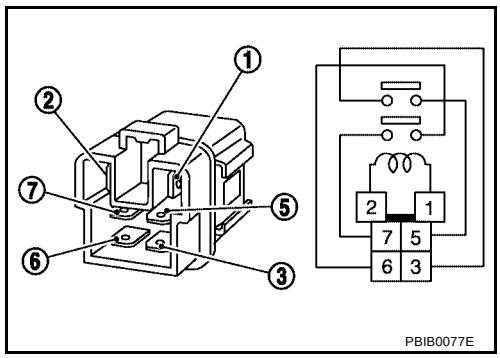
UBS00280

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

UBS00281

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

UBS00282

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000*1 1000	CAN communication line	● ECM cannot communicate to other control units. ● ECM cannot communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted)
U1001*2 1001			

***1:This self-diagnosis has the one trip detection.**
***2:The MIL will not light up for this diagnosis.**

DTC Confirmation Procedure

UBS00283

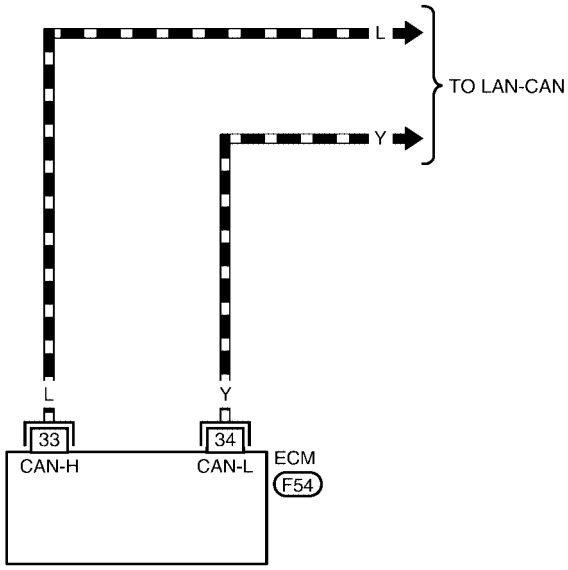
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1352, "Diagnostic Procedure" .

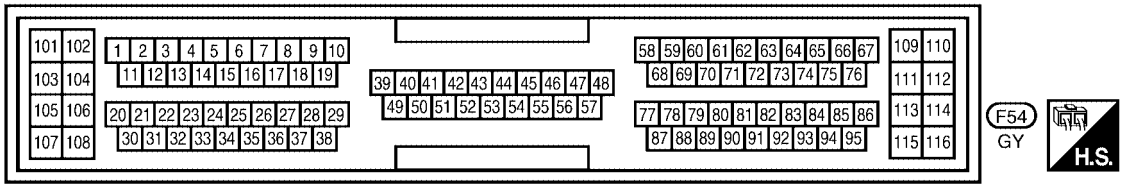
Wiring Diagram

UBS00284

EC-CAN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
: DATA LINE





BBWA0212E

Diagnostic Procedure

UBS00285

Go to LAN-23, "CAN SYSTEM (TYPE 3)"

DTC P0011 IVT CONTROL

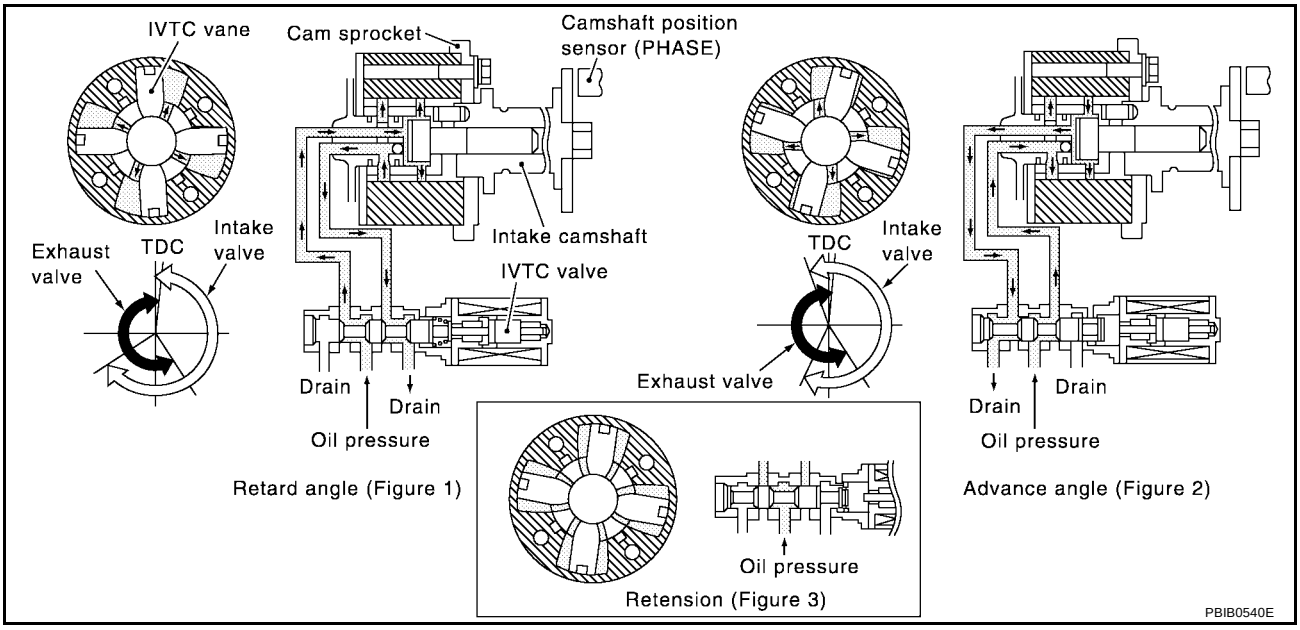
PFP:23796

Description

UBS00286

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed sensor	Vehicle speed		



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

CONSULT-II Reference Value in Data Monitor Mode

UBS00287

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		2,000 rpm	Approx. 0° - 20°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 25% - 60%

On Board Diagnosis Logic

UBS00288

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	● Crankshaft position sensor (POS) ● Camshaft position sensor (PHASE) ● Accumulation of debris to the signal pick-up portion of the camshaft

FAIL-SAFE MODE

ECM enters in fail-safe mode when the malfunction is detected.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

UBS00289

CAUTION:
Always drive at a safe speed.

NOTE:

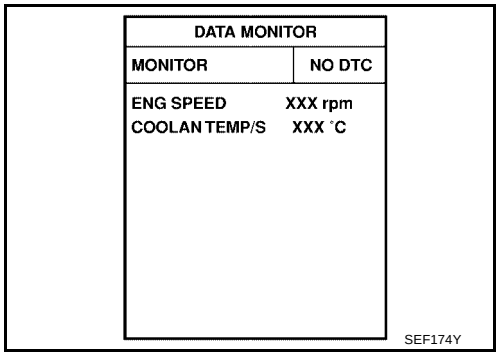
- **If DTC P0011 is displayed with DTC P1111, first perform trouble diagnosis for "DTC P1111". See EC-1600 .**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLANT TEMPS	70 - 105°C (158 - 221°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)



4. If 1st trip DTC is detected, go to EC-1354, "Diagnostic Procedure" .

WITH GST

Follow the procedure "WITH CONSULT-II" above.

Diagnostic Procedure

UBS0028A

1. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1494, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace crankshaft position sensor (POS).

2. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1500, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace camshaft position sensor (PHASE).

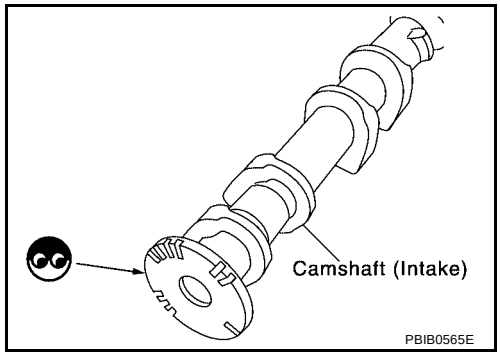
3. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 4.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For wiring diagram refer to CKP sensor (POS) EC-1491 and CMP sensor (PHASE) EC-1497 .

>> **INSPECTION END**

DTC P0031, P0032 HO2S1 HEATER

PFP:22690

Description

UBS0028B

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

UBS0028C

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80°C (176°F) ● Engine speed: Below 3,600 rpm	Approx. 50%

On Board Diagnosis Logic

UBS0028D

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heater oxygen sensor 1 heater
P0032 0032	Heated oxygen sensor 1 heater control circuit high	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heater oxygen sensor 1 heater

DTC Confirmation Procedure

UBS0028E

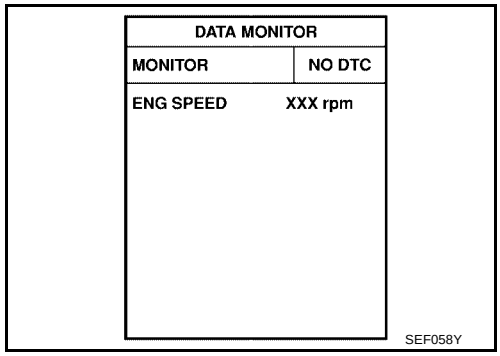
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and run it for at least 6 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-1359, "Diagnostic Procedure" .



WITH GST

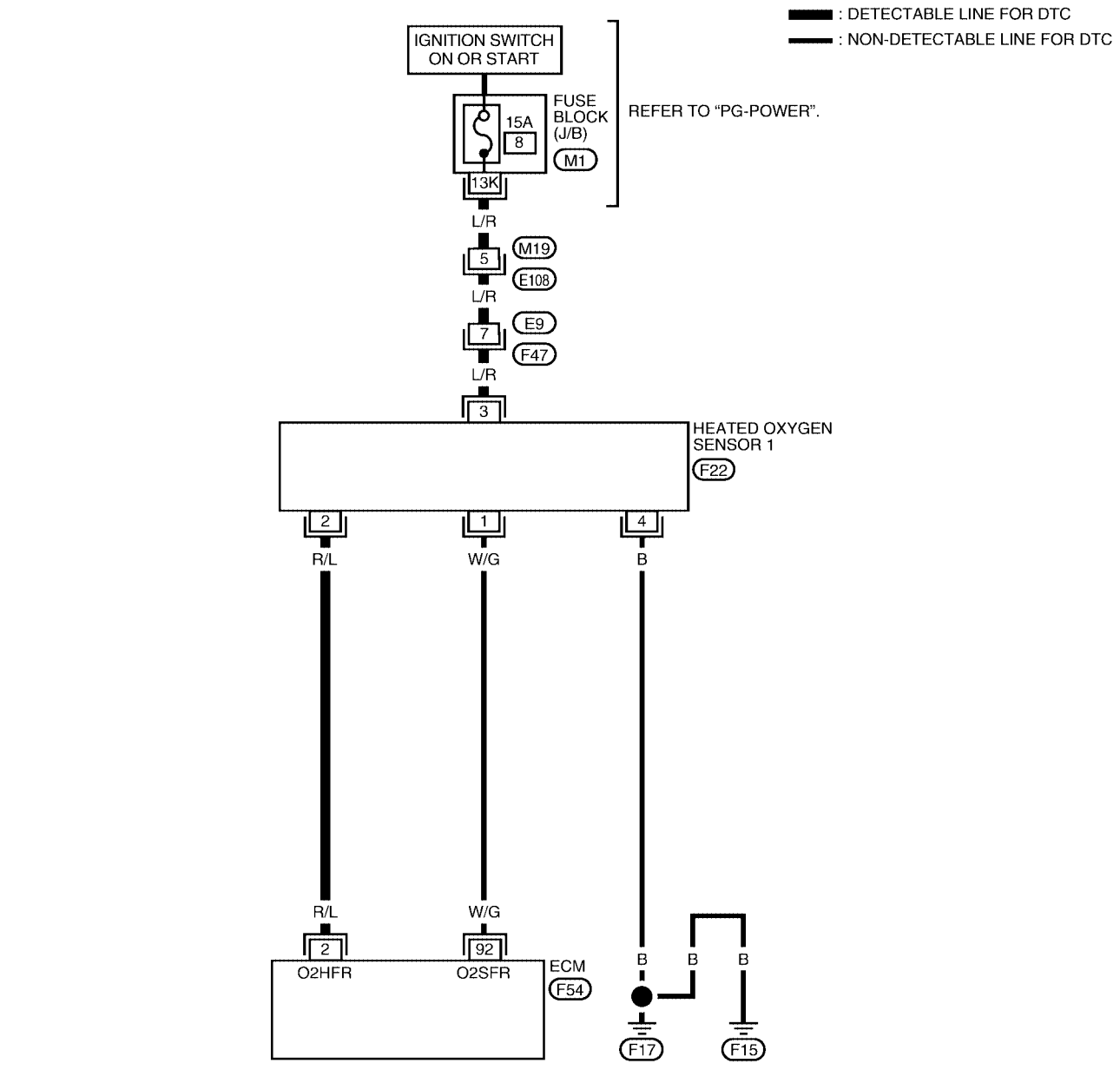
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and run it for at least 6 seconds at idle speed.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine and run it for at least 6 seconds at idle speed.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-1359, "Diagnostic Procedure" .

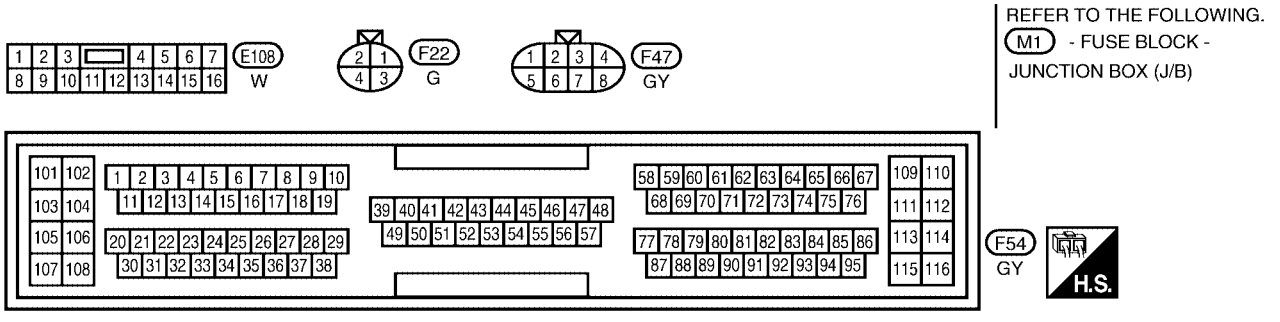
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS0028F

EC-HO2S1H-01



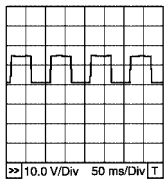


BBWA0411E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/L	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

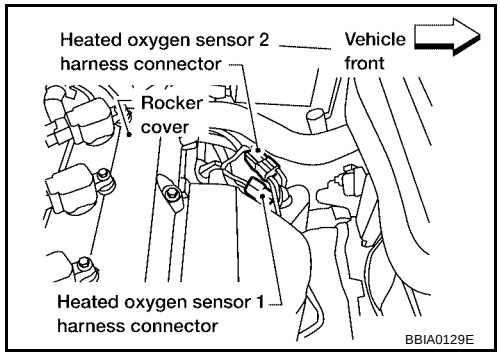
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS0028G

1. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch “ON”.

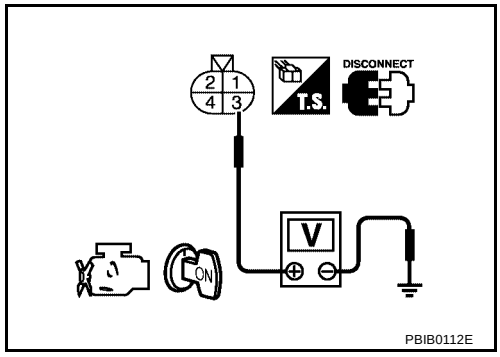


4. Check voltage between HO2S1 terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E9, F47
- Fuse block (J/B) connector M1
- 15A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair harness or connectors.

3. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1361, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS0028H

HEATED OXYGEN SENSOR 1 HEATER

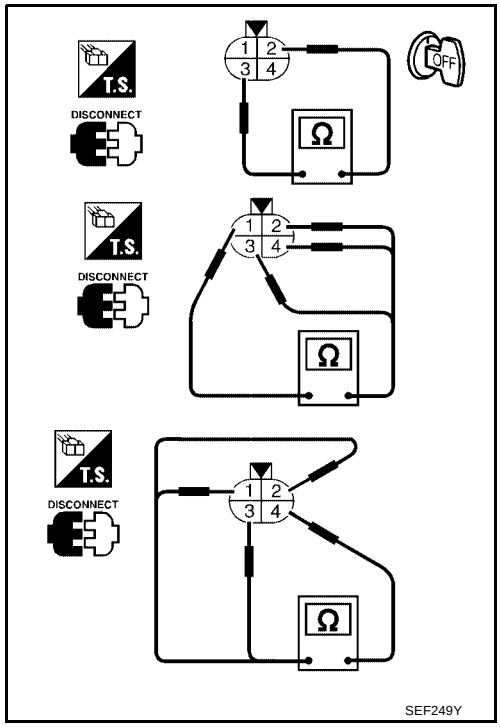
1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
2 and 3	3.3 - 4.0 Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

UBS0028I

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

DTC P0037, P0038 HO2S2 HEATER

PFP:226A0

Description

UBS0028J

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
Below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	ON

CONSULT-II Reference Value in Data Monitor Mode

UBS0028K

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	ON
	● Engine speed: Above 3,600 rpm	OFF

On Board Diagnosis Logic

UBS0028L

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) ● Heated oxygen sensor 2 heater
P0038 0038	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) ● Heated oxygen sensor 2 heater

DTC Confirmation Procedure

UBS0028M

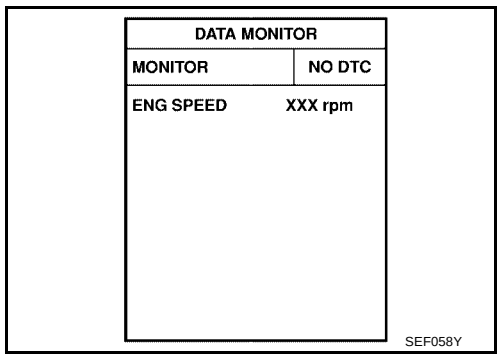
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.

4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minute.
6. If 1st trip DTC is detected, go to EC-1365, "Diagnostic Procedure" .



WITH GST

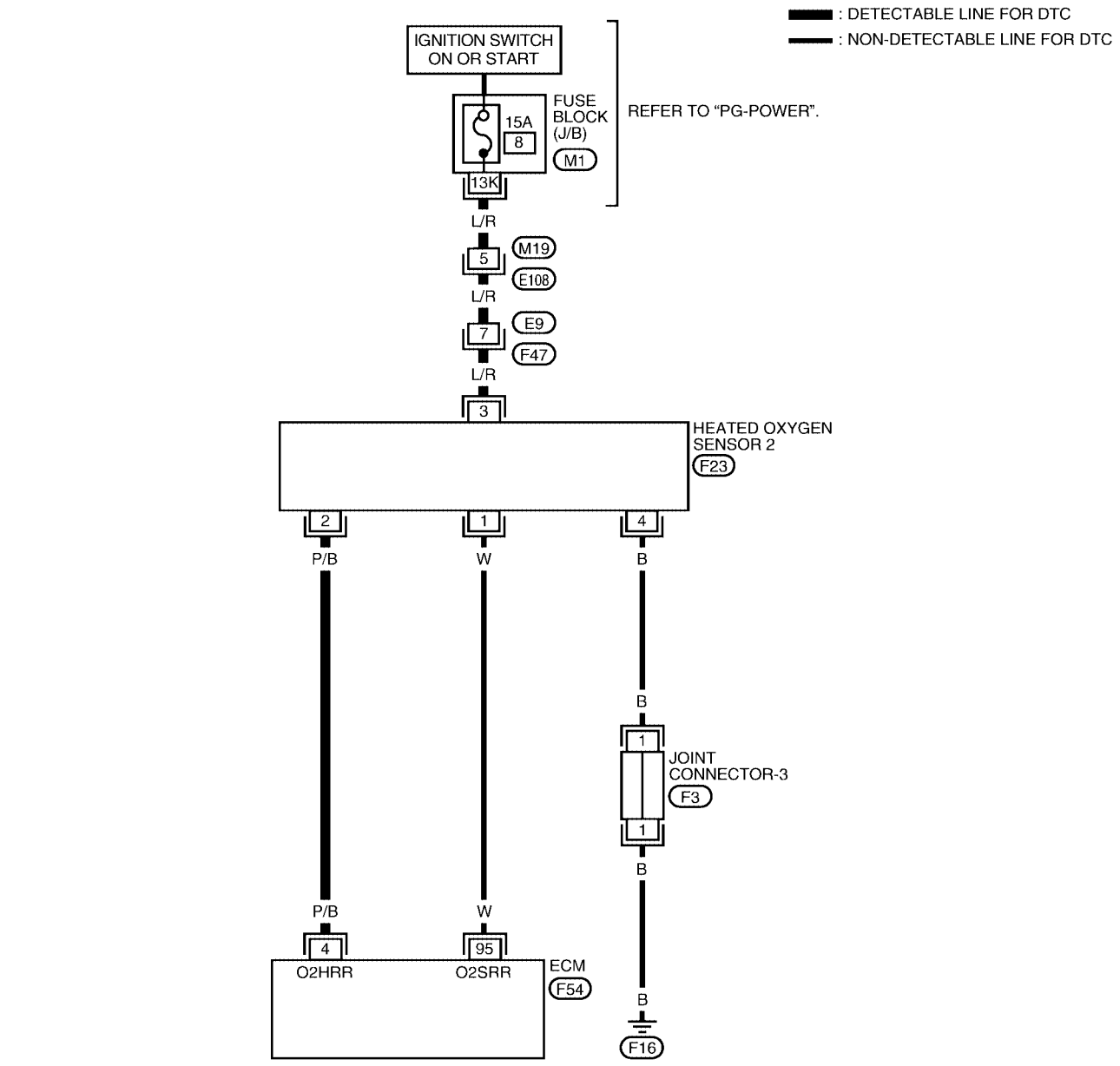
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for one minute.
8. Select “MODE 3” with GST.
9. If DTC is detected, go to EC-1365, "Diagnostic Procedure" .

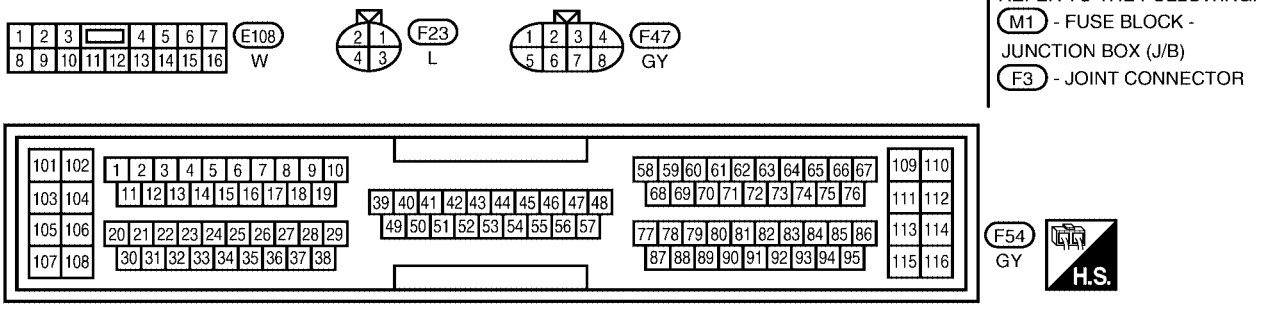
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS0028N

EC-HO2S2H-01





BBWA0412E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

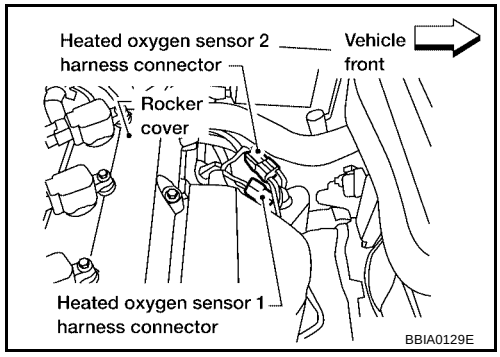
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	P/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm after the following conditions are met. ● Engine: After warming up ● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS0028O

1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch "ON".

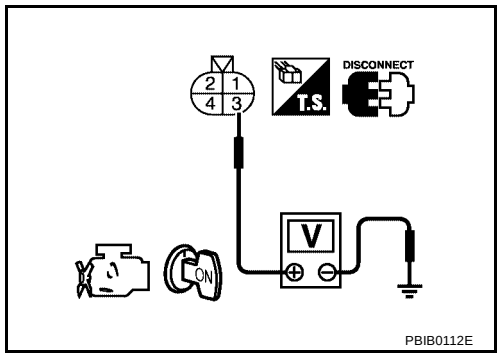


4. Check voltage between HO2S2 terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E9, F47
- Fuse block (J/B) connector M1
- 15A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 4 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-1367, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS0028P

HEATED OXYGEN SENSOR 2 HEATER

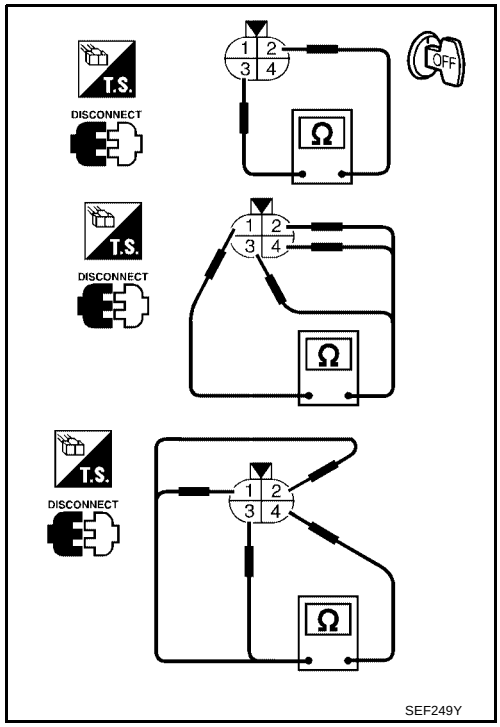
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
2 and 3	3.3 - 4.0 Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

2. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

UBS0028Q

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

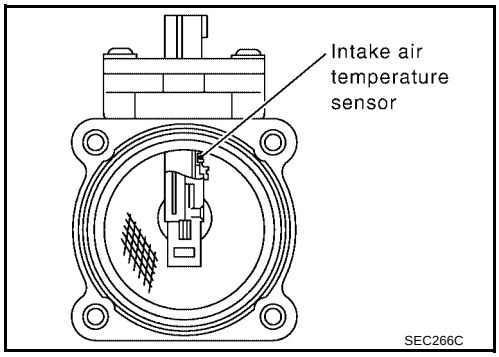
DTC P0101 MAF SENSOR

PFP:22680

Component Description

UBS0028R

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS0028S

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS0028T

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0101 0101	Mass air flow sensor circuit range/performance problem	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor
		B)	A low voltage from the sensor is sent to ECM under heavy load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor

DTC Confirmation Procedure

UBS0028U

Perform “PROCEDURE FOR MALFUNCTION A” first.
If the DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”.

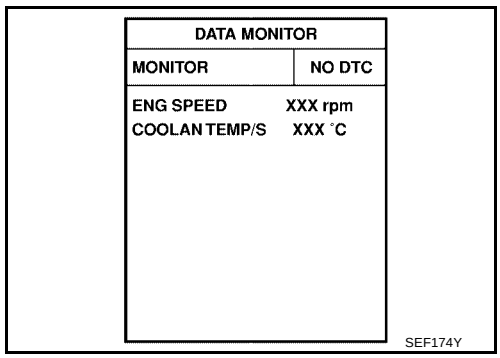
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

NOTE:
If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch “ON”) instead of running engine at idle speed.

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and warm it up to normal operating temperature.
4. Run engine for at least 10 seconds at idle speed.
5. If DTC is detected, go to EC-1372, "Diagnostic Procedure" .



With GST

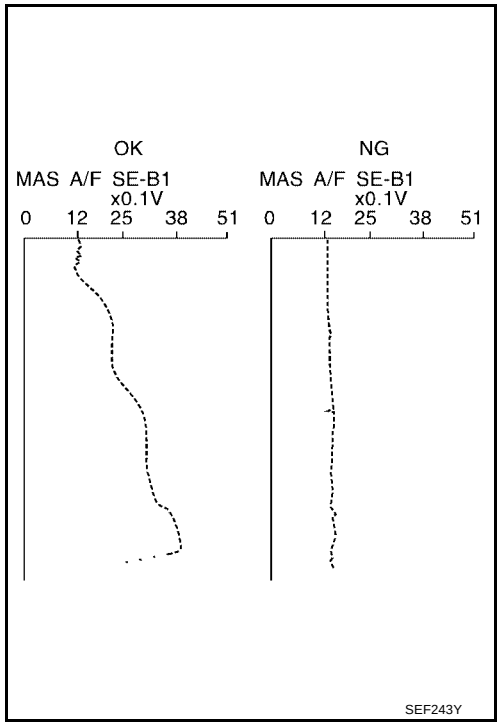
Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

CAUTION:
Always drive vehicle at a safe speed.

With CONSULT-II

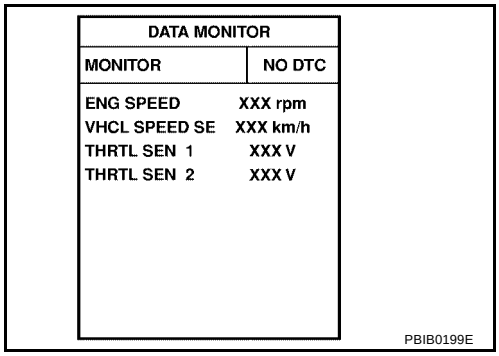
1. Turn ignition switch “ON”.
2. Start engine and warm it up to normal operating temperature.
   If engine cannot be started, go to EC-1372, "Diagnostic Procedure" .
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Check the voltage of “MAS A/F SE-B1” with “DATA MONITOR”.
5. Increases engine speed to about 4,000 rpm.
6. Monitor the linear voltage rise in response to engine speed increases.
   If NG, go to EC-1372, "Diagnostic Procedure" .
   If OK, go to following step.



7. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
THRTL SEN 1	More than 3V
THRTL SEN 2	More than 3V
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

8. If DTC is detected, go to EC-1372, "Diagnostic Procedure" .



Overall Function Check

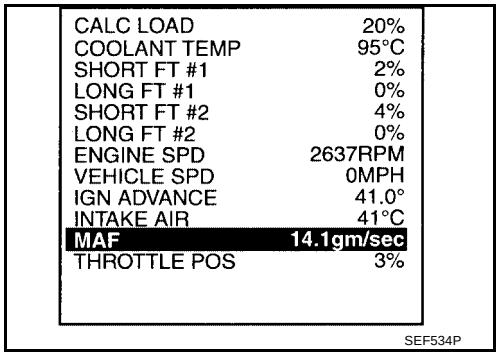
UBS0028V

PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a DTC might not be confirmed.

With GST

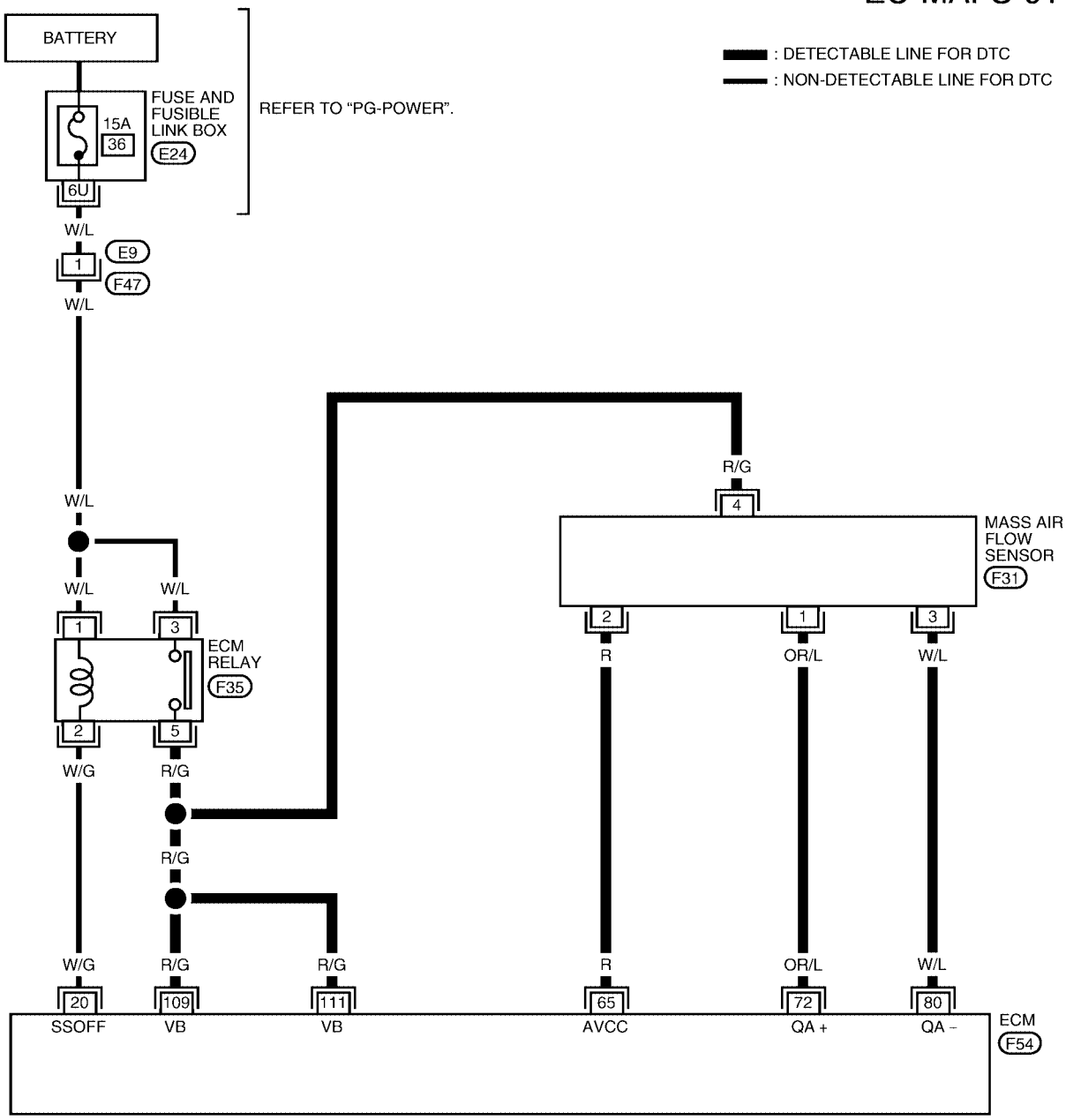
1. Start engine and warm it up to normal operating temperature.
2. Select “MODE 1” with GST.
3. Check the mass air flow sensor signal with “MODE 1”.
4. Check for linear mass air flow sensor signal value rise in response to increases to about 4,000 rpm in engine speed.
5. If NG, go to EC-1372, "Diagnostic Procedure" .

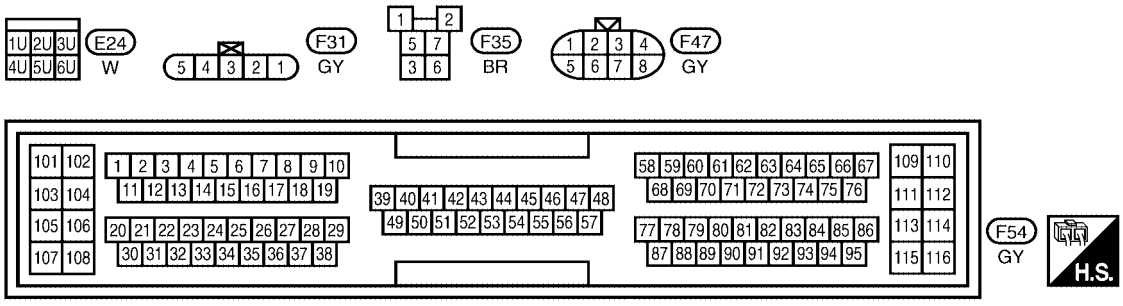


Wiring Diagram

UBS0028W

EC-MAFS-01





BBWA0213E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
72	OR/L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
80	W/L	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

UBS0028X

1. INSPECTION START

Which malfunction (A or B) is duplicated?

A or B

A >> GO TO 3.
B >> GO TO 2.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

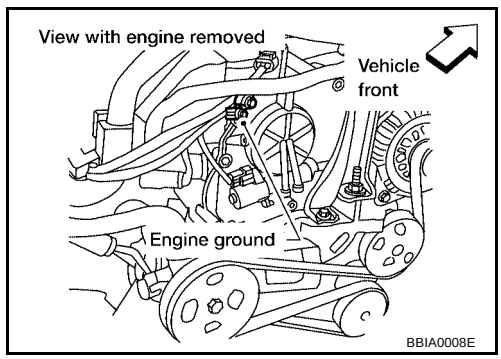
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

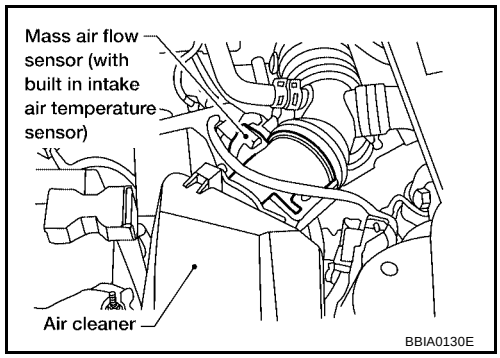
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



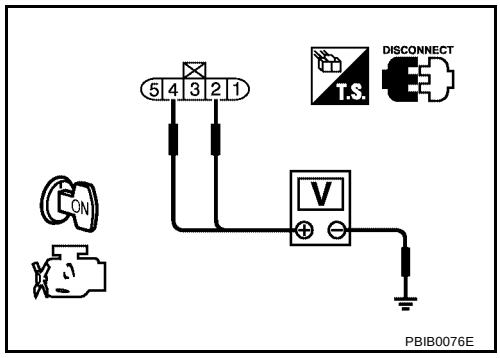
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 80. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 72. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-1374, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

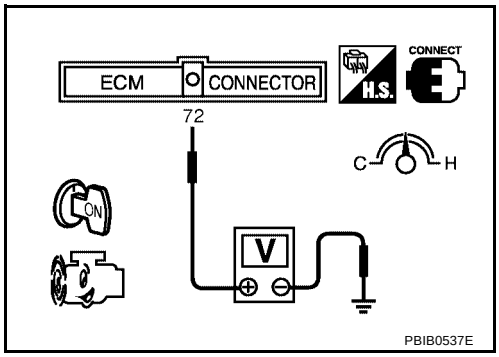
>> **INSPECTION END**

Component Inspection

UBS0028Y

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 72 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.5
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.

4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

UBS0028Z

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

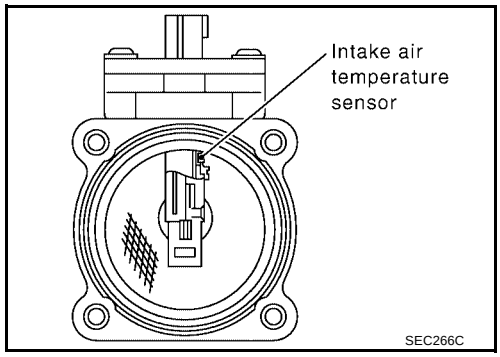
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

UBS00290

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS00291

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS00292

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

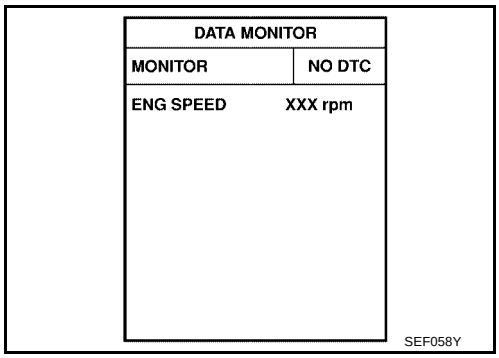
UBS00293

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-1378, "Diagnostic Procedure" .



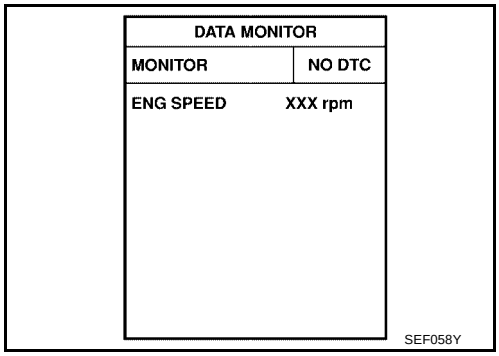
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1378, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-1378, "Diagnostic Procedure" .



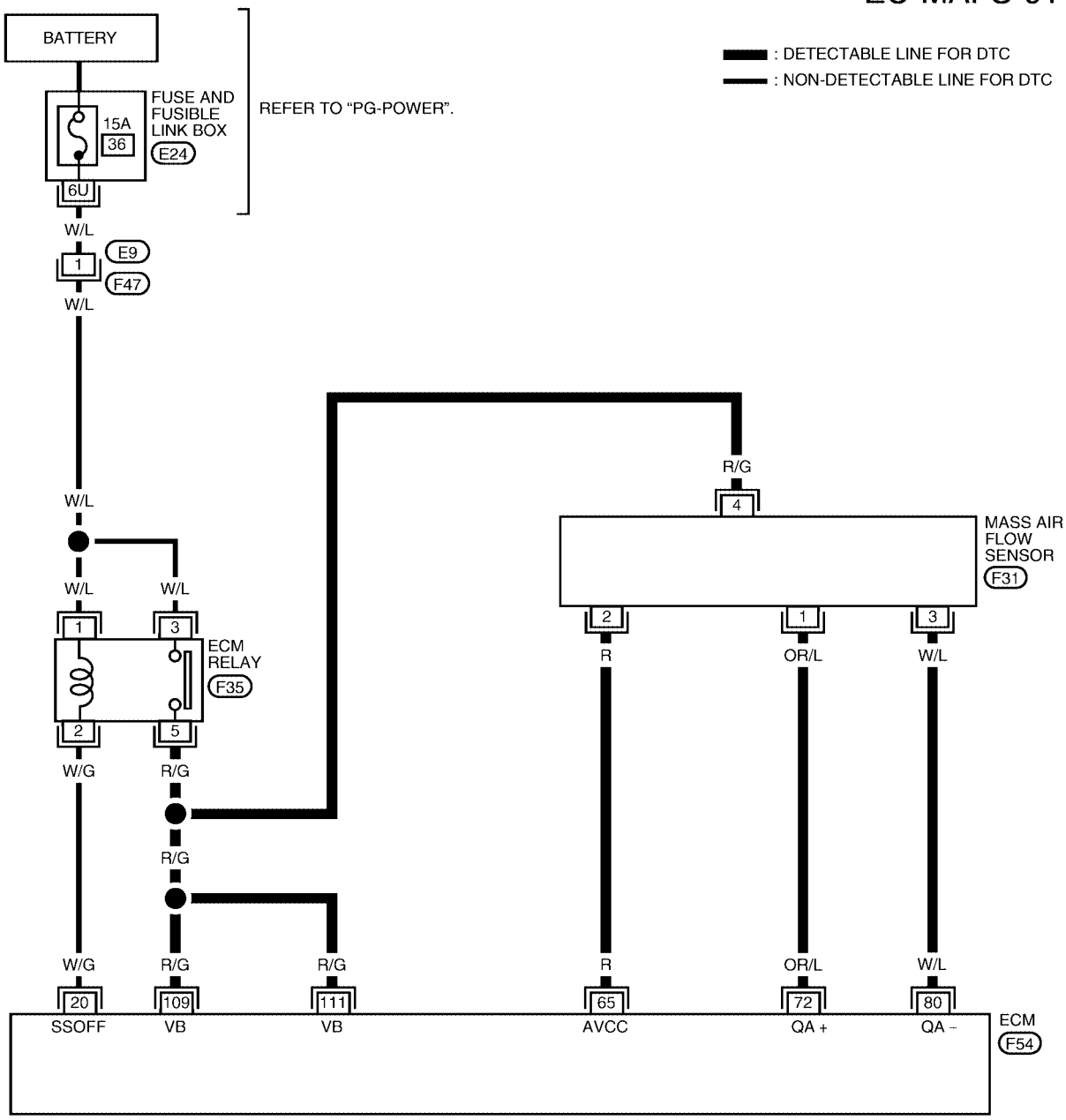
With GST

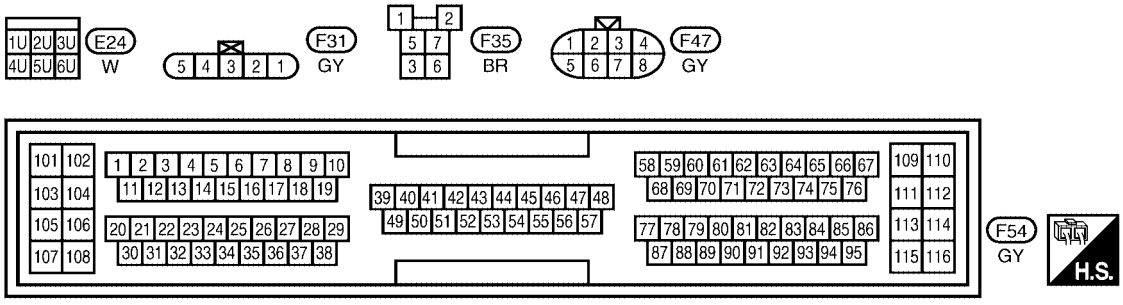
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS00294

EC-MAFS-01





BBWA0213E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
72	OR/L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
80	W/L	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

UBS00295

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

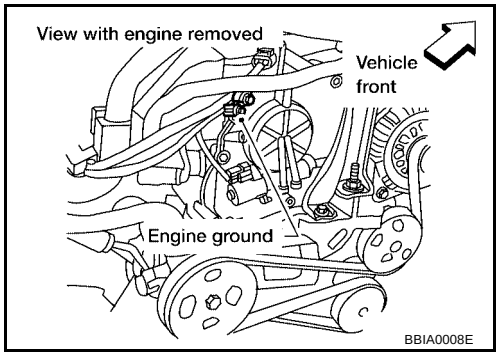
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

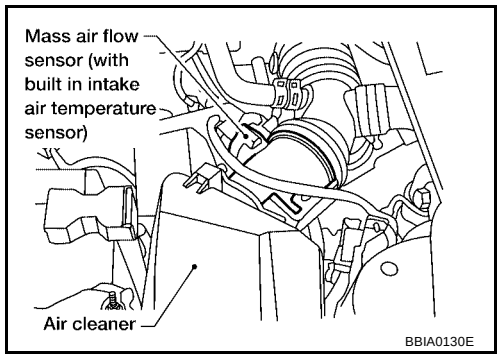
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



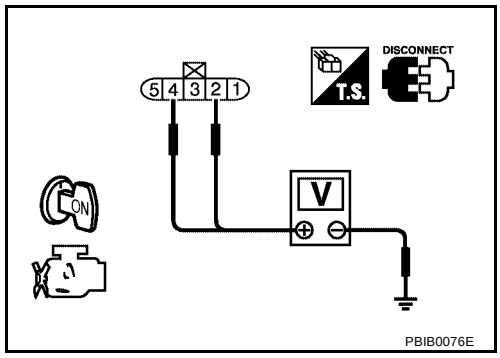
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 80. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 72. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-1380, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

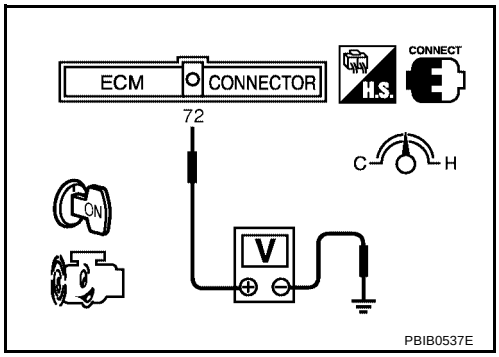
>> **INSPECTION END**

Component Inspection

UBS00296

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 72 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.5
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.

4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

UBS00297

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

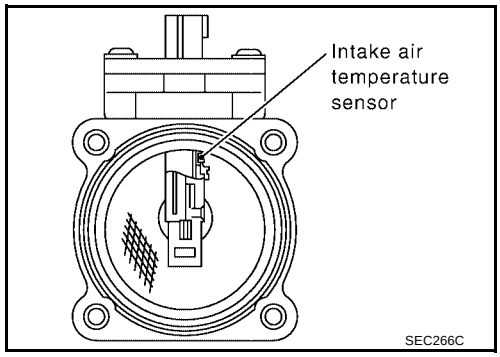
DTC P0112, P0113 IAT SENSOR

PFP:22630

Component Description

UBS00298

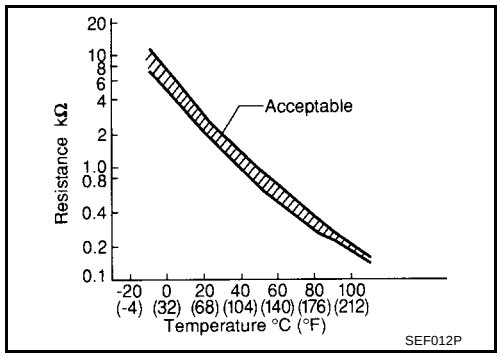
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 84 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS00299

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

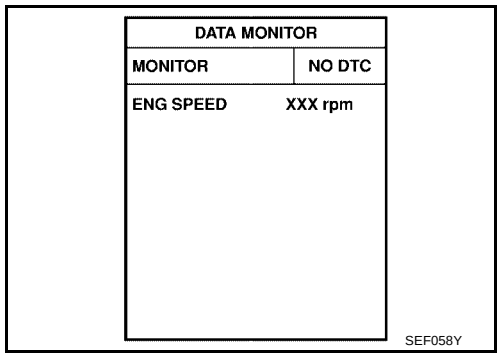
DTC Confirmation Procedure

UBS0029A

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1384, "Diagnostic Procedure" .



WITH GST

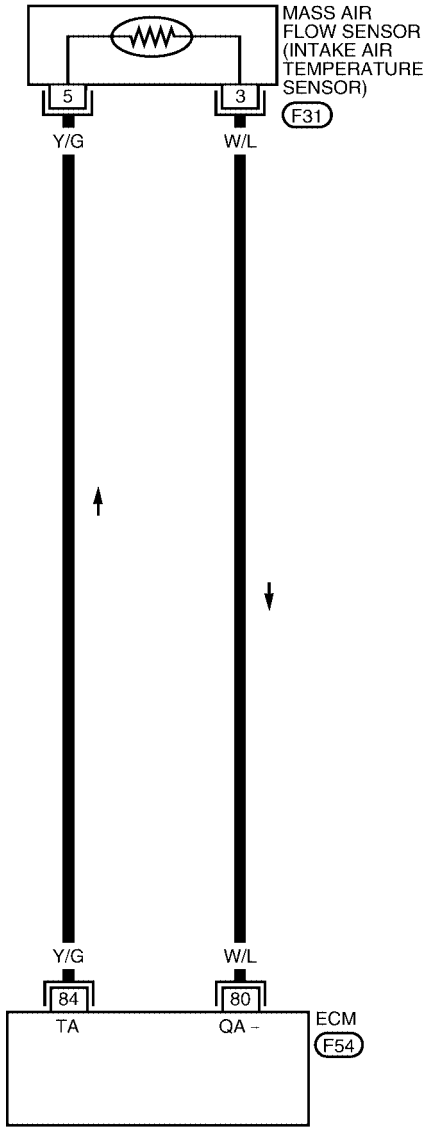
Follow the procedure “With CONSULT-II” above.

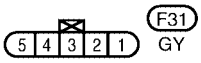
Wiring Diagram

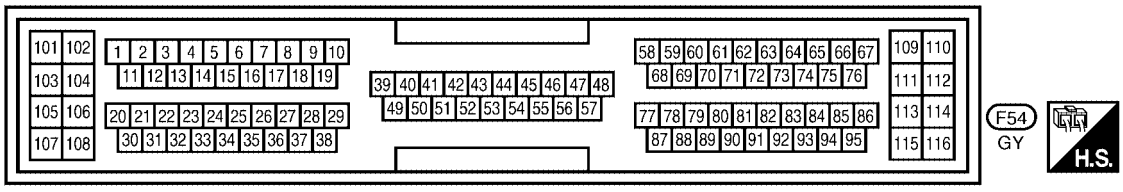
UBS0029B

EC-IATS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC







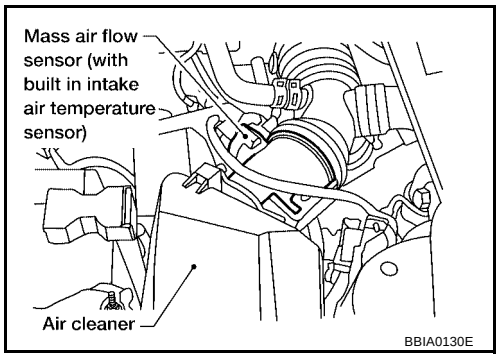
BBWA0214E

Diagnostic Procedure

UBS0029C

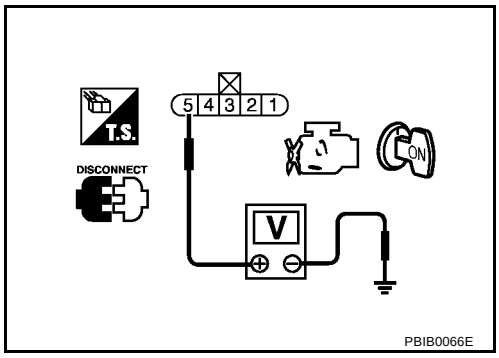
1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair harness or connectors.

2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between MAF sensor terminal 3 and ECM terminal 80. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair harness or connectors.

3. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1385, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

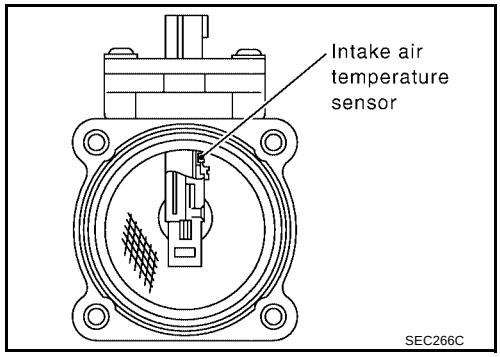
UBS0029D

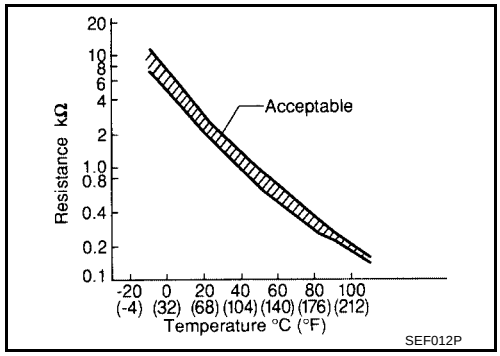
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

UBS0029E

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

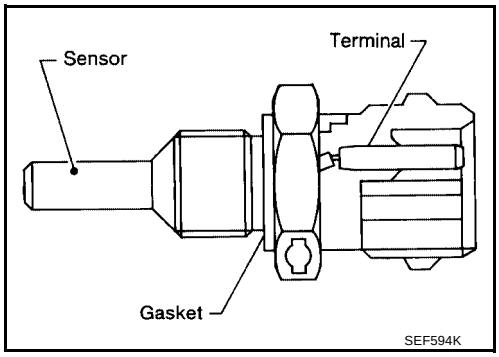
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

UBS0029F

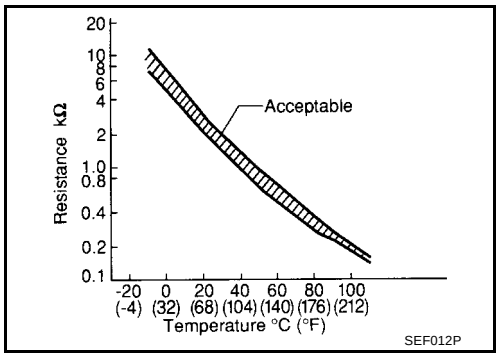
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS0029G

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

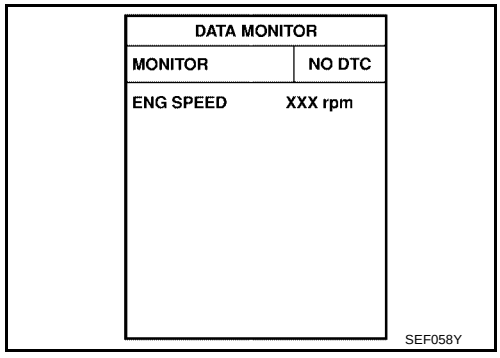
DTC Confirmation Procedure

UBS0029H

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1389, "Diagnostic Procedure" .



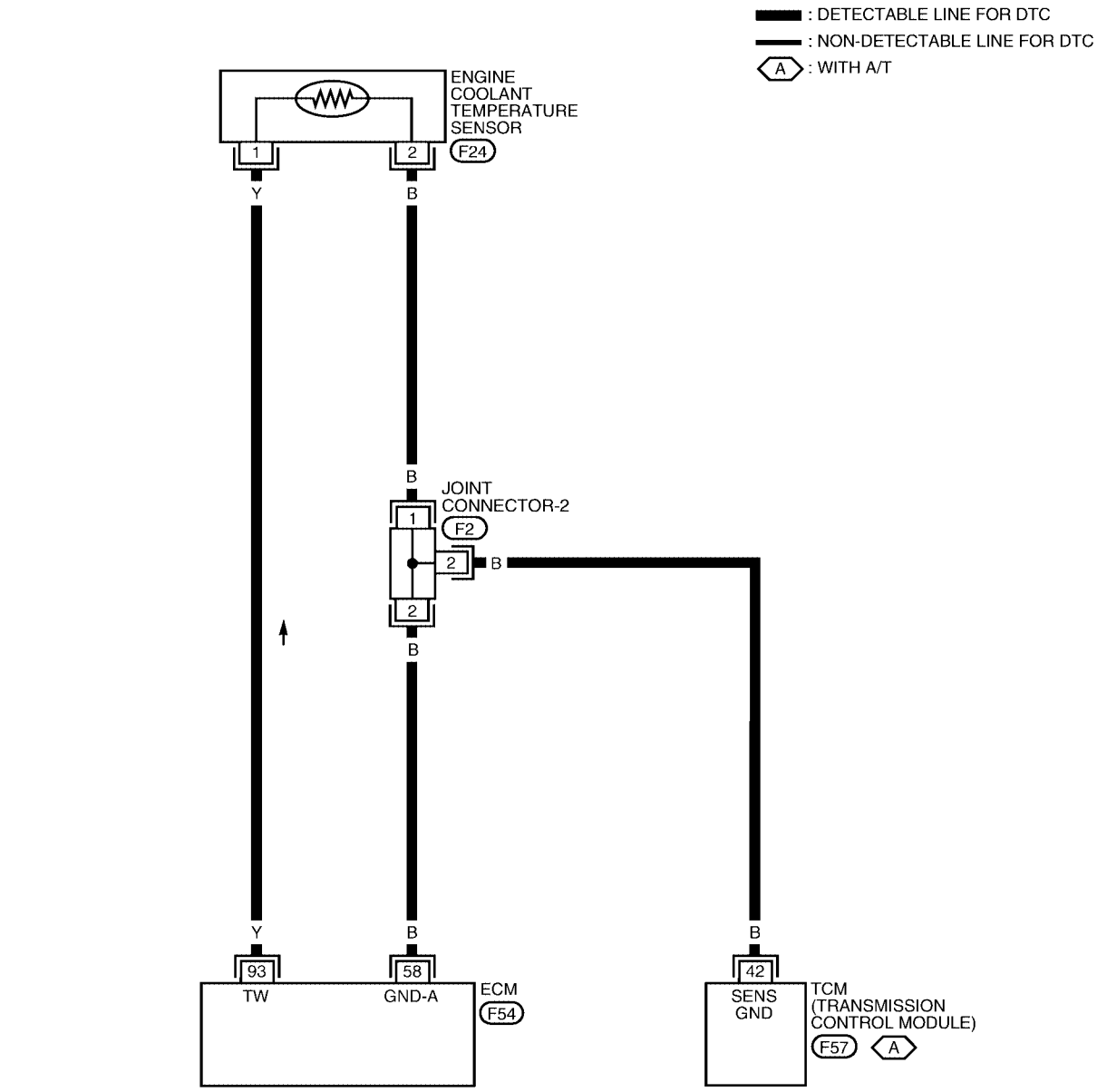
WITH GST

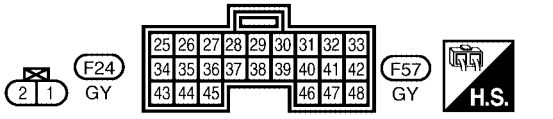
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

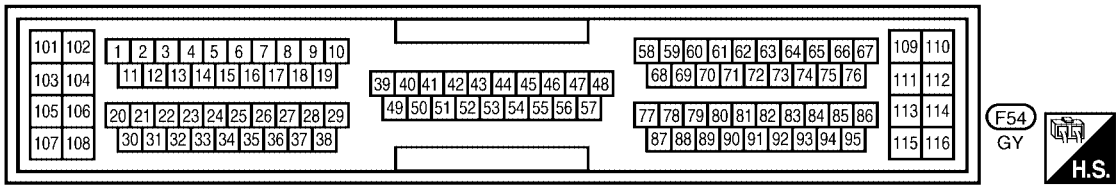
UBS0029I

EC-ECTS-01





REFER TO THE FOLLOWING.
F2 -JOINT CONNECTOR



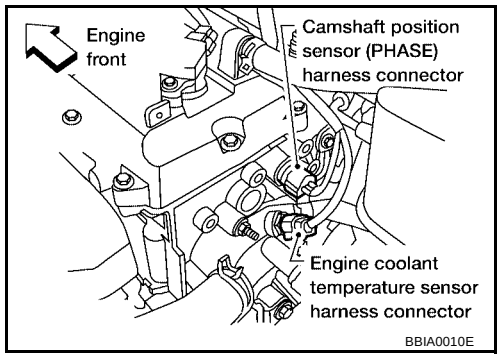
BBWA0413E

Diagnostic Procedure

UBS0029J

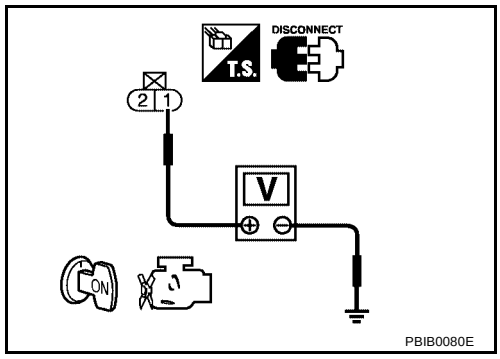
1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-2
- Harness for open or short between engine coolant temperature sensor and ECM
- Harness for open or short between engine coolant temperature sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1390, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

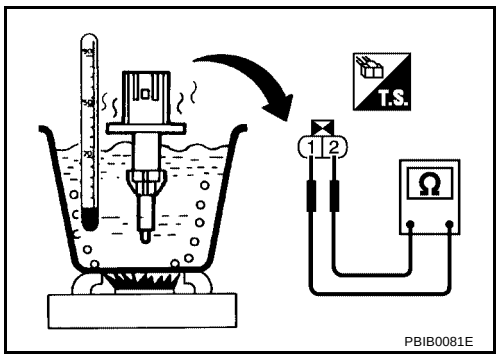
>> **INSPECTION END**

Component Inspection

UBS0029K

ENGINE COOLANT TEMPERATURE SENSOR

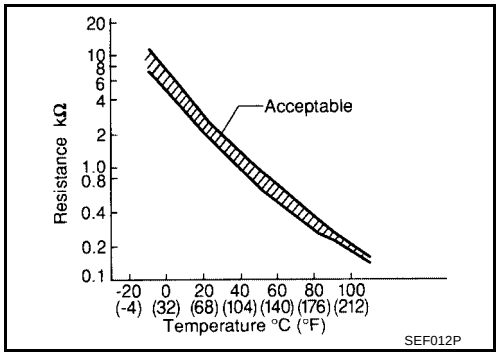
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS0029L

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .

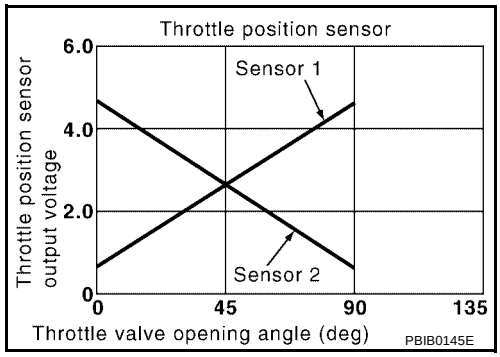
DTC P0122, P0123 TP SENSOR

PFP:16119

Component Description

UBS00571

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS00572

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2★	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st(M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

★: Throttle position sensor2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS00573

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122 0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 2)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

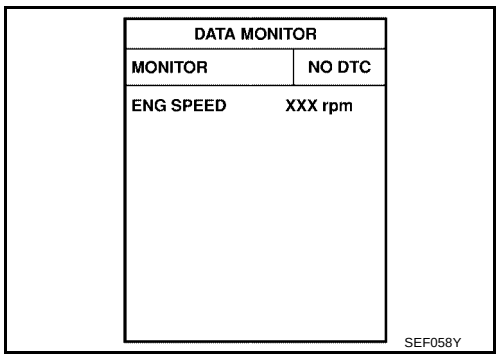
DTC Confirmation Procedure

UBS00574

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1394, "Diagnostic Procedure" .

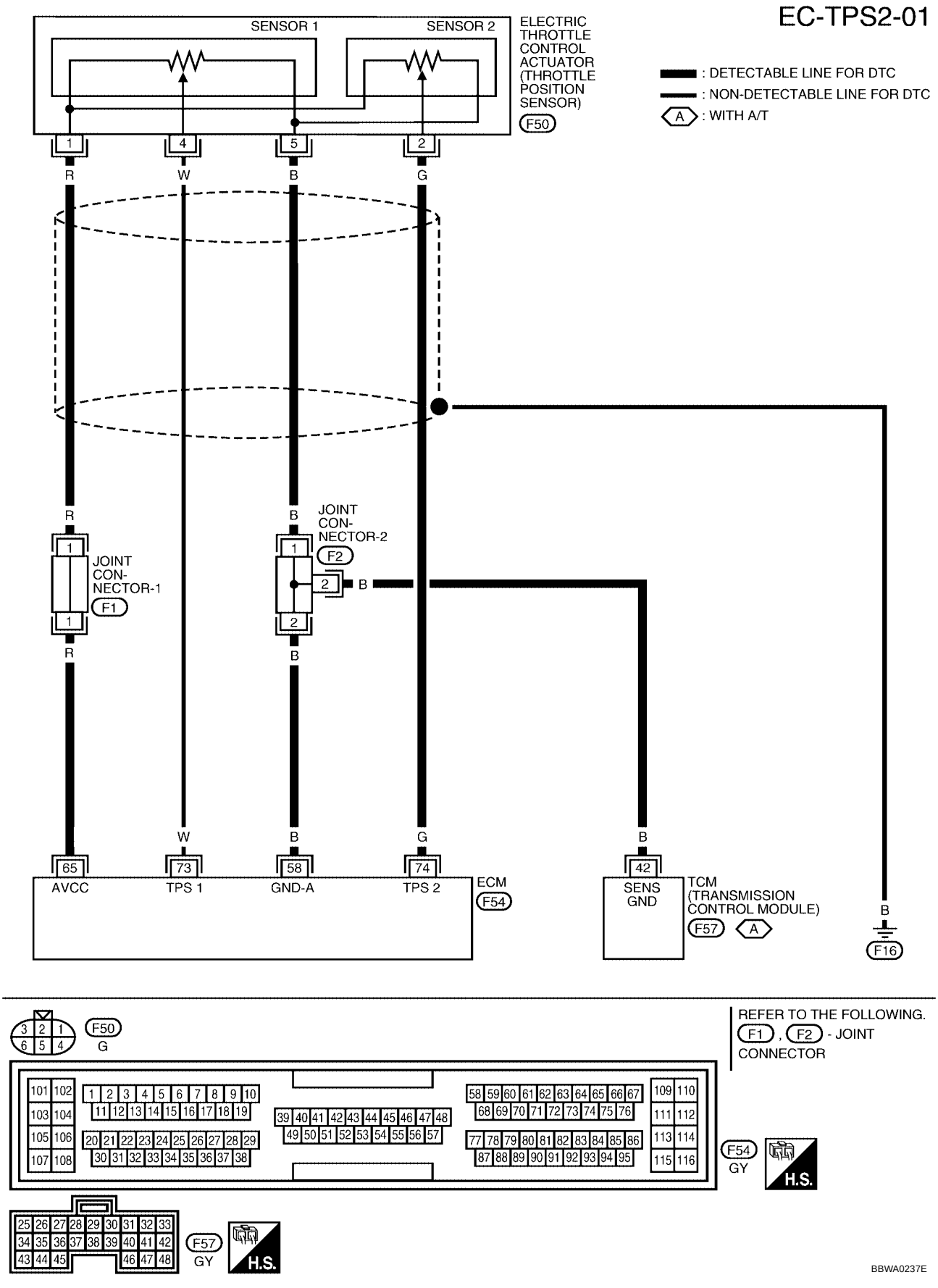


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS00575



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
73	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
74	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

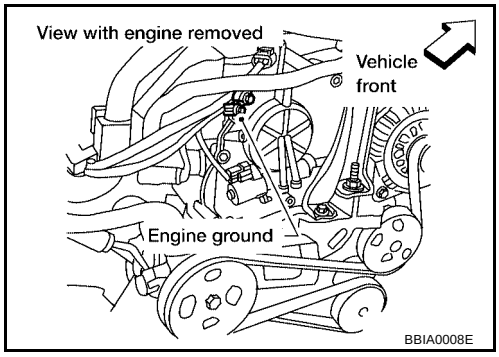
Diagnostic Procedure

UBS00576

1. RETIGHTEN GROUND SCREWS

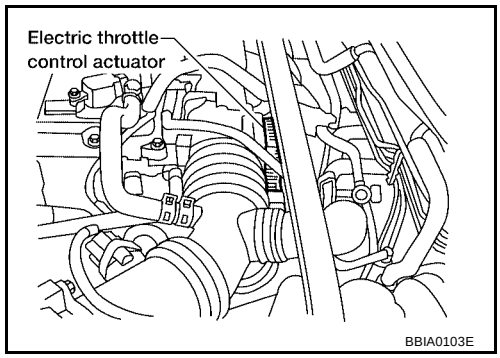
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

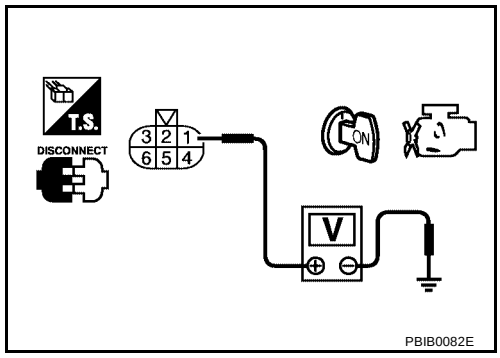


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between electric throttle control actuator and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electric throttle control actuator terminal 5 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-2
- Harness for open or short between electric throttle control actuator and ECM
- Harness for open or short between electric throttle control actuator and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 74 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE POSITION SENSOR

Refer to EC-1396, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

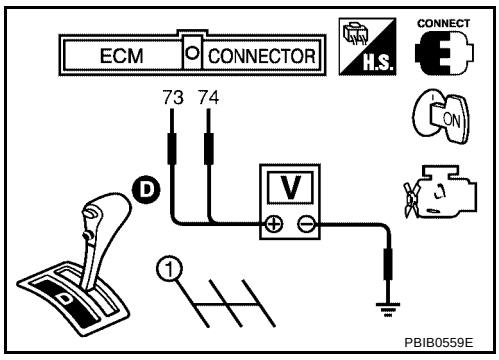
Component Inspection

UBS00577

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 73 (TP sensor 1signal), 74 (TP sensor 2signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
73 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
74 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1255, "Throttle Valve Closed Position Learning" .
8. Perform EC-1255, "Idle Air Volume Learning" .

Removal and Installation

UBS00578

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

DTC P0125 ECT SENSOR

PFP:22630

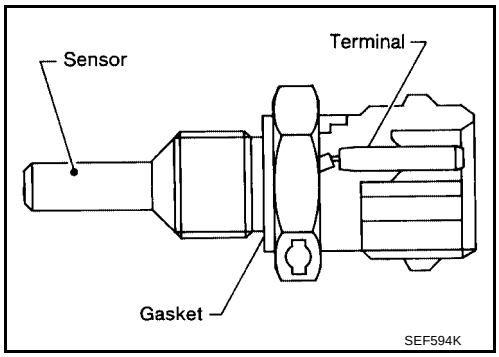
Description

UBS0029M

NOTE:
If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to EC-1386 .

COMPONENT DESCRIPTION

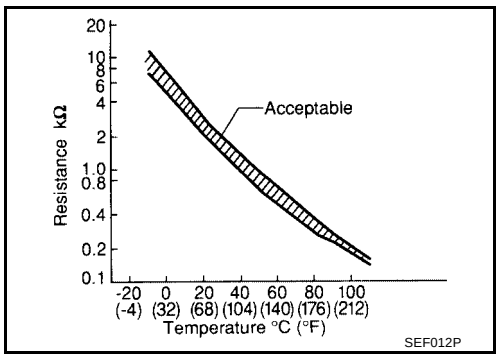
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS0029N

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	Insufficient engine coolant temperature for closed loop fuel control	● Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. ● Engine coolant temperature is insufficient for closed loop fuel control.	● Harness or connectors (High resistance in the circuit) ● Engine coolant temperature sensor ● Thermostat

DTC Confirmation Procedure

UBS0029O

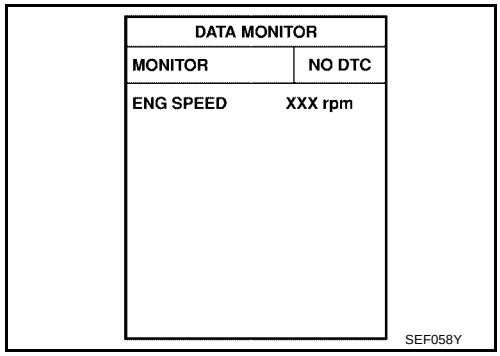
CAUTION:
Be careful not to overheat engine.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Check that “COOLAN TEMP/S” is above 10°C (50°F).
   If it is above 10°C (50°F), the test result will be OK.
   If it is below 10°C (50°F), go to following step.
4. Start engine and run it for 65 minutes at idle speed.
   If “COOLAN TEMP/S” increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.
5. If DTC is detected, go to EC-1399, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS0029P

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1399, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace engine coolant temperature sensor.

2. CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm the engine coolant does not flow.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace thermostat. Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .

3. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

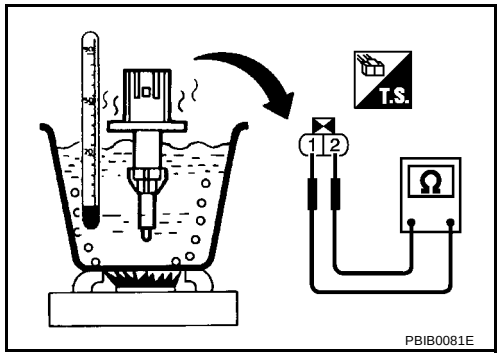
>> **INSPECTION END**

Component Inspection

UBS0029Q

ENGINE COOLANT TEMPERATURE SENSOR

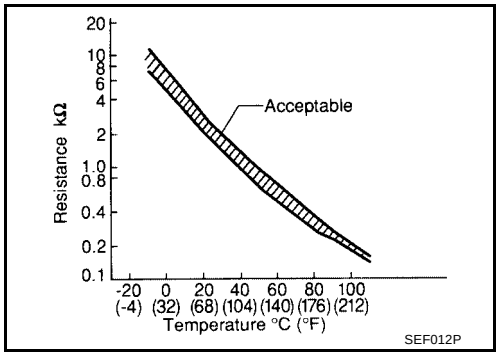
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS0029R

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .

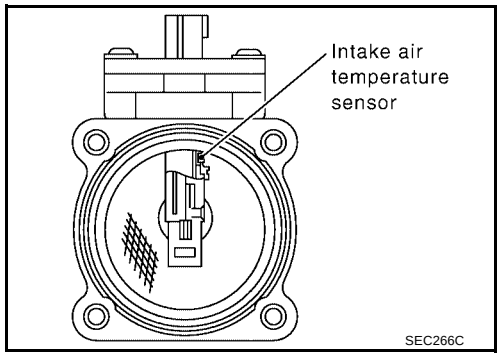
DTC P0127 IAT SENSOR

PFP:22630

Component Description

UBS0029S

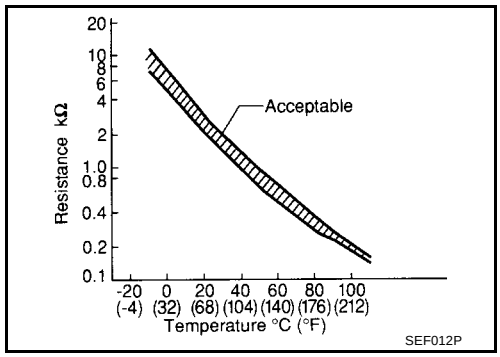
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 84 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

UBS0029T

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127 0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Intake air temperature sensor

DTC Confirmation Procedure

UBS0029U

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

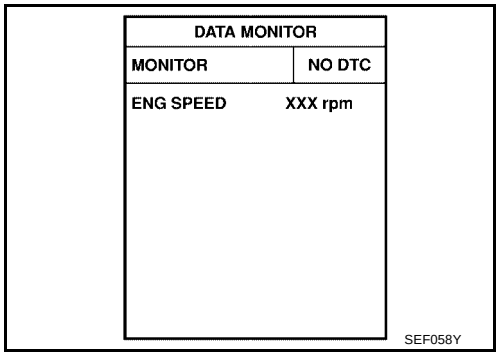
TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Wait until engine coolant temperature is less than 90°C (194°F)

a. Turn ignition switch “ON”.

b. Select “DATA MONITOR” mode with CONSULT-II.
c. Check the engine coolant temperature.
d. If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch “OFF” and cool down engine.
   - Perform the following steps before engine coolant temperature is above 90°C (194°F).
2. Turn ignition switch “ON”.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6. If 1st trip DTC is detected, go to EC-1402, "Diagnostic Procedure" .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS0029V

1. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1402, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

2. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
Refer to EC-1383, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

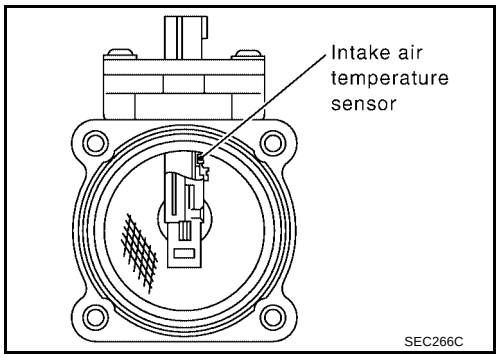
UBS0029W

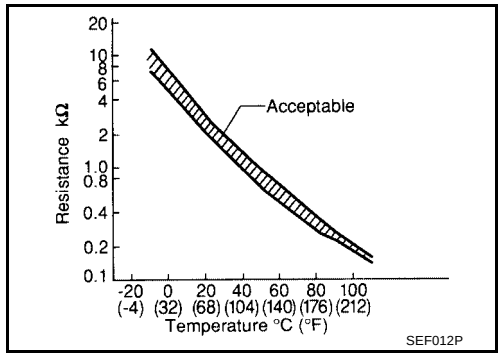
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

UBS0029X

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

DTC P0128 THERMOSTAT FUNCTION

PFP:21200

On Board Diagnosis Logic

UBS0029Y

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.
This is due to a leak in the seal or the thermostat stuck open.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128 0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	● Thermostat ● Leakage from sealing portion of thermostat ● Engine coolant temperature sensor

DTC Confirmation Procedure

UBS0029Z

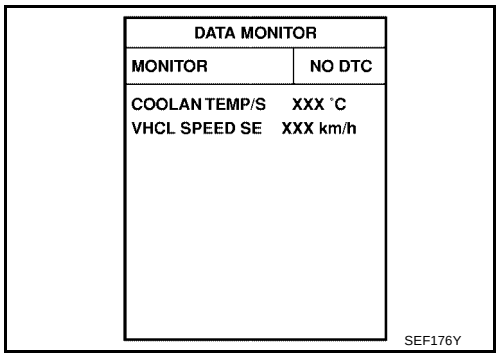
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:

- **For best results, perform at ambient temperature of –10°C (14°F) or higher.**
- **For best results, perform at engine coolant temperature of –10°C (14°F) to 68°C (154°F).**

WITH CONSULT-II

1. Replace thermostat with new one. Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" . Use only a genuine NISSAN thermostat as a replacement. If an incorrect thermostat is used, the MIL may come on.
2. Turn ignition switch “ON”.
3. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
4. Check that the “COOLAN TEMP/S” is above 68°C (154°F).
   If it is below 68°C (154°F), go to following step.
   If it is above 68°C (154°F), stop engine and cool down the engine to less than 68°C (154°F), then retry from step 2.
5. Drive vehicle for 10 consecutive minutes under the following conditions.

VHCL SPEED SE	80 - 120 km/h (50 - 75 MPH)



If 1st trip DTC is detected, go to EC-1404, "Diagnostic Procedure" .

WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002A0

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1405, "Component Inspection" .

OK or NG

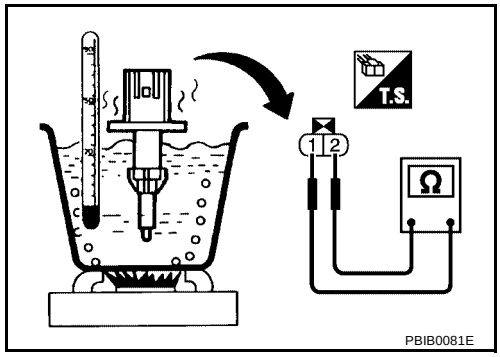
OK >> **INSPECTION END**
NG >> Replace engine coolant temperature sensor.

Component Inspection

UBS002A1

ENGINE COOLANT TEMPERATURE SENSOR

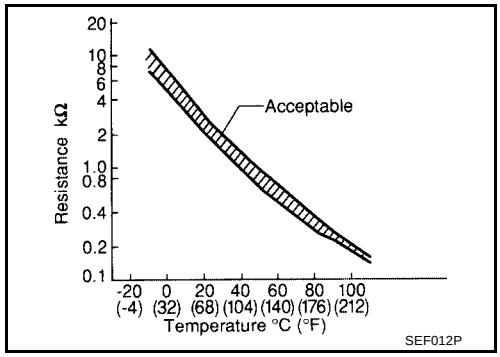
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 93 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

UBS002A2

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .

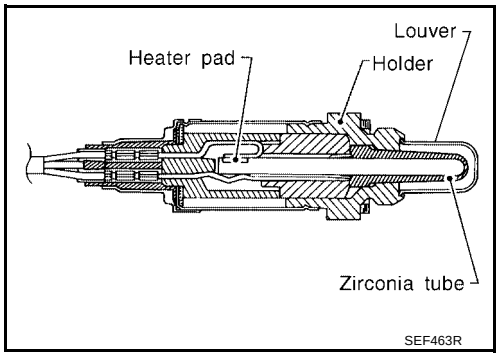
DTC P0132 HO2S1

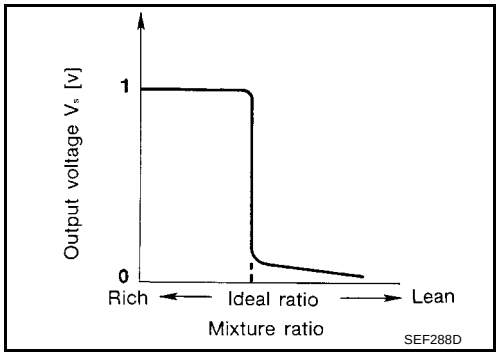
PFP:22690

Component Description

UBS002A3

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002A4

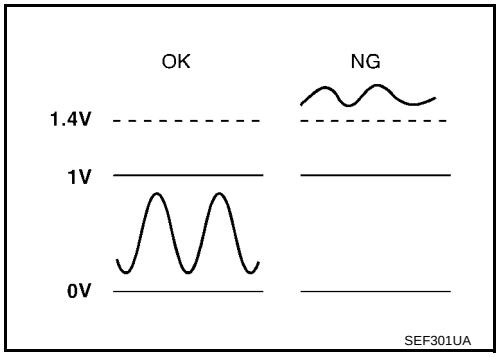
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002A5

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1

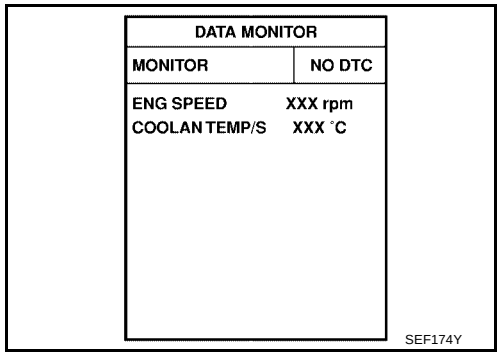
DTC Confirmation Procedure

UBS002A6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-1409, "Diagnostic Procedure" .



WITH GST

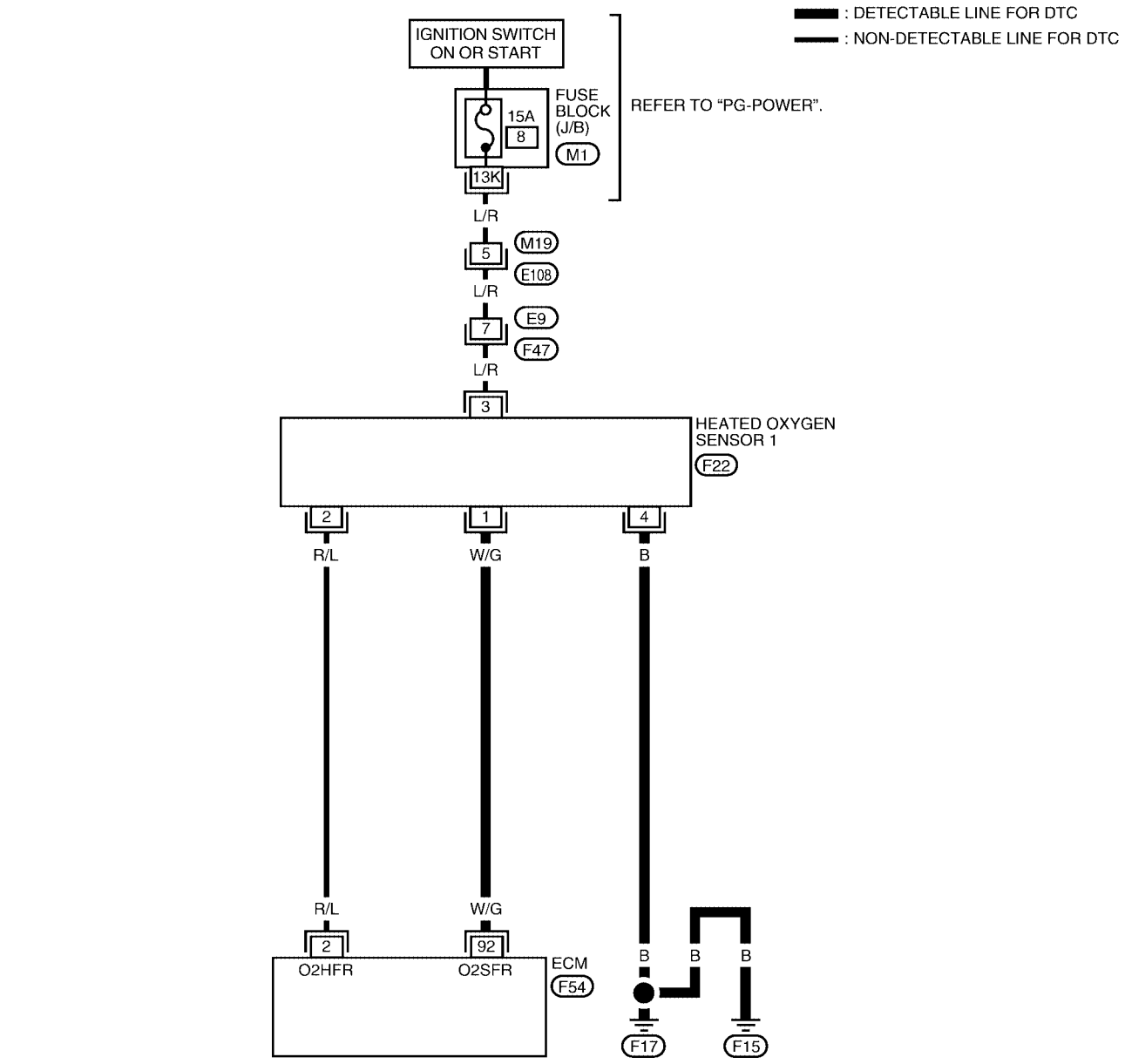
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Restart engine and let it idle for 2 minutes.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-1409, "Diagnostic Procedure" .

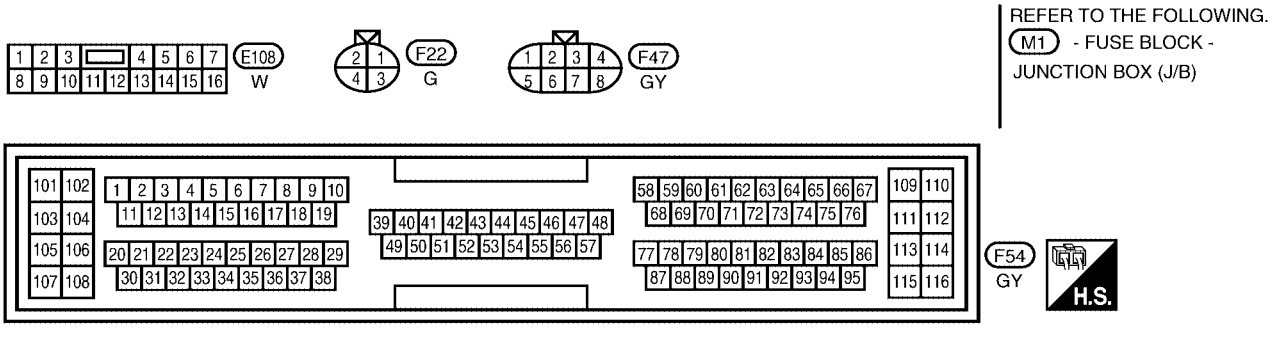
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

UBS002A7

EC-HO2S1-01





BBWA0414E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
92	W/G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

Diagnostic Procedure

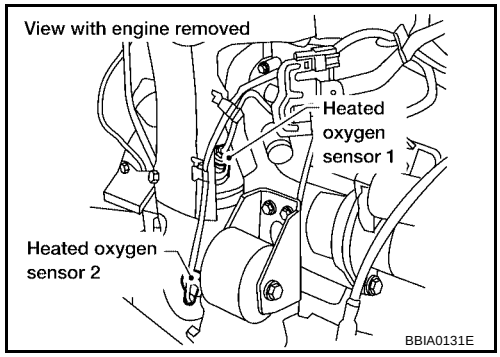
UBS002A8

1. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check harness continuity between HO2S1 terminal 4 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

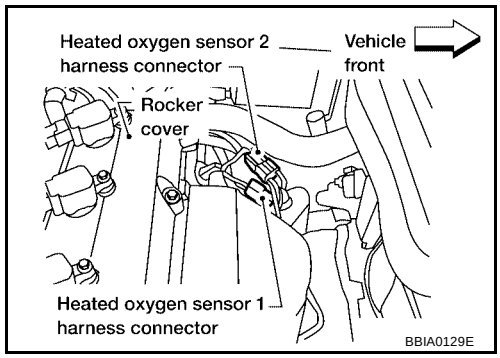
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

4. Also check harness for short to power.



OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 CONNECTOR FOR WATER

1. Disconnect heated oxygen sensor 1 harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1410, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

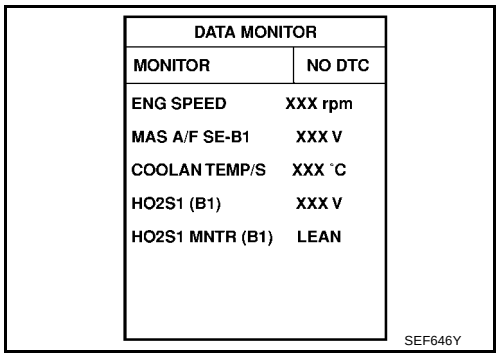
Component Inspection

UBS002A9

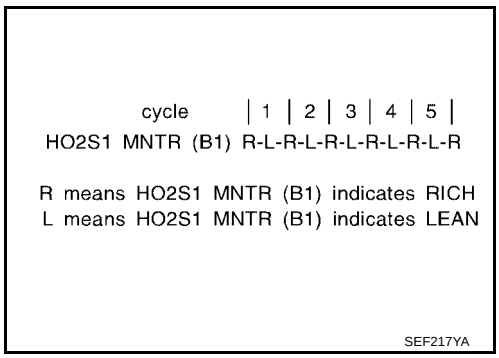
HEATED OXYGEN SENSOR 1

With CONSULT-II

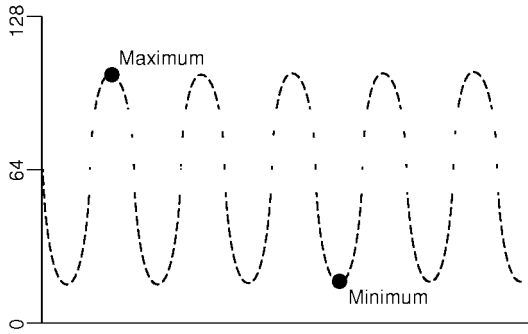
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



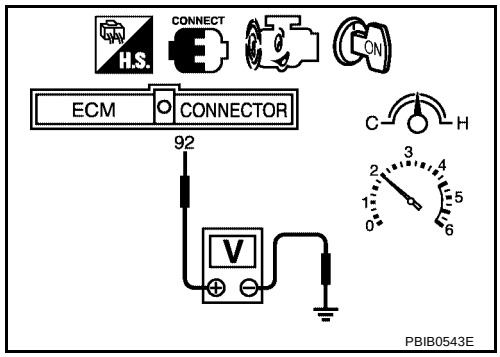
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002AA

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

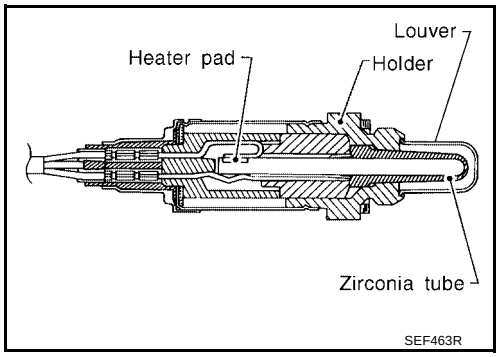
DTC P0133 HO2S1

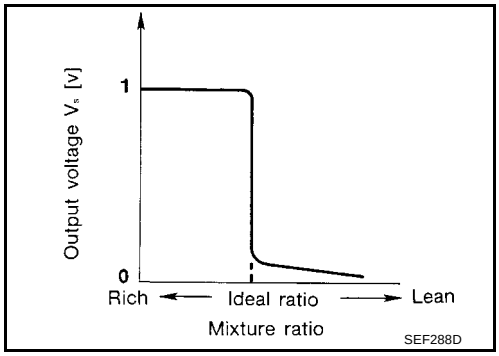
PFP:22690

Component Description

UBS002AB

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002AC

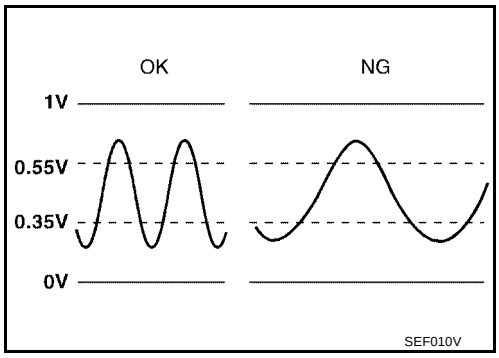
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002AD

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133	Heated oxygen sensor 1 circuit slow response	The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV valve ● Mass air flow sensor

DTC Confirmation Procedure

UBS002AE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

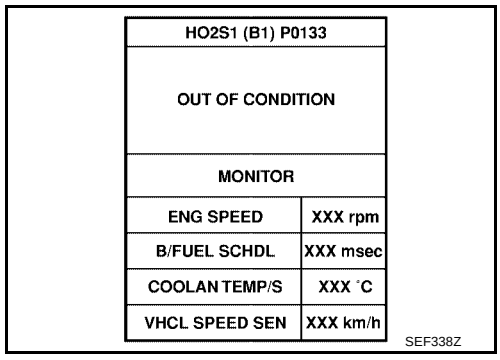
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:

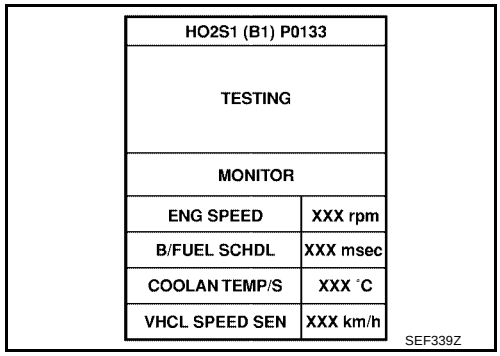
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



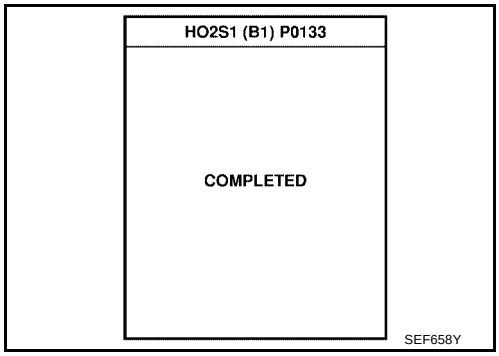
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 20 to 50 seconds.)

ENG SPEED	1,200 - 3,200 rpm
Vehicle speed	More than 80 km/h (50 MPH)
B/FUEL SCHDL	1.9 - 13.0 msec
Selector lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.



7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1416, "Diagnostic Procedure" .



Overall Function Check

UBS002AF

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

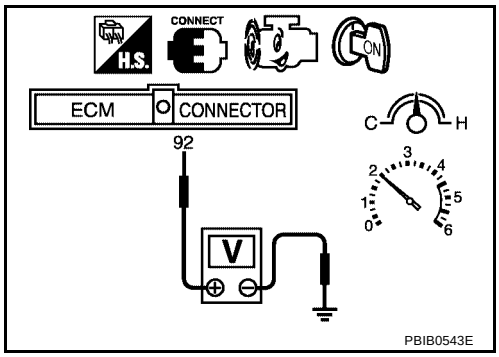
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1(B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.

1 time:	**0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**
2 times:	**0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**

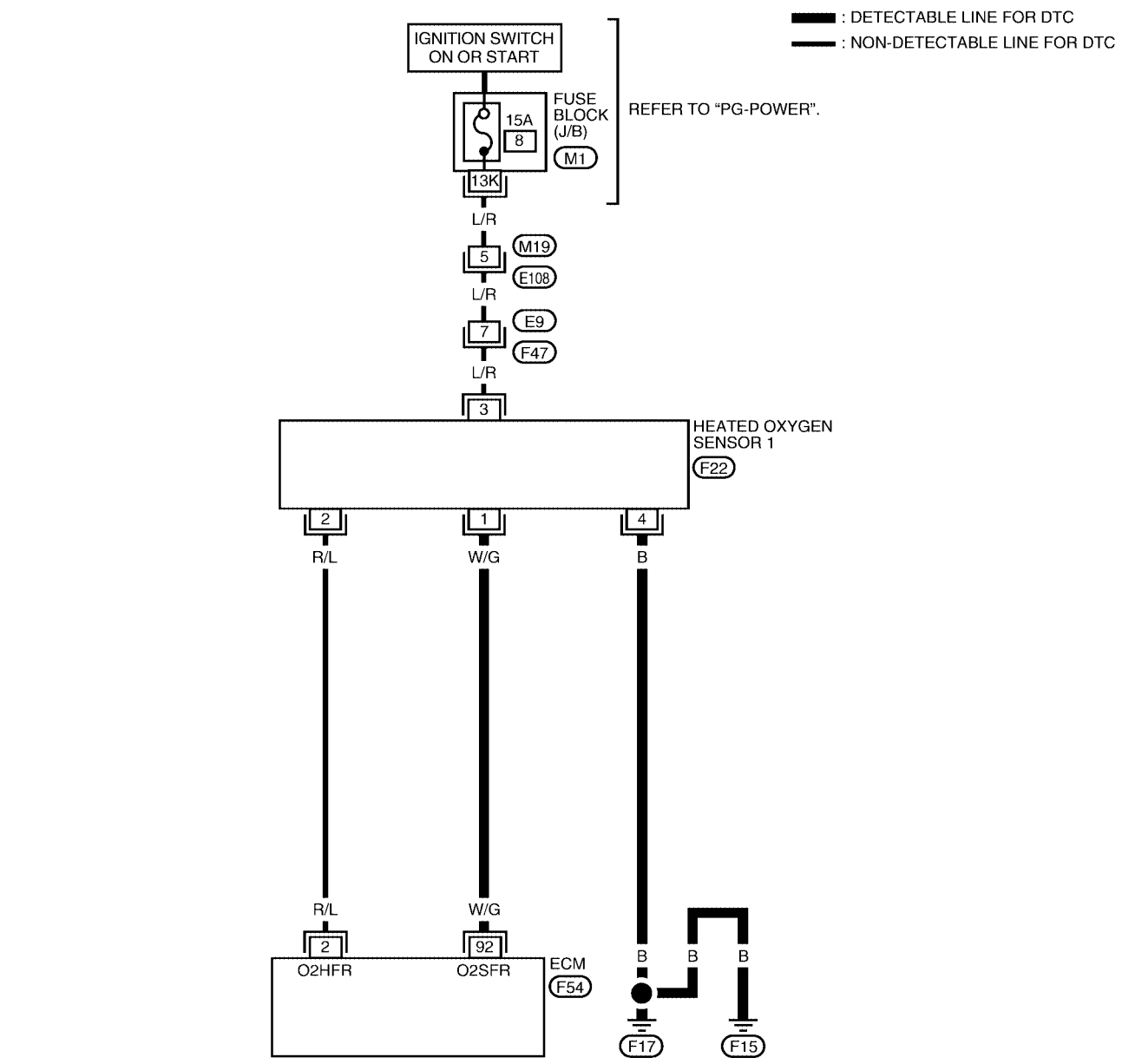
4. If NG, go to EC-1416, "Diagnostic Procedure" .

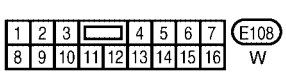


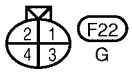
Wiring Diagram

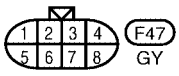
UBS002AG

EC-HO2S1-01

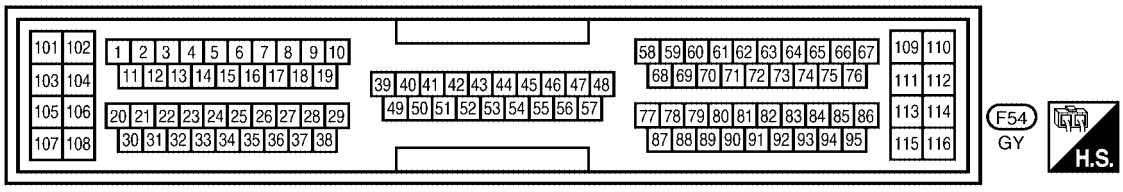








REFER TO THE FOLLOWING.
M1 - FUSE BLOCK - JUNCTION BOX (J/B)



BBWA0414E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
92	W/G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

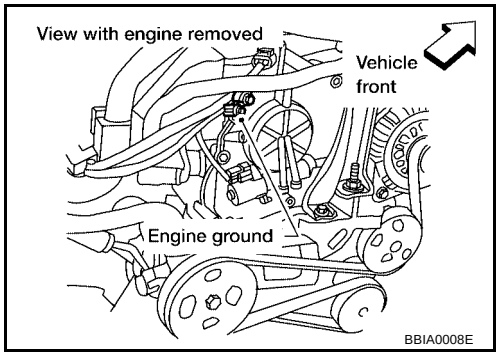
Diagnostic Procedure

UBS002AH

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

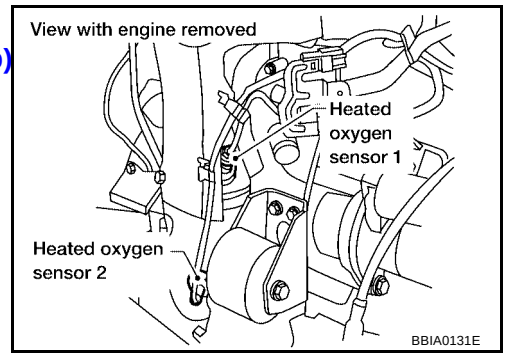


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

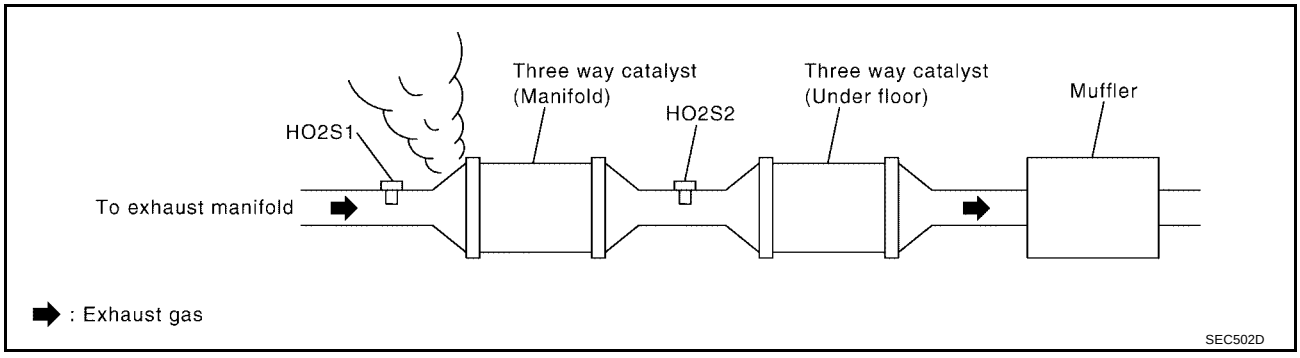
Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

>> GO TO 3.



3. CHECK FOR EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (Manifold).



OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

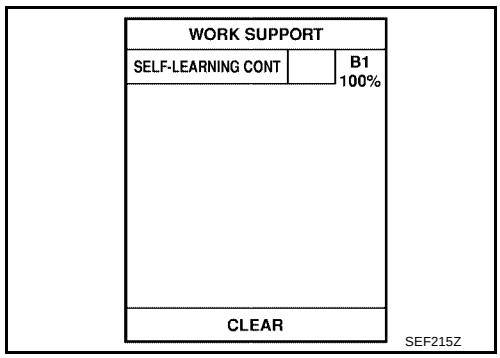
OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

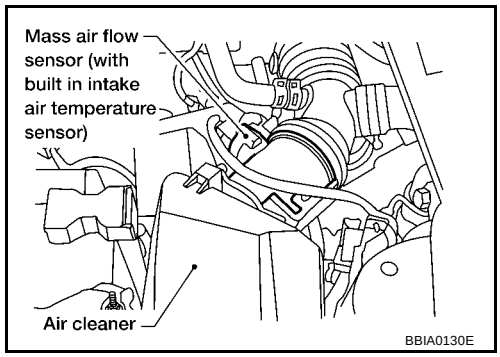
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or DTC P0172 (Refer to EC-1442 or EC-1449).
No >> GO TO 6.

6. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor1 harness connector.
3. Check harness continuity between HO2S1 terminal 4 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

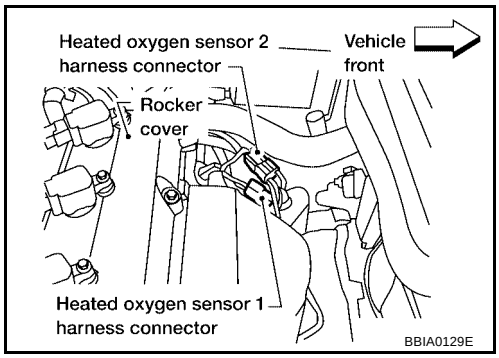
OK >> GO TO 7.
NG >> Repair open circuit or short to power in harness or connectors.

7. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and engine ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



4. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1361, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace malfunctioning heated oxygen sensor 1.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-1374, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK PCV VALVE

Refer to EC-1858, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace PCV valve.

11. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1418, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace heated oxygen sensor 1.

12. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

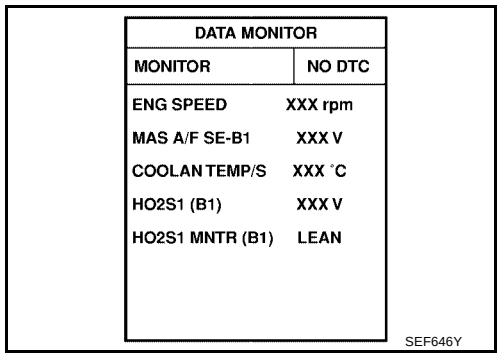
UBS002AI

HEATED OXYGEN SENSOR 1

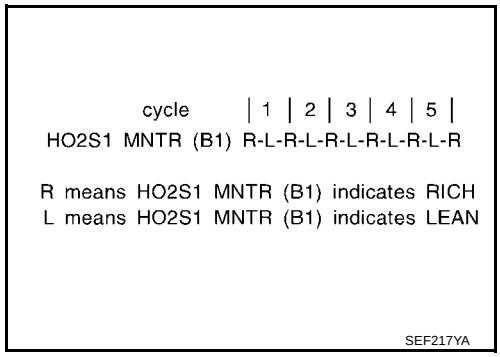
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.

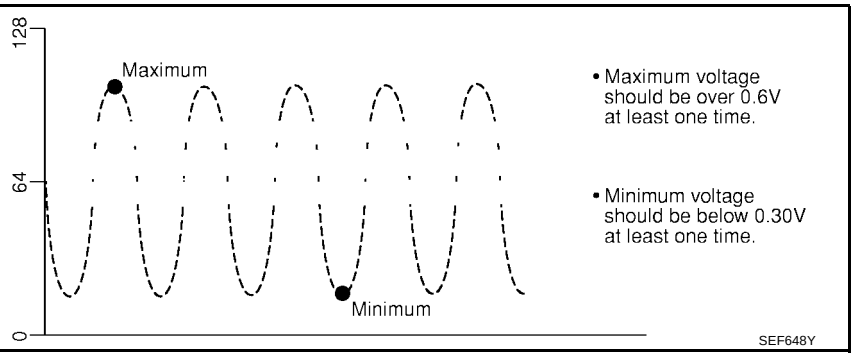
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



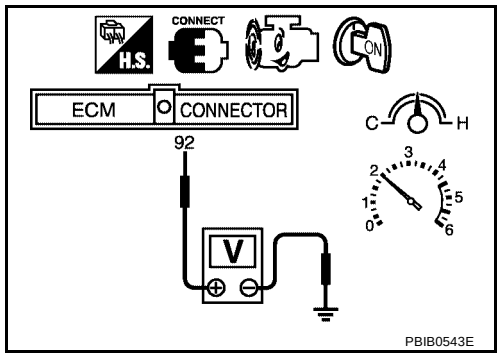
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002AJ

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

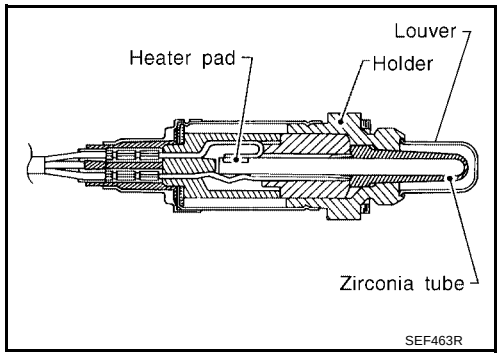
DTC P0134 HO2S1

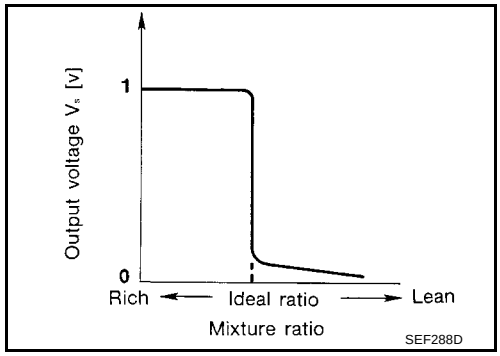
PFP:22690

Component Description

UBS002AK

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002AL

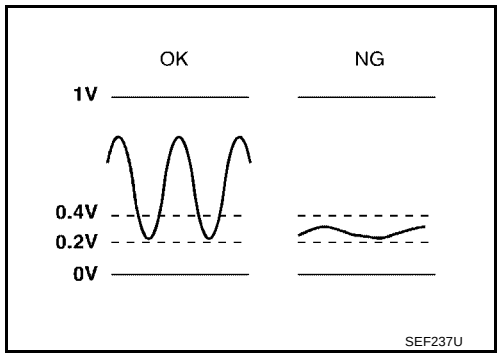
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002AM

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 1

DTC Confirmation Procedure

UBS002AN

CAUTION:
Always drive vehicle at a safe speed.

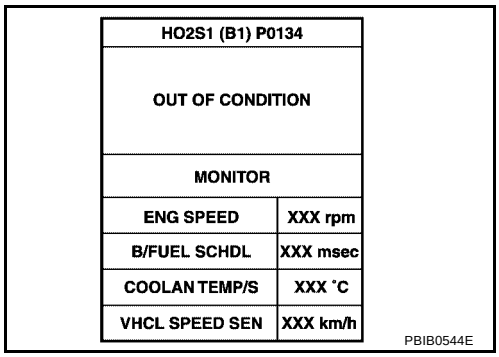
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

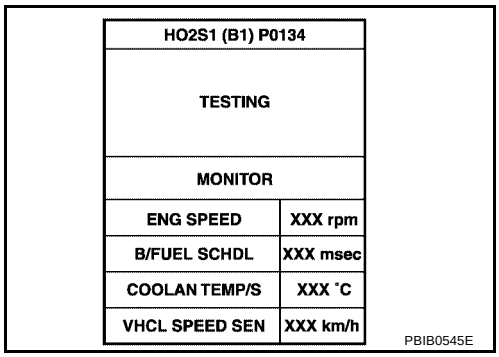
1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 (B1) P0134” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
3. Touch “START”.
4. Let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 4.



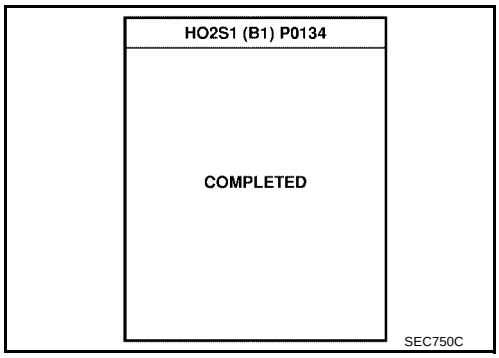
5. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,200 - 3,200 rpm
Vehicle speed	More than 64 km/h (40 MPH)
B/FUEL SCHDL	1.9 - 13.0 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1425, "Diagnostic Procedure" .



Overall Function Check

UBS002AO

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a D TC might not be confirmed.

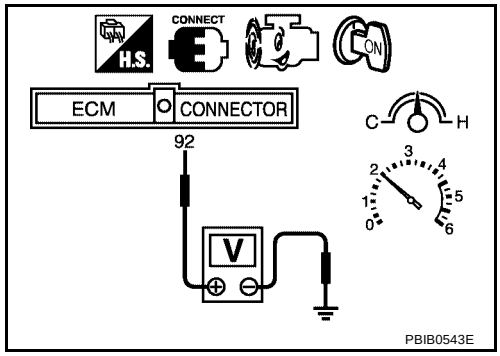
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage does not remain in the range of 0.2 to 0.4V.

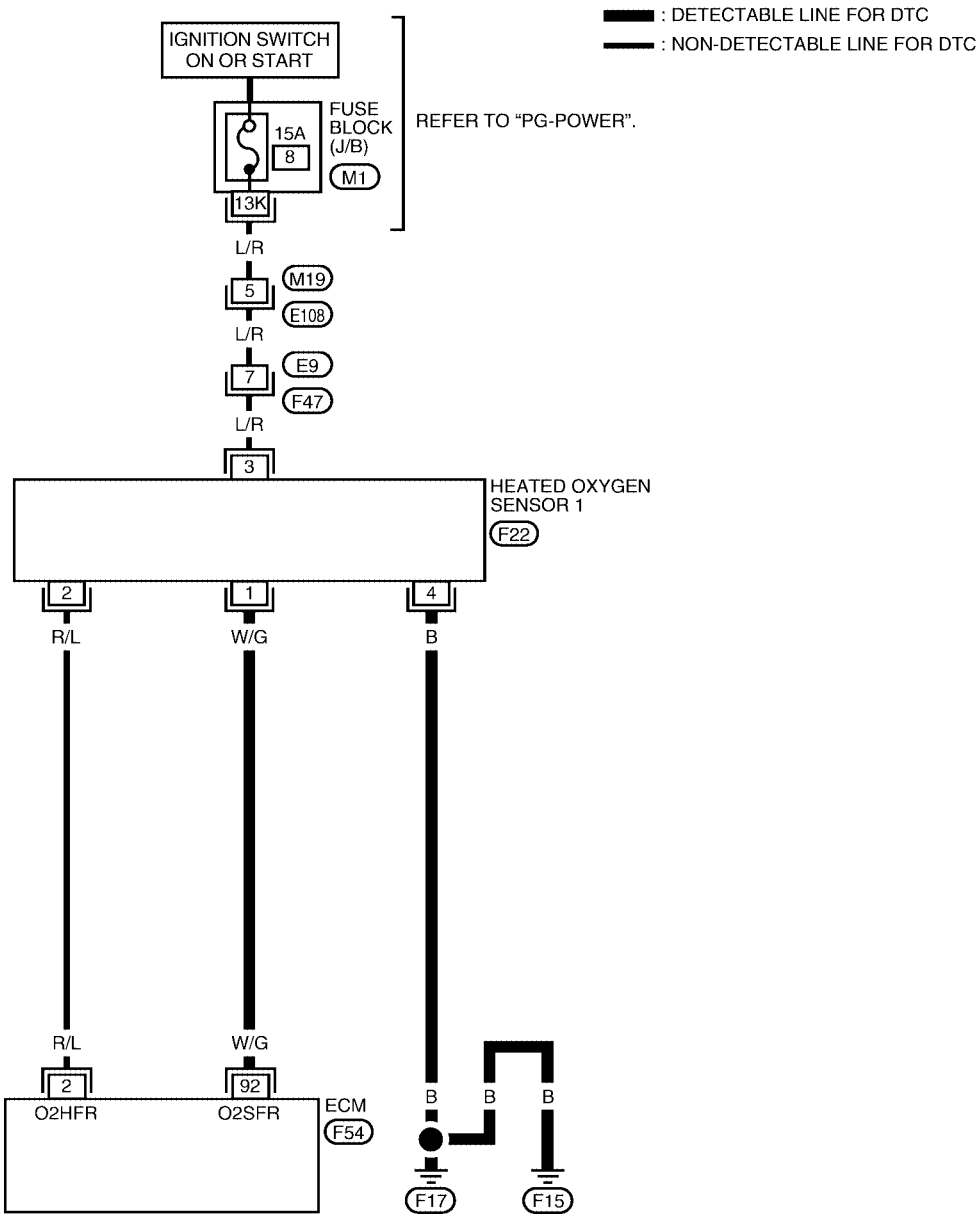
4. If NG, go to EC-1425, "Diagnostic Procedure" .

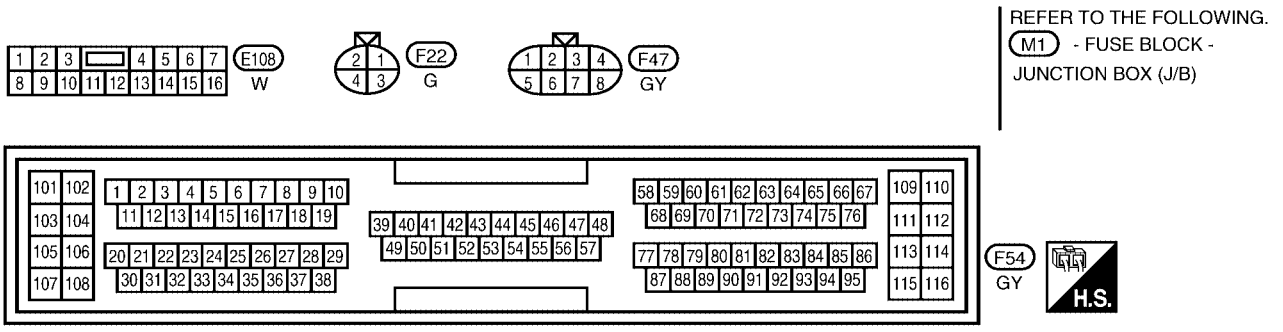


Wiring Diagram

UBS002AP

EC-HO2S1-01





BBWA0414E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
92	W/G	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)

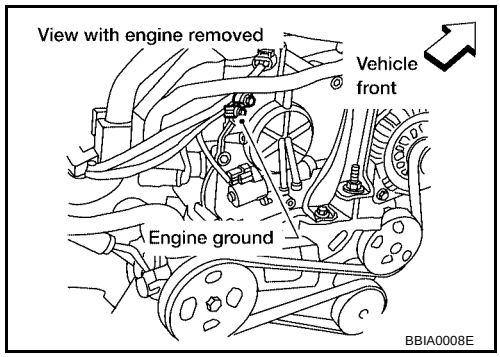
Diagnostic Procedure

UBS002AQ

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor1 harness connector.
3. Check harness continuity between HO2S1 terminal 4 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

3. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

Continuity should not exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1426, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002AR

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

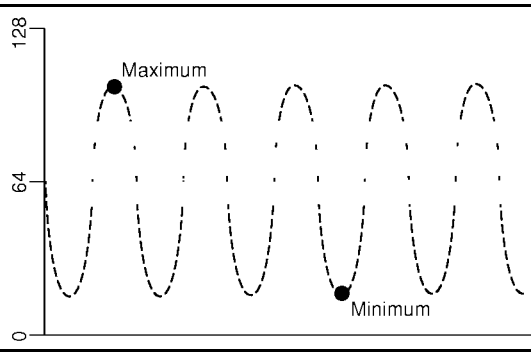
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

CAUTION:

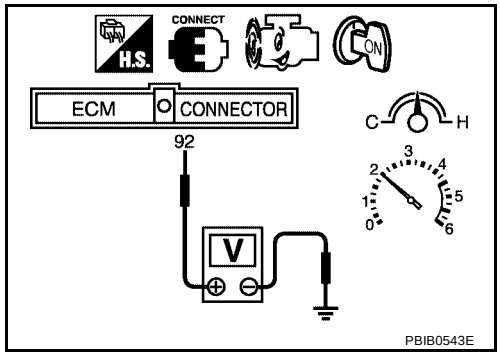
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002AS

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

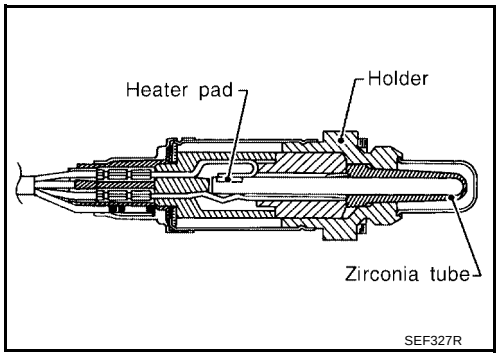
DTC P0138 HO2S2

PFP:226A0

Component Description

UBS002AT

The heated oxygen sensor 2, after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS002AU

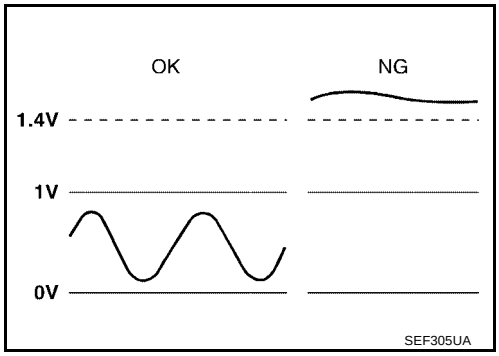
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Warm-up condition ● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

On Board Diagnosis Logic

UBS002AV

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2

DTC Confirmation Procedure

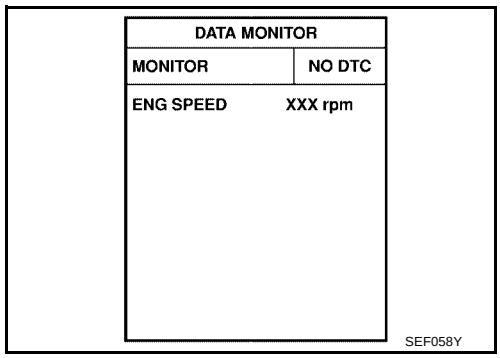
UBS002AW

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF”and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for two minutes.
6. If 1st trip DTC is detected, go to EC-1431, "Diagnostic Procedure" .



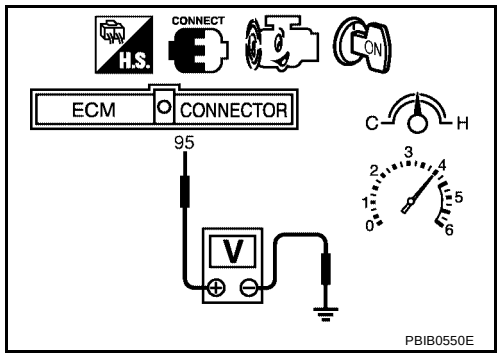
Overall Function Check

UBS002AX

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

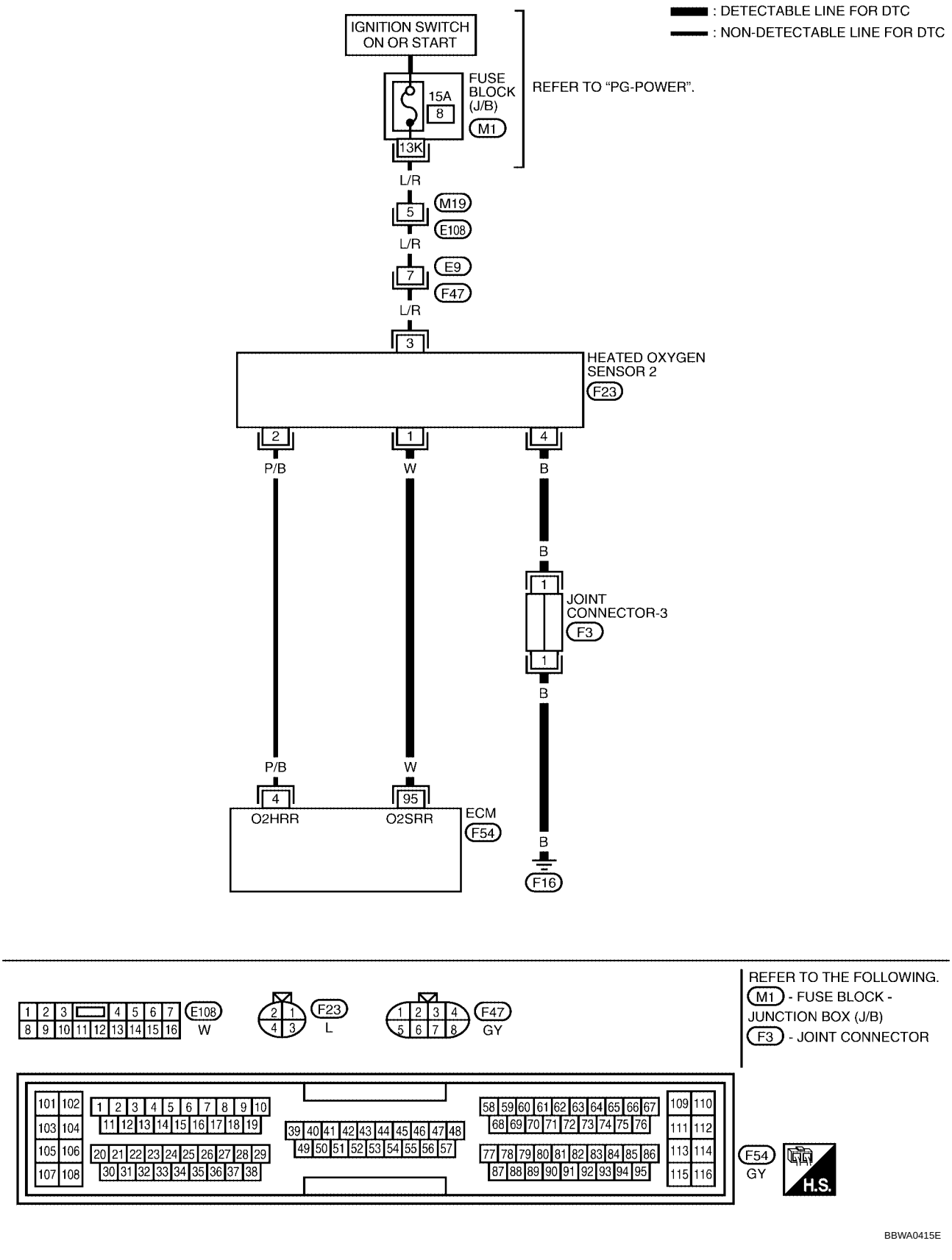
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for two minutes.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and keep the engine speed at between 3,500 to 4,000 rpm for at least one minute under no load.
7. Let engine idle for two minutes.
8. Select “Mode 3” with GST.
9. If DTC is detected, go to EC-1431, "Diagnostic Procedure" .



Wiring Diagram

UBS002AY

EC-HO2S2-01



BBWA0415E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600rpm after the following conditions are met. – Engine after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V

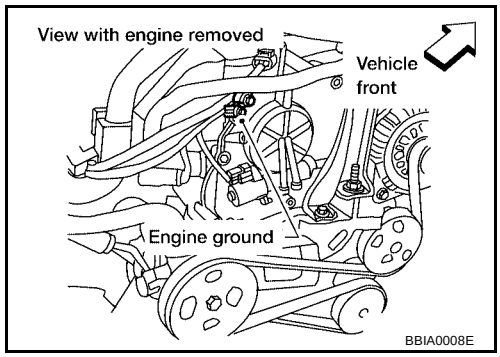
Diagnostic Procedure

UBS002AZ

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

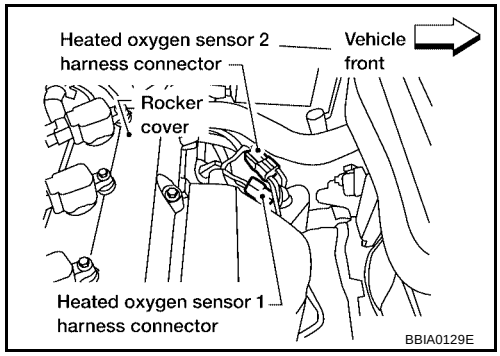
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open and short between HO2S2 and engine ground

>> Repair open circuit or short to power in harness connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 95 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Check harness continuity between ECM terminal 95 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.
4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HARNESS CONNECTOR

Check HO2S2 harness connector for water.

Water should not exist.

OK or NG

OK >> GO TO 6.
NG >> Repair or replace harness connector.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1432, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002B0

HEATED OXYGEN SENSOR 2

With CONSULT-II

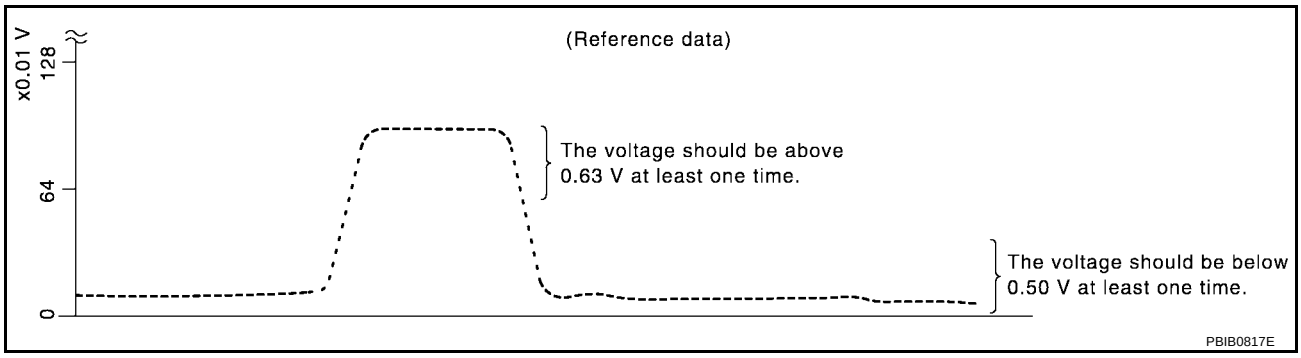
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for two minutes.

6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



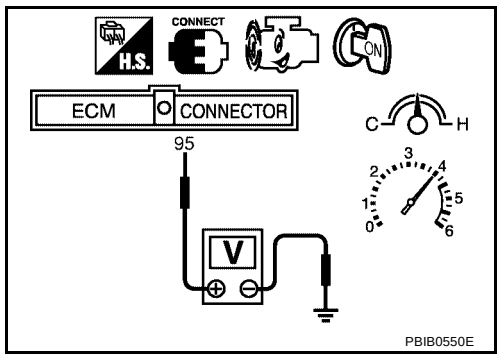
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is –25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine warm it up to the normal operating temperature.
2. Turn ignition switch “OFF“ and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002B1

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

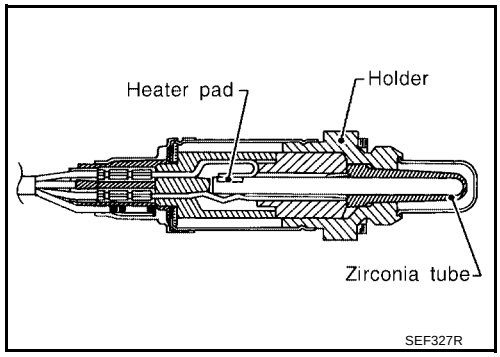
DTC P0139 HO2S2

PFP:226A0

Component Description

UBS002B2

The heated oxygen sensor 2, after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS002B3

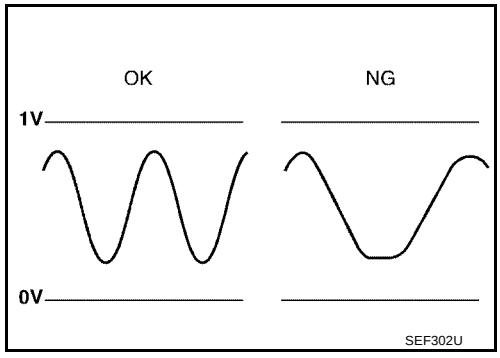
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Warm-up condition	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.		LEAN ←→ RICH

On Board Diagnosis Logic

UBS002B4

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

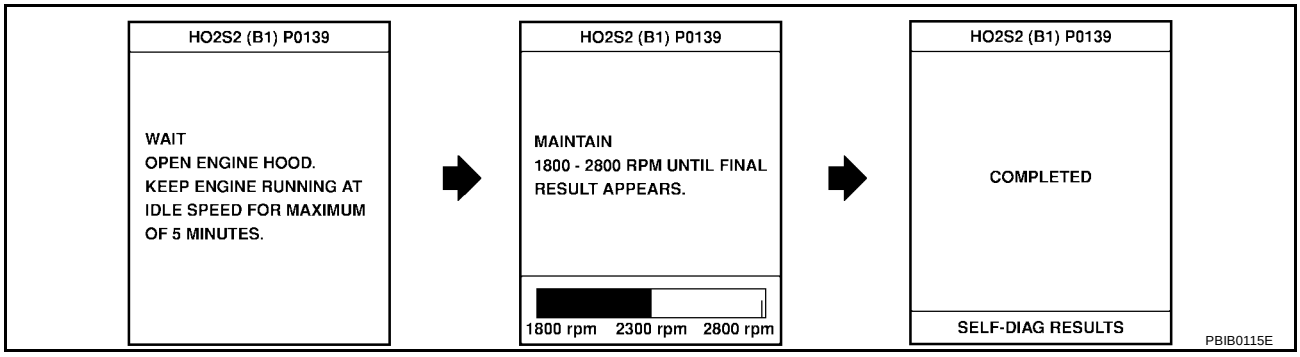
UBS002B5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
For the best results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Select “HO2S2 (B1) P0139” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-1438, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 3.

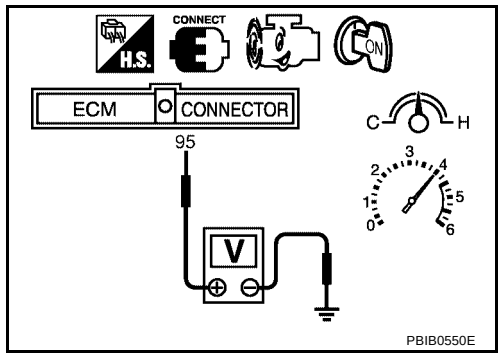
Overall Function Check

UBS002B6

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   A change of voltage should be more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.

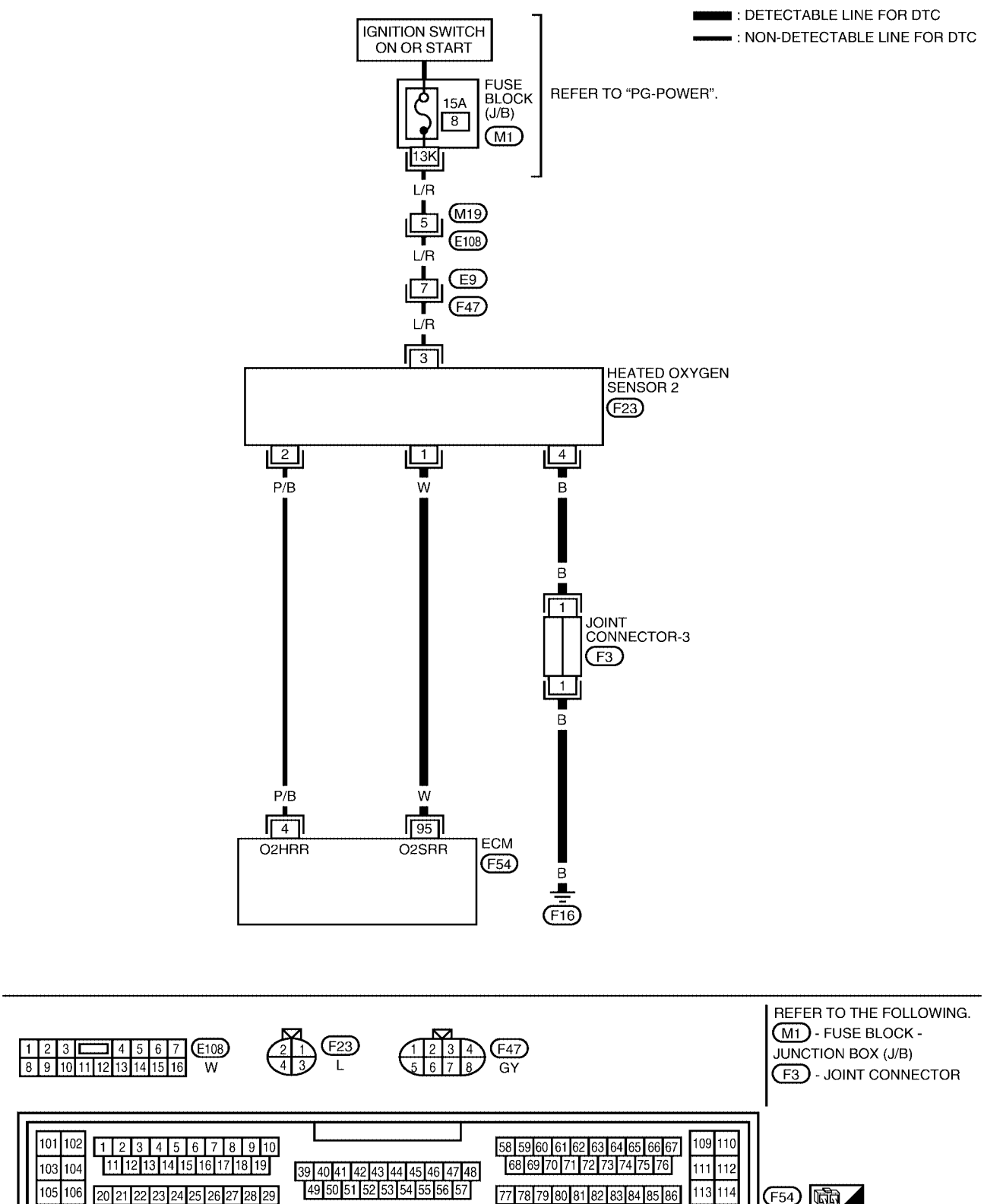


7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should change at more than 0.06V for 1 second during this procedure.
8. If NG, go to EC-1438, "Diagnostic Procedure" .

Wiring Diagram

UBS002B7

EC-HO2S2-01



BBWA0415E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600rpm after the following conditions are met. – Engine after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V

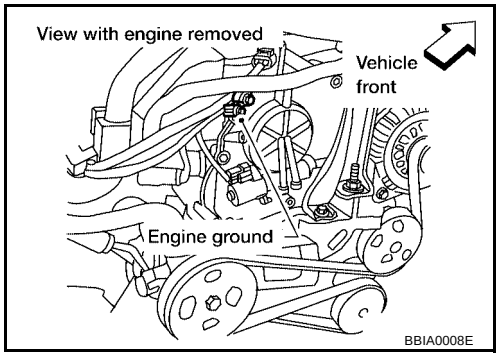
Diagnostic Procedure

UBS002B8

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

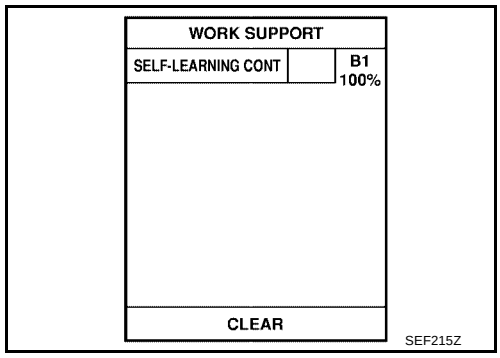
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

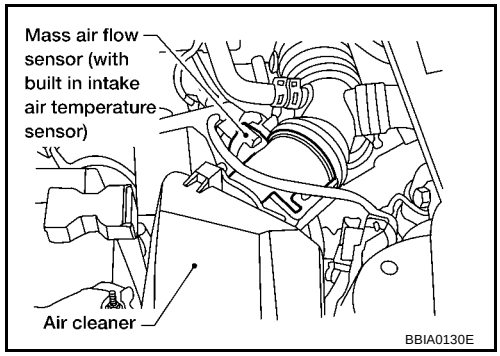
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-1442 or EC-1449 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

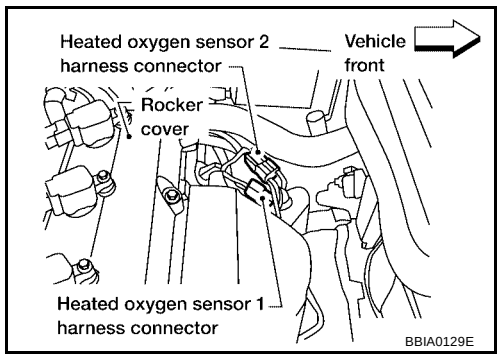
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open and short between HO2S2 and engine ground

>> Repair open circuit or short to power in harness or connectors.

5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 95 and HO2S2 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Check harness continuity between ECM terminal 95 or HO2S2 terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should not exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1440, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

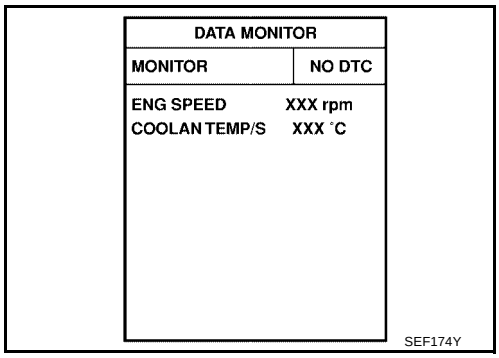
Component Inspection

UBS002B9

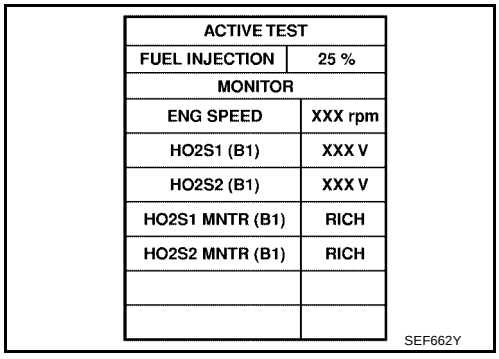
HEATED OXYGEN SENSOR 2

With CONSULT-II

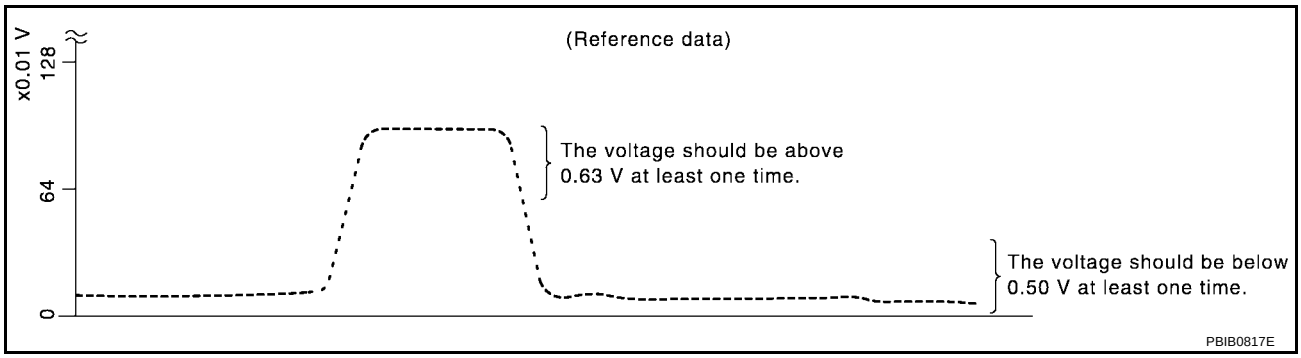
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minutes.



6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



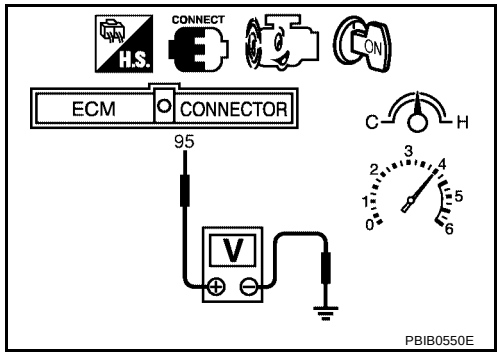
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002BA

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P0171 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

UBS002BB

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171	Fuel injection system too lean	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor ● Incorrect PCV hose connection

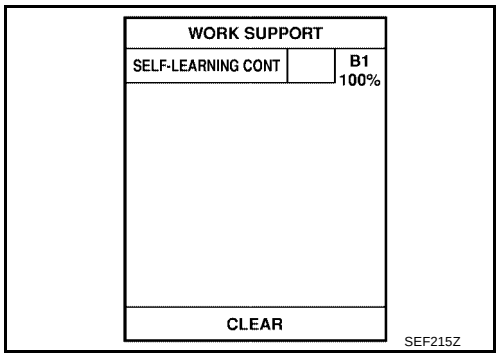
DTC Confirmation Procedure

UBS002BC

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

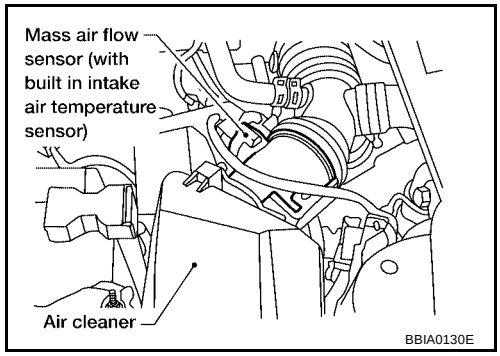
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-1445, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-1445, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

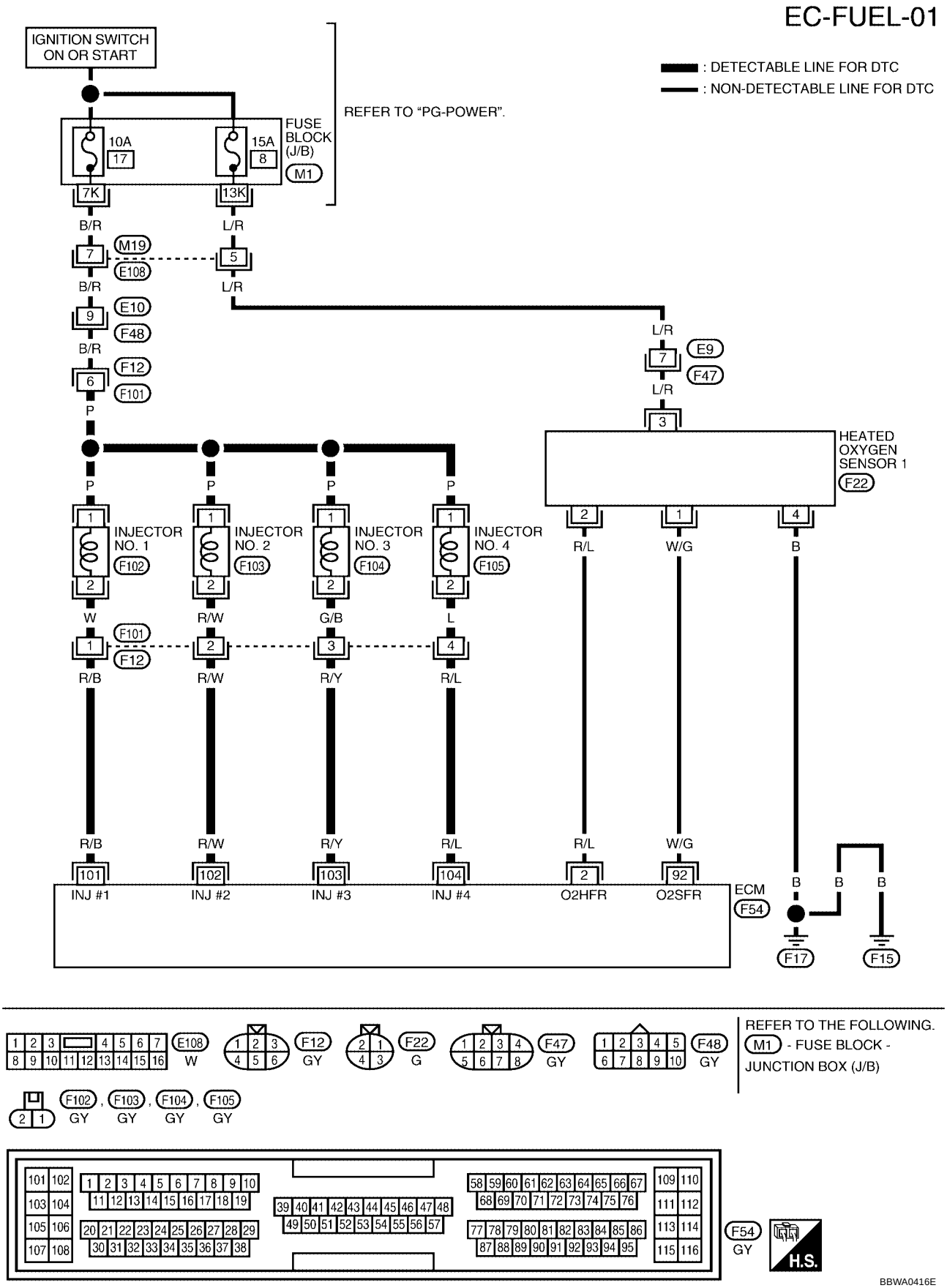
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-1445, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.



10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-1445, "Diagnostic Procedure" .
    If engine does not start, check exhaust and intake air leak visually.

Wiring Diagram

UBS002BD

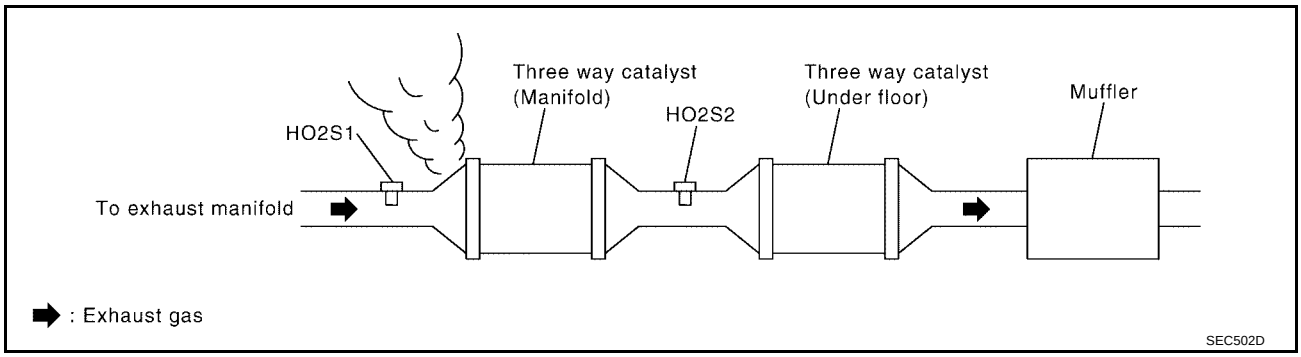


Diagnostic Procedure

UBS002BE

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

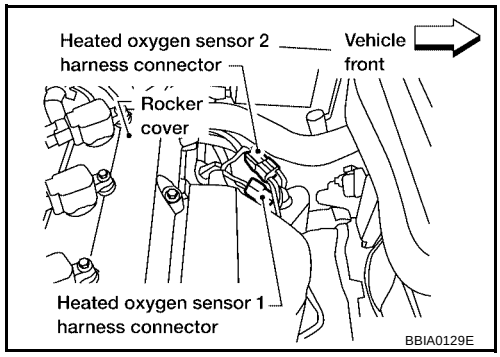
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-1257, "Fuel Pressure Check" .

At idling: Approximately 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

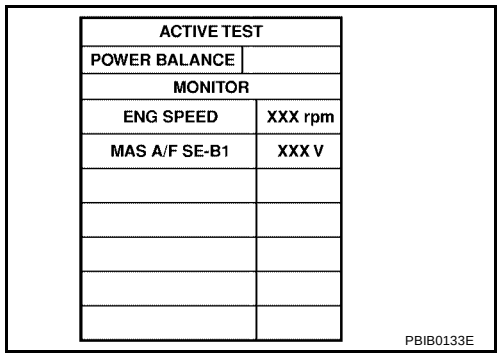
OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1375, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

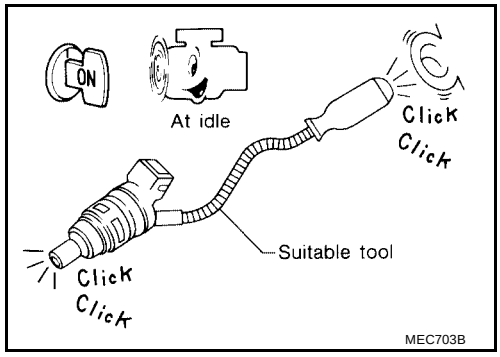
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



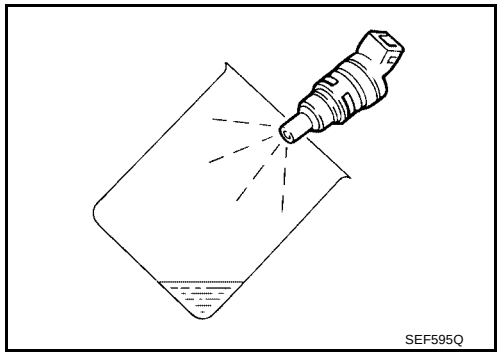
OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-1796, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Disconnect injector harness connectors.
4. Remove injector gallery assembly. Refer to EM-118, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

Fuel should be sprayed evenly for each injector.



OK or NG

OK >> GO TO 8.
NG >> Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0172 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

UBS002BF

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172	Fuel injection system too rich	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

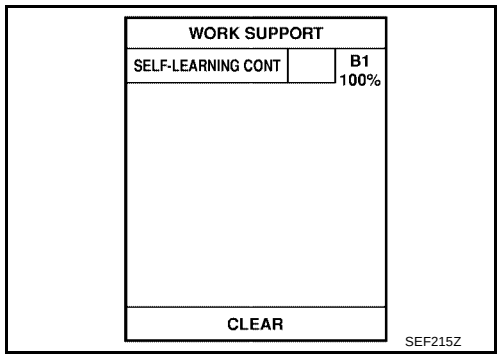
DTC Confirmation Procedure

UBS002BG

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

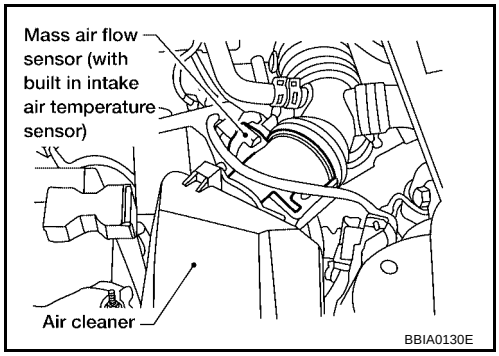
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-1452, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal.
   If engine starts, go to EC-1452, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.



WITH GST

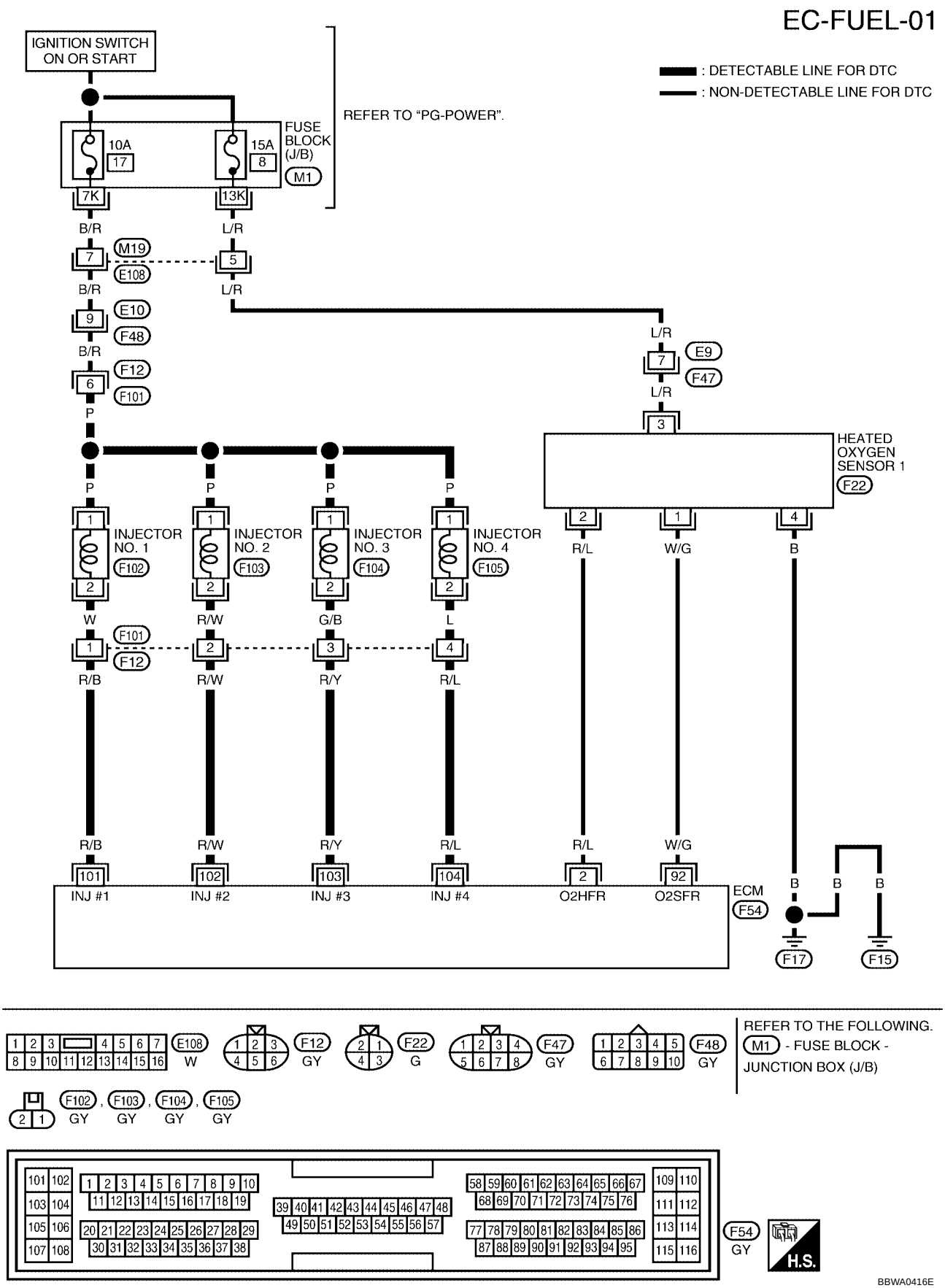
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-1452, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-1452, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



Wiring Diagram

UBS002BH



REFER TO THE FOLLOWING.
M1 - FUSE BLOCK - JUNCTION BOX (J/B)

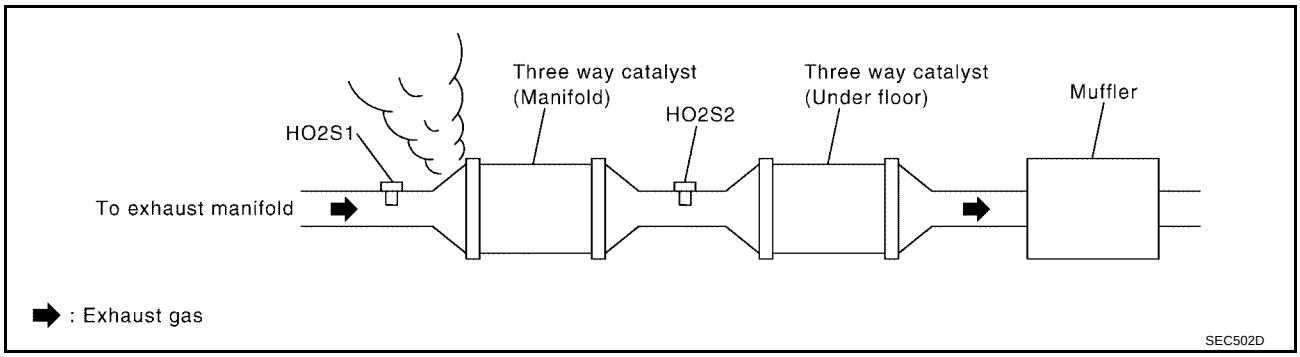
BBWA0416E

Diagnostic Procedure

UBS002BI

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (manifold).



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

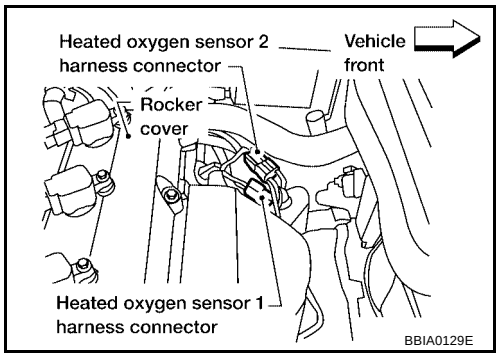
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 92 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminal 92 or HO2S1 terminal 1 and engine ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-1257, "Fuel Pressure Check" .

   At idling: 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

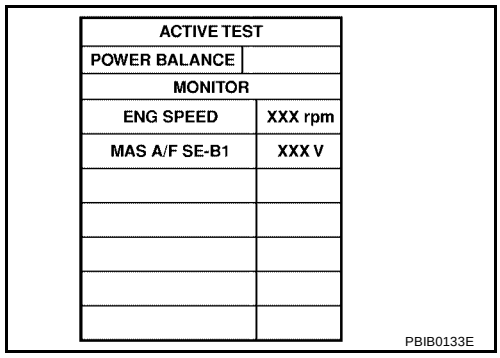
OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1375, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

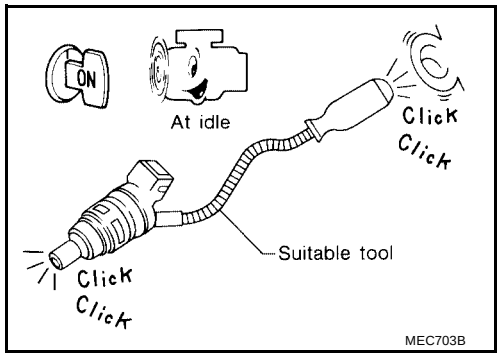
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-1796, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Remove injector assembly. Refer to EM-118, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect injector harness connectors.
   The injector harness connectors should remain connected.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

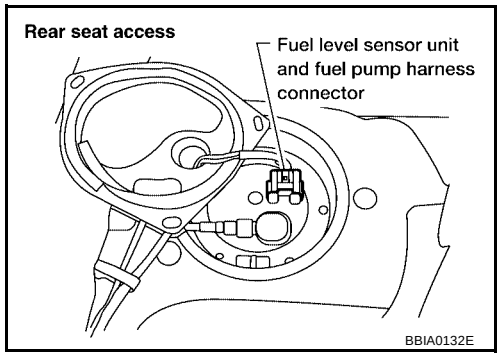
DTC P0181 FTT SENSOR

PFP:22630

Component Description

UBS002BJ

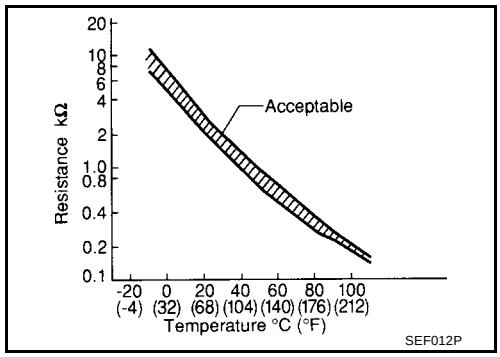
The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 70 (Fuel tank temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may lead to ECM's transistor damage. Use ground other than ECM, such as engine ground.

On Board Diagnosis Logic

UBS002BK

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181 0181	Fuel tank temperature sensor circuit range/ performance	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel tank temperature sensor

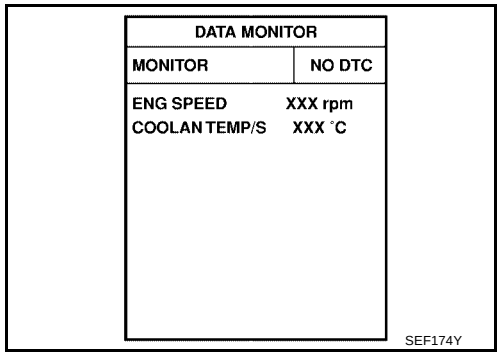
DTC Confirmation Procedure

UBS002BL

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Check “COOLAN TEMP/S” value.
   If “COOLAN TEMP/S” is less than 60°C (140°F), the result will be OK.
   If “COOLAN TEMP/S” is above 60°C (140°F), go to the following step.
4. Cool engine down until “COOLAN TEMP/S” signal is less than 60°C (140°F).
5. Wait at least 10 seconds.
6. If 1st trip DTC is detected, go to EC-1456, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002BM

1. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace fuel tank temperature sensor.

2. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
Refer to EC-1458, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

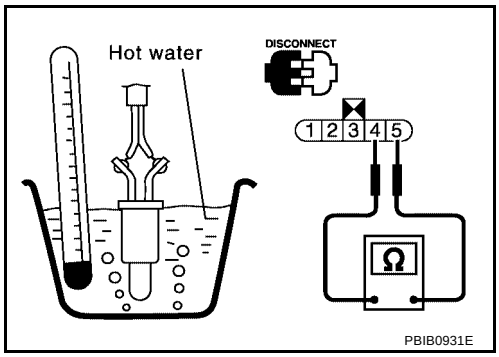
UBS002BN

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace fuel level sensor unit.



Removal and Installation

UBS002BO

FUEL TANK TEMPERATURE SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

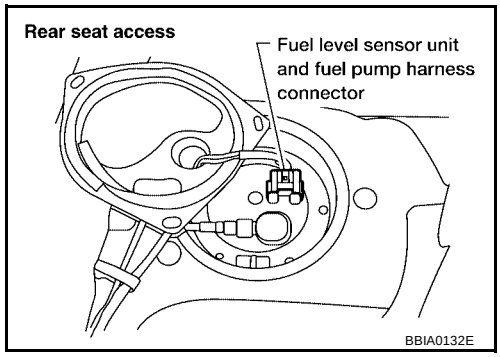
DTC P0182, P0183 FTT SENSOR

PFP:22630

Component Description

UBS002BP

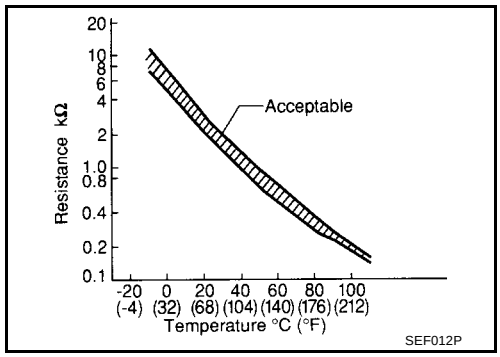
The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 70 (Fuel tank temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may lead to ECM's transistor damage. Use ground other than ECM, such as engine ground.

On Board Diagnosis Logic

UBS002BQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182 0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Fuel tank temperature sensor
P0183 0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

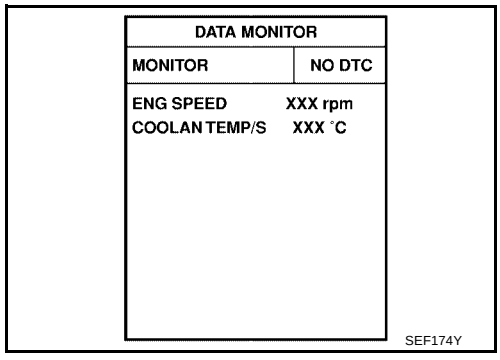
DTC Confirmation Procedure

UBS002BR

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1459, "Diagnostic Procedure" .



WITH GST

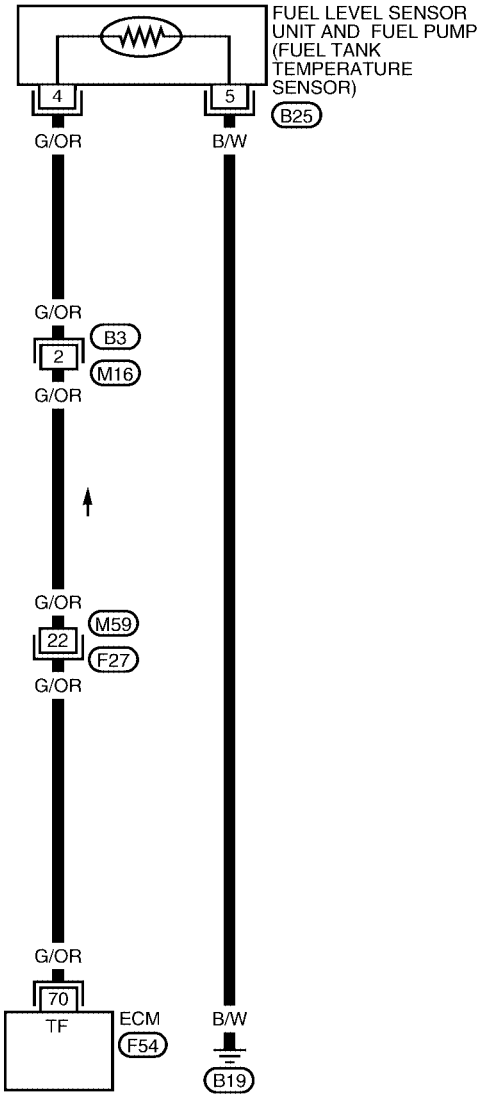
Follow the procedure “WITH CONSULT-II” above.

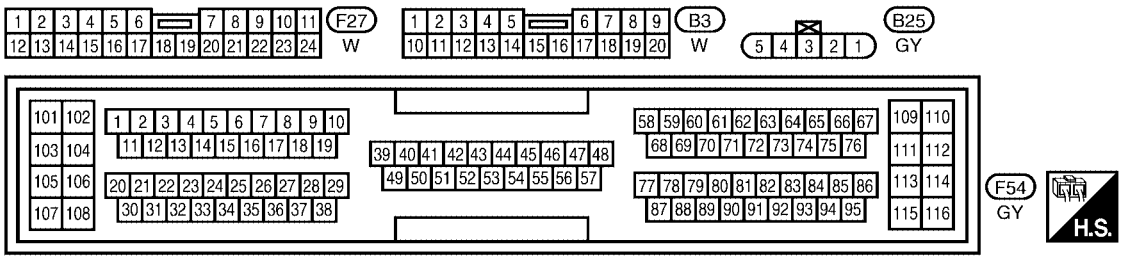
Wiring Diagram

UBS002BS

EC-FTTS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





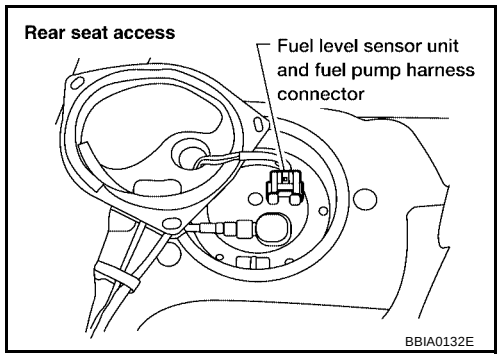
BBWA0221E

Diagnostic Procedure

UBS002BT

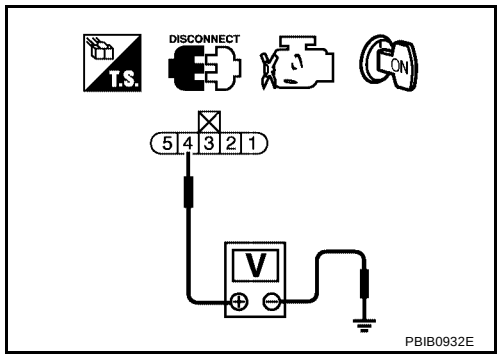
1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between fuel level sensor unit and fuel pump terminal 4 and body ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M59, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair harness or connector.

3. CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1460, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel tank temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

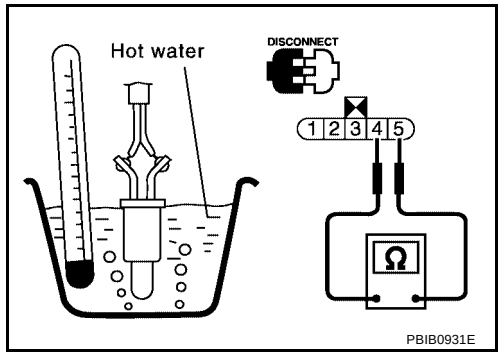
UBS002BU

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace fuel level sensor unit.



Removal and Installation

UBS002BV

FUEL TANK TEMPERATURE SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

DTC P0217 COOLANT OVERTEMPERATURE ENRICHMENT PROTECTION

PFP:00019

System Description

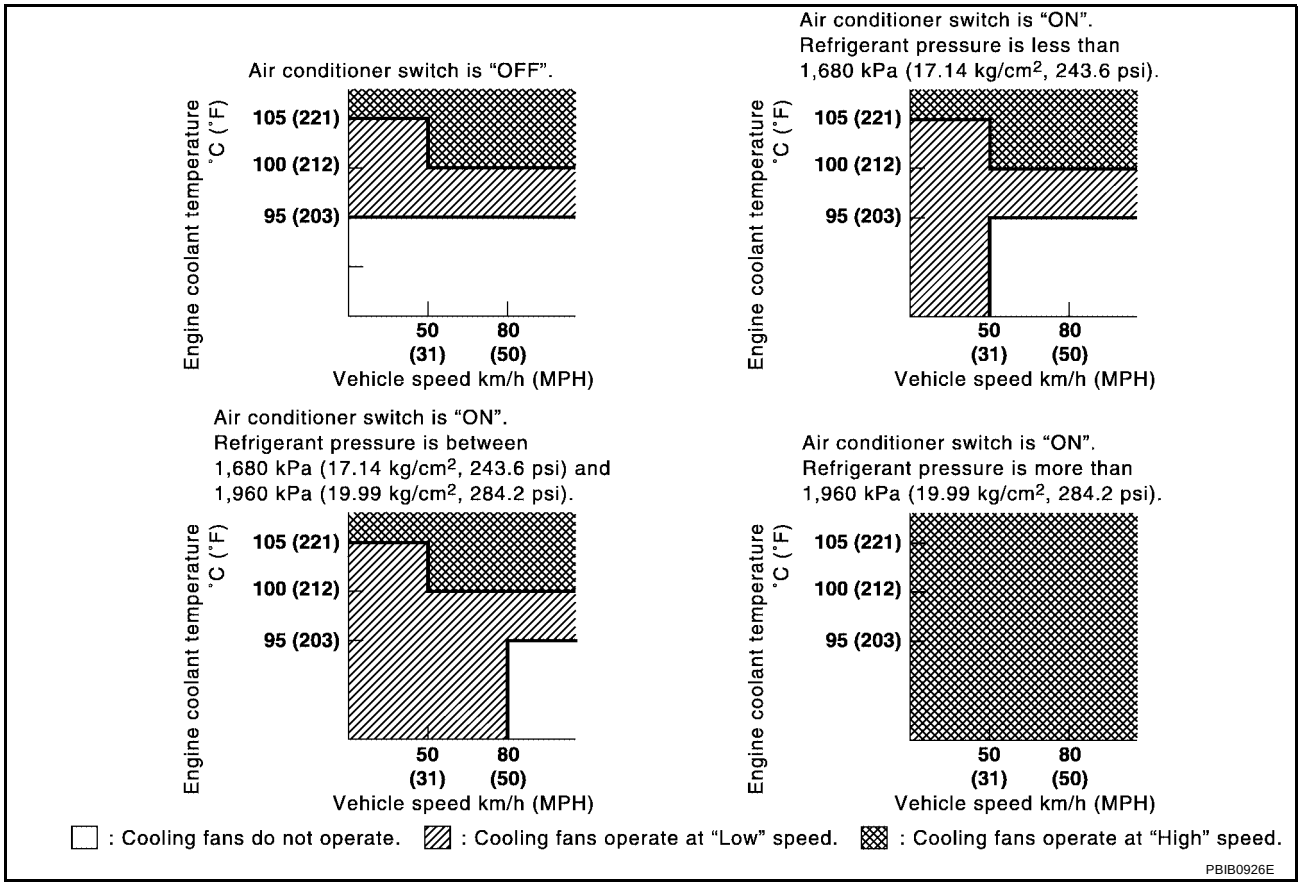
UBS002BW

COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

UBS002BX

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

On Board Diagnosis Logic

UBS002BY

This diagnosis checks whether the engine coolant temperature is extraordinary high, even when the load is not heavy.
When malfunction is detected, the malfunction indicator lamp (MIL) will light up even in the first trip.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0217 0217	Engine coolant over temperature condition	Engine coolant temperature is excessively high under normal engine speed.	● Harness or connectors (The cooling fan circuit is open or shorted) ● Cooling fan ● Thermostat ● Improper ignition timing ● Engine coolant temperature sensor ● Blocked radiator ● Blocked front end (Improper fitting of nose mask) ● Crushed vehicle frontal area (Vehicle frontal is collided but not repaired) ● Blocked air passage by improper installation of front fog lamp or fog lamps ● Improper mixture ratio of coolant ● Damaged bumper For more information, refer to EC-1473, "Main 12 Causes of Overheating" .

CAUTION:
When a malfunction is indicated, be sure to replace the coolant. Refer to MA-23, "Changing Engine Coolant" . Also, replace the engine oil. Refer to LU-17, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

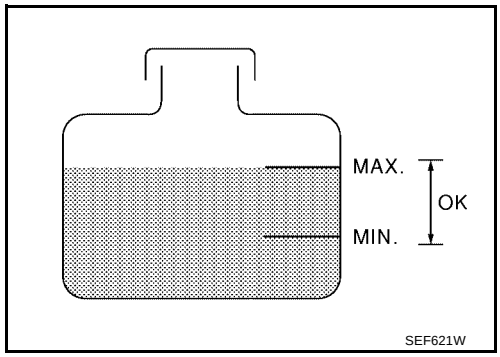
Overall Function Check

UBS002BZ

Use this procedure to check the overall function of the coolant overtemperature enrichment protection check, a DTC might not be confirmed.

WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high-pressure fluid escaping from the radiator.
Wrap a thick cloth around the cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II



1. Check the coolant level and mixture ratio (using coolant tester) in the reservoir tank and radiator.
Allow engine to cool before checking coolant level and mixture ratio.
   - If the coolant level in the reservoir and/or radiator is below the proper range, go to EC-1466, "Diagnostic Procedure" .
   - If the coolant mixture ratio is out of the range of 45 to 55%, replace the coolant in the following procedure MA-23, "Changing Engine Coolant" .

a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant from a kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .

b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

c. After checking or replacing coolant, go to step 3 below.

2. Ask the customer if engine coolant has been added. If it has been added, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.

3. Start engine and let it idle.

4. Make sure that A/C switch is “OFF” and air conditioner is not operating. If NG, check air conditioner circuit. Refer to MTC-19, "TROUBLE DIAGNOSIS" After repair, go to the next step.

5. Perform “ENG COOLANT TEMP” in “ACTIVE TEST” mode with CONSULT-II at idle.

a. Set “ENG COOLANT TEMP” to 95°C (203°F) and make sure that cooling fan operates at low speed.
If NG, go to EC-1466, "Diagnostic Procedure" .

b. Set “ENG COOLANT TEMP” to 105°C (221°F) and make sure that cooling fan operates at high speed. If NG, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.

6. Check for blocked coolant passage.

a. Warm up engine to normal operating temperature, then grasp radiator upper hose and lower hose and make sure that coolant flows.
If NG, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.
Be extremely careful not to touch any moving or adjacent parts.

7. Check for blocked radiator air passage.

a. When market fog lamps have been installed, check for damaged fans and clogging in the condenser and radiator.

b. Check the front end for clogging caused by insects or debris.

c. Check for improper fitting of front-end cover, damaged radiator grille or bumper, damaged vehicle front.
If NG, take appropriate action and then go to the next step.

8. Check function of ECT sensor.
Refer to EC-1390, "Component Inspection" .
If NG, replace ECT sensor and go to the next step.

9. Check ignition timing. Refer to EC-1291, "Basic Inspection" .
Make sure that ignition timing is 15°±5° at idle.
If NG, refer to EC-1291, "Basic Inspection" , and then recheck.

WITH GST

1. Check the coolant level and mixture ratio (using coolant tester) in the reservoir tank and radiator.
Allow engine to cool before checking coolant level and mixture ratio.
   - If the coolant level in the reservoir and/or radiator is below the proper range, and go to EC-1466, "Diagnostic Procedure" .
   - If the coolant mixture ratio is out of the range of 45 to 55%, replace the coolant in the following procedure MA-23, "Changing Engine Coolant" .

a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant from a kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .

b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

c. After checking or replacing coolant, go to step 3 below.

2. Ask the customer if engine coolant has been added. If it has been added, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.
3. Start engine and let it idle.
4. Make sure that A/C switch is “OFF” and air conditioner is not operating. If NG, check air conditioner circuit. Refer to MTC-19, "TROUBLE DIAGNOSIS" . After repair, go to the next step.
5. Turn ignition switch “OFF”.
6. Disconnect engine coolant temperature sensor harness connector.
7. Connect 150Ω resistor to engine coolant temperature sensor.
8. Start engine and make sure that cooling fan operates.
   Be careful not to overheat engine.
   If NG, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.
9. Check for blocked coolant passage.

a. Warm up engine to normal operating temperature, then grasp radiator upper hose and lower hose and make sure that coolant flows.
   If NG, go to EC-1466, "Diagnostic Procedure" . After repair, go to the next step.
   Be extremely careful not to touch any moving or adjacent parts.

10. Check for blocked radiator air passage.

a. When market fog lamps have been installed, check for damaged fans and clogging in the condenser and radiator.

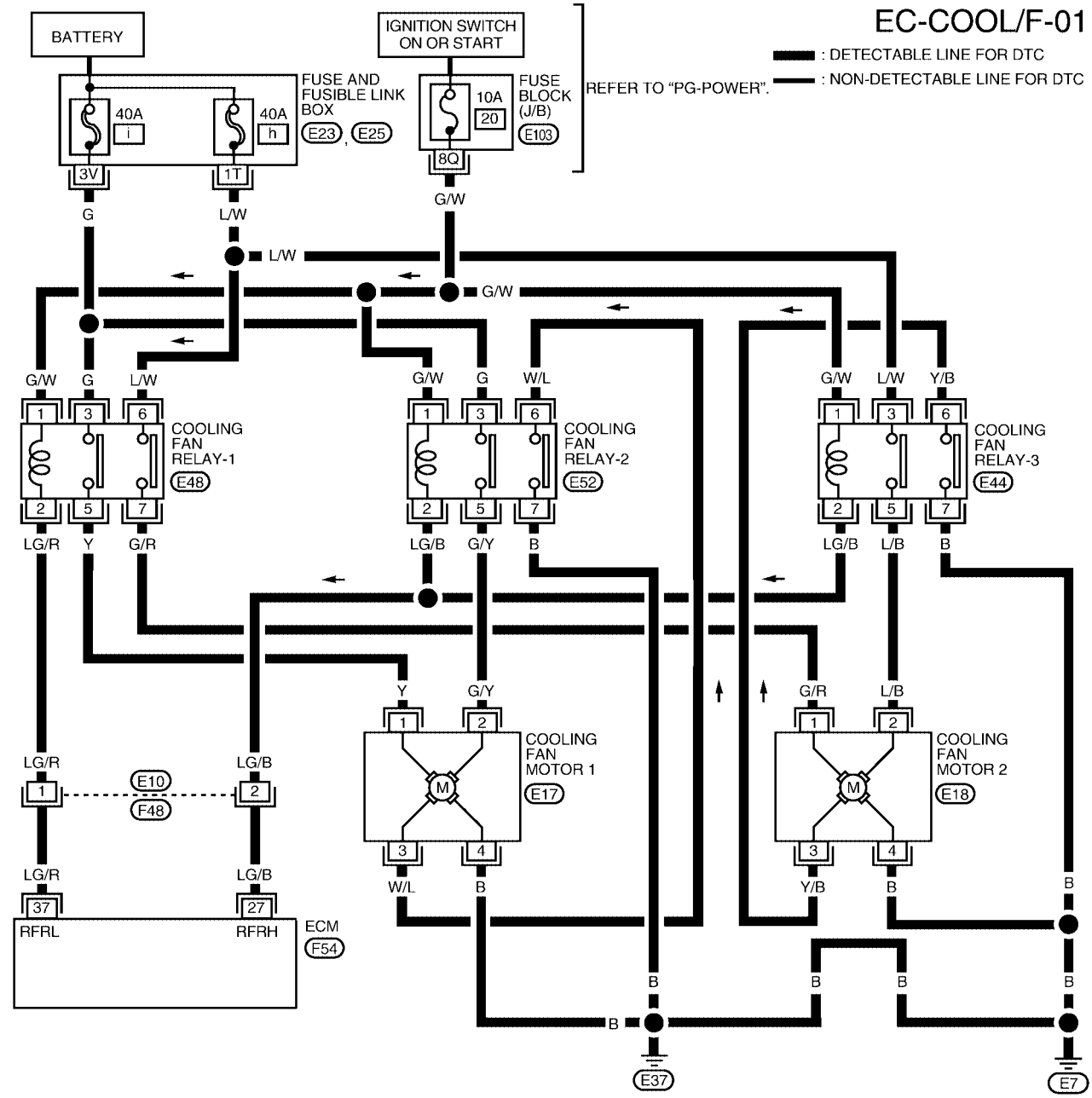
b. Check the front end for clogging caused by insects or debris.

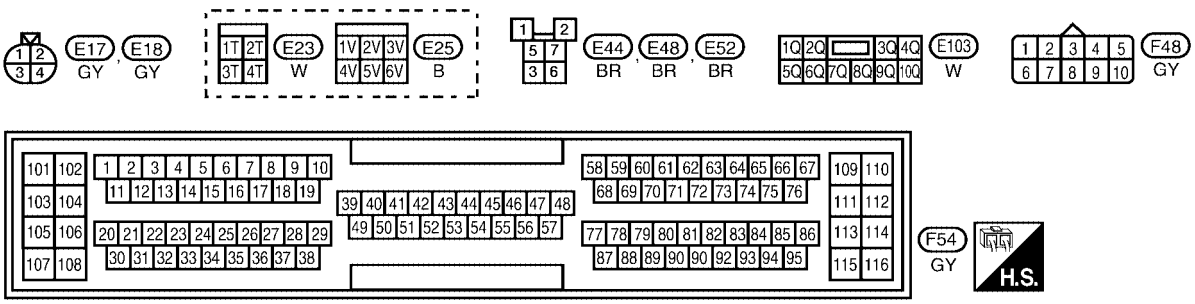
c. Check for improper fitting of front-end cover, damaged radiator grille or bumper, damaged vehicle front.
   If NG, take appropriate action and then go to the next step.

11. Check function of ECT sensor.
    Refer to EC-1390, "Component Inspection" .
    If NG, replace ECT sensor and go to the next step.
12. Check ignition timing. Refer to EC-1291, "Basic Inspection" .
    Make sure that ignition timing is 15°±5° at idle.
    If NG, refer to EC-1291, "Basic Inspection" , and then recheck.

Wiring Diagram

UBS002C0





BBWA0431E

Diagnostic Procedure

UBS002C1

1. INSPECTION START

Do you have CONSULT-II?

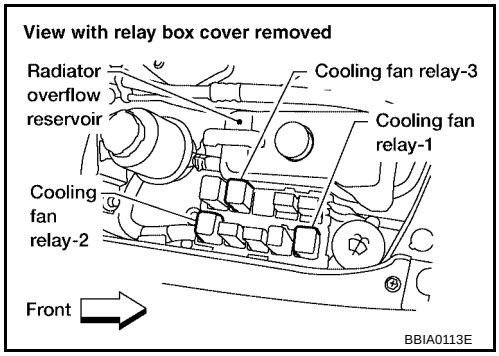
Yes or No

Yes >> GO TO 2.
No >> GO TO 4.

2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.



3. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “LOW” on the CONSULT-II screen.
4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 3.
NG >> Check cooling fan low speed control circuit. (Go to EC-1470, "PROCEDURE A" .)

ACTIVE TEST	
COOLING FAN	LOW
MONITOR	
COOLAN TEMP/S	XXX °C

SEF784Z

3. CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relays-2 and -3.
3. Start engine and let it idle.
4. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “HIGH” on the CONSULT-II screen.
5. Make sure that cooling fans-1 and -2 operate at high speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-1472, "PROCEDURE B" .)

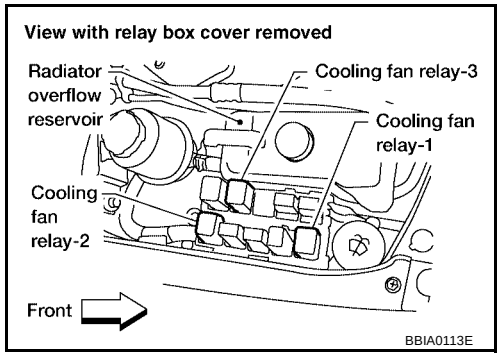
ACTIVE TEST	
COOLING FAN	HIGH
MONITOR	
COOLAN TEMP/S	XXX °C

SEF785Z

4. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

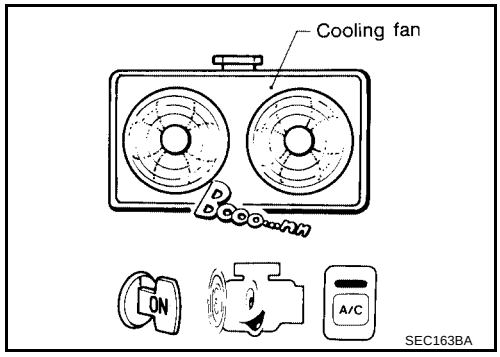
1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.
3. Turn air conditioner switch “ON”.
4. Turn blower fan switch “ON”.



5. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 5.
NG >> Check cooling fan low speed control circuit. (Go to EC-1470, "PROCEDURE A" .)



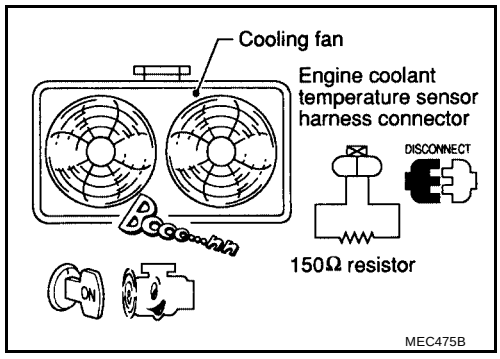
5. CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relays-2 and -3.
3. Turn air conditioner switch and blower fan switch “OFF”.
4. Disconnect engine coolant temperature sensor harness connector.
5. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
6. Restart engine and make sure that cooling fans-1 and -2 operate at high speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-1472, "PROCEDURE B" .)



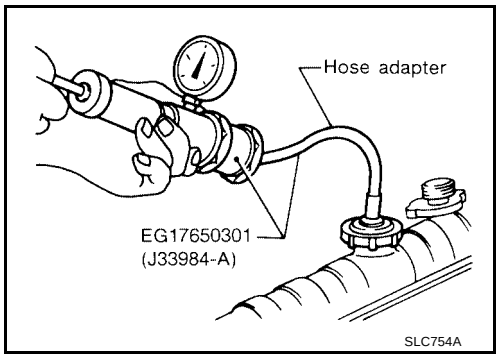
6. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.6 kg/cm^2 , 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.

Pressure should not drop.



OK or NG

OK >> GO TO 7.
NG >> Check the following for leak.

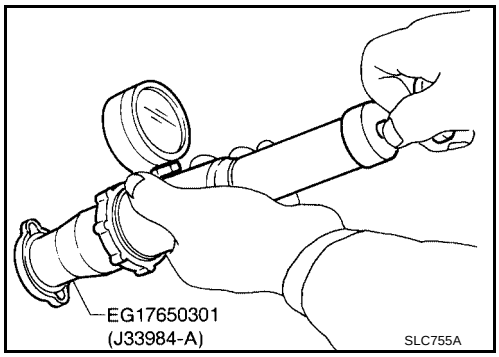
- Hose
- Radiator
- Water pump
  Refer to CO-26, "WATER PUMP" .

7. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure:

59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 8.
NG >> Replace radiator cap.

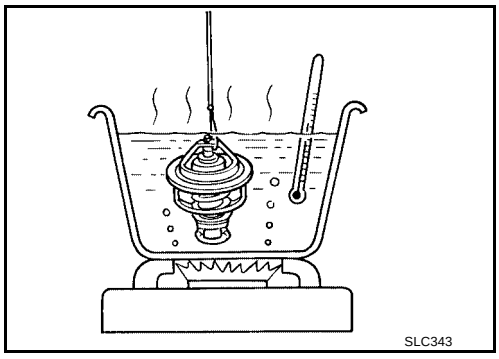
8. CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.

   Valve opening temperature: 82°C (180°F) [standard]

   Valve lift: More than 8 mm/95°C (0.31 in/203°F)

3. Check if valve is closed at 5°C (9°F) below valve opening temperature.
   For details, refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .



OK or NG

OK >> GO TO 9.
NG >> Replace thermostat.

9. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1390, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace engine coolant temperature sensor.

10. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to EC-1473, "Main 12 Causes of Overheating" .

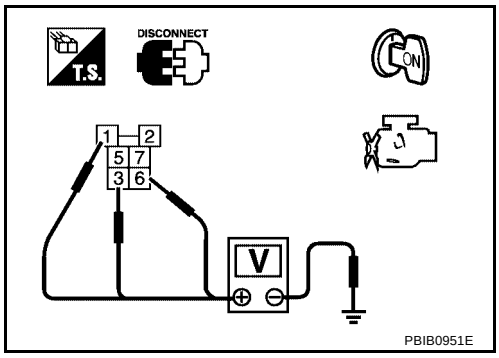
>> **INSPECTION END**

PROCEDURE A

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

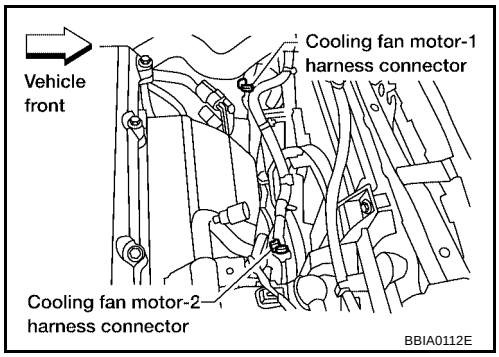
- 10A fuse
- Fuse block (J/B) connector E103
- 40A fusible links
- Fuse and fusible link box connectors E23, E25
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and fusible links

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 4 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 4 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 37 and cooling fan relay-1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relay-1 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-1474, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1474, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

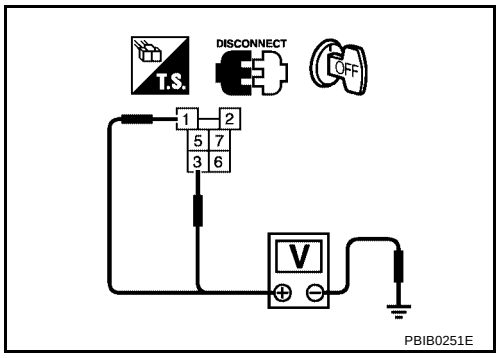
>> **INSPECTION END**

PROCEDURE B

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relays-2 and -3 terminals 1, 3 and body ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

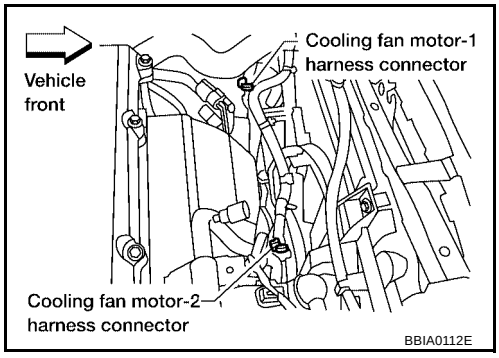
- Harness for open or short between cooling fan relays-2 and -3 and fuse
- Harness for open or short between cooling fan relays-2 and -3 and fusible links

>> Repair harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between the following;
   cooling fan relay-2 terminal 5 and cooling fan motor-1 terminal 2,
   cooling fan relay-2 terminal 6 and cooling fan motor-1 terminal 3,
   cooling fan relay-2 terminal 7 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between the following;
   cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 2,
   cooling fan relay-3 terminal 6 and cooling fan motor-2 terminal 3,
   cooling fan relay-3 terminal 7 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 27 and cooling fan relay-2 terminal 2, cooling fan relay-3 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relays-2, -3 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAYS-2 AND -3

Refer to EC-1474, "COOLING FAN RELAYS-1, -2 AND -3" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relays.

7. CHECK COOLING FAN MOTORS

Refer to EC-1474, "COOLING FAN MOTORS-1 AND -2" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

UBS002C2

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-14, "Anti-freeze Coolant Mixture Ratio" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-23, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa ($0.6 - 1.0$ kg/cm^2 , 9 - 14 psi) (Limit)	See CO-34, "CHECKING RADIATOR CAP" .

Engine	Step	Inspection item	Equipment	Standard	Reference page
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-24, "CHECKING COOLING SYSTEM FOR LEAKS" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" , and CO-30, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P0217 (EC-1461).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-23, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-24, "CHECKING RESERVOIR LEVEL" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-145, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-145, "CYLINDER HEAD" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-22, "OVERHEATING CAUSE ANALYSIS" .

Component Inspection

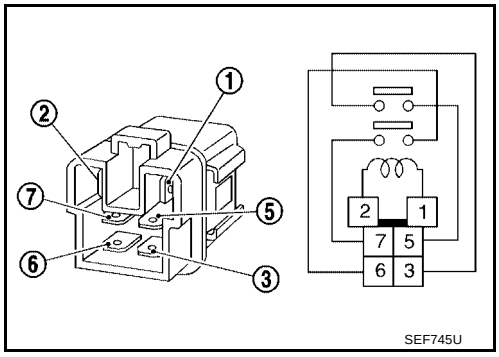
UBS002C3

COOLING FAN RELAYS-1, -2 AND -3

Check continuity between terminals 3 and 5, 6 and 7.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace relay.

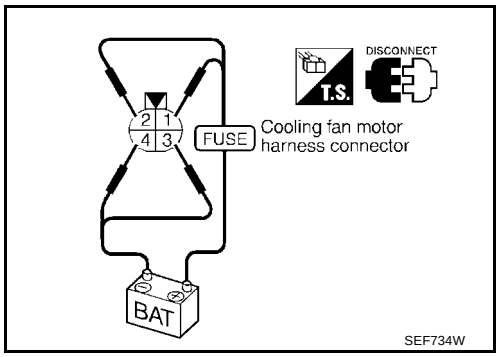


COOLING FAN MOTORS-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(+)	(–)
Cooling fan motor	Low	1	4
	High	1, 2	3, 4

Cooling fan motor should operate.
If NG, replace cooling fan motor.



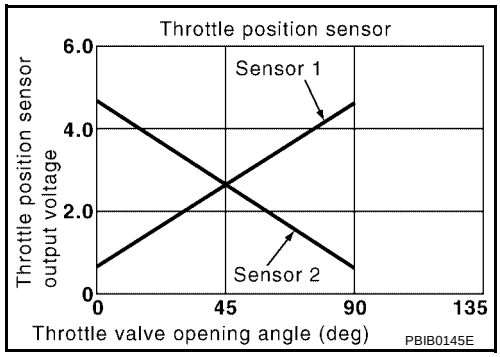
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

UBS0055P

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS0055Q

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2★	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

★: Throttle position sensor2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS0055R

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode an the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

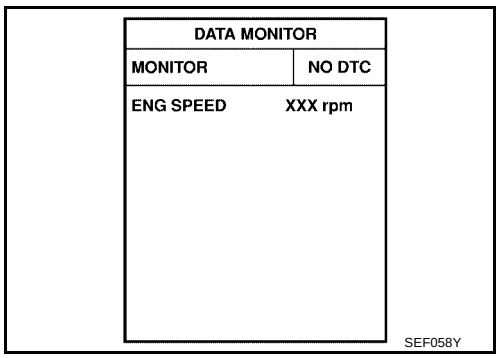
DTC Confirmation Procedure

UBS0055S

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1478, "Diagnostic Procedure" .

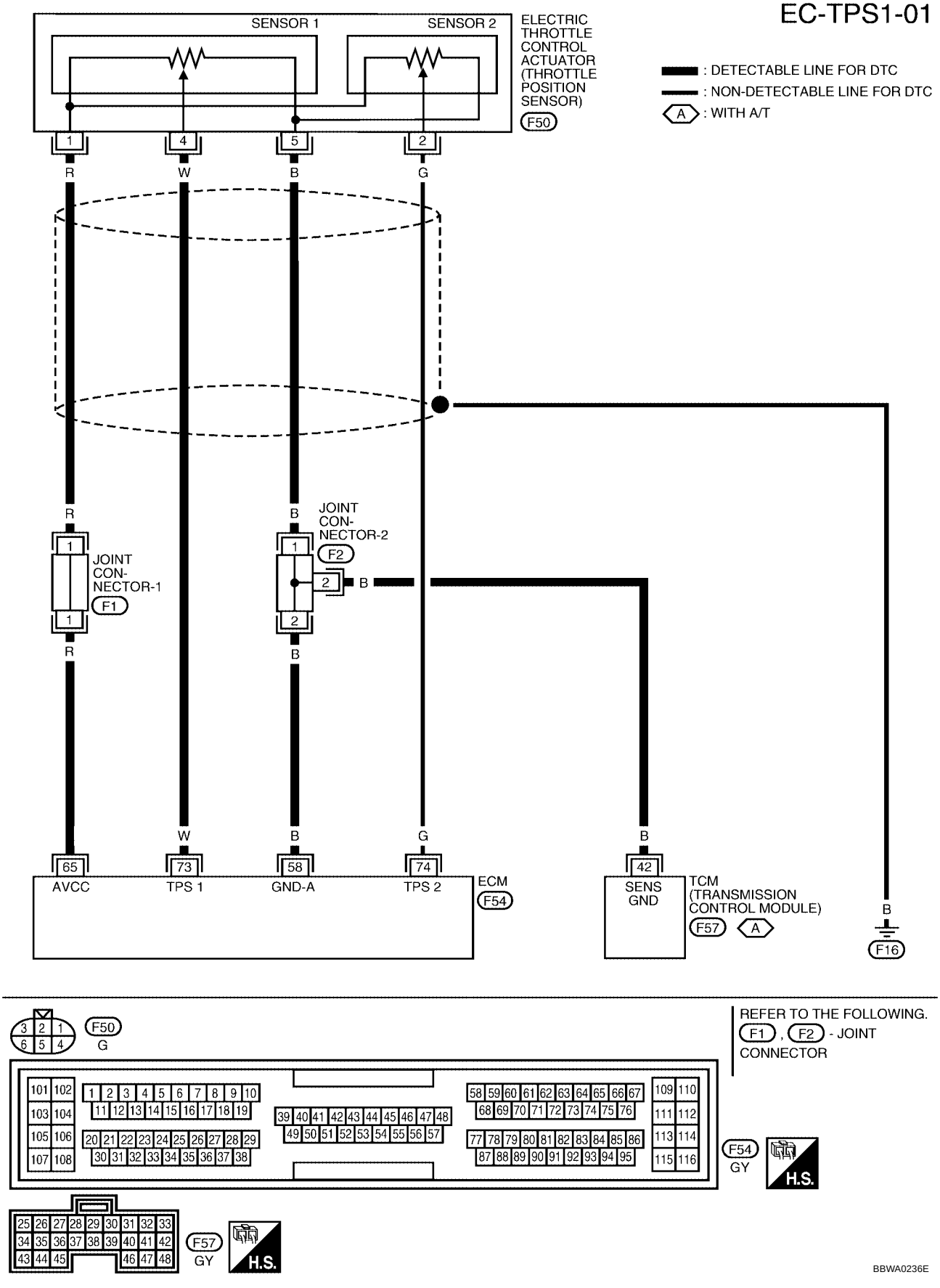


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS0055T



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
73	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position: "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● **Engine stopped** ● Shift lever position: "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
74	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position: "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● **Engine stopped** ● Shift lever position: "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

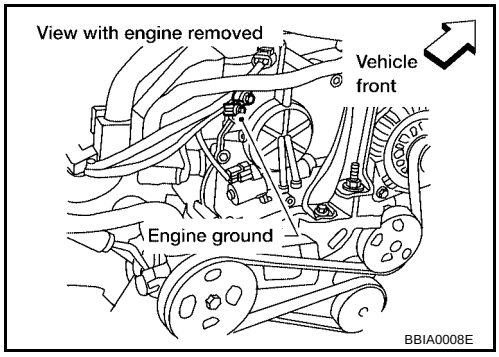
Diagnostic Procedure

UBS0055U

1. RETIGHTEN GROUND SCREWS

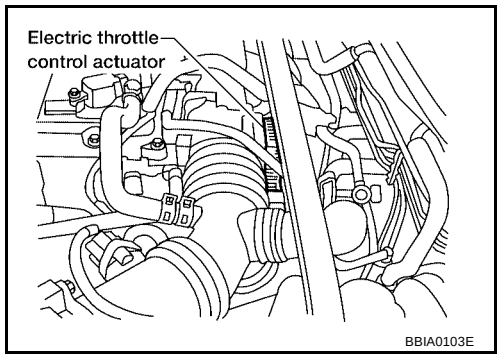
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

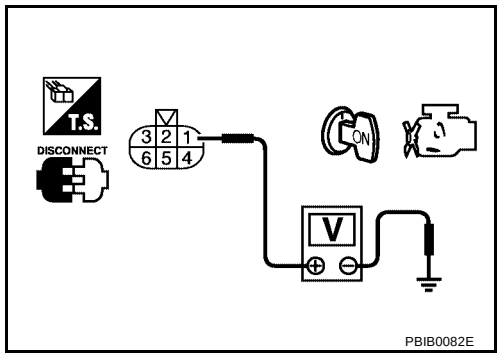


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between electric throttle control actuator and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electric throttle control actuator terminal 5 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-2
- Harness for open or short between electric throttle control actuator and ECM
- Harness for open or short between electric throttle control actuator and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 73 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE POSITION SENSOR

Refer to EC-1480, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

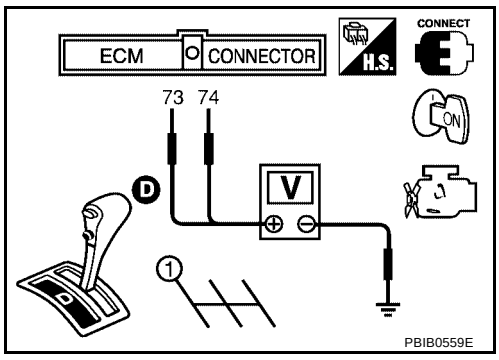
Component Inspection

UBS0055V

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 73 (TP sensor 1), 74 (TP sensor 2) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
73 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
74 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1255, "Throttle Valve Closed Position Learning" .
8. Perform EC-1255, "Idle Air Volume Learning" .

Removal and Installation

UBS0055W

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

PFP:00000

On Board Diagnosis Logic

UBS002D0

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor (POS) signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● The injector circuit is open or shorted ● Fuel injectors ● Intake air leak ● The ignition signal circuit is open or shorted ● Lack of fuel ● Drive plate or flywheel ● Heated oxygen sensor 1 ● Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	

DTC Confirmation Procedure

UBS002D1

CAUTION:

Always drive vehicle at a safe speed.

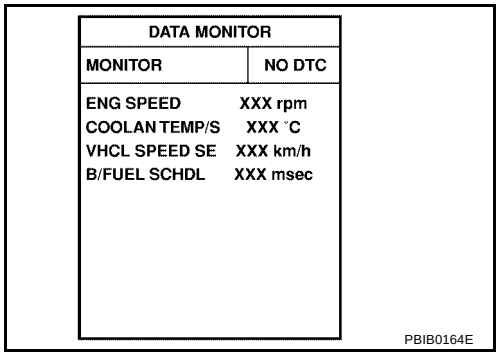
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”, and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.

4. Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
   NOTE:
   Refer to the freeze frame data for the test driving conditions.
5. If 1st trip DTC is detected, go to EC-1482, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002D2

1. CHECK FOR INTAKE AIR LEAK

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

OK or NG

OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

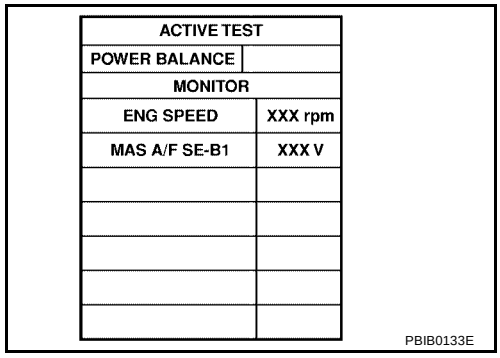
OK or NG

OK >> GO TO 3.
NG >> Repair or replace it.

3. PERFORM POWER BALANCE TEST

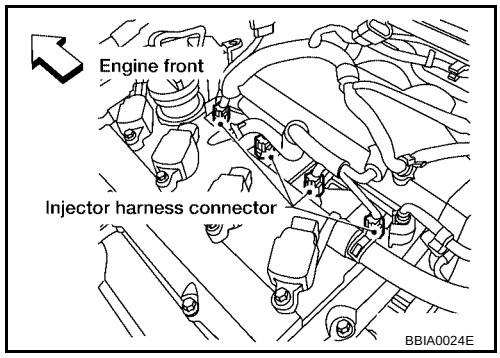
With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?



Without CONSULT-II

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



Yes or No

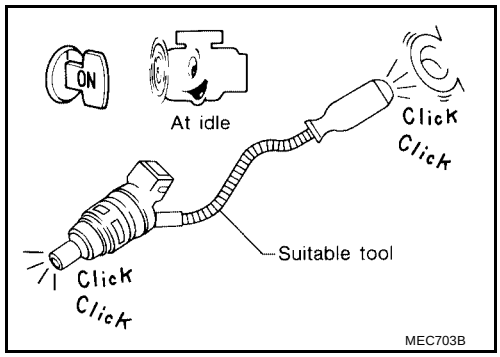
Yes >> GO TO 4.
No >> GO TO 7.

4. CHECK INJECTOR

Does each injector make an operating sound at idle?

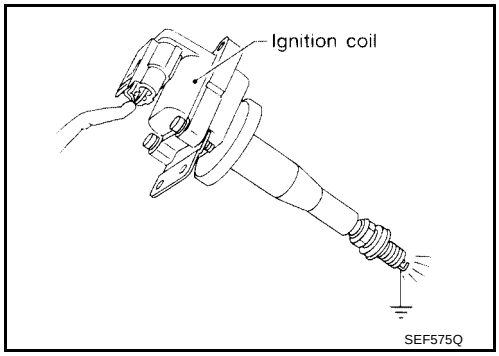
Yes or No

Yes >> GO TO 5.
No >> Check injector(s) and circuit(s). Refer to EC-1796, "INJECTOR CIRCUIT" .



5. CHECK IGNITION SPARK

1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

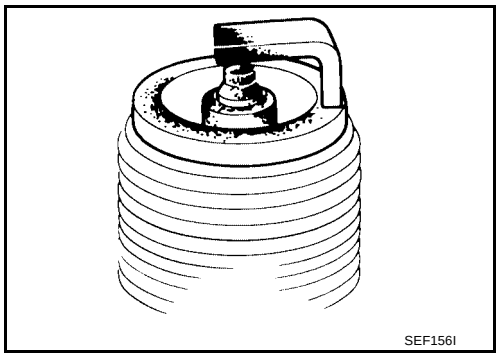


OK or NG

OK >> GO TO 6.
NG >> Check ignition coil, power transistor and their circuits. Refer to EC-1777, "IGNITION SIGNAL" .

6. CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.



OK or NG

OK >> GO TO 7.
NG >> Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-27, "Changing Spark Plugs (Double Platinum - Tipped Type)" .

7. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-145, "CHECKING COMPRESSION PRESSURE" .

Standard:	**1,190 kPa (12.1 kg/cm^2 , 172 psi)/250 rpm**
Minimum:	**990 kPa (10.1 kg/cm^2 , 144 psi)/250 rpm**
Difference between each cylinder:	**98 kPa (1.0 kg/cm^2 , 14 psi)/250 rpm**

OK or NG

OK >> GO TO 8.
NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

8. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-1257, "FUEL PRESSURE RELEASE" .
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-1257, "Fuel Pressure Check" .

At idle: Approx. 350 kPa (3.57 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 9.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

9. CHECK IGNITION TIMING

Check the following items. Refer to EC-1291, "Basic Inspection" .

Items		Specifications
Target idle speed	A/T	700 ± 50 rpm (in “P” or “N” position)
	M/T	700 ± 50 rpm
Ignition timing	A/T	15 ± 5° BTDC (in “P” or “N” position)
	M/T	15 ± 5° BTDC

OK or NG

OK >> GO TO 10.
NG >> Follow the “Basic Inspection”.

10. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1410, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. CHECK MASS AIR FLOW SENSOR

With CONSULT-II
Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT-II.

1.4 - 4.0 g·m/sec: at idling
4.0 - 10.0 g·m/sec: at 2,500 rpm

With GST
Check mass air flow sensor signal in MODE 1 with GST.

1.4 - 4.0 g·m/sec: at idling
4.0 - 10.0 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 12.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1375, "DTC P0102, P0103 MAF SENSOR" .

12. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-1295, "Symptom Matrix Chart" .

OK or NG

OK >> GO TO 13.
NG >> Repair or replace.

13. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

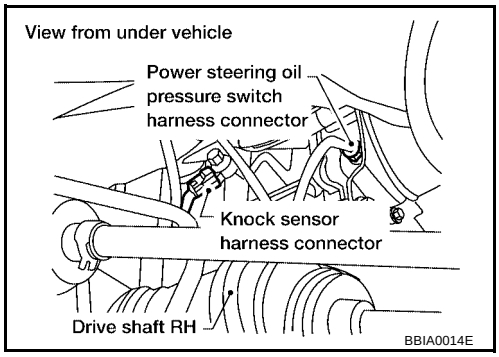
DTC P0327, P0328 KS

PFP:22060

Component Description

UBS002D3

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

UBS002D4

The MIL will not light for knock sensor malfunction.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

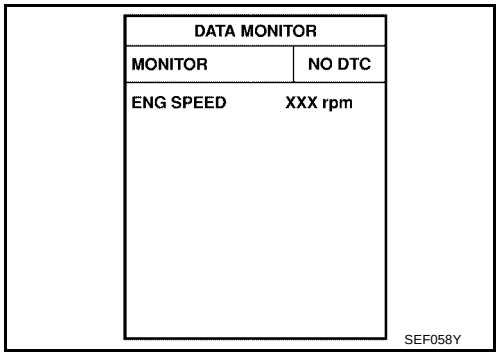
UBS002D5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-1488, "Diagnostic Procedure" .



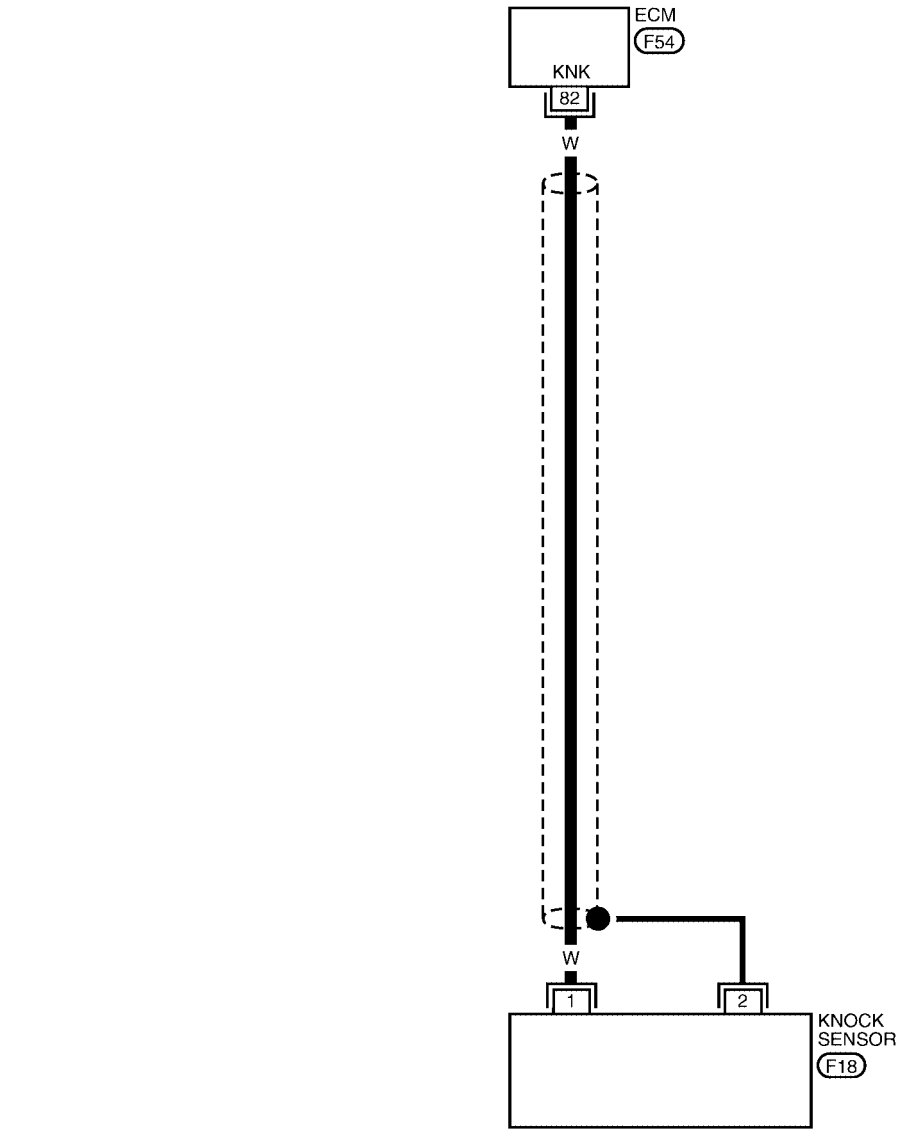
WITH GST

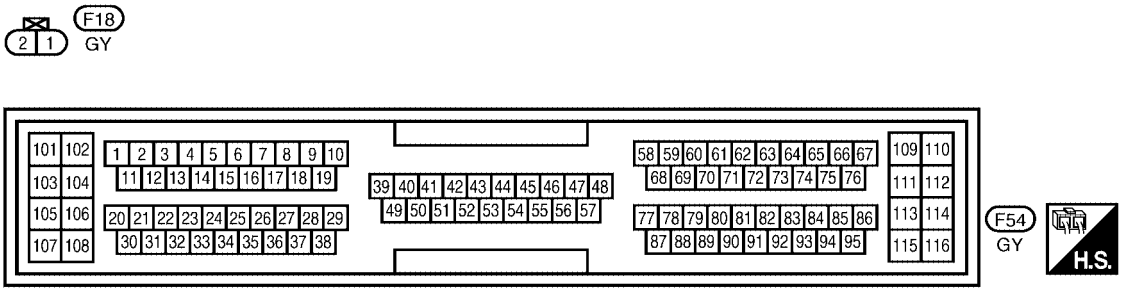
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002D6

EC-KS-01





BBWA0016E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V

Diagnostic Procedure

UBS002D7

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 82 and engine ground. Refer to Wiring Diagram.

   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

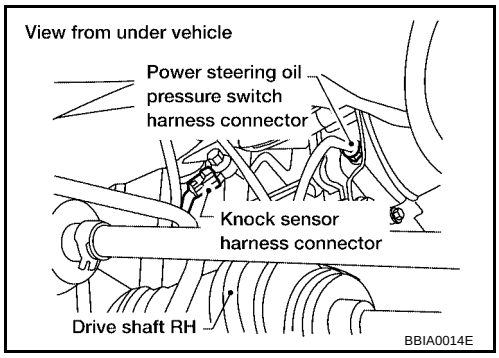
OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 82 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

Refer to EC-1489, "Component Inspection" .

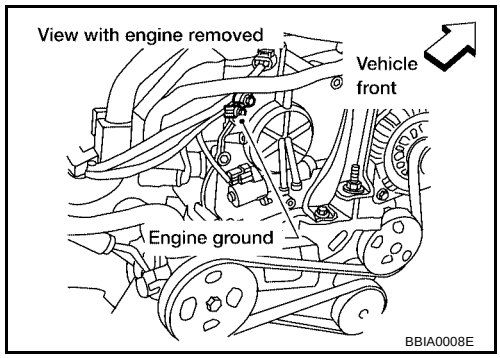
OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 5.



5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002D8

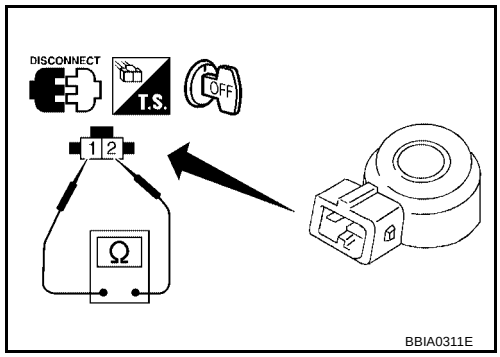
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



Removal and Installation

UBS002D9

KNOCK SENSOR

Refer to EM-160, "CYLINDER BLOCK" .

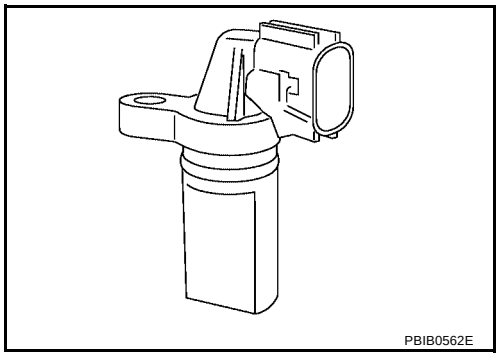
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

UBS002DA

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

UBS002DB

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED·	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

UBS002DC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted) ● Crankshaft position sensor (POS) ● Signal plate

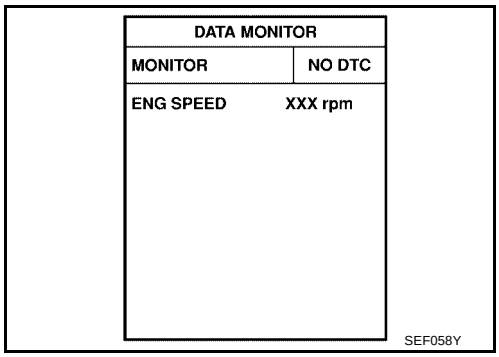
DTC Confirmation Procedure

UBS002DD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-1492, "Diagnostic Procedure" .



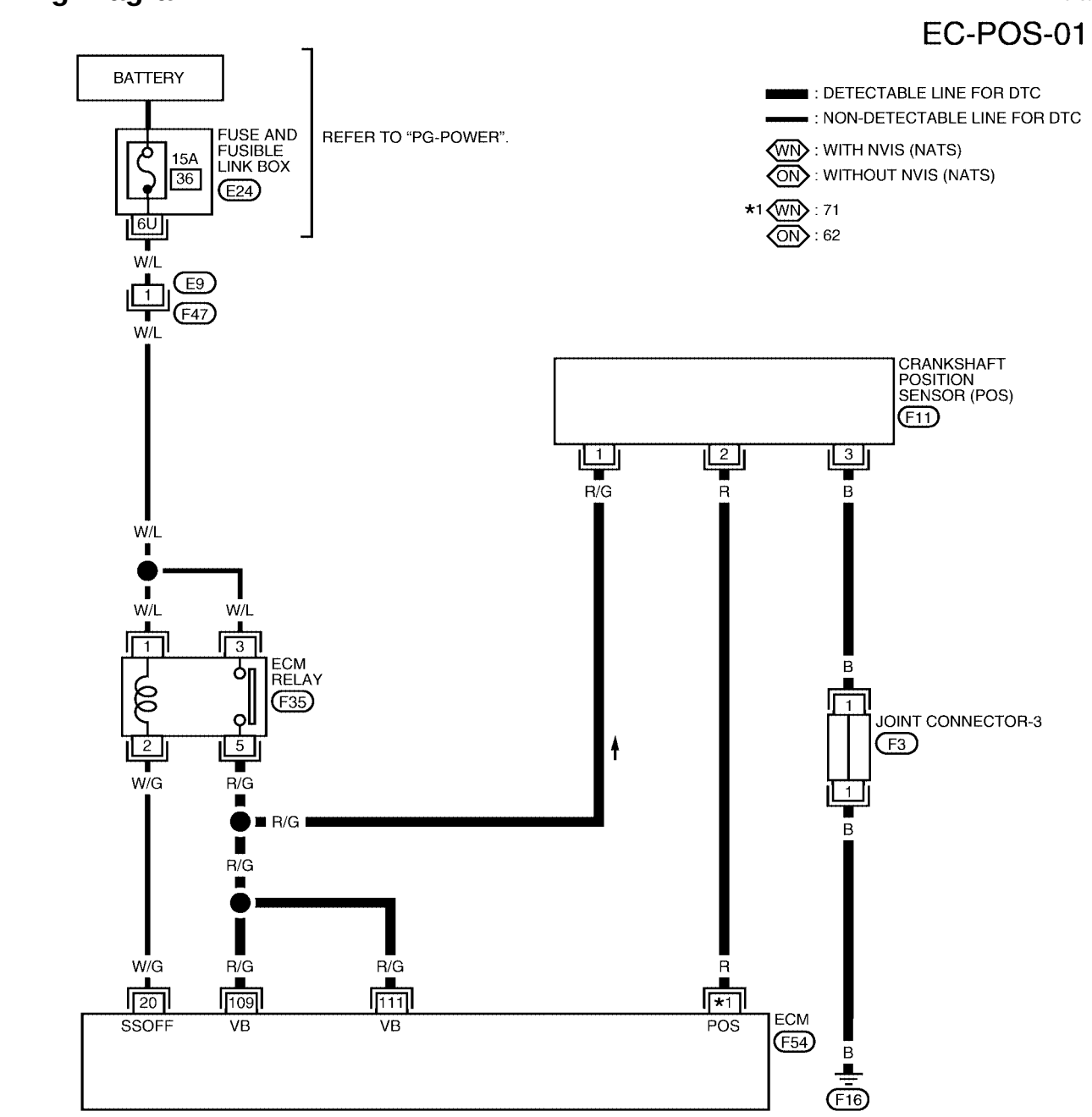
SEF058Y

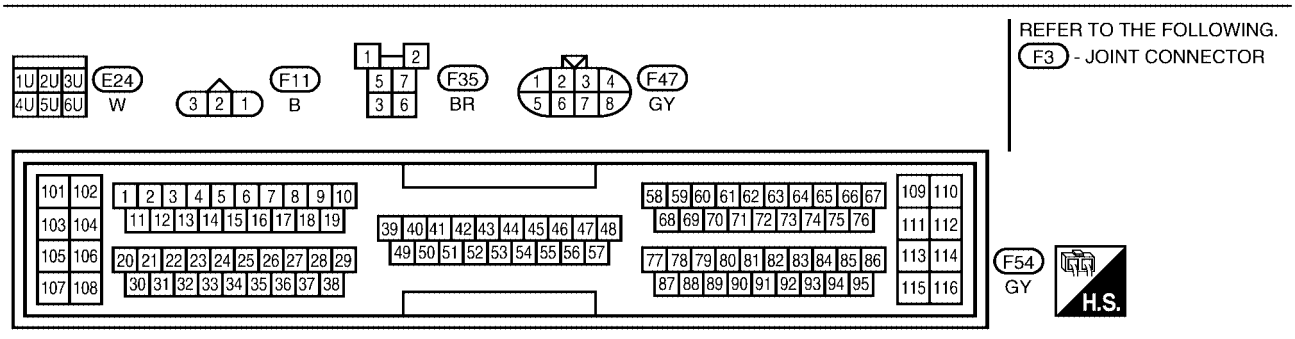
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002DE



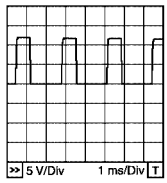
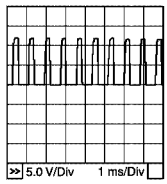


BBWA0222E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62 (Without NVIS) 71 (With NVIS)	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

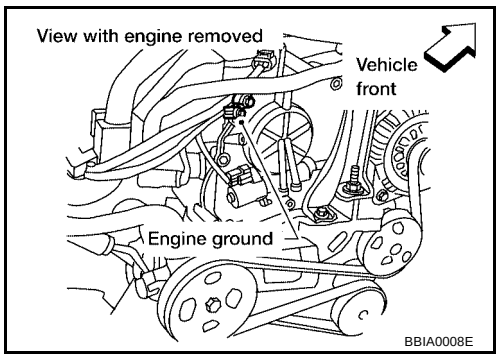
Diagnostic Procedure

UBS002DF

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

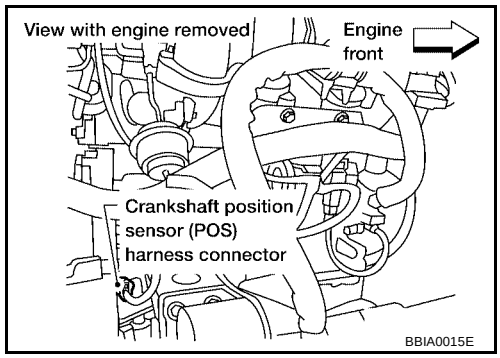
>> GO TO 2.



BBIA0008E

2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch “ON”.



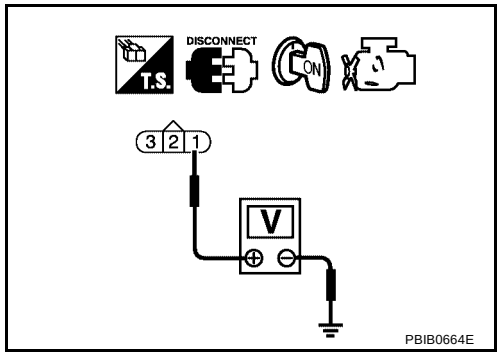
3. Check voltage between CKP sensor (POS) terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between CKP sensor (POS) terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open or short between crankshaft position sensor (POS) and engine ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 62 or 71 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1494, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace crankshaft position sensor (POS).

8. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 9.
NG >> Replace the signal plate.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

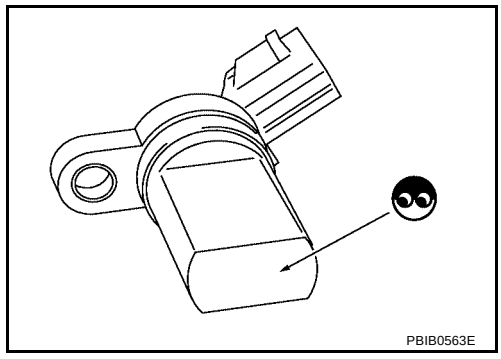
>> **INSPECTION END**

Component Inspection

UBS002DG

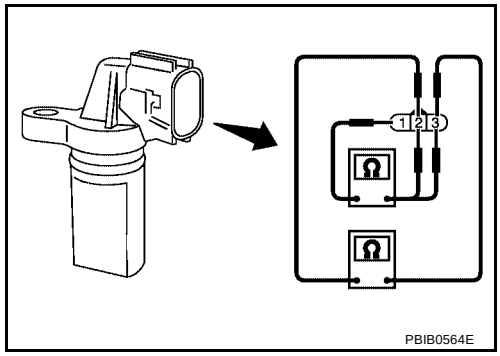
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞
1 (+) - 3 (-)	
2 (+) - 3 (-)	



UBS002DH

6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-160, "CYLINDER BLOCK" .

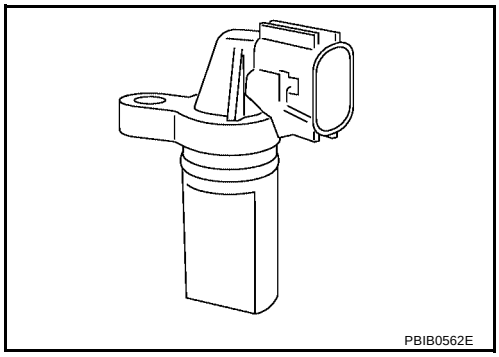
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

UBS002DI

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

UBS002DJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-9 .) ● Starting system circuit (Refer to SC-9 .) ● Dead (Weak) battery

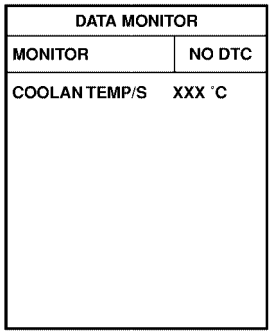
DTC Confirmation Procedure

UBS002DK

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-1498, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-1498, "Diagnostic Procedure" .



SEF013Y

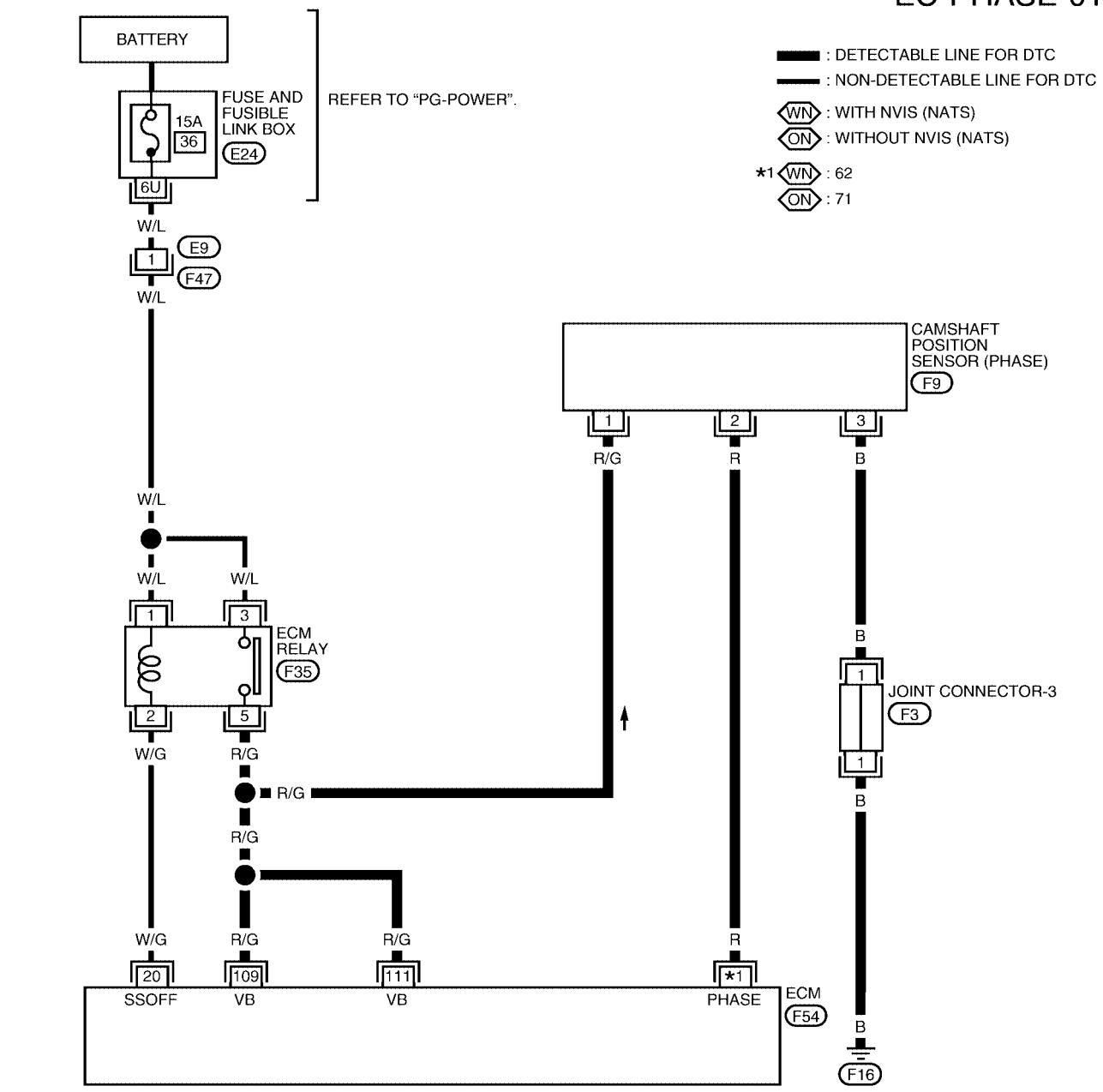
WITH GST

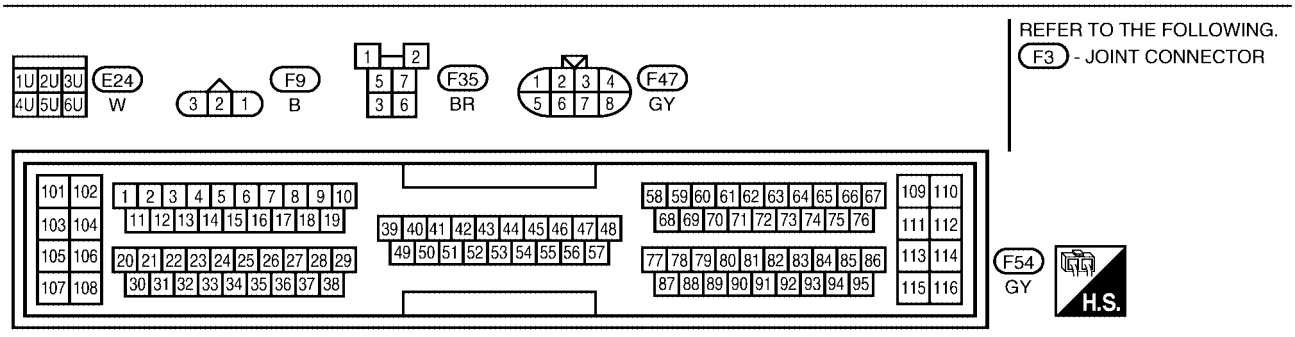
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002DL

EC-PHASE-01



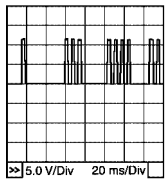
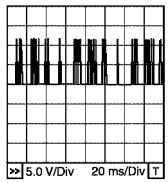


BBWA0223E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62 (With NVIS) 71 (Without NVIS)	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002DM

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

Yes or No

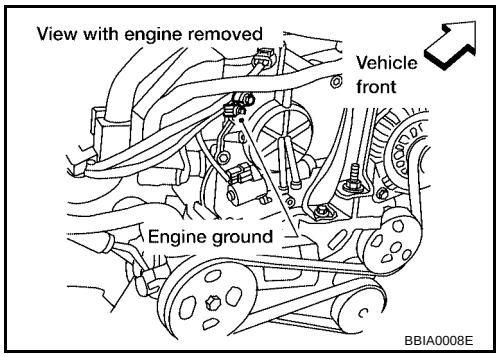
Yes >> GO TO 2.

No >> Check starting system. (Refer to SC-9, "STARTING SYSTEM" .)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

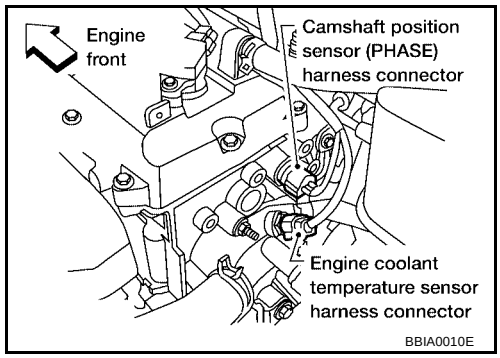
>> GO TO 3.



BBIA0008E

3. CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



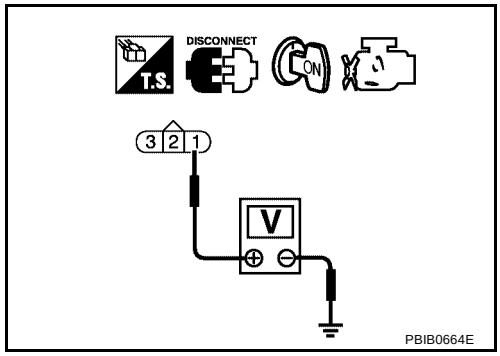
3. Check voltage between CMP sensor (PHASE) terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between CMP sensor (PHASE) terminal 3 and engine ground.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open or short between camshaft position sensor (PHASE) and engine ground

>> Repair open circuit or short to power in harness or connectors.

7. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 62 or 71 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1500, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace camshaft position sensor (PHASE).

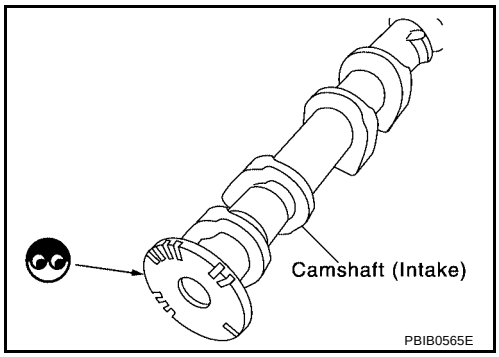
9. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 10.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



10. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

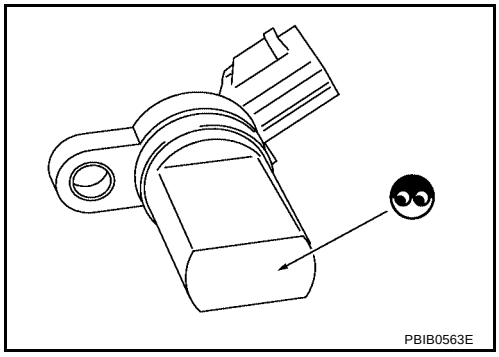
>> **INSPECTION END**

Component Inspection

UBS002DN

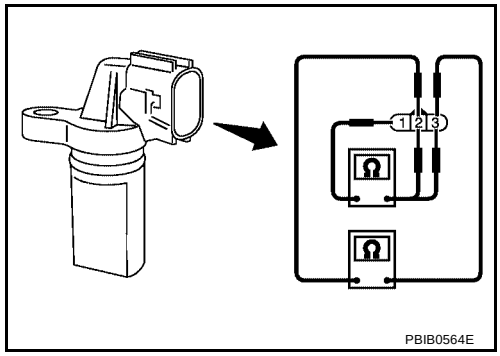
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞
1 (+) - 3 (-)	
2 (+) - 3 (-)	



UBS002DO

Removal and Installation

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-123, "CAMSHAFT" .

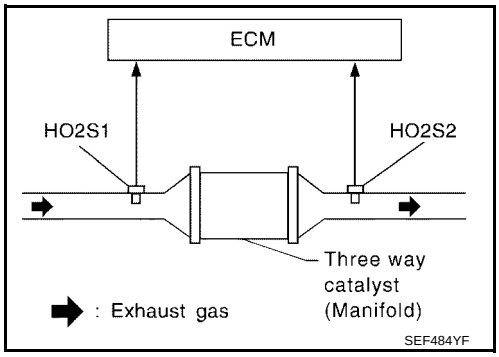
DTC P0420 THREE WAY CATALYST FUNCTION

PFP:20905

On Board Diagnosis Logic

UBS002DP

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 and 2.
A three way catalyst (Manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst (Manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	● Three way catalyst (Manifold) does not operate properly. ● Three way catalyst (Manifold) does not have enough oxygen storage capacity.	● Three way catalyst (Manifold) ● Exhaust tube ● Intake air leaks ● Fuel injectors ● Fuel injector leaks ● Spark plug ● Improper ignition timing

DTC Confirmation Procedure

UBS002DQ

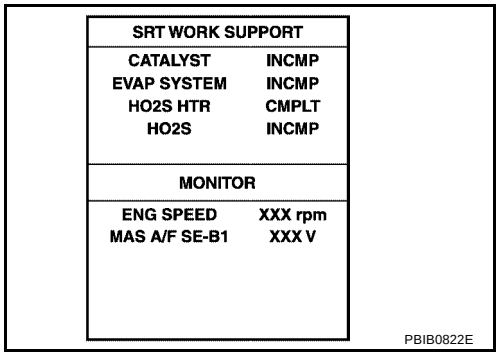
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

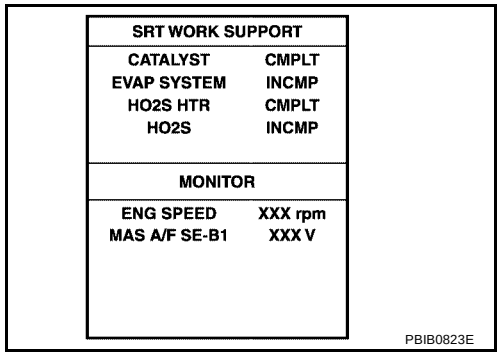
TESTING CONDITION:

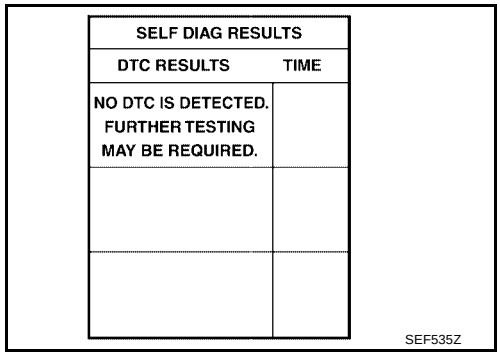
- **Do not hold engine speed for more than the specified minutes below.**

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Open engine hood.
6. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
7. Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
   If “INCMP” of “CATALYST” changed to “COMPLT”, go to step 10.
8. Wait 5 seconds at idle.



9. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).
   If not “CMPLT”, perform the following.
   a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
   b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
   c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.
   d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 6.
10. Select “SELF-DIAG RESULTS” mode with CONSULT-II.
11. Confirm that the 1st trip DTC is not detected.
    If the 1st trip DTC is detected, go to EC-1504, "Diagnostic Procedure" .





Overall Function Check

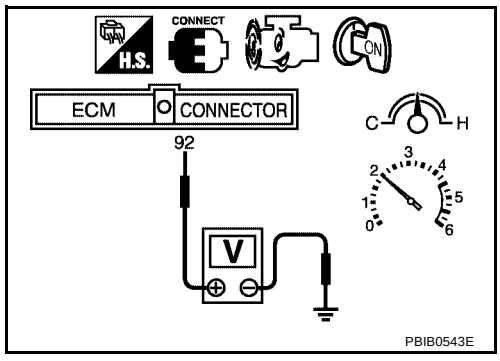
UBS002DR

Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a DTC might not be confirmed.

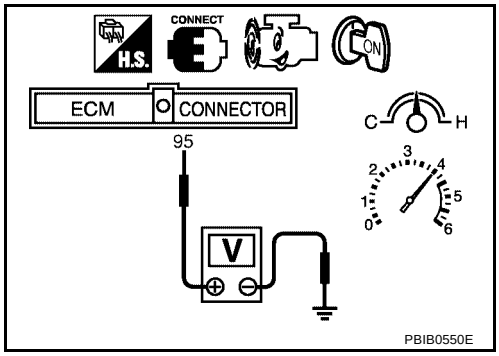
CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 92 [HO2S1 signal] and engine ground, and ECM terminal 95 [HO2S2 signal] and engine ground.
6. Keep engine speed at 2,000 rpm constant under no load.



7. Make sure that the voltage switching frequency (high & low) between ECM terminal 95 and engine ground is very less than that of ECM terminal 92 and engine ground.
   Switching frequency ratio = A/B
   A: Heated oxygen sensor 2 voltage switching frequency
   B: Heated oxygen sensor 1 voltage switching frequency
   This ratio should be less than 0.75.
   If the ratio is greater than above, it means three way catalyst (manifold) does not operate properly. Go to EC-1504, "Diagnostic Procedure" .



NOTE:
If the voltage at terminal 92 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for “DTC P0133” first. (See EC-1412 .)

Diagnostic Procedure

UBS002DS

1. CHECK EXHAUST SYSTEM

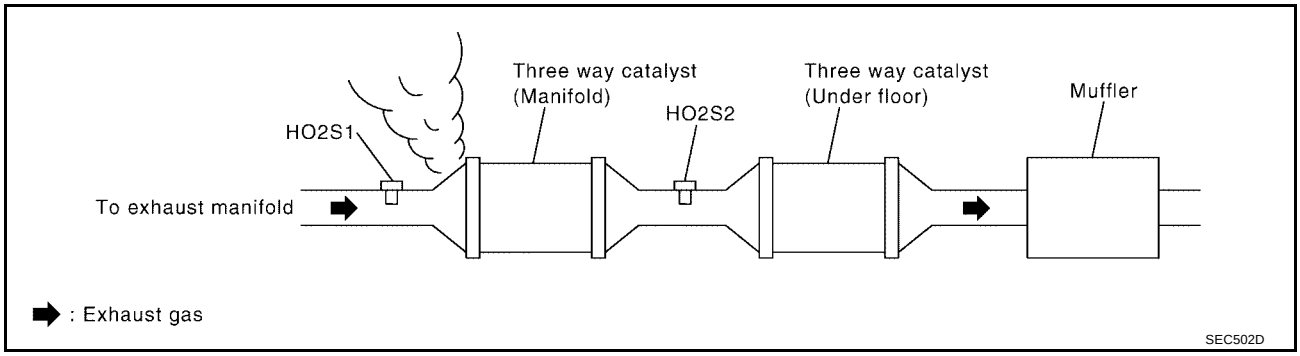
Visually check exhaust tubes and muffler for dent.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before the three way catalyst (Manifold).



OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check the following items. Refer to EC-1291, "Basic Inspection" .

Items		Specifications
Ignition timing	A/T	15° ± 5° BTDC (in “P” or “N” position)
	M/T	15° ± 5° BTDC
Target idle speed	A/T	700 ± 50 rpm (in “P” or “N” position)
	M/T	700 ± 50 rpm

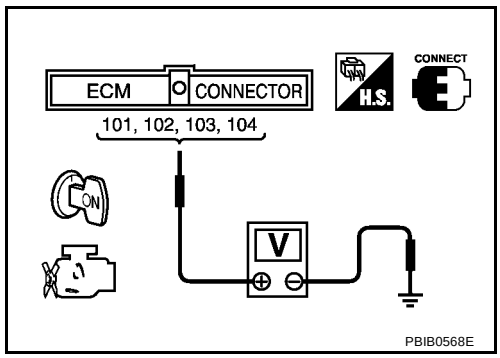
OK or NG

OK >> GO TO 5.
NG >> Follow the “Basic Inspection”.

5. CHECK INJECTORS

1. Stop engine and then turn ignition switch “ON”.
2. Check voltage between ECM terminals 101, 102, 103, 104 and ground with CONSULT-II or tester.
   Refer to Wiring Diagram for Injectors, EC-1797 .

Battery voltage should exist.

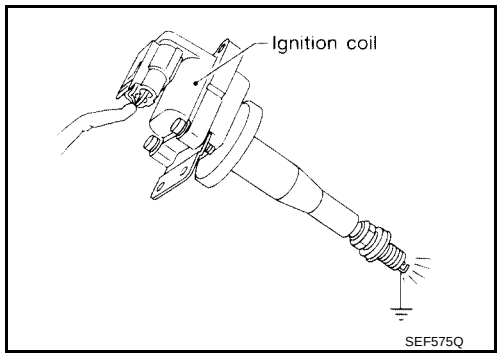


OK or NG

OK >> GO TO 6.
NG >> Perform EC-1798, "Diagnostic Procedure" .

6. CHECK IGNITION SPARK

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



OK or NG

OK >> GO TO 7.
NG >> Check ignition coil with power transistor and their circuit.
Refer to EC-1777, "IGNITION SIGNAL" .

7. CHECK INJECTOR

1. Turn ignition switch “OFF”.
2. Remove injector assembly.
   Refer to EM-118, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Turn ignition switch “ON”.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injector(s) from which fuel is dripping.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Trouble is fixed.>>**INSPECTION END**
Trouble is not fixed.>>Replace three way catalyst (Manifold).

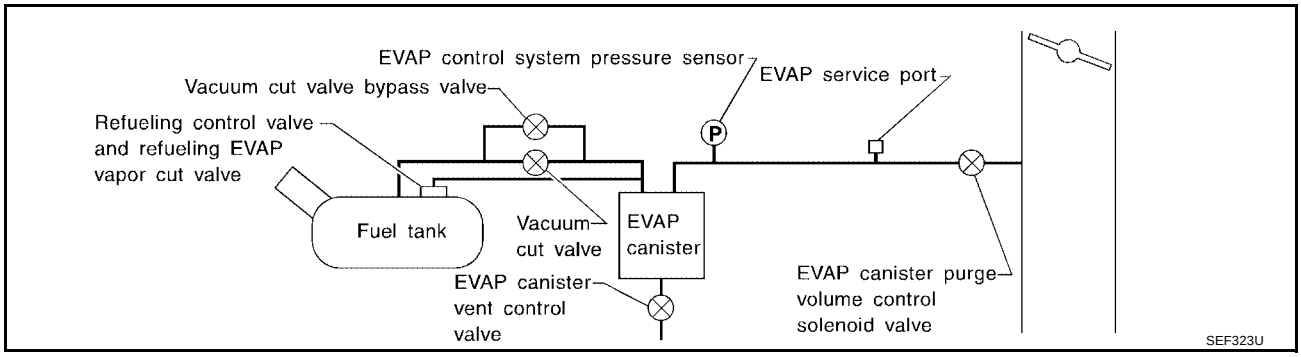
DTC P0441 EVAP CONTROL SYSTEM

PFP:14950

System Description

UBS002DT

NOTE:
If DTC P0441 is displayed with P2122, P2123, P2127, P2128 or P2138, perform trouble diagnosis for displayed other DTC.



In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

On Board Diagnosis Logic

UBS002DU

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441 0441	EVAP control system incorrect purge flow	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	● EVAP canister purge volume control solenoid valve stuck closed ● EVAP control system pressure sensor and the circuit ● Loose, disconnected or improper connection of rubber tube ● Blocked rubber tube ● Cracked EVAP canister ● EVAP canister purge volume control solenoid valve circuit ● Accelerator pedal position sensor ● Blocked purge port ● EVAP canister vent control valve

DTC Confirmation Procedure

UBS002DV

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Always perform test at a temperature of 0°C (32°F) or more.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

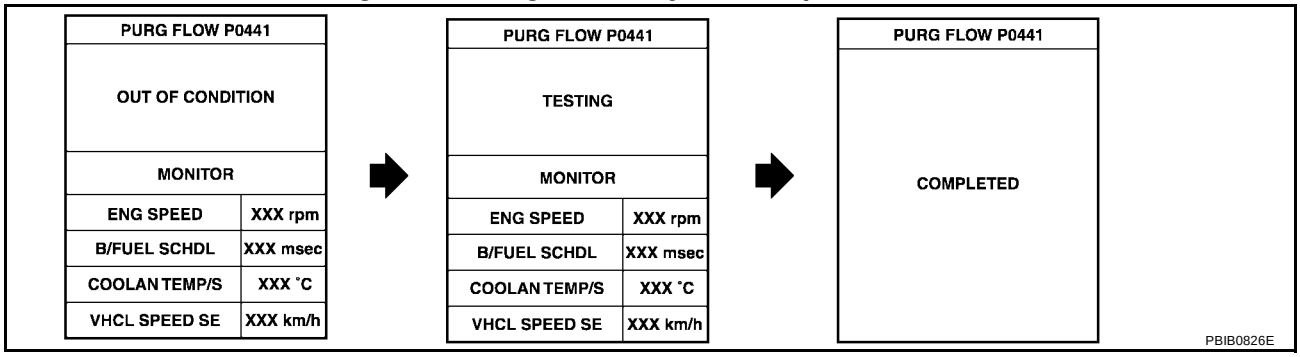
WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and let it idle for at least 70 seconds.
4. Select “PURG FLOW P0441” of “EVAPORATIVE SYSTEM” in “DTC CONFIRMATION” mode with CONSULT-II.

5. Touch “START”.
   If “COMPLETED” is displayed, go to step 7.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take at least 35 seconds.)

Selector lever	Suitable position
Vehicle speed	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,800 rpm
B/FUEL SCHDL	1.0 - 10.0 msec
Engine coolant temperature	70 - 100°C (158 - 212°F)

If “TESTING” is not changed for a long time, retry from step 2.



7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1509, "Diagnostic Procedure" .

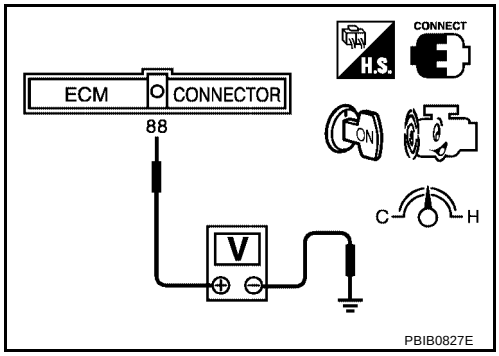
Overall Function Check

UBS002DW

Use this procedure to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine (TCS switch “OFF”) and warm it up to normal operating temperature.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Start engine and wait at least 70 seconds.
5. Set voltmeter probes to ECM terminals 88 (EVAP control system pressure sensor signal) and ground.
6. Check EVAP control system pressure sensor value at idle speed and note it.
7. Establish and maintain the following conditions for at least 1 minute.



Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than “P”, “N” or “R”

8. Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed (measured at step 6) for at least 1 second.
9. If NG, go to EC-1509, "Diagnostic Procedure" .

Diagnostic Procedure

UBS002DX

1. CHECK EVAP CANISTER

1. Turn ignition switch “OFF”.
2. Check EVAP canister for cracks.

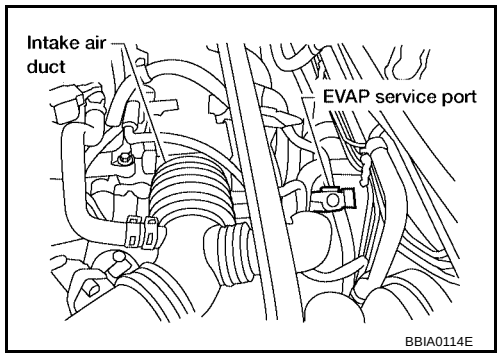
OK or NG

OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> Replace EVAP canister.

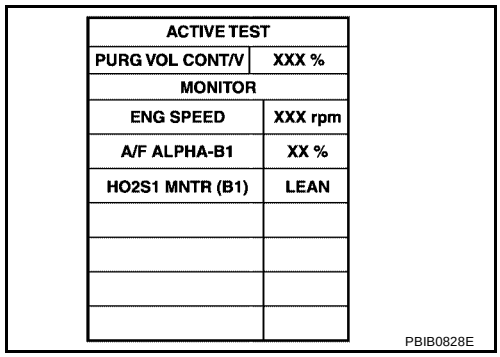
2. CHECK PURGE FLOW

With CONSULT-II

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
2. Start engine and let it idle.



3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II.
4. Rev engine up to 2,000 rpm.
5. Touch “Qd” and “Qu” on CONSULT-II screen to adjust “PURG VOL CONT/V” opening and check vacuum existence.



PURG VOL CONT/V	Vacuum
100.0%	Should exist.
0.0%	Should not exist.

OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

3. CHECK PURGE FLOW

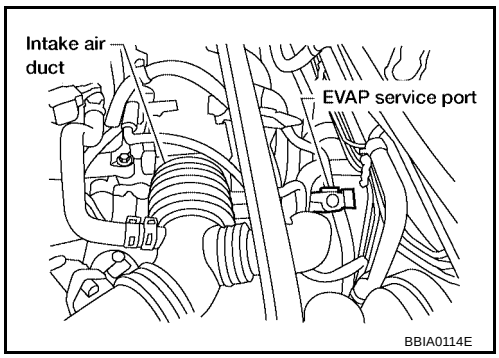
Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum gauge indication when revving engine up to 2,000 rpm.

   Vacuum should exist.

6. Release the accelerator pedal fully and let idle.

   Vacuum should not exist.



OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

4. CHECK EVAP PURGE LINE

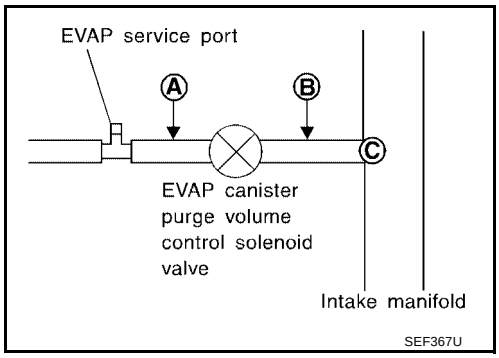
1. Turn ignition switch “OFF”.
2. Check EVAP purge line for improper connection or disconnection. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK (With CONSULT-II)>>GO TO 5.
OK (Without CONSULT-II)>>GO TO 6.
NG >> Repair it.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

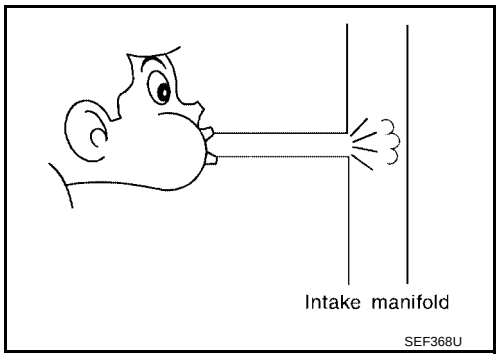
1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B** .
2. Blow air into each hose and EVAP purge port **C** .



3. Check that air flows freely.

OK or NG

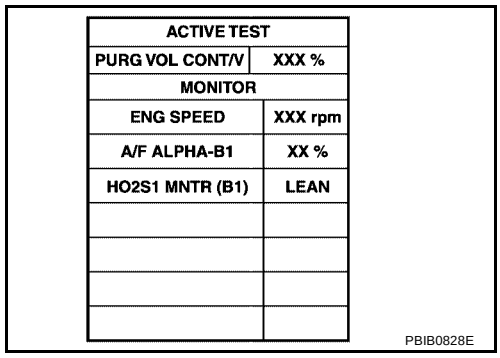
OK >> GO TO 6.
NG >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

1. Turn ignition switch “OFF”.
2. Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 9.
NG >> Repair it.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to “DTC Confirmation Procedure” for DTC P0452 (EC-1534) and P0453 (EC-1540).

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP control system pressure sensor.

11. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 12.
NG >> Clean the rubber tube using an air blower.

12. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace EVAP canister vent control valve.

13. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 14.
NG >> Replace it.

14. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 15.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

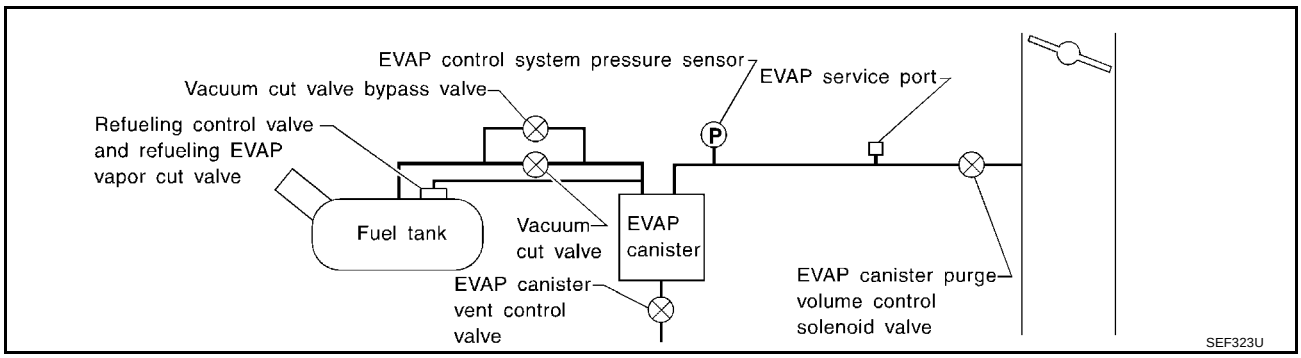
DTC P0442 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS002DY

NOTE:
If DTC P0442 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-1687 .)
This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.
The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve is opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0442 0442	EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Fuel level sensor and the circuit ● Refueling control valve ● ORVR system leaks

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS002DZ

NOTE:

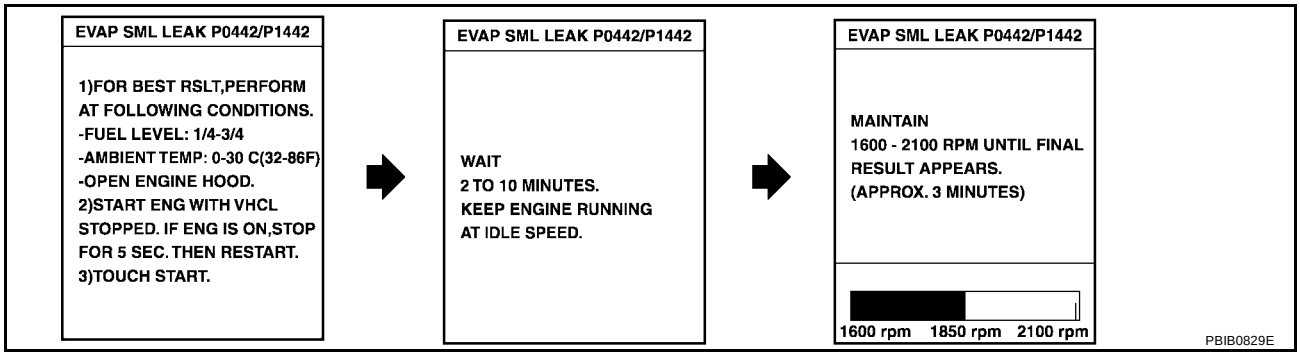
- **If DTC P0442 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-1687 .)**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Always perform test at a temperature of 0 to 30°C (32 to 86°F).**

WITH CONSULT-II

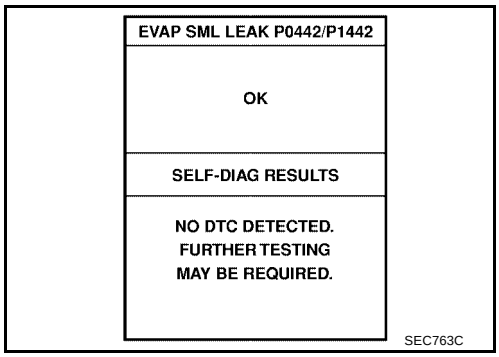
1. Turn ignition switch "ON".
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
4. Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 30°C (32 - 86°F)
5. Select "EVAP SML LEAK P0442/P1442" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
   Follow the instruction displayed.



NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-1291, "Basic Inspection" .

6. Make sure that "OK" is displayed.
   If "NG" is displayed, refer to EC-1515, "Diagnostic Procedure" .

NOTE:
Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.



WITH GST

NOTE:
Be sure to read the explanation of "Driving Pattern" on EC-1270 before driving vehicle.

1. Start engine.

2. Drive vehicle according to “Driving Pattern”, EC-1270 .
3. Stop vehicle.
4. Select “MODE 1” with GST.
   If SRT of EVAP system is not set yet, go to the following step.
   If SRT of EVAP system is set, the result will be OK.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine.
   It is not necessary to cool engine down before driving.
7. Drive vehicle again according to the “Driving Pattern”, EC-1270 .
8. Stop vehicle.
9. Select “MODE 3” with GST.
   If P0442 is displayed on the screen, go to EC-1515, "Diagnostic Procedure" .
   If P0441 is displayed on the screen, go to “Diagnostic Procedure” for DTC P0441, EC-1509 .
   If P0441 and P0442 are not displayed on the screen, go to the following step.
10. Select “MODE 1” with GST.
    If SRT of EVAP system is set, the result will be OK.
    If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

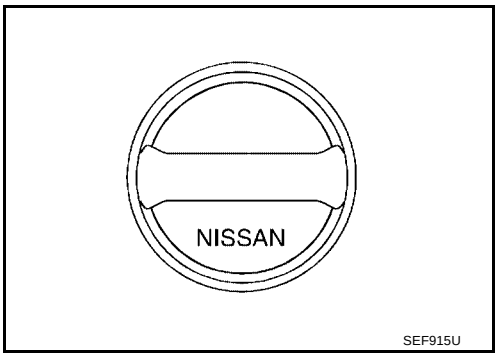
UBS002E0

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)" .

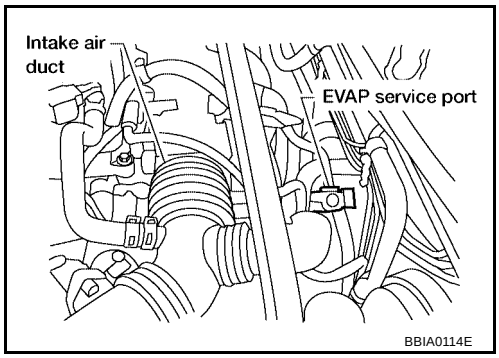
OK or NG

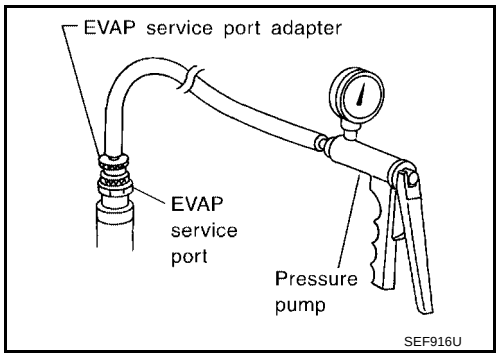
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





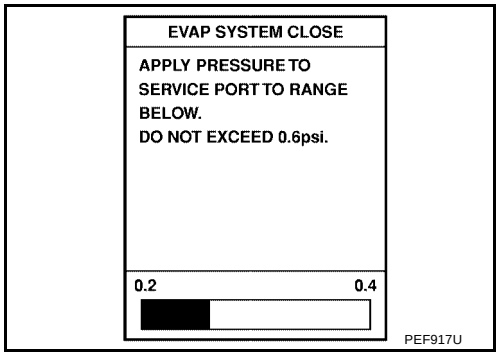
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

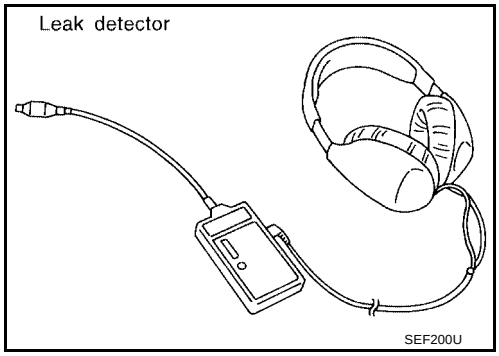
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

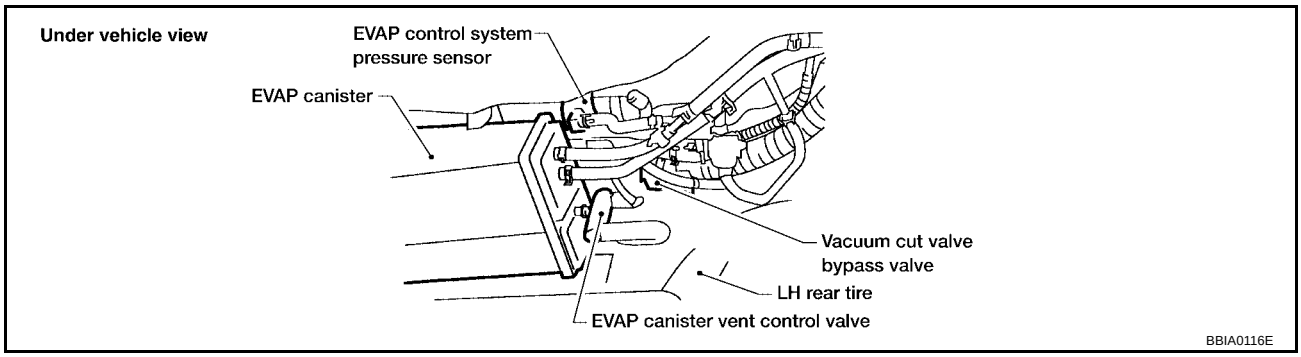
OK >> GO TO 8.
NG >> Repair or replace.



7. CHECK FOR EVAP LEAK

Without CONSULT-II

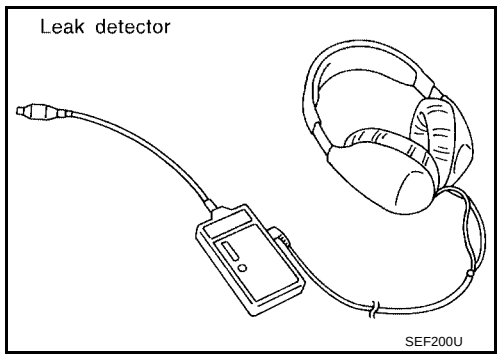
1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**

5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-1687, "DTC Confirmation Procedure" .

OK or NG

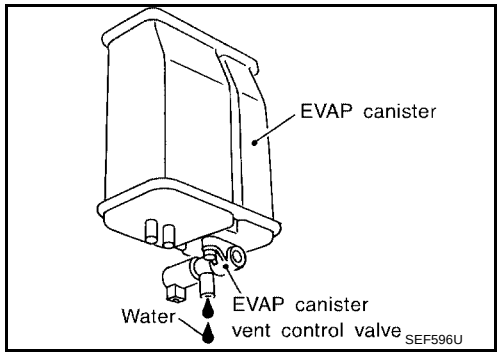
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

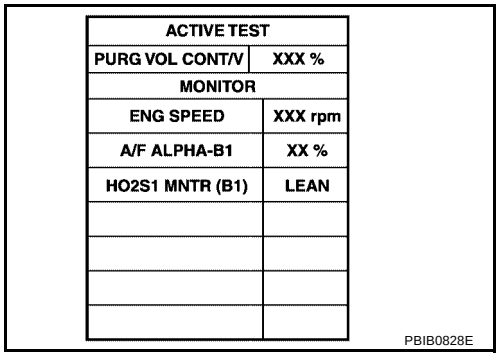
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK REFUELING EVAP VAPOR LINE

Check refueling EVAP vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1852, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses, tubes or filler neck tube.

22. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling control valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

UBS002E2

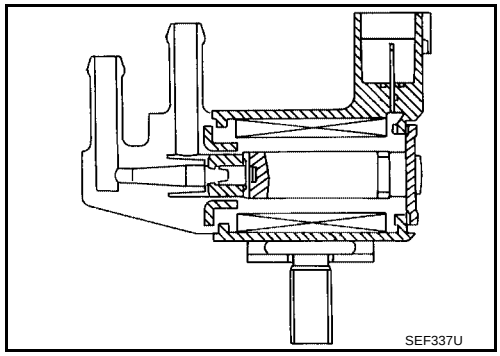
SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed sensor	Vehicle speed		

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

UBS002E3

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

On Board Diagnosis Logic

UBS002E4

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	● Harness or connectors (The sensor circuit is shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

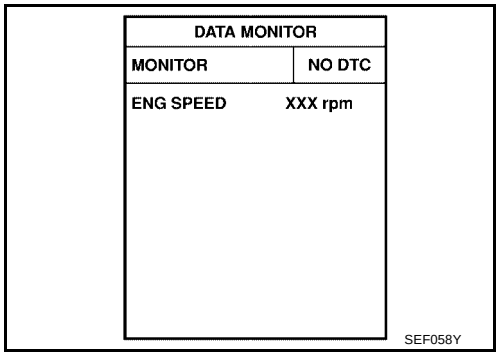
UBS002E5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 13 seconds.
4. If 1st trip DTC is detected, go to EC-1524, "Diagnostic Procedure" .



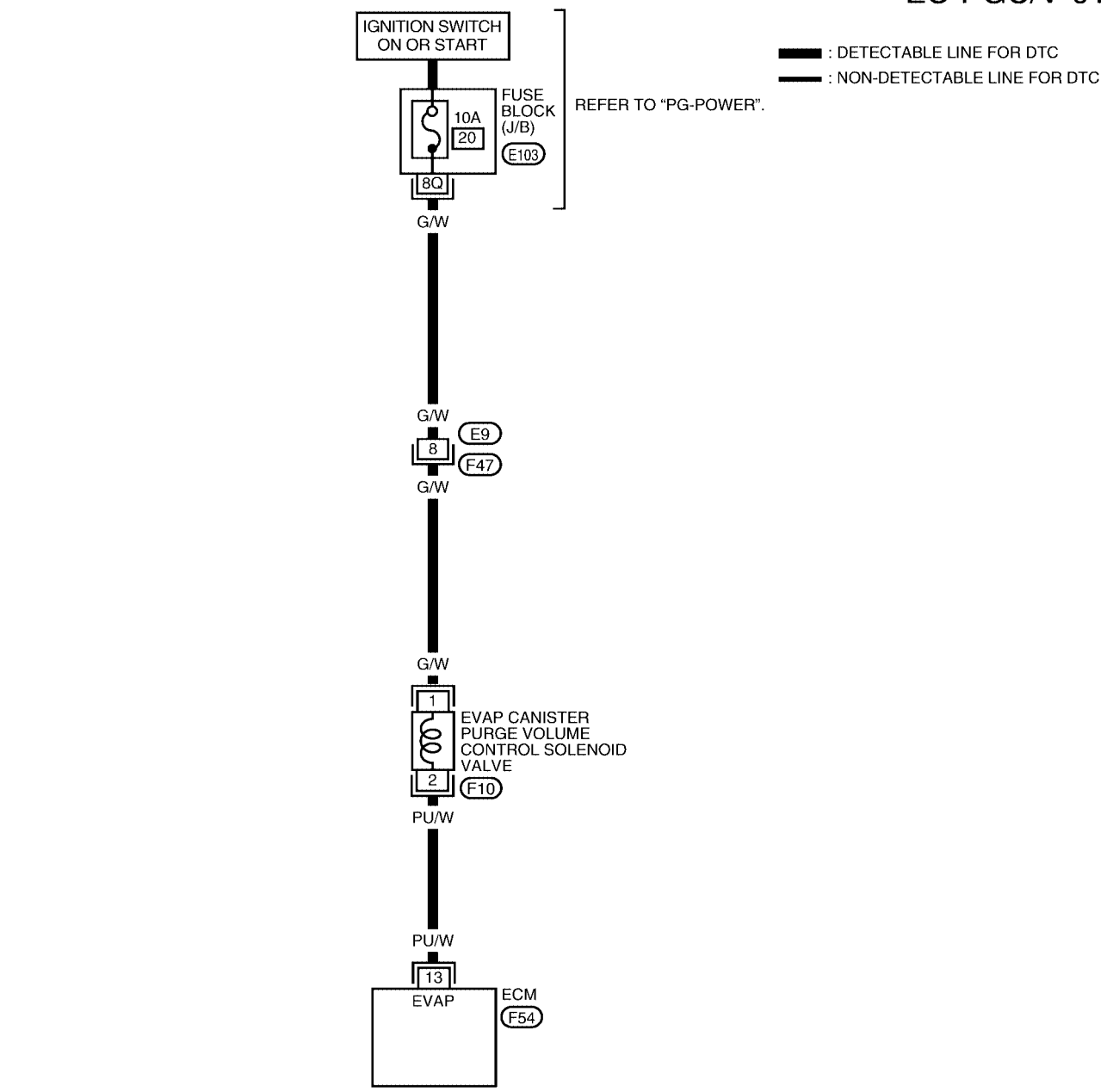
WITH GST

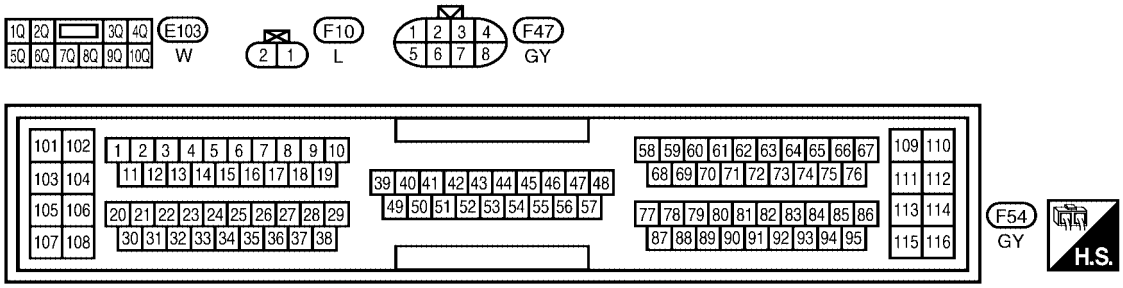
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002E6

EC-PGC/V-01



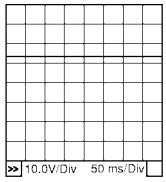
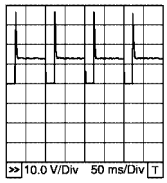


BBWA0224E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	PU/W	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

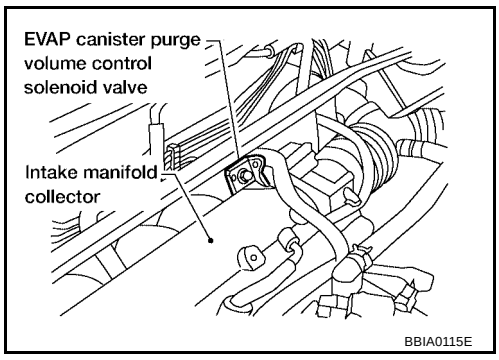
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002E7

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



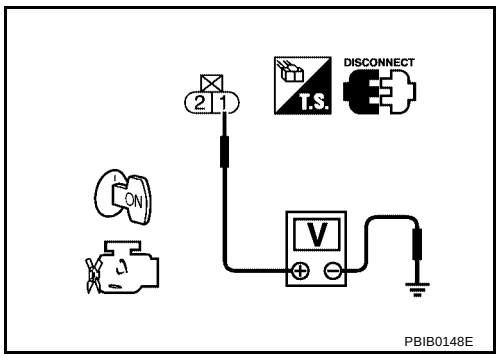
BBIA0115E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and engine ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



PBIB0148E

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse block (J/B) connector E103
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 13 and EVAP canister purge volume control solenoid valve terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

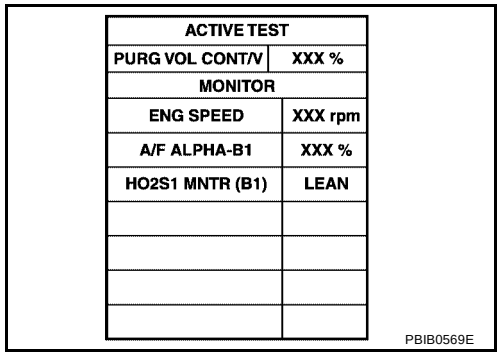
OK or NG

OK (With CONSULT-II)>>GO TO 4.
OK (Without CONSULT-II)>>GO TO 5.
NG >> Repair open circuit or short to ground and short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

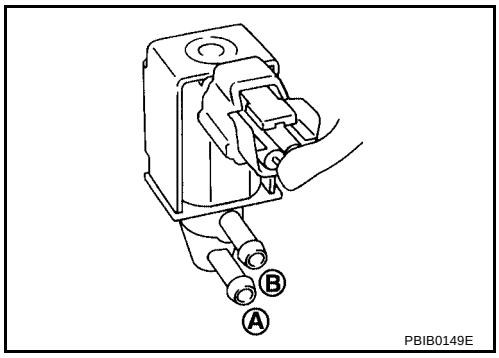
UBS002E8

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

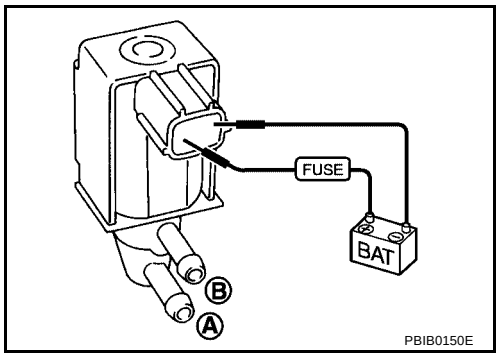
Condition (PURG VOL CONT/V value)	Air passage continuity between **A** and **B**
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	Yes
No supply	No



Removal and Installation

UBS002E9

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-105, "INTAKE MANIFOLD" .

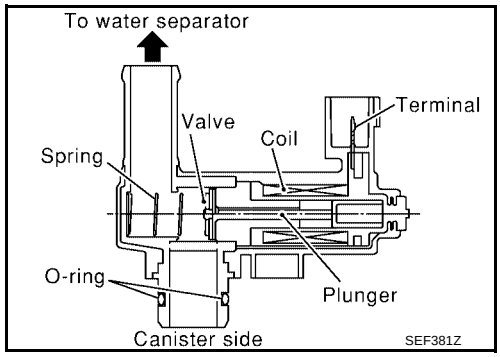
DTC P0447 EVAP CANISTER VENT CONTROL VALVE

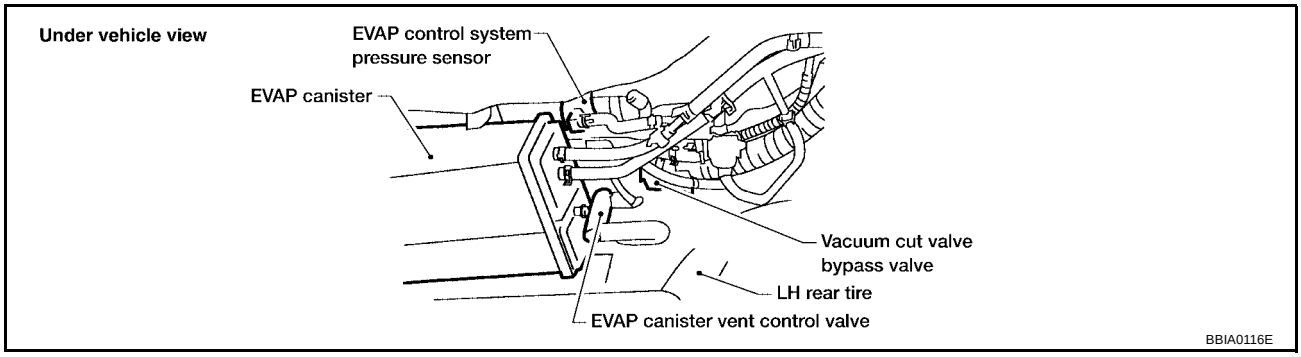
PFP:14935

Component Description

UBS002EA

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002EB

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002EC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447 0447	EVAP canister vent control valve circuit open	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister vent control valve

DTC Confirmation Procedure

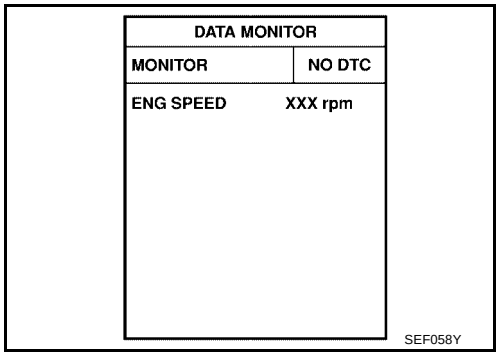
UBS002ED

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch "ON".

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 8 seconds.
4. If 1st trip DTC is detected, go to EC-1530, "Diagnostic Procedure" .



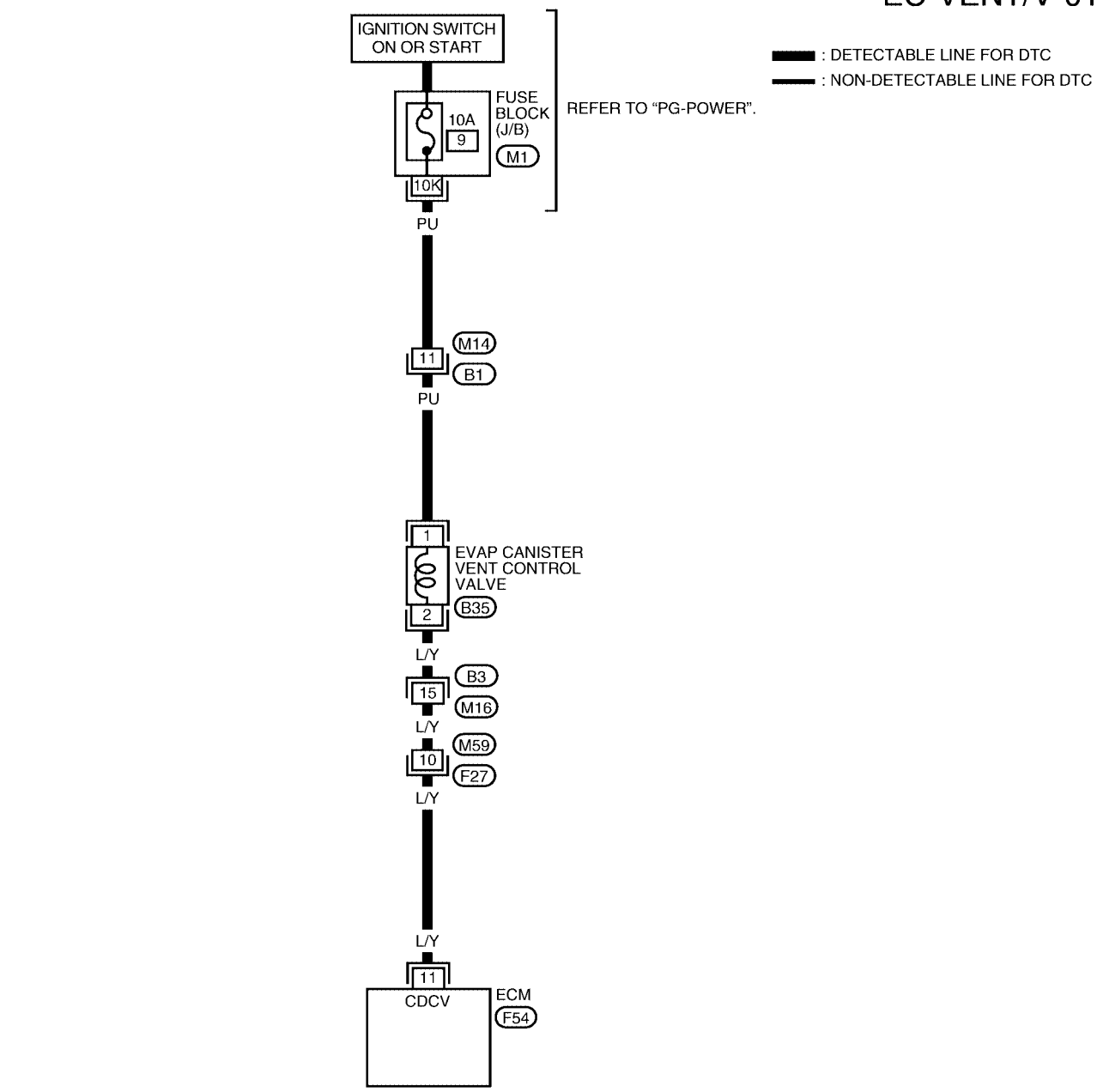
WITH GST

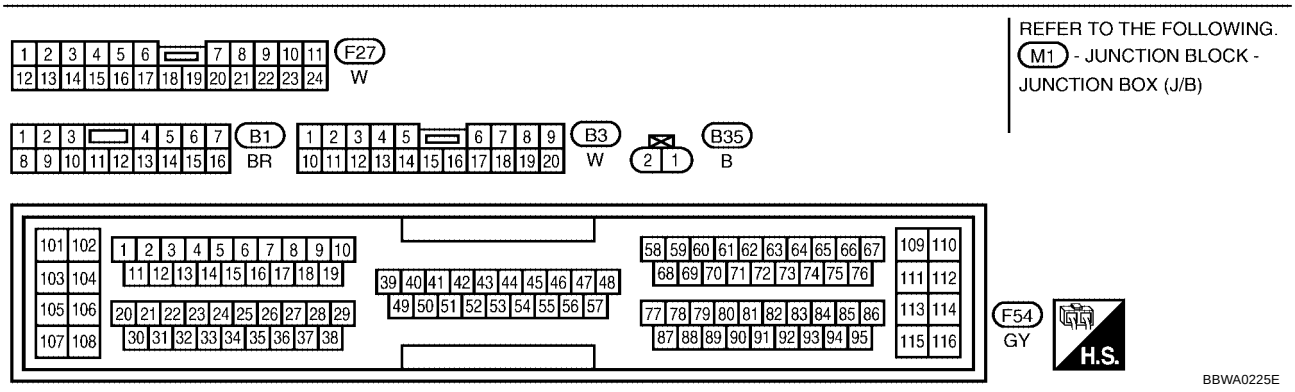
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002EE

EC-VENT/V-01





Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002EF

1. INSPECTION START

Do you have CONSULT-II?

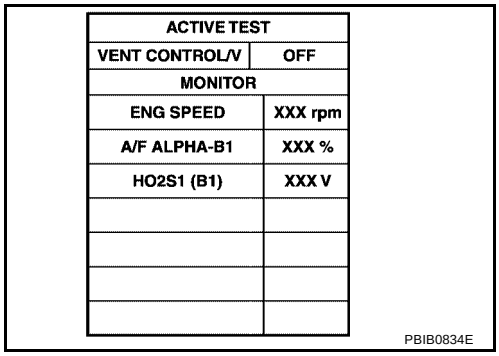
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch "OFF" and then turn "ON".
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON/OFF" on CONSULT-II screen.
4. Check for operating sound of the valve.
   Clicking noise should be heard.

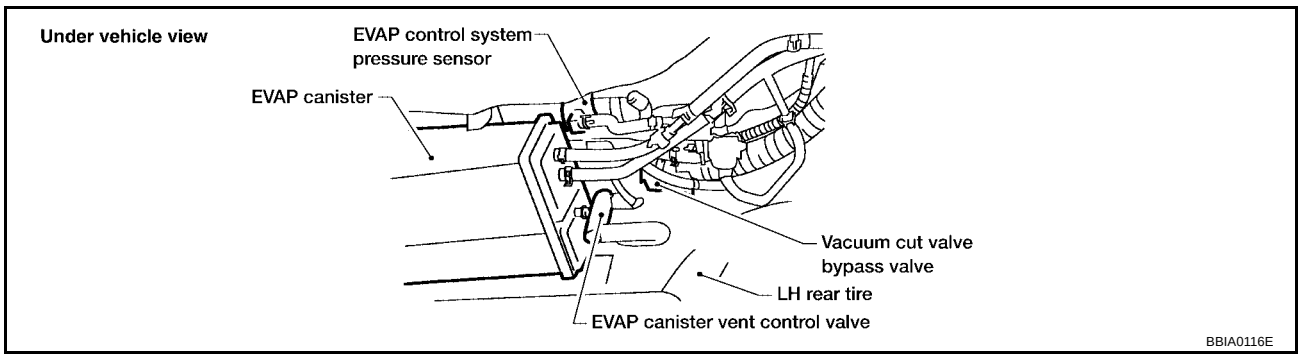


OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

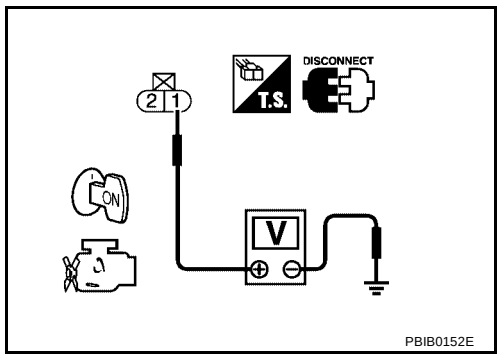
3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister vent control valve harness connector.



3. Turn ignition switch “ON”.
4. Check voltage between EVAP canister vent control valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M14, B1
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between EVAP canister vent control valve and fuse

>> Repair harness or connectors.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 11 and EVAP canister vent control valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M59, F27
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 8.
NG >> Clean the rubber tube using an air blower.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister vent control valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

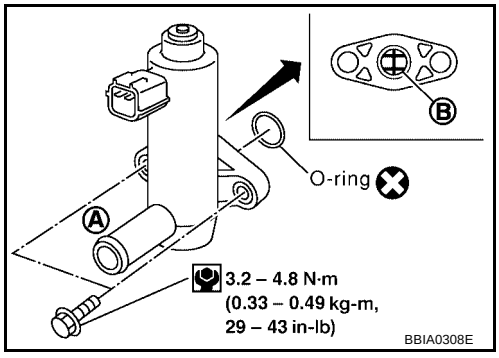
Component Inspection

UBS002EG

EVAP CANISTER VENT CONTROL VALVE

With CONSULT-II

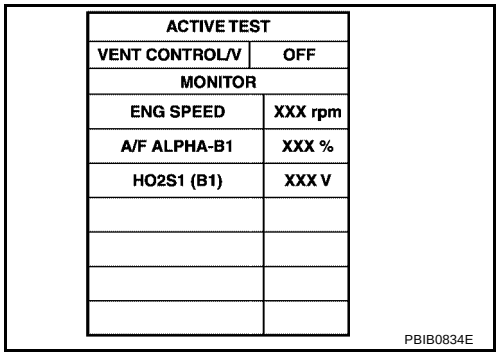
1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.

Condition	Air passage continuity between **A** and **B**
ON	No
OFF	Yes

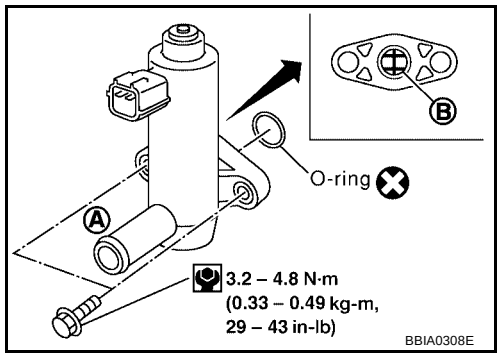
Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.



7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform inspection again.

Without CONSULT-II

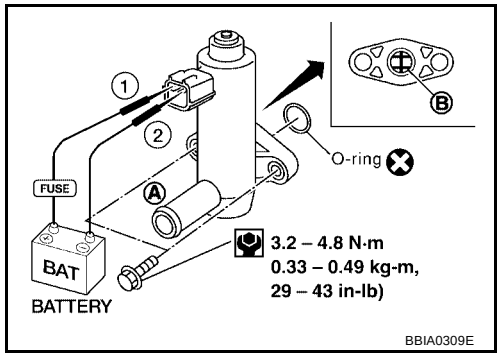
1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	No
OFF	Yes

Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.



4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform inspection again.

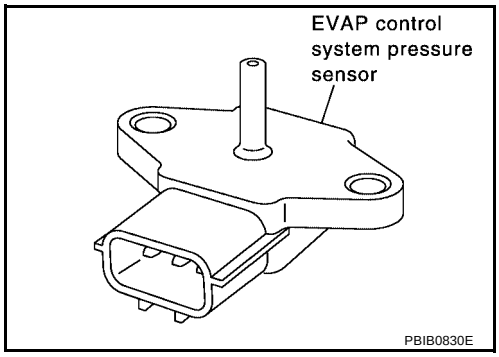
DTC P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

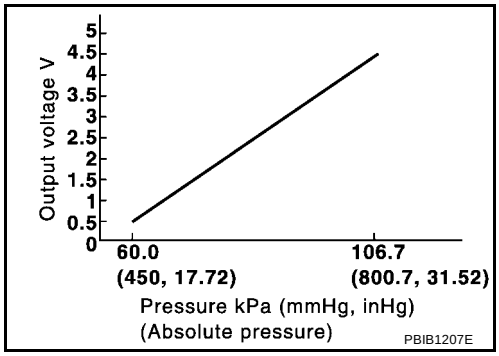
PFP:25085

Component Description

UBS002EH

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002EI

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	1.8 - 4.8V

On Board Diagnosis Logic

UBS002EJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452 0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP control system pressure sensor

DTC Confirmation Procedure

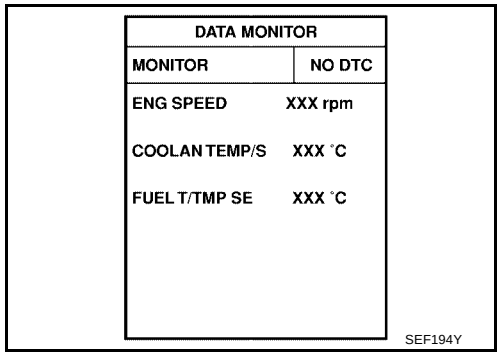
UBS002EK

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

WITH CONSULT-II

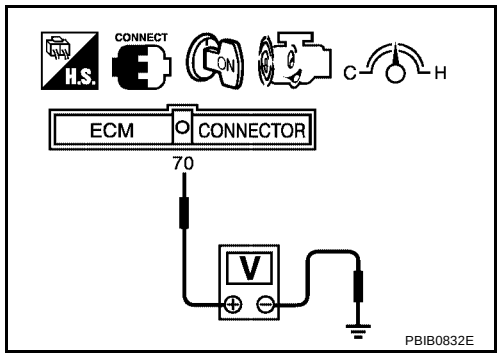
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.

4. Select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
   If 1st trip DTC is detected, go to EC-1537, "Diagnostic Procedure" .



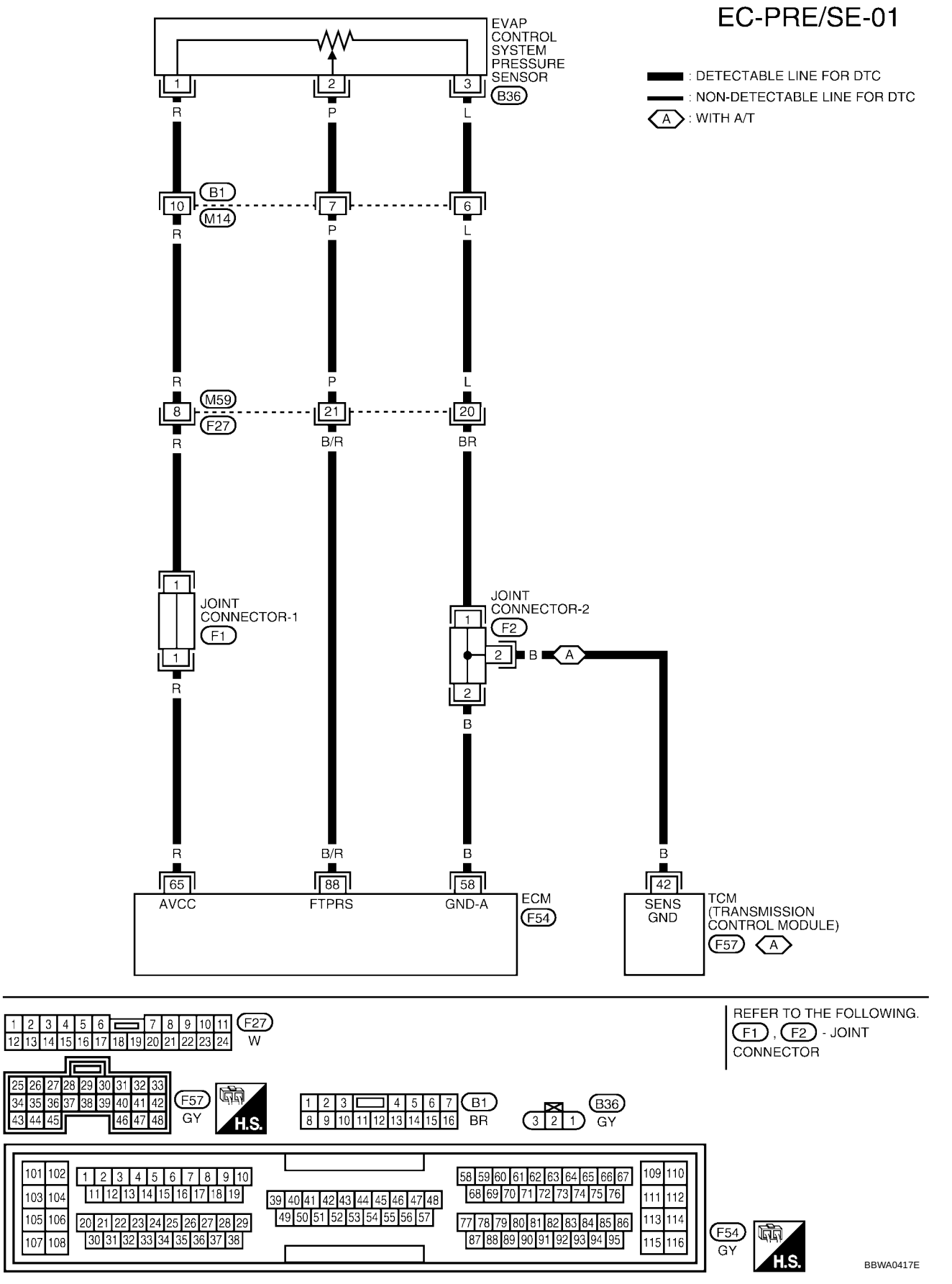
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 70 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and wait at least 20 seconds.
5. Select “MODE 7” with GST.
   If 1st trip DTC is detected, go to EC-1537, "Diagnostic Procedure" .



Wiring Diagram

UBS002EL



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
88	B/R	EVAP control system pressure sensor	**[Ignition switch "ON"]**	1.8 - 4.8V

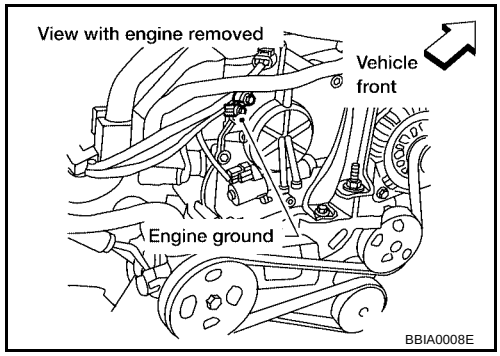
Diagnostic Procedure

UBS002EM

1. RETIGHTEN GROUND SCREWS

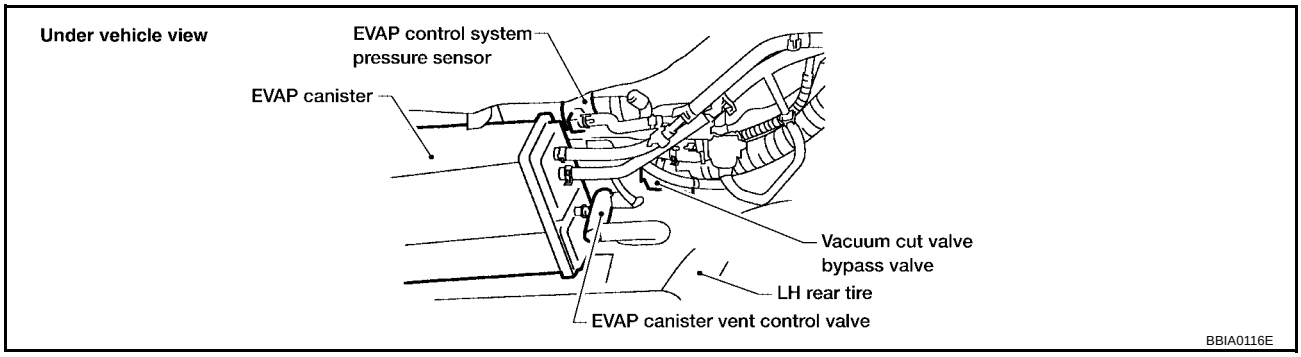
Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check sensor harness connector for water.

Water should not exist.

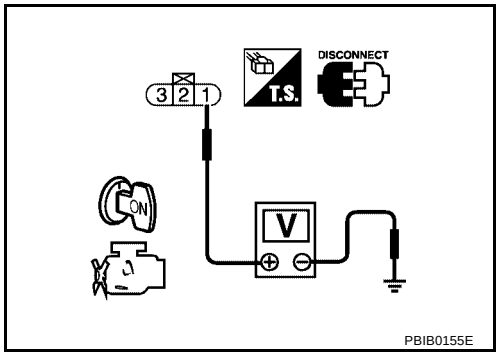
OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “ON”.
2. Check voltage between EVAP control system pressure sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EVAP control system pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-2
- Harness for open or short between EVAP control system pressure sensor and ECM
- Harness for open or short between EVAP control system pressure sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 88 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between ECM and EVAP control system pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

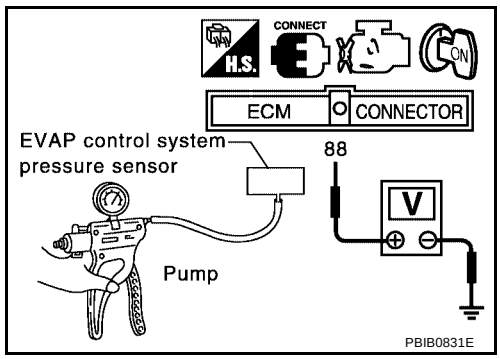
Component Inspection

UBS002EN

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch “ON” and check output voltage between ECM terminal 88 and ground under the following conditions.

Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200, -7.87)	2.1 to 2.5V lower than above value



CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or over pressure 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

5. If NG, replace EVAP control system pressure sensor.

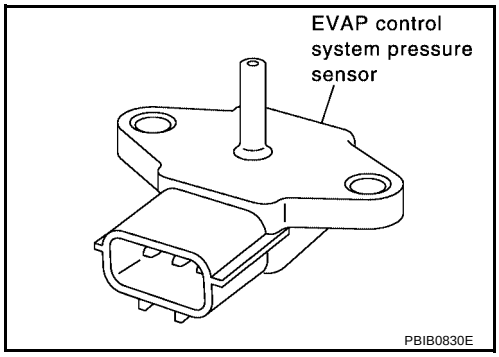
DTC P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

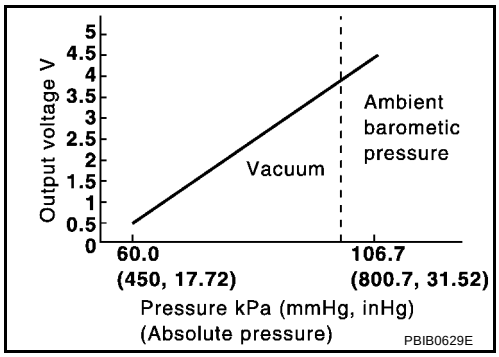
PFP:25085

Component Description

UBS002EO

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002EP

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	1.8 - 4.8V

On Board Diagnosis Logic

UBS002EQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453 0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● EVAP control system pressure sensor ● EVAP canister vent control valve ● EVAP canister ● Rubber hose from EVAP canister vent control valve to vehicle frame

DTC Confirmation Procedure

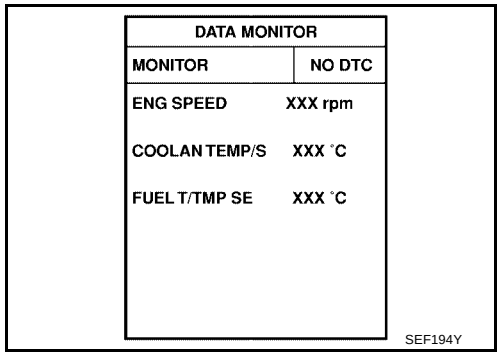
UBS002ER

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

WITH CONSULT-II

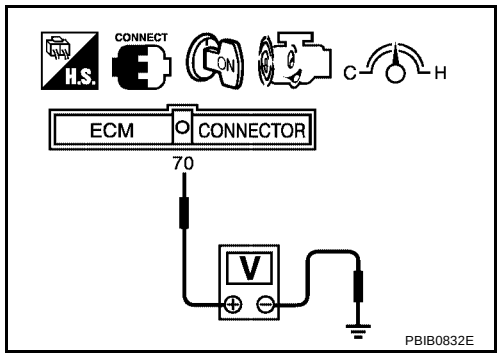
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.

4. Select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6. Wait at least 10 seconds.
7. If 1st trip DTC is detected, go to EC-1543, "Diagnostic Procedure" .



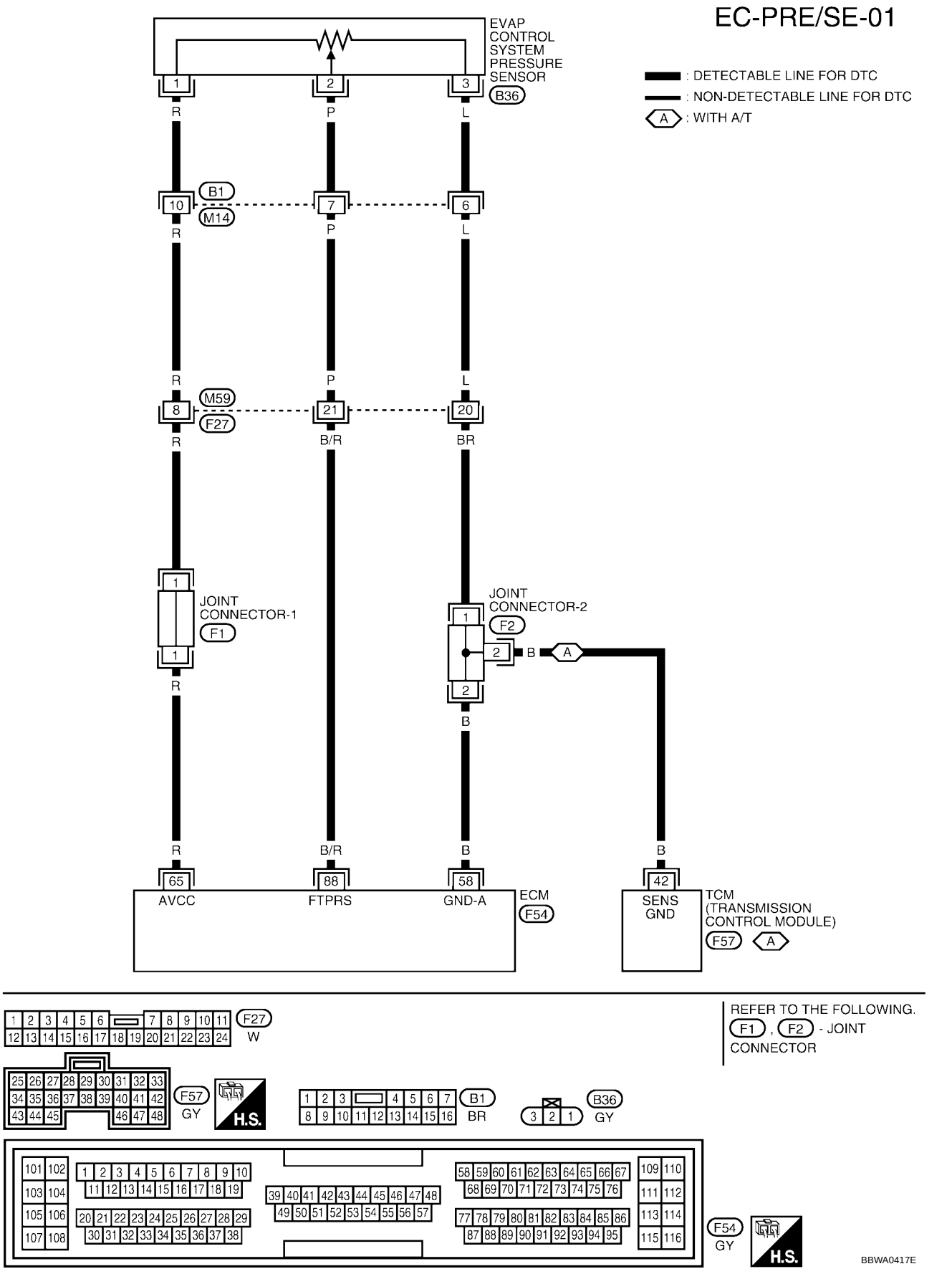
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Wait at least 10 seconds.
5. Select “MODE 7” with GST.
6. If 1st trip DTC is detected, go to EC-1543, "Diagnostic Procedure" .



Wiring Diagram

UBS002ES



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
88	B/R	EVAP control system pressure sensor	**[Ignition switch "ON"]**	1.8 - 4.8V

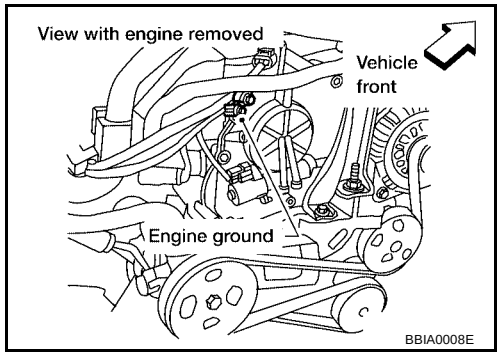
Diagnostic Procedure

UBS002ET

1. RETIGHTEN GROUND SCREWS

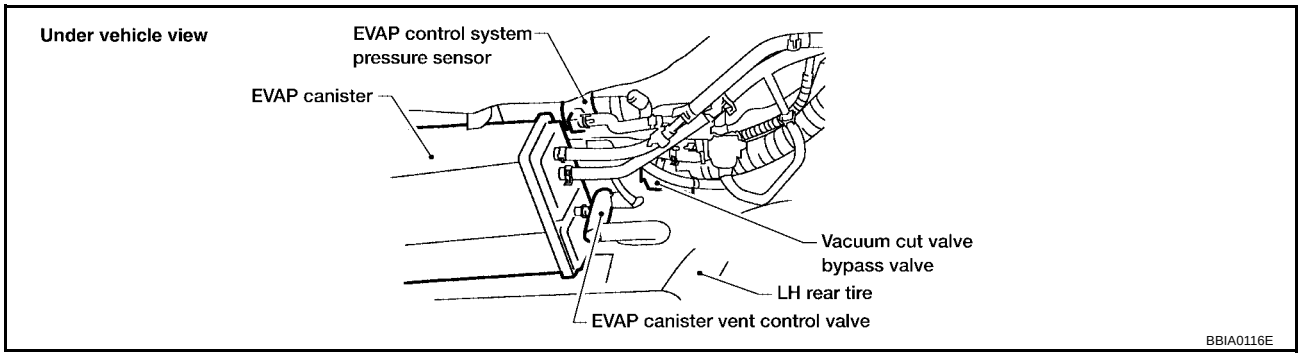
Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check sensor harness connector for water.

Water should not exist.

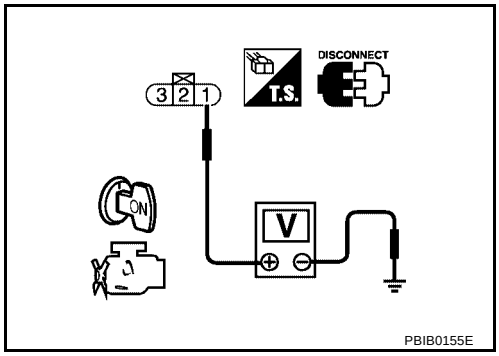
OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “ON”.
2. Check voltage between EVAP control system pressure sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EVAP control system pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Joint connector-2
- Harness for open or short between EVAP control system pressure sensor and ECM
- Harness for open or short between EVAP control system pressure sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 88 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between ECM and EVAP control system pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 10.
NG >> Clean the rubber tube using an air blower.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP canister vent control valve.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1546, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP control system pressure sensor.

12. CHECK RUBBER TUBE

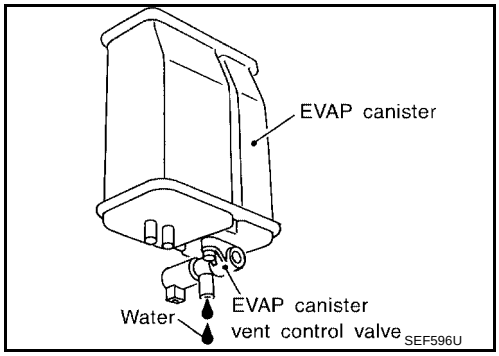
Check obstructed rubber tube connected to EVAP canister vent control valve.

OK or NG

OK >> GO TO 13.
NG >> Clean rubber tube using an air blower, repair or replace rubber tube.

13. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



Yes or No

Yes >> GO TO 14.
No >> GO TO 16.

14. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

16. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

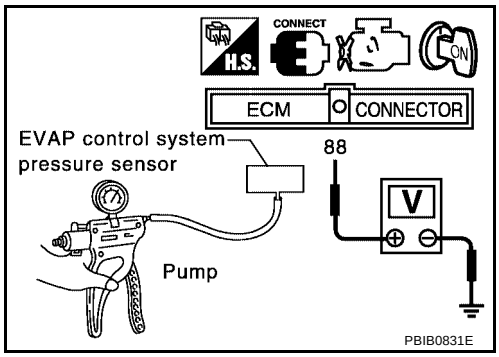
>> **INSPECTION END**

Component Inspection

UBS002EU

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch “ON” and check output voltage between ECM terminal 88 and ground under the following conditions.



Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
-26.7 (-200 mmHg, -7.87)	2.1 to 2.5V lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

5. If NG, replace EVAP control system pressure sensor.

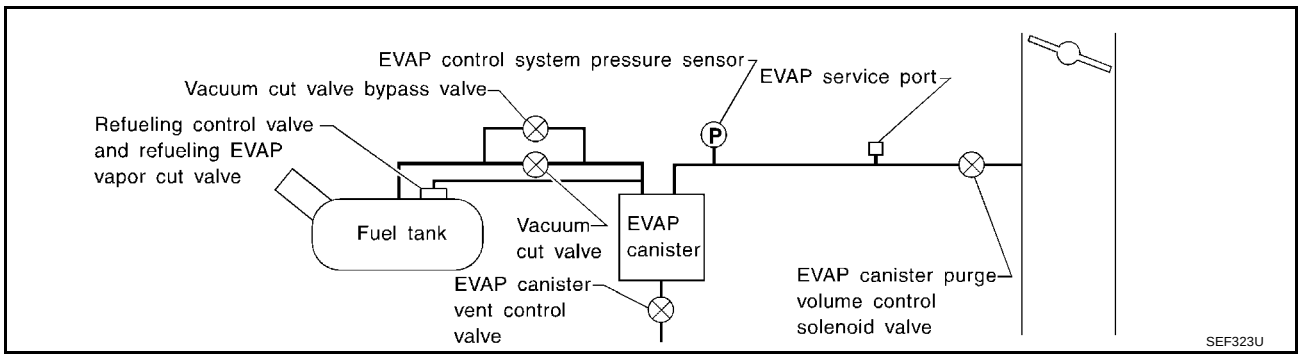
DTC P0455 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS002EV

NOTE:
If DTC P0455 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (EC-1687 .)
This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0455 0455	EVAP control system gross leak detected	EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.	● Fuel filler cap remains open or fails to close. ● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent. ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged. ● EVAP control system pressure sensor ● Refueling control valve ● ORVR system leaks

CAUTION:
- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS002EW

CAUTION:
Never remove fuel filler cap during the DTC Confirmation Procedure.

NOTE:

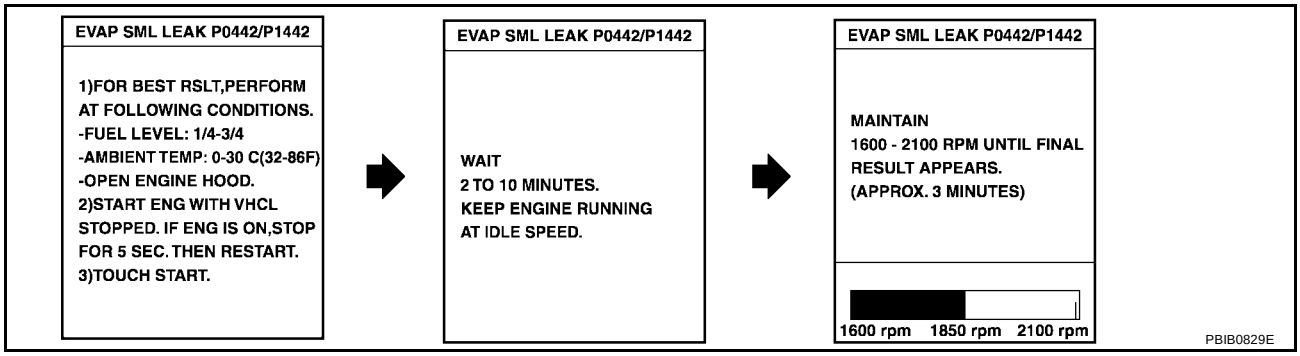
- **If DTC P0455 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (EC-1687 .)**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedures.**

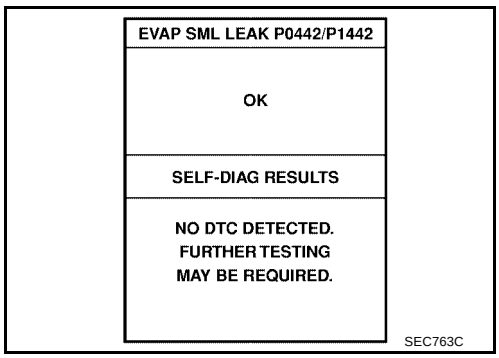
WITH CONSULT-II

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch “ON”.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
5. Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.



NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-1291, "Basic Inspection" .

7. Make sure that “OK” is displayed.
   If “NG” is displayed, select “SELF-DIAG RESULTS” mode and make sure that “EVAP GROSS LEAK [P0455]” is displayed. If it is displayed, refer to EC-1549, "Diagnostic Procedure" .
   If P0442 is displayed, perform “Diagnostic Procedure” for DTC P0442, EC-1515 .



WITH GST

NOTE:
Be sure to read the explanation of “Driving Pattern” on EC-1270 before driving vehicle.

1. Start engine.
2. Drive vehicle according to “Driving Pattern”, EC-1270 .
3. Stop vehicle.
4. Select “MODE 1” with GST.
   - If SRT of EVAP system is not set yet, go to the following step.

- If SRT of EVAP system is set, the result will be OK.

5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine.
   It is not necessary to cool engine down before driving.
7. Drive vehicle again according to the “Driving Pattern”, EC-1270 .
8. Stop vehicle.
9. Select “MODE 3” with GST.
   - If P0455 is displayed on the screen, go to EC-1549, "Diagnostic Procedure" .
   - If P0442 is displayed on the screen, go to “Diagnostic Procedure”, for DTC P0442, EC-1515 .
   - If P0441 is displayed on the screen, go to “Diagnostic Procedure” for DTC P0441, EC-1509 .
   - If P0455, P0441and P0442 are not displayed on the screen, go to the following step.
10. Select “MODE 1” with GST.
    - If SRT of EVAP system is set, the result will be OK.
    - If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

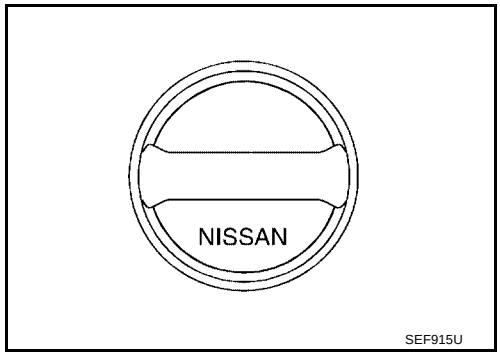
UBS002EX

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 6.
NG >> Repair or reconnect the hose.

6. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-1687, "DTC Confirmation Procedure" .

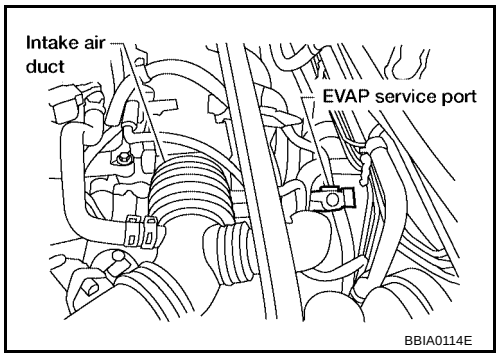
OK or NG

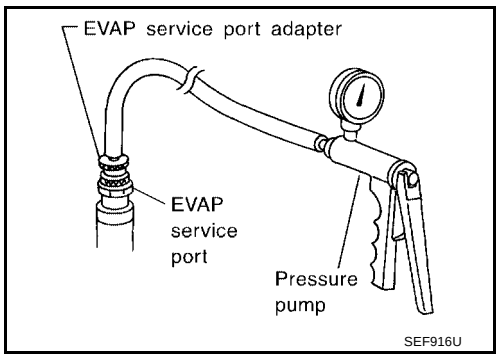
OK >> GO TO 8.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

8. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





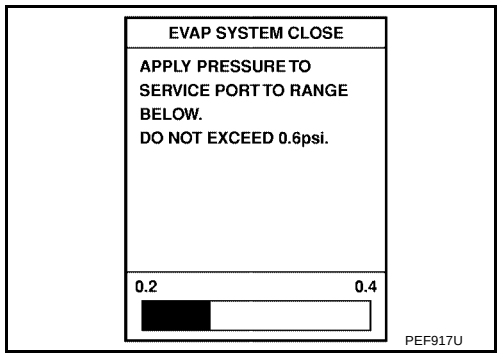
Models with CONSULT-II>>GO TO 9.
Models without CONSULT-II>>GO TO 10.

9. CHECK FOR EVAP LEAK

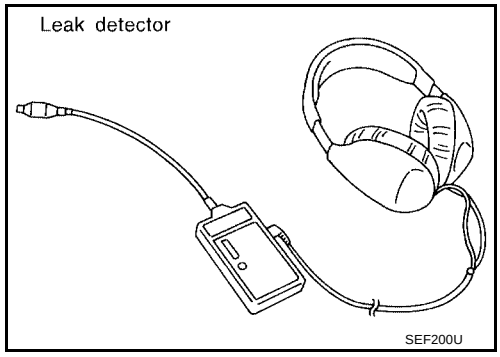
With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



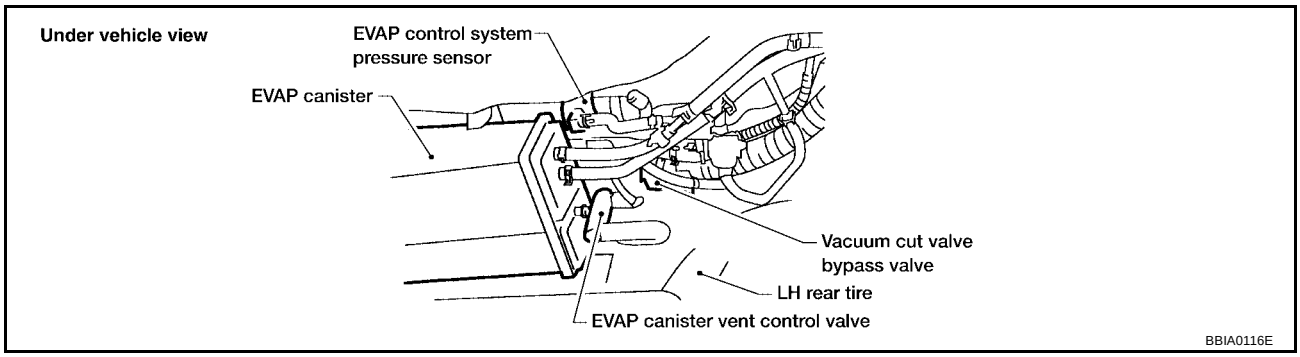
OK or NG

OK >> GO TO 11.
NG >> Repair or replace.

10. CHECK FOR EVAP LEAK

Without CONSULT-II

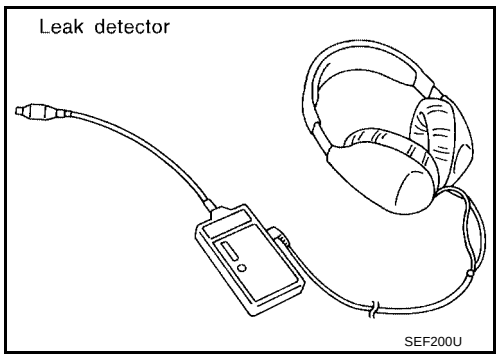
1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**

5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



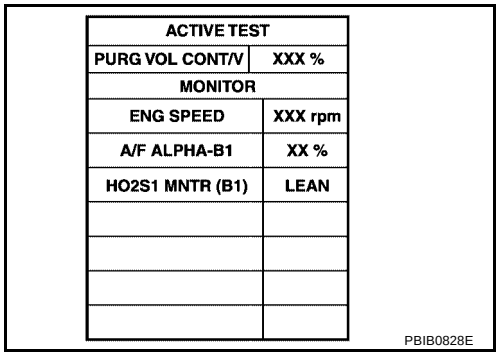
OK or NG

OK >> GO TO 12.
NG >> Repair or replace.

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

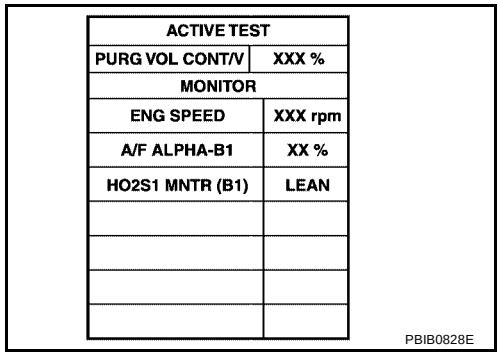
OK or NG

OK (With CONSULT-II)>>GO TO 14.
OK (Without CONSULT-II)>>GO TO 15.
NG >> Repair or reconnect the hose.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK REFUELING EVAP VAPOR LINE

Check refueling EVAP vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1852, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 19.
NG >> Repair or replace hoses and tubes.

19. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 20.
NG >> Repair or replace hoses, tubes or filler neck tube.

20. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 21.
NG >> Replace refueling control valve with fuel tank.

21. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

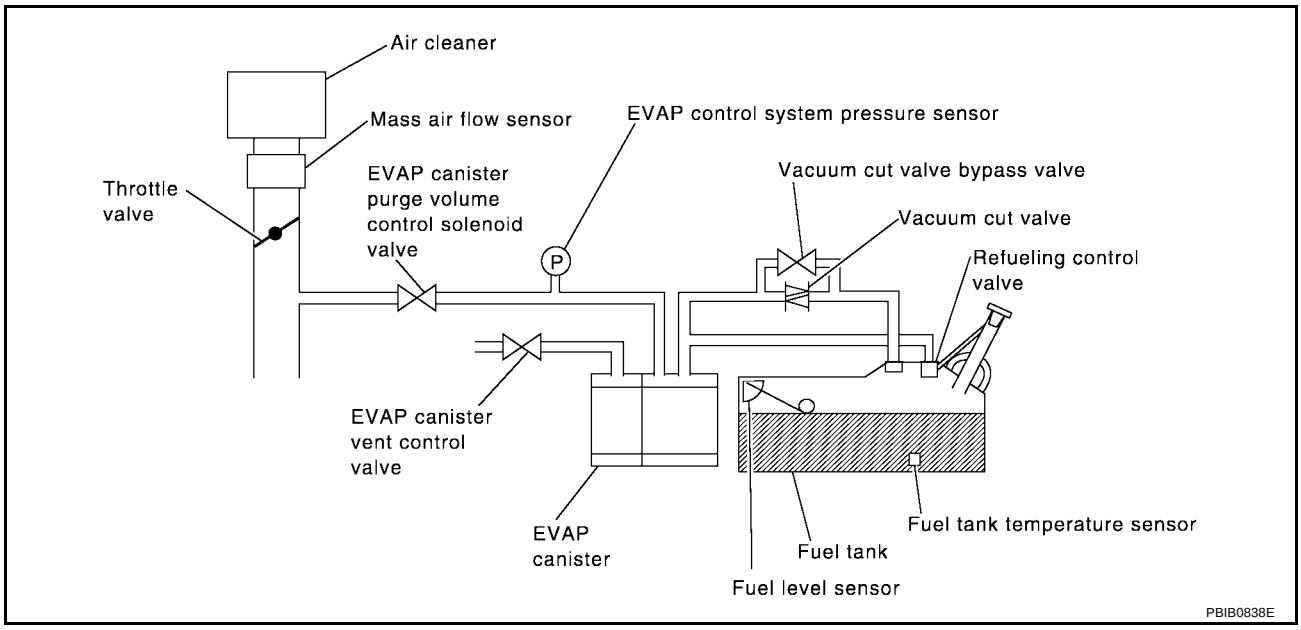
DTC P0456 EVAP CONTROL SYSTEM

PFP:14950

On Board Diagnosis Logic

UBS002EY

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.
The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve is opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.
If ECM judges a leak which corresponds to a very small leak, the very small leak P0456 will be detected.
If ECM judges a leak equivalent to a small leak, EVAP small leak P0442 will be detected.
If ECM judges there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456 0456	Evaporative emission control system very small leak (negative pressure check)	● EVAP system has a very small leak. ● EVAP system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Refueling control valve ● ORVR system leaks ● Fuel level sensor and the circuit ● Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS002EZ

NOTE:

- **If DTC P0456 is displayed with P0442, first perform TROUBLE DIAGNOSIS FOR DTC P0456.**
- **After repair, make sure that the hoses and clips are installed properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

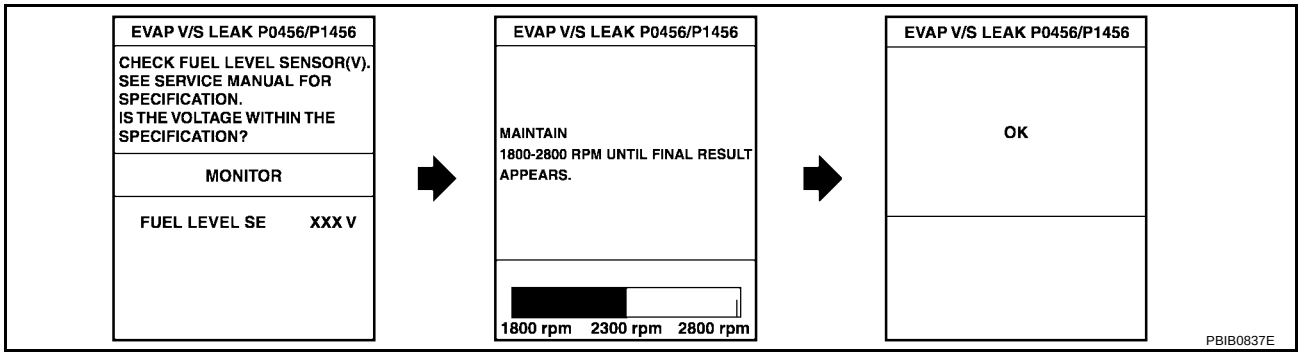
- **Open engine hood before conducting following procedure.**
- **If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**
  - **Fuel filler cap is removed.**
  - **Refilled or drained the fuel.**
  - **EVAP component parts is/are removed.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Make sure the following conditions are met.
   FUEL LEVEL SE: 0.25 - 1.15V

COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
INT A/TEMP SE: More than 0°C (32°F)
If NG, turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle) or refilling/draining fuel until the output voltage condition of the “FUEL LEVEL SE” meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1).

3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Select “EVAP V/S LEAK P0456/P1456” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
Follow the instruction displayed.



6. Make sure that “OK” is displayed.
If “NG” is displayed, refer to EC-1558, "Diagnostic Procedure" .

NOTE:
- **If the engine speed cannot be maintained within the range displayed on CONSULT-II screen, go to EC-1291, "Basic Inspection" .**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

Overall Function Check

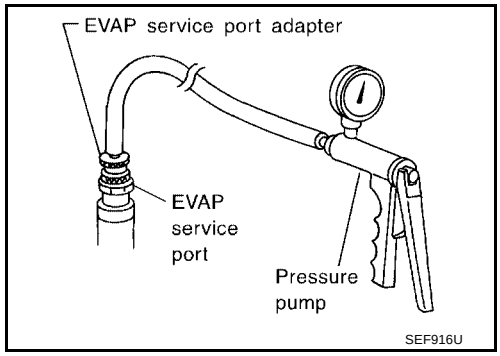
UBS002F0

WITH GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a DTC might not be confirmed.

CAUTION:
- **Never use compressed air, doing so may damage the EVAP system.**
- **Do not start engine.**
- **Do not exceeded 4.12 kPa (0.042 kg/cm^2 , 0.6 psi).**

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch “ON”.
5. Connect GST and select MODE 8.
6. Using MODE 8 control the EVAP canister vent control valve (close) and vacuum cut valve bypass valve (open).
7. Apply pressure and make sure the following conditions are satisfied.
Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg)
Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (3 mmHg, 0.12 inHg).
If NG, go to EC-1558, "Diagnostic Procedure" .
If OK, go to next step.
8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.



10. Turn ignition switch “OFF” and wait at least 10 seconds.
11. Restart engine and let it idle for 90 seconds.
12. Keep engine speed at 2,000 rpm for 30 seconds.
13. Turn ignition switch “OFF”.

NOTE:
For more information, refer to GST instruction manual.

Diagnostic Procedure

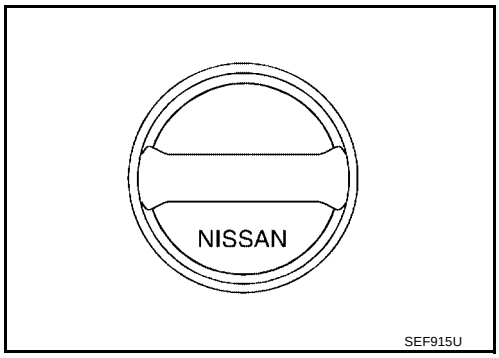
UBS002F1

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "Component Inspection" .

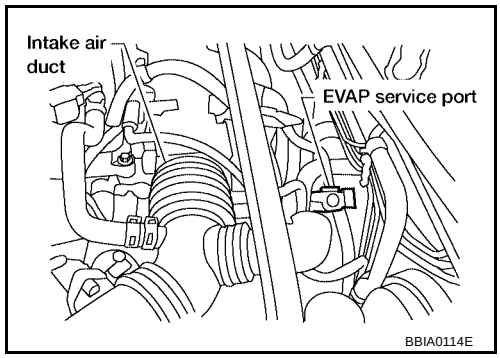
OK or NG

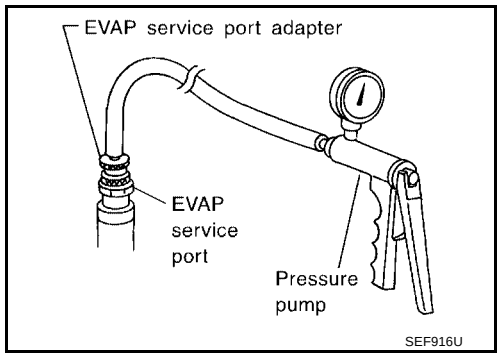
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





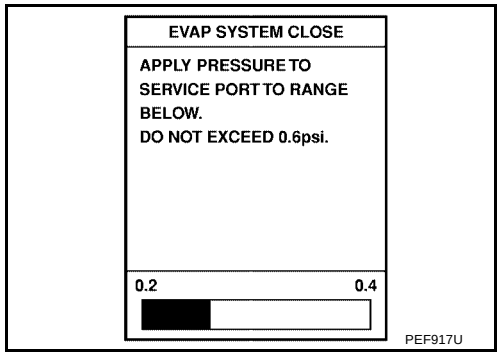
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

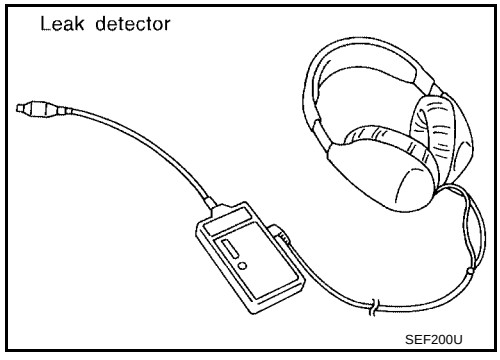
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

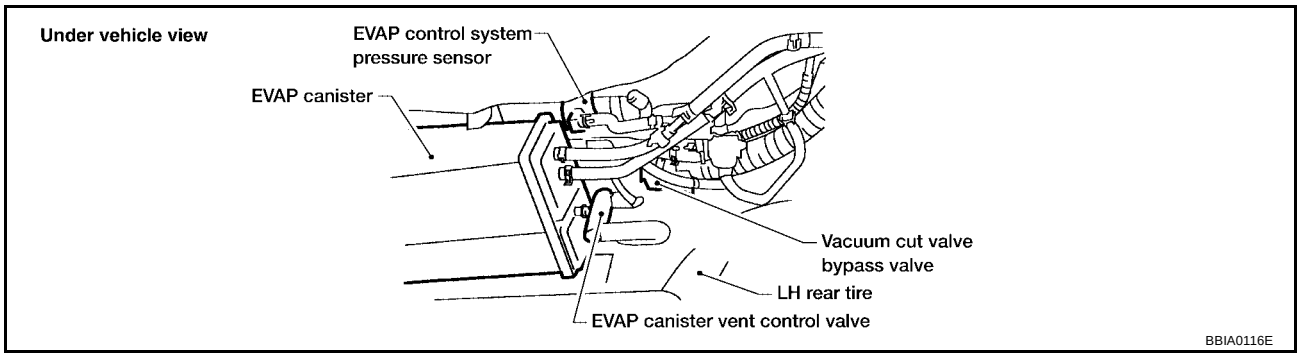
OK >> GO TO 8.
NG >> Repair or replace.



7. CHECK FOR EVAP LEAK

Without CONSULT-II

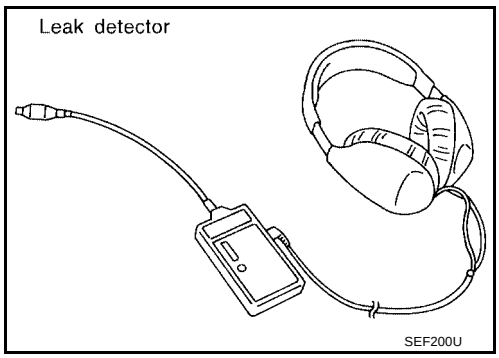
1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**

5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to EC-1693, "Component Inspection" .

OK or NG

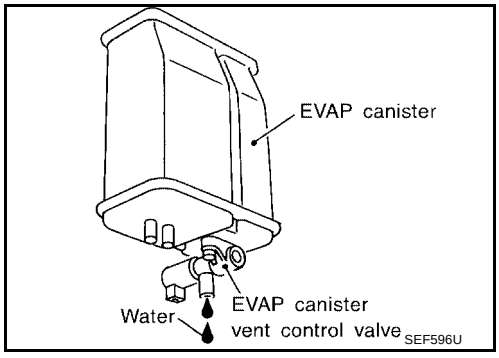
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 10.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

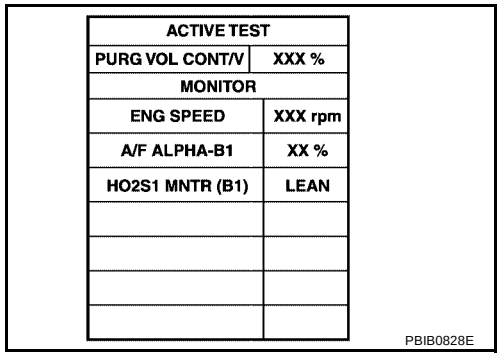
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "FUEL TANK TEMPERATURE SENSOR" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK REFUELING EVAP VAPOR LINE

Check refueling EVAP vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1852, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses, tubes or filler neck tube.

22. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling control valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

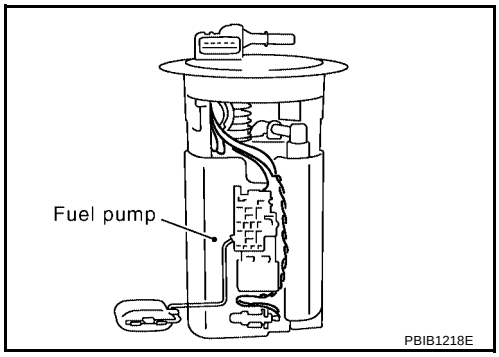
DTC P0460 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS002F3

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS002F4

When the vehicle is parked, naturally the fuel level in the fuel tank is stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0460 0460	Fuel level sensor circuit noise	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor

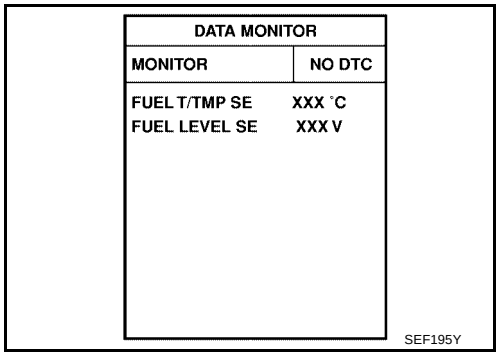
DTC Confirmation Procedure

UBS002F5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait maximum of 2 consecutive minutes.
4. If 1st trip DTC is detected, go to EC-1566, "Diagnostic Procedure" .

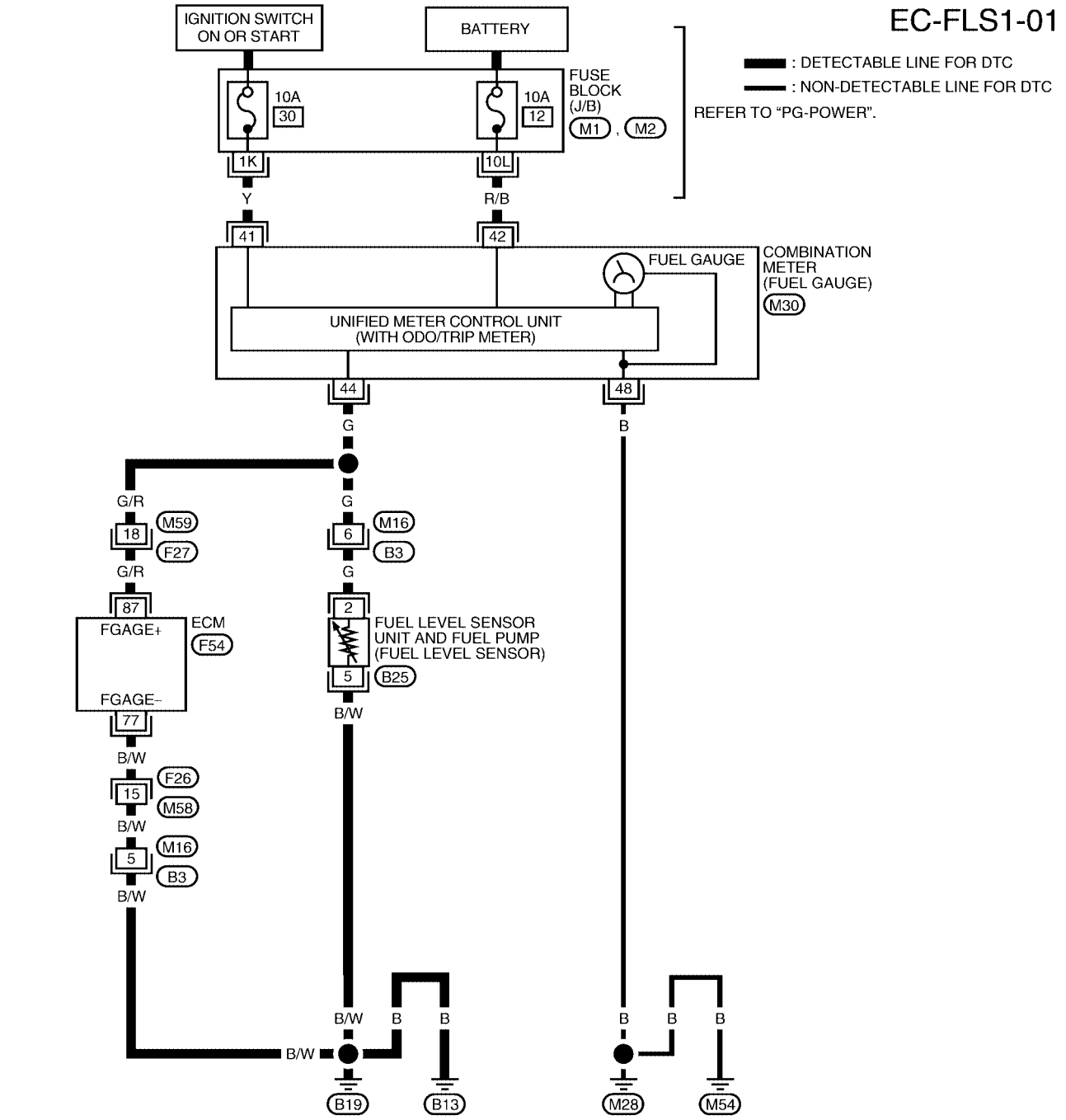


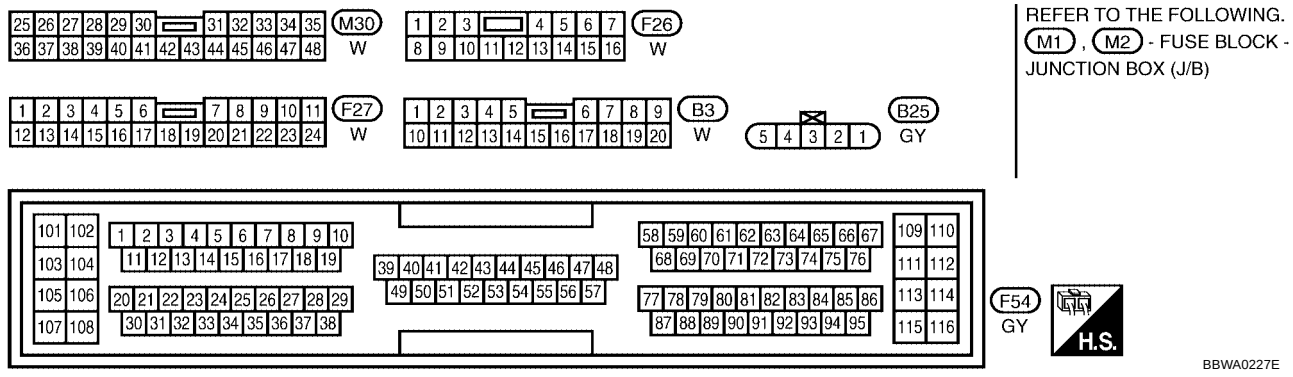
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002F6





BBWA0227E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

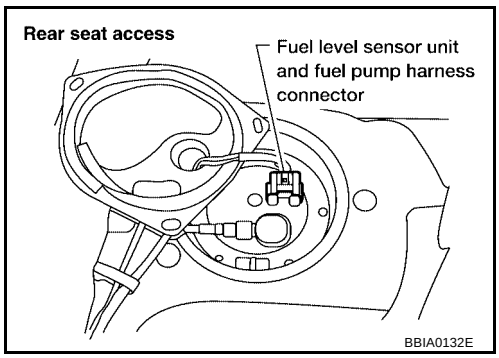
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
77	B/W	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V
87	G/R	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.

Diagnostic Procedure

UBS002F7

1. CHECK FUEL LEVEL SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch "ON".

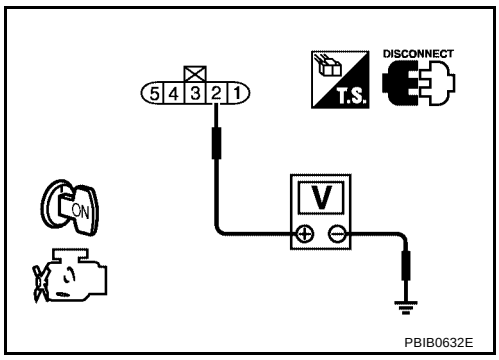


4. Check voltage between fuel level sensor unit and fuel pump terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M16, B3
- Harness for open or short between combination meter and fuel level sensor until and fuel pump

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between fuel level sensor unit and fuel pump and body ground

>> Repair open circuit or short to power in harness or connectors.

5. CHECK FUEL LEVEL SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 87 and fuel level sensor unit and fuel pump terminal 2, ECM terminal 77 and fuel level sensor unit and fuel pump terminal 5. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M16, B3
- Harness connectors M58, F26
- Harness connectors M59, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 8.
NG >> Replace fuel level sensor unit.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Remove and Installation

UBS002F8

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

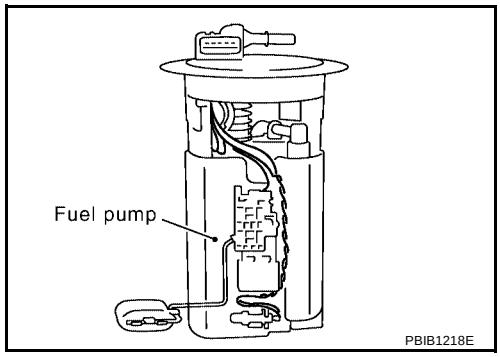
DTC P0461 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS002F9

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS002FA

Driving long distances naturally affect fuel gauge level.
This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0461 0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor

Overall Function Check

UBS002FB

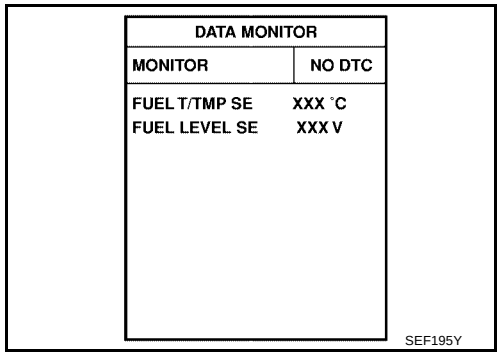
Use this procedure to check the overall function of the fuel level sensor function. During this check, a 1st trip DTC might not be confirmed.

WARNING:
When performing following procedure, be sure to observe the handling of the fuel. Refer to FL-7, "FUEL TANK" .
TESTING CONDITION:
Before starting overall function check, preparation of draining fuel and refilling fuel is required.

WITH CONSULT-II

NOTE:
Start from step 11, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-1257, "FUEL PRESSURE RELEASE" .
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch “OFF” and wait at least 10 seconds then turn “ON”.
6. Select “FUEL LEVEL SE” in “DATA MONITOR” mode with CONSULT-II.
7. Check “FUEL LEVEL SE” output voltage and note it.
8. Select “FUEL PUMP” in “ACTIVE TEST” mode with CONSULT-II.
9. Touch “ON” and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
11. Check “FUEL LEVEL SE” output voltage and note it.
12. Check “FUEL LEVEL SE” output voltage and confirm whether the voltage changes more than 0.03V during step 7 to 11.
    If NG, check the fuel level sensor, refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

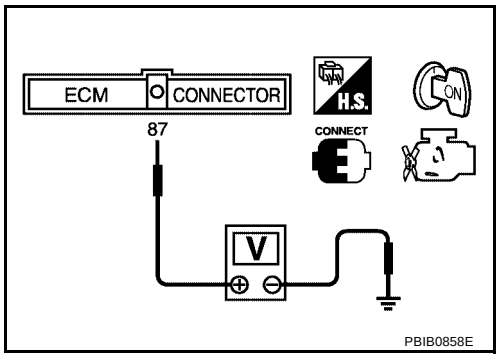


WITH GST

NOTE:

Start from step 11, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-1257, "FUEL PRESSURE RELEASE" .
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch “OFF”.
6. Set voltmeters probe between ECM terminal 87 (fuel level sensor signal) and ground.
7. Turn ignition switch “ON”.
8. Check voltage between ECM terminal 87 and ground and note it.
9. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
10. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
11. Confirm that the voltage between ECM terminal 87 and ground changes more than 0.03V during step 8 - 10.
    If NG, check component of fuel level sensor, refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .



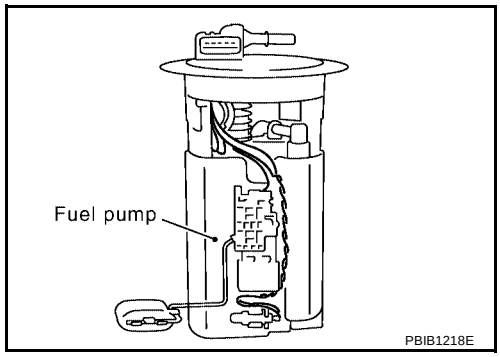
DTC P0462, P0463 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS002FC

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS002FD

ECM receives two signals from the fuel level sensor circuit.
One is fuel level sensor power supply circuit, and the other is fuel level sensor ground circuit.
This diagnosis indicates the former, to detect open or short circuit malfunction.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462 0462	Fuel level sensor circuit low input	An excessively low voltage is sent from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted) ● Fuel level sensor
P0463 0463	Fuel level sensor circuit high input	An excessively high voltage is sent from the sensor is sent to ECM.	

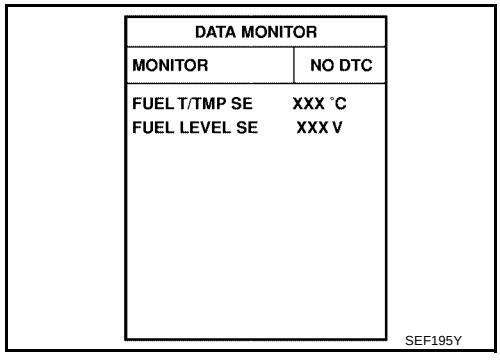
DTC Confirmation Procedure

UBS002FE

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1573, "Diagnostic Procedure" .

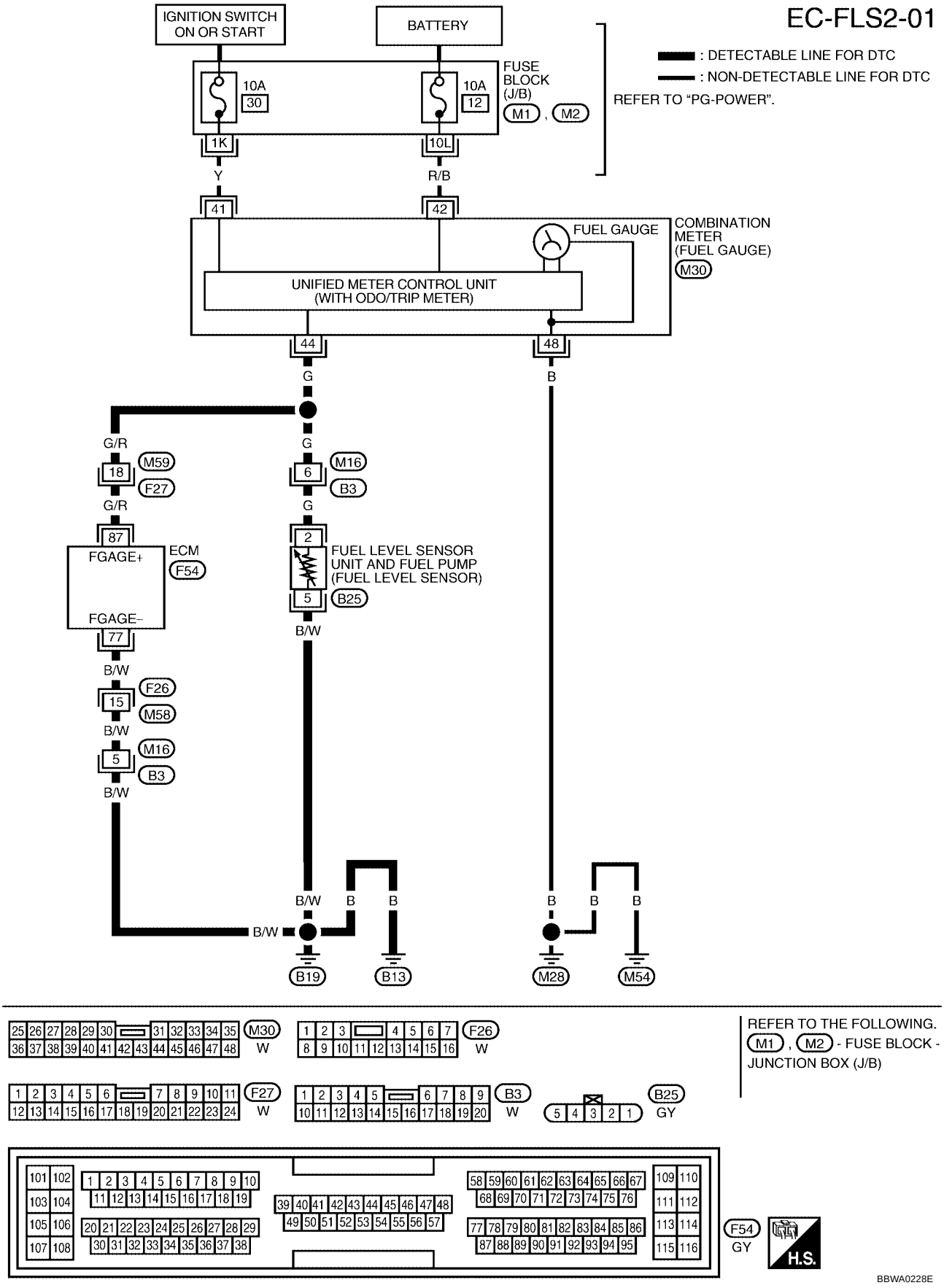


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002FF



BBWA0228E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

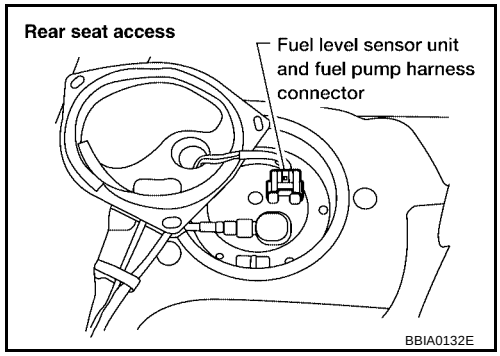
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
77	B/W	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V
87	G/R	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.

Diagnostic Procedure

UBS002FG

1. CHECK FUEL LEVEL SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch "ON".

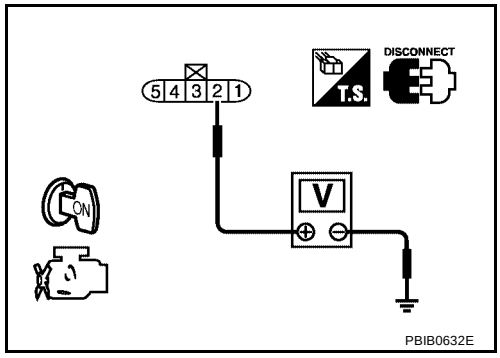


4. Check voltage between fuel level sensor unit and fuel pump terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M16, B3
- Harness for open or short between combination meter and fuel level sensor unit and fuel pump

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 5 and body ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK FUEL LEVEL SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 87 and fuel level sensor unit and fuel pump terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M16, B3
- Harness connectors M59, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 7.
NG >> Replace fuel level sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS002FH

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

DTC P0500 VSS

PFP:32702

Description

UBS002FI

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the combination meter. The combination meter then sends a signal to the ECM.

On Board Diagnosis Logic

UBS002FJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The vehicle speed sensor circuit is open or shorted) ● Vehicle speed sensor ● Combination meter

DTC Confirmation Procedure

UBS002FK

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

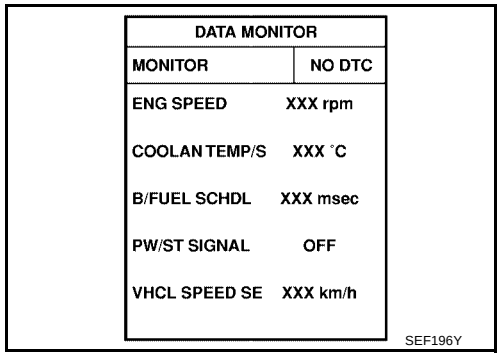
TESTING CONDITION:

Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-1577, "Diagnostic Procedure" .
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,200 - 6,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	6.0 - 31.8 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF



6. If 1st trip DTC is detected, go to EC-1577, "Diagnostic Procedure" .

Overall Function Check

UBS002FL

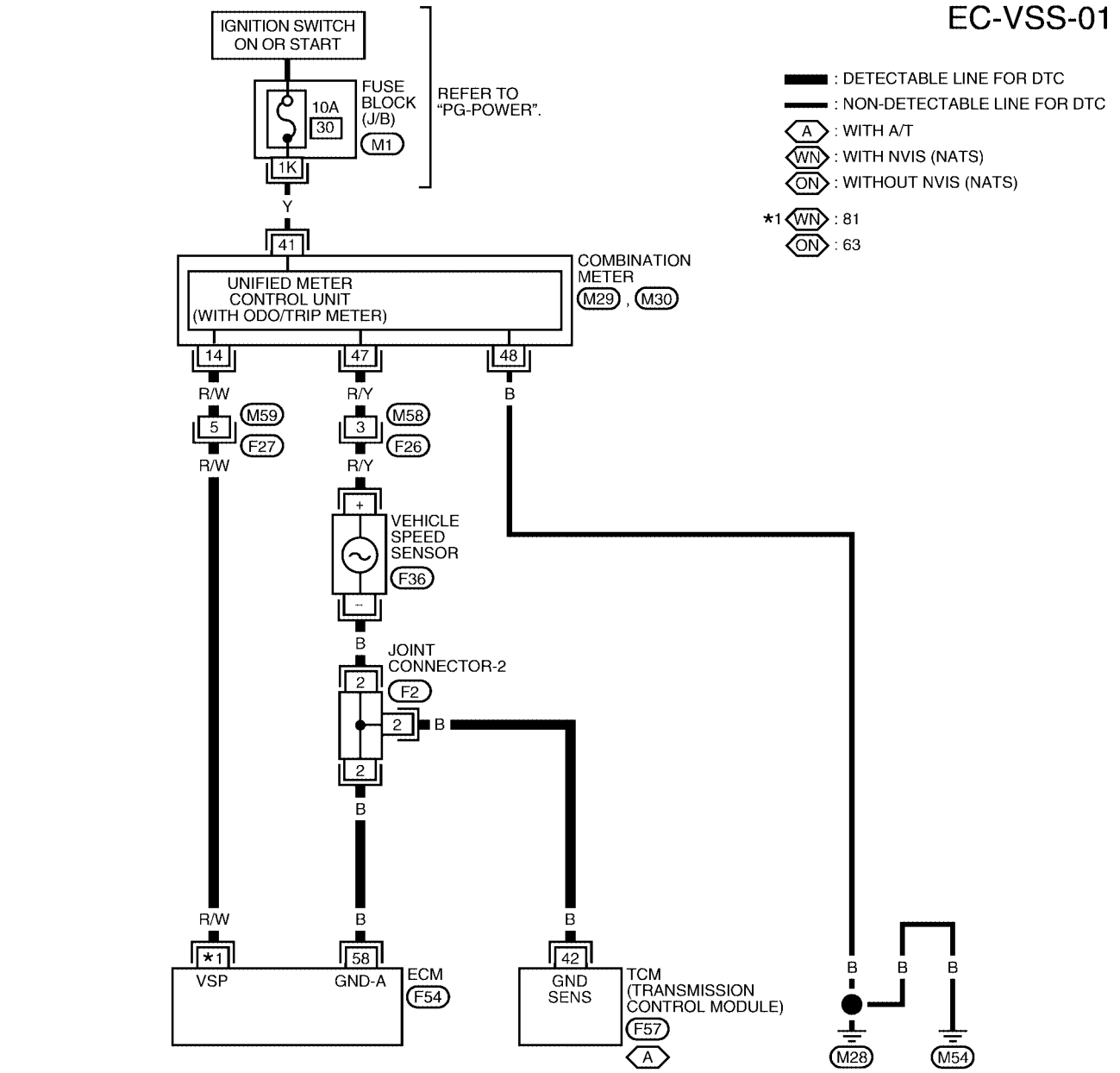
Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a 1st trip DTC might not be confirmed.

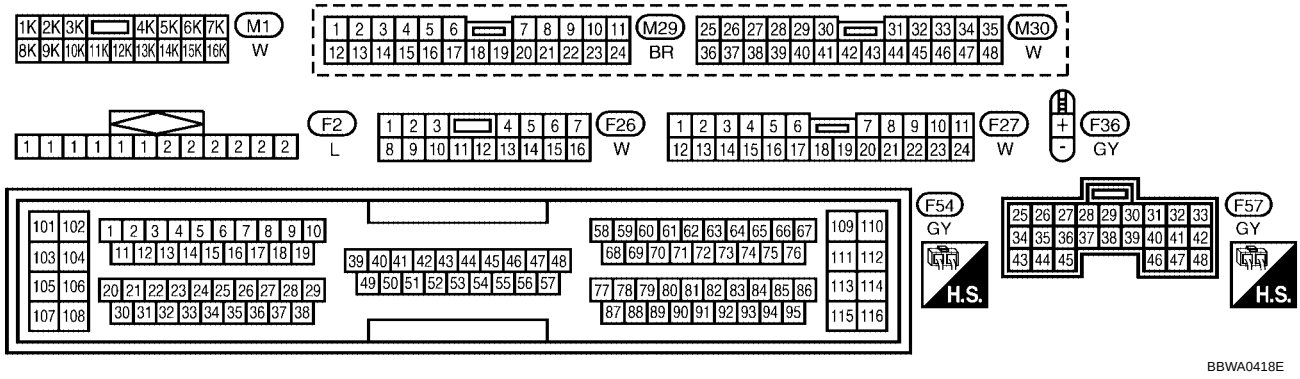
WITH GST

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed sensor signal in “MODE 1” with GST.
   The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-1577, "Diagnostic Procedure" .

Wiring Diagram

UBS002FM



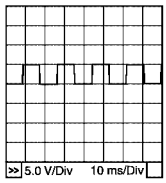


BBWA0418E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63 (Without NVIS) 81 With (NVIS)	R/W	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● Vehicle speed is 40 km/h (25MPH)	Approximately 2.3V★  PBIB0531E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002FN

1. CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM terminal 81 (Models with NVIS) or 63 (Models without NVIS) and combination meter terminal 14.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and combination meter

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK SPEEDOMETER FUNCTION

Make sure that speedometer functions properly.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT

Check the following.

- Harness connectors M58, F26
- Joint connector-2
- Harness for open or short between combination meter and vehicle speed sensor
- Harness for open or short between vehicle speed sensor and ECM
- Harness for open or short between vehicle speed sensor and TCM

OK or NG

OK >> Check combination meter and vehicle speed sensor. Refer to DI-3, "METERS AND GAUGES" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0506 ISC SYSTEM

PFP:23781

Description

UBS002FO

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC displayed.
The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

UBS002FP

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506 0506	Idle speed control system RPM lower than expected	The idle speed is less than the target idle speed by 100 rpm or more.	● Electric throttle control actuator ● Intake air leak

DTC Confirmation Procedure

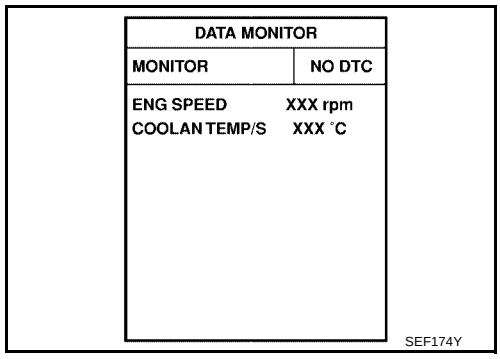
UBS002FQ

NOTE:
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform EC-1255, "Idle Air Volume Learning" , before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the EC-1862, "SERVICE DATA AND SPECIFICATIONS (SDS)" .**

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

WITH CONSULT-II

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” again and select “DATA MONITOR” mode with CONSULT-II.
5. Start engine and run it for at least 1 minute at idle speed.
6. If 1st trip DTC is detected, go to EC-1580, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002FR

1. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 2.
NG >> Discover air leak location and repair.

2. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .
4. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
5. Perform EC-1255, "Throttle Valve Closed Position Learning" .
6. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P0507 ISC SYSTEM

PFP:23781

Description

UBS002FS

NOTE:
If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC displayed.
The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration, and engine load (air conditioner, power steering and cooling fan operation, etc.).

On Board Diagnosis Logic

UBS002FT

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507 0507	Idle speed control system RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	● Electric throttle control actuator ● Intake air leak ● PCV system

DTC Confirmation Procedure

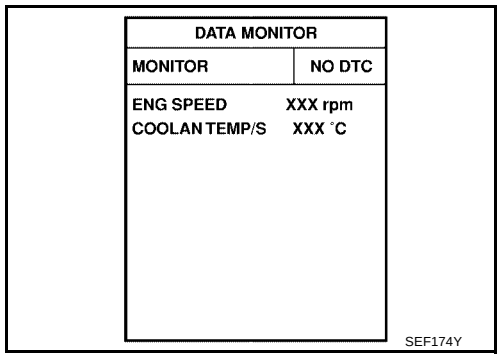
UBS002FU

NOTE:
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
- **If the target idle speed is out of the specified value, perform EC-1255, "Idle Air Volume Learning" , before conducting “DTC Confirmation Procedure”. For the target idle speed, refer to the EC-1862, "SERVICE DATA AND SPECIFICATIONS (SDS)" .**

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

WITH CONSULT-II

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON” again and select “DATA MONITOR” mode with CONSULT-II.
5. Start engine and run it for at least 1 minute at idle speed.
6. If 1st trip DTC is detected, go to EC-1582, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002FV

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Discover air leak location and repair.

3. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .
4. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
5. Perform EC-1255, "Throttle Valve Closed Position Learning" .
6. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

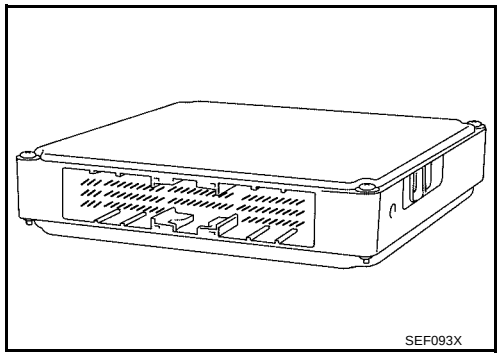
DTC P0605 ECM

PFP:23710

Component Description

UBS002FW

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


SEF093X

On Board Diagnosis Logic

UBS002FX

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	● ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. ● ECM deactivates ASCD operation.

DTC Confirmation Procedure

UBS002FY

Perform “PROCEDURE FOR MALFUNCTION A” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no malfunction on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

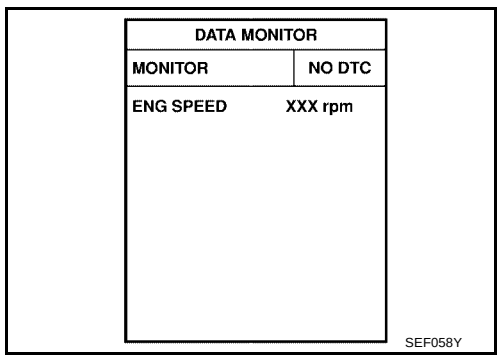
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1584, "Diagnostic Procedure" .



SEF058Y

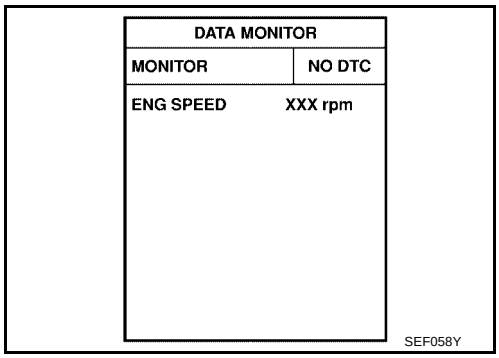
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-1584, "Diagnostic Procedure" .



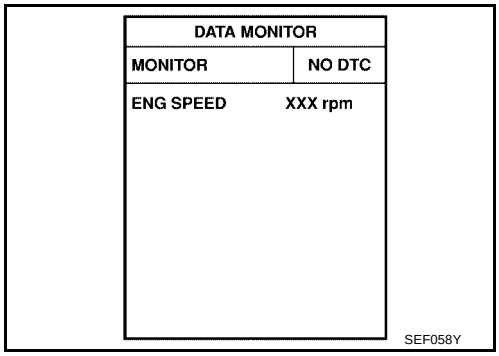
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 procedure, 32 times.
5. If 1st trip DTC is detected, go to EC-1584, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS002FZ

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1583 .
5. Is the 1st trip DTC P0605 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1583 .
5. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .
3. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
4. Perform EC-1255, "Throttle Valve Closed Position Learning" .
5. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P0650 MIL

PFP:24810

Component Description

UBS002G0

Malfunction Indicator Lamp (MIL) is located on the instrument panel. When the ignition switch is turned ON without engine running, MIL will light up. This is a bulb check. When the engine is started, MIL should go off. If MIL remains on, the on board diagnostic system has detected an engine system malfunction.

On Board Diagnosis Logic

UBS002G1

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0650 0650	Malfunction indicator (MIL) control circuit	● An excessively high voltage is sent to ECM through the MIL circuit under the condition that calls for MIL light up. ● An excessively low voltage is sent to ECM through the MIL circuit under the condition that calls for MIL not to light up.	● Harness or connectors (MIL circuit is open or shorted.) ● MIL

FAIL-SAFE MODE

ECM enters in fail-safe mode when both DTC P0650 and another DTC, which calls for MIL to light up, are detected at the same time.

Detected items	Engine operating condition in fail-safe mode
MIL circuit	Engine speed will not rise more than 2,500 rpm due to the fuel cut

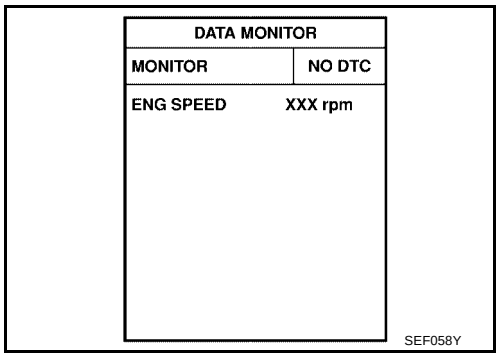
DTC Confirmation Procedure

UBS002G2

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1588, "Diagnostic Procedure" .



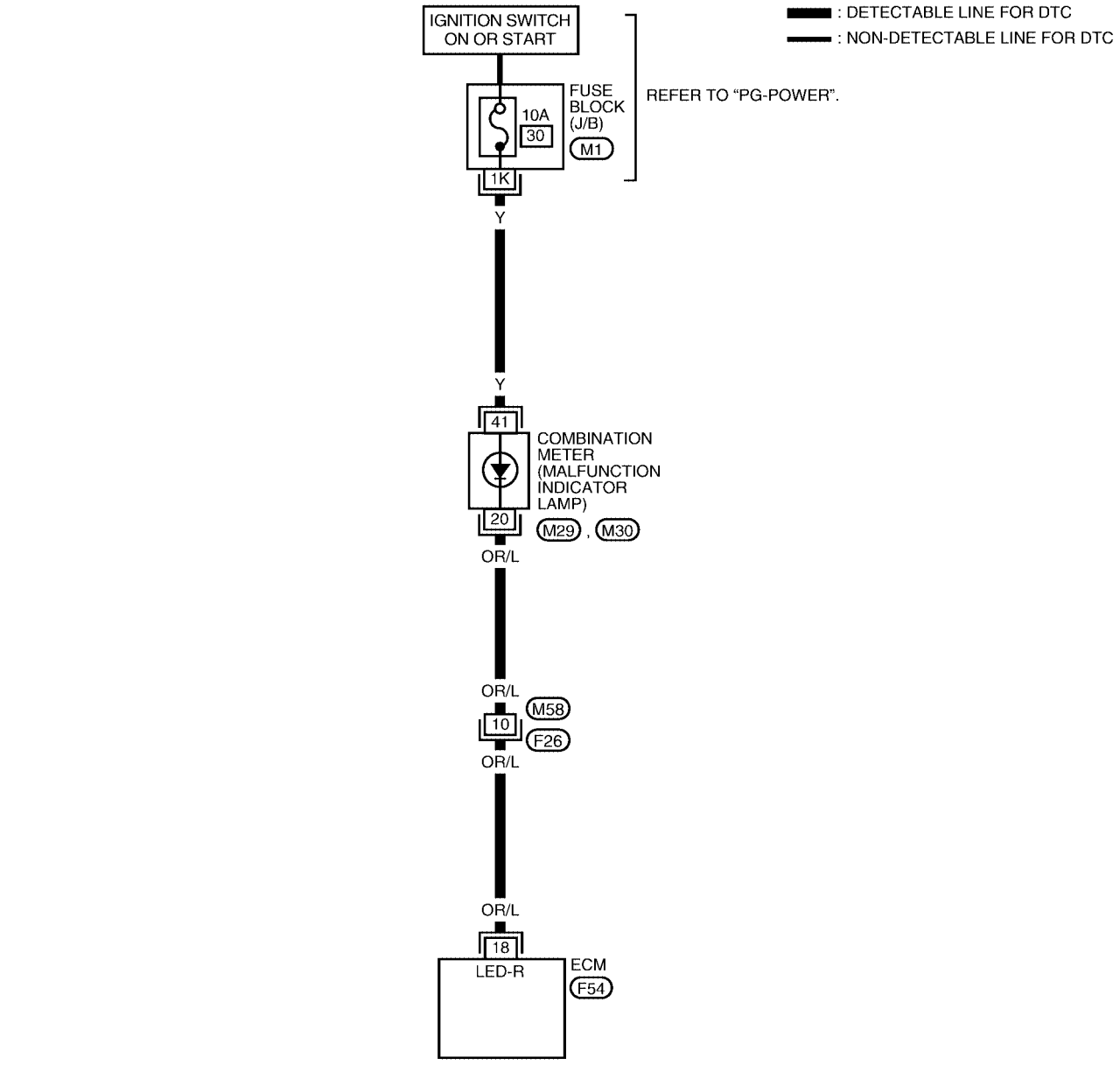
WITH GST

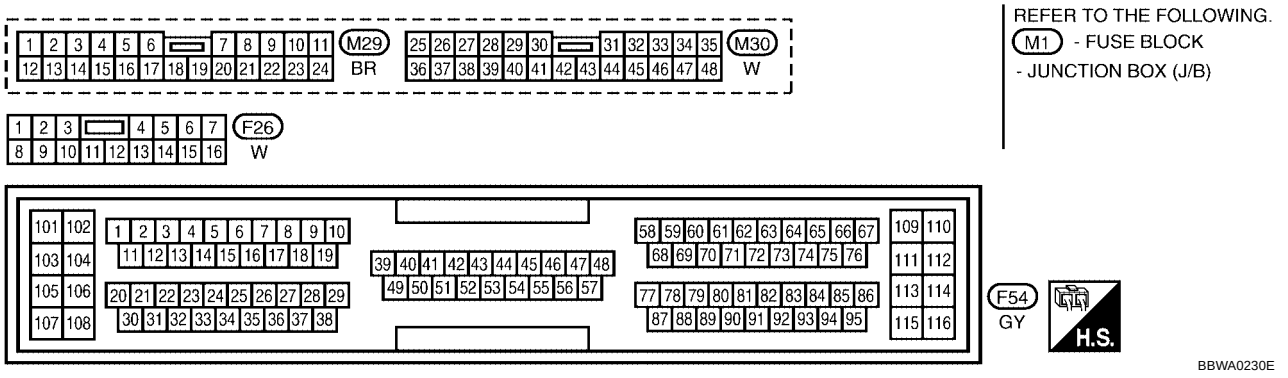
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002G3

EC-MIL-01





BBWA0230E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
18	OR/L	MIL	**[Ignition switch "ON"]**	0 - 1.0V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)

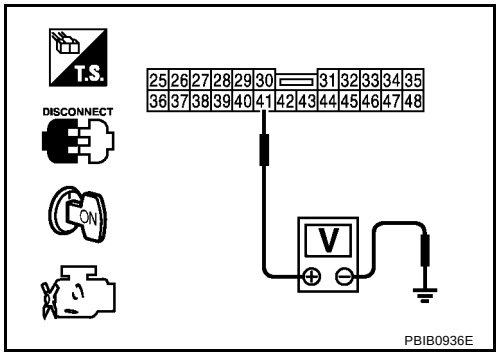
Diagnostic Procedure

UBS002G4

1. CHECK MIL POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector.
3. Turn ignition switch "ON".
4. Check voltage between combination meter terminal 41 and ground with CONSULT-II or tester

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between fuse and combination meter

>> Repair harness or connectors.

3. CHECK MIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 18 and combination meter terminal 20. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

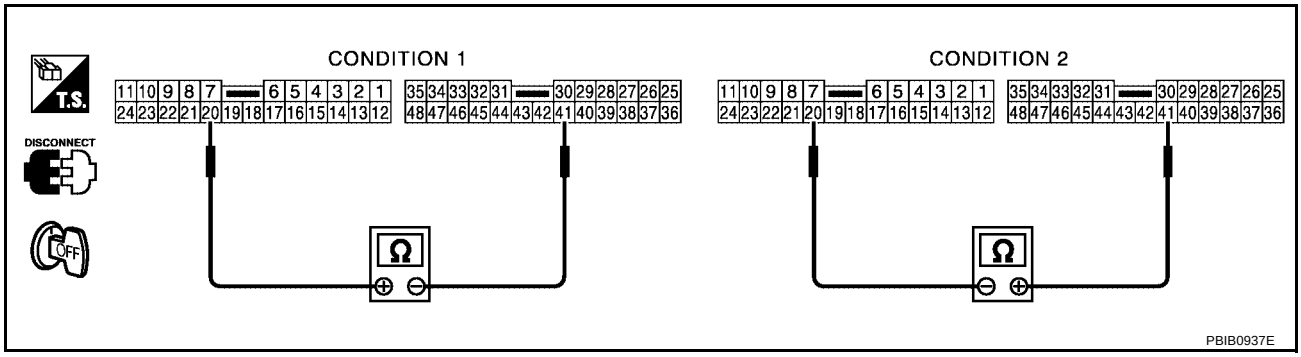
Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and combination meter

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK COMBINATION METER

1. Turn ignition switch “OFF”.
2. Disconnect combination meter harness connectors.
3. Check continuity under the following conditions.



CONDITION	Combination meter terminal No. (Polarity)	Continuity
1	20 (+) - 41 (–)	Should not exist.
2	41 (+) - 20 (–)	Should exist.

OK or NG

OK >> GO TO 6.
NG >> Replace combination meter. Refer to DI-8, "Combination Meter" .

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

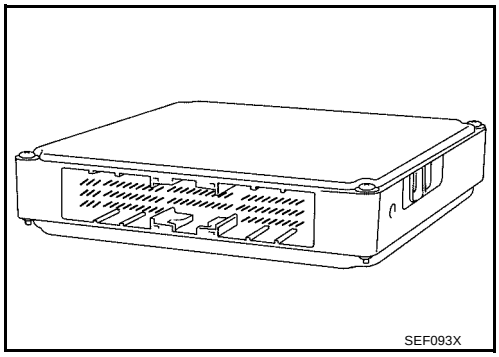
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

UBS002G5

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.



On Board Diagnosis Logic

UBS002G6

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back-up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

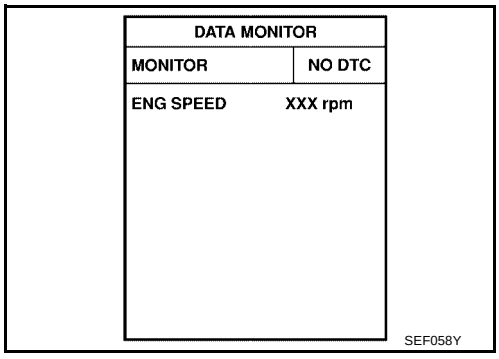
DTC Confirmation Procedure

UBS002G7

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-1592, "Diagnostic Procedure" .



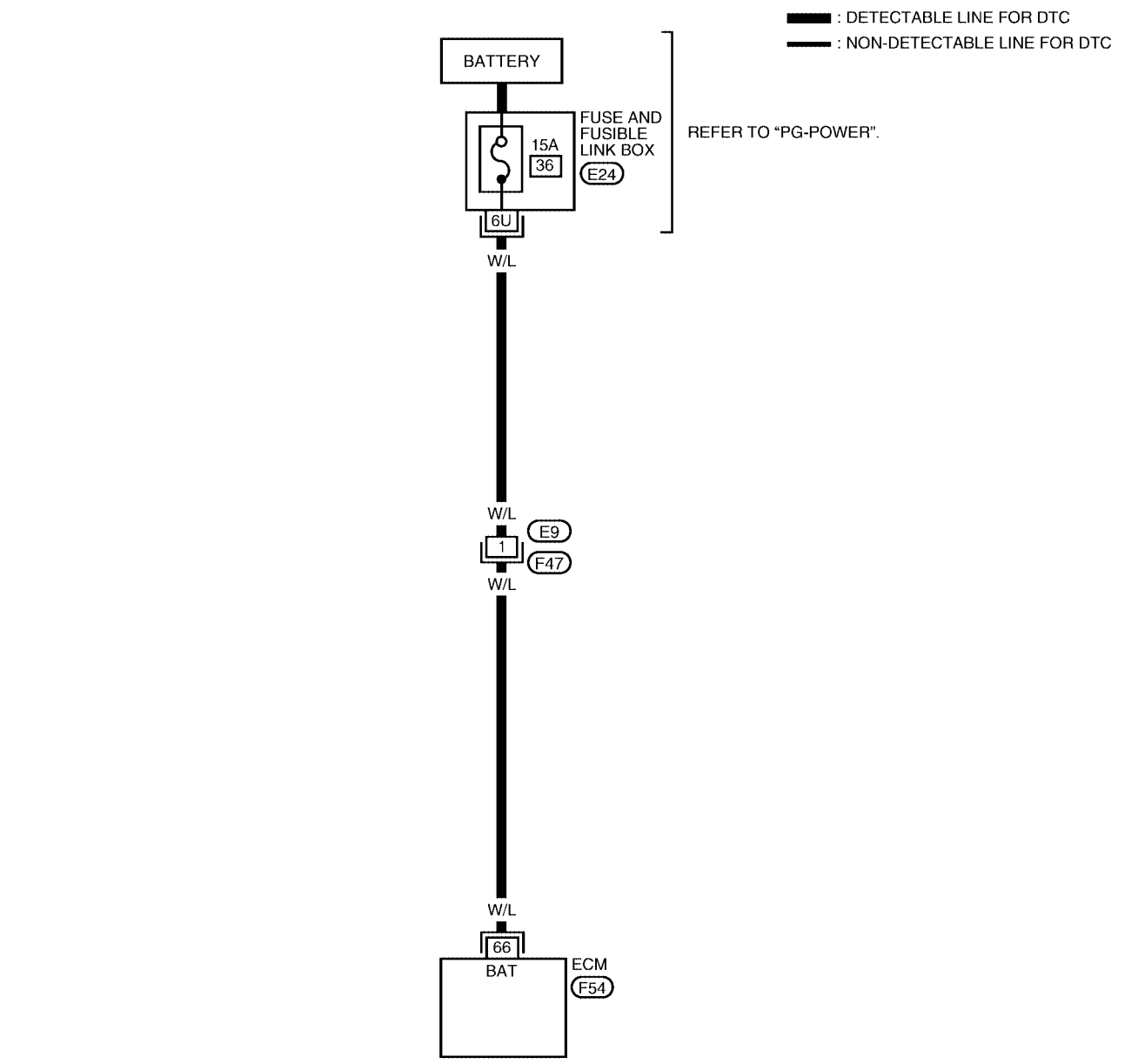
WITH GST

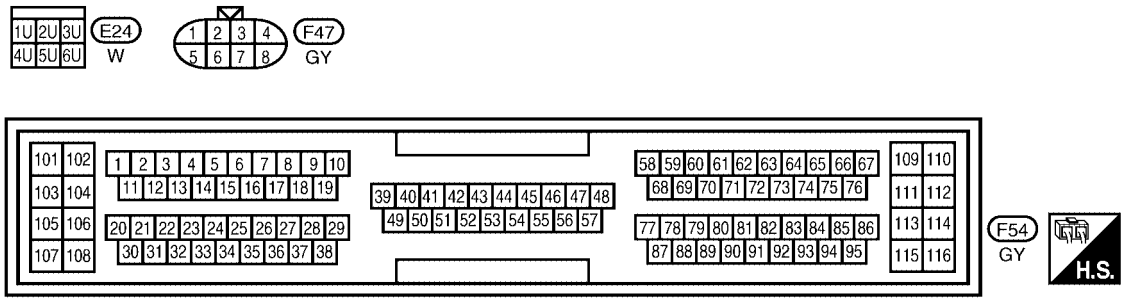
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002G8

EC-ECM/PW-01





BBWA0419E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
66	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

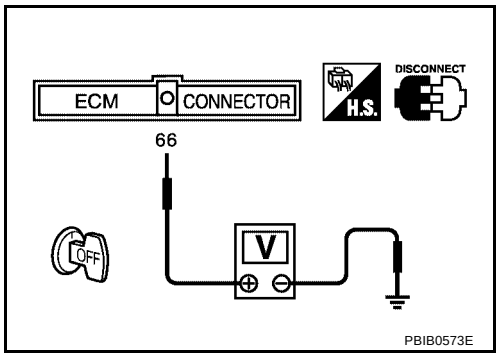
Diagnostic Procedure

UBS002G9

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 66 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse and fusible link box connector E24
- 15A fuse
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 4.
NG >> Repair or replace harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1590 .
5. Is the 1st trip DTC P1065 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1590 .
5. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to EC-1275, "NVIS (Nissan Vehicle Immobilizer System — NATS)" .
3. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
4. Perform EC-1255, "Throttle Valve Closed Position Learning" .
5. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

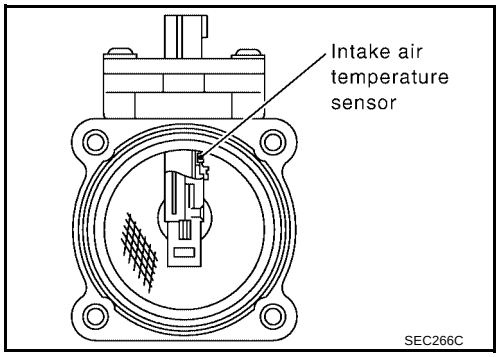
DTC P1102 MAF SENSOR

PFP:22680

Component Description

UBS002GA

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

UBS002GB

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s

On Board Diagnosis Logic

UBS002GC

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1102 1102	Mass air flow sensor circuit range/performance problem	A voltage from the sensor is constantly approx.1.0V when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

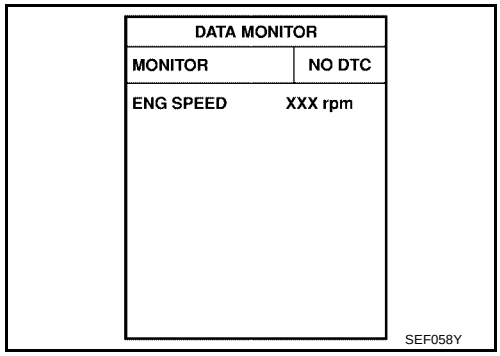
UBS002GD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-1597, "Diagnostic Procedure" .



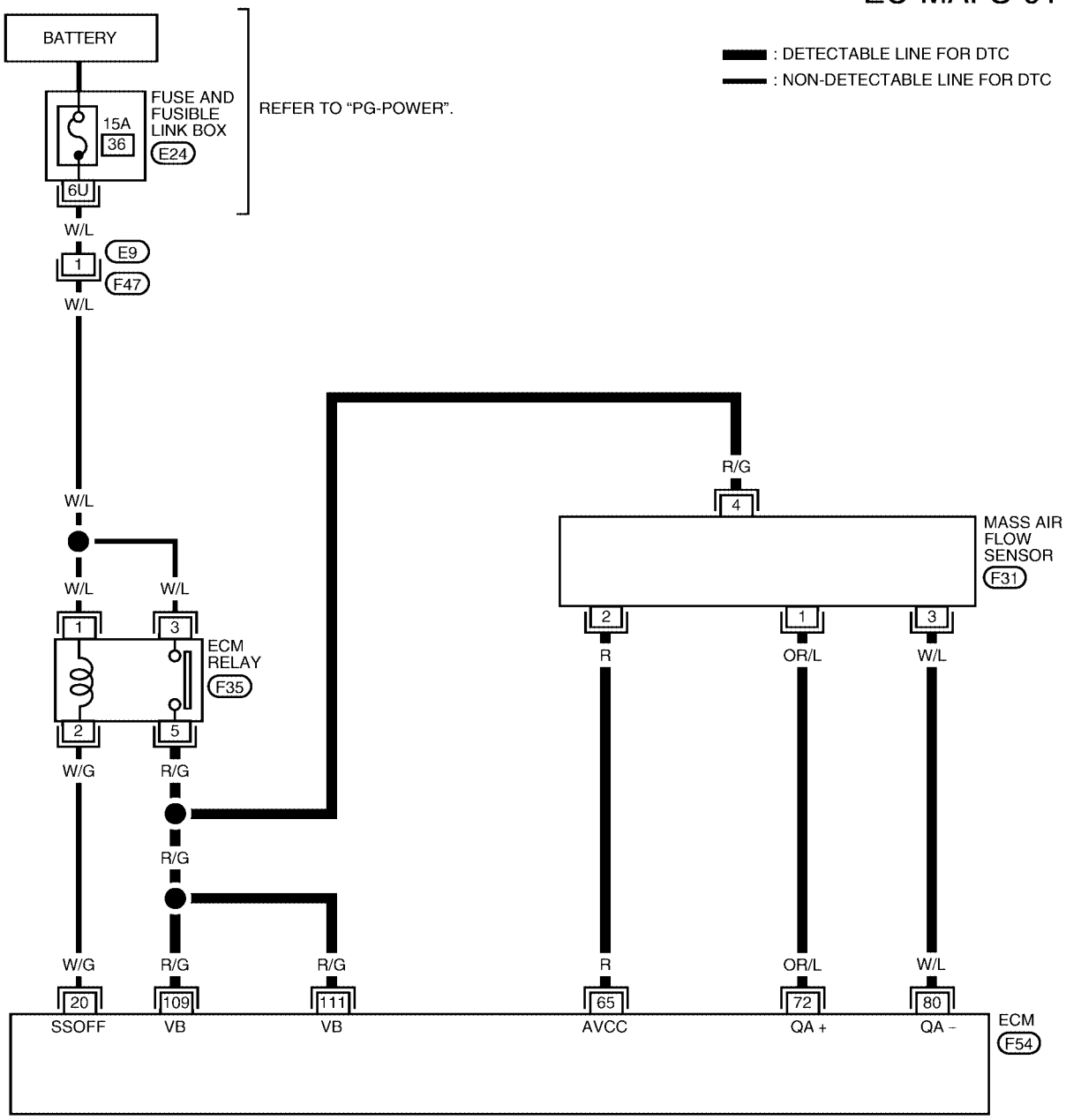
WITH GST

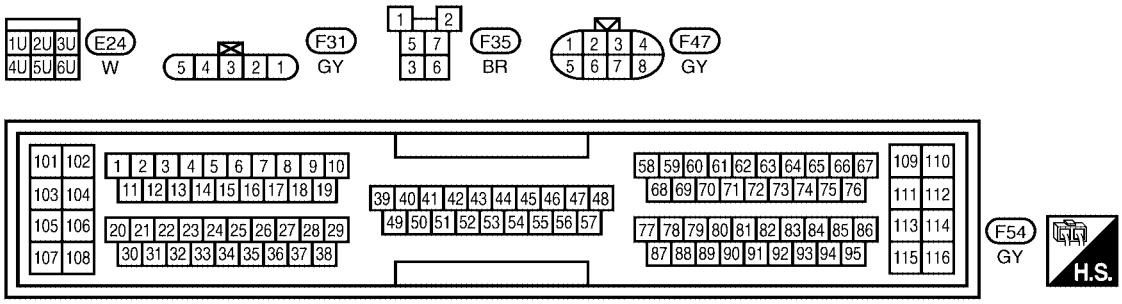
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

UBS002GE

EC-MAFS-01





BBWA0213E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
72	OR/L	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
80	W/L	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

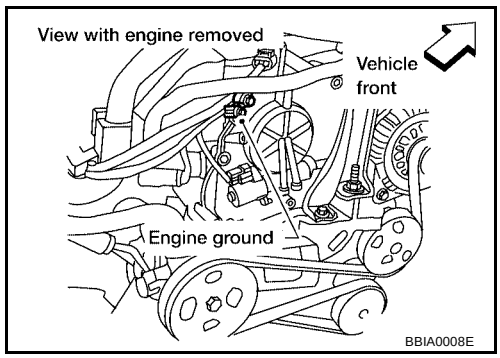
Diagnostic Procedure

UBS002GF

1. RETIGHTEN GROUND SCREWS

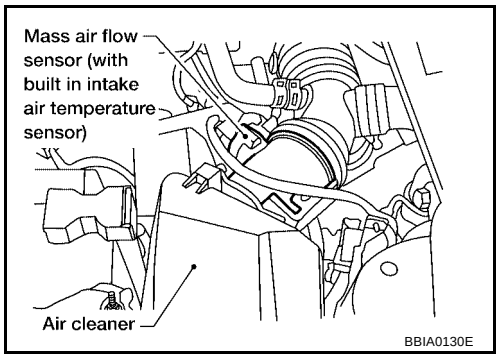
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



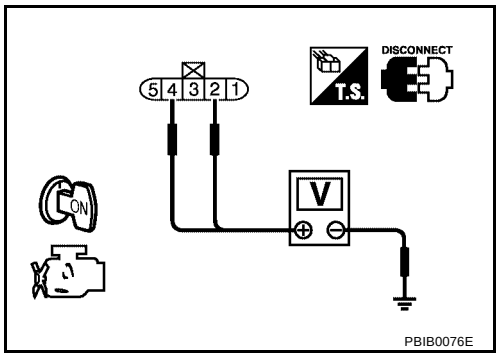
2. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM relay
- Harness for open or short between mass air flow sensor and ECM

>> Repair harness or connectors.

4. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 80. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 72. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MASS AIR FLOW SENSOR

Refer to EC-1599, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace mass air flow sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

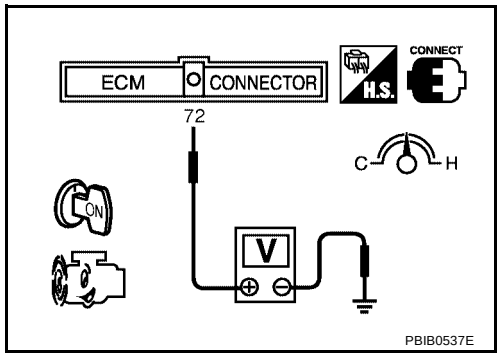
UBS002GG

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 72 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.5
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

UBS002GH

MASS AIR FLOW SENSOR

Refer to EM-103, "AIR CLEANER AND AIR DUCT" .

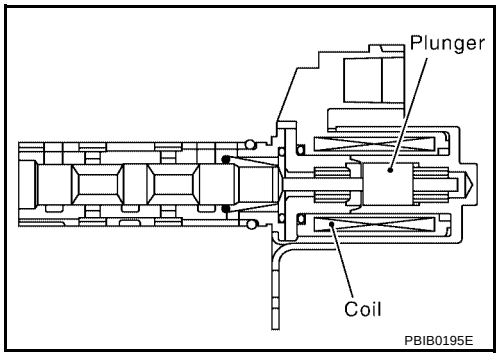
DTC P1111 IVT CONTROL SOLENOID VALVE

PFP:23796

Component Description

UBS002GI

Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
The shorter pulse width retards valve angle.
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

UBS002GJ

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 25% - 60%

On Board Diagnosis Logic

UBS002GK

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111 1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	● Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

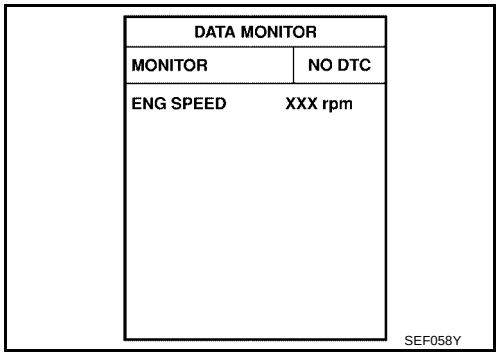
DTC Confirmation Procedure

UBS002GL

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If 1st trip DTC is detected, go to EC-1602, "Diagnostic Procedure" .



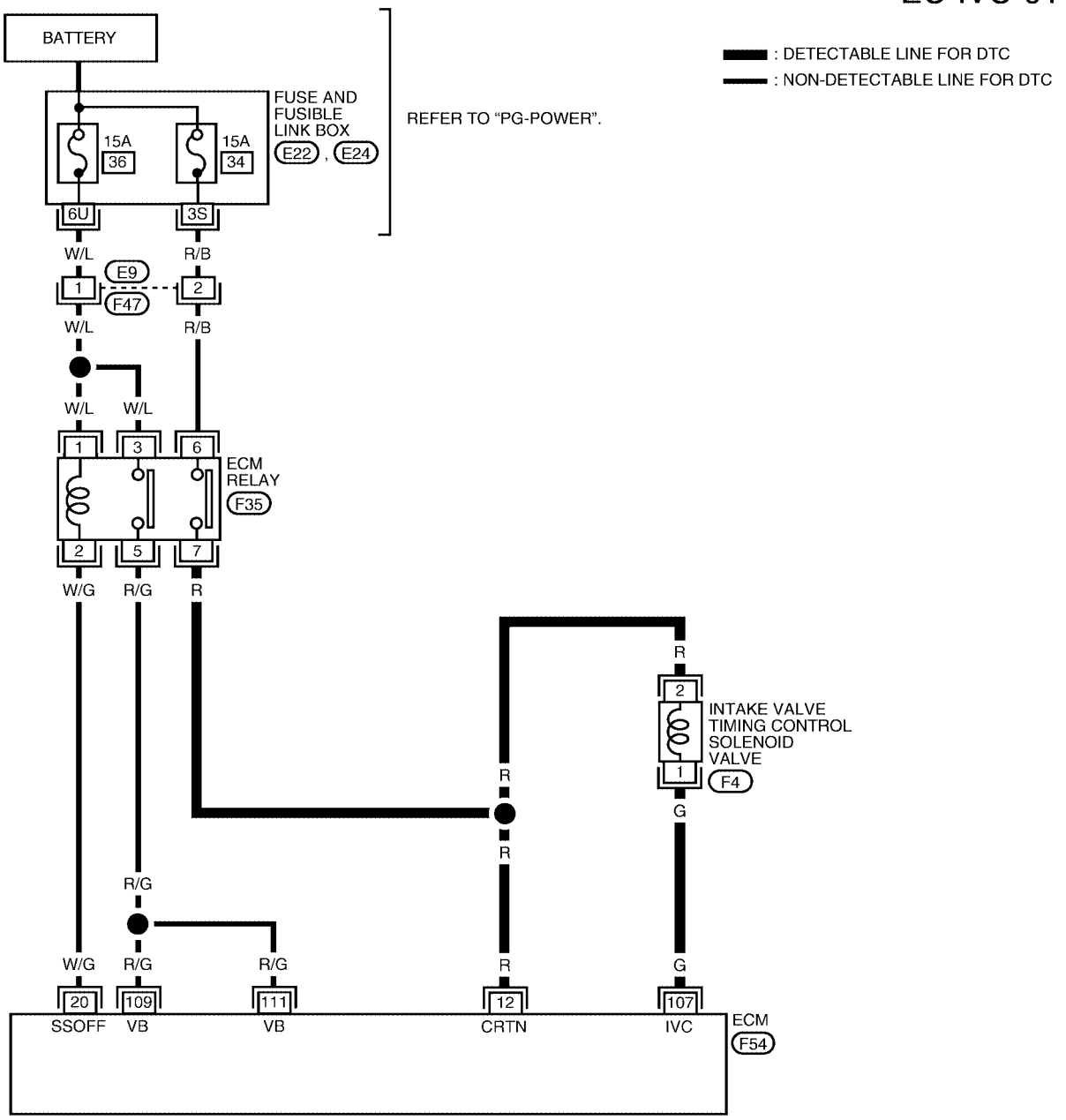
WITH GST

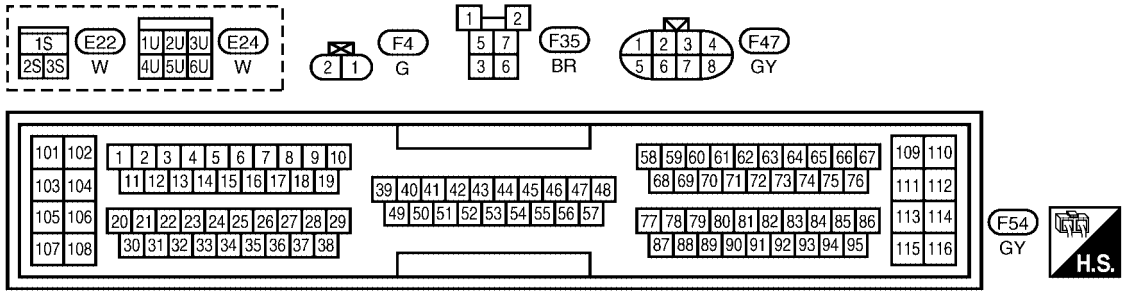
Following the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002GM

EC-IVC-01



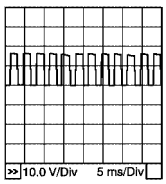


BBWA0232E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
107	G	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 9V★  PBIB0532E

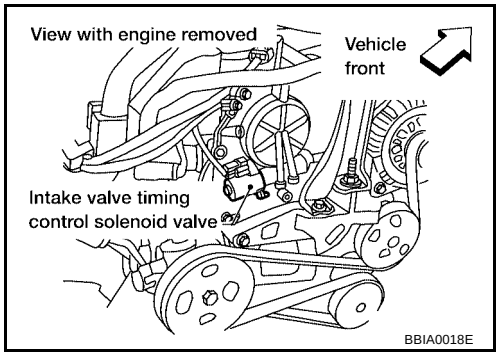
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002GN

1. CHECK POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



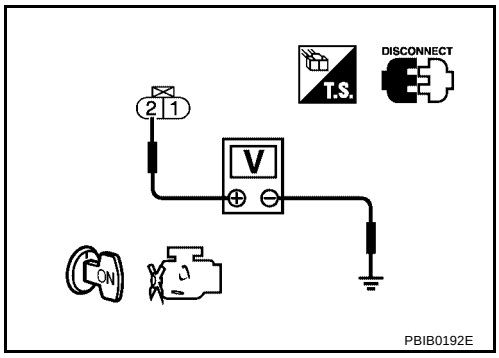
BBIA0018E

4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



PBIB0192E

2. DETECT MALFUNCTION PART

Check the following.

- Harness for open or short between intake valve timing control solenoid valve and ECM
- Harness for open or short between intake valve timing control solenoid valve and ECM relay

>> Repair or replace harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 107 and intake valve timing control solenoid valve terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-1603, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace intake valve timing control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

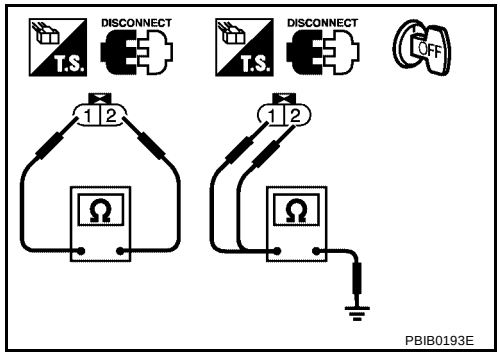
Component Inspection

UBS002GO

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

UBS002GP

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-134, "TIMING CHAIN" .

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

UBS0056D

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS0056E

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters fail-safe mode and the MIL lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters fail-safe mode and the MIL lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

UBS0056F

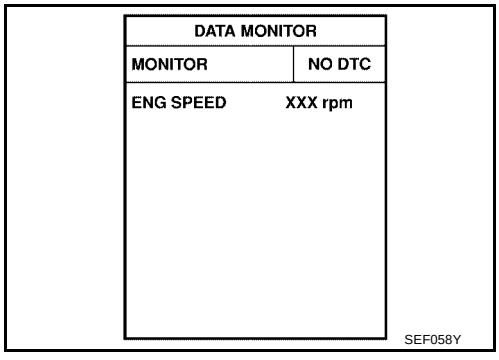
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
  If there is no malfunction on “PROCEDURE FOR MALFUNCTION A AND B”, perform “PROCEDURE FOR MALFUNCTION C”.
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-1605, "Diagnostic Procedure" .



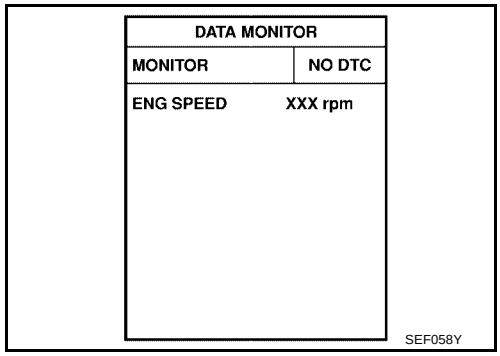
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-1605, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

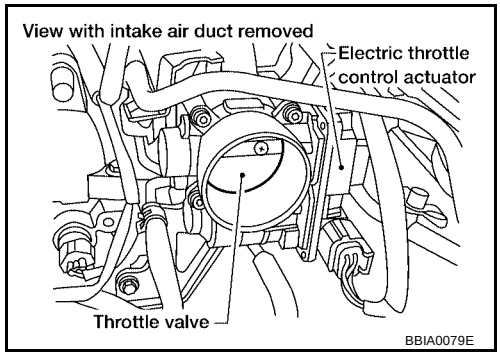
UBS0056G

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

UBS006JN

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-1604 or EC-1613 .
Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS006JO

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted) ● Electric throttle control actuator

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

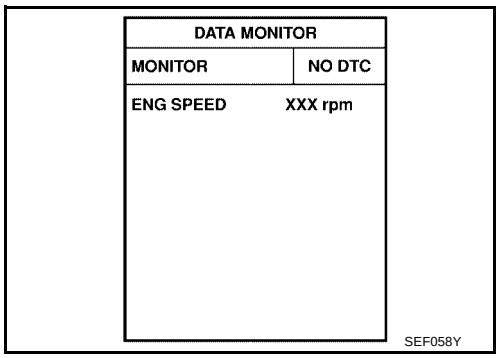
DTC Confirmation Procedure

UBS006JP

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1608, "Diagnostic Procedure" .



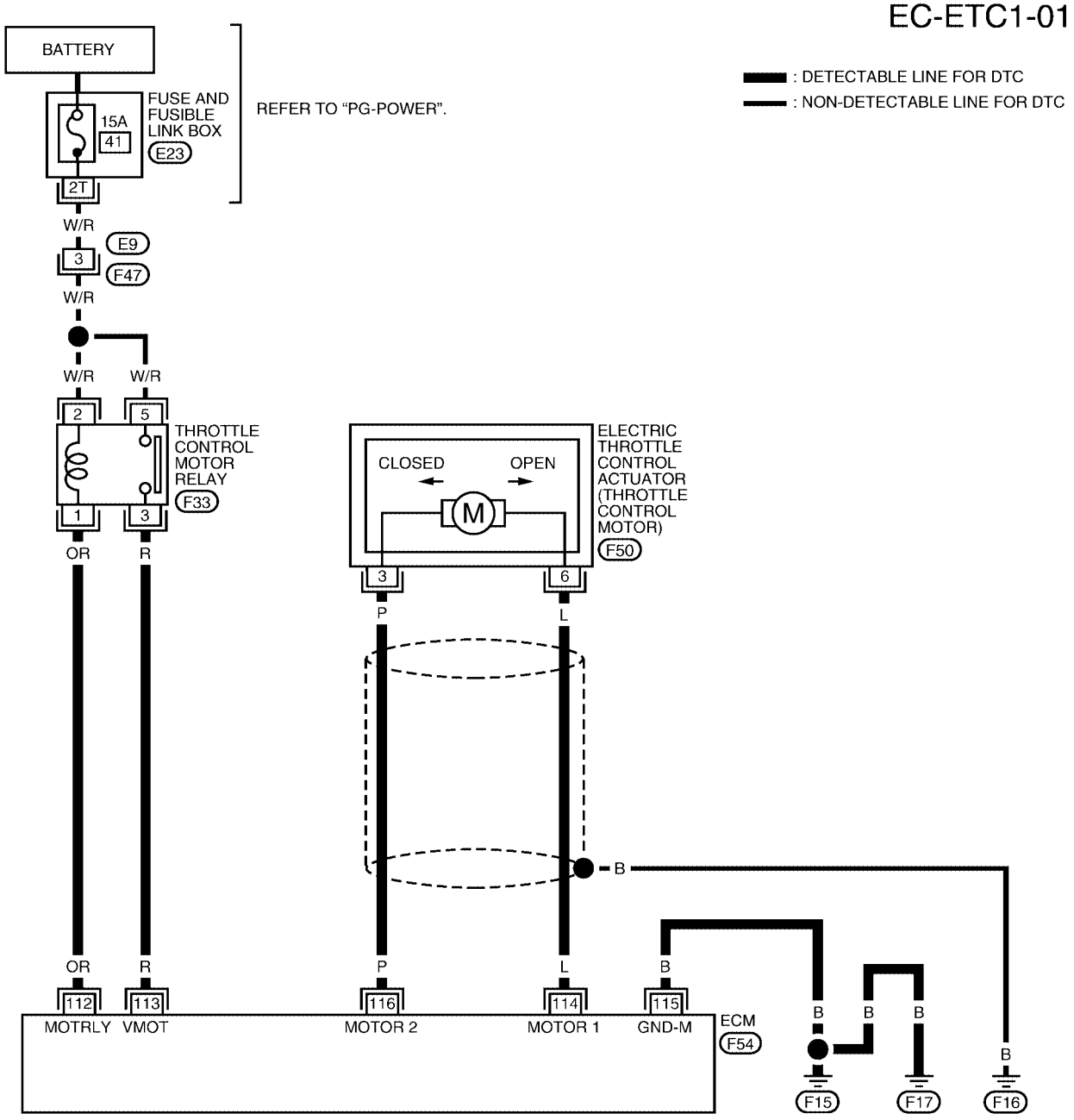
WITH GST

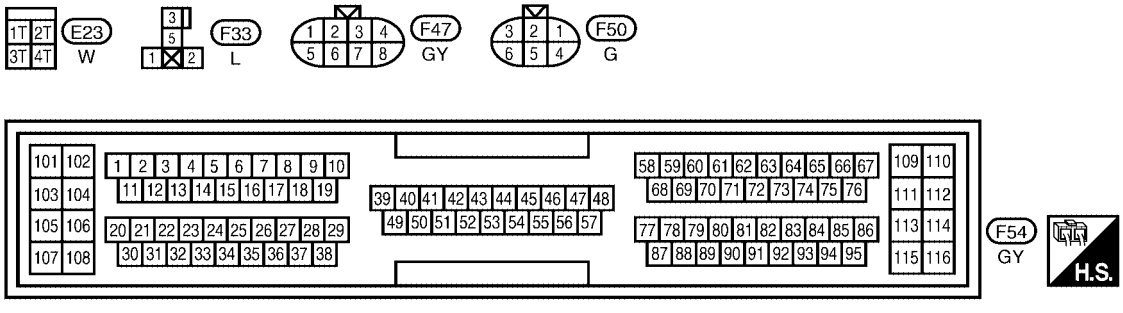
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006JQ

EC-ETC1-01



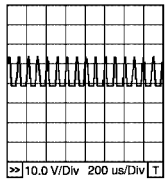
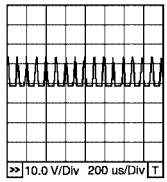


BBWA0249E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
112	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
113	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
114	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
115	B	Throttle control motor ground	**[Engine is running]** ● Idle speed	Approximately 0V
116	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

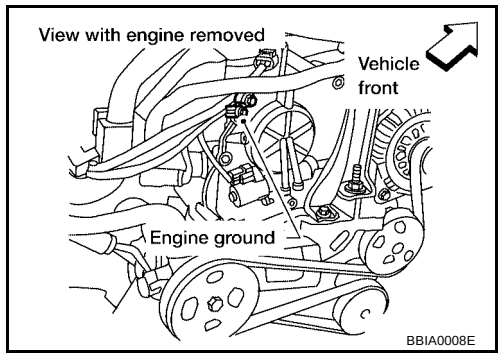
Diagnostic Procedure

UBS006JR

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



BBIA0008E

2. CHECK THROTTLE CONTROL MOTOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 115 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

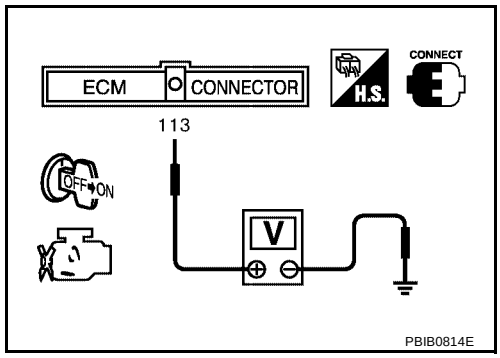
OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Reconnect harness connectors disconnected.
2. Check voltage between ECM terminal 113 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

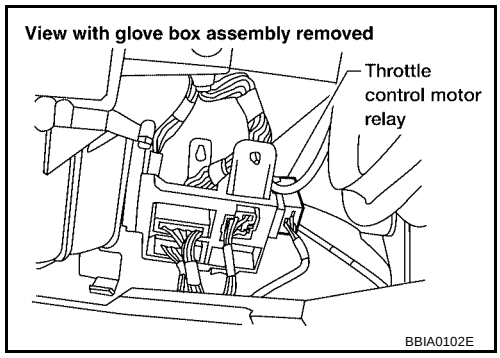


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay harness connector.

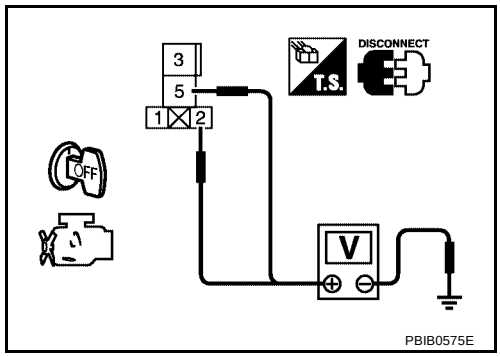


3. Check voltage between throttle control motor relay terminals 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse and fusible link box connector E23
- 15A fuse
- Harness for open or short between throttle control motor relay and battery

>> Repair or replace harness or connectors.

6. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check continuity between ECM terminal 113 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check continuity between ECM terminal 112 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-1612, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace throttle control motor relay.

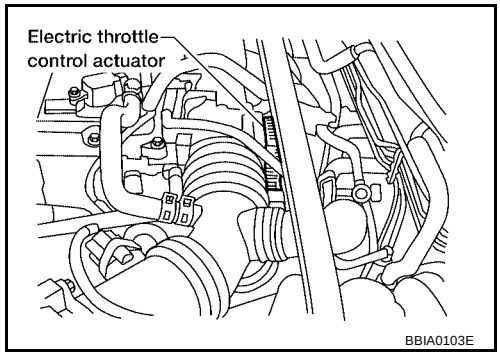
9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	114	Should not exist
	116	Should exist
6	114	Should exist
	116	Should not exist

5. Also check harness for short to ground and short to power.

OK or NG

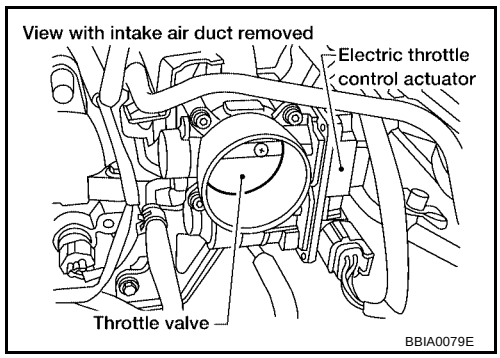
OK >> GO TO 11.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1612, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

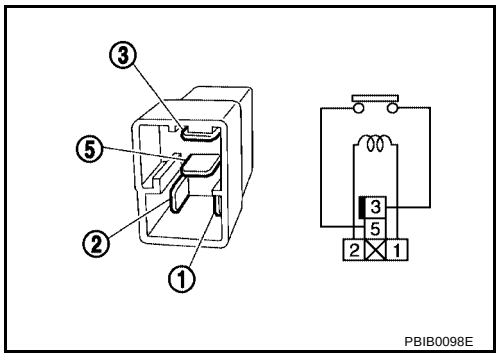
UBS006JS

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



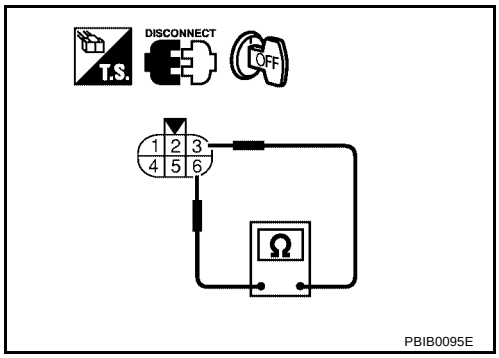
PBIB0098E

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-1255, "Throttle Valve Closed Position Learning" .
5. Perform EC-1255, "Idle Air Volume Learning" .



PBIB0095E

Remove and Installation

UBS006JT

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

UBS006JU

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

UBS006JV

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

UBS006JW

These self-diagnosis have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low.	● Harness or connectors (Throttle control motor relay circuit is open) ● Throttle control motor relay

FAIL-SAFE MODE

When the DTC is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

UBS006JX

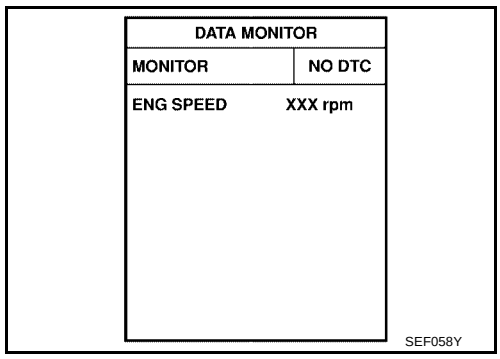
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-1616, "Diagnostic Procedure" .



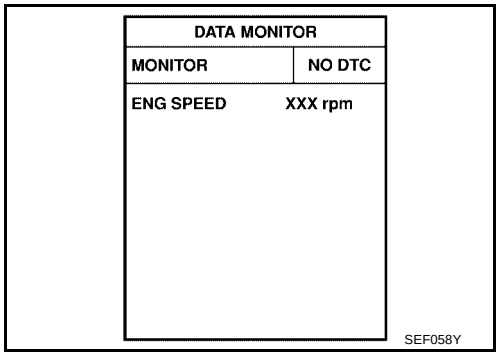
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1616, "Diagnostic Procedure" .



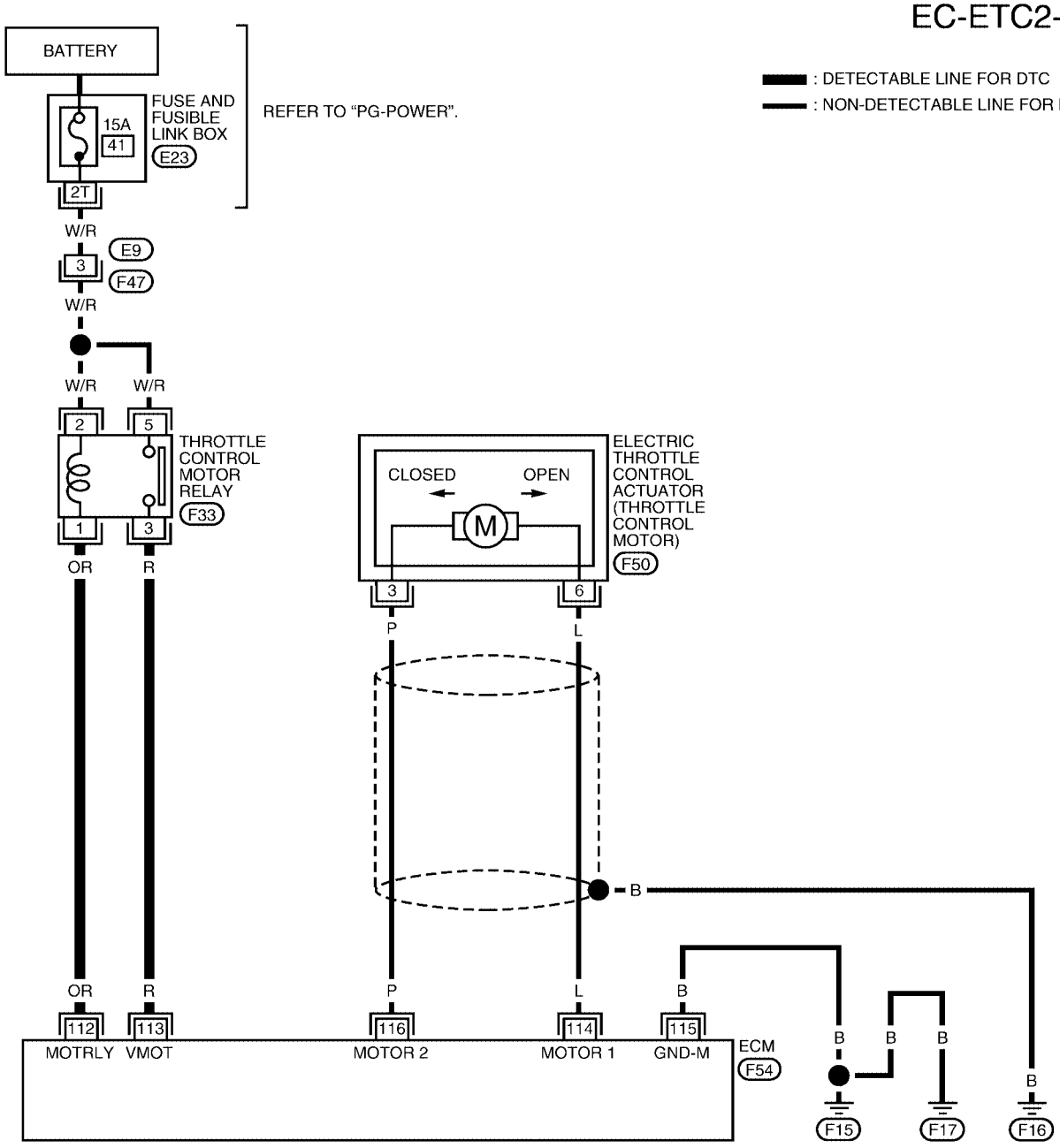
With GST

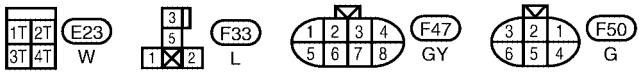
Follow the procedure “With CONSULT-II” above.

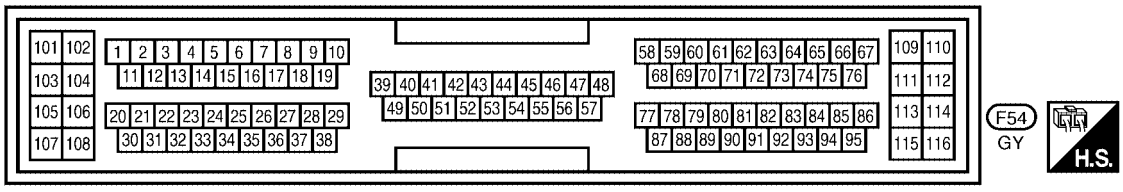
Wiring Diagram

UBS006JY

EC-ETC2-01







BBWA0250E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

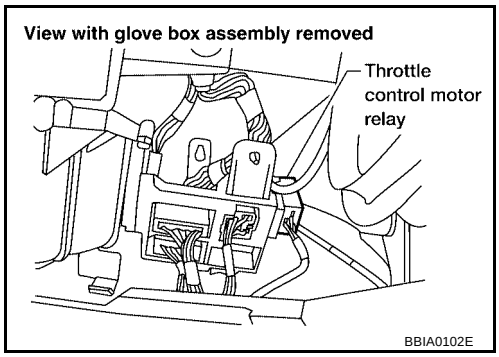
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
112	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
113	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS006JZ

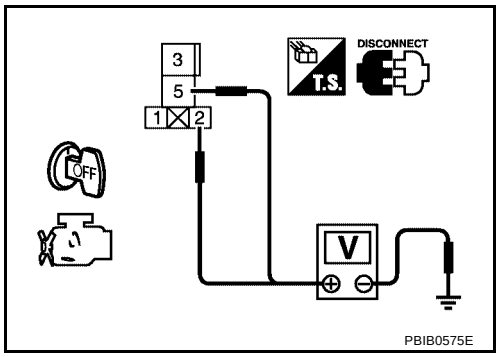
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay harness connector.



3. Check voltage between throttle control motor relay terminal 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse and fusible link connector E23
- 15A fuse
- Harness for open or short between throttle control motor relay and battery

>> Repair or replace harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check continuity between ECM terminal 113 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check continuity between ECM terminal 112 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-1617, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace throttle control motor relay.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

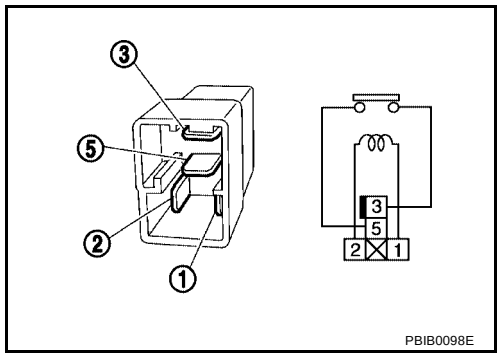
UBS006K0

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



PBIB0098E

DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

UBS006K1

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

UBS006K2

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

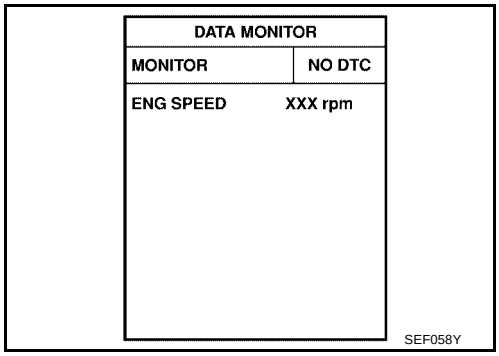
DTC Confirmation Procedure

UBS006K3

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1620, "Diagnostic Procedure" .



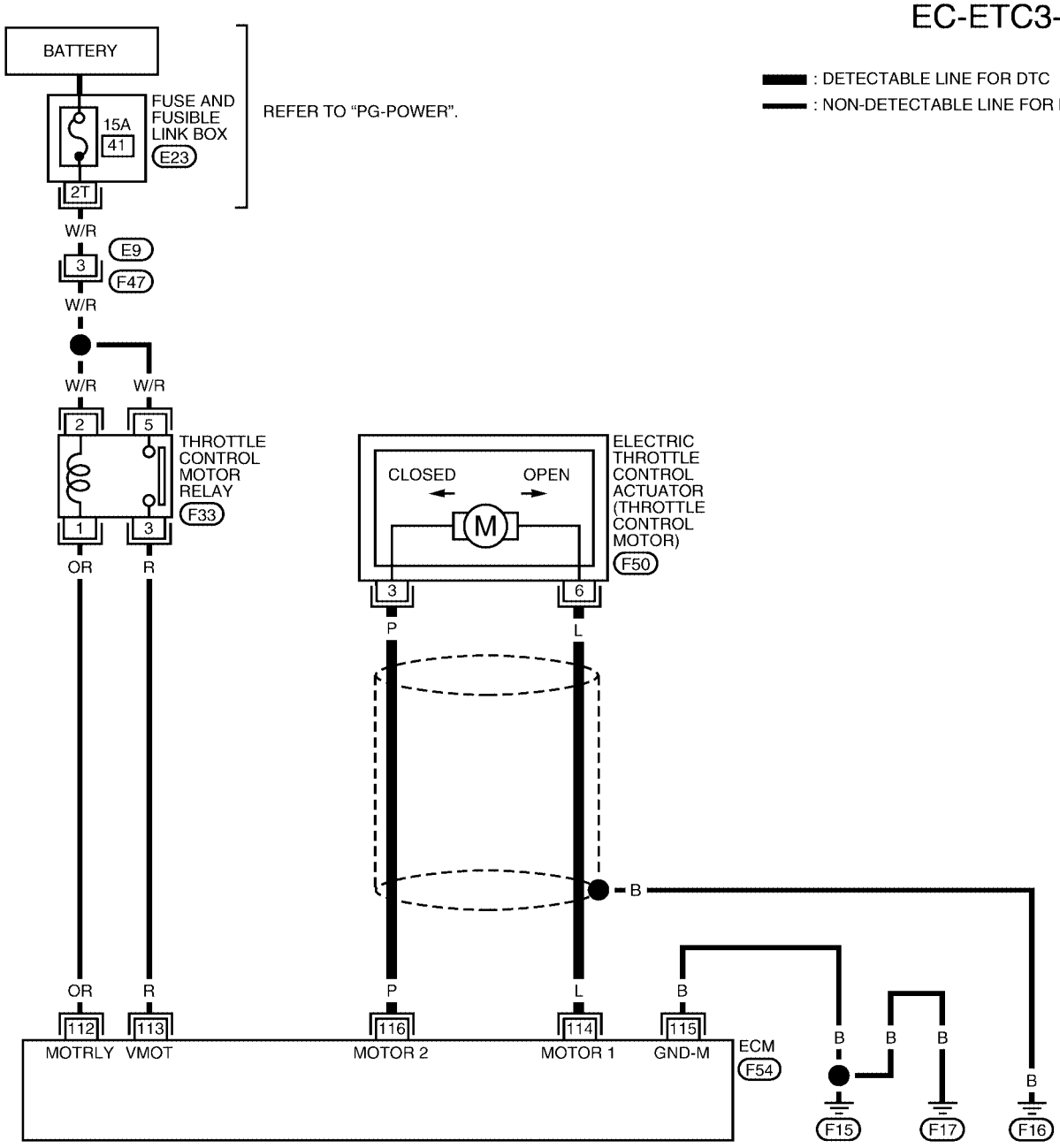
WITH GST

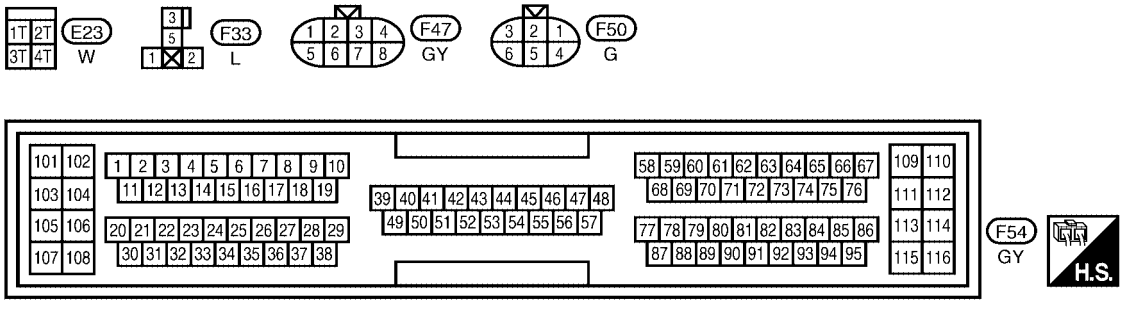
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006K4

EC-ETC3-01



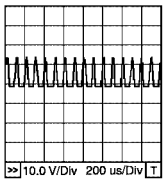
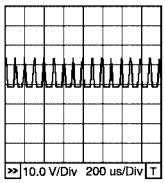


BBWA0251E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
114	L	Throttle control motor (Open)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
116	P	Throttle control motor (Close)	**[Ignition switch "ON"]** ● **Engine stopped** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

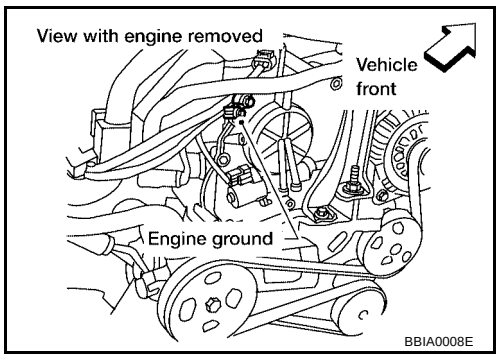
Diagnostic Procedure

UBS006K5

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

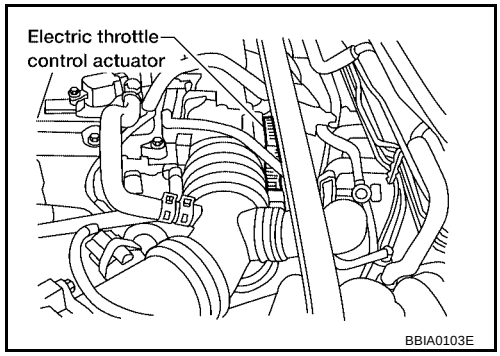
>> GO TO 2.



BBIA0008E

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	114	Should not exist
	116	Should exist
6	114	Should exist
	116	Should not exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1621, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

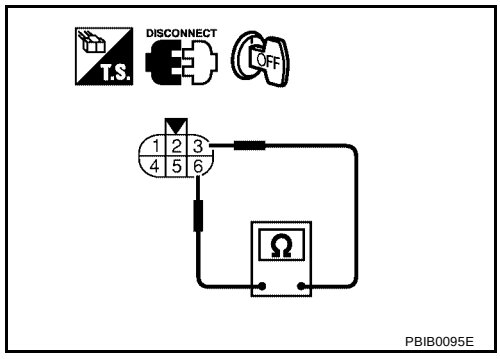
Component Inspection

UBS006K6

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-1255, "Throttle Valve Closed Position Learning" .
5. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006K7

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

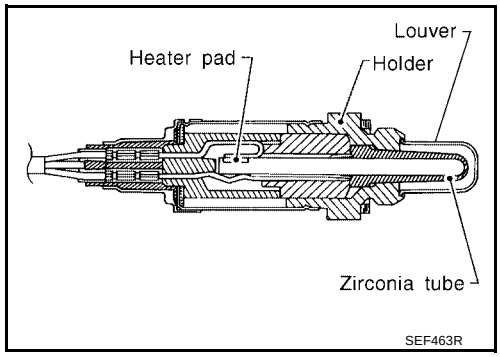
DTC P1143 HO2S1

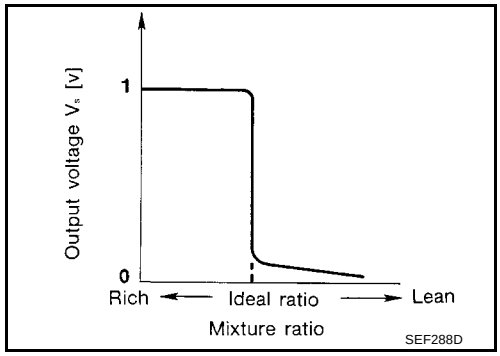
PFP:22690

Component Description

UBS002HF

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002HG

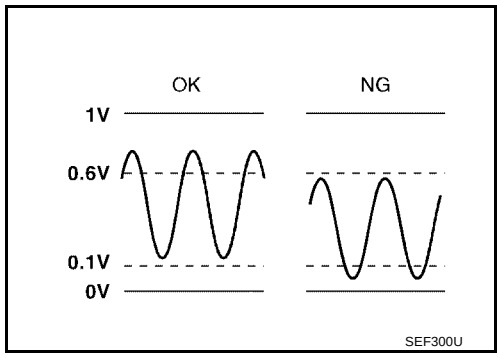
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002HH

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1143 1143	Heated oxygen sensor 1 lean shift monitoring	The maximum and minimum voltage from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

UBS002HI

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

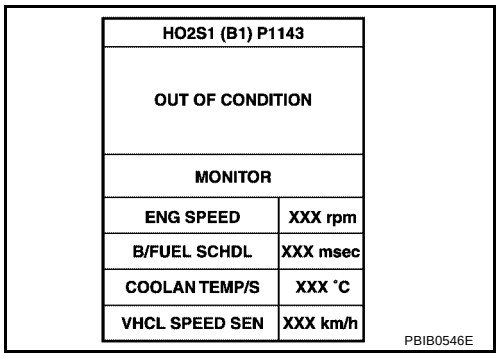
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

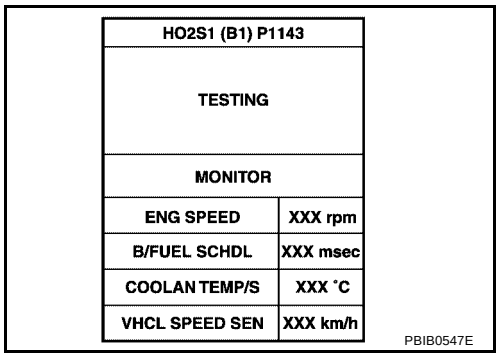
   NOTE:

   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



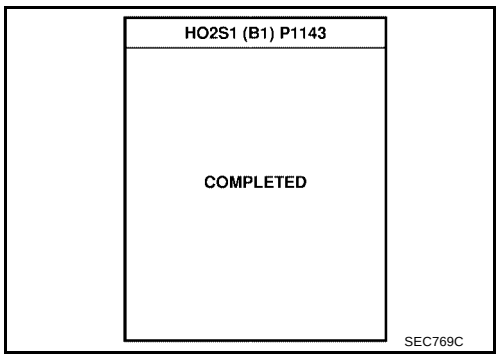
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,200 - 3,200 rpm
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	1.9 - 13.0 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1625, "Diagnostic Procedure" .



Overall Function Check

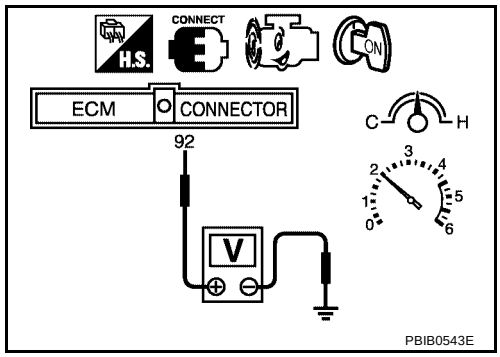
UBS002HJ

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.

2. Set voltmeter probes between ECM terminal 92 [HO2S1(B1) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is over 0.6V at at least one time.
   - The minimum voltage is over 0.1V at at least one time.
4. If NG, go to EC-1625, "Diagnostic Procedure" .



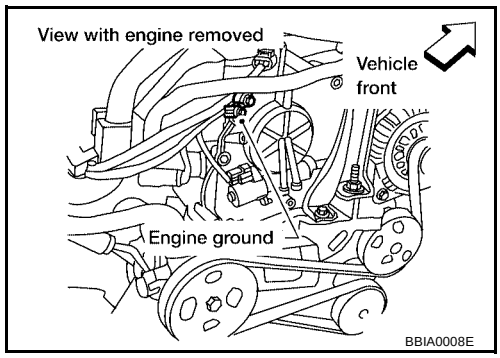
Diagnostic Procedure

UBS002HK

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



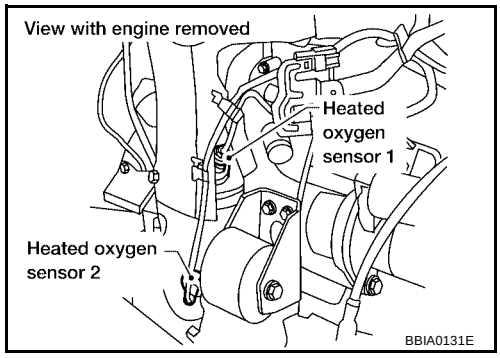
2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque:

40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

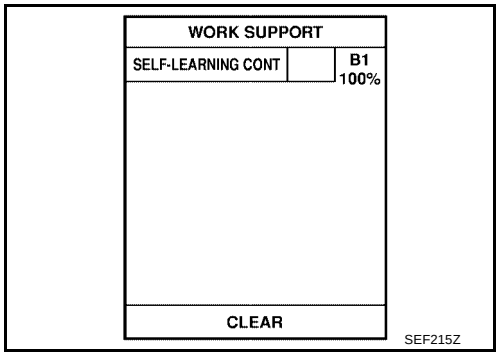
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

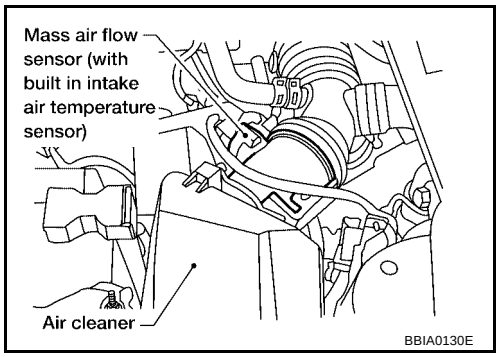
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-1442 .
No >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1361, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1627, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-1408, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

UBS002HL

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

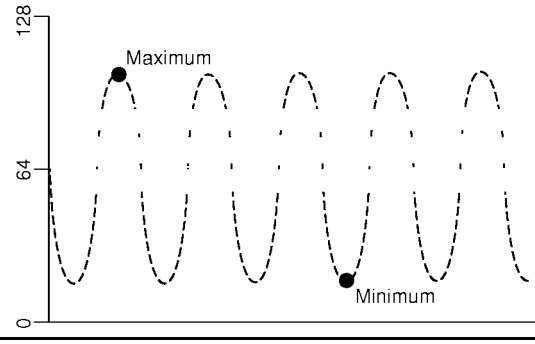
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



CAUTION:

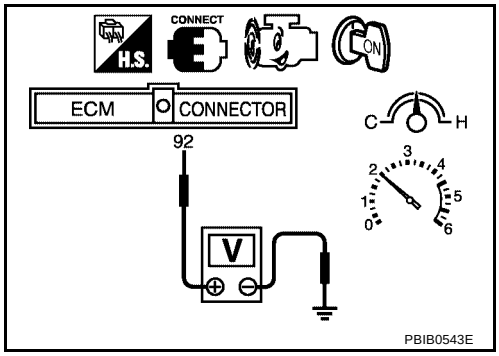
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002HM

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

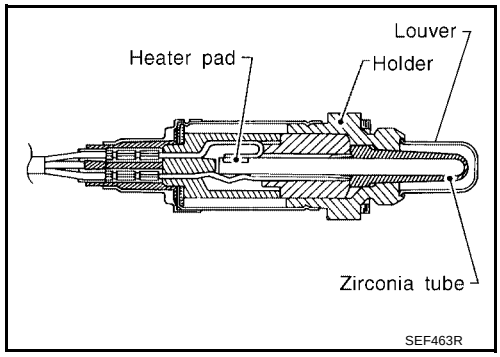
DTC P1144 HO2S1

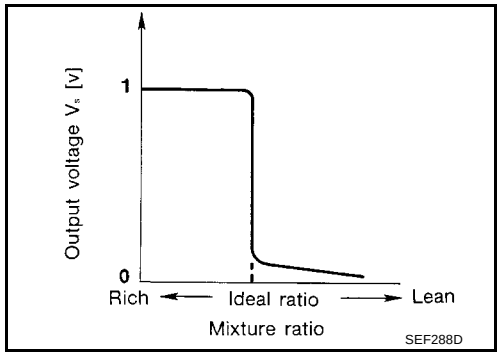
PFP:22690

Component Description

UBS002HN

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

UBS002HO

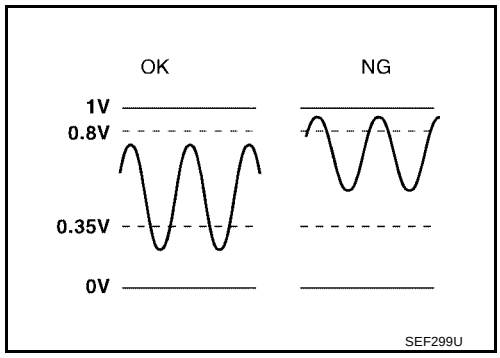
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

UBS002HP

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144 1144	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors

DTC Confirmation Procedure

UBS002HQ

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

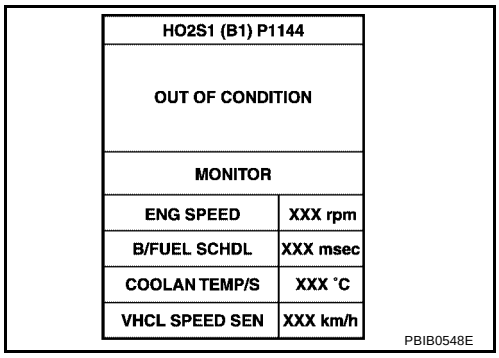
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 5 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1144” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

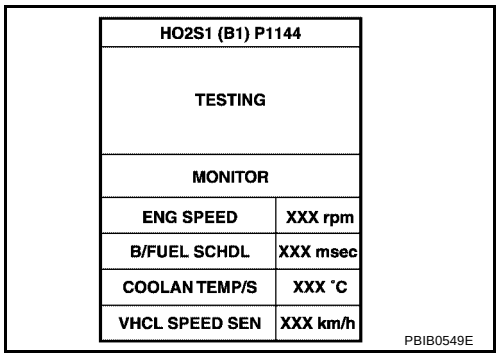
   NOTE:

   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



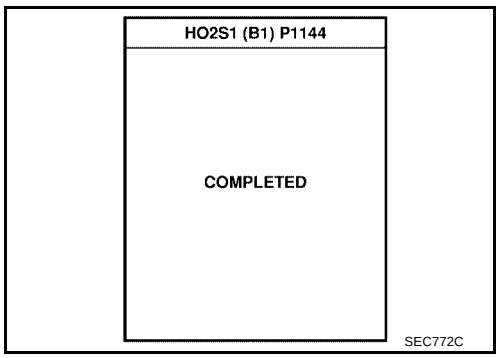
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,200 - 3,200 rpm
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	1.9 - 13.0 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1631, "Diagnostic Procedure" .



Overall Function Check

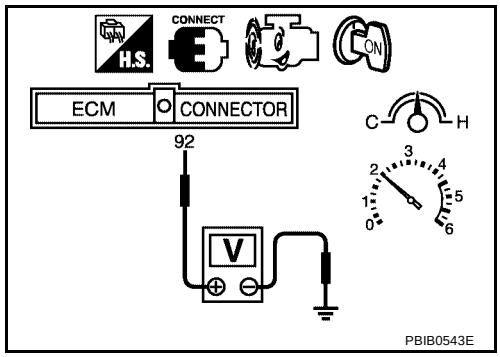
UBS002HR

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.

2. Set voltmeter probes between ECM terminal 92 [HO2S1(B1) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is below 0.8V at least one time.
   - The minimum voltage is below 0.35V at least one time.
4. If NG, go to EC-1631, "Diagnostic Procedure" .



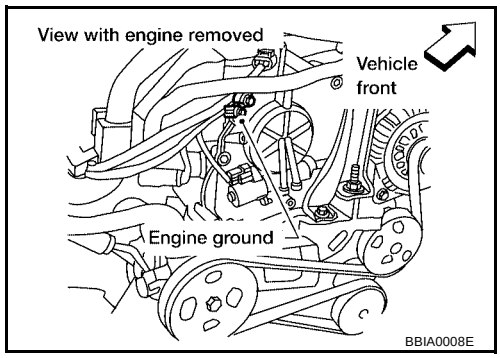
Diagnostic Procedure

UBS002HS

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

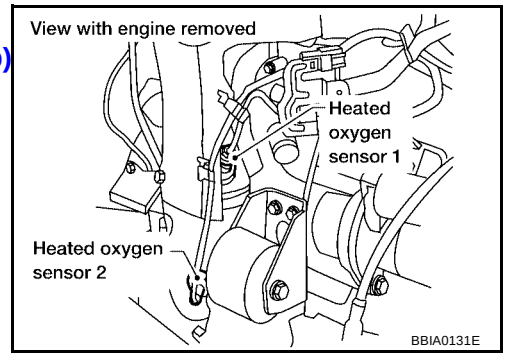


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

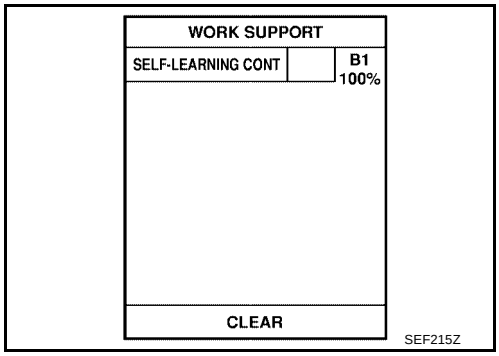
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

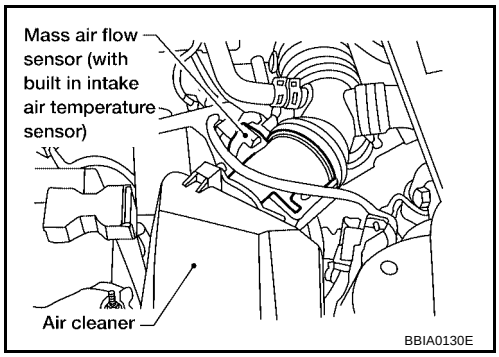
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-1449 .
No >> GO TO 4.

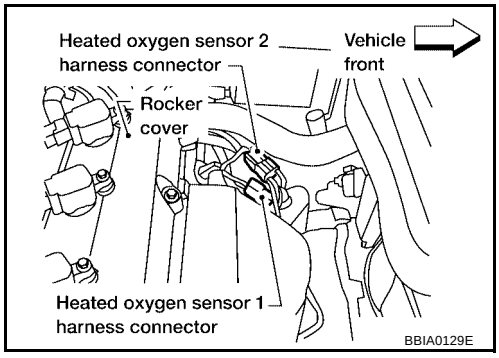
4. CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.



5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1361, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1633, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-1408, "Wiring Diagram" .

>> **INSPECTION END**

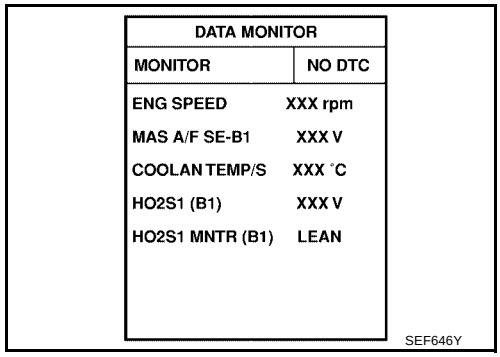
Component Inspection

UBS002HT

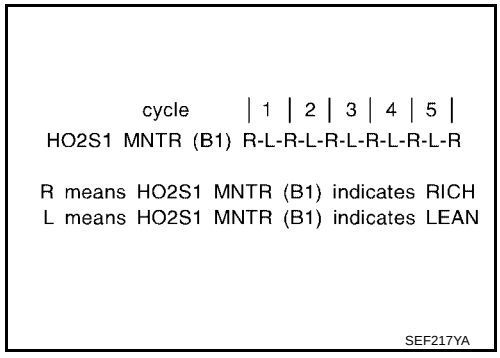
HEATED OXYGEN SENSOR 1

With CONSULT-II

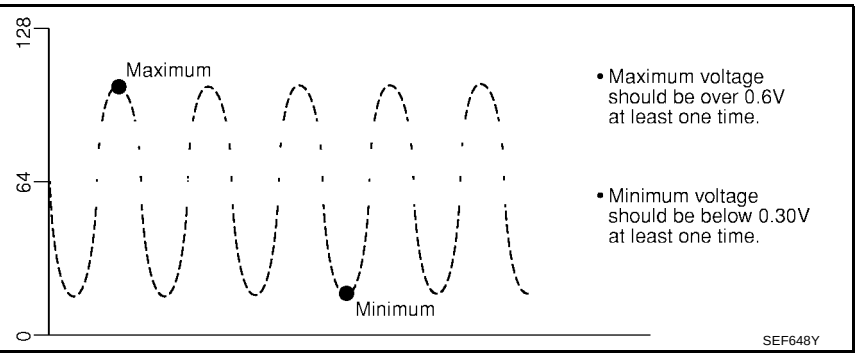
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



CAUTION:

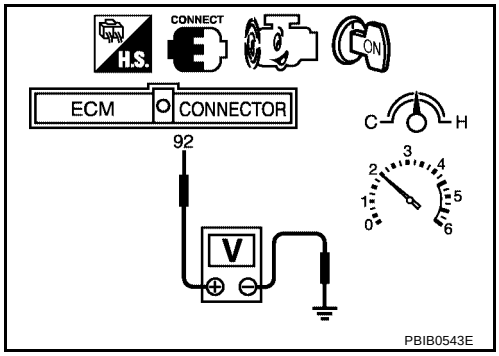
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002HU

HEATED OXYGEN SENSOR 1

Refer to EM-110, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

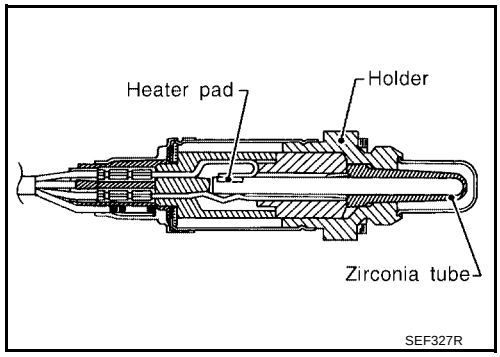
DTC P1146 HO2S2

PFP:226A0

Component Description

UBS002HV

The heated oxygen sensor 2, after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS002HW

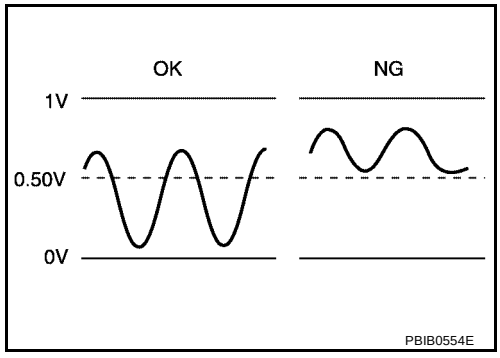
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Warm-up condition ● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)			LEAN ←→ RICH

On Board Diagnosis Logic

UBS002HX

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146 1146	Heated oxygen sensor 2 minimum voltage monitoring	The minimum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors

DTC Confirmation Procedure

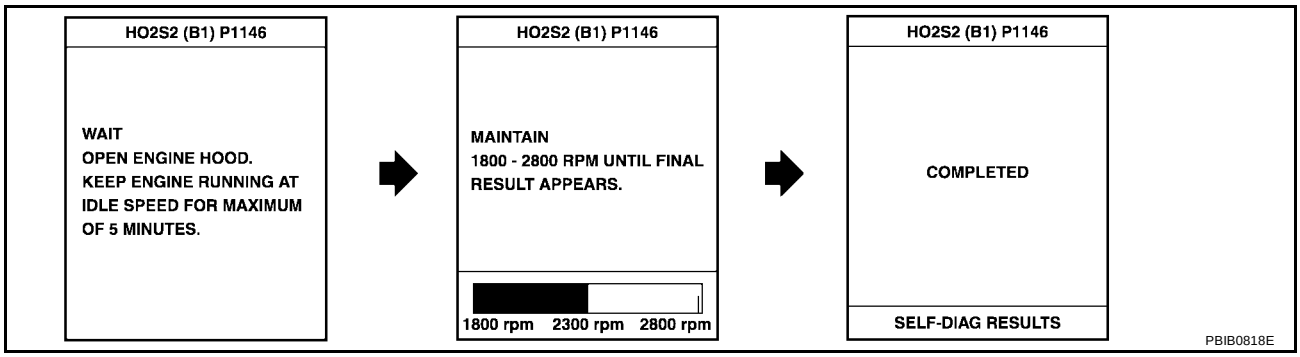
UBS002HY

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Open engine hood before conducting following procedure.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.

4. Let engine idle for one minutes.
5. Select “HO2S2 (B1) P1146” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, go to EC-1638, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANTEMP/S” indiction on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step3.

Overall Function Check

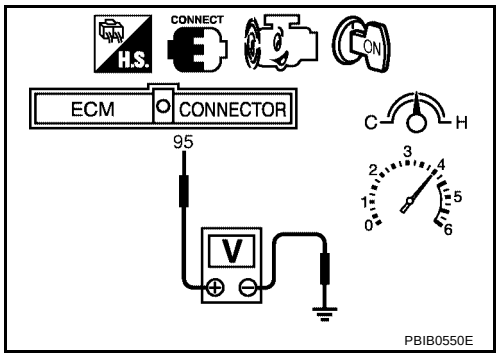
UBS002HZ

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.50V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.

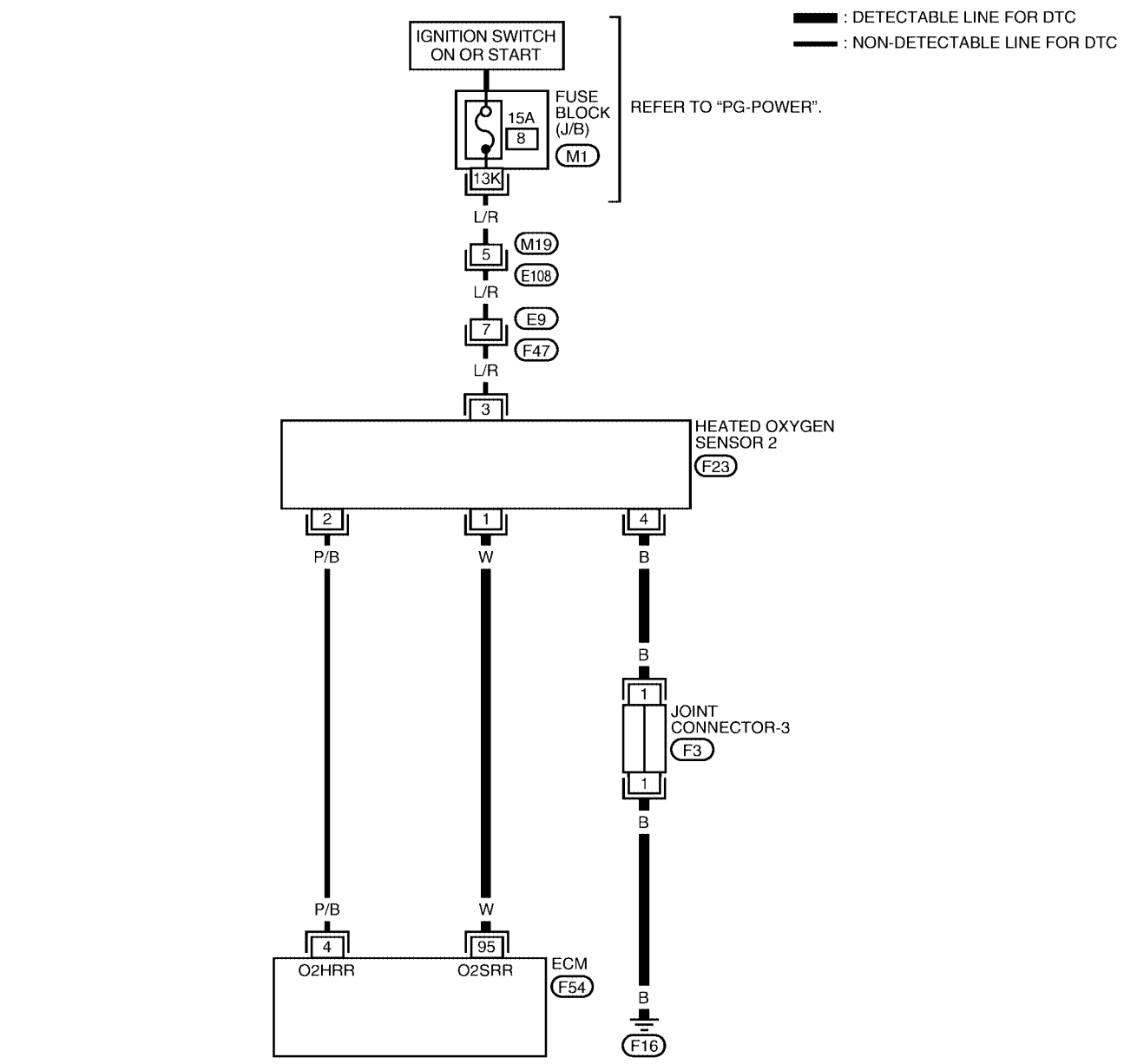


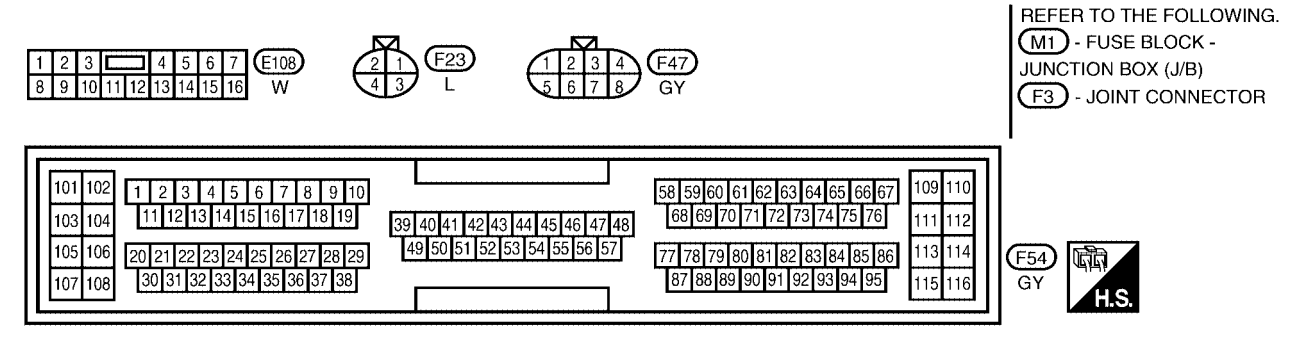
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, go to EC-1638, "Diagnostic Procedure" .

Wiring Diagram

UBS002I0

EC-HO2S2-01





BBWA0415E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600rpm after the following conditions are met. – Engine after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V

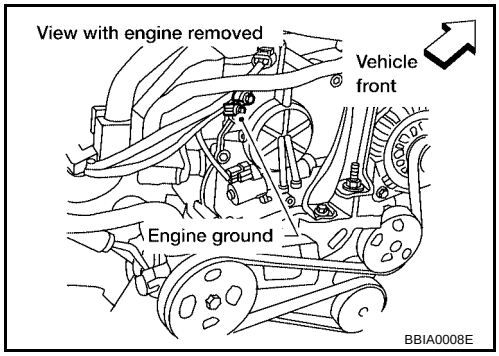
Diagnostic Procedure

UBS002I1

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

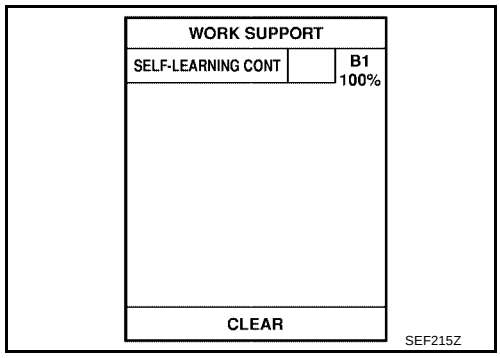
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

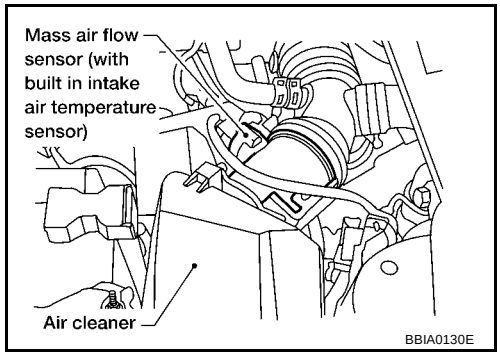
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-1449 .
No >> GO TO 3.

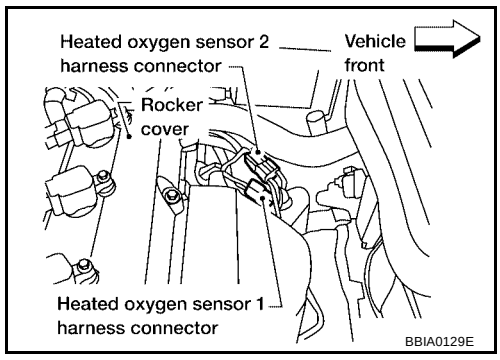
3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open and short between HO2S2 and engine ground

>> Repair open circuit or short to power in harness or connectors.

5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 95 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Check harness continuity between ECM terminal 95 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.
4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1640, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

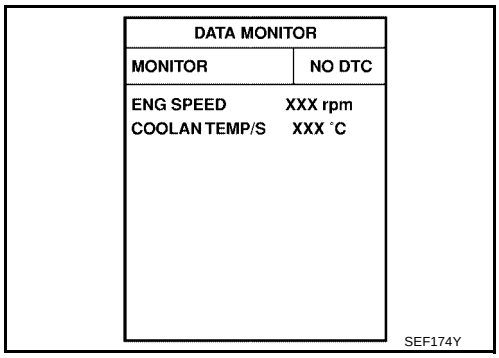
Component Inspection

UBS002I2

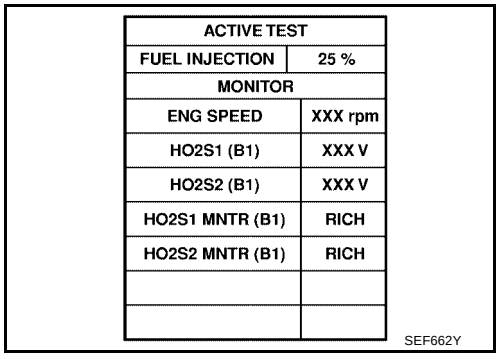
HEATED OXYGEN SENSOR 2

With CONSULT-II

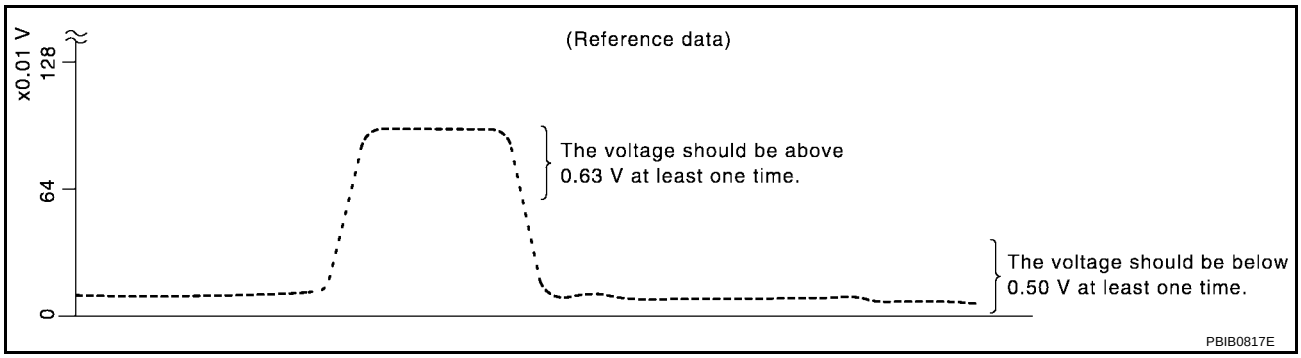
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minutes.



6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



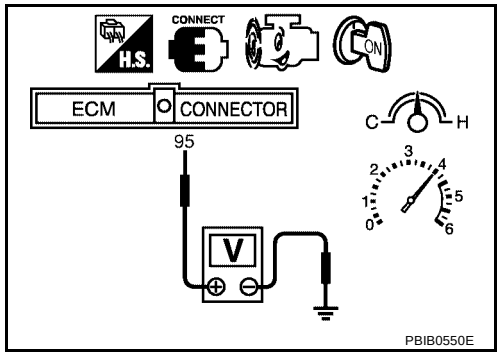
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002I3

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

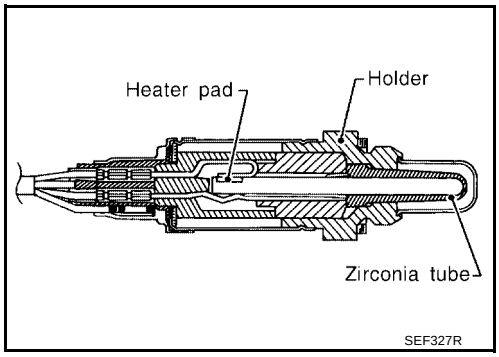
DTC P1147 HO2S2

PFP:226A0

Component Description

UBS002I4

The heated oxygen sensor 2, after three way catalyst (Manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

UBS002I5

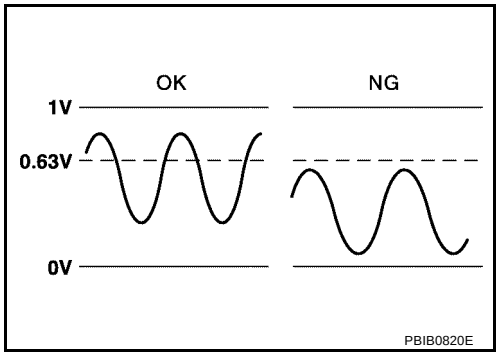
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Warm-up condition	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load.		LEAN ←→ RICH

On Board Diagnosis Logic

UBS002I6

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147 1147	Heated oxygen sensor 2 maximum voltage monitoring	The maximum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

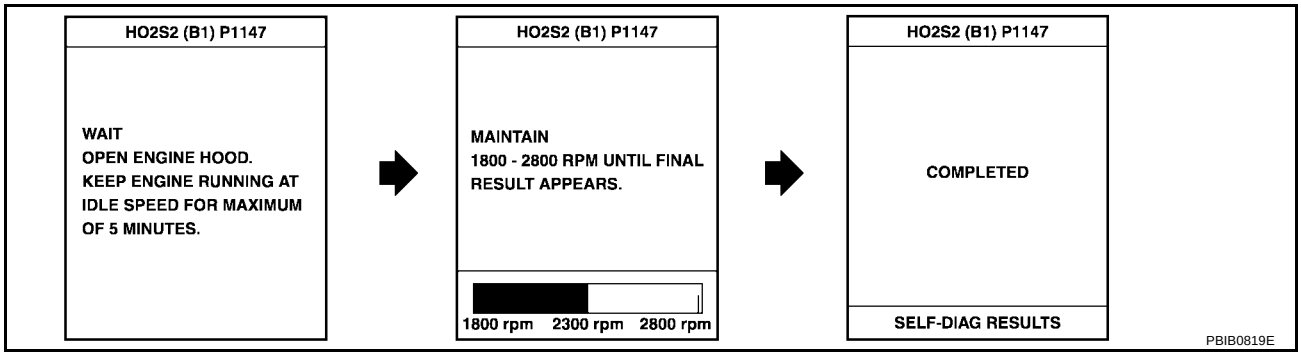
UBS002I7

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
For the best result, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select “HO2S2 (B1) P1147” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II and follow the instruction of CONSULT-II.



6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, go to EC-1645, "Diagnostic Procedure" .
   If “CAN NOT BE DIAGNOSED” is displayed, perform the following.

a. Turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch “ON” and select “COOLANTEMP/S” in “DATA MONITOR” mode with CONSULT-II.
c. Start engine and warm it up while monitoring “COOLANTEMP/S” indication on CONSULT-II.
d. When “COOLANTEMP/S” indication reaches to 70°C (158°F), go to step 3.

Overall Function Check

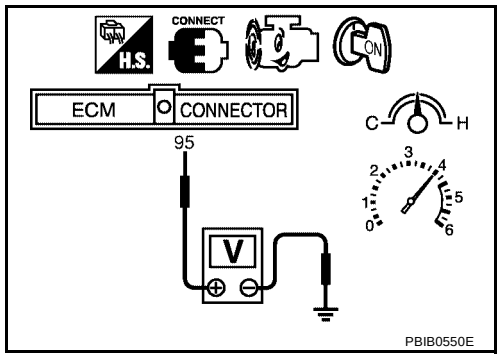
UBS002I8

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
5. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage can be confirmed in step 5, step 6 is not necessary.

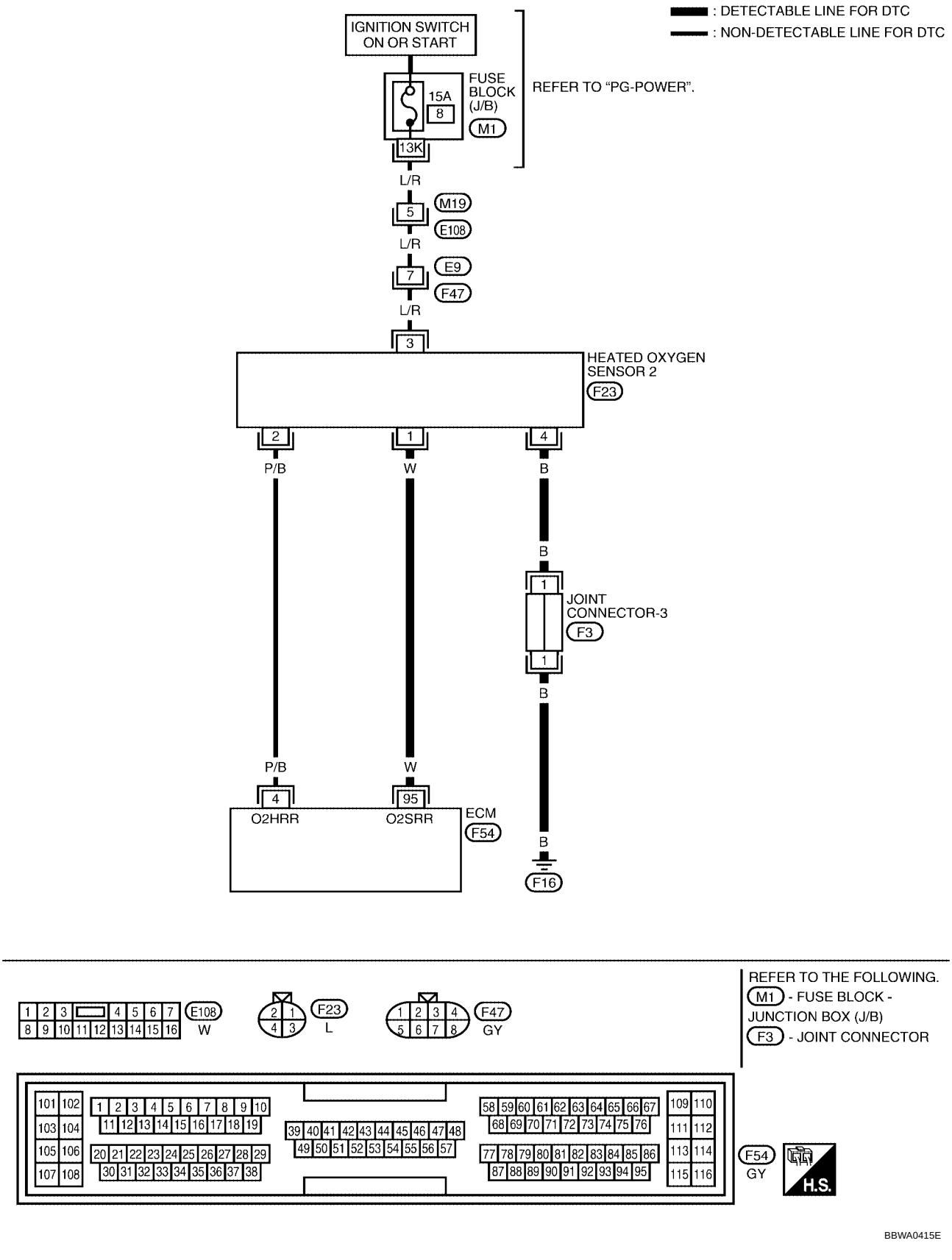


6. Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be above 0.63V at least once during this procedure.
7. If NG, go to EC-1645, "Diagnostic Procedure" .

Wiring Diagram

UBS002I9

EC-HO2S2-01



BBWA0415E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
95	W	Heated oxygen sensor 2	**[Engine is running]** ● Engine speed is below 3,600rpm after the following conditions are met. – Engine after warming up – Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load. ● Revving engine from idle to 3,000 rpm quickly.	0 - Approximately 1.0V

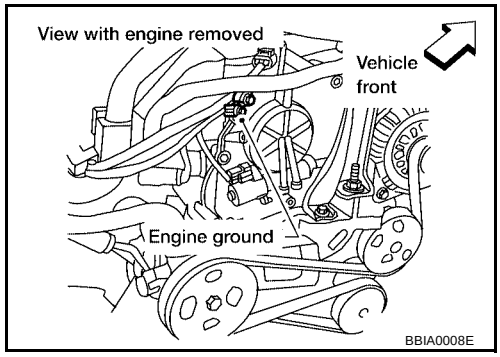
Diagnostic Procedure

UBS002IA

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

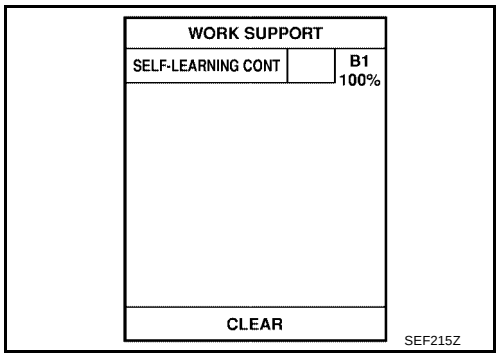
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

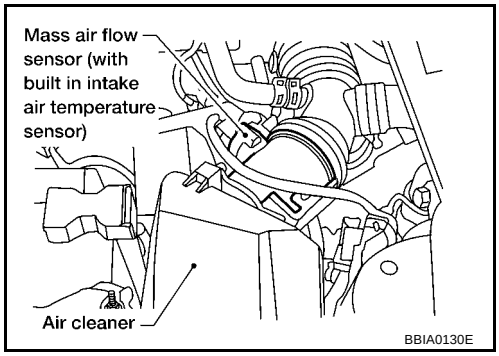
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1273, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-1442 .
No >> GO TO 3.

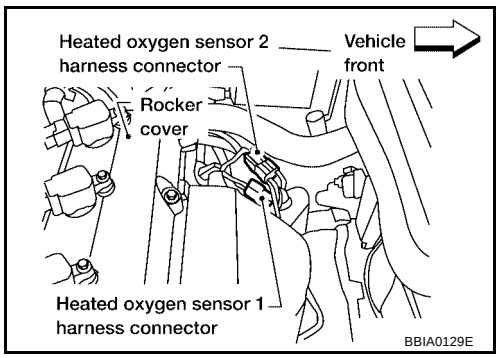
3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-3
- Harness for open or short between HO2S2 and engine ground

>> Repair open circuit or short to power in harness or connectors.

5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 95 and HO2S2 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Check harness continuity between ECM terminal 95 or HO2S2 terminal 1 and ground. Refer to Wiring Diagram.

Continuity should not exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1647, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

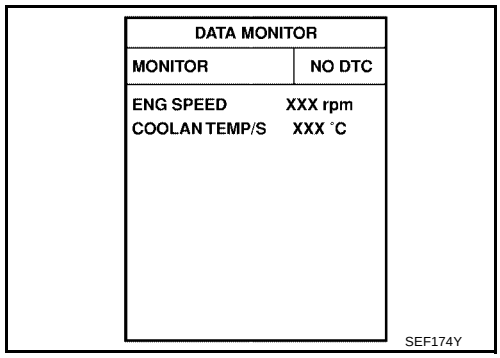
Component Inspection

UBS002IB

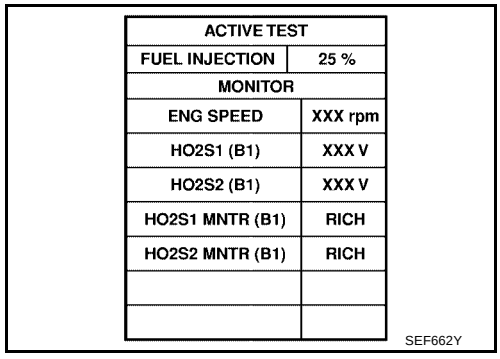
HEATED OXYGEN SENSOR 2

With CONSULT-II

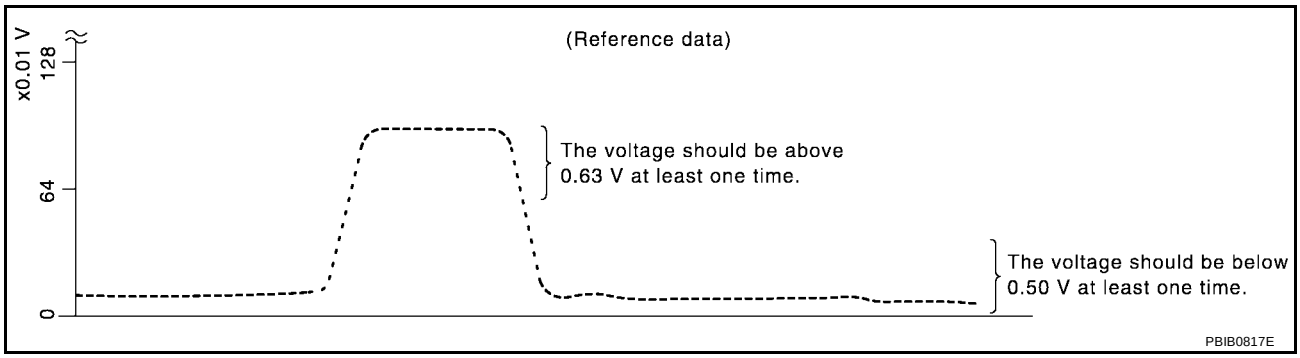
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minutes.



6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.



7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



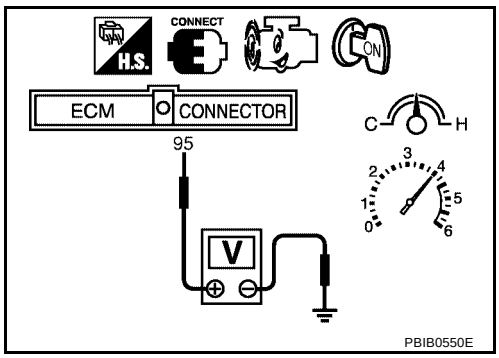
“HO2S2 (B1)” should be above 0.63V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is –25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minutes.
5. Set voltmeter probes between ECM terminal 95 [HO2S2 (B1) signal] and engine ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.63V at least once during this procedure.
   If the voltage is above 0.63V at step 6, step 7 is not necessary.



7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

UBS002IC

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P1148 CLOSED LOOP CONTROL

PFP:22690

On Board Diagnosis Logic

UBS002ID

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148	Closed loop control function	The closed loop control function does not operate even when vehicle is driving in the specified condition.	● The heated oxygen sensor 1 circuit is open or shorted. ● Heated oxygen sensor 1 ● Heated oxygen sensor heater

DTC Confirmation Procedure

UBS002IE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

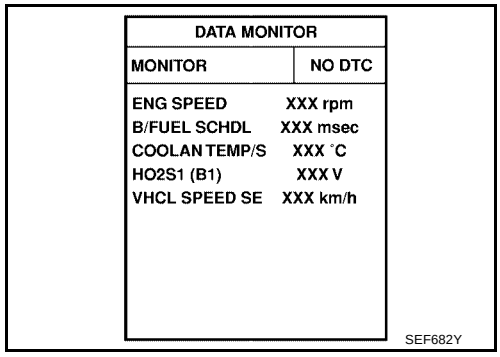
TESTING CONDITION:

- **Never raise engine speed above 3,600 rpm during the “DTC Confirmation Procedure”. If the engine speed limit is exceeded, retry the procedure from step 2.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Hold engine speed at 2,000 rpm and check one of the following.
   - “HO2S1 (B1)” voltage should go above 0.70V at least once.
   - “HO2S1 (B1)” voltage should go below 0.21V at least once.

   If the check result is NG, perform EC-1650, "Diagnostic Procedure" .
   If the check result is OK, perform the following step.
4. Let engine idle at least 5 minutes.
5. Maintain the following condition at least 50 consecutive seconds.



B/FUEL SCHDL	2.8 msec or more
ENG SPEED	More than 1,600 rpm
Selector lever	Suitable position
VHCL SPEED SE	More than 70 km/h (43 MPH)

During this test, P0134 may be displayed on CONSULT-II screen.

6. If DTC is detected, go to EC-1650, "Diagnostic Procedure" .

Overall Function Check

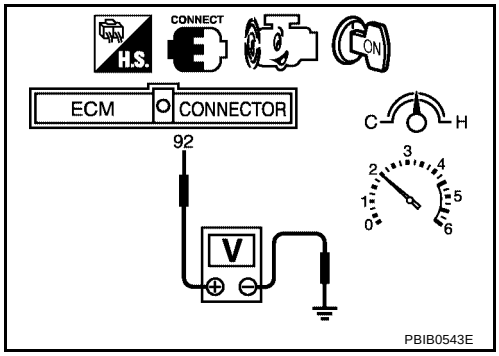
UBS002IF

Use this procedure to check the overall function of the closed loop control. During this check, a DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.

2. Set voltmeter probes between ECM terminal 92 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no-load.
   - The voltage should go above 0.70V at least once.
   - The voltage should go below 0.21V at least once.
4. If NG, go to EC-1650, "Diagnostic Procedure" .



Diagnostic Procedure

UBS002IG

Perform trouble diagnosis for “DTC P0133”, EC-1416 .

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

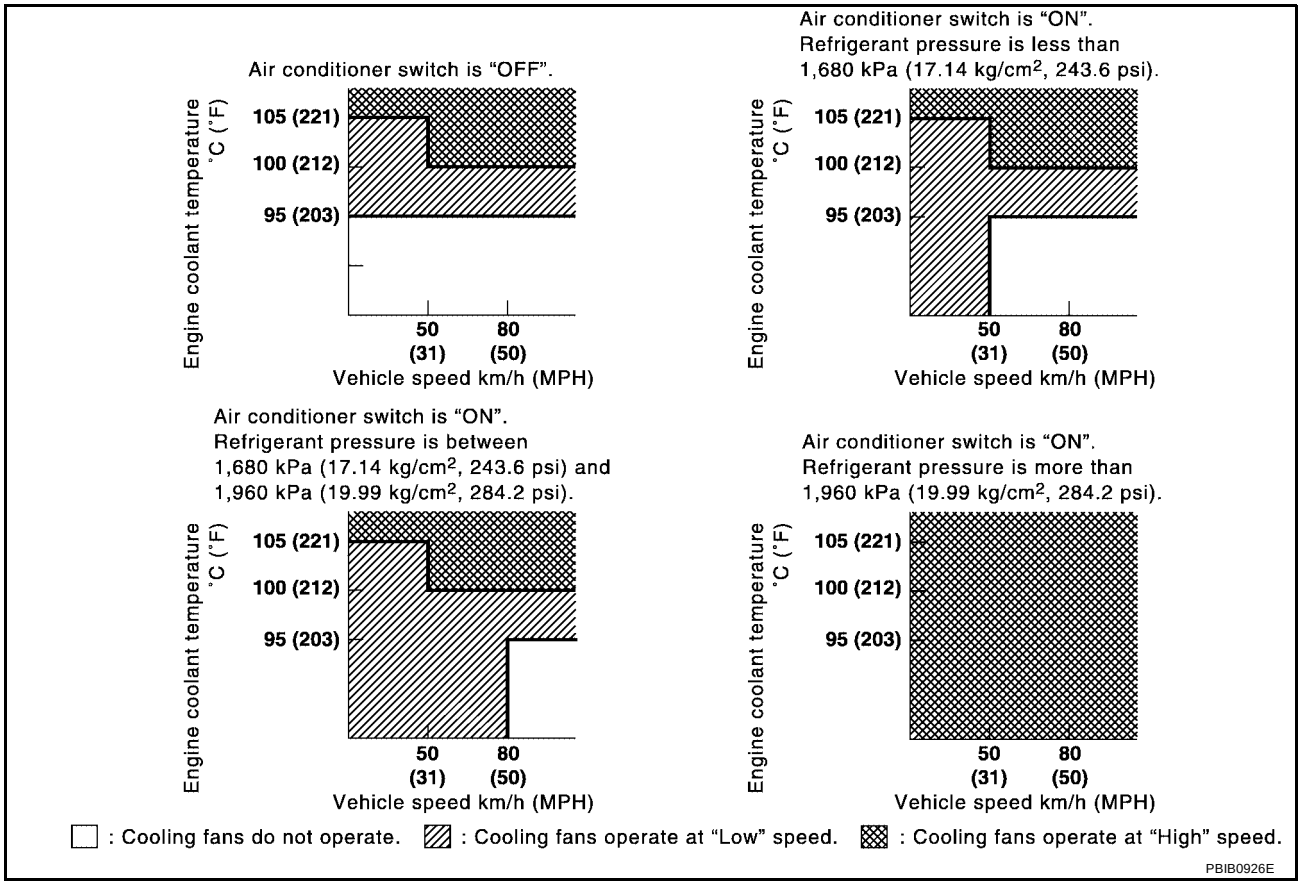
UBS002IH

COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

UBS002II

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

On Board Diagnosis Logic

UBS002IJ

This self-diagnosis has the one trip detection logic.
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-1662, "Main 12 Causes of Overheating" .

CAUTION:
When a malfunction is indicated, be sure to replace the coolant. Refer to MA-23, "Changing Engine Coolant" . Also, replace the engine oil. Refer to LU-17, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

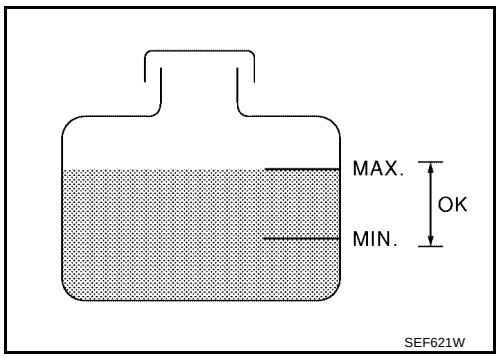
UBS002IK

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

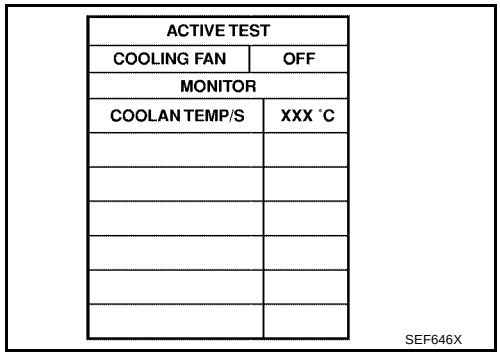
WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1655, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1655, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.

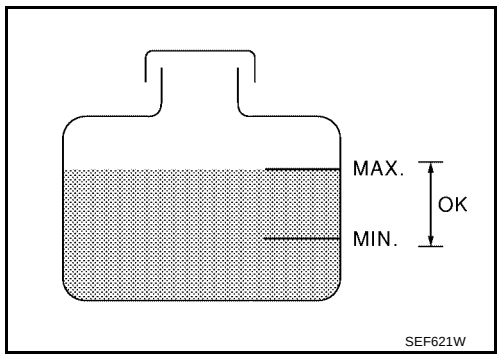


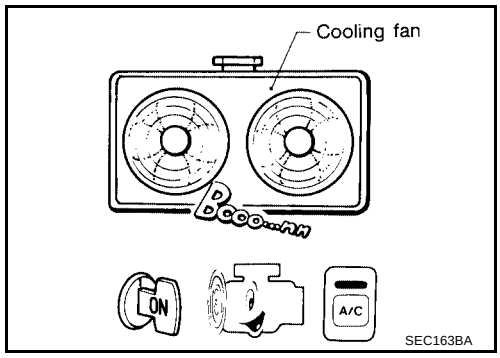
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-1655, "Diagnostic Procedure" .



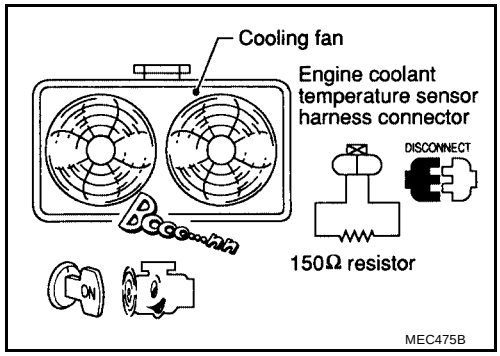
WITH GST

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1655, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1655, "Diagnostic Procedure" .
3. Start engine.
   Be careful not to overheat engine.
4. Turn air conditioner switch “ON”.
5. Turn blower fan switch “ON”.
6. Make sure that cooling fan operates at low speed.
   If NG, go to EC-1655, "Diagnostic Procedure" .
   If OK, go to the following step.
7. Turn ignition switch “OFF”.
8. Turn air conditioner switch and blower fan switch “OFF”.
9. Disconnect engine coolant temperature sensor harness connector.
10. Connect 150Ω resistor to engine coolant temperature sensor harness connector.



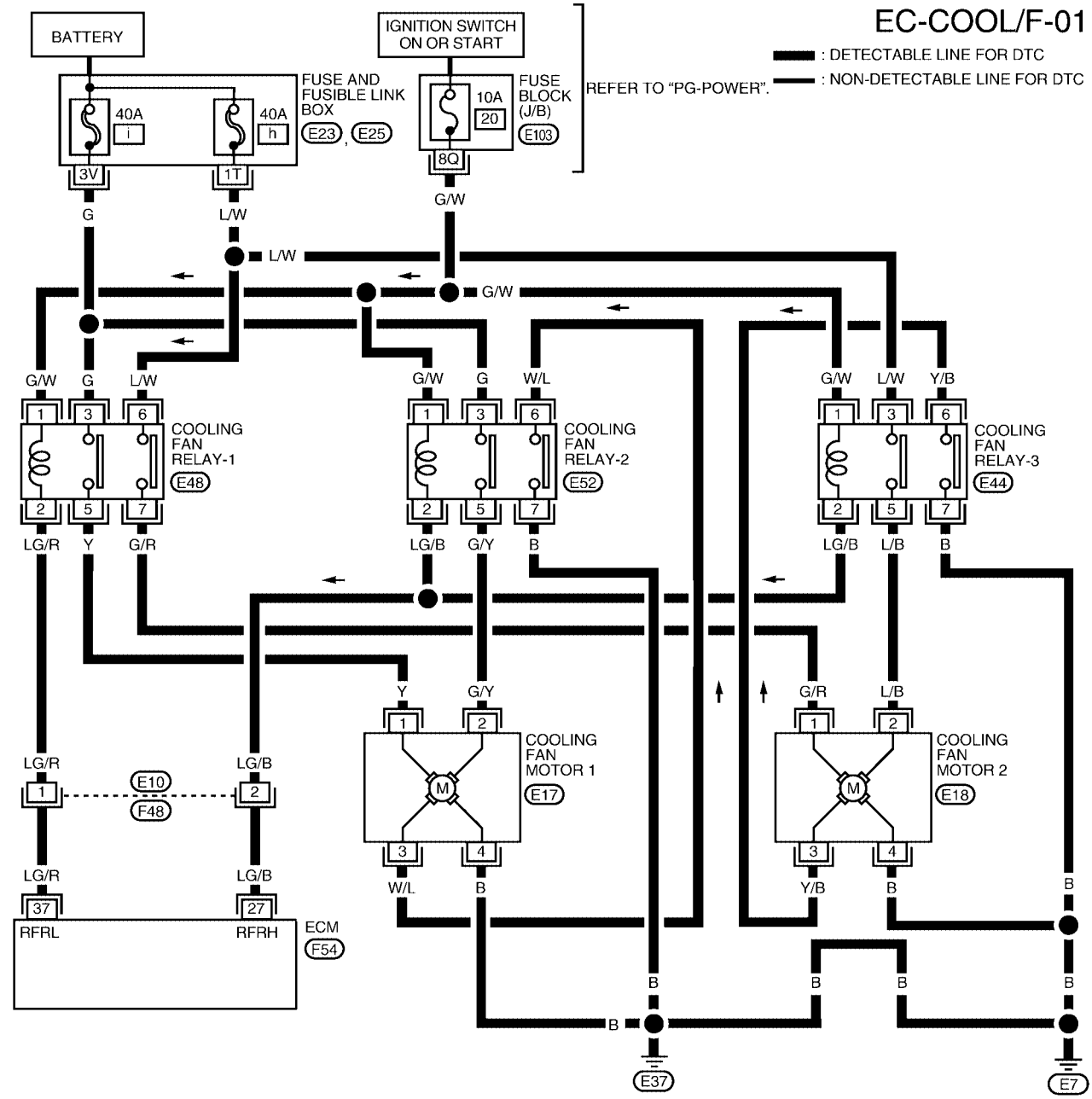


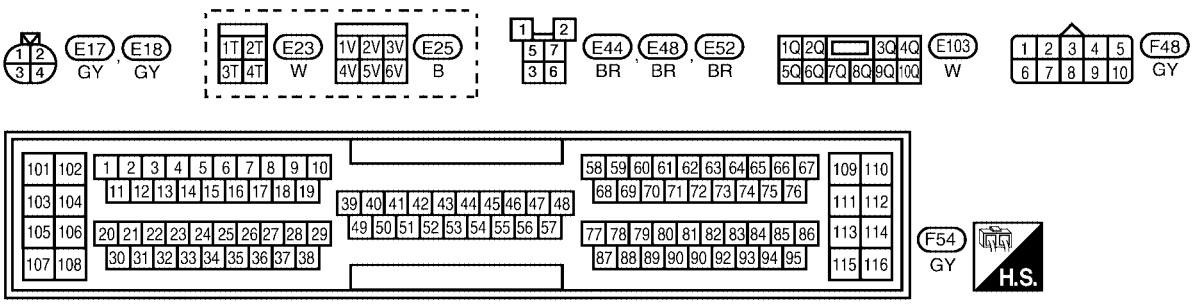
11. Restart engine and make sure that cooling fan operates at higher speed than low speed.
    Be careful not to overheat engine.
12. If NG, go to EC-1655, "Diagnostic Procedure" .



Wiring Diagram

UBS002IL





BBWA0431E

Diagnostic Procedure

UBS002IM

1. INSPECTION START

Do you have CONSULT-II?

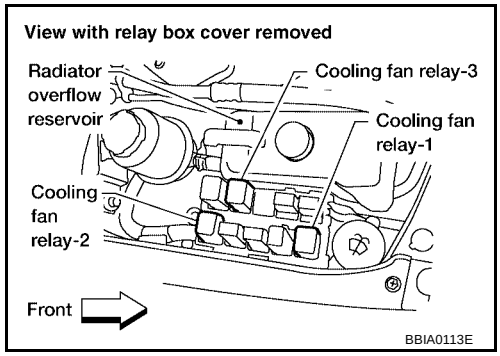
Yes or No

Yes >> GO TO 2.
No >> GO TO 4.

2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

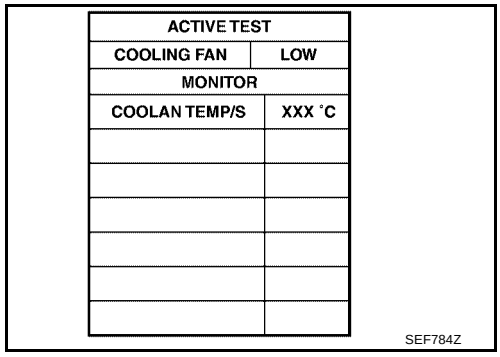
1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.



3. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “LOW” on the CONSULT-II screen.
4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 3.
NG >> Check cooling fan low speed control circuit. (Go to EC-1659, "PROCEDURE A" .)



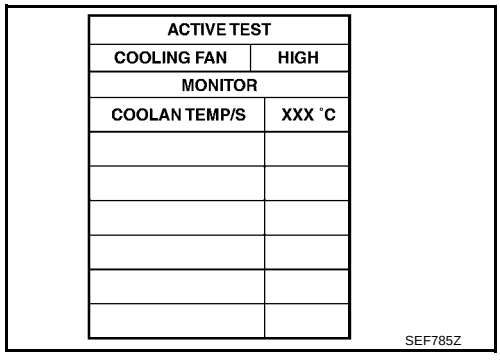
3. CHECK COOLING FAN HIGH SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relays-2 and -3.
3. Start engine and let it idle.
4. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “HIGH” on the CONSULT-II screen.
5. Make sure that cooling fans-1 and -2 operate at high speed.

OK or NG

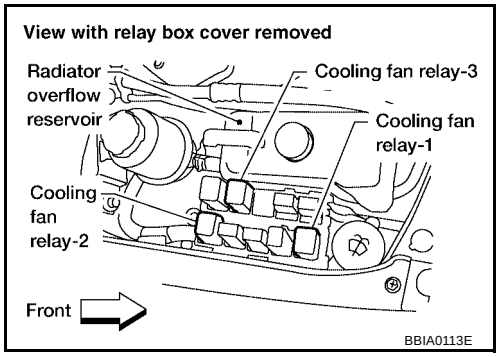
OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-1661, "PROCEDURE B" .)



4. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

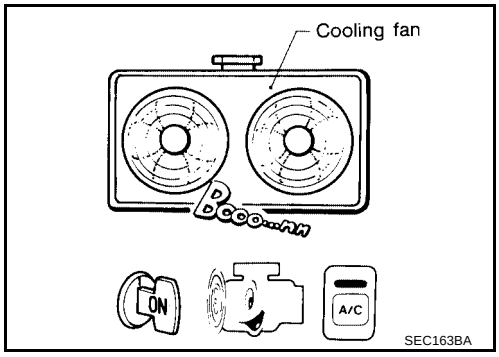
1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.
3. Turn air conditioner switch “ON”.
4. Turn blower fan switch “ON”.



5. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 5.
NG >> Check cooling fan low speed control circuit. (Go to EC-1659, "PROCEDURE A" .)



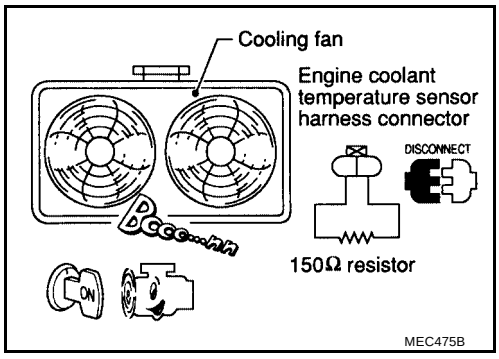
5. CHECK COOLING FAN HIGH SPEED OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relays-2 and -3.
3. Turn air conditioner switch and blower fan switch “OFF”.
4. Disconnect engine coolant temperature sensor harness connector.
5. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
6. Restart engine and make sure that cooling fans-1 and -2 operate at high speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan high speed control circuit. (Go to EC-1661, "PROCEDURE B" .)



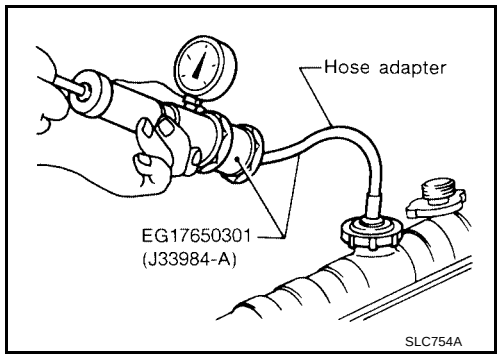
6. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.6 kg/cm^2 , 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.

Pressure should not drop.



OK or NG

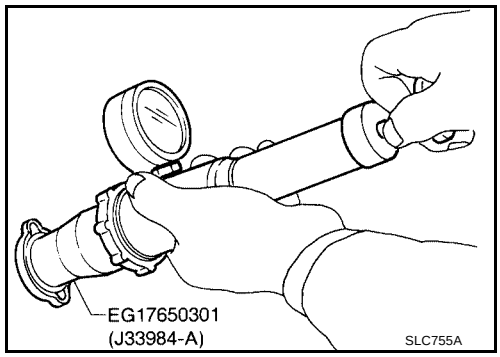
OK >> GO TO 7.
NG >> Check the following for leak.
- Hose
- Radiator
- Water pump
  Refer to CO-26, "WATER PUMP" .

7. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure:

59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 8.
NG >> Replace radiator cap.

8. CHECK THERMOSTAT

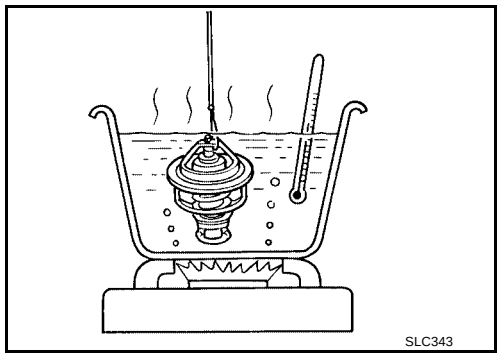
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.

   Valve opening temperature:

   82°C (180°F) [standard]

   Valve lift:

   More than 8 mm/95°C (0.31 in/203°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.
   For details, refer to CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" .



OK or NG

OK >> GO TO 9.
NG >> Replace thermostat.

9. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1390, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace engine coolant temperature sensor.

10. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to EC-1662, "Main 12 Causes of Overheating" .

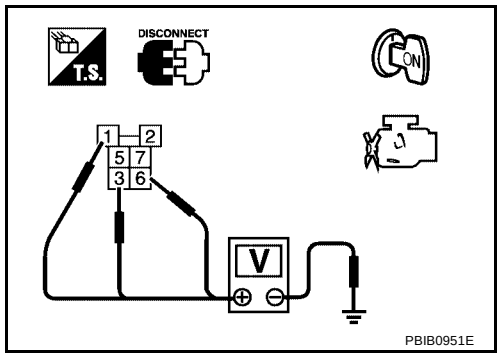
>> **INSPECTION END**

PROCEDURE A

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

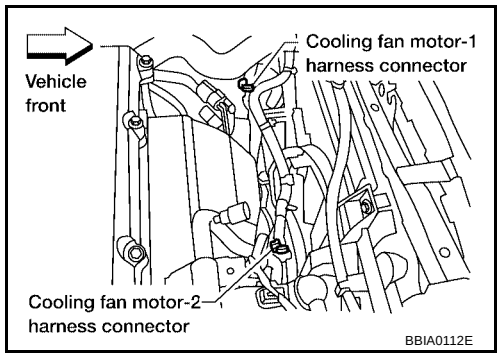
- 10A fuse
- Fuse block (J/B) connector E103
- 40A fusible links
- Fuse and fusible link box connectors E23, E25
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and fusible links

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 4 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 4 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 37 and cooling fan relay-1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relay-1 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-1663, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1663, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

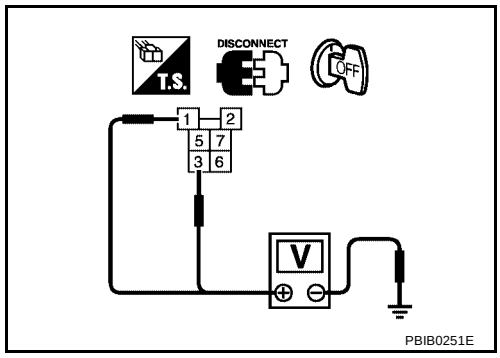
>> **INSPECTION END**

PROCEDURE B

1. CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch “ON”.
4. Check voltage between cooling fan relays-2 and -3 terminals 1, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

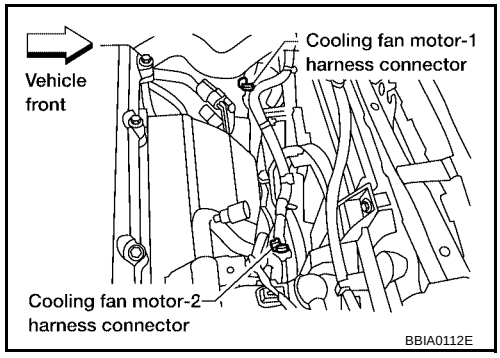
- Harness for open or short between cooling fan relays-2 and -3 and fuse
- Harness for open or short between cooling fan relays-2 and -3 and fusible links

>> Repair harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between the following;
   cooling fan relay-2 terminal 5 and cooling fan motor-1 terminal 2,
   cooling fan relay-2 terminal 6 and cooling fan motor-1 terminal 3,
   cooling fan relay-2 terminal 7 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.
5. Check harness continuity between the following;
   cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 2,
   cooling fan relay-3 terminal 6 and cooling fan motor-2 terminal 3,
   cooling fan relay-3 terminal 7 and body ground.
   Refer to Wiring Diagram.

Continuity should exist.

6. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 27 and cooling fan relay-2 terminal 2, cooling fan relay-3 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Harness for open or short between cooling fan relays-2, -3 and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAYS-2 AND -3

Refer to EC-1663, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relays.

7. CHECK COOLING FAN MOTORS

Refer to EC-1663, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

UBS002IN

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-14, "Anti-freeze Coolant Mixture Ratio" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-23, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See CO-34, "CHECKING RADIATOR CAP" .

Engine	Step	Inspection item	Equipment	Standard	Reference page
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-24, "CHECKING COOLING SYSTEM FOR LEAKS" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-28, "THERMOSTAT AND THERMOSTAT HOUSING" , and CO-30, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-1651).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-23, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-24, "CHECKING RESERVOIR LEVEL" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-145, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-145, "CYLINDER HEAD" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-22, "OVERHEATING CAUSE ANALYSIS" .

Component Inspection

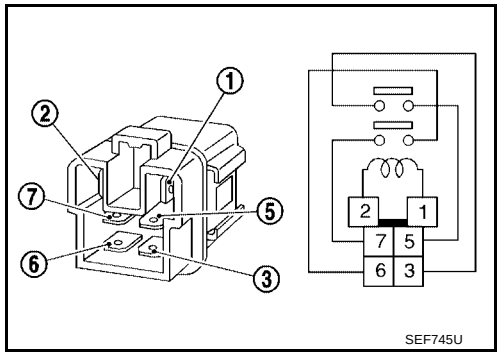
UBS002IO

COOLING FAN RELAYS-1, -2 AND -3

Check continuity between terminals 3 and 5, 6 and 7.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace relay.



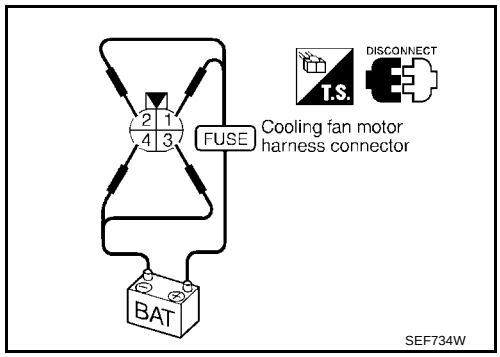
COOLING FAN MOTORS-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(+)	(–)
Cooling fan motor	Low	1	4
	High	1, 2	3, 4

Cooling fan motor should operate.

If NG, replace cooling fan motor.



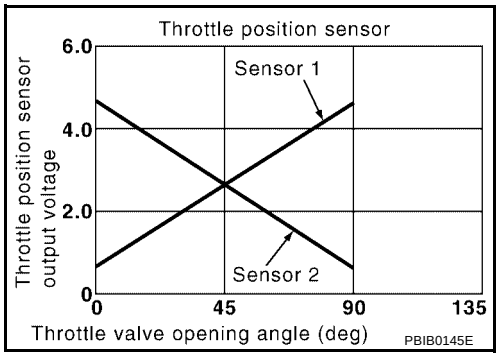
DTC P1225 TP SENSOR

PFP:16119

Component Description

UBS002IX

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

UBS002IY

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

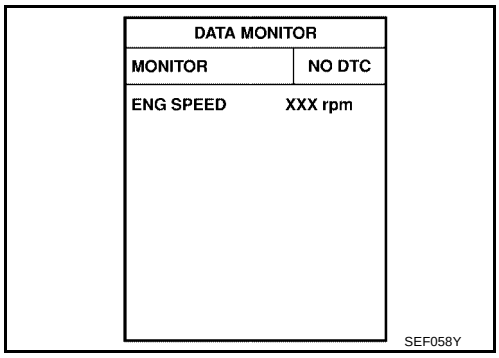
DTC Confirmation Procedure

UBS002IZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-1665, "Diagnostic Procedure" .



WITH GST

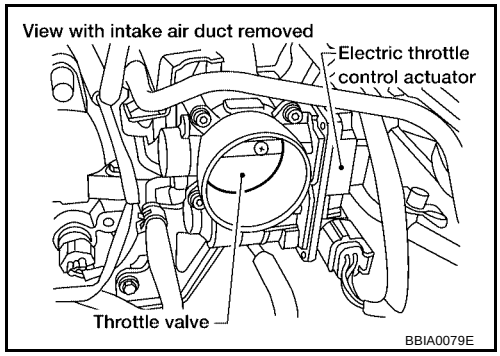
Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS002J0

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

UBS002J1

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

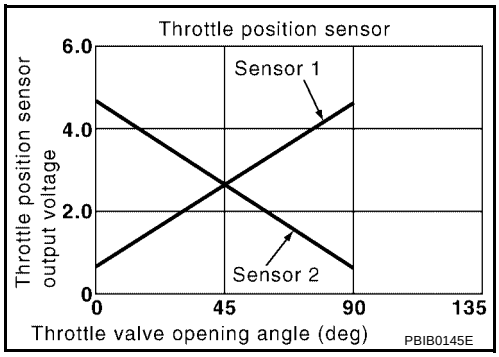
DTC P1226 TP SENSOR

PFP:16119

Component Description

UBS002J2

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

UBS002J3

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

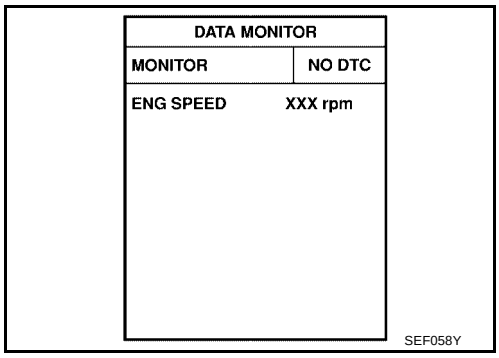
DTC Confirmation Procedure

UBS002J4

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-1667, "Diagnostic Procedure" .



WITH GST

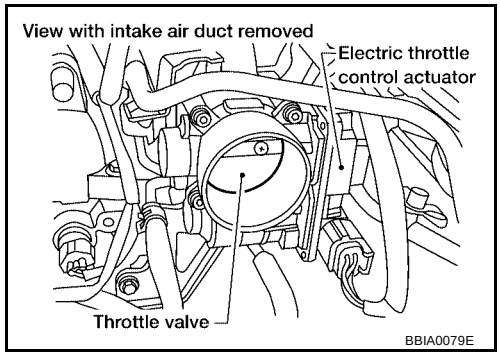
Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

UBS002J5

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

UBS002J6

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

UBS002JF

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) (APP sensor 1 circuit is shorted.) (MAF sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2) ● Accelerator pedal position sensor (APP sensor 1) ● MAF sensor ● EVAP control system pressure sensor ● Refrigerant pressures sensor ● ECM pin terminal

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

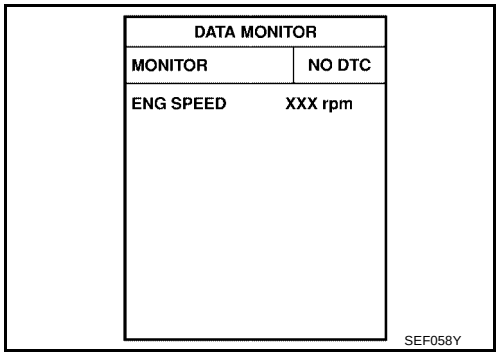
DTC Confirmation Procedure

UBS002JG

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1670, "Diagnostic Procedure" .

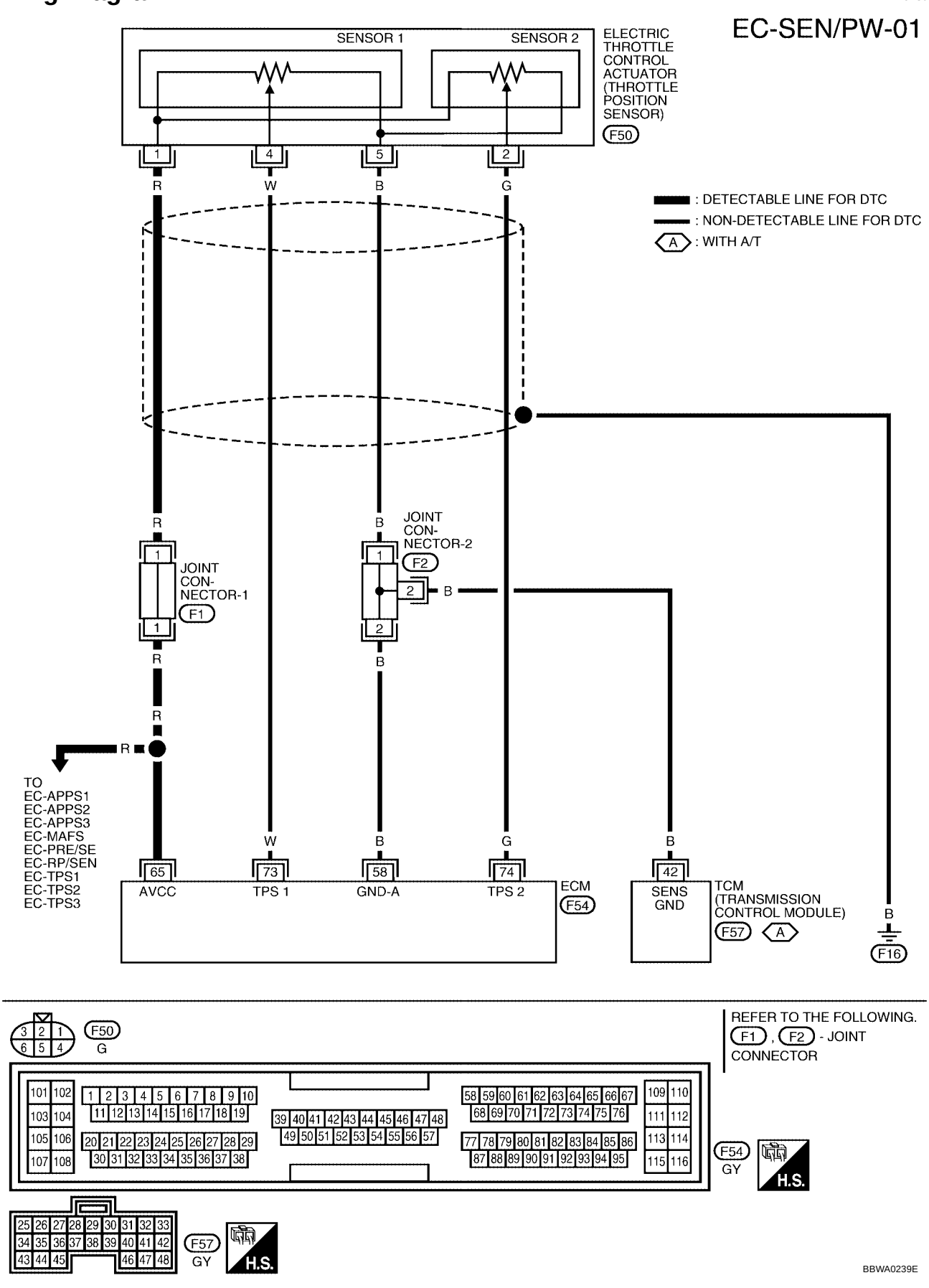


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002JH



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V

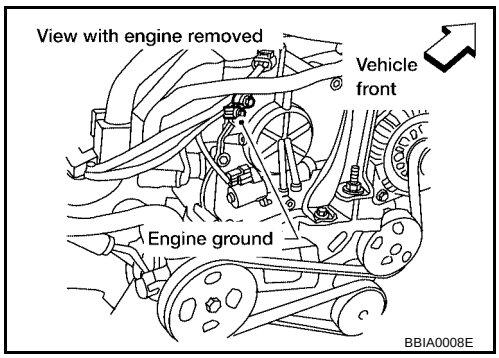
Diagnostic Procedure

UBS002JI

1. RETIGHTEN GROUND SCREWS

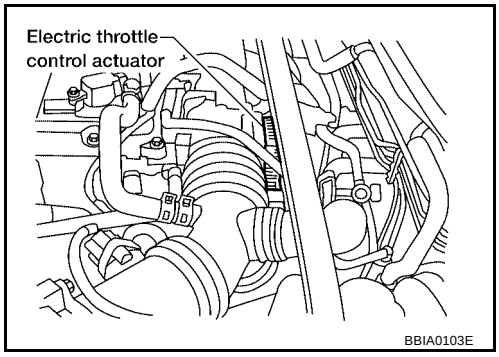
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch "ON".

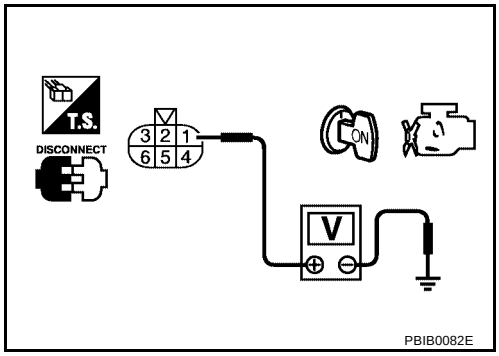


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 5.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground, between the following terminals

ECM terminal	Sensor terminals	Reference Wiring Diagram
65	Electric throttle control actuator terminal 1	EC-1765
	APP sensor terminal 2	EC-1772
	MAF sensor terminal 2	EC-1371
	EVAP control system pressure sensor terminal 1	EC-1536
	Refrigerant pressure sensor terminal 3	EC-1817

- Joint connector-1
- ECM pin terminal

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Accelerator pedal position sensor (Refer to EC-1775, "Component Inspection" .)
- Mass air flow sensor (Refer to EC-1374, "Component Inspection" .)
- EVAP control system pressure sensor (Refer to EC-1539, "Component Inspection" .)
- Refrigerant pressure sensor (Refer to MTC-19, "TROUBLE DIAGNOSIS" .)

OK or NG

OK >> GO TO 7.
NG >> Replace malfunctioning component.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-1768, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

UBS002JJ

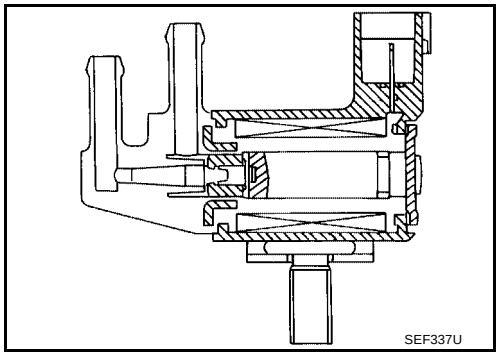
SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor (CAN communication line)	Vehicle speed		

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

UBS002JK

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

On Board Diagnosis Logic

UBS002JL

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1444 1444	EVAP canister purge volume control solenoid valve	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	● EVAP control system pressure sensor ● EVAP canister purge volume control solenoid valve (The valve is stuck open.) ● EVAP canister vent control valve ● EVAP canister ● Hoses (Hoses are connected incorrectly or clogged.)

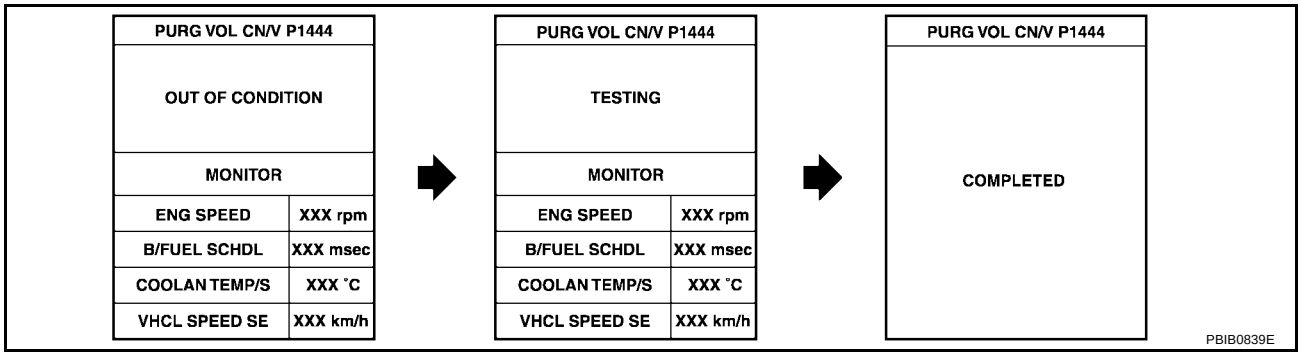
DTC Confirmation Procedure

UBS002JM

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
5. Touch “START”.
6. Start engine and let it idle until “TESTING” on CONSULT-II changes to “COMPLETED”. (It will take approximately 10 seconds.)
   If “TESTING” is not displayed after 5 minutes, retry from step 2.



7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1675, "Diagnostic Procedure" .

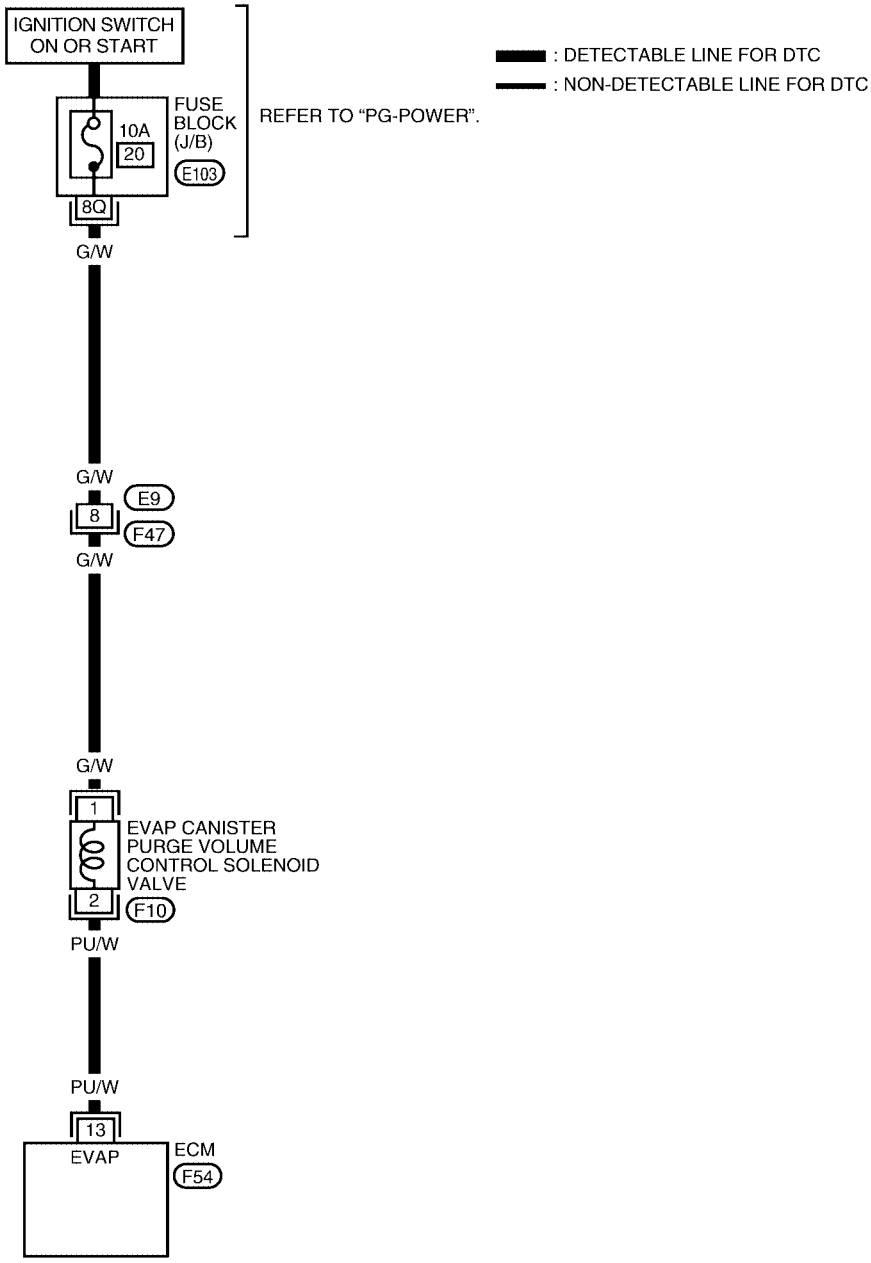
WITH GST

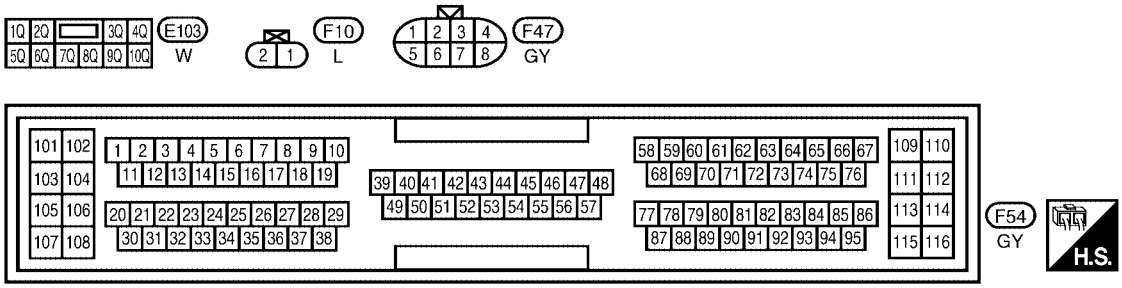
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and let it idle for at least 20 seconds.
4. Select “MODE 7” with GST.
5. If 1st trip DTC is detected, go to EC-1675, "Diagnostic Procedure" .

Wiring Diagram

UBS002JN

EC-PGC/V-01



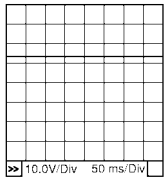
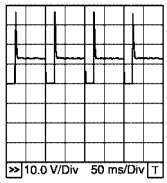


BBWA0224E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	PU/W	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

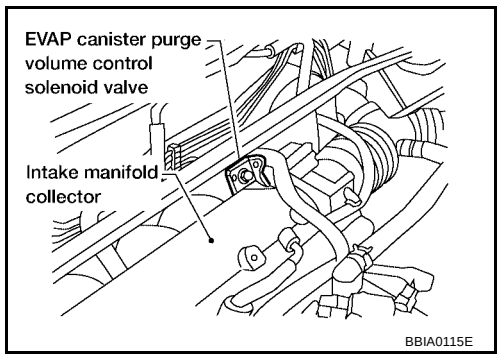
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002JO

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

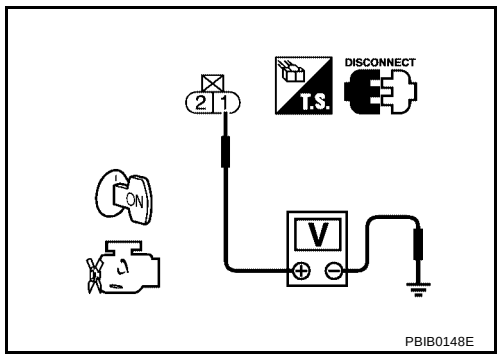
1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



BBIA0115E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and engine ground with CONSULT-II or tester.

Voltage: Battery voltage



PBIB0148E

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse block (J/B) connector E103
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 13 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

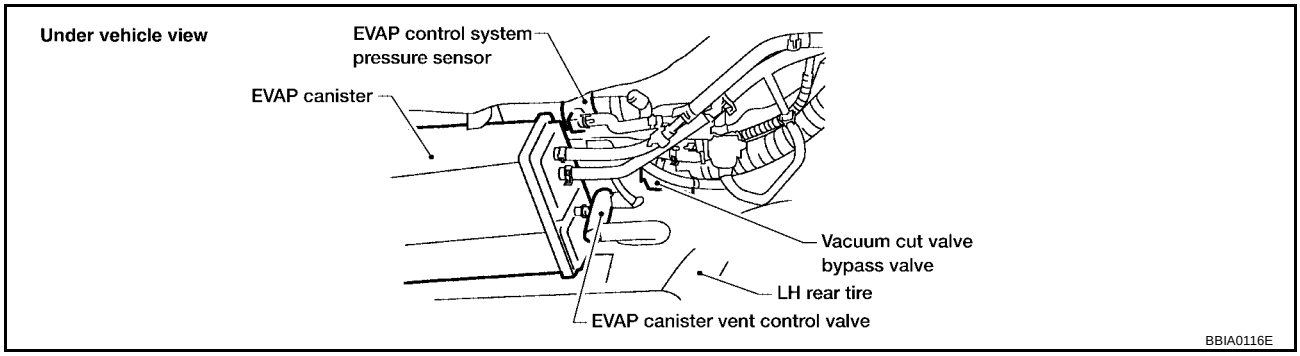
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 5.
NG >> Repair it.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP control system pressure sensor.

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

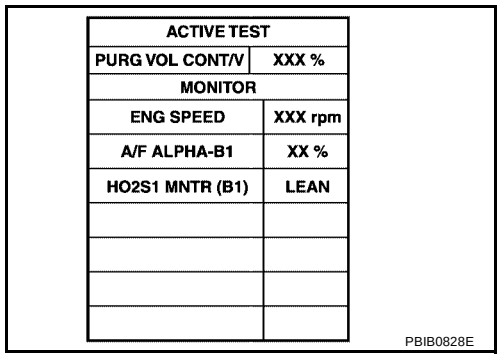
OK or NG

OK (With CONSULT-II)>>GO TO 7.
OK (Without CONSULT-II)>>GO TO 8.
NG >> Replace EVAP control system pressure sensor.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Reconnect harness connectors disconnected.
3. Start engine.
4. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister purge volume control solenoid valve.

9. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 10.
NG >> Clean the rubber tube using an air blower.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

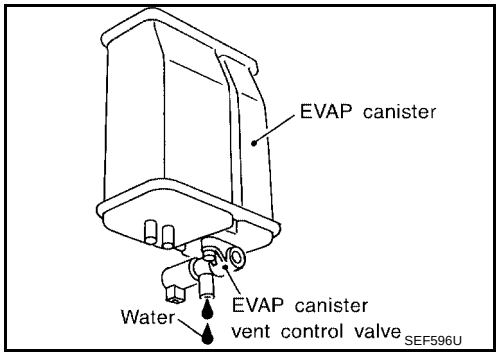
Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP canister vent control valve.

11. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



Yes or No

Yes >> GO TO 12.
No >> GO TO 14.

12. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

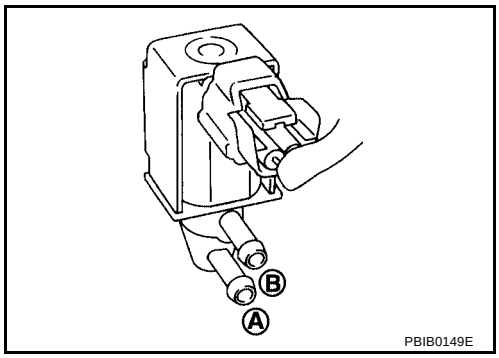
UBS002JP

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

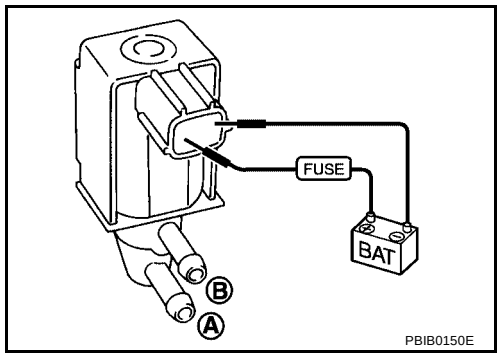
Condition (PURG VOL CONT/V value)	Air passage continuity between **A** and **B**
100.0%	Yes
0.0%	No



Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	Yes
No supply	No



UBS002JQ

Removal and Installation

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-105, "INTAKE MANIFOLD" .

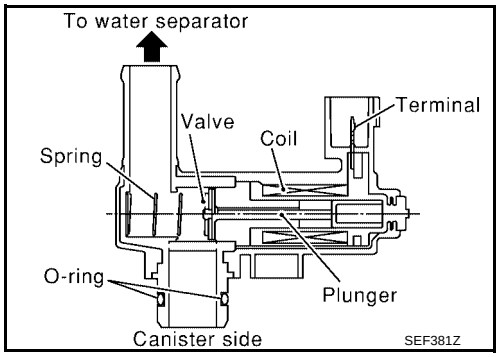
DTC P1446 EVAP CANISTER VENT CONTROL VALVE

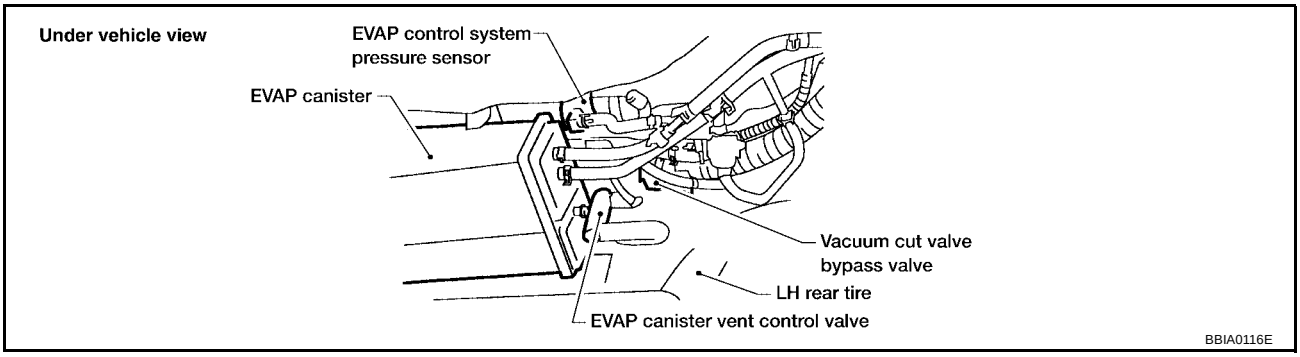
PFP:14935

Component Description

UBS002JR

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002JS

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002JT

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1446 1446	EVAP canister vent control valve close	EVAP canister vent control valve remains closed under specified driving conditions.	● EVAP canister vent control valve ● EVAP control system pressure sensor and the circuit ● Blocked rubber tube to EVAP canister vent control valve ● EVAP canister is saturated with water

DTC Confirmation Procedure

UBS002JU

CAUTION:
Always drive vehicle at a safe speed.

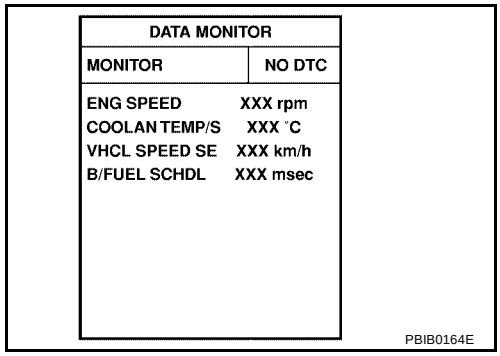
NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch "ON".

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine.
4. Drive vehicle at a speed of approximately 80 km/h (50 MPH) for a maximum of 15 minutes.

   NOTE:
   If a malfunction exists, NG result may be displayed quicker.
5. If 1st trip DTC is detected, go to EC-1683, "Diagnostic Procedure" .



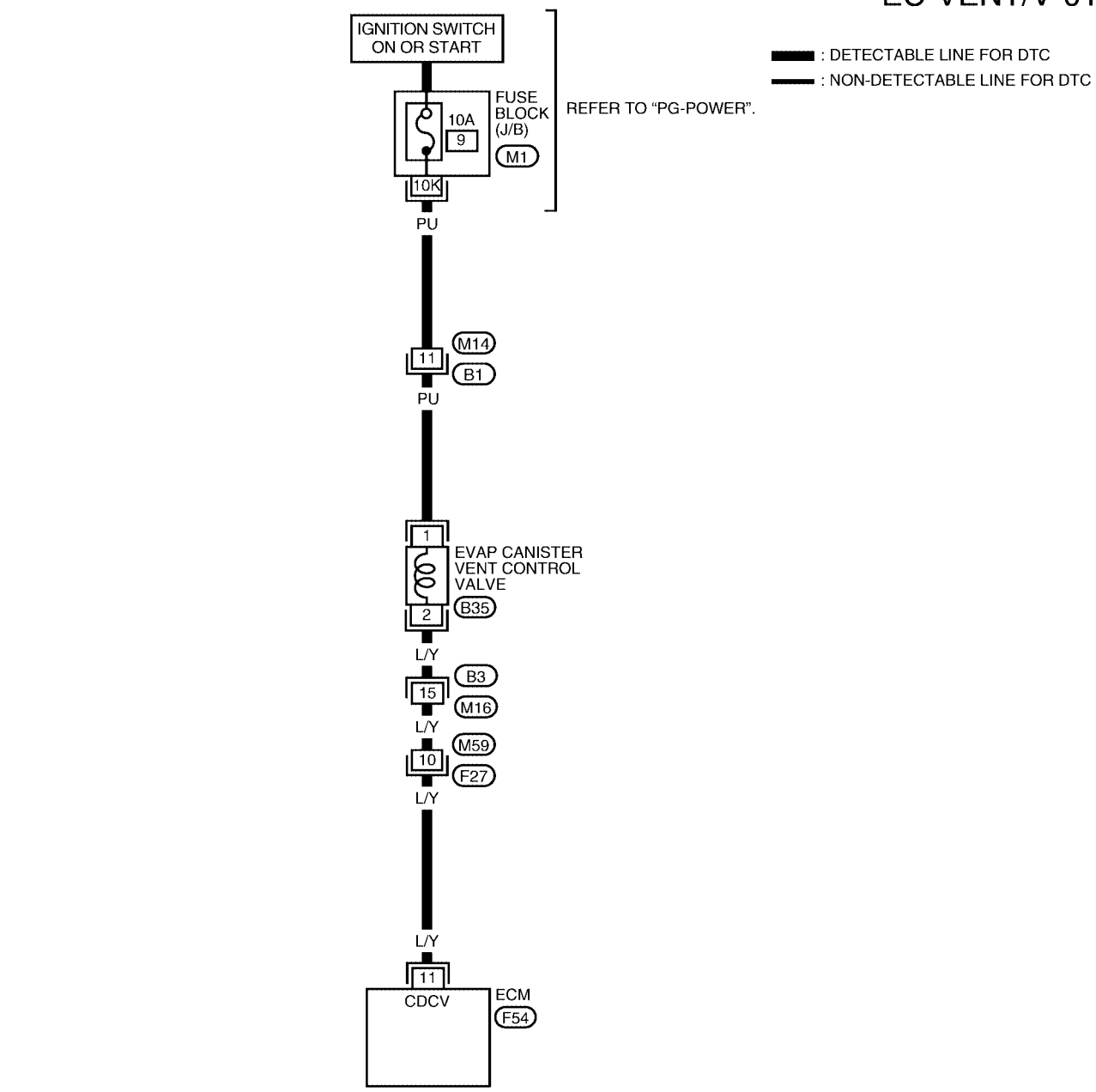
WITH GST

Follow the procedure “WITH CONSULT-II” above.

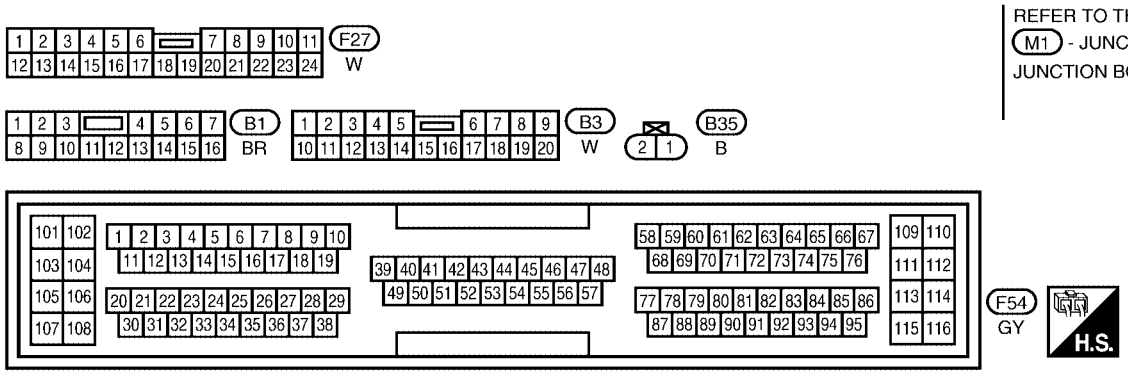
Wiring Diagram

UBS002JV

EC-VENT/V-01



REFER TO THE FOLLOWING.
M1 - JUNCTION BLOCK - JUNCTION BOX (J/B)



BBWA0225E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

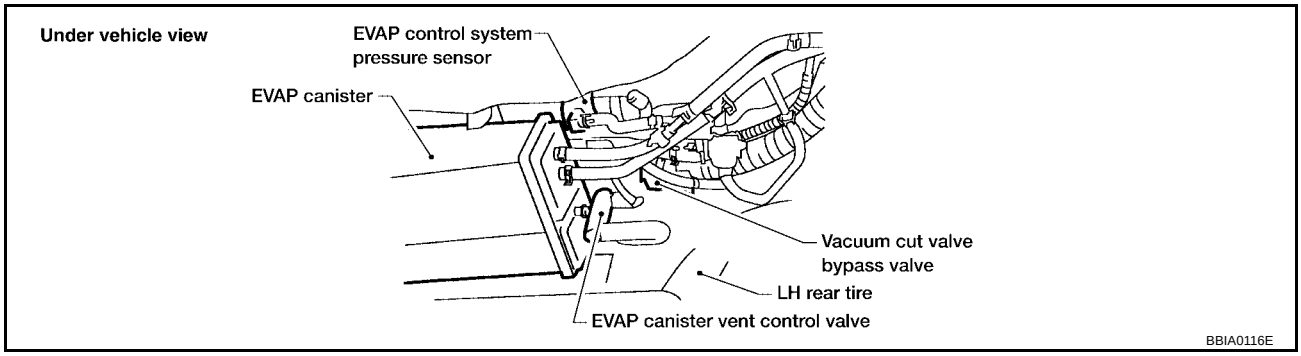
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002JW

1. CHECK RUBBER TUBE

1. Turn ignition switch "OFF".
2. Disconnect rubber tube connected to EVAP canister vent control valve.



3. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 2.
NG >> Clean rubber tube using an air blower.

2. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1685, "Component Inspection" .

OK or NG

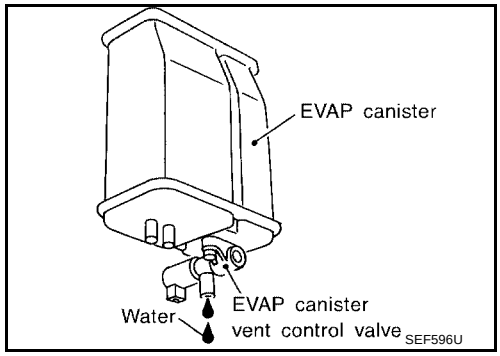
OK >> GO TO 3.
NG >> Replace EVAP canister vent control valve.

3. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.

Yes or No

Yes >> GO TO 4.
No >> GO TO 6.



4. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

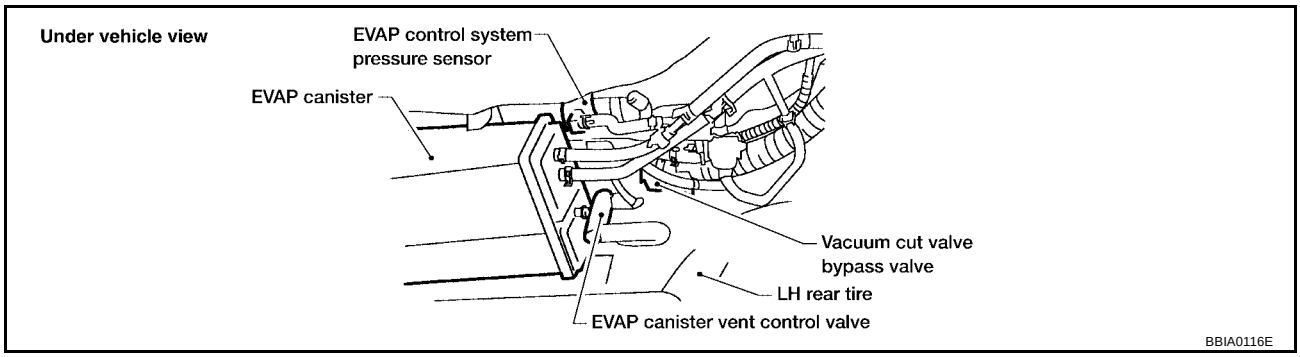
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 7.
NG >> Repair it.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP control system pressure sensor.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP control system pressure sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

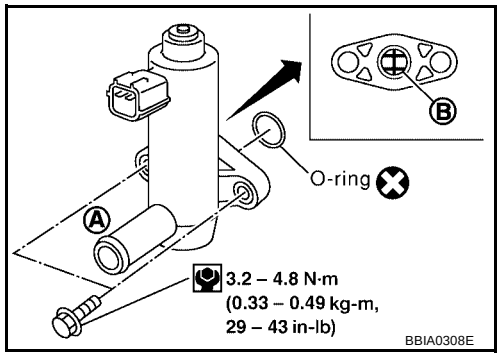
Component Inspection

UBS002JX

EVAP CANISTER VENT CONTROL VALVE

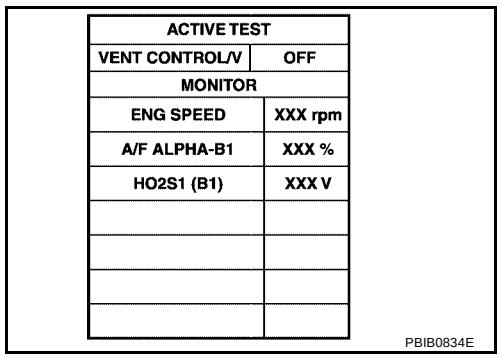
With CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.

Condition	Air passage continuity between **A** and **B**
ON	No
OFF	Yes

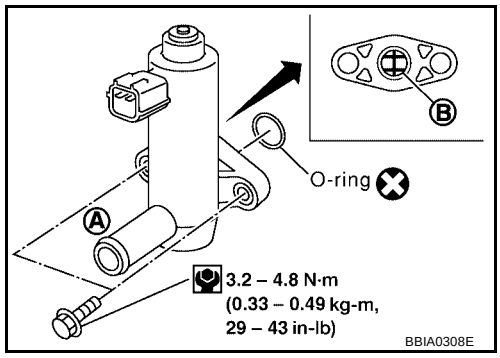


Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform inspection again.

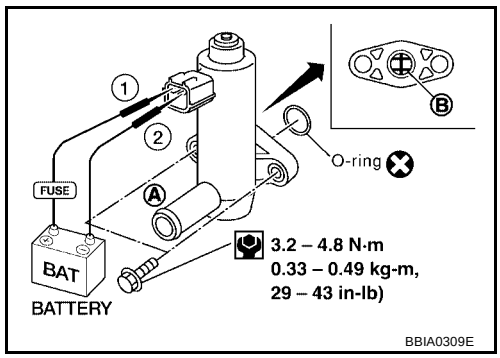
Without CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	No
OFF	Yes



Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.

5. Perform inspection again.

DTC P1448 EVAP CANISTER VENT CONTROL VALVE

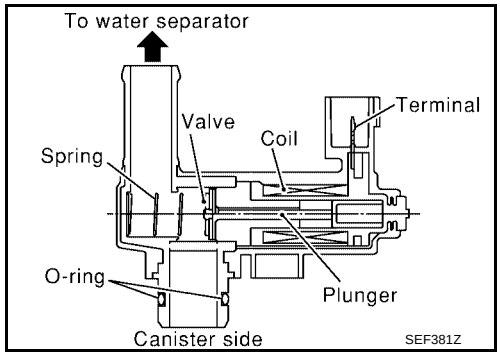
PFP:14935

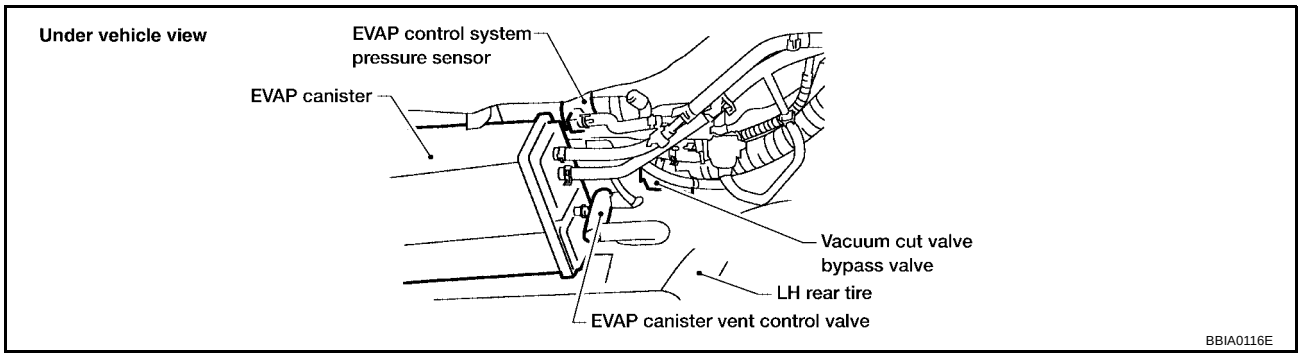
Component Description

UBS002JY

NOTE:
If DTC P1448 is displayed with P0442, perform trouble diagnosis for DTC P1448 first.

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.





CONSULT-II Reference Value in Data Monitor Mode

UBS002JZ

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002K0

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1448 1448	EVAP canister vent control valve open	EVAP canister vent control valve remains opened under specified driving conditions.	● EVAP canister vent control valve ● EVAP control system pressure sensor and the circuit ● Blocked rubber tube to EVAP canister vent control valve ● EVAP canister is saturated with water ● Vacuum cut valve

DTC Confirmation Procedure

UBS002K1

NOTE:
- **If DTC P1448 is displayed with P0442, perform trouble diagnosis for DTC P1448 first.**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

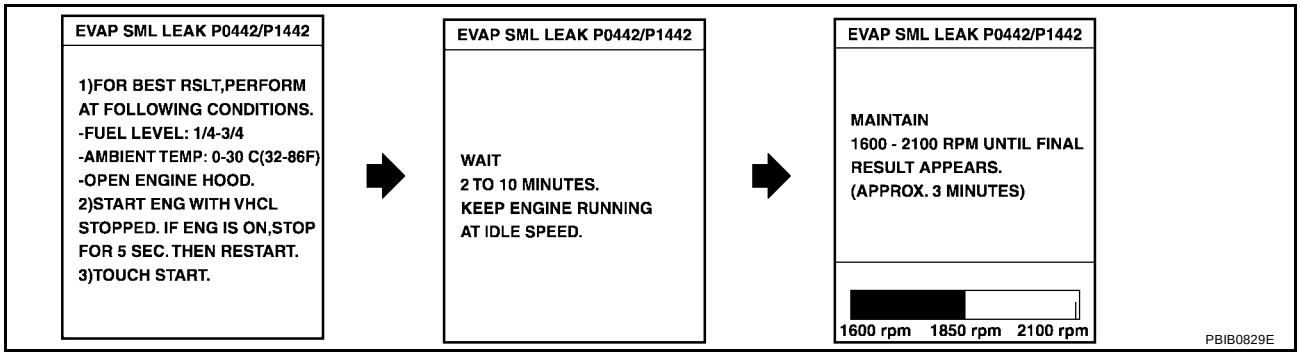
WITH CONSULT-II

TESTING CONDITION:
- **Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Always perform test at a temperature of 0 to 30°C (32 to 86°F).**

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Make sure that the following conditions are met.

COOLAN TEMP/S	0 - 70°C (32 - 158°F)
INT/A TEMP SE	0 - 30°C (32 - 86°F)

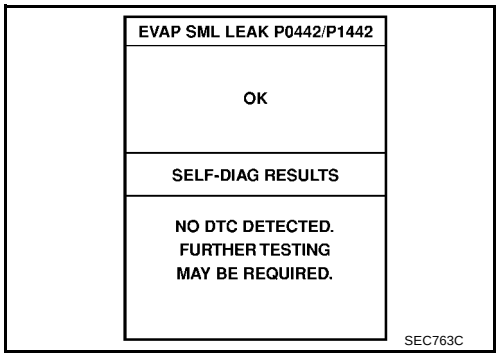
5. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.



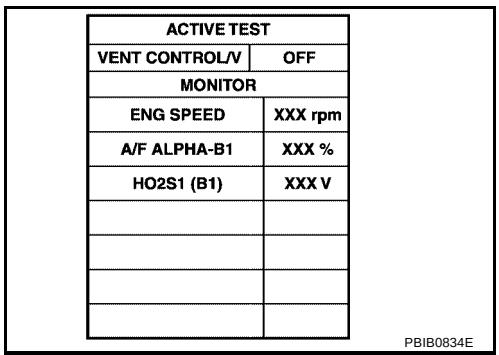
   If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to EC-1291, "Basic Inspection" .

6. Make sure that “OK” is displayed.
   If “NG” is displayed, go to the following step.

   NOTE:
   Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

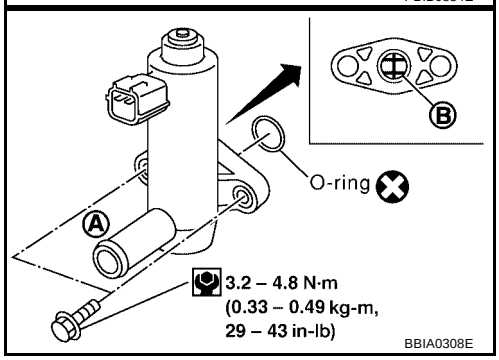


7. Stop engine and wait at least 10 seconds, then turn “ON”.
8. Disconnect hose from vehicle frame.
9. Select “VENT CONTROL/V” of “ACTIVE TEST” mode with CONSULT-II.
10. Touch “ON” and “OFF” alternately.



11. Make sure the following.

Condition VENT CONTROL/V	Air passage continuity between **A** and **B**
ON	No
OFF	Yes



   If the result is NG, go to EC-1691, "Diagnostic Procedure" .
   If the result is OK, go to “Diagnostic Procedure” for DTC P0442, EC-1515 .

Overall Function Check

UBS002K2

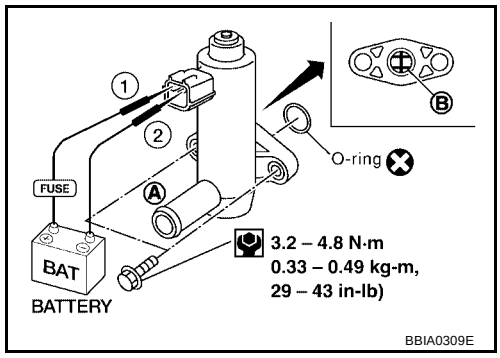
Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.

WITH GST

1. Disconnect hose from vehicle frame.
2. Disconnect EVAP canister vent control valve harness connector.
3. Verify the following.

Condition	Air passage continuity
12V direct current supply between terminals 1 and 2	No
No supply	Yes

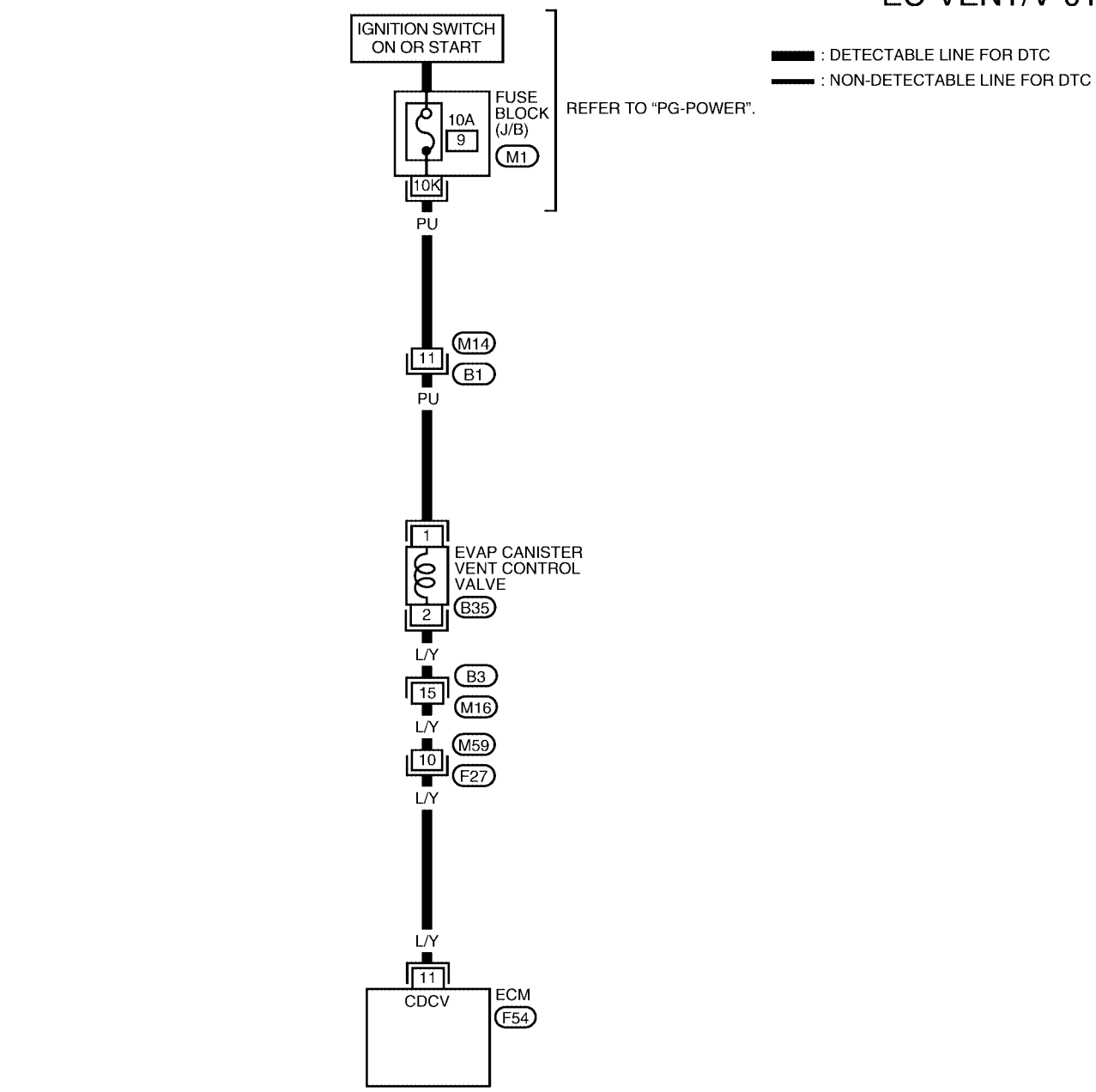
If the result is NG, go to EC-1691, "Diagnostic Procedure" .
If the result is OK, go to “Diagnostic Procedure” for DTC P0442, EC-1515 .

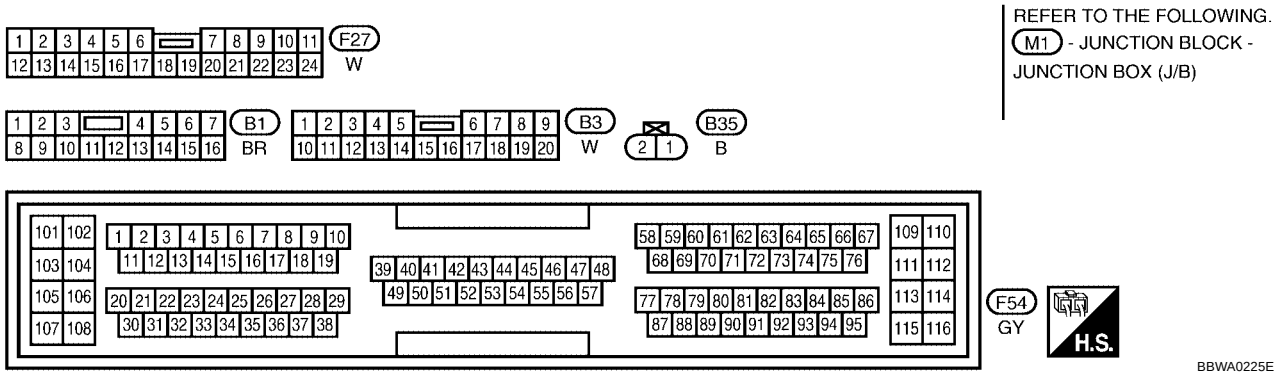


Wiring Diagram

UBS002K3

EC-VENT/V-01





BBWA0225E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

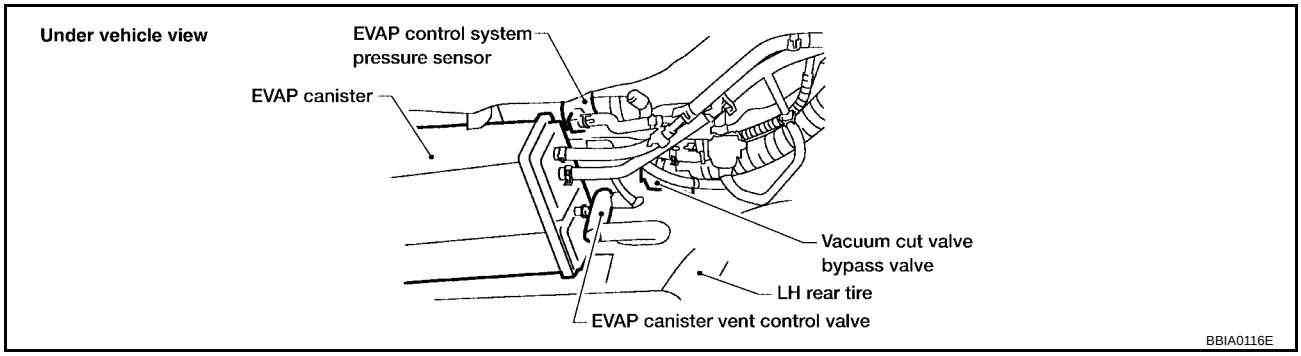
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	L/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002K4

1. CHECK RUBBER TUBE

1. Turn ignition switch "OFF".
2. Disconnect rubber tube connected to EVAP canister vent control valve.



3. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 2.
NG >> Clean rubber tube using an air blower.

2. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1693, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace EVAP canister vent control valve.

3. CHECK VACUUM CUT VALVE

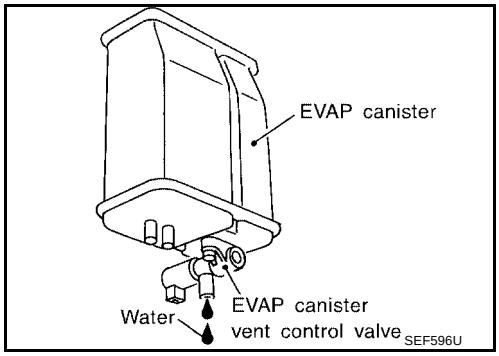
Refer to EC-1721, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace vacuum cut valve.

4. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



Yes or No

Yes >> GO TO 5.
No >> GO TO 7.

5. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

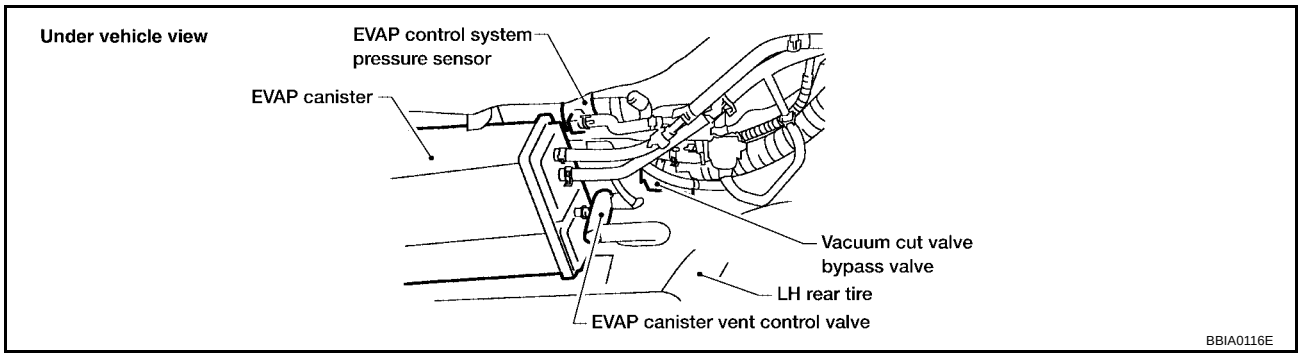
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 8.
NG >> Repair it.

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP control system pressure sensor.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

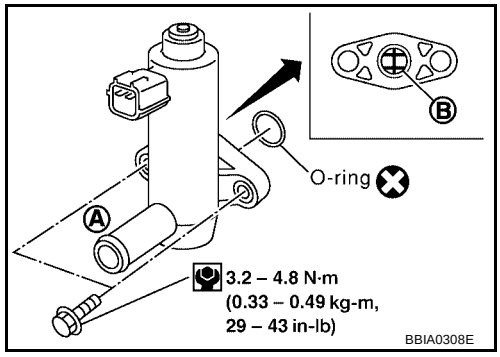
Component Inspection

UBS002K5

EVAP CANISTER VENT CONTROL VALVE

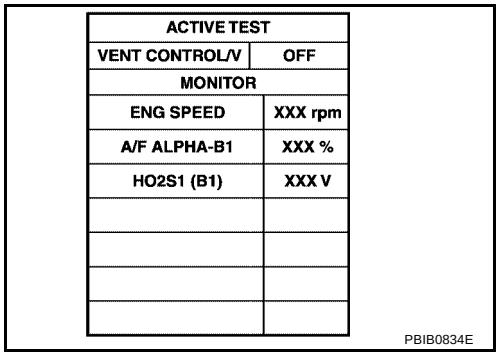
With CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch “ON”.



5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.

Condition	Air passage continuity between **A** and **B**
ON	No
OFF	Yes

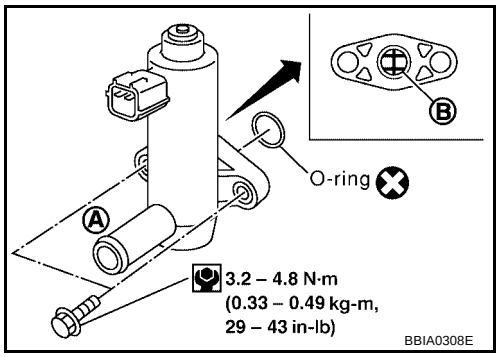


Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

7. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
8. Perform inspection again.

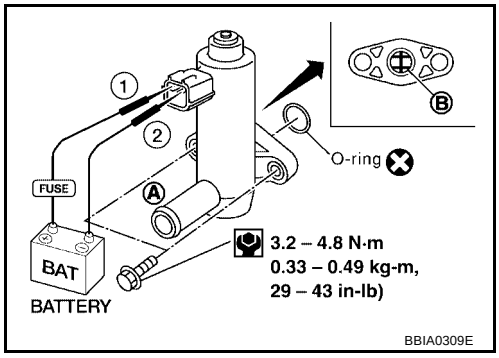
Without CONSULT-II

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



3. Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	No
OFF	Yes



Operation takes less than 1 second.
Make sure new O-ring is installed properly.
If NG, go to next step.

4. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
5. Perform inspection again.

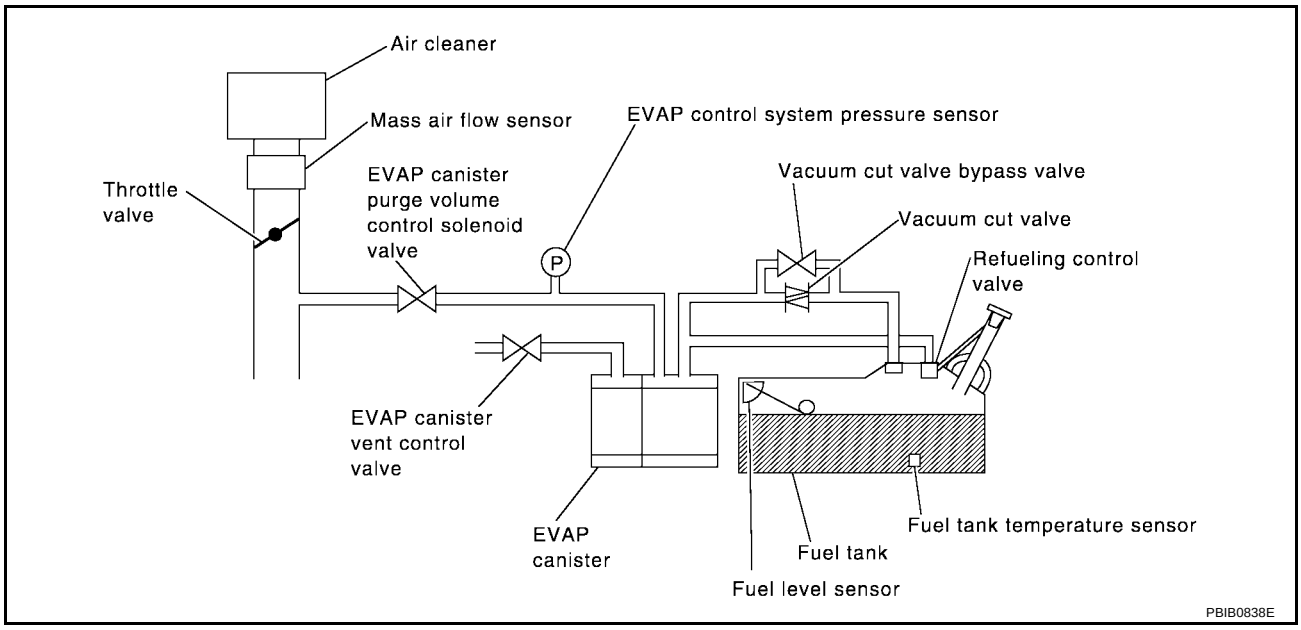
DTC P1456 EVAP CONTROL SYSTEM

PFP:14710

On Board Diagnosis Logic

UBS002K6

This diagnosis detects very small leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using of vapor pressure in the fuel tank.
The EVAP canister vent control valve is closed to shut the EVAP purge line. The vacuum cut valve bypass valve will then be opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP control system pressure sensor can now monitor the pressure inside the fuel tank. If pressure increases, the ECM will check for leaks in the line between the vacuum cut valve and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1456 1456	Evaporative emission control system very small leak (positive pressure check)	● EVAP system has a very small leak. ● EVAP system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Fuel tank temperature sensor ● O-ring of EVAP canister vent control valve is missing or damaged ● EVAP canister is saturated with water ● EVAP control system pressure sensor ● Refueling control valve ● ORVR system leaks ● Fuel level sensor and the circuit ● Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC Confirmation Procedure

UBS002K7

NOTE:

- **After repair, make sure that the hoses and clips are installed properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

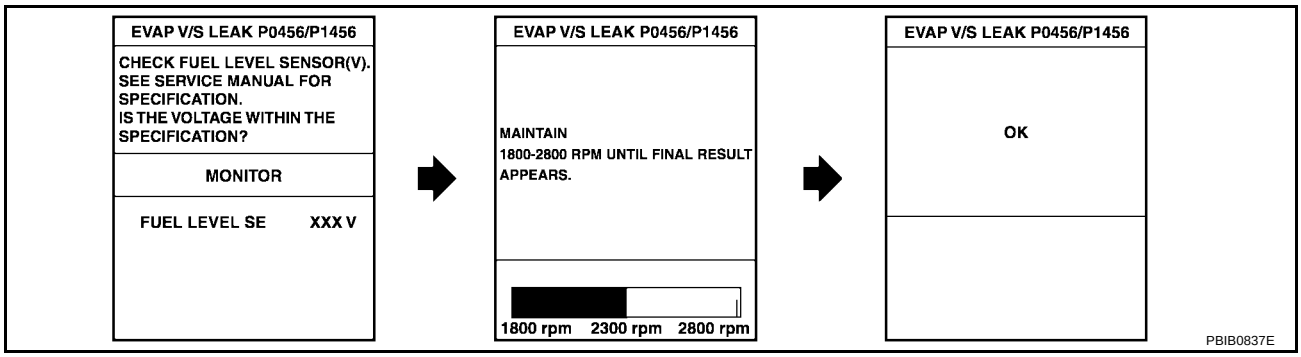
- **Open engine hood before conducting following procedure.**
- **If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**
  - **Fuel filler cap is removed.**
  - **Refilled or drained the fuel.**
  - **EVAP component parts is/are removed.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Make sure the following conditions are met.
   FUEL LEVEL SE: 0.25 - 1.15V
   COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
   FUEL T/TMP SE: 0 - 35°C (32 - 95°F)

INT A/TEMP SE: More than 0°C (32°F)
If NG, turn ignition switch “OFF” and leave the vehicle in a cool place (soak the vehicle) or refilling/draining fuel until the output voltage condition of the “FUEL LEVEL SE” meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1).

3. Turn ignition switch “OFF” and wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Select “EVAP V/S LEAK P0456/P1456” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.



6. Make sure that “OK” is displayed.
   If “NG” is displayed, refer to EC-1698, "Diagnostic Procedure" .

NOTE:
- **If the engine speed cannot be maintained within the range displayed on CONSULT-II screen, go to EC-1291, "Basic Inspection" .**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

Overall Function Check

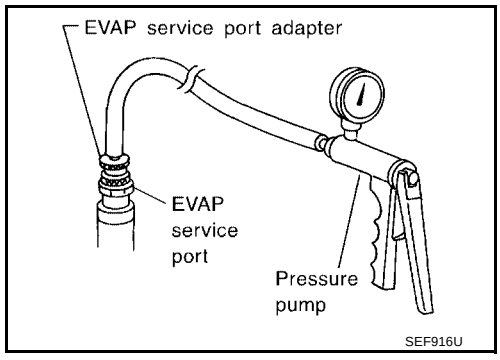
UBS002K8

WITH GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a 1st trip DTC might not be confirmed.

CAUTION:
- **Never use compressed air, doing so may damage the EVAP system.**
- **Do not start engine.**
- **Do not exceeded 4.12 kPa (0.042 kg/cm^2 , 0.6 psi).**

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch “ON”.
5. Connect GST and select MODE 8.
6. Using MODE 8 control the EVAP canister vent control valve (close) and vacuum cut valve bypass valve (open).
7. Apply pressure and make sure the following conditions are satisfied.
   Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg)
   Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (3 mmHg, 0.12 inHg).
   If NG, go to EC-1698, "Diagnostic Procedure" .
   If OK, go to next step.



8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.
10. Turn ignition switch “OFF” and wait at least 10 seconds.
11. Restart engine and let it idle for 90 seconds.

12. Keep engine speed at 2,000 rpm for 30 seconds.
13. Turn ignition switch “OFF”.

NOTE:
For more information, refer to GST instruction manual.

Diagnostic Procedure

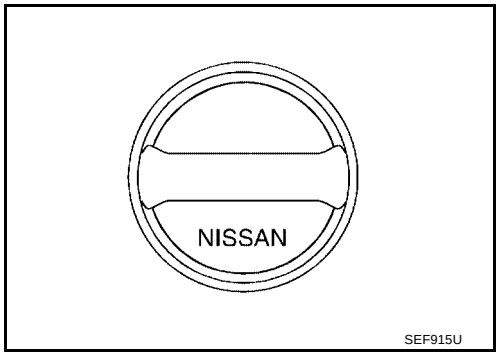
UBS002K9

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch “OFF”.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-1849, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)" .

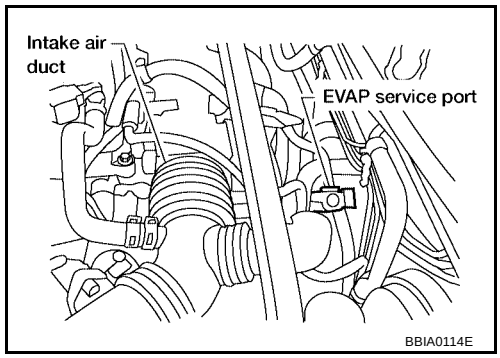
OK or NG

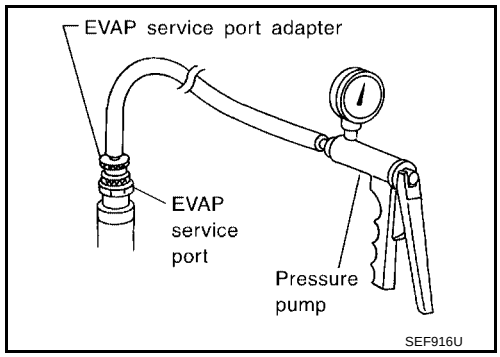
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.





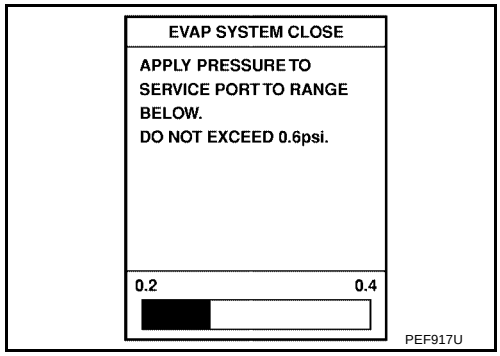
Models with CONSULT-II>>GO TO 6.
Models without CONSULT-II>>GO TO 7.

6. CHECK FOR EVAP LEAK

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-II.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

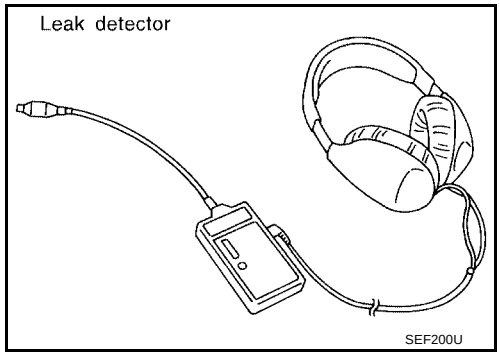
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

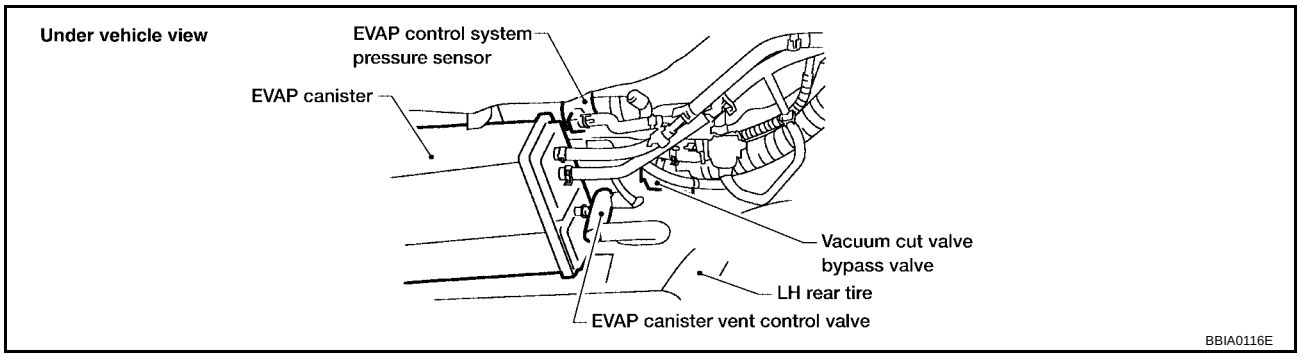
OK >> GO TO 8.
NG >> Repair or replace.



7. CHECK FOR EVAP LEAK

Without CONSULT-II

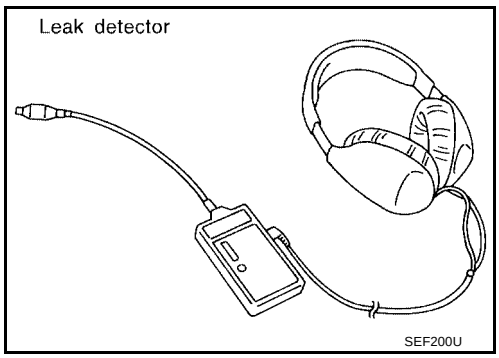
1. Turn ignition switch “OFF”.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.

   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in the system.**

5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .



OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

Refer to “DTC Confirmation Procedure”, EC-1687 .

OK or NG

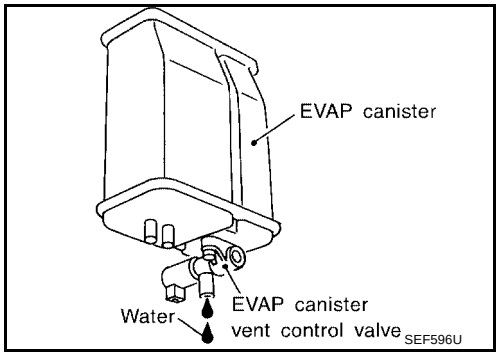
OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

9. CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 11.
No (With CONSULT-II)>>GO TO 12.
No (Without CONSULT-II)>>GO TO 13.



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK (With CONSULT-II)>>GO TO 12.
OK (Without CONSULT-II)>>GO TO 13.
NG >> GO TO 12.

11. DETECT MALFUNCTIONING PART

Check the following.

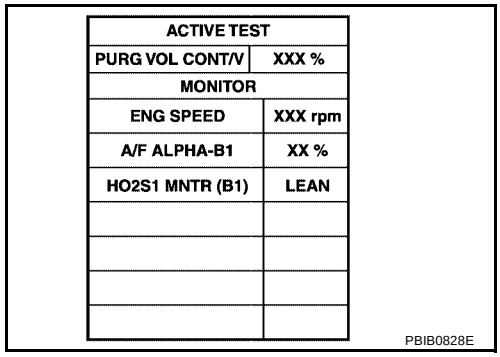
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-II screen to increase “PURG VOL CONT/V” opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 16.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 15.
NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1526, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. CHECK REFUELING EVAP VAPOR LINE

Check refueling EVAP vapor line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to EC-1852, "ON BOARD REFUELING VAPOR RECOVERY (ORVR)" .

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK SIGNAL LINE AND RECIRCULATION LINE

Check signal line and recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hoses, tubes or filler neck tube.

22. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 23.
NG >> Replace refueling control valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

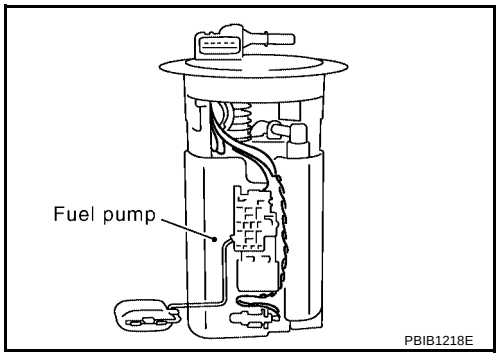
DTC P1464 FUEL LEVEL SENSOR

PFP:25060

Component Description

UBS002KB

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.



On Board Diagnosis Logic

UBS002KC

ECM receives two signals from the fuel level sensor.
One is fuel level sensor power supply circuit, and the other is fuel level sensor ground circuit.
This diagnosis indicates the latter to detect open circuit malfunction.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1464 1464	Fuel level sensor circuit ground signal	A high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted)

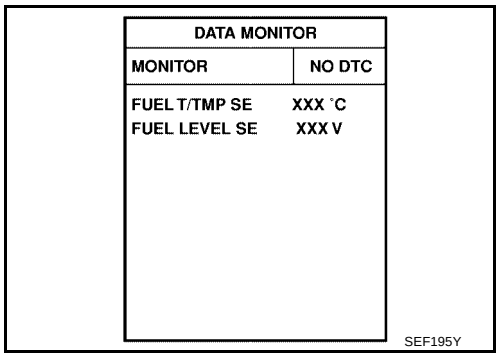
DTC Confirmation Procedure

UBS002KD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1706, "Diagnostic Procedure" .

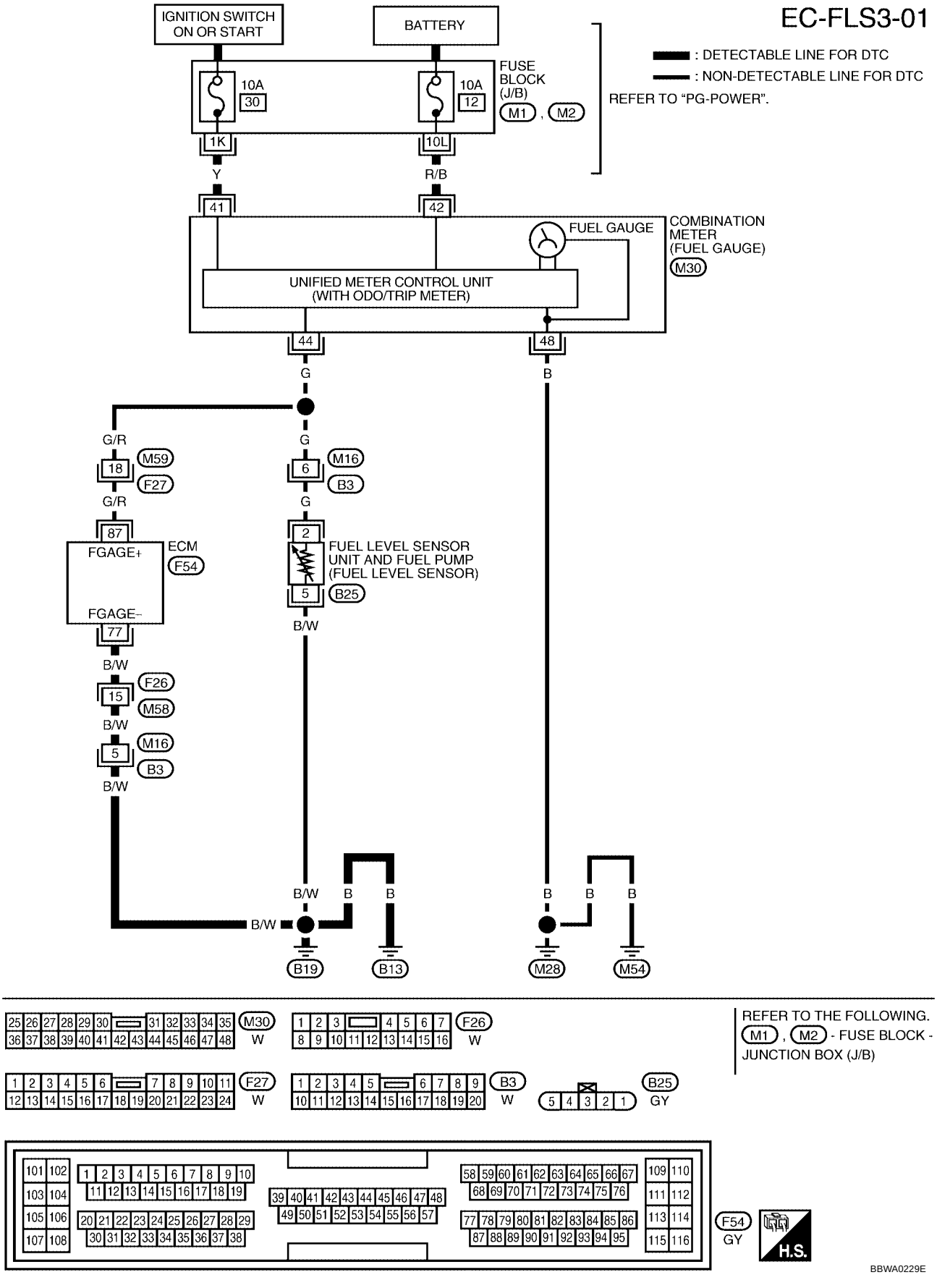


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002KE



BBWA0229E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
77	B/W	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V
87	G/R	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.

Diagnostic Procedure

UBS002KF

1. CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 77 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F26, M58
- Harness connectors M16, B3
- Harness for open and short between ECM and body ground

>> Replace open circuit or short to power in harness or connectors.

3. CHECK FUEL LEVEL SENSOR

Refer to DI-26, "FUEL LEVEL SENSOR UNIT CHECK" .

OK or NG

OK >> GO TO 4.
NG >> Replace fuel level sensor unit.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Removal and Installation

UBS002KG

FUEL LEVEL SENSOR

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

DTC P1490 VACUUM CUT VALVE BYPASS VALVE

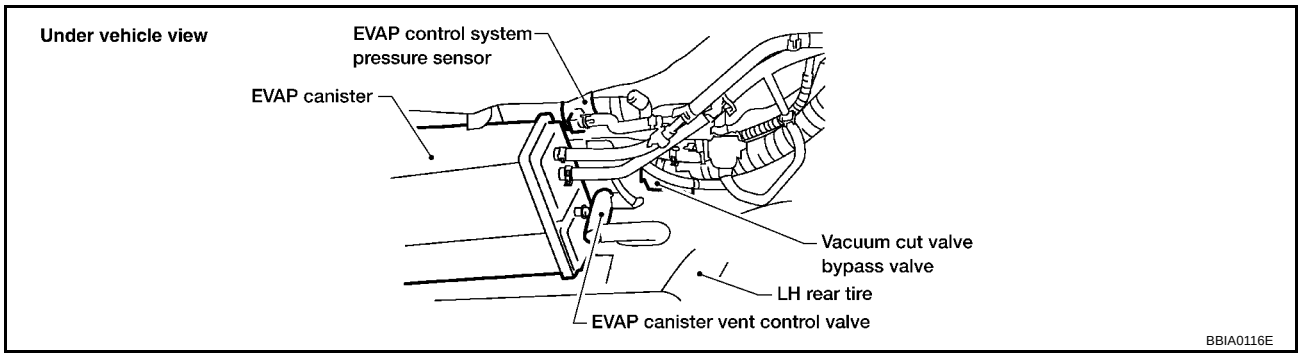
PFP:17372

Description

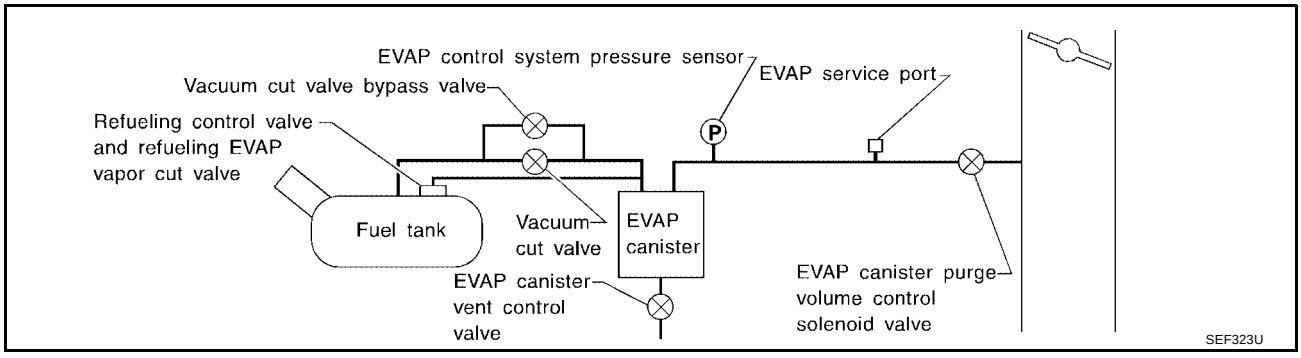
UBS002KH

COMPONENT DESCRIPTION

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.
The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.
The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.



EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT-II Reference Value in Data Monitor Mode

UBS002KI

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPAS S/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002KJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1490 1490	Vacuum cut valve bypass valve circuit	An improper voltage signal is sent to ECM through vacuum cut valve bypass valve.	● Harness or connectors (The vacuum cut valve bypass valve circuit is open or shorted) ● Vacuum cut valve bypass valve

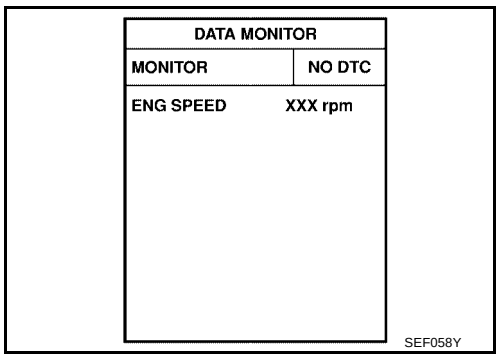
DTC Confirmation Procedure

UBS002KK

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle speed.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1710, "Diagnostic Procedure" .



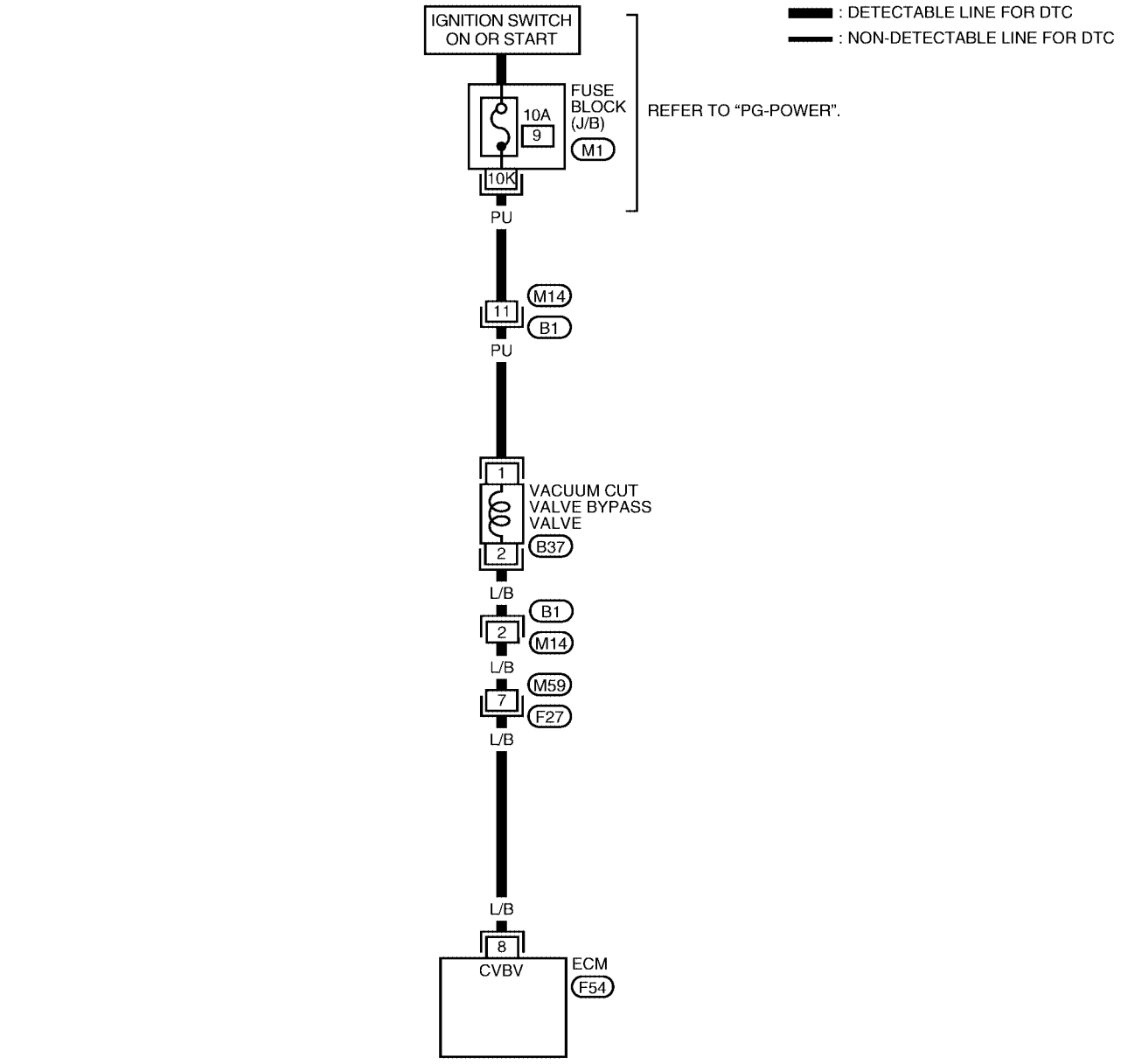
WITH GST

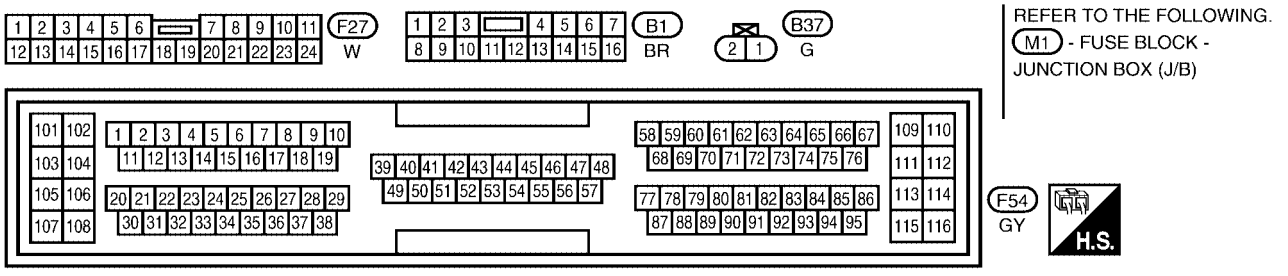
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002KL

EC-BYPS/V-01





BBWA0240E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8	L/B	Vacuum cut valve bypass valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002KM

1. INSPECTION START

Do you have CONSULT-II?

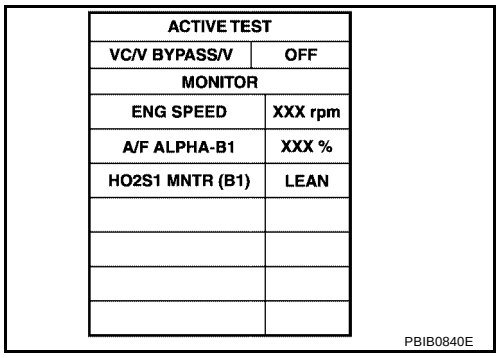
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK VACUUM CUT VALVE BYPASS VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch "OFF" and then "ON".
2. Select "VC/V BYPASS/V" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON/OFF" on CONSULT-II screen.
4. Make sure that clicking sound is heard from the vacuum cut valve bypass valve.

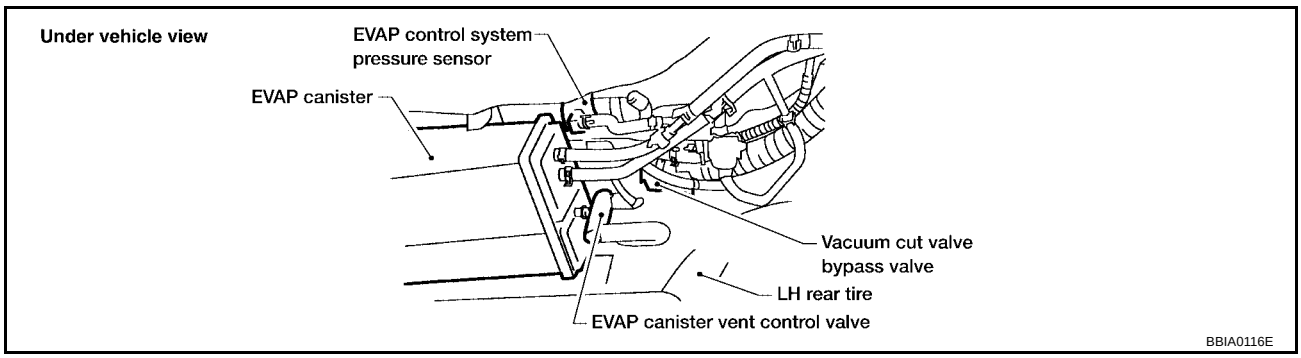


OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

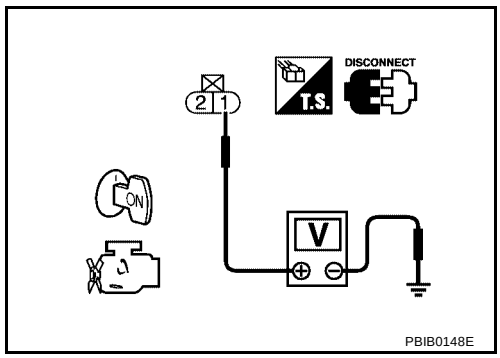
3. CHECK VACUUM CUT VALVE BYPASS VALUE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect vacuum cut valve bypass valve harness connector.



3. Turn ignition switch “ON”.
4. Check voltage between vacuum cut valve bypass valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M14, B1
- Fuel block (J/B) connector M1
- 10A fuse
- Harness for open or short between vacuum cut valve bypass valve and fuse

>> Repair harness or connectors.

5. CHECK VACUUM CUT VALVE BYPASS VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 8 and vacuum cut valve bypass valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M59, F27
- Harness for open or short between vacuum cut valve bypass valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK VACUUM CUT VALVE BYPASS VALVE

Refer to EC-1712, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace vacuum cut valve bypass valve.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002KN

VACUUM CUT VALVE BYPASS VALVE

With CONSULT-II

1. Reconnect harness disconnected connectors.
2. Turn ignition switch ON.
3. Perform “VC/V BYPASS/V” in “ACTIVE TEST” mode.

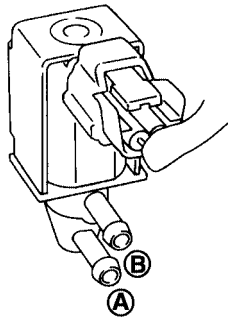
ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0840E

4. Check air passage continuity and operation delay time under the following conditions.

Condition VC/V BYPASS/V	Air passage continuity between **A** and **B**
ON	Yes
OFF	No

Operation takes less than 1 second.
If NG, replace vacuum cut valve bypass valve.



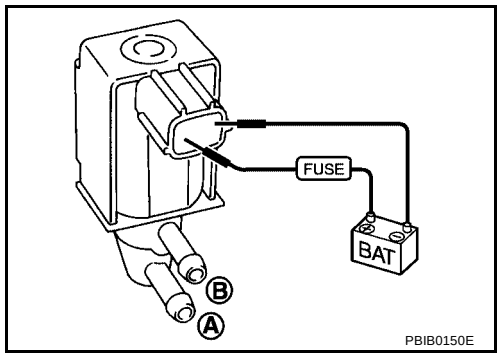
PBIB0149E

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	Yes
No supply	No

Operation takes less than 1 second.
If NG, replace vacuum cut valve bypass valve.



DTC P1491 VACUUM CUT VALVE BYPASS VALVE

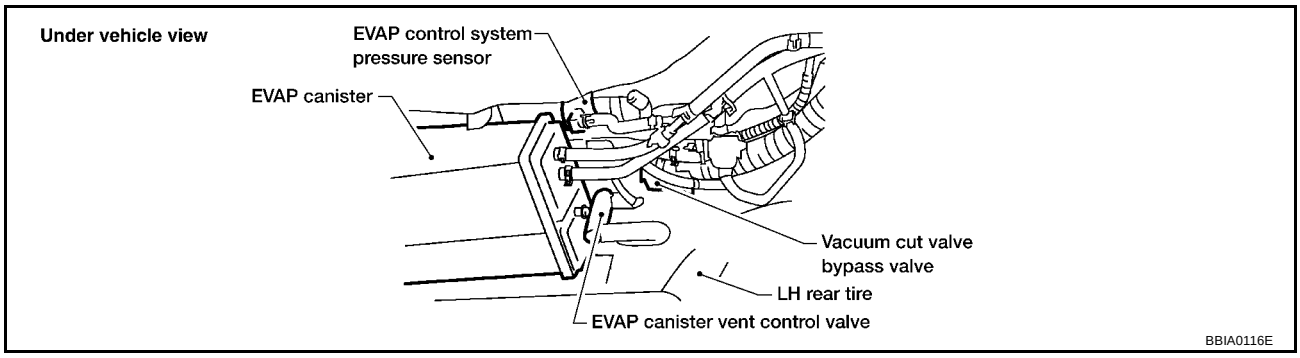
PFP:17372

Description

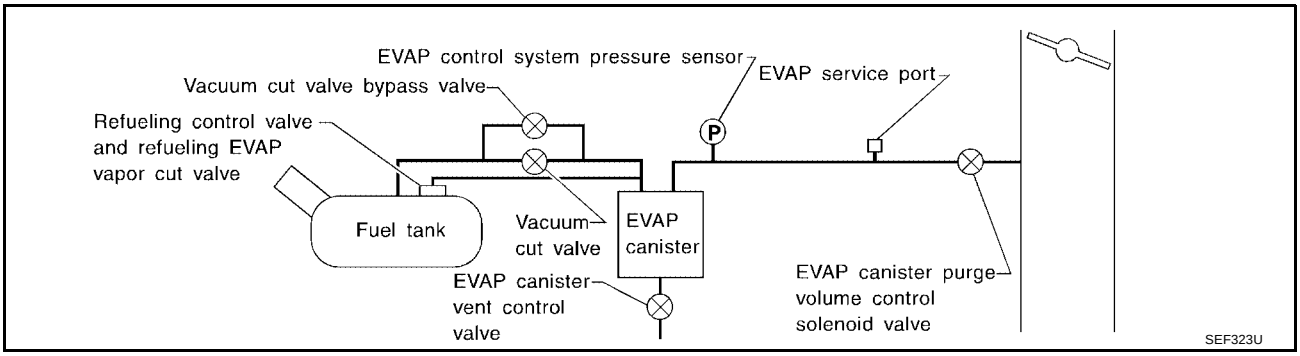
UBS002KO

COMPONENT DESCRIPTION

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.
The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.
The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.



EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT-II Reference Value in Data Monitor Mode

UBS002KP

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPAS S/V	● Ignition switch: ON	OFF

On Board Diagnosis Logic

UBS002KQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1491 1491	Vacuum cut valve bypass valve	Vacuum cut valve bypass valve does not operate properly.	● Vacuum cut valve bypass valve ● Vacuum cut valve ● Bypass hoses for clogging ● EVAP control system pressure sensor and circuit ● EVAP canister vent control valve ● Hose between fuel tank and vacuum cut valve clogged ● Hose between vacuum cut valve and EVAP canister clogged ● EVAP canister ● EVAP purge port of fuel tank for clogging

DTC Confirmation Procedure

UBS002KR

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

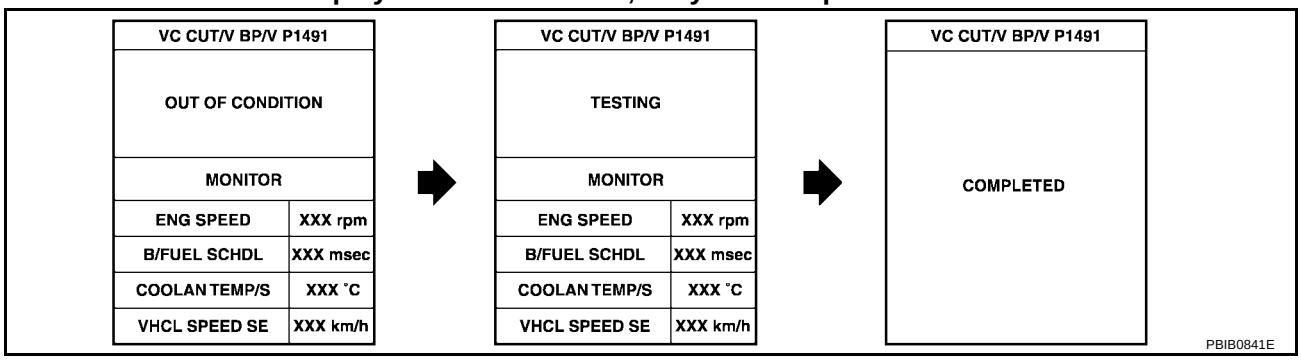
TESTING CONDITION:
Always perform test at a temperature of 5 to 30°C (41 to 86°F).

WITH CONSULT-II

1. Turn ignition switch "ON".
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch "OFF" and wait at least 10 seconds.
4. Start engine and let it idle for at least 70 seconds.
5. Select "VC CUT/V BP/V P1491" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
6. Touch "START".
7. When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)

ENG SPEED	1,000 - 3,800 rpm
Selector lever	Suitable position
Vehicle speed	36 - 120 km/h (22 - 75 MPH)
B/FUEL SCHDL	1.0 - 7.2 msec

If "TESTING" is not displayed after 5 minutes, retry from step 3.



8. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to EC-1718, "Diagnostic Procedure" .

Overall Function Check

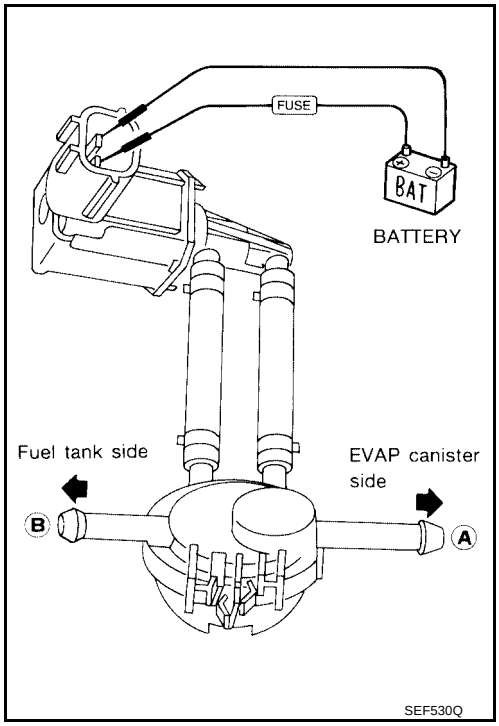
UBS002KS

Use this procedure to check the overall function of vacuum cut valve bypass valve. During this check, the 1st trip DTC might not be confirmed.

WITH GST

1. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.

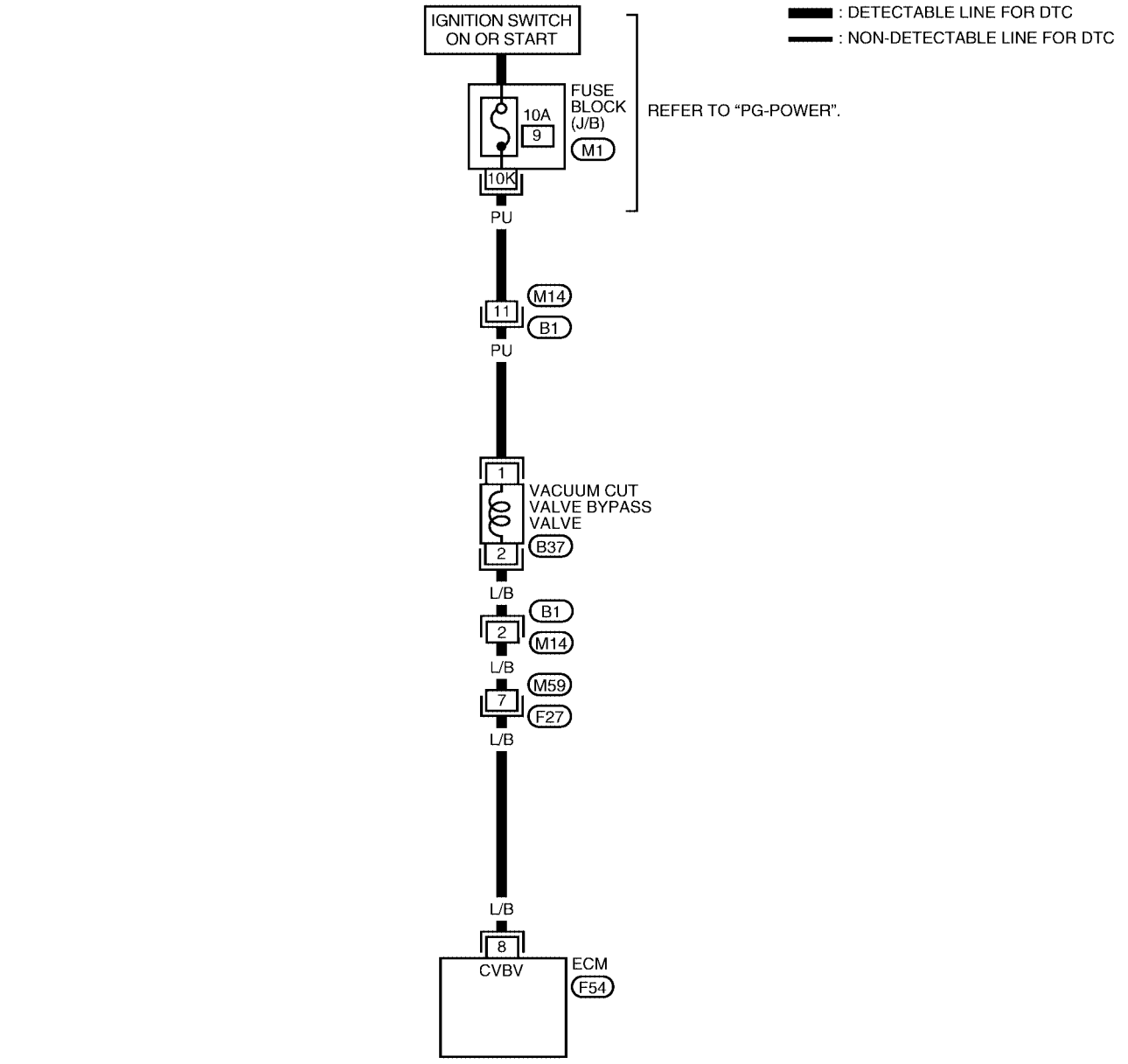
2. Apply vacuum to port **A** and check that there is no suction from port **B** .
3. Apply vacuum to port **B** and check that there is suction from port **A** .
4. Blow air in port **B** and check that there is a resistance to flow out of port **A** .
5. Supply battery voltage to the terminal.
6. Blow air in port **A** and check that air flows freely out of port **B** .
7. Blow air in port **B** and check that air flows freely out of port **A** .
8. If NG, go to EC-1718, "Diagnostic Procedure" .

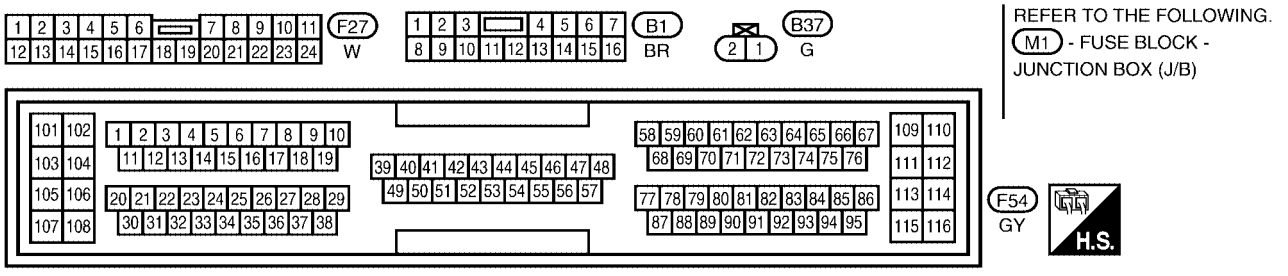


Wiring Diagram

UBS002KT

EC-BYPS/V-01





BBWA0240E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8	L/B	Vacuum cut valve bypass valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002KU

1. INSPECTION START

Do you have CONSULT-II?

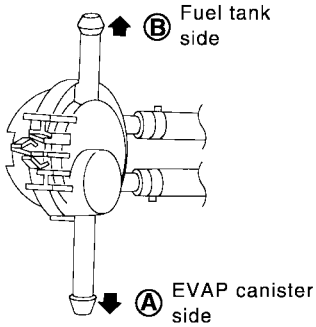
Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK VACUUM CUT VALVE BYPASS VALVE OPERATION

With CONSULT-II

1. Turn ignition switch "OFF".
2. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
3. Apply vacuum to port **A** and check that there is no suction from port **B** .
4. Apply vacuum to port **B** and check that there is suction from port **A** .
5. Blow air in port **B** and check that there is a resistance to flow out of port **A** .
6. Turn ignition switch "ON".
7. Select "VC/V BYPASS/V" in "ACTIVE TEST" mode with CONSULT-II and touch "ON".
8. Blow air in port **A** and check that air flows freely out of port **B** .
9. Blow air in port **B** and check that air flows freely out of port **A** .



ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0842E

OK or NG

OK >> GO TO 4.
NG >> GO TO 7.

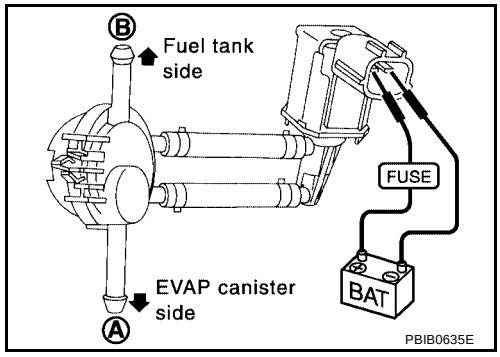
3. CHECK VACUUM CUT VALVE BYPASS VALVE OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
3. Apply vacuum to port **A** and check that there is no suction from port **B** .
4. Apply vacuum to port **B** and check that there is suction from port **A** .
5. Blow air in port **B** and check that there is a resistance to flow out of port **A** .
6. Disconnect vacuum cut valve bypass valve harness connector.
7. Supply battery voltage to the terminal.
8. Blow air in port **A** and check that air flows freely out of port **B** .
9. Blow air in port **B** and check that air flows freely out of port **A** .

OK or NG

OK >> GO TO 4.
NG >> GO TO 7.



4. CHECK EVAP PURGE LINE

Check EVAP purge line between EVAP canister and fuel tank for clogging or disconnection.

OK or NG

OK >> GO TO 5.
NG >> Repair it.

5. CHECK EVAP PURGE PORT

Check EVAP purge port of fuel tank for clogging.

OK or NG

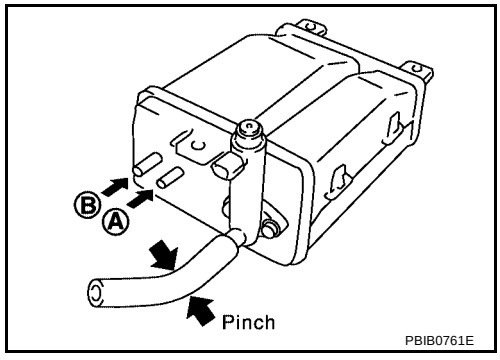
OK >> GO TO 6.
NG >> Clean EVAP purge port.

6. CHECK EVAP CANISTER

1. Pinch the fresh air hose.
2. Blow air into port **A** and check that it flows freely out of port **B** .

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP canister.



7. CHECK BYPASS HOSE

Check bypass hoses for clogging.

OK or NG

OK >> GO TO 8.
NG >> Repair or replace hoses.

8. CHECK VACUUM CUT VALVE BYPASS VALVE

Refer to EC-1721, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace vacuum cut valve bypass valve.

9. CHECK VACUUM CUT VALVE

Refer to EC-1721, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace vacuum cut valve.

10. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

1. Turn ignition switch “OFF”.
2. Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK >> GO TO 11.
NG >> Repair or replace.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP control system pressure sensor.

12. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1539, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace EVAP control system pressure sensor.

13. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 14.
NG >> Clean the rubber tube using an air blower.

14. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1532, "Component Inspection" .

OK or NG

OK >> GO TO 15.
NG >> Replace EVAP canister vent control valve.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002KV

VACUUM CUT VALVE BYPASS VALVE

With CONSULT-II

1. Reconnect harness disconnected connectors.
2. Turn ignition switch ON.
3. Perform “VC/V BYPASS/V” in “ACTIVE TEST” mode.

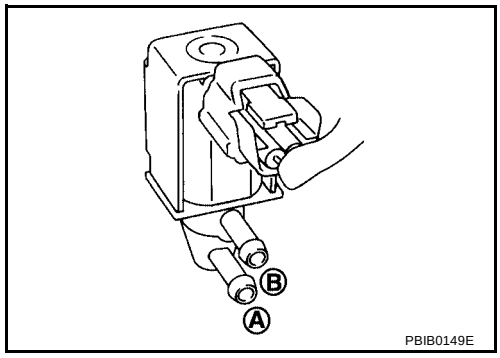
ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0840E

4. Check air passage continuity and operation delay time under the following conditions.

Condition VC/V BYPASS/V	Air passage continuity between **A** and **B**
ON	Yes
OFF	No

Operation takes less than 1 second.
If NG, replace vacuum cut valve bypass valve.



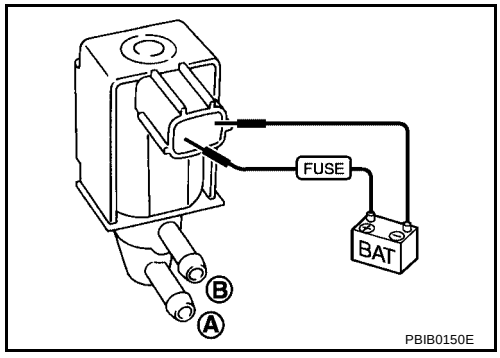
PBIB0149E

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between **A** and **B**
12V direct current supply between terminals 1 and 2	Yes
No supply	No

Operation takes less than 1 second.
If NG, replace vacuum cut valve bypass valve.

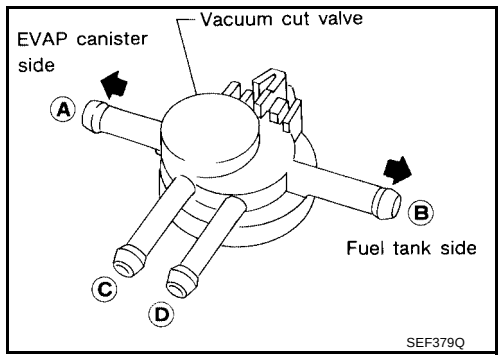


PBIB0150E

VACUUM CUT VALVE

Check vacuum cut valve as follows:

1. Plug port **C** and **D** with fingers.
2. Apply vacuum to port **A** and check that there is no suction from port **B** .
3. Apply vacuum to port **B** and check that there is suction from port **A** .
4. Blow air in port **B** and check that there is a resistance to flow out of port **A** .
5. Open port **C** and **D** .
6. Blow air in port **A** check that air flows freely out of port **C** .
7. Blow air in port **B** check that air flows freely out of port **D** .
8. If NG, replace vacuum cut valve.



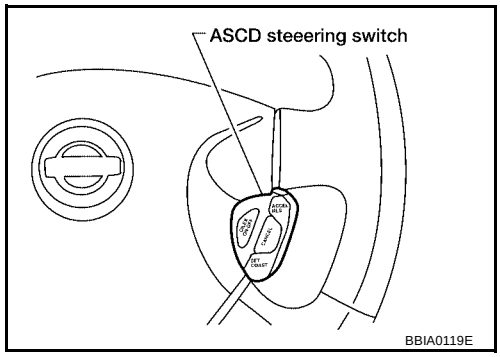
DTC P1564 ASCD STEERING SWITCH

PFP:25551

Component Description

UBS002KW

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS002KX

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAIN SW	● Ignition switch: ON	● CRUISE switch: Depressed	ON
		● CRUISE switch: Released	OFF
CANCEL	● Ignition switch: ON	● CANCEL switch: Depressed	ON
		● CANCEL switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	● ACCEL/RES switch: Depressed	ON
		● ACCEL/RES switch: Released	OFF
SET SW	● Ignition switch: ON	● COAST/SET switch: Depressed	ON
		● COAST/SET switch: Released	OFF

On Board Diagnosis Logic

UBS002KY

This self-diagnosis has the one trip detection logic.
The MIL will not light up for this diagnosis.

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1583 .

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1564 1564	ASCD steering switch	● An excessively high voltage signal from the ASCD steering switch is sent to ECM. ● ECM detects that input signal from the ASCD steering switch is out of the specified range. ● ECM detects that the ASCD steering switch is stuck ON.	● Harness or connectors (The switch circuit is open or shorted.) ● ASCD steering switch ● ECM

DTC Confirmation Procedure

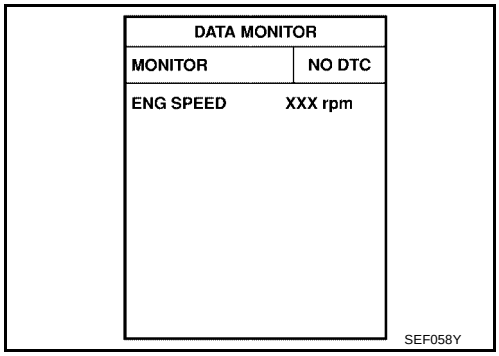
UBS002KZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 10 seconds.
4. Press “CRUISE” switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press “ACCEL/RES” switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press “COAST/SET” switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Press “CANCEL” switch for at least 10 seconds, then release it and wait at least 10 seconds.
8. If 1st trip DTC is detected, go to EC-1727, "Diagnostic Procedure" .



WITH GST

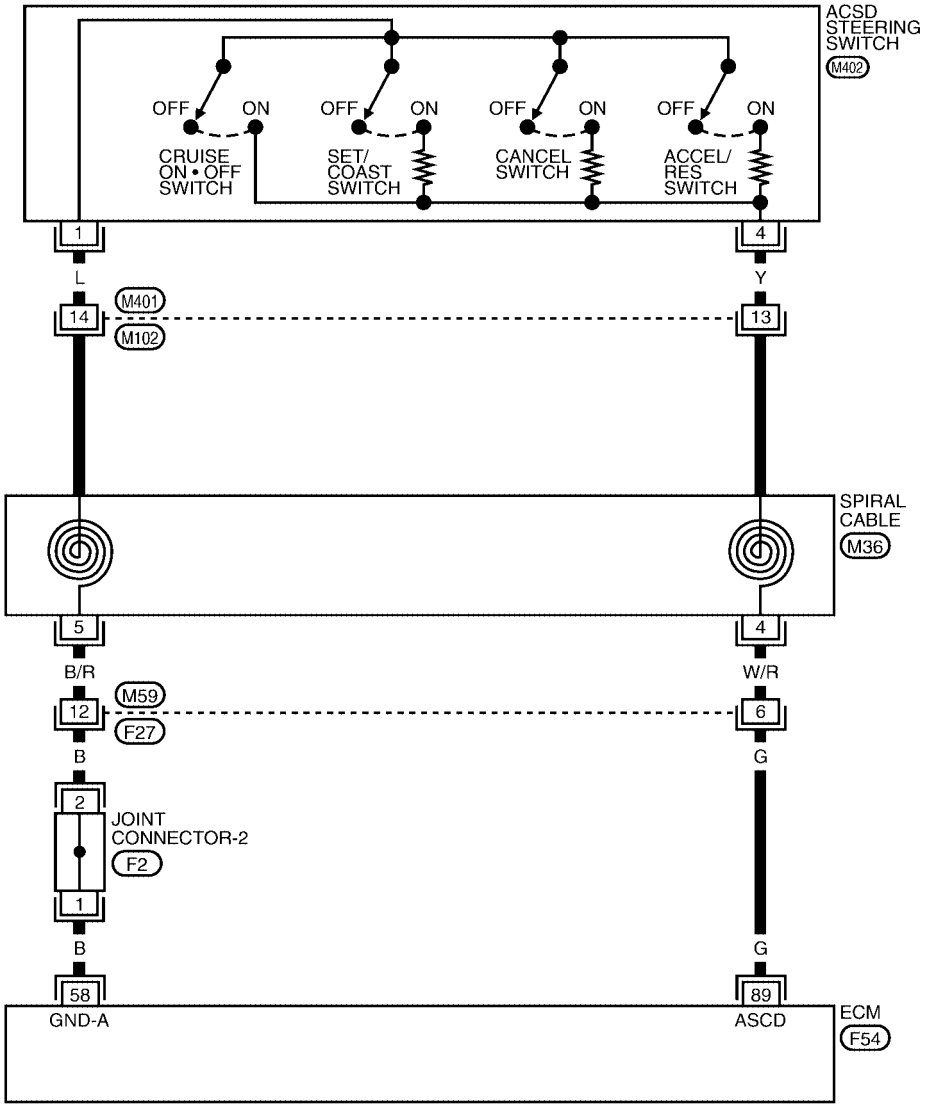
Follow the procedure “WITH CONSULT-II” above.

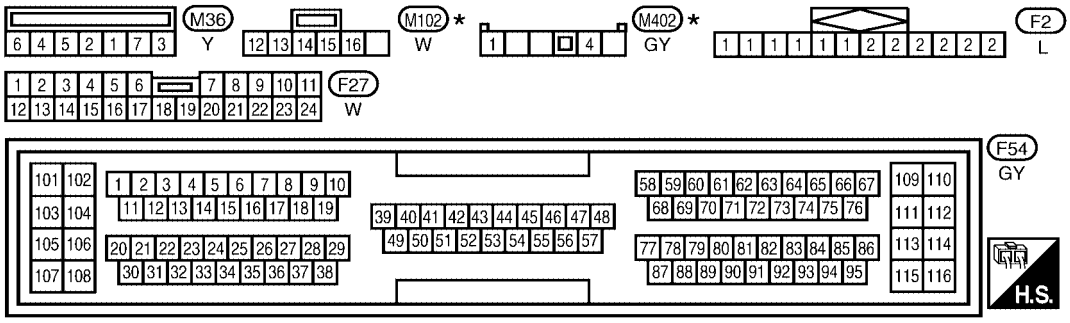
Wiring Diagram

UBS002L0

EC-ASC/SW-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





★: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" OF PG SECTION.

BBWA0420E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
89	G	ASCD steering switch	**[Ignition switch "ON"]** ● ASCD steering switch is "OFF".	Approximately 4.0V
			[Ignition switch "ON"] ● CRUISE switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1.0V
			[Ignition switch "ON"] ● SET/COAST switch is "ON".	Approximately 2.0V
			[Ignition switch "ON"] ● ACCEL/RES switch is "ON".	Approximately 3.0V

Diagnostic Procedure

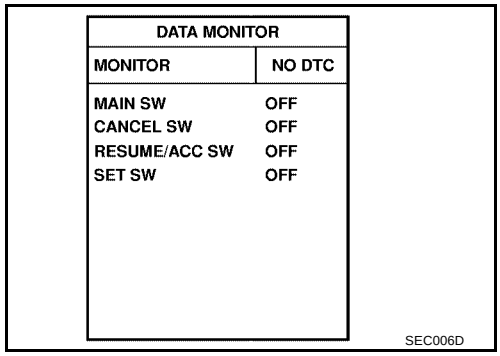
UBS002L1

1. CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “MAIN SW”, “RESUME/ACC SW”, “SET SW” and “CANCEL SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check each item indication under the following conditions.

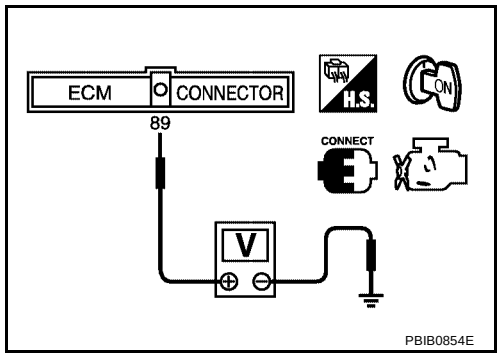
Switch	Monitor item	Condition	Indication
CUISE	MAIN SW	Pressed	ON
		Released	OFF
COAST/SET	SET SW	Pressed	ON
		Released	OFF
ACCEL/RES	RESUME/ACC SW	Pressed	ON
		Released	OFF
CANCEL	CANCEL SW	Pressed	ON
		Released	OFF



Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 89 and ground with pressing each button.

Switch	Condition	Voltage [V]
CRUISE	Pressed	Approx. 0.5
	Released	Approx. 4.0
COAST/SET	Pressed	Approx. 2.0
	Released	Approx. 4.0
ACCEL/RES	Pressed	Approx. 3.0
	Released	Approx. 4.0
CANCEL	Pressed	Approx. 1.0
	Released	Approx. 4.0



OK or NG

OK >> GO TO 7.
NG >> GO TO 2.

2. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

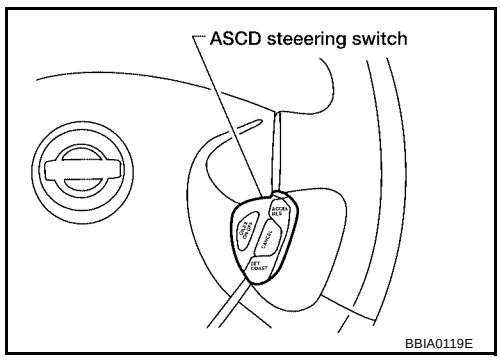
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect ASCD steering switch harness connector.
4. Check harness continuity between ASCD steering switch terminal 1 and ECM terminal 58. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors M102, M401
- Joint connector-2
- Spiral cable
- Harness for open and short between ECM and ASCD steering switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 89 and ASCD steering switch terminal 4. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness connectors M102, M401
- Spiral cable
- Harness for open and short between ECM and ASCD steering switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD STEERING SWITCH

Refer to EC-1728, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace ASCD steering switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1606, "DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION" .

>> **INSPECTION END**

Component Inspection

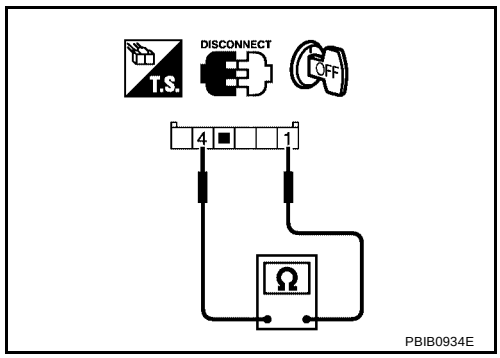
UBS002L2

ASCD STEERING SWITCH

1. Disconnect ASCD steering switch.

2. Check continuity between ASCD steering switch terminals 1 and 4 with pushing each switch.

Switch	Condition	Resistance [Ω]
CRUISE SW	Pressed	Approx. 4,000
	Released	Approx. 0
COAST/SET SW	Pressed	Approx. 660
	Released	Approx. 0
ACCEL/RES SW	Pressed	Approx. 1,000
	Released	Approx. 0
CANCEL SW	Pressed	Approx. 250
	Released	Approx. 0



If NG, replace ASCD steering switch.

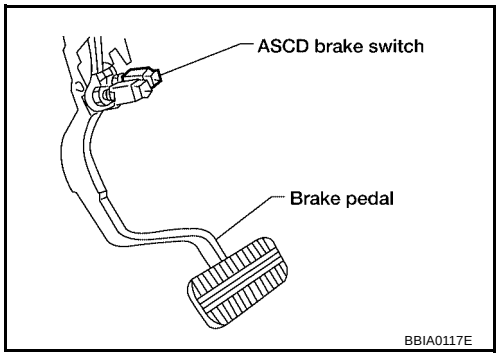
DTC P1572 ASCD BRAKE SWITCH

PFP:25320

Component Description

UBS002L3

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

UBS002L4

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (ASCD brake switch)	● Ignition switch: ON	● Brake pedal: Fully released	ON
		● Brake pedal: Slightly depressed	OFF
BRAKE SW2 (stop lamp switch)	● Ignition switch: ON	● Brake pedal: Fully released	OFF
		● Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

UBS002L5

The MIL will not light up for this diagnosis.

NOTE:
If DTC P1572 is displayed with DTC P0605 or P1805, first perform the trouble diagnosis for DTC P0605 or P1805. Refer to EC-1583 or EC-1746 .

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1572 1572	ASCD brake switch	ON signals from the stop lamp switch and the ASCD brake switch are sent to ECM at the same time.	● Harness or connectors (The stop lamp switch circuit is open or shorted.) ● Harness or connectors (The ASCD brake switch circuit is open or shorted.) ● Harness or connectors (The ASCD clutch switch circuit is open or shorted.) ● Stop lamp switch ● ASCD brake switch ● ASCD clutch switch ● Incorrect stop lamp switch installation ● Incorrect ASCD brake switch installation ● Incorrect ASCD clutch switch installation ● ECM

DTC Confirmation Procedure

UBS002L6

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:

Steps 3 and 4 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position

If 1st trip DTC is detected, go to EC-1733, "Diagnostic Procedure" .
If 1st trip DTC is not detected, go to the following step.

4. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned condition.

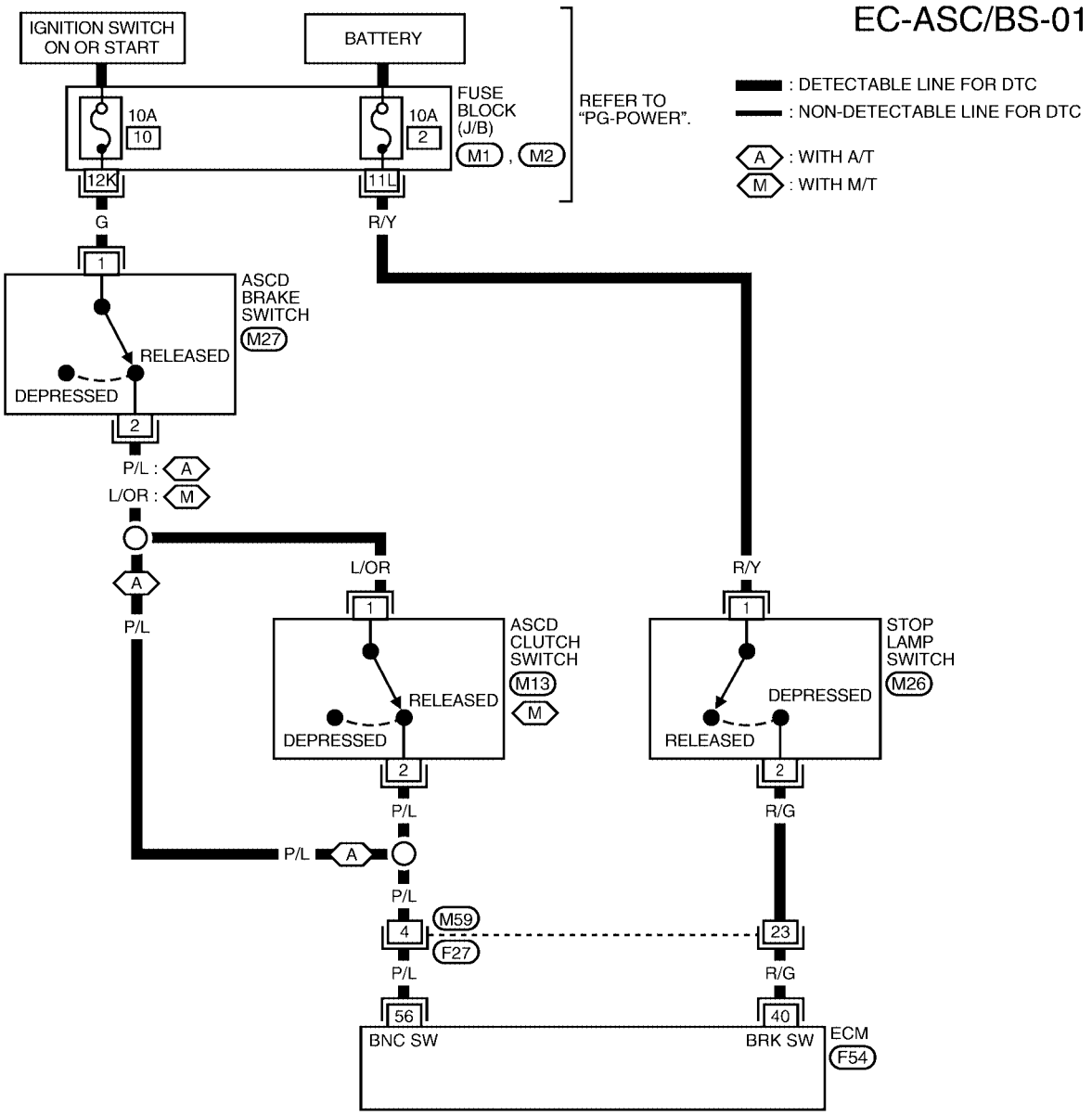
5. If 1st trip DTC is detected, go to EC-1733, "Diagnostic Procedure" .

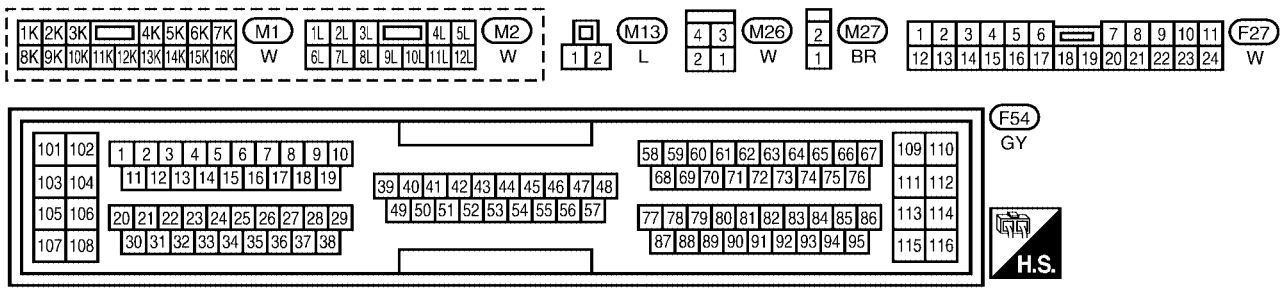
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002L7





BBWA0421E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
56	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released ● Clutch pedal is fully released (M/T models)	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002L8

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

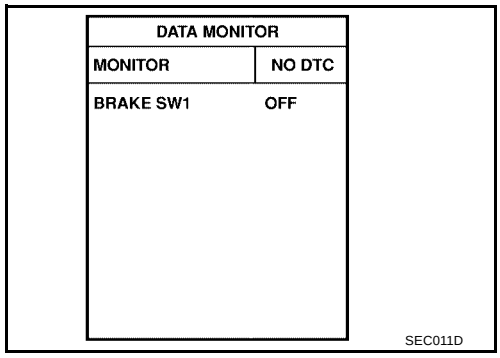
1. Turn ignition switch "ON".
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-II.
3. Check "BRAKE SW1" indication under the following conditions.

M/T models

CONDITION	INDICATION
When clutch pedal or brake pedal is depressed	OFF
When clutch pedal and brake pedal are fully released	ON

A/T models

CONDITION	INDICATION
When brake pedal is depressed	OFF
When brake pedal is fully released	ON



Without CONSULT-II

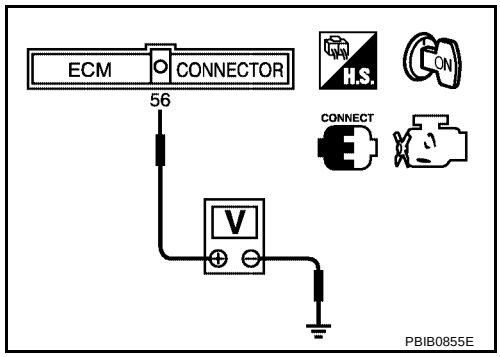
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 56 and ground under the following conditions.

M/T models

CONDITION	VOLTAGE
When clutch pedal or brake pedal is depressed	Approximately 0V
When clutch pedal and brake pedal are fully released	Battery voltage

A/T models

CONDITION	VOLTAGE
When brake pedal is depressed	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

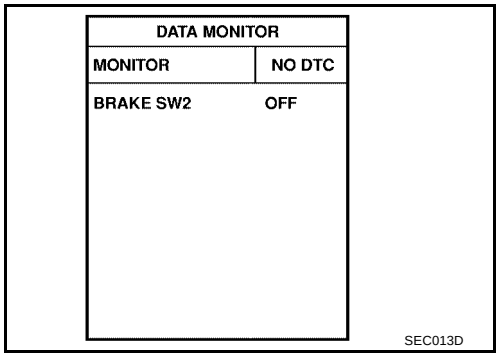
OK >> GO TO 2.
NG (M/T models) >>GO TO 3.
NG (A/T models) >>GO TO 4.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

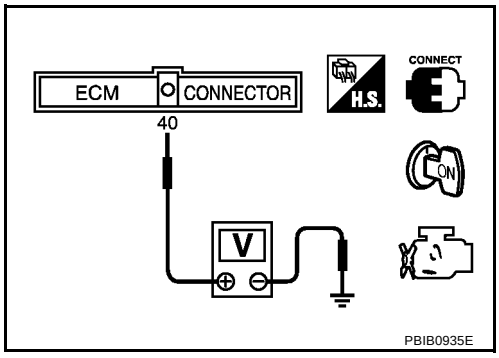
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 40 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

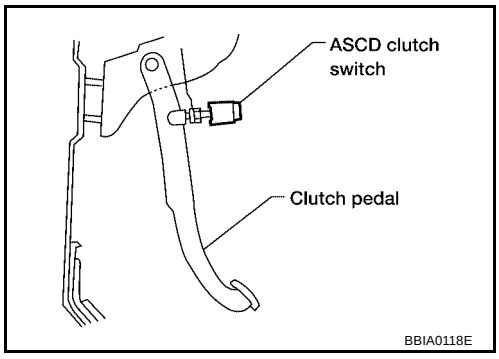


OK or NG

OK >> GO TO 18.
NG >> GO TO 13.

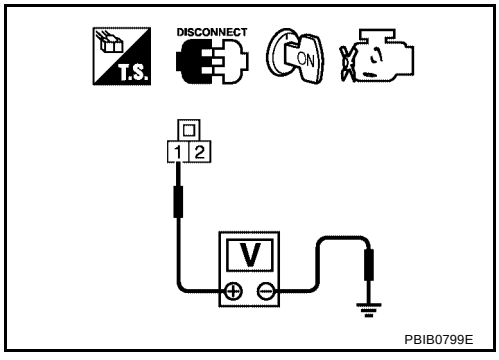
3. CHECK ASCD BRAKE SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-II or tester.

CONDITION	VOLTAGE
When brake pedal is released	Battery voltage
When brake pedal is depressed	Approx. 0V

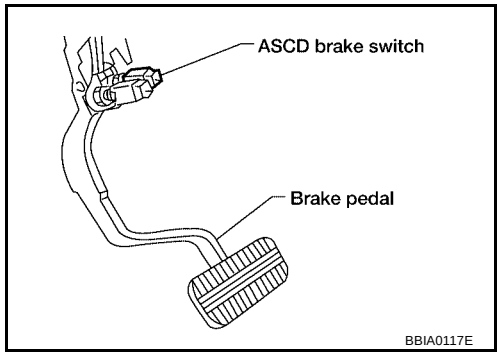


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch “ON”.

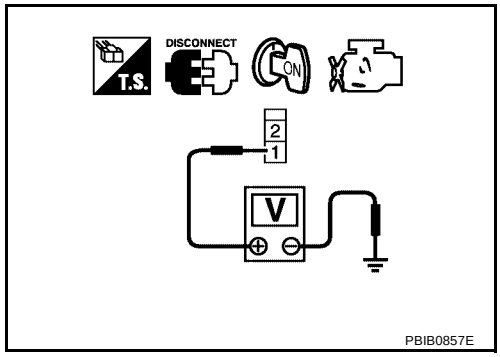


4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK (M/T models)>>GO TO 6.
OK (A/T models)>>GO TO 7.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ASCD BRAKE SWITCH

Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD brake switch.

10. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and ASCD clutch switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD clutch switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

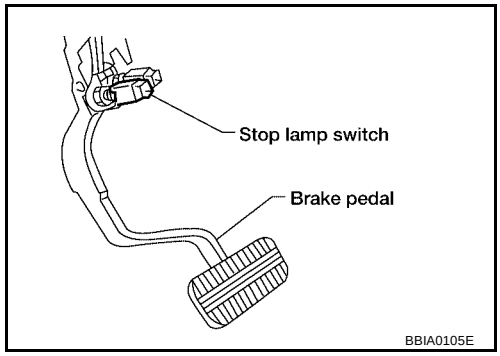
Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD clutch switch.

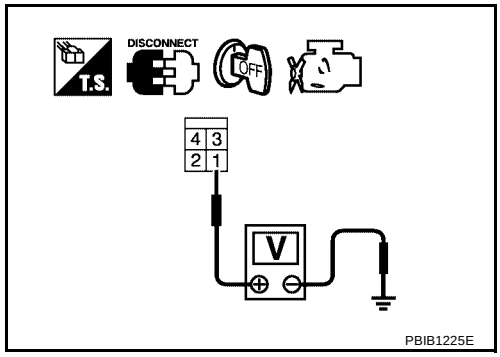
13. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT -II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 40 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK STOP LAMP SWITCH

Refer to EC-1738, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace stop lamp switch.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

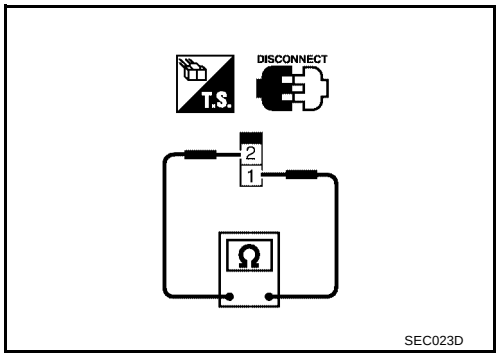
UBS002L9

ASCD BRAKE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Check continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should exist.
When brake pedal is depressed.	Should not exist.

If NG, adjust ASCD brake switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.

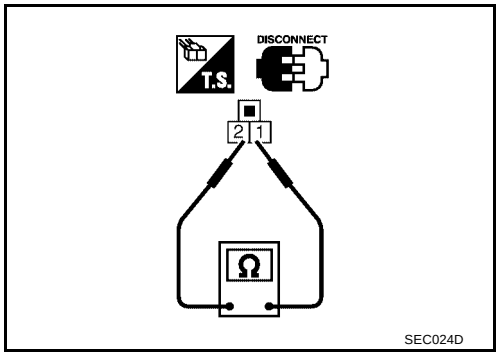


ASCD CLUTCH SWITCH (FOR M/T MODELS)

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Check continuity between ASCD clutch switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When clutch pedal is fully released.	Should exist.
When clutch pedal is depressed.	Should not exist.

If NG, adjust ASCD clutch switch installation, refer to CL-23, "CLUTCH SYSTEM" , and perform step 3 again.

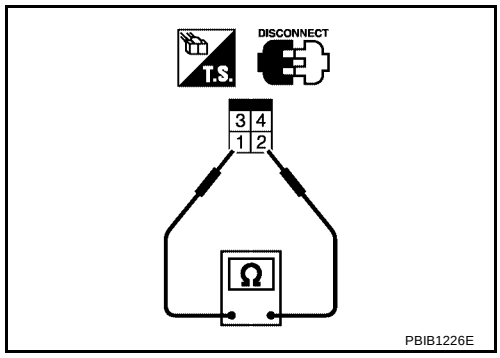


STOP LAMP SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.
3. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 3 again.



DTC P1574 ASCD VEHICLE SPEED SENSOR

PFP:31036

Component Description

UBS002LA

The ECM receives two vehicle speed sensor signals. One is sent from combination meter, and the other is from TCM (Transmission control module) via CAN communication line. The ECM uses these signals for ASCD control. Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for ASCD functions.

On Board Diagnosis Logic

UBS002LB

The MIL will not light up for this diagnosis.

NOTE:

- **If DTC P1574 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1350, "DTC U1000, U1001 CAN COMMUNICATION LINE" .**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-1575, "DTC P0500 VSS" .**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1583, "DTC P0605 ECM" .**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1574 1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	● Harness or connectors (The CAN communication line is open or shorted.) ● Harness or connectors (The combination meter circuit is open or shorted.) ● TCM ● Combination meter ● Vehicle speed sensor ● ECM

DTC Confirmation Procedure

UBS002LC

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

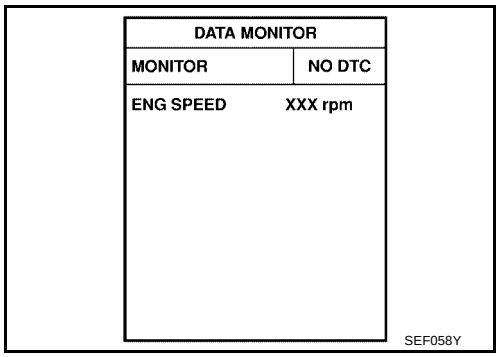
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Step 3 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Drive the vehicle at more than 40 km/h (25MPH).
4. If 1st trip DTC is detected, go to EC-1741, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

UBS002LD

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-428, "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" .

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2. CHECK VEHICLE SPEED SENSOR CIRCUIT

Refer to DI-26, "VEHICLE SPEED SENSOR SIGNAL CHECK" .

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-3, "METERS AND GAUGES" .

>> **INSPECTION END**

DTC P1706 PNP SWITCH

PFP:32006

Component Description

UBS002LE

When the shift lever position is “P” (A/T models only) or “N”, park/neutral position (PNP) switch is “ON”. ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

UBS002LF

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF

On Board Diagnosis Logic

UBS002LG

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706 1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	● Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.] ● Park/neutral position (PNP) switch

DTC Confirmation Procedure

UBS002LH

CAUTION:

Always drive vehicle at a safe speed.

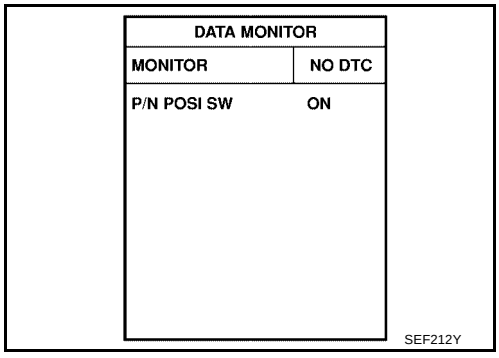
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II. Then check the “P/N POSI SW” signal under the following conditions.

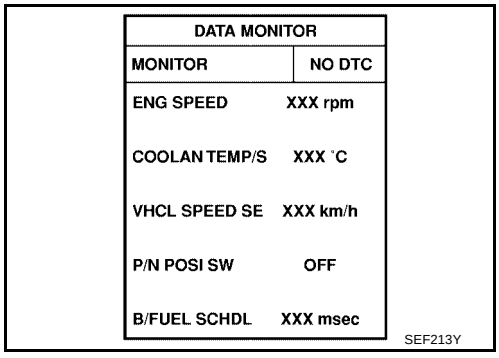
Position (Selector lever)	Known-good signal
“N” and “P” position	ON
Except the above position	OFF



If NG, go to EC-1745, "Diagnostic Procedure" .
If OK, go to following step.

3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and warm it up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,500 - 3,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.0 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 MPH)
Selector lever	Suitable position



6. If 1st trip DTC is detected, go to EC-1745, "Diagnostic Procedure" .

Overall Function Check

UBS002LI

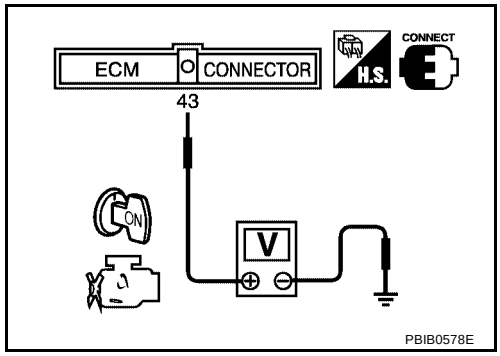
Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 43 (PNP switch signal) and body ground under the following conditions.

Condition (Gear position)	Voltage V (Known good data)
“P” (A/T models only) and “N” position	Approx. 0
Except the above position	A/T models: Battery voltage M/T: Approximately 5V

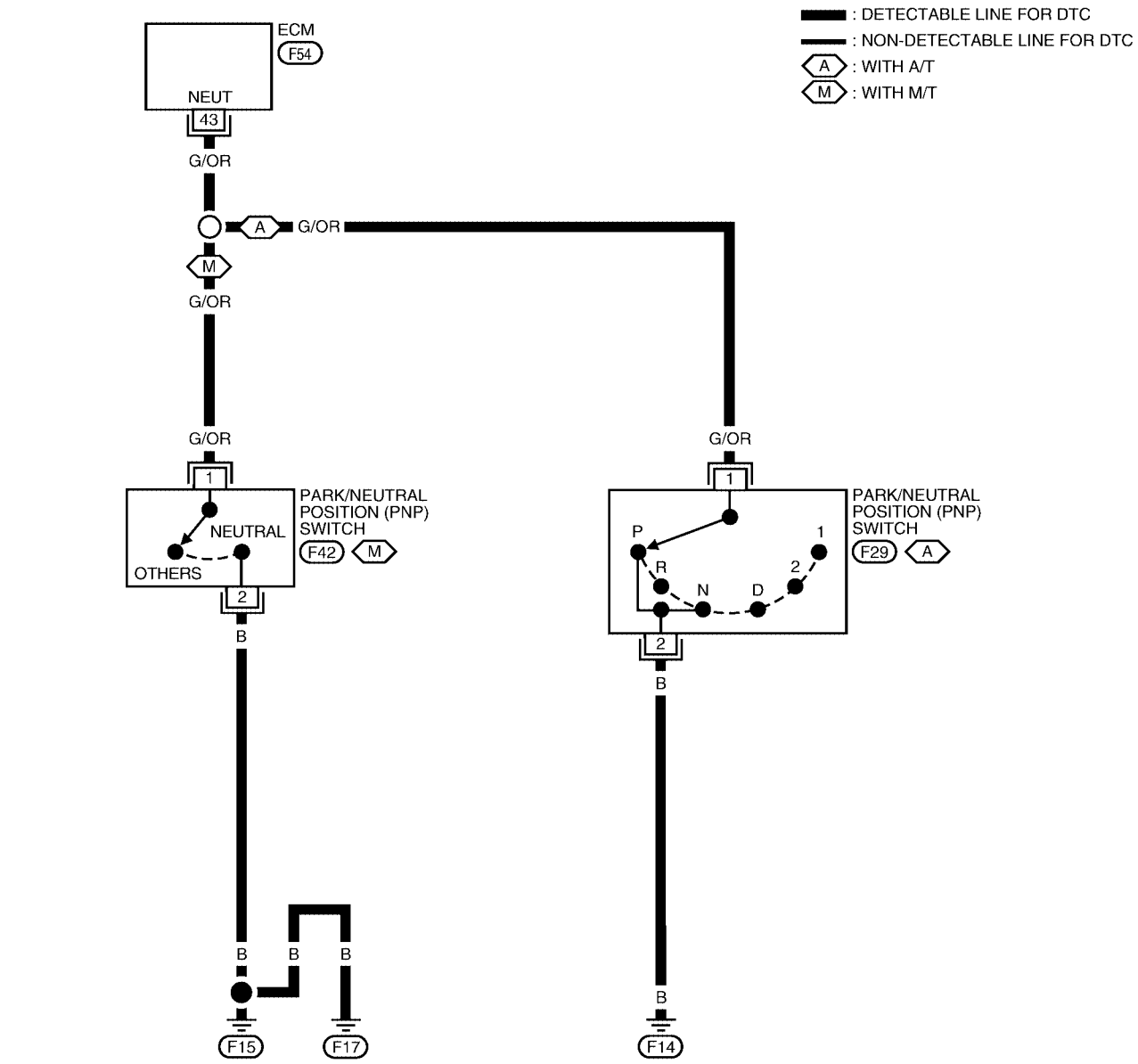
3. If NG, go to EC-1745, "Diagnostic Procedure" .

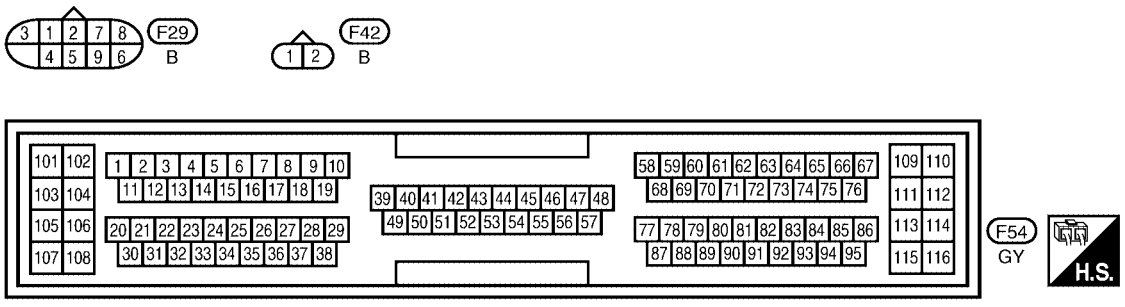


Wiring Diagram

UBS002LJ

EC-PNP/SW-01





BBWA0241E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
43	G/OR	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models), "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

UBS002LK

1. CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and body ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to power in harness or connectors.

2. CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 43 and PNP switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.

3. CHECK PNP SWITCH

Refer to AT-491, "DTC P0705 PARK/NEUTRAL POSITION SWITCH" (A/T models), MT-139, "POSITION SWITCH" (6M/T models) or MT-78, "POSITION SWITCH" (5M/T models).

OK or NG

OK >> GO TO 4.
NG >> Replace PNP switch.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

UBS002LL

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

UBS002LM

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

UBS002LN

The MIL will not light up for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

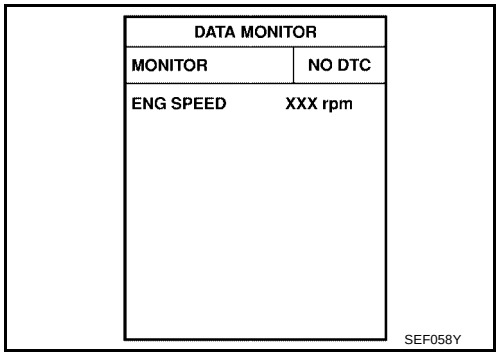
Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range.	
	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

UBS002LO

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-1748, "Diagnostic Procedure" .

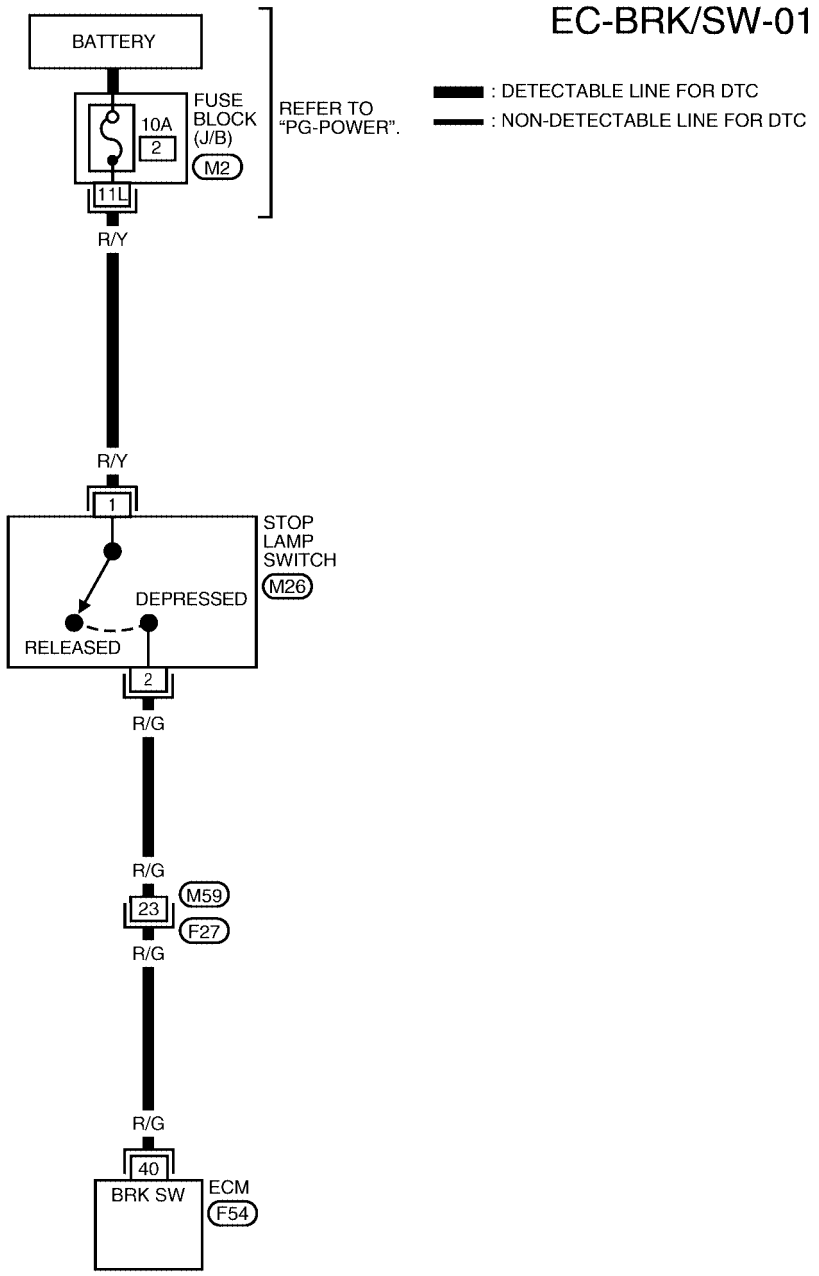


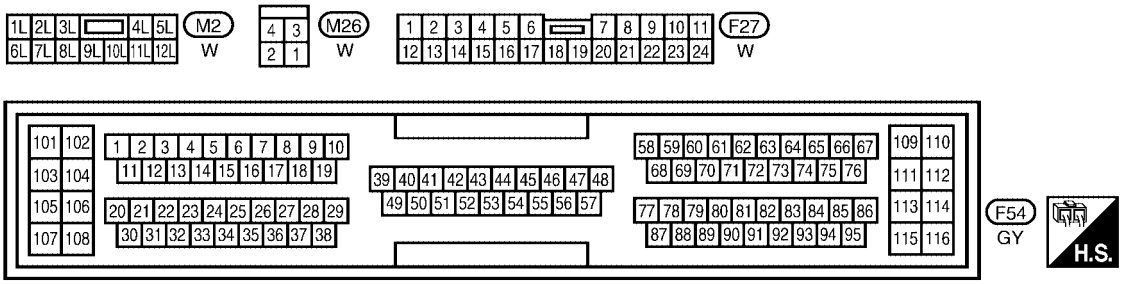
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS002LP





BBWA0422E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002LQ

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the brake pedal.

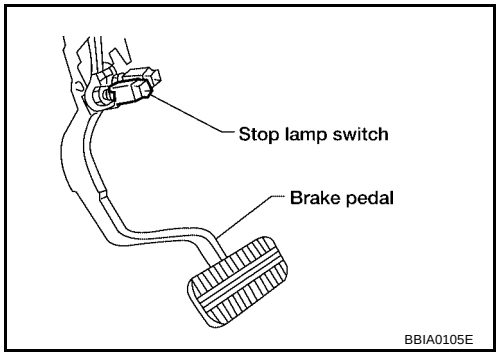
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

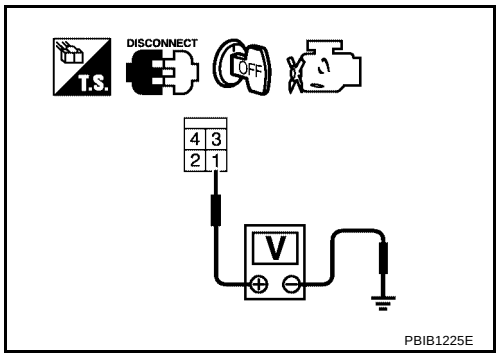
2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.



2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

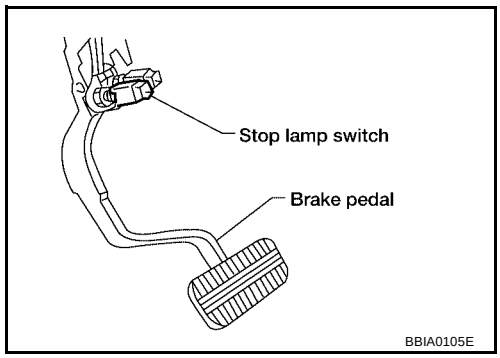
- 10A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.
4. Check harness continuity between ECM terminal 40 and stop lamp switch terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.
5. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-1750, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

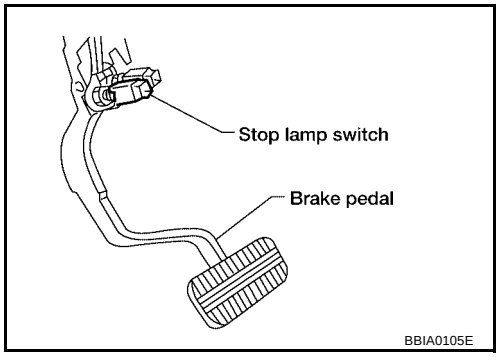
>> **INSPECTION END**

Component Inspection

UBS002LR

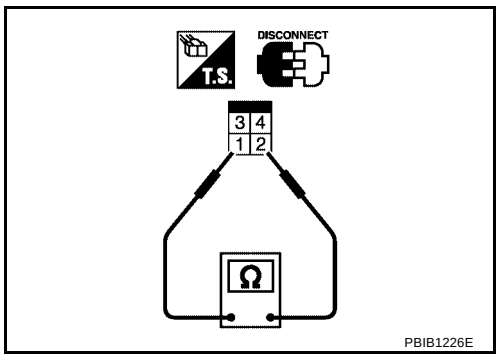
STOP LAMP SWITCH

1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.



If NG, adjust brake pedal installation, refer to BR-11, "BRAKE PEDAL AND BRACKET" , and perform step 2 again.

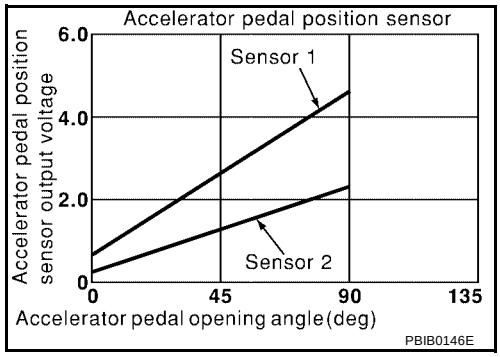
DTC P2122, P2123 APP SENSOR

PFP:18002

Component Description

UBS006K8

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS006K9

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

UBS006KA

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122 2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P2123 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

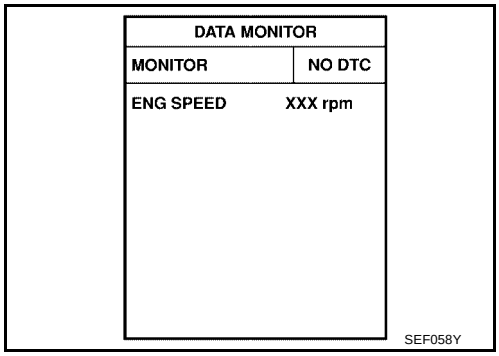
UBS006KB

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1754, "Diagnostic Procedure" .



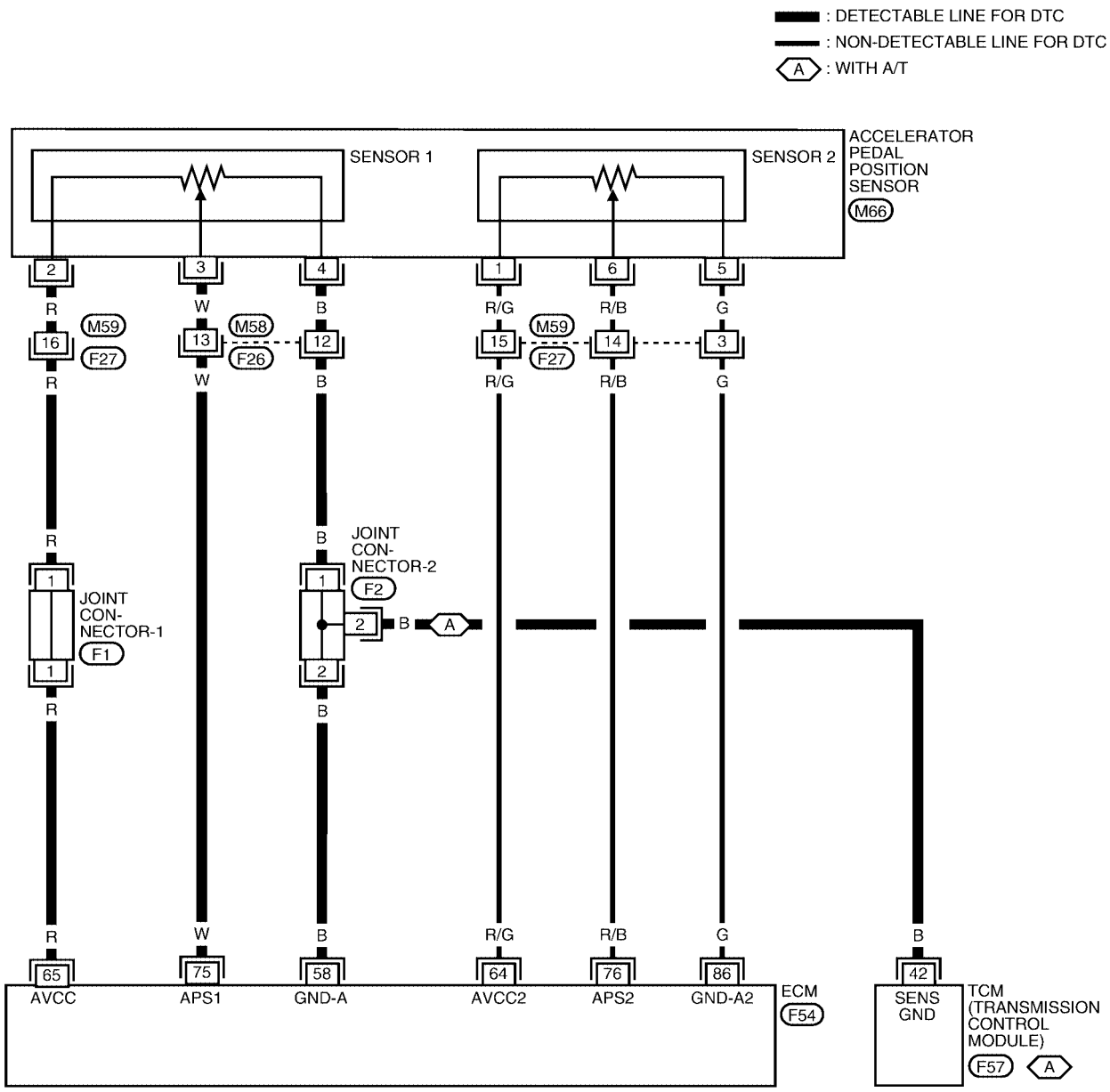
WITH GST

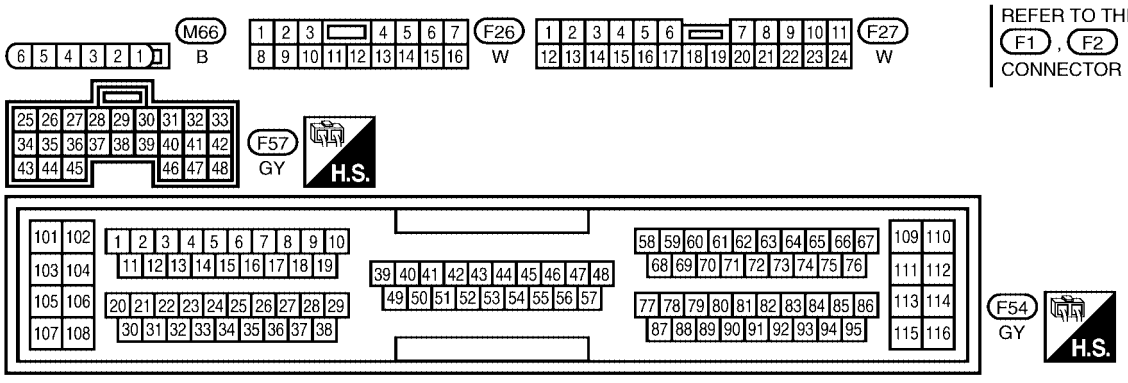
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006KC

EC-APPS1-01





Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
64	R/G	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 2.5V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
75	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 4.2V
76	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.21 - 0.36V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 2.1V
86	G	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V

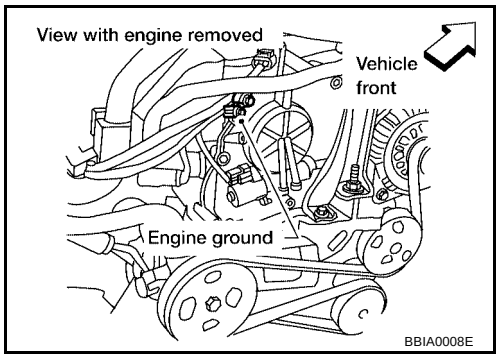
Diagnostic Procedure

UBS006KD

1. RETIGHTEN GROUND SCREWS

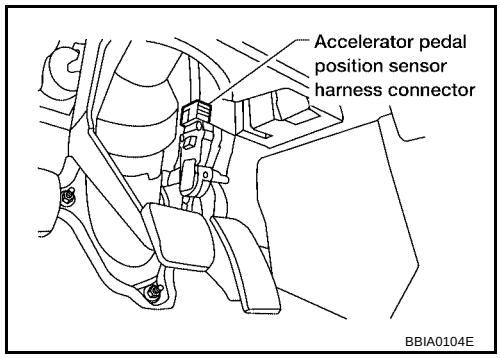
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



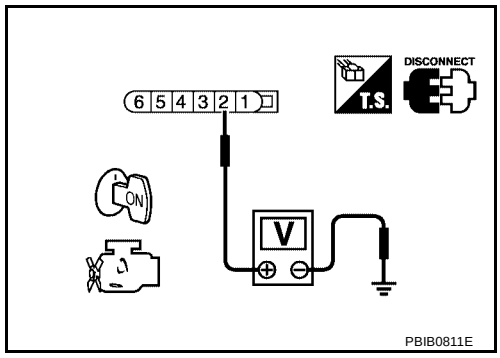
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between APP sensor terminal 4 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Joint connector-2
- Harness for open or short between ECM and accelerator pedal position sensor
- Harness for open or short between TCM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 75 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1756, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace accelerator pedal assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

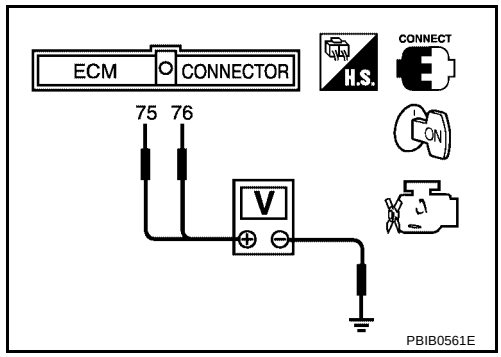
>> **INSPECTION END**

Component Inspection

UBS006KE

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 75 (APP sensor 1 signal), 76 (APP sensor 2 signal) and engine ground under the following conditions.



Terminal	Accelerator pedal	Voltage
75 (Accelerator pedal position sensor 1)	Fully released	0.41 - 0.71V
	Fully depressed	More than 4.2V
76 (Accelerator pedal position sensor 2)	Fully released	0.21 - 0.36V
	Fully depressed	More than 2.1V

4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1255, "Throttle Valve Closed Position Learning" .
7. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006KF

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

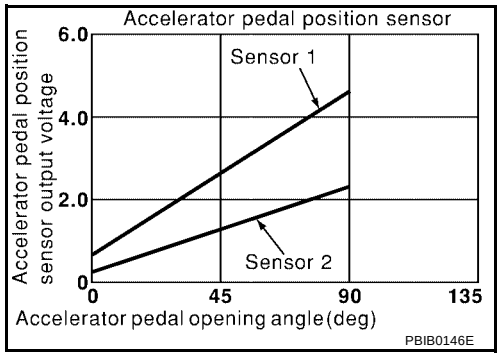
DTC P2127, P2128 APP SENSOR

PFP:18002

Component Description

UBS006KG

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS006KH

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN2★	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

★: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006KI

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127 2127	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2)
P2128 2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

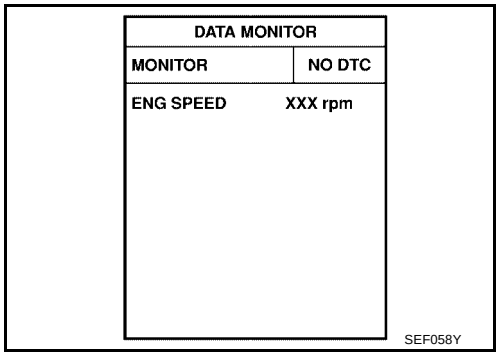
UBS006KJ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1760, "Diagnostic Procedure" .



WITH GST

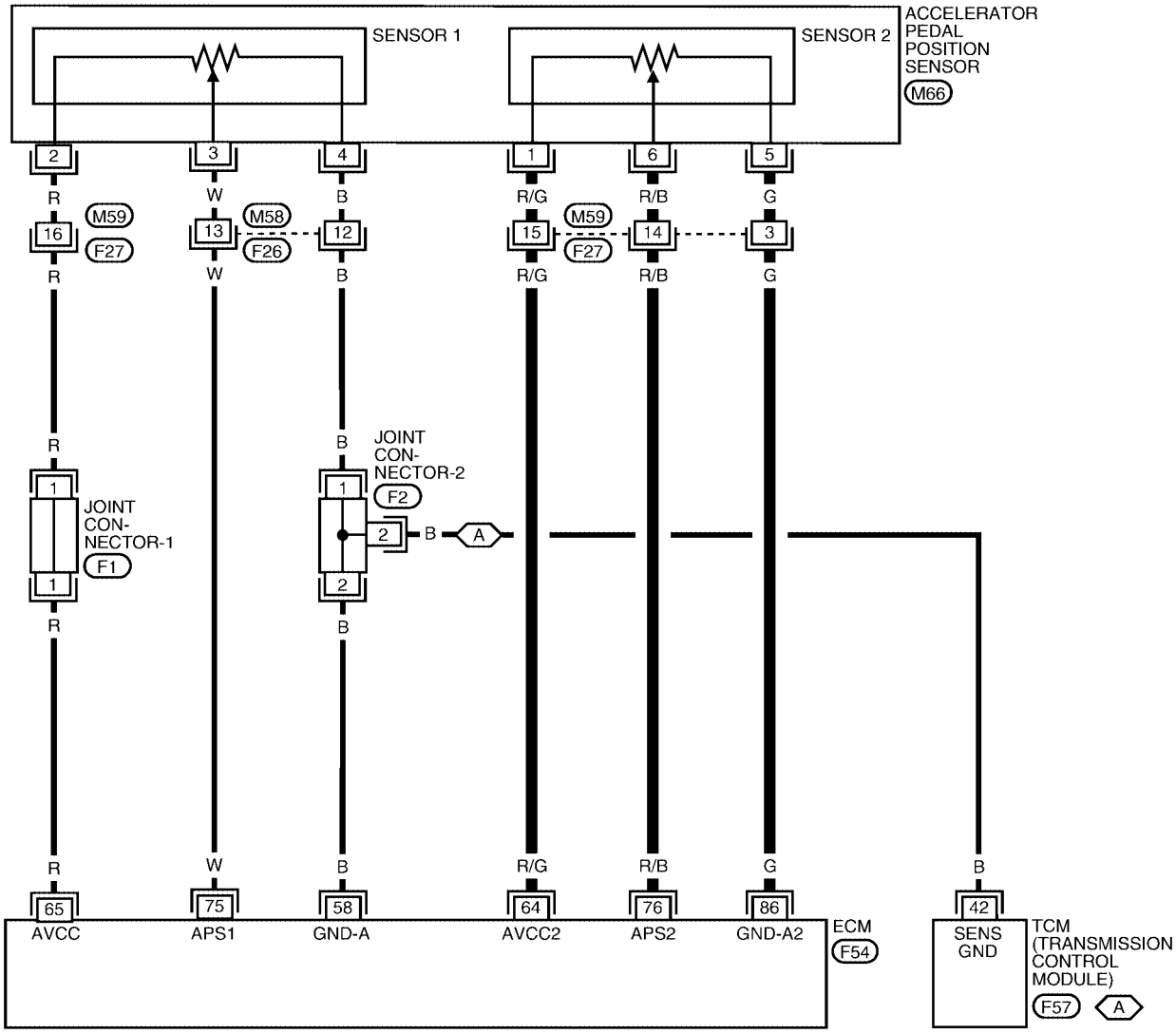
Follow the procedure “WITH CONSULT-II” above.

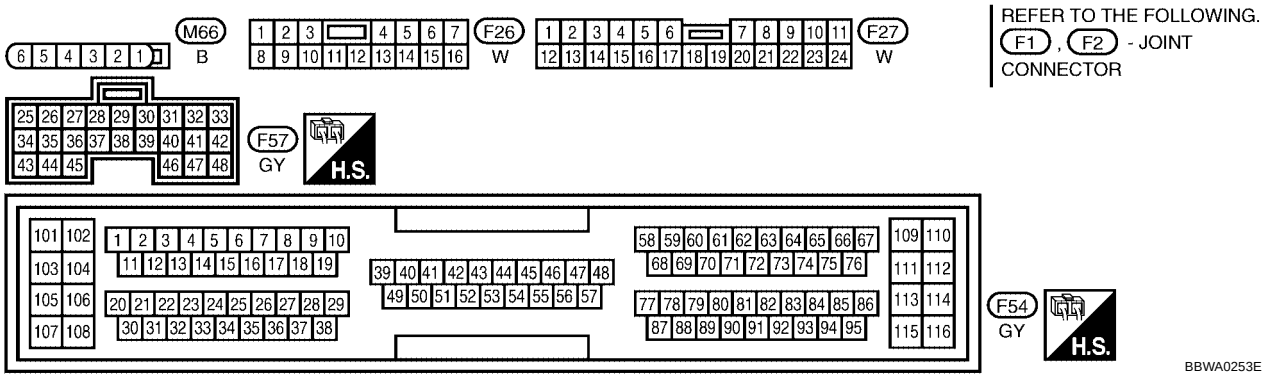
Wiring Diagram

UBS006KK

EC-APPS2-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
A : WITH A/T





Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
64	R/G	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 2.5V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
75	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 4.2V
76	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.21 - 0.36V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 2.1V
86	G	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V

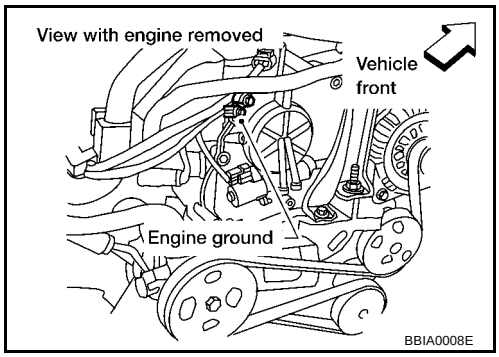
Diagnostic Procedure

UBS006KL

1. RETIGHTEN GROUND SCREWS

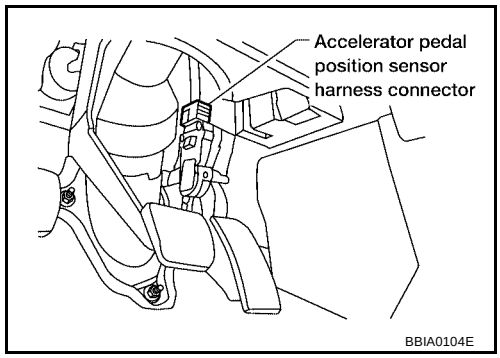
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



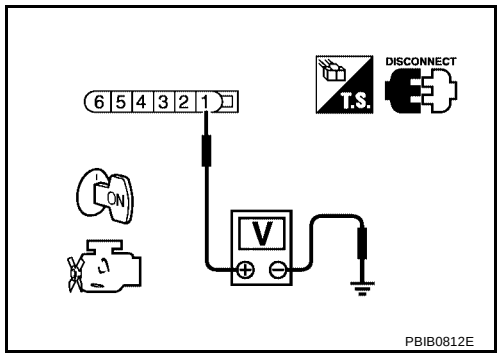
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 2.5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between APP sensor terminal 5 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 76 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1762, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace accelerator pedal assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

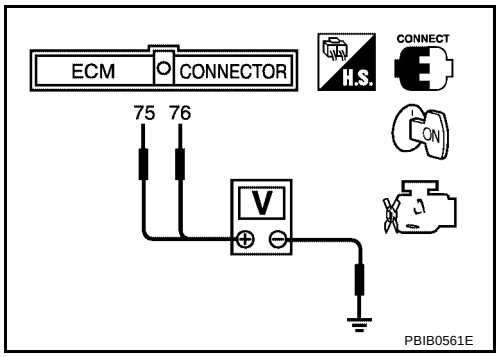
Component Inspection

UBS006KM

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 75 (APP sensor 1 signal), 76 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
75 (Accelerator pedal position sensor 1)	Fully released	0.41 - 0.71V
	Fully depressed	More than 4.2V
76 (Accelerator pedal position sensor 2)	Fully released	0.21 - 0.36V
	Fully depressed	More than 2.1V



4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1255, "Throttle Valve Closed Position Learning" .
7. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006KN

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

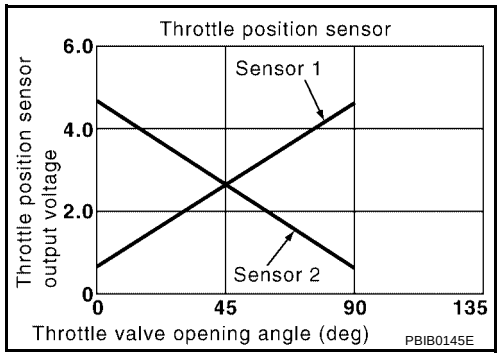
DTC P2135 TP SENSOR

PFP:16119

Component Description

UBS006KO

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

UBS006KP

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2★	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

★: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006KQ

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135 2135	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

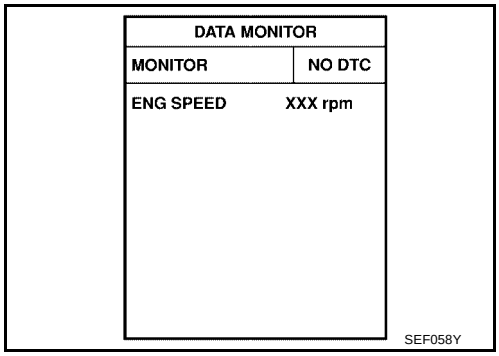
UBS006KR

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1766, "Diagnostic Procedure" .

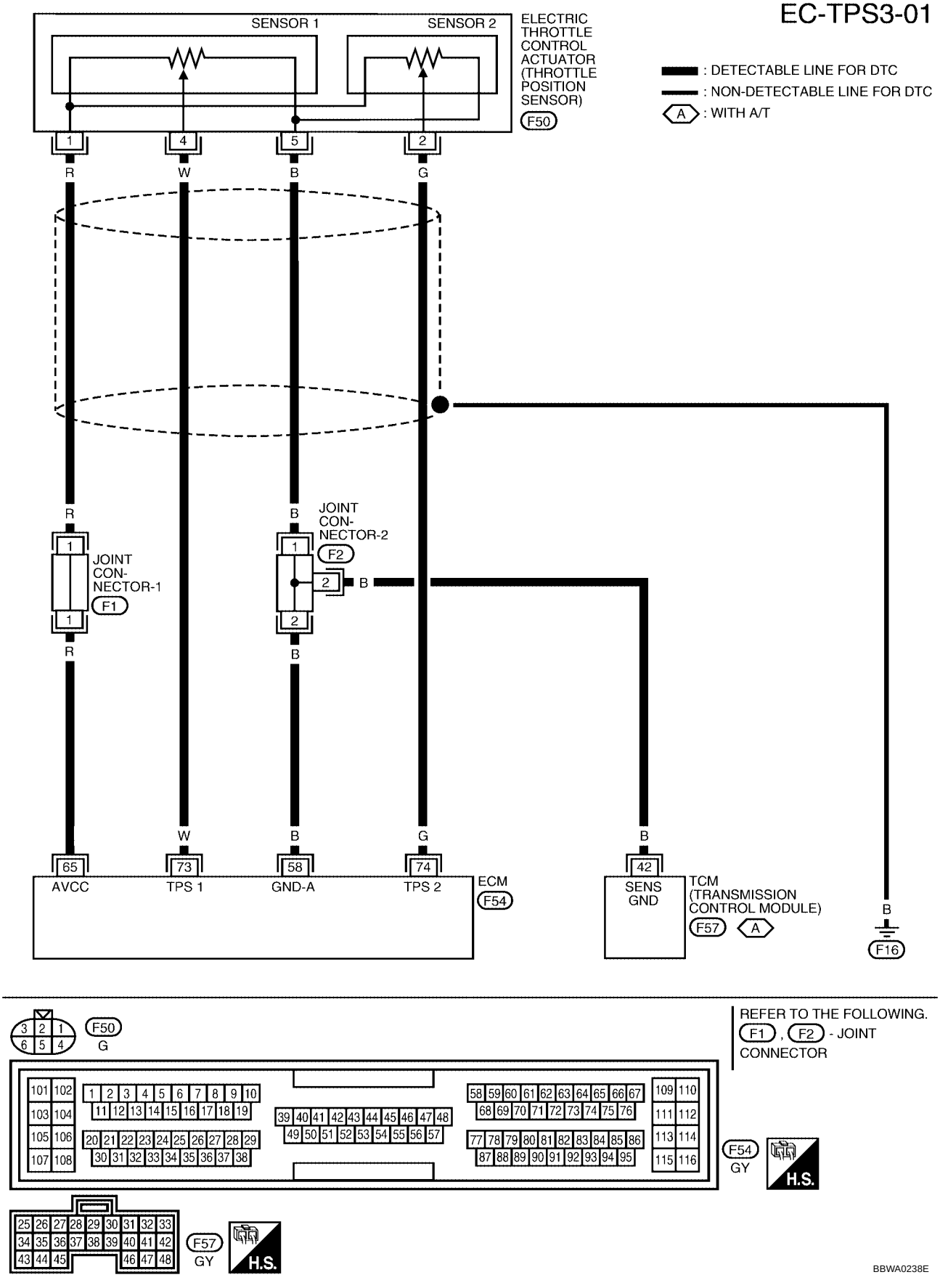


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006KS



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
73	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● **Engine speed** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● **Engine speed** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
74	G	Throttle position sensor 2	**[Ignition switch "ON"]** ● **Engine speed** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● **Engine speed** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

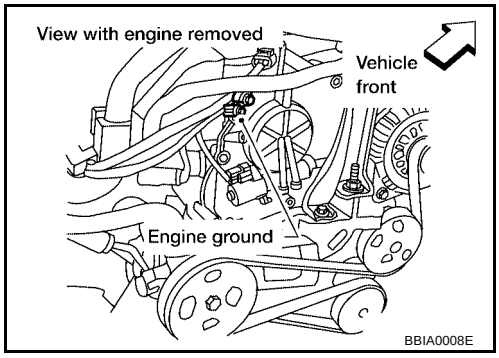
Diagnostic Procedure

UBS006KT

1. RETIGHTEN GROUND SCREWS

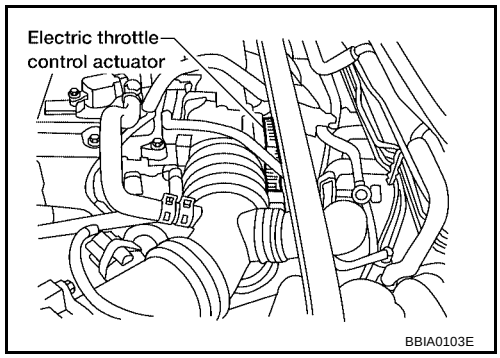
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

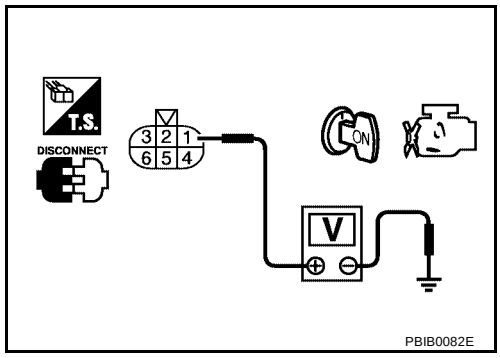


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-1
- Harness for open or short between electric throttle control actuator and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electric throttle control actuator terminal 5 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Joint connector-2
- Harness for open or short between electric throttle control actuator and ECM
- Harness for open or short between electric throttle control actuator and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 73 and electric throttle control actuator terminal 4, ECM terminal 74 and electric throttle control actuator terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE POSITION SENSOR

Refer to EC-1768, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Perform EC-1255, "Idle Air Volume Learning" .

>> **INSPECTION END**

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

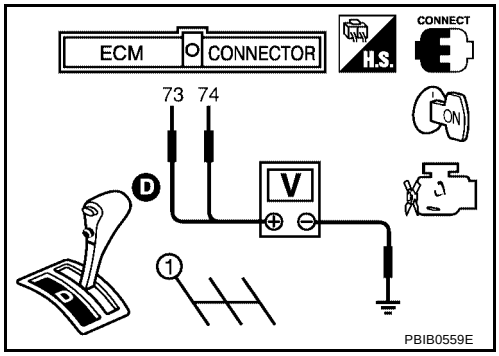
Component Inspection

UBS006KU

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1255, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 73 (TP sensor 1), 74 (TP sensor 2) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
73 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
74 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1255, "Throttle Valve Closed Position Learning" .
8. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006KV

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-105, "INTAKE MANIFOLD" .

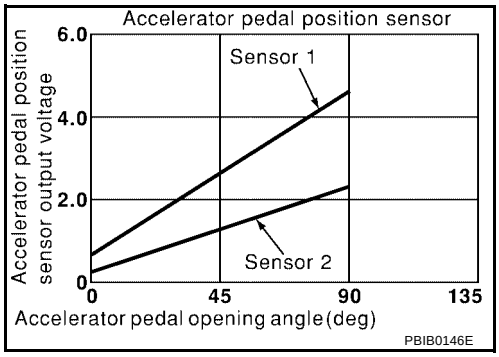
DTC P2138 APP SENSOR

PFP:18002

Component Description

UBS006KW

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

UBS006KX

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2★	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V
CLSD THL POS	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

★: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

UBS006KY

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138 2138	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

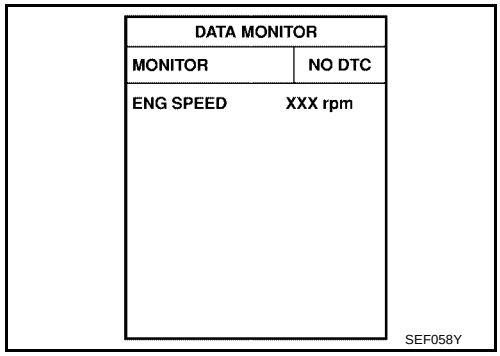
UBS006KZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1773, "Diagnostic Procedure" .



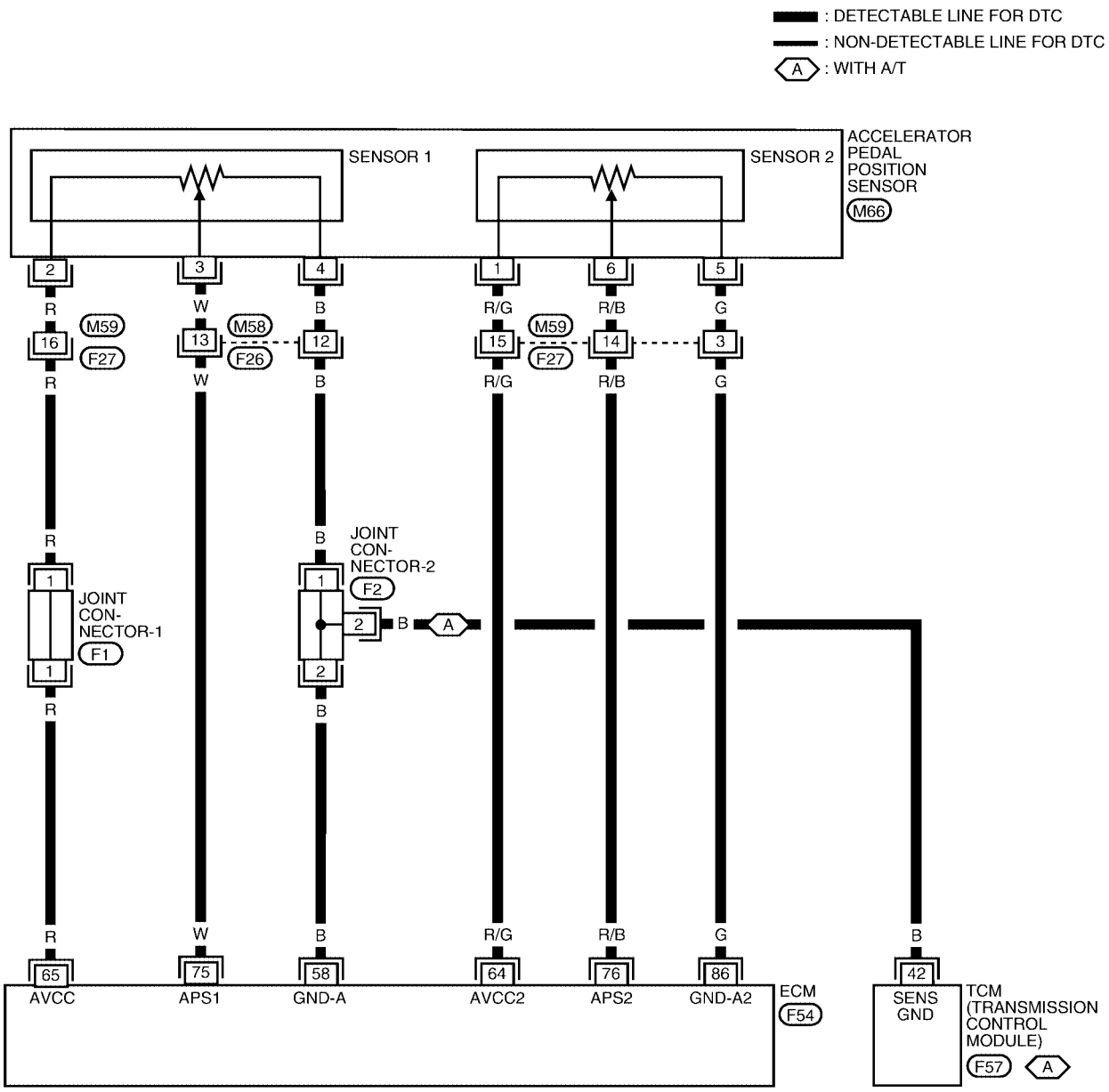
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

UBS006L0

EC-APPS3-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
64	R/G	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 2.5V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
75	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.41 - 0.71V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 4.2V
76	R/B	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● **Engine speed** ● Accelerator pedal fully released	0.21 - 0.36V
			[Ignition switch "ON"] ● **Engine speed** ● Accelerator pedal fully depressed	More than 2.1V
86	G	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V

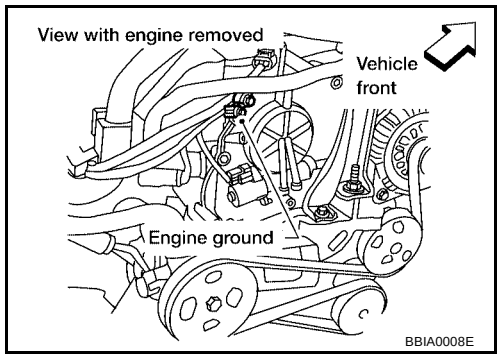
Diagnostic Procedure

UBS006L1

1. RETIGHTEN GROUND SCREWS

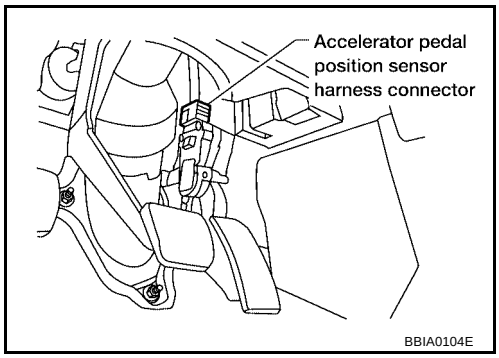
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



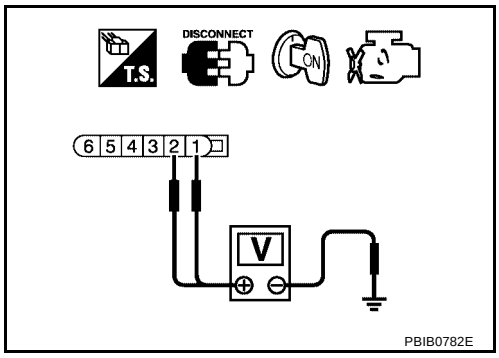
2. CHECK APP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminals 1, 2 and ground with CONSULT-II or tester.

APP sensor terminal	Voltage (V)
1	Approximately 2.5
2	Approximately 5



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E59, F27
- Joint connector-1
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between APP sensor terminal 4, 5 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness connectors M59, F27
- Joint connector-2
- Harness for open or short between ECM and accelerator pedal position sensor
- Harness for open or short between TCM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 75 and APP sensor terminal 3, ECM terminal 76 and APP sensor terminal 6.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Harness connectors M59, F27
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1775, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace accelerator pedal assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

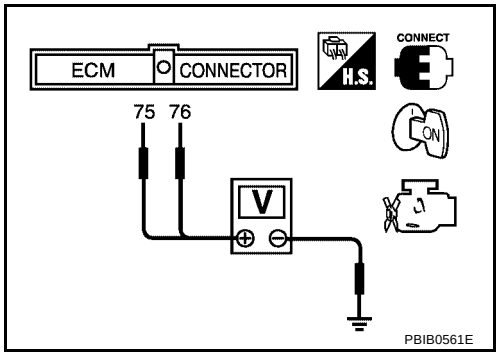
UBS006L2

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.

3. Check voltage between ECM terminals 75 (APP sensor 1 signal), 76 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
75 (Accelerator pedal position sensor 1)	Fully released	0.41 - 0.71V
	Fully depressed	More than 4.2V
76 (Accelerator pedal position sensor 2)	Fully released	0.21 - 0.36V
	Fully depressed	More than 2.1V



4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-1255, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1255, "Throttle Valve Closed Position Learning" .
7. Perform EC-1255, "Idle Air Volume Learning" .

Remove and Installation

UBS006L3

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

IGNITION SIGNAL

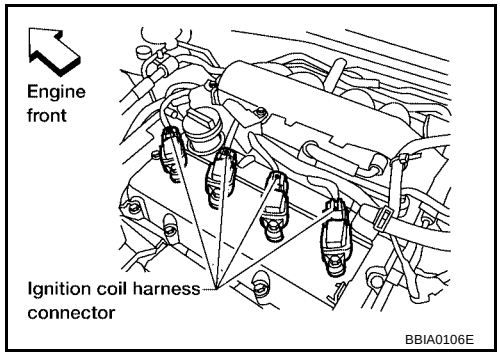
PFP:22448

Component Description

UBS002LS

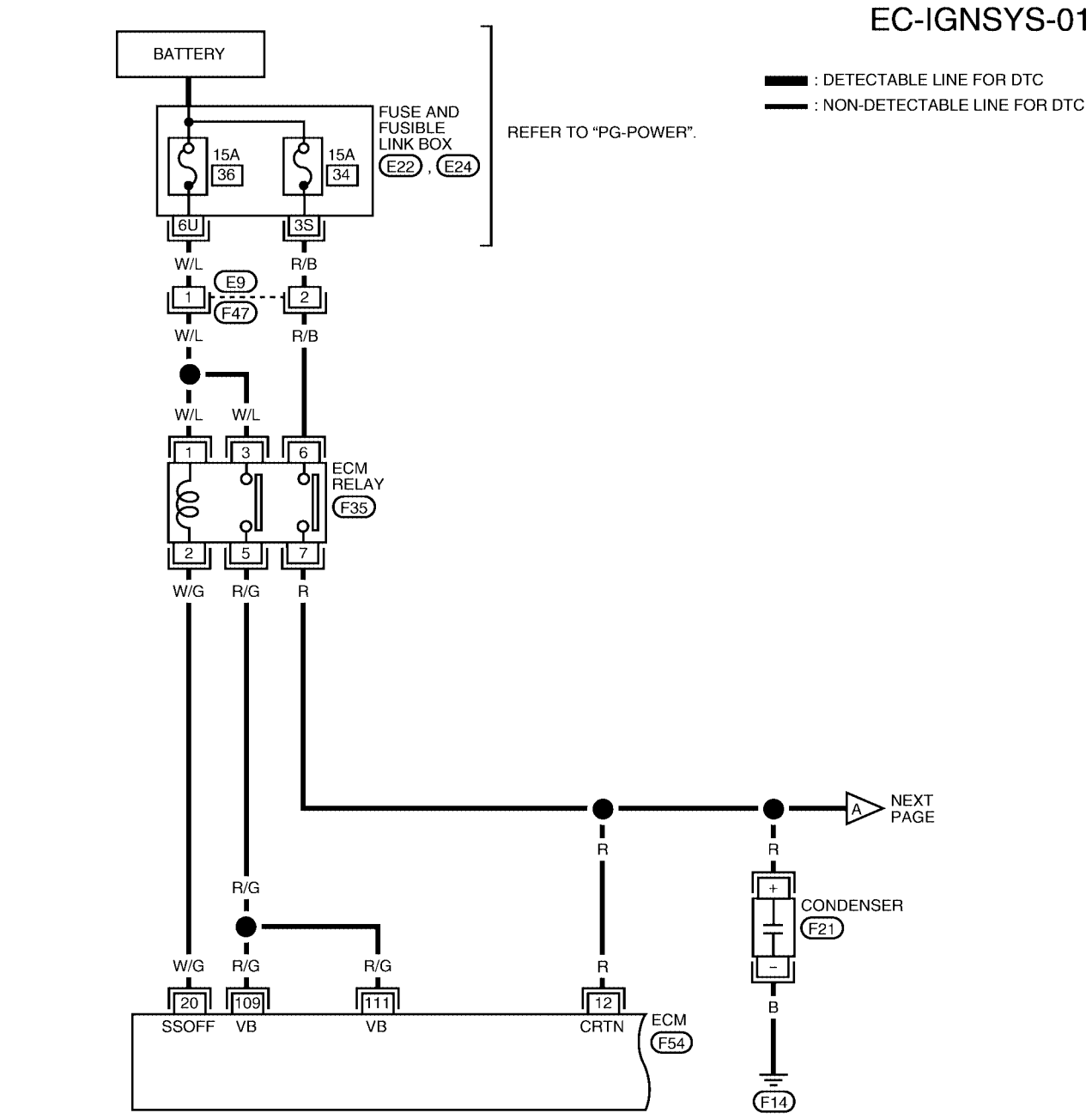
IGNITION COIL & POWER TRANSISTOR

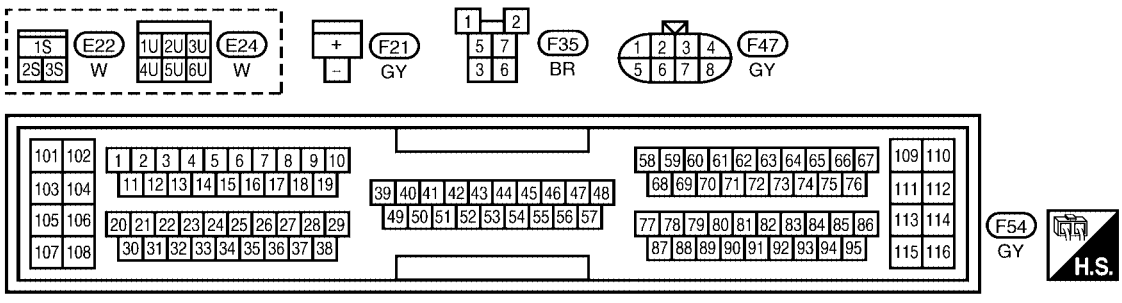
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.



Wiring Diagram

UBS002LT





BBWA0233E

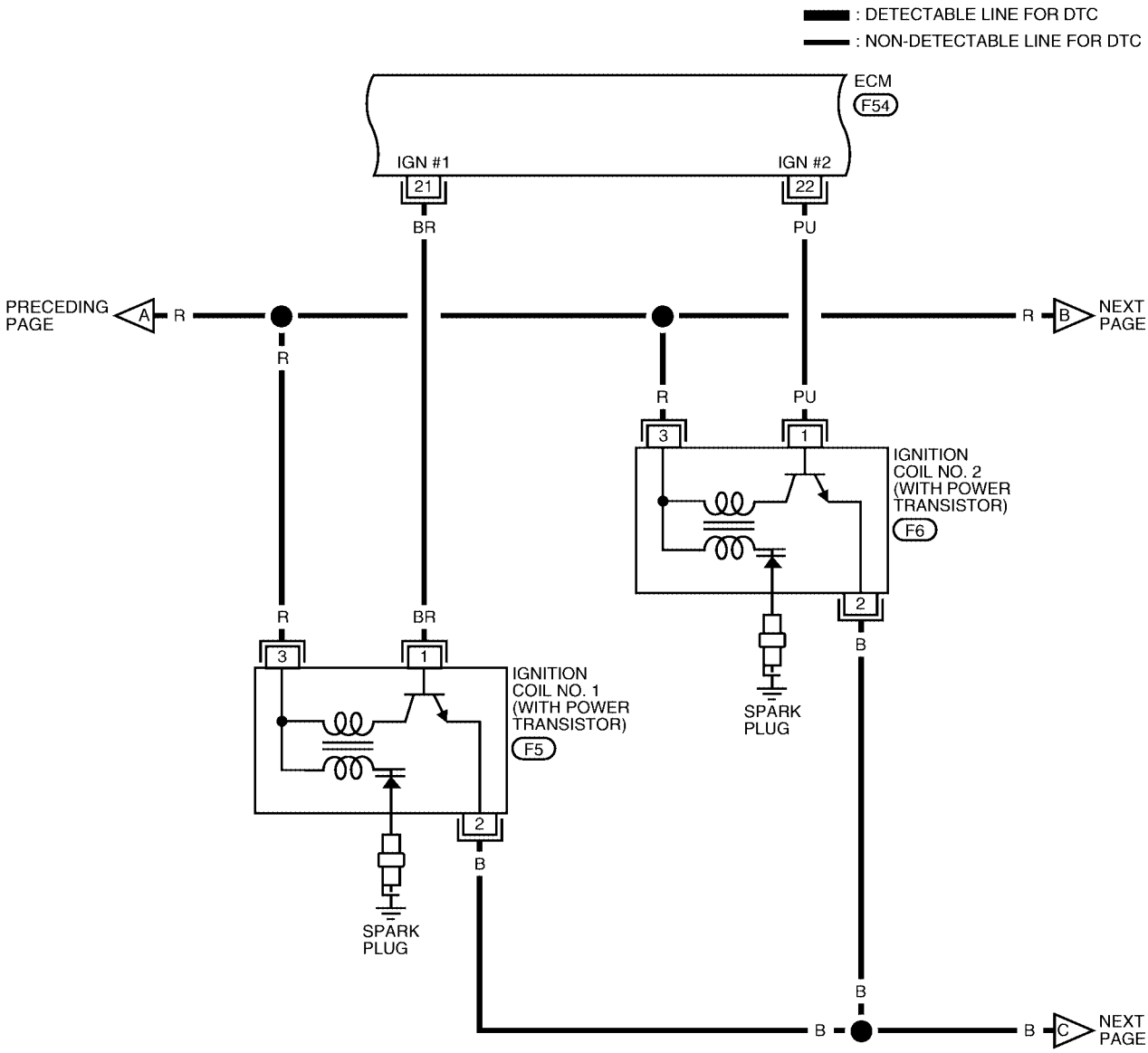
Specification data are reference values and are measured between each terminal and ground.

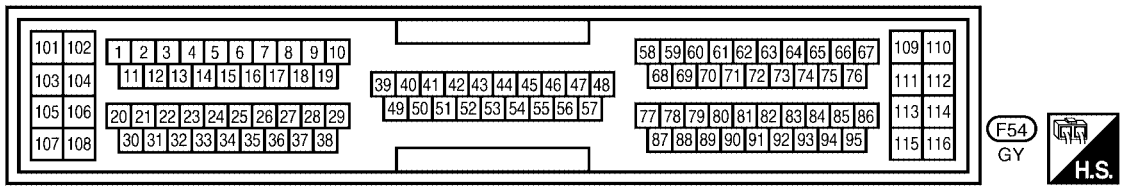
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	R	Counter current return	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
20	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
109 111	R/G R/G	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02



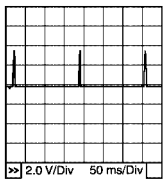
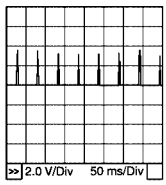


BBWA0234E

Specification data are reference values and are measured between each terminal and ground.

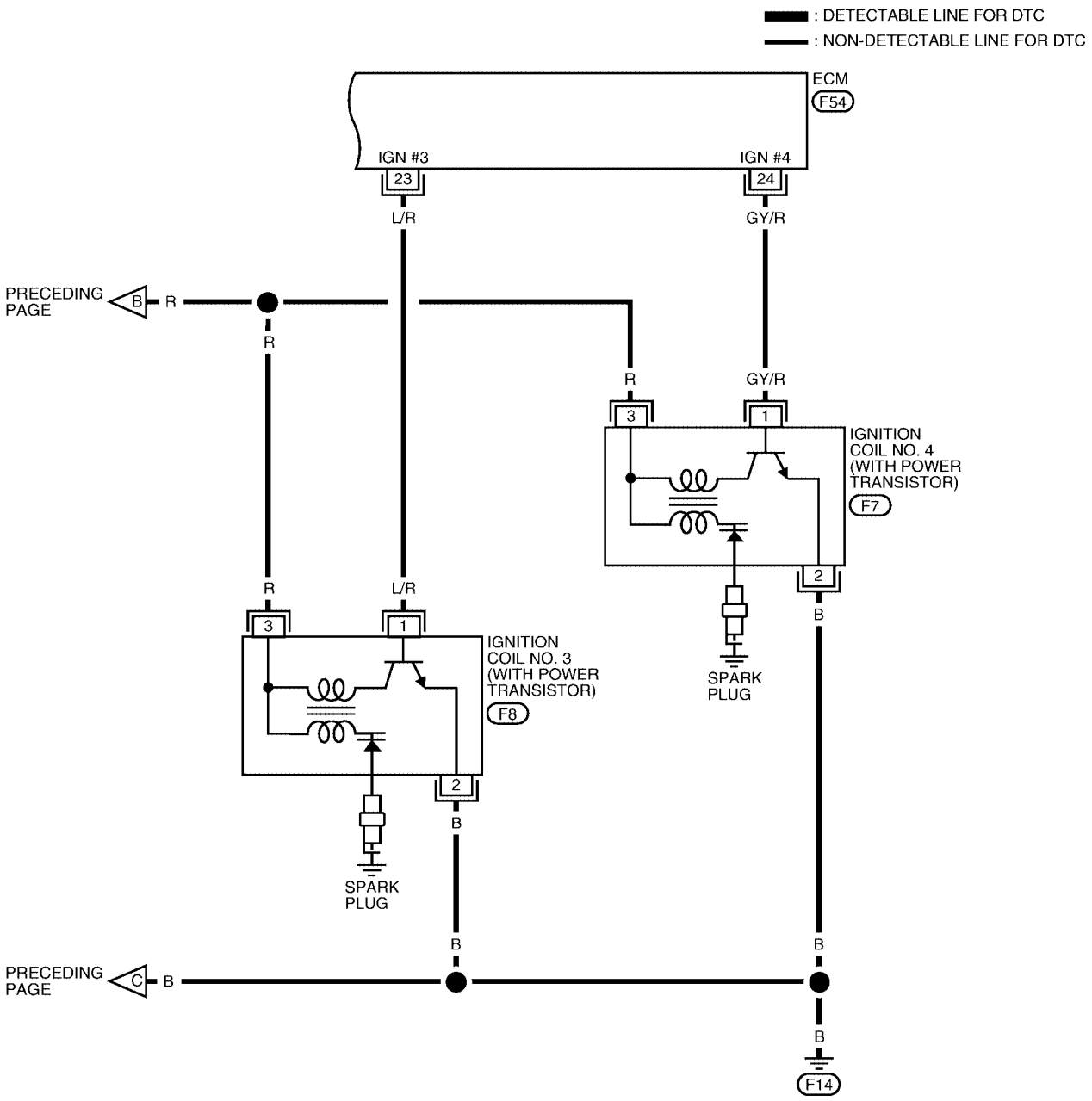
CAUTION:

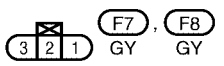
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

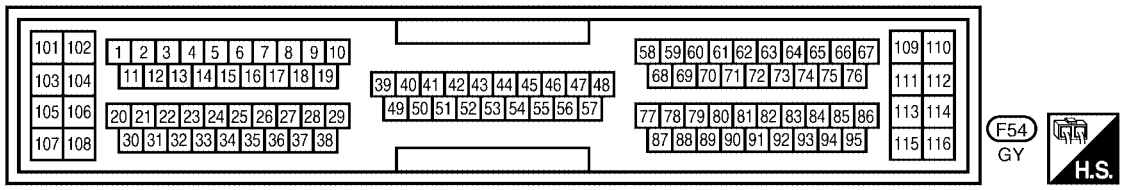
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22	BR PU	Ignition signal No. 1 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-IGNSYS-03





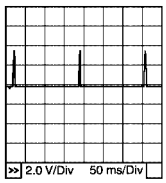
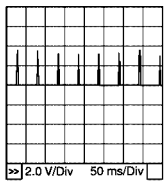


BBWA0235E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23 24	L/R GY/R	Ignition signal No. 3 Ignition signal No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002LU

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.

Is engine running?

Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

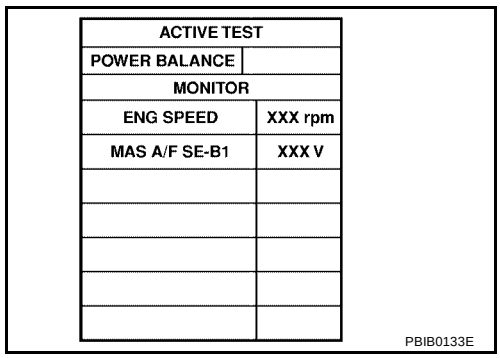
2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that all circuits do not produce a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

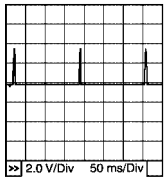


PBIB0133E

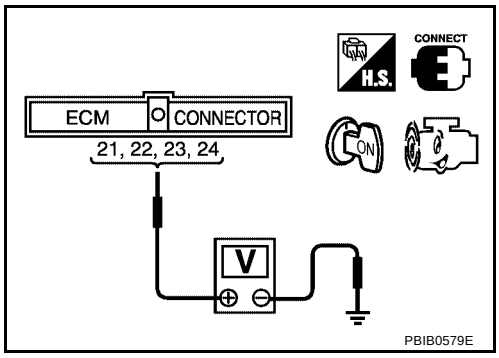
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 21, 22, 23, 24 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



PBIB0579E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 8.

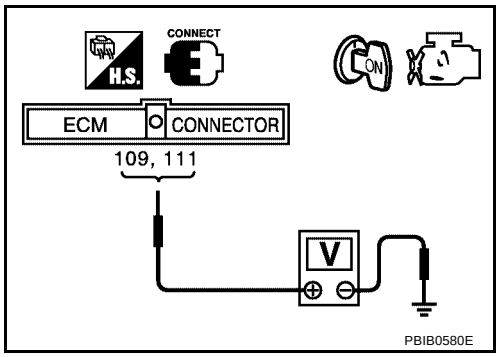
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check voltage between ECM terminals 109, 111 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-1342, "POWER SUPPLY CIRCUIT FOR ECM" .



PBIB0580E

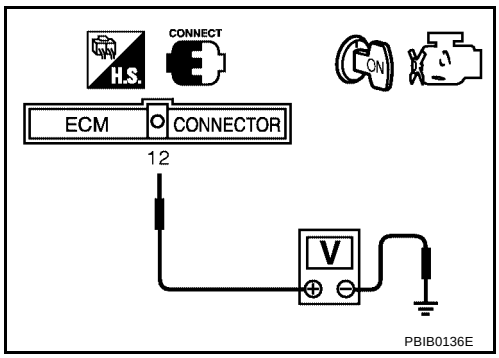
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

Check voltage between ECM terminal 12 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.
NG >> Go to EC-1342, "POWER SUPPLY CIRCUIT FOR ECM" .



PBIB0136E

6. CHECK CONDENSER CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check harness continuity between ECM terminal 12 and condenser terminal **+** , condenser terminal **–** and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CONDENSER

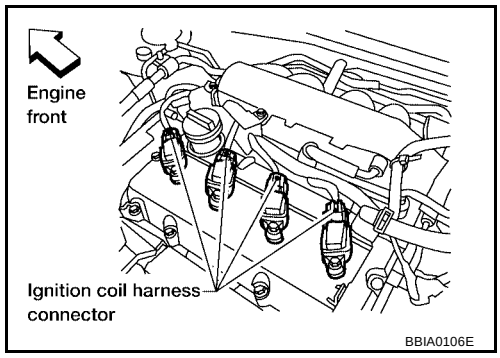
Refer to EC-1786, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace condenser.

8. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch ON.

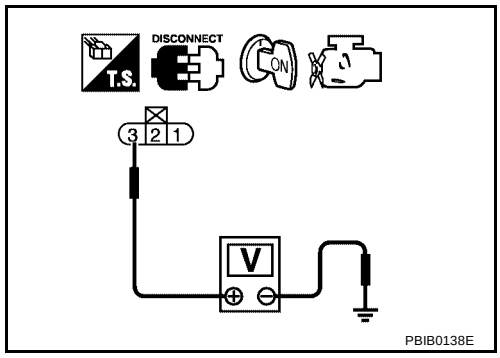


5. Check voltage between ignition coil terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.



9. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ignition coil and ECM relay
- Harness for open or short between ignition coil and ECM

>> Repair or replace harness or connectors.

10. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between ignition coil terminal 2 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 11.
NG >> Repair open circuit or short to power in harness or connectors.

11. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 21, 22, 23, 24 and ignition coil terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1786, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace ignition coil with power transistor.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

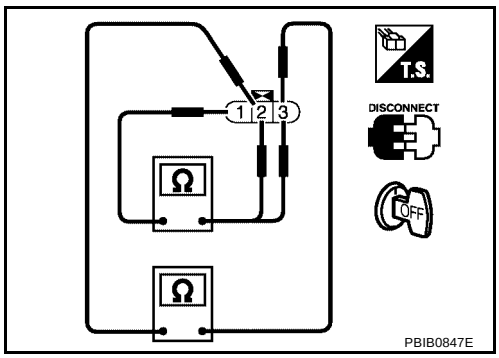
Component Inspection

UBS002LV

IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
1 and 2	Except 0 or ∞
1 and 3	Except 0
2 and 3	

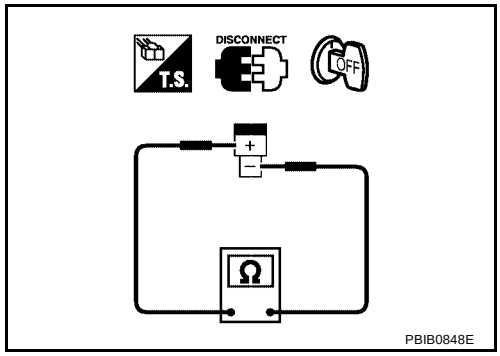


CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.

3. Check resistance between condenser terminals as **+** and **–** .

Resistance: Above 1 MΩ at 25°C (77°F)



UBS002LW

Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-115, "IGNITION COIL" .

VIAS

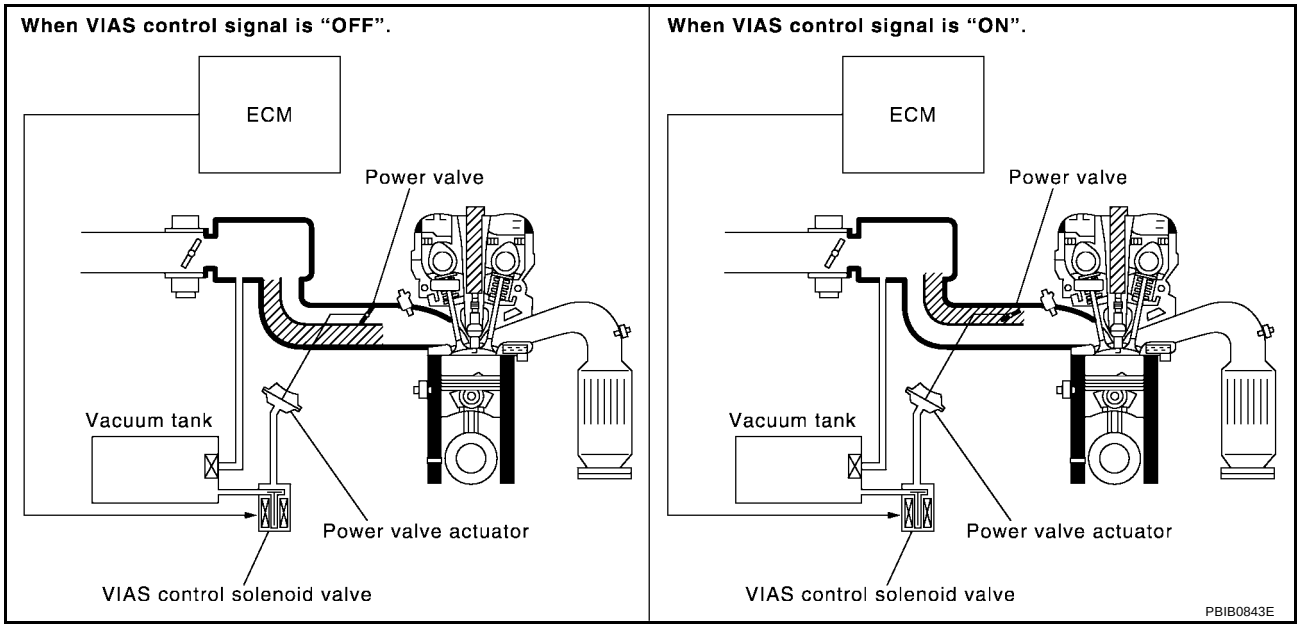
PFP:14956

Description

UBS002LX

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Mass air flow sensor	Amount of intake air	VIAS control	VIAS control solenoid valve
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Ignition switch	Start signal		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Engine coolant temperature sensor	Engine coolant temperature		



When the engine is running at low or medium speed, the power valve is fully closed. Under this condition, the effective suction port length is equivalent to the total length of the intake manifold collector's suction port including the intake valve. This long suction port provides increased air intake which results in improved suction efficiency and higher torque generation.

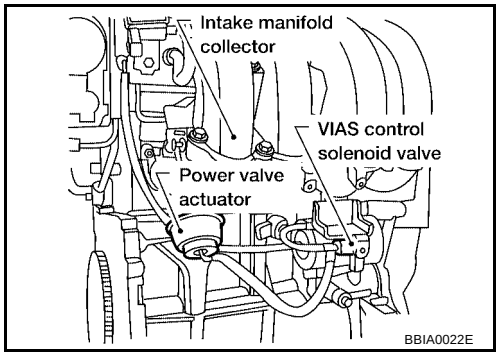
The surge tank and one-way valve are provided. When engine is running at high speed, the ECM sends the signal to the VIAS control solenoid valve. This signal introduces the intake manifold vacuum into the power valve actuator and therefore opens the power valve to two suction passages together in the collector.

Under this condition, the effective port length is equivalent to the length of the suction port provided independently for each cylinder. This shortened port length results in enhanced engine output with reduced suction resistance under high speeds.

COMPONENT DESCRIPTION

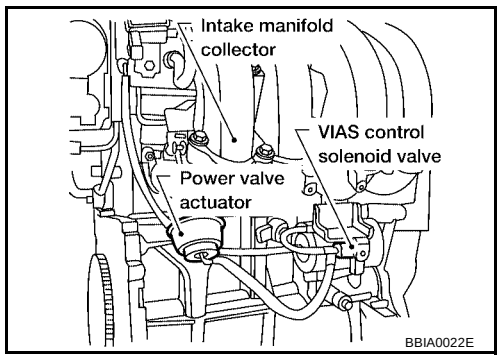
Power Valve

The power valve is installed in intake manifold collector and used to control the suction passage of the variable induction air control system. It is set in the fully closed or fully opened position by the power valve actuator operated by the vacuum stored in the surge tank. The vacuum in the surge tank is controlled by the VIAS control solenoid valve.



VIAS Control Solenoid Valve

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and feeds the vacuum signal to the power valve actuator.



CONSULT-II Reference Value in Data Monitor Mode

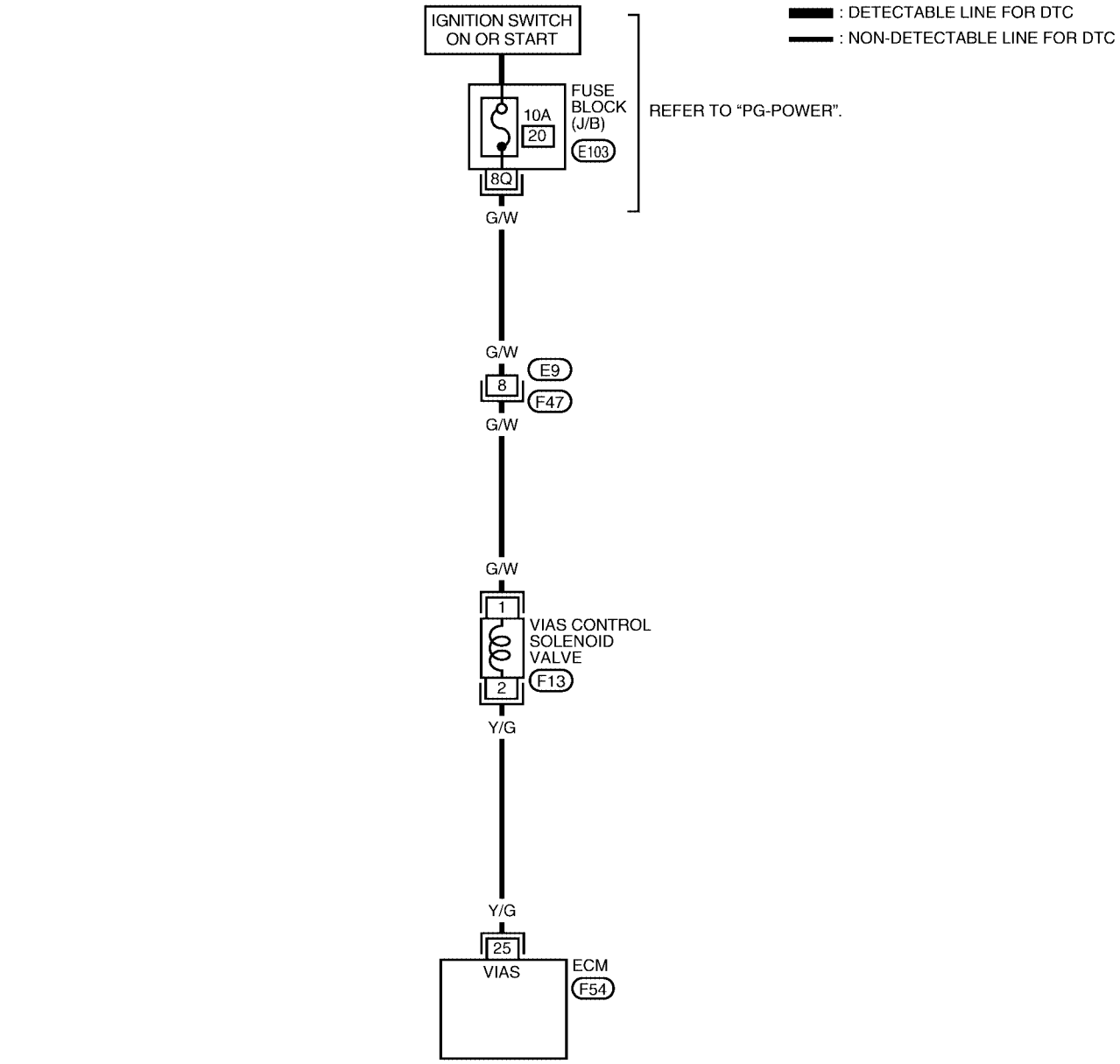
UBS002LY

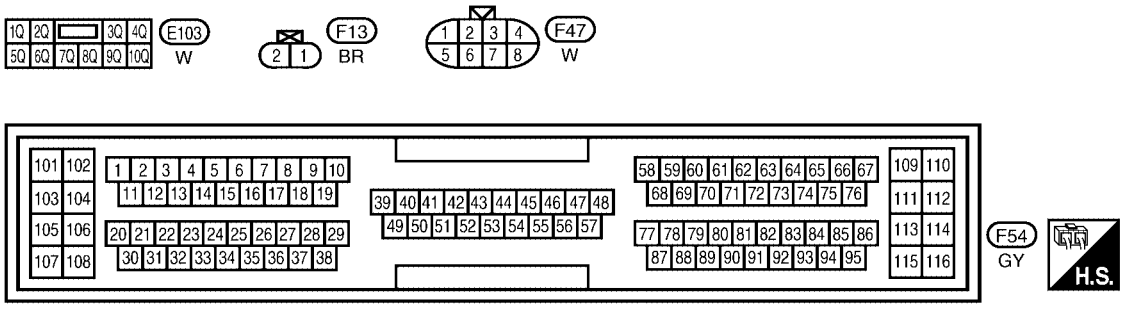
MONITOR ITEM	CONDITION		SPECIFICATION
VIAS S/V	● Engine: After warming up	Idle	OFF
		More than 5,000 rpm	ON

Wiring Diagram

UBS002LZ

EC-VIAS-01





BBWA0243E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	Y/G	VIAS control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is above 5,000 rpm	0 - 1.0V

Diagnostic Procedure

UBS002M0

1. CHECK OVERALL FUNCTION

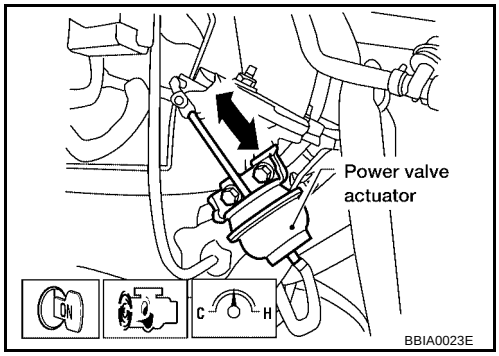
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode with CONSULT-II.

ACTIVE TEST	
VIAS SOL VALVE	OFF
MONITOR	
ENG SPEED	XXX rpm

PBIB0844E

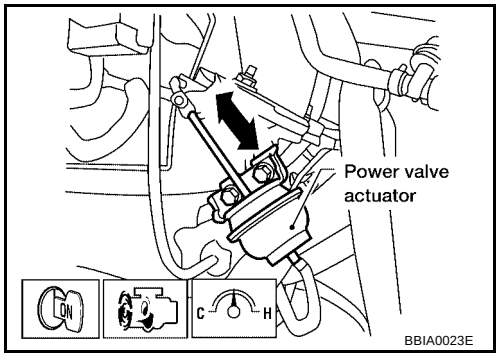
3. Turn VIAS control solenoid valve “ON” and “OFF”, and make sure that power valve actuator rod moves.



BBIA0023E

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Rev engine quickly up to above 5,000 rpm and make sure that power valve actuator rod moves.



BBIA0023E

OK or NG

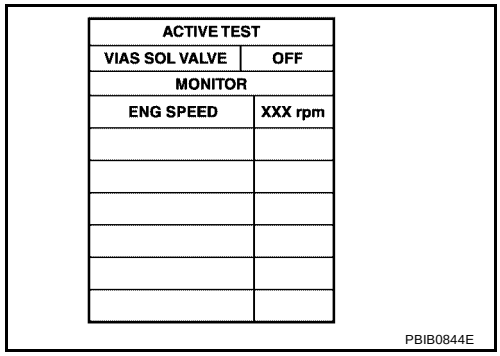
OK >> **INSPECTION END**
NG (With CONSULT-II)>>GO TO 2.
NG (Without CONSULT-II)>>GO TO 3.

2. CHECK VACUUM EXISTENCE

With CONSULT-II

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Start engine and let it idle.
3. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode with CONSULT-II.
4. Turn VIAS control solenoid valve “ON” and “OFF”, and check vacuum existence under the following conditions.

VIAS SOL VALVE	Vacuum
ON	Should exist.
OFF	Should not exist.



OK or NG

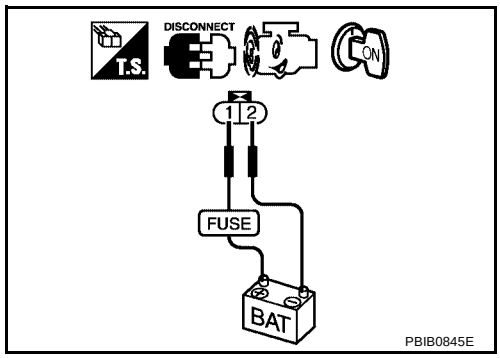
OK >> Repair or replace power valve actuator.
NG >> GO TO 4.

3. CHECK VACUUM EXISTENCE

Without CONSULT-II

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Disconnect VIAS control solenoid valve harness connector.
3. Start engine and let it idle.
4. Apply 12V of direct current between VIAS control solenoid valve terminals 1 and 2.
5. Check vacuum existence under the following conditions.

Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.



OK or NG

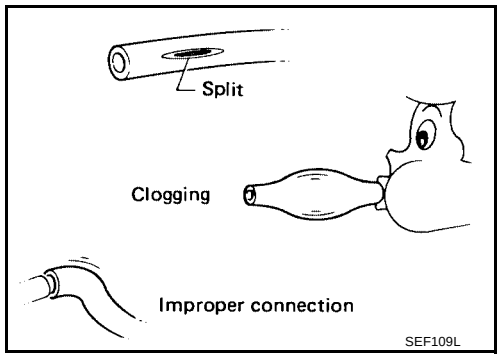
OK >> Repair or replace power valve actuator.
NG >> GO TO 4.

4. CHECK VACUUM HOSE

1. Stop engine.
2. Check hoses and tubes between intake manifold and power valve actuator for crack, clogging, improper connection or disconnection. Refer to EC-1237, "Vacuum Hose Drawing" .

OK or NG

OK >> GO TO 5.
NG >> Repair hoses or tubes.



5. CHECK VACUUM TANK

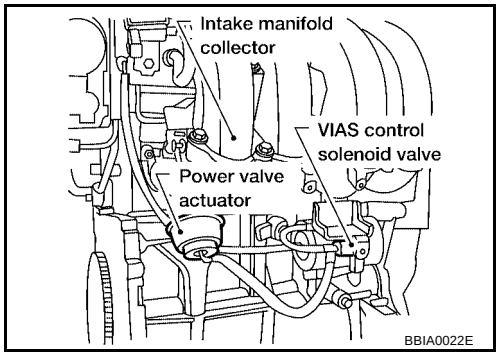
Refer to EC-1795, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace vacuum tank.

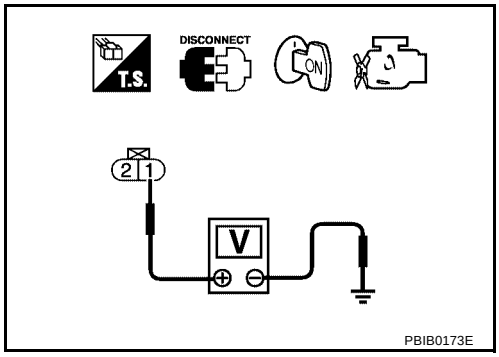
6. CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “ON”.
2. Disconnect VIAS control solenoid valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between VIAS control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Fuse block (J/B) connector E103
- 10A fuse
- Harness continuity between fuse and VIAS control solenoid valve

>> Repair harness or connectors.

8. CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 25 and VIAS control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK VIAS CONTROL SOLENOID VALVE

Refer to EC-1795, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace VIAS control solenoid valve.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

UBS002M1

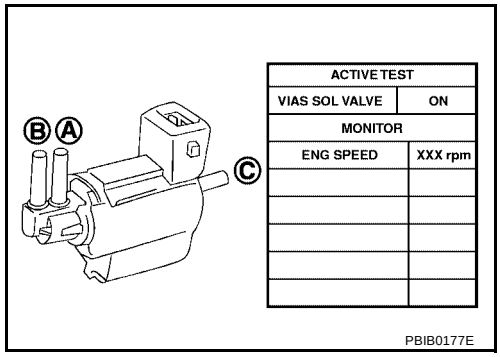
VIAS CONTROL SOLENOID VALVE

With CONSULT-II

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time under the following conditions.

Condition VIAS SOL VALVE	Air passage continuity between **A** and **B**	Air passage continuity between **A** and **C**
ON	Yes	No
OFF	No	Yes

Operation takes less than 1 second.

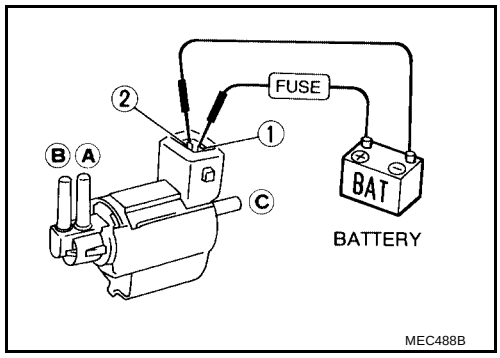


With GST

Check air passage continuity and operation delay time under the following conditions.

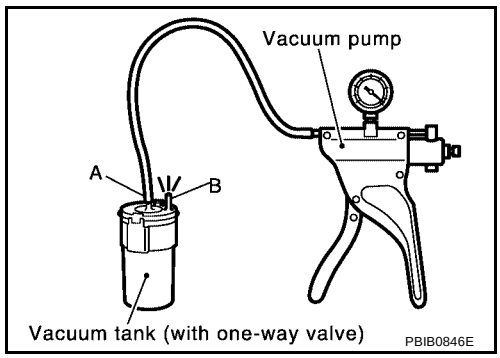
Condition	Air passage continuity between **A** and **B**	Air passage continuity between **A** and **C**
12V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

Operation takes less than 1 second.



VACUUM TANK

1. Disconnect vacuum hose connected to vacuum tank.
2. Connect a vacuum pump to the port **A** of vacuum pump.
3. Apply vacuum and make sure that vacuum exists at the port **B** .



Removal and Installation

UBS002M2

VIAS CONTROL SOLENOID VALVE

Refer to EM-105, "INTAKE MANIFOLD" .

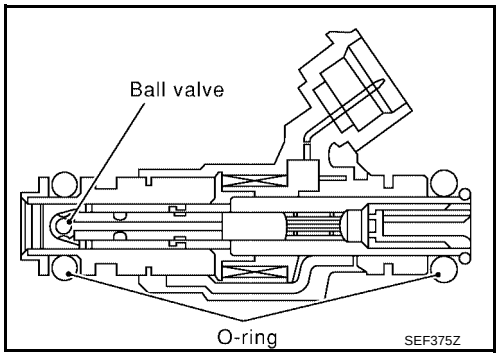
INJECTOR CIRCUIT

PFP:16600

Component Description

UBS002M3

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

UBS002M4

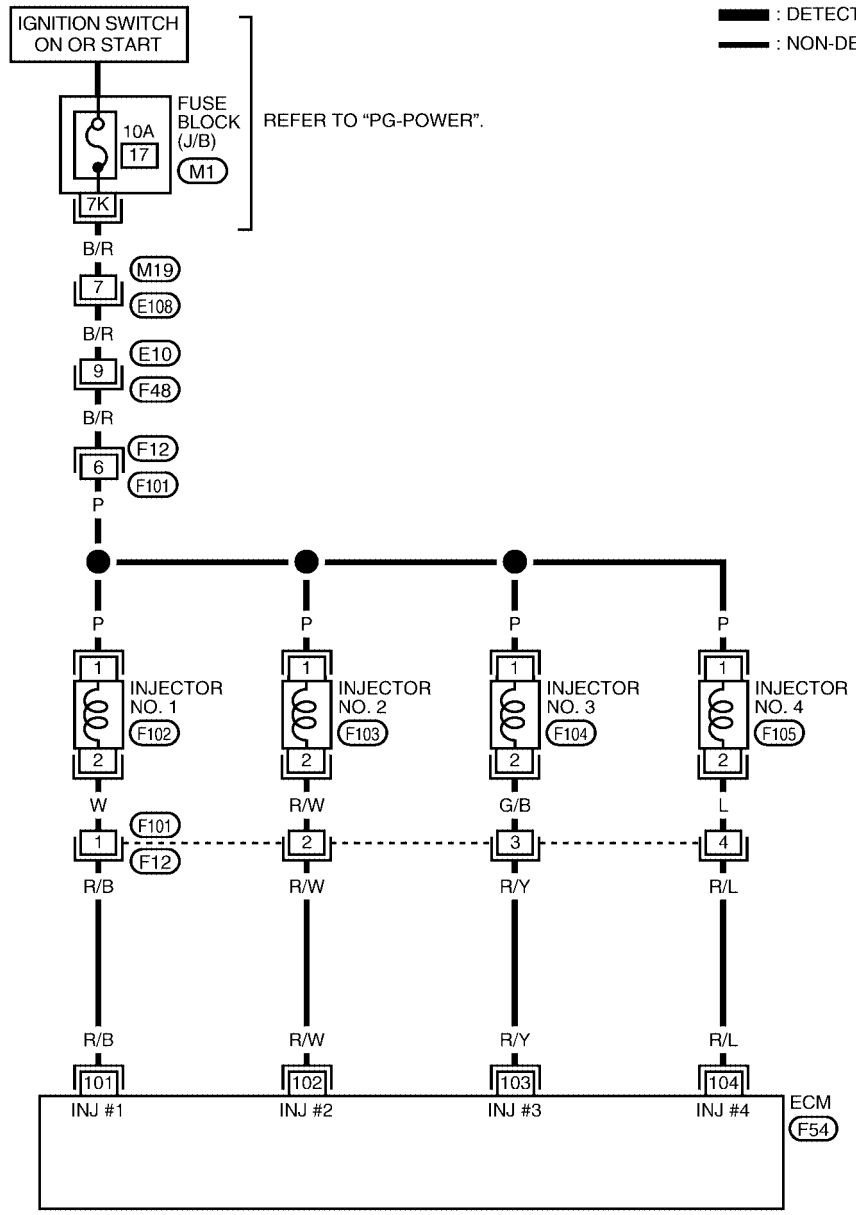
Specification data are reference values.

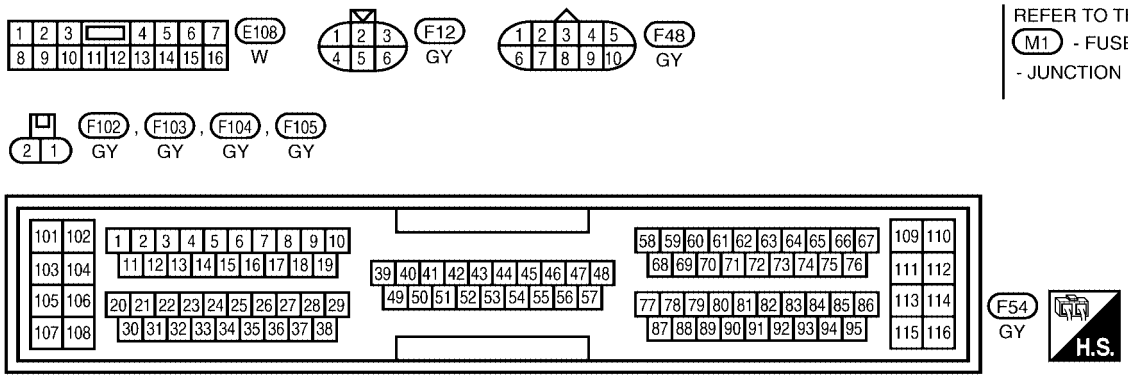
MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.5 - 3.5 msec
		2,000 rpm	2.5 - 3.5 msec
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec

Wiring Diagram

UBS002M5

EC-INJECT-01

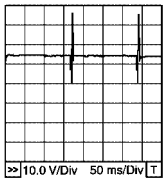
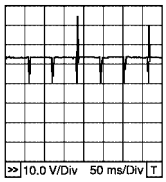




Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101 102 103 104	R/B R/W R/Y R/L	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002M6

1. INSPECTION START

Turn ignition switch to “START”.

Is any cylinder ignited?

Yes or No

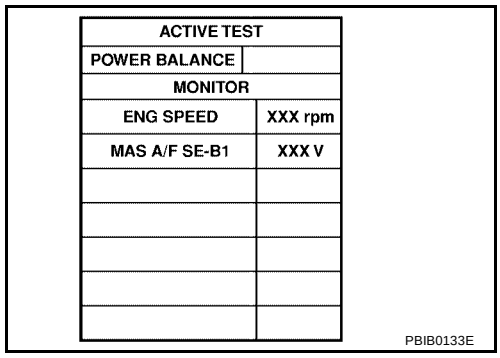
Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

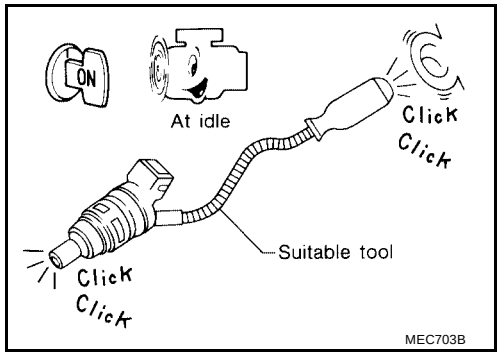
With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.

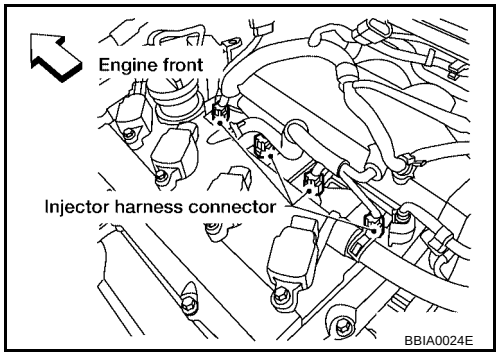


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

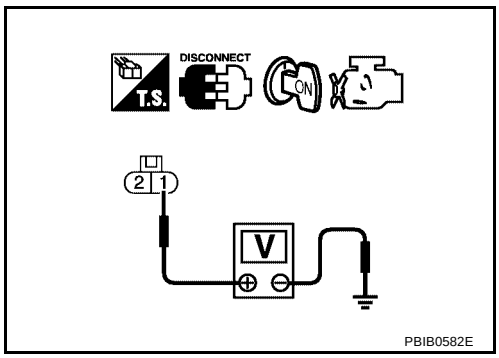
3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M19, E108
- Harness connectors E10, F48
- Harness connectors F12, F101
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

>> Repair harness or connectors.

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 101, 102, 103, 104. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F12, F101
- Harness for open or short between injector and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INJECTOR

Refer to EC-1801, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace injector.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

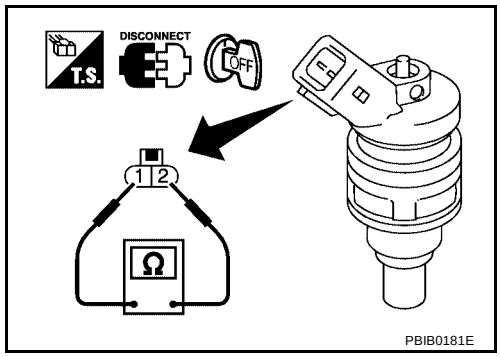
Component Inspection

UBS002M7

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 12.1 - 12.9Ω [at 20°C (68°F)]



PBIB0181E

Removal and Installation

UBS002M8

INJECTOR

Refer to EM-118, "FUEL INJECTOR AND FUEL TUBE" .

START SIGNAL

PFP:48750

CONSULT-II Reference Value in Data Monitor Mode

UBS002M9

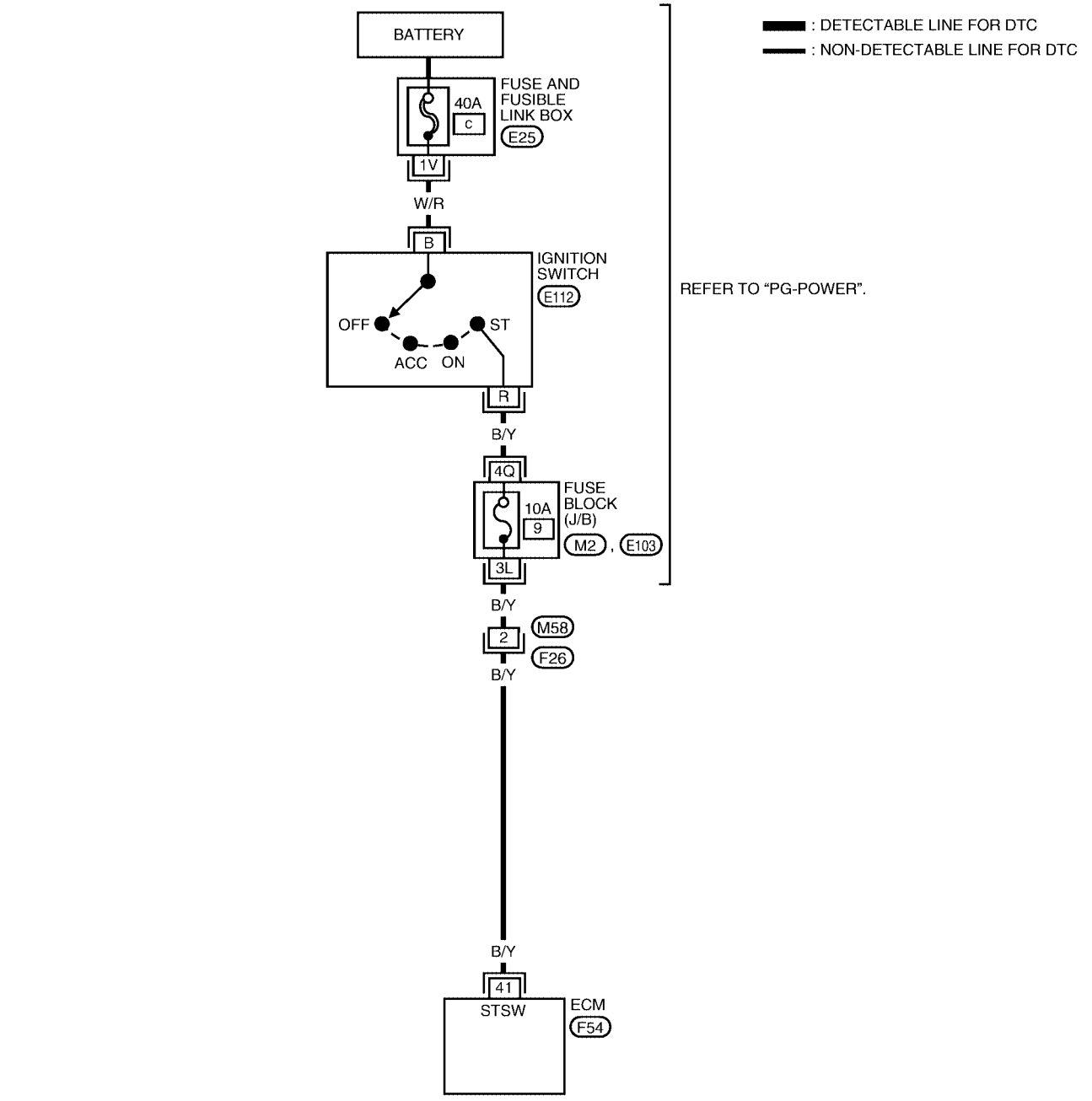
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

Wiring Diagram

UBS002MA

EC-S/SIG-01



BBWA0245E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 14V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

UBS002MB

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

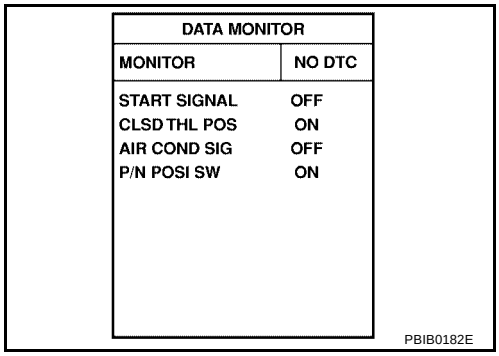
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	START SIGNAL
Ignition switch "ON"	OFF
Ignition switch "START"	ON



OK or NG

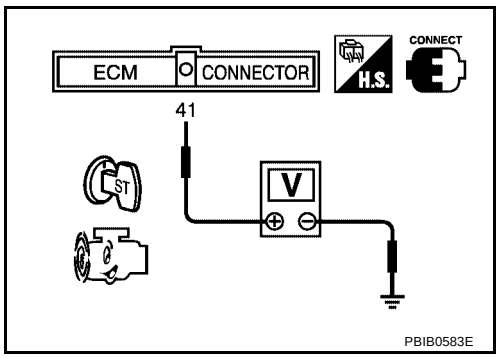
OK >> **INSPECTION END**
NG >> GO TO 4.

3. CHECK OVERALL FUNCTION

Without CONSULT-II

Check voltage between ECM terminal 41 and ground under the following conditions.

Condition	Voltage
Ignition switch "START"	Battery voltage
Other positions	Approximately 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. CHECK STARTING SYSTEM

Turn ignition switch "OFF", then turn it to "START".

Does starter motor operate?

Yes or No

Yes >> GO TO 5.
No >> Refer to SC-9, "STARTING SYSTEM" .

5. CHECK FUSE

1. Turn ignition switch “OFF”.
2. Disconnect 10A fuse.
3. Check if 10A fuse is OK.

OK or NG

OK >> GO TO 6.
NG >> Replace 10A fuse.

6. CHECK START SIGNAL INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Disconnect ignition switch harness connector.
3. Check harness continuity between ECM terminal 41 and fuse block (J/B), ignition switch and fuse block (J/B). Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M58, F26
- Fuse block (J/B) connectors M2, E103
- Harness for open or short between ignition switch and fuse block (J/B)
- Harness for open or short between ECM and fuse block (J/B)

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

FUEL PUMP CIRCUIT

PFP:17042

Description

UBS002MC

SYSTEM DESCRIPTION

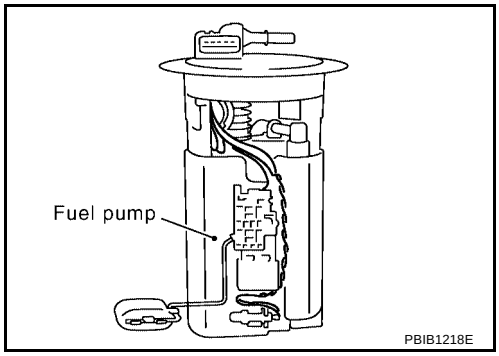
Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed	Fuel pump control	Fuel pump relay
Ignition switch	Start signal		

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

UBS002MD

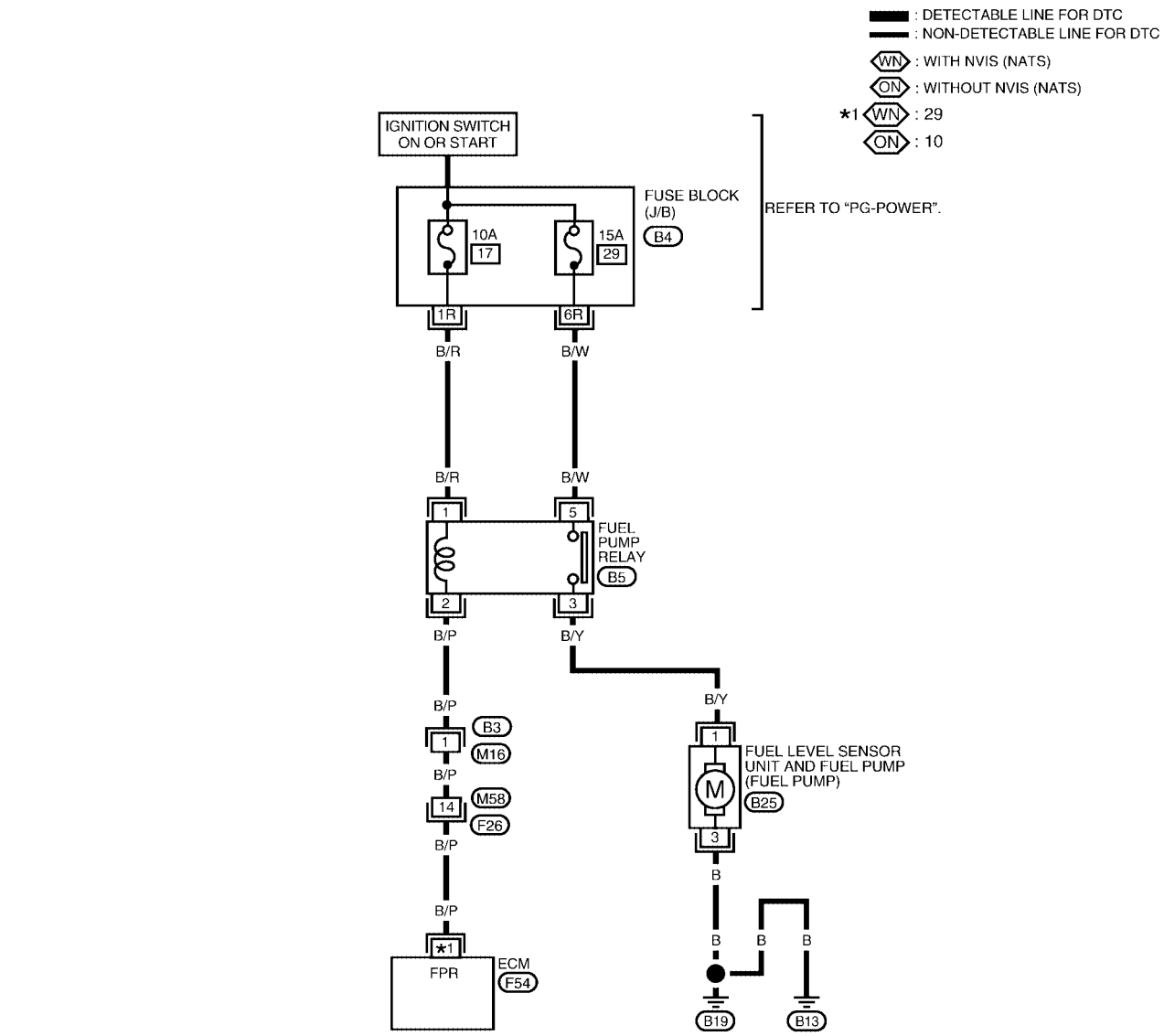
Specification data are reference values.

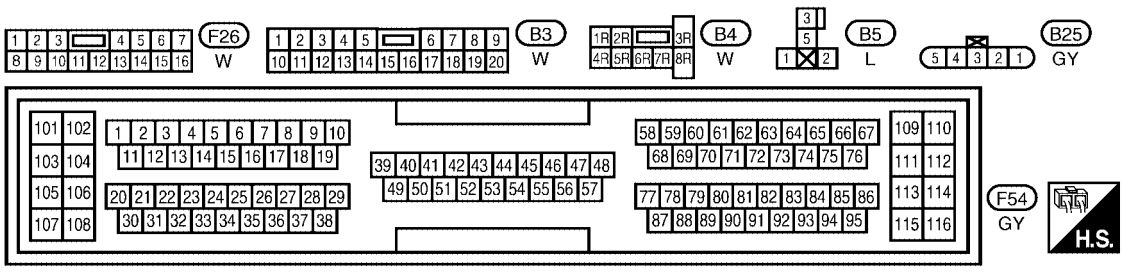
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

UBS002ME

EC-F/PUMP-01





BBWA0423E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

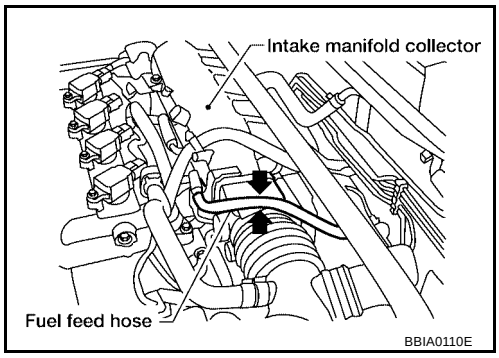
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
10 (Without NVIS)	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
29 (With NVIS)			**[Ignition switch "ON"]** ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002MF

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned "ON".

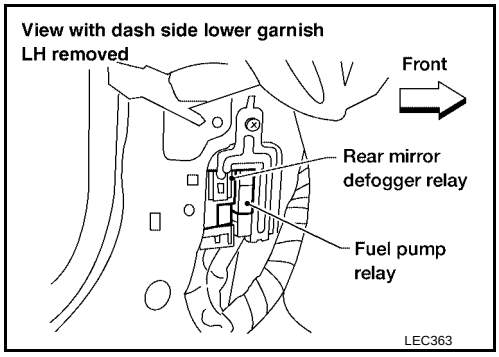


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

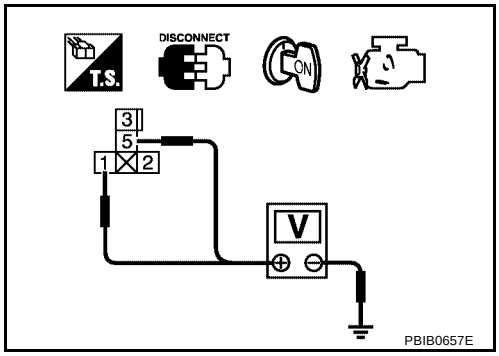
2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B4
- 10A fuse
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

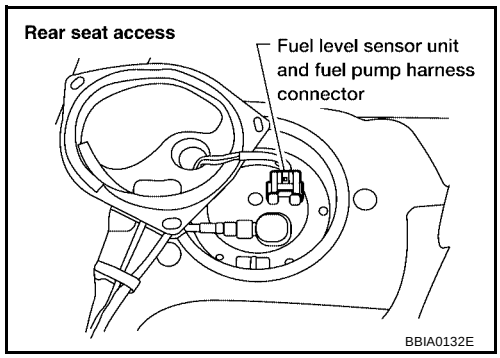
>> Repair harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel pump terminal 1, fuel pump terminal 3 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 10 or 29 and fuel pump relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B3, M16
- Harness connectors M58, F26
- Harness for open or short between ECM and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK FUEL PUMP RELAY

Refer to EC-1810, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace fuel pump relay.

8. CHECK FUEL PUMP

Refer to EC-1810, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel pump.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

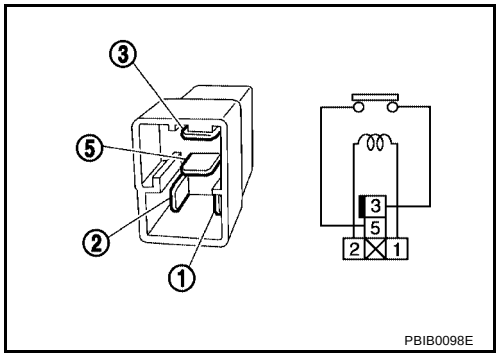
Component Inspection

UBS002MG

FUEL PUMP RELAY

Check continuity between terminals 3 and 5 under the following conditions.

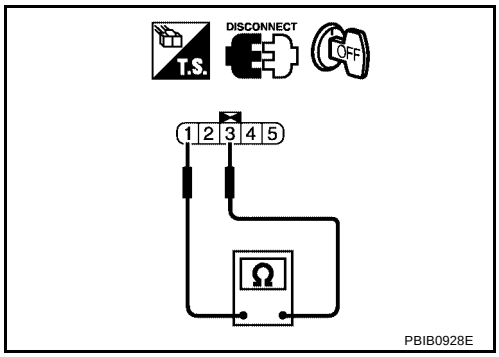
Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No



FUEL PUMP

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between fuel level sensor unit and fuel pump terminals 1 and 3.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]



Removal and Installation

UBS002MH

FUEL PUMP

Refer to FL-3, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY" .

POWER STEERING OIL PRESSURE SWITCH

PFP:49761

Component Description

UBS002MI

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

CONSULT-II Reference Value in Data Monitor Mode

UBS002MJ

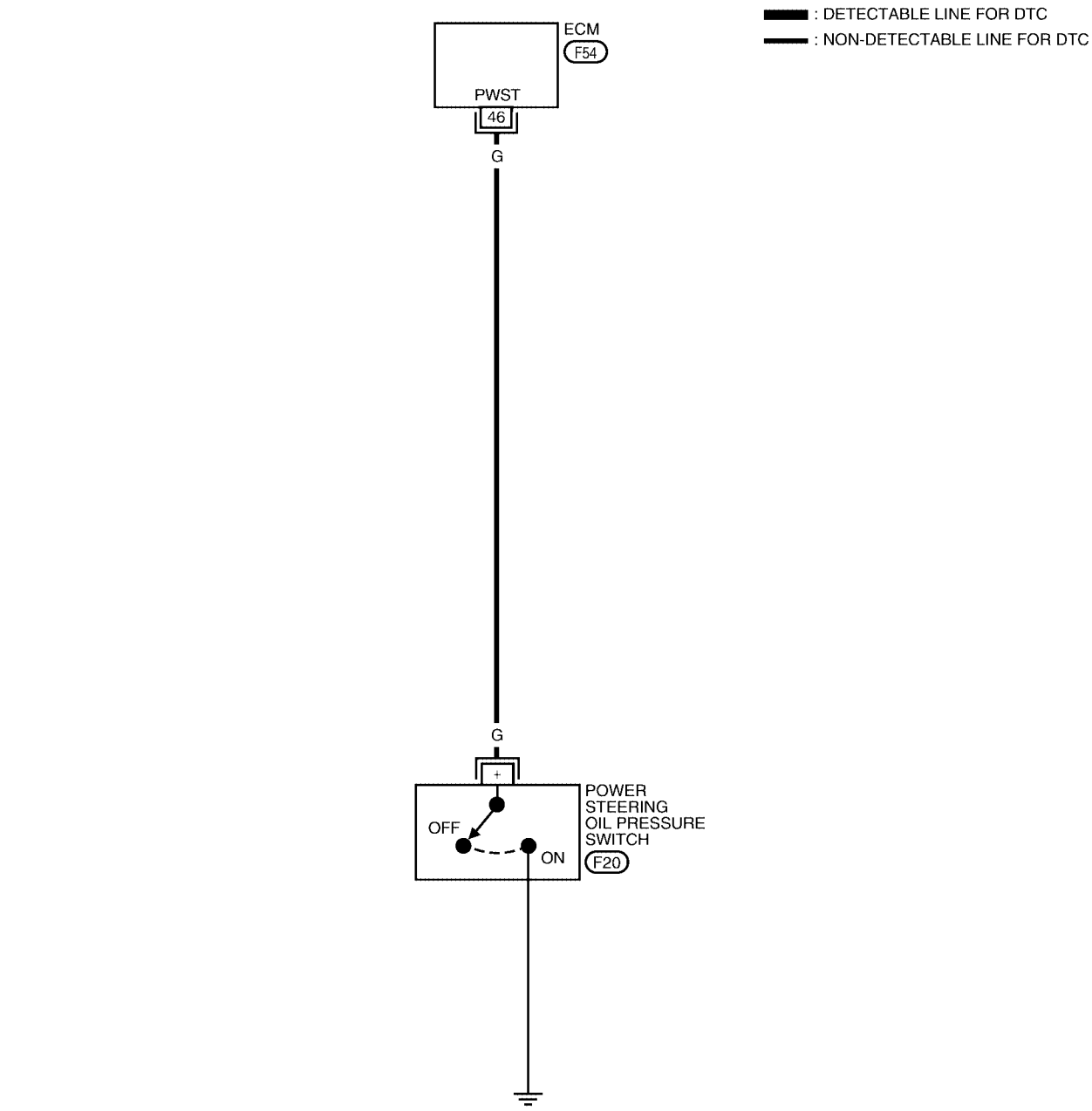
Specification data are reference values.

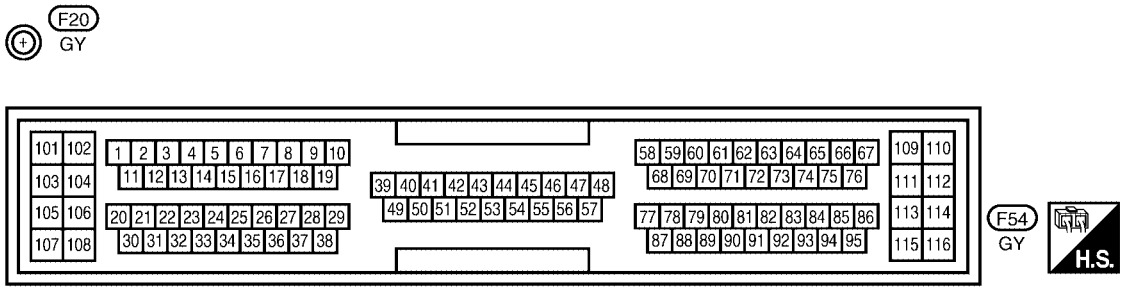
MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is fully turned	ON

Wiring Diagram

UBS002MK

EC-PST/SW-01





BBWA0247E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	G	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned	Approximately 0V
			[Engine is running] ● Steering wheel is not being turned	Approximately 5V

Diagnostic Procedure

UBS002ML

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

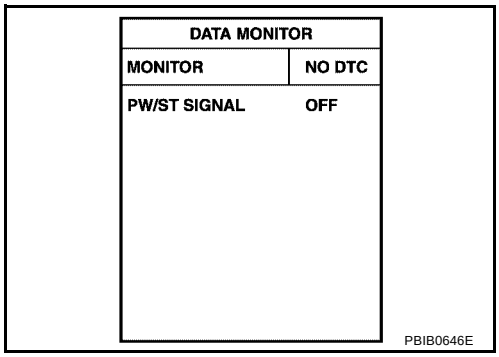
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Check “PW/ST SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Steering in neutral position	OFF
Steering is turned	ON



OK or NG

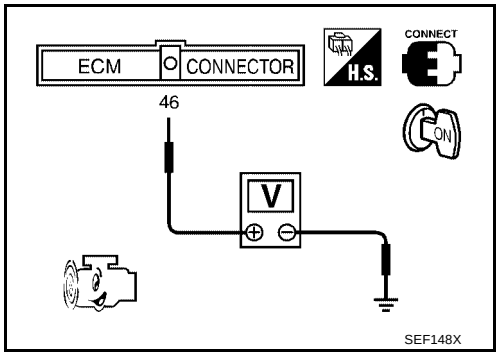
OK >> **INSPECTION END**
NG >> GO TO 4.

3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 46 and ground under the following conditions.

Condition	Voltage
When steering wheel is turned quickly	Approximately 0V
Except above	Approximately 5V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect power steering oil pressure switch harness connector.
4. Check harness continuity between ECM terminal 46 and power steering oil pressure switch terminal **+** . Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM and power steering oil pressure switch.

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK POWER STEERING OIL PRESSURE SWITCH

Refer to EC-1815, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace power steering oil pressure switch.

7. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

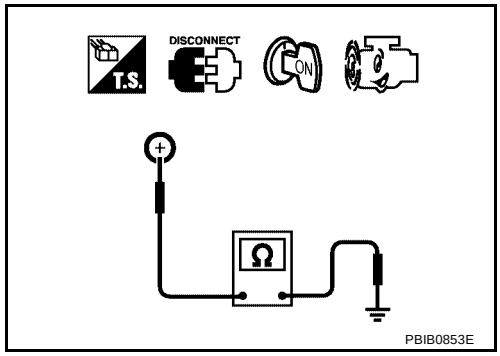
>> **INSPECTION END**

Component Inspection

UBS002MM

POWER STEERING OIL PRESSURE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect power steering oil pressure switch harness connector.
3. Start engine.
4. Check continuity between power steering oil pressure switch terminal **+** and body ground.



Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.

Removal and Installation

UBS002MN

POWER STEERING OIL PRESSURE SWITCH

Refer to PS-21, "POWER STEERING OIL PUMP" .

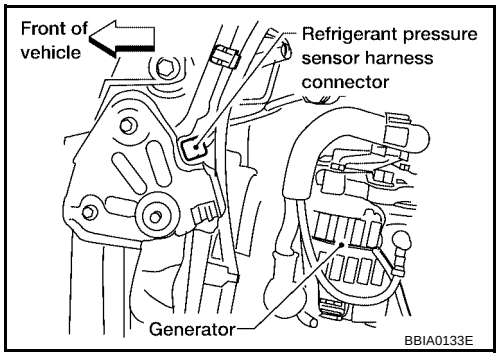
REFRIGERANT PRESSURE SENSOR

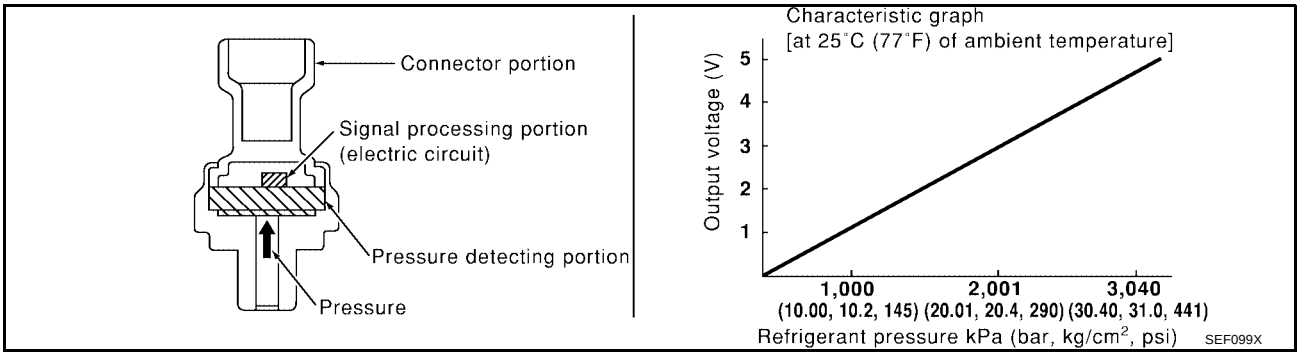
PFP:92136

Component Description

UBS002MO

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

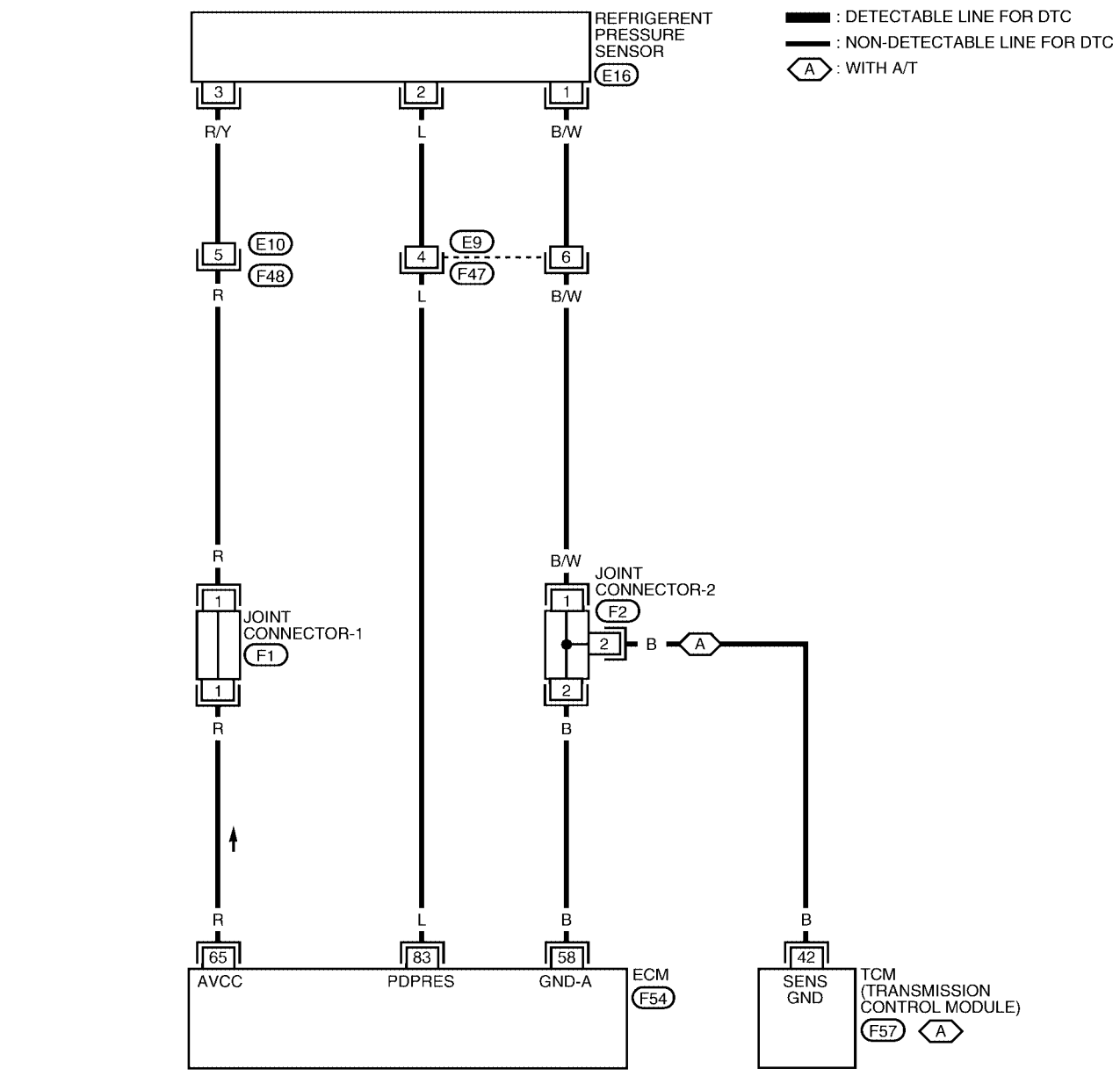


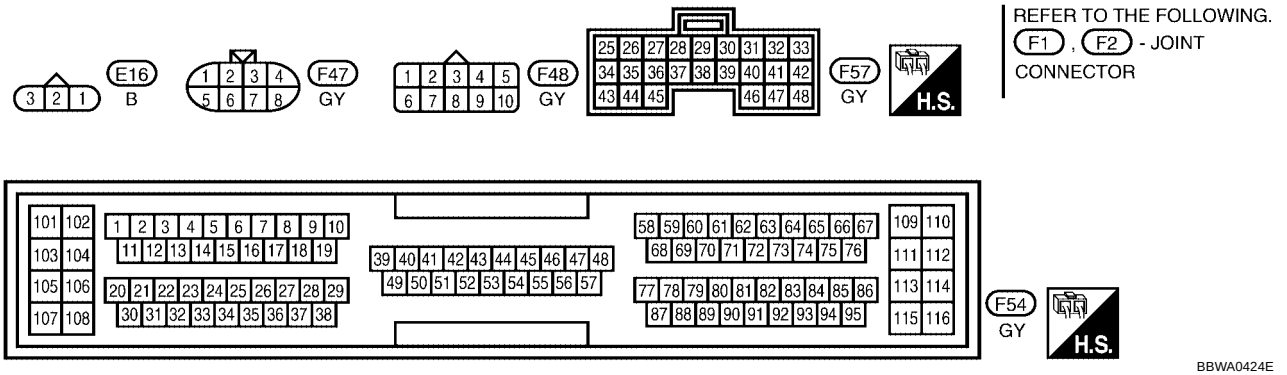


Wiring Diagram

UBS002MP

EC-RP/SEN-01





BBWA0424E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
65	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
83	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

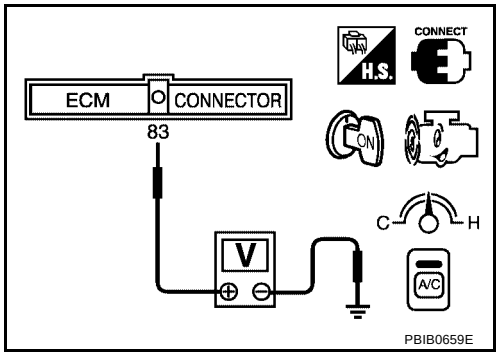
Diagnostic Procedure

UBS002MQ

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 83 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

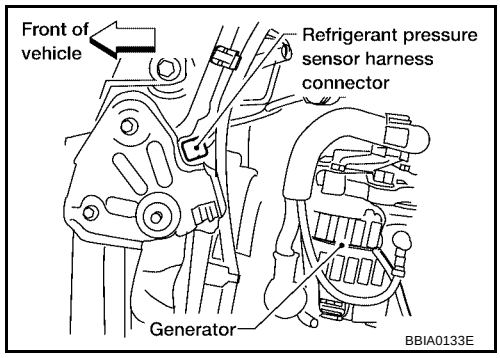


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

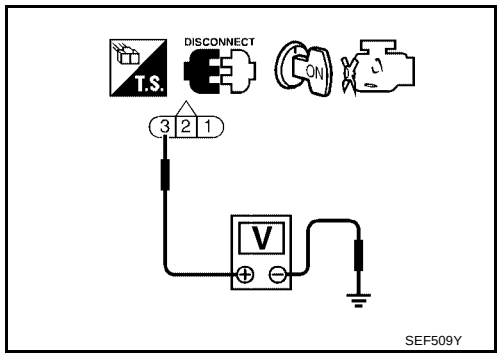
2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E10, F48
- Joint connector-1
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between refrigerant pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Joint connector-2
- Harness for open or short between ECM and refrigerant pressure sensor
- Harness for open or short between TCM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 83 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E9, F47
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace.

Removal and Installation

UBS002MR

REFRIGERANT PRESSURE SENSOR

Refer to MTC-82, "REFRIGERANT LINES" .

ELECTRICAL LOAD SIGNAL

PFP:25350

CONSULT-II Reference Value in Data Monitor Mode

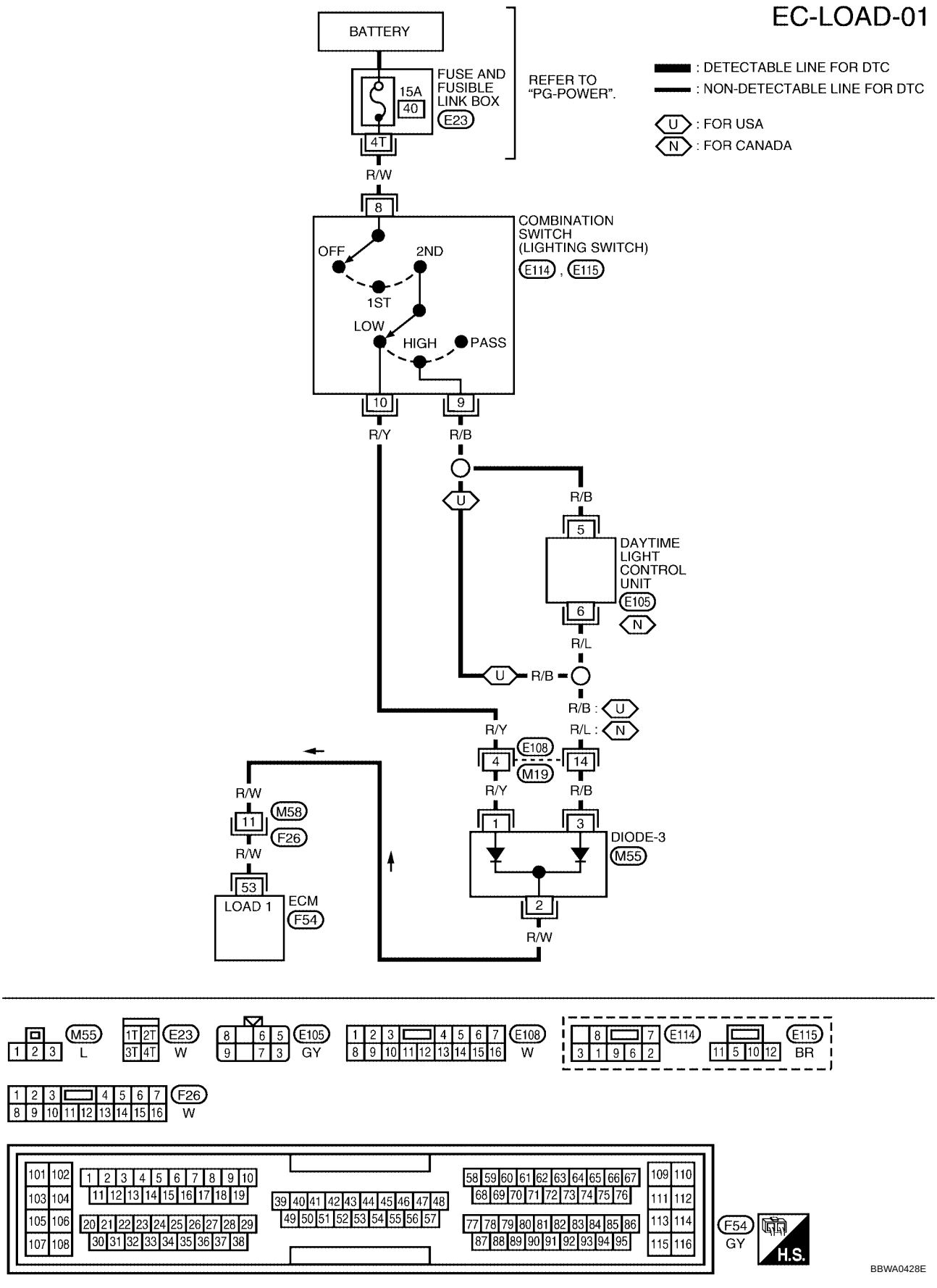
UBS002MS

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF

Wiring Diagram

UBS002MT



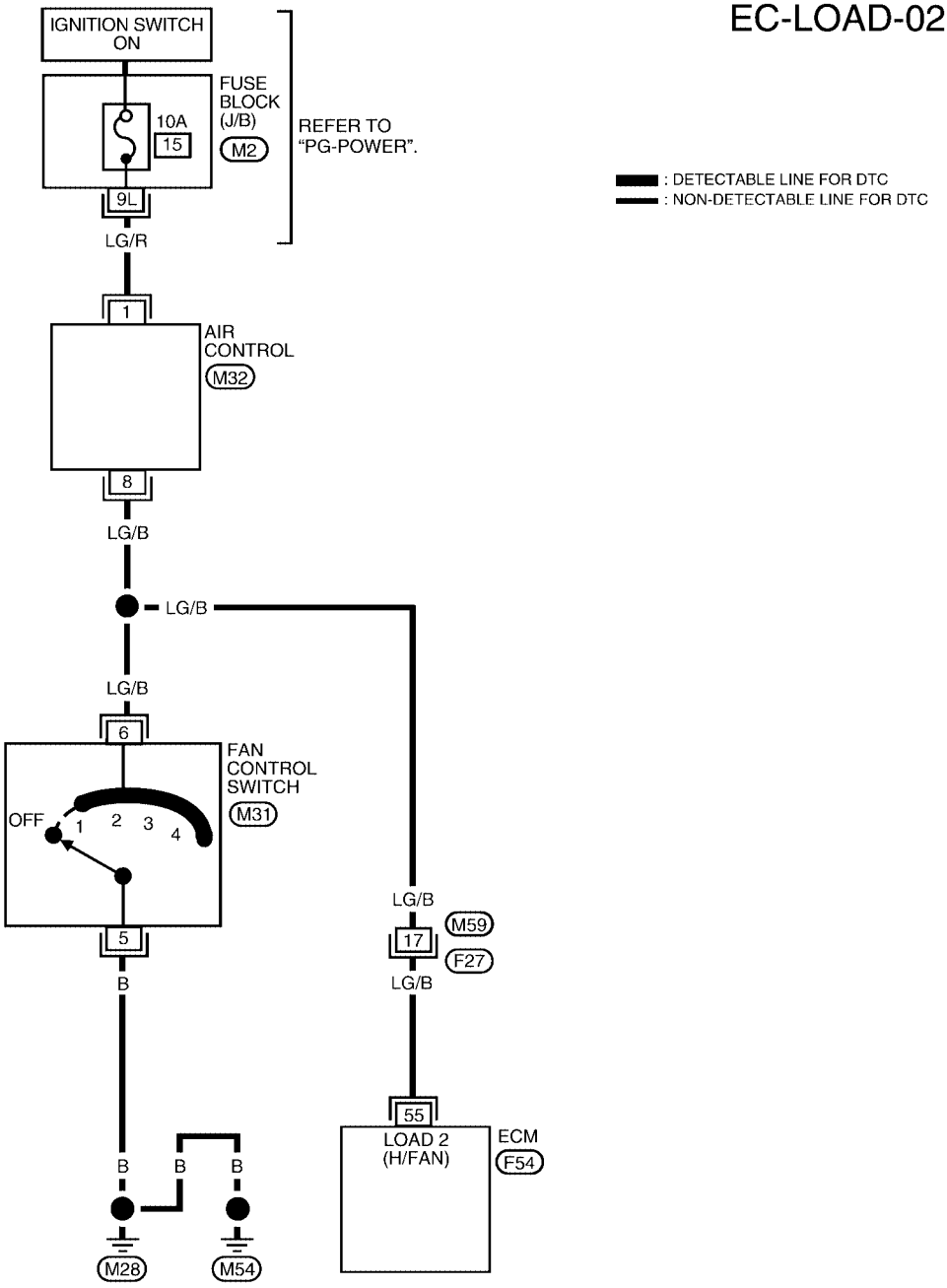
Specification data are reference values and are measured between each terminal and ground.

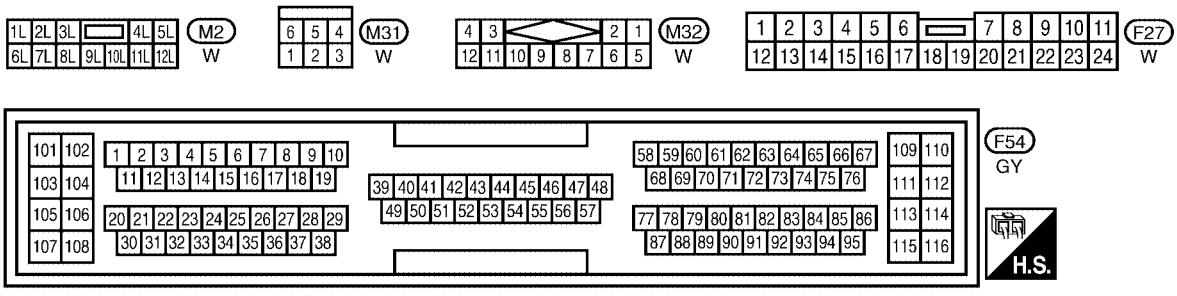
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
53	R/W	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V

EC-LOAD-02





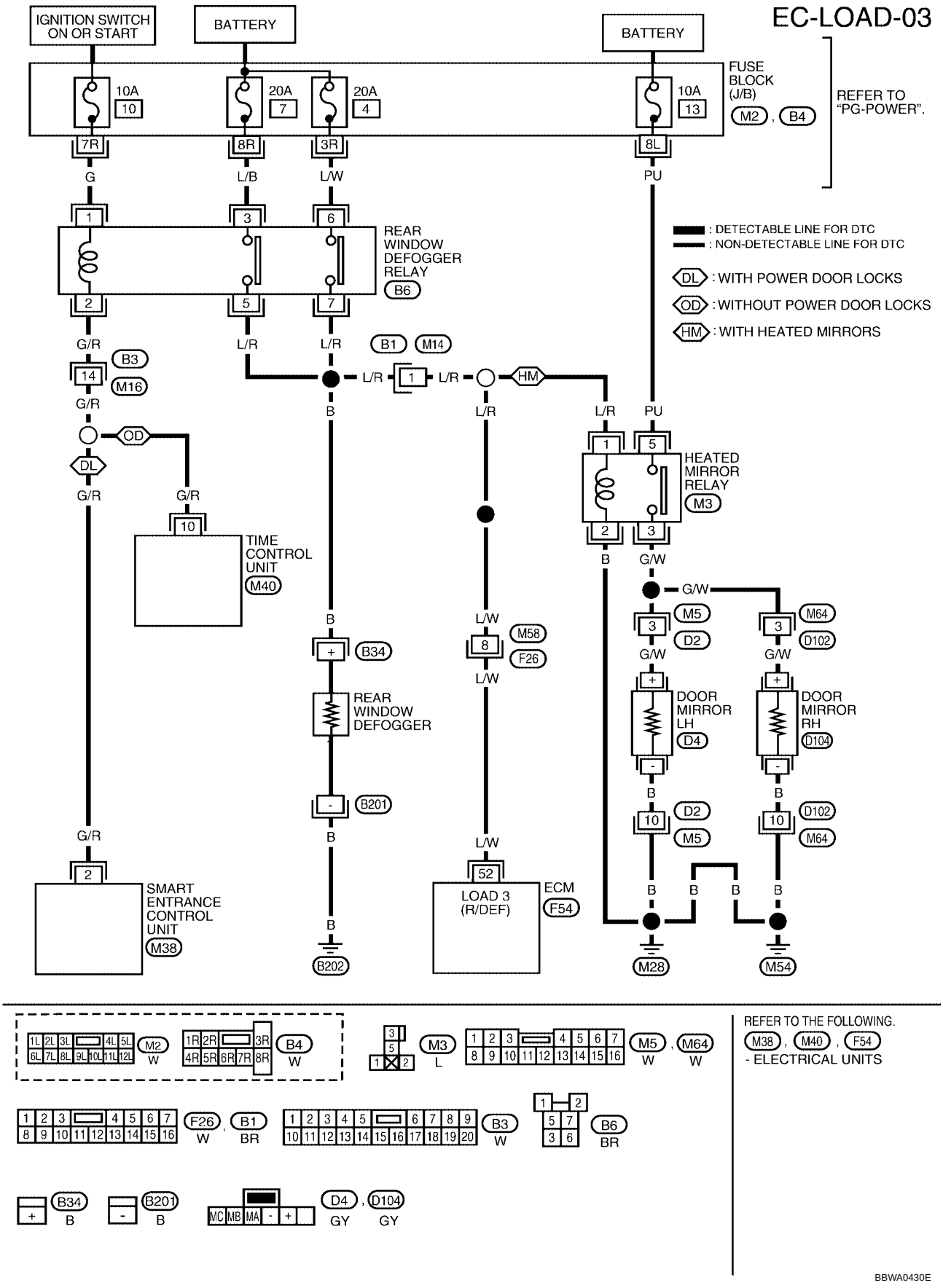
BBWA0429E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
55	LG/B	Heater fan switch	**[Engine is running]** ● Heater fan switch “ON”	Approximately 0V
			[Engine is running] ● Heater fan switch “OFF”	Approximately 5V


EC-LOAD-03
IGNITION SWITCH ON OR START
BATTERY
BATTERY
FUSE BLOCK (J/B)
M2, B4
REFER TO "PG-POWER".
10A 10
20A 7
20A 4
10A 13
7R
8R
3R
8L
G
L/B
L/W
PU
REAR WINDOW DEFOGGER RELAY
B6
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
DL : WITH POWER DOOR LOCKS
OD : WITHOUT POWER DOOR LOCKS
HM : WITH HEATED MIRRORS
G/R
B3
M16
L/R
B1
M14
OD
DL
HEATED MIRROR RELAY
M3
TIME CONTROL UNIT
M40
B
G/W
B34
REAR WINDOW DEFOGGER
L/W
M58
F26
M5
D2
M64
D102
DOOR MIRROR LH
D4
DOOR MIRROR RH
D104
B201
SMART ENTRANCE CONTROL UNIT
M38
LOAD 3 (R/DEF)
ECM
F54
B202
M28
M54
REFER TO THE FOLLOWING.
M38, M40, F54
- ELECTRICAL UNITS
BBWA0430E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
52	L/W	Electrical load signal (Rear window defogger signal)	**[Ignition switch "ON"]** ● Rear window defogger switch is "ON"	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Rear window defogger switch is "OFF"	Approximately 0V

Diagnostic Procedure

UBS002MU

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

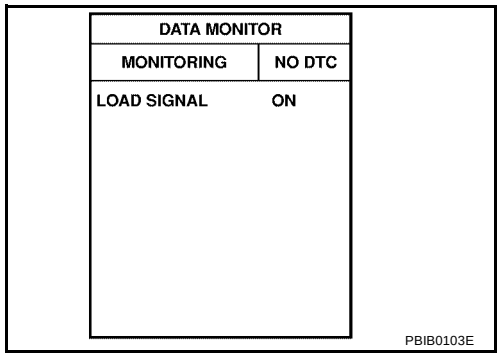
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-1

With CONSULT-II

1. Turn ignition switch "ON".
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

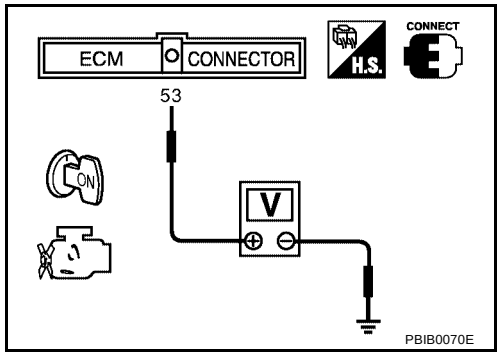
OK >> GO TO 4.
NG >> GO TO 8.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-1

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 53 and ground under the following conditions.

Condition	Voltage
Lighting switch "ON" at 2nd position	BATTERY VOLTAGE
Lighting switch "OFF"	0V



OK or NG

OK >> GO TO 5.
NG >> GO TO 8.

4. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-2

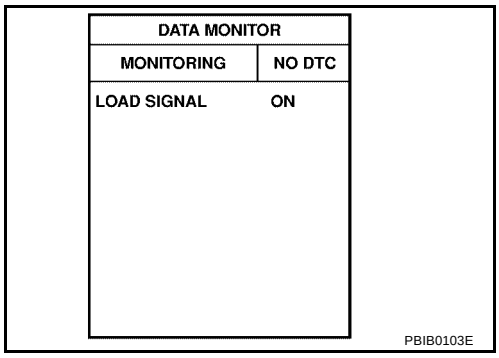
With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
FAN control switch “ON” in any position	ON
FAN control switch “OFF“	OFF

OK or NG

OK >> GO TO 6.
NG >> GO TO 13.



5. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-2

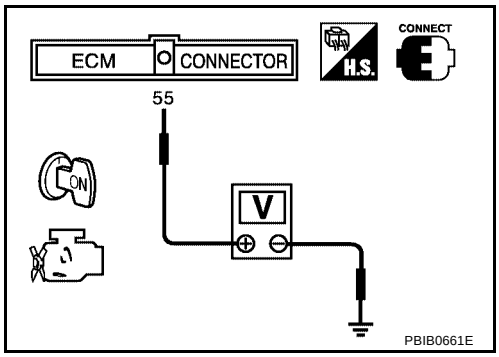
Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 55 and ground under the following conditions.

Condition	Voltage
FAN control switch “ON” in any position	Approximately 0V
FAN control switch “OFF”	Approximately 5V

OK or NG

OK >> GO TO 7.
NG >> GO TO 13.



6. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-3

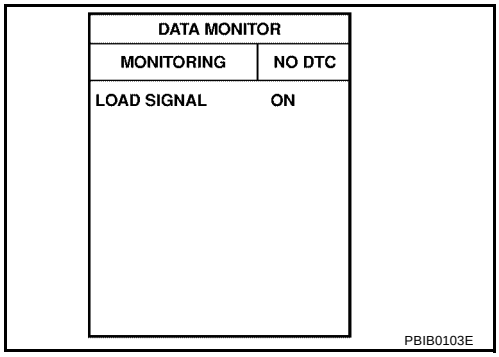
With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “LOAD SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Condition	LOAD SIGNAL
Rear window defogger switch “ON”	ON
Rear window defogger switch “OFF“	OFF

OK or NG

OK >> INSPECTION END.
NG >> GO TO 16.

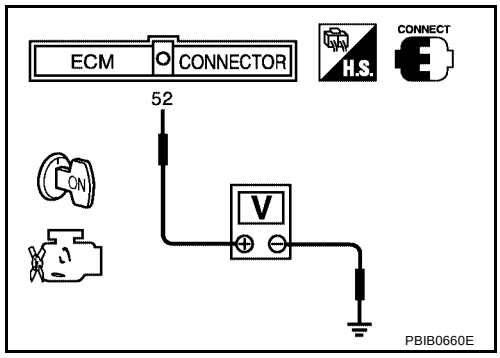


7. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-3

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 52 and ground under the following conditions.

Condition	Voltage
Rear window defogger switch “ON”	BATTERY VOLTAGE
Rear window defogger switch “OFF”	Approximately 0V



OK or NG

OK >> INSPECTION END.
NG >> GO TO 16.

8. CHECK HEADLAMP FUNCTION

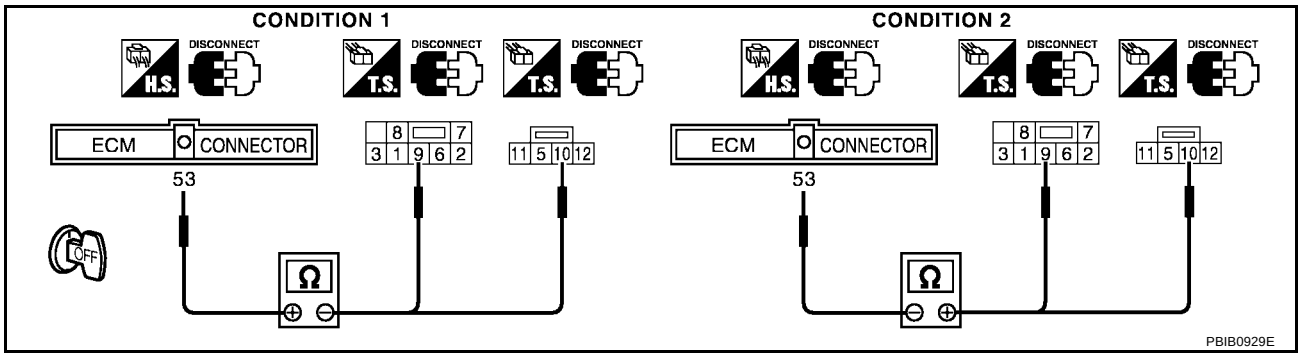
1. Start engine.
2. Turn the lighting switch “ON” at 2nd position.
3. Check that headlamps are illuminated.

OK or NG

OK (Models for USA)>>GO TO 8.
OK (Models for Canada)>>GO TO 11.
NG >> Refer to LT-6, "HEADLAMP (FOR USA)" or LT-10, "HEADLAMP (FOR CANADA) — DAYTIME LIGHT SYSTEM —" .

9. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connectors.
4. Check harness continuity between ECM terminal 53 and lighting switch terminal 9, 10 under the following conditions.



Condition	Continuity
1	Should not exist
2	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

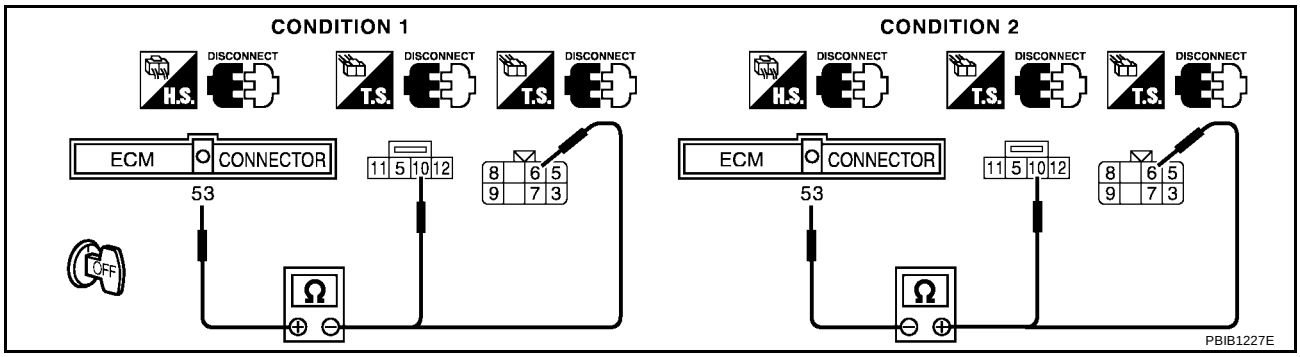
Check the following.

- Harness connectors E108, M19
- Harness connectors M58, F26
- Diode M55
- Harness for open and short between ECM and lighting switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connector E114.
   Disconnect daytime light control unit harness connector.
4. Check harness continuity between ECM terminal 53 and lighting switch terminal 10, daytime light control unit terminal 6 under the following conditions.



Condition	Continuity
1	Should not exist
2	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E108, M19
- Harness connectors M58, F26
- Diode M55
- Harness for open and short between ECM and lighting switch
- Harness for open and short between ECM and daytime light control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

13. CHECK HEATER FAN SWITCH FUNCTION

1. Start engine.
2. Turn the heater fan switch “ON” in any position.
3. Check that heater fan turns properly.

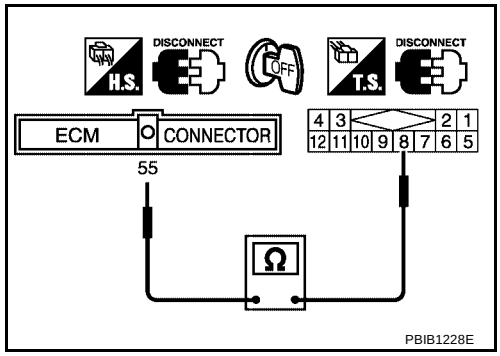
OK or NG

OK >> GO TO 14.
NG >> Refer to MTC-19, "TROUBLE DIAGNOSIS"

14. CHECK HEATER FAN INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect air control connector.
4. Check harness continuity between ECM terminal 55 and air control terminal 8.

Continuity should exist.



5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 15.

15. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open and short between ECM and air control

>> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK REAR WINDOW DEFOGGER FUNCTION

1. Start engine.
2. Turn “ON” the rear window defogger switch.
3. Check the rear windshield. Is the rear windshield heated up?

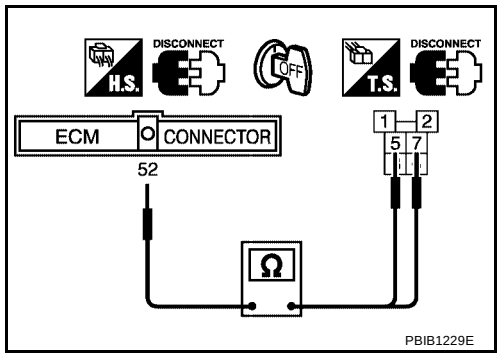
Yes or No

Yes >> GO TO 17.
No >> Refer to GW-17, "REAR WINDOW DEFOGGER"

17. CHECK REAR WINDOW DEFOGGER INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect rear window defogger relay.
4. Check harness continuity between ECM terminal 52 and rear window defogger terminal 5, 7.

Continuity should exist.



5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 19.
NG >> GO TO 18.

18. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M14
- Harness connectors M56, F26
- Harness for open and short between ECM and rear window defogger relay.

>> Repair open circuit or short to ground or short to power in harness or connectors.

19. CHECK INTERMITTENT INCIDENT

Perform EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

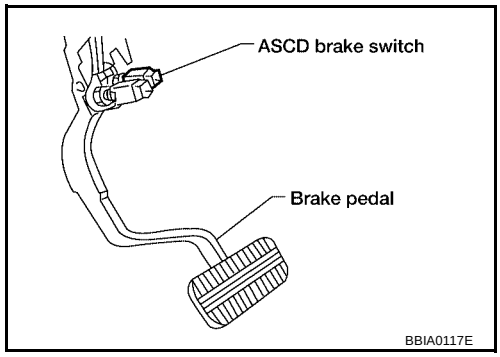
ASCD BRAKE SWITCH

PFP:25320

Component Description

UBS002MV

When depress on the brake pedal, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal)
Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.



CONSULT-II Reference Value in Data Monitor Mode

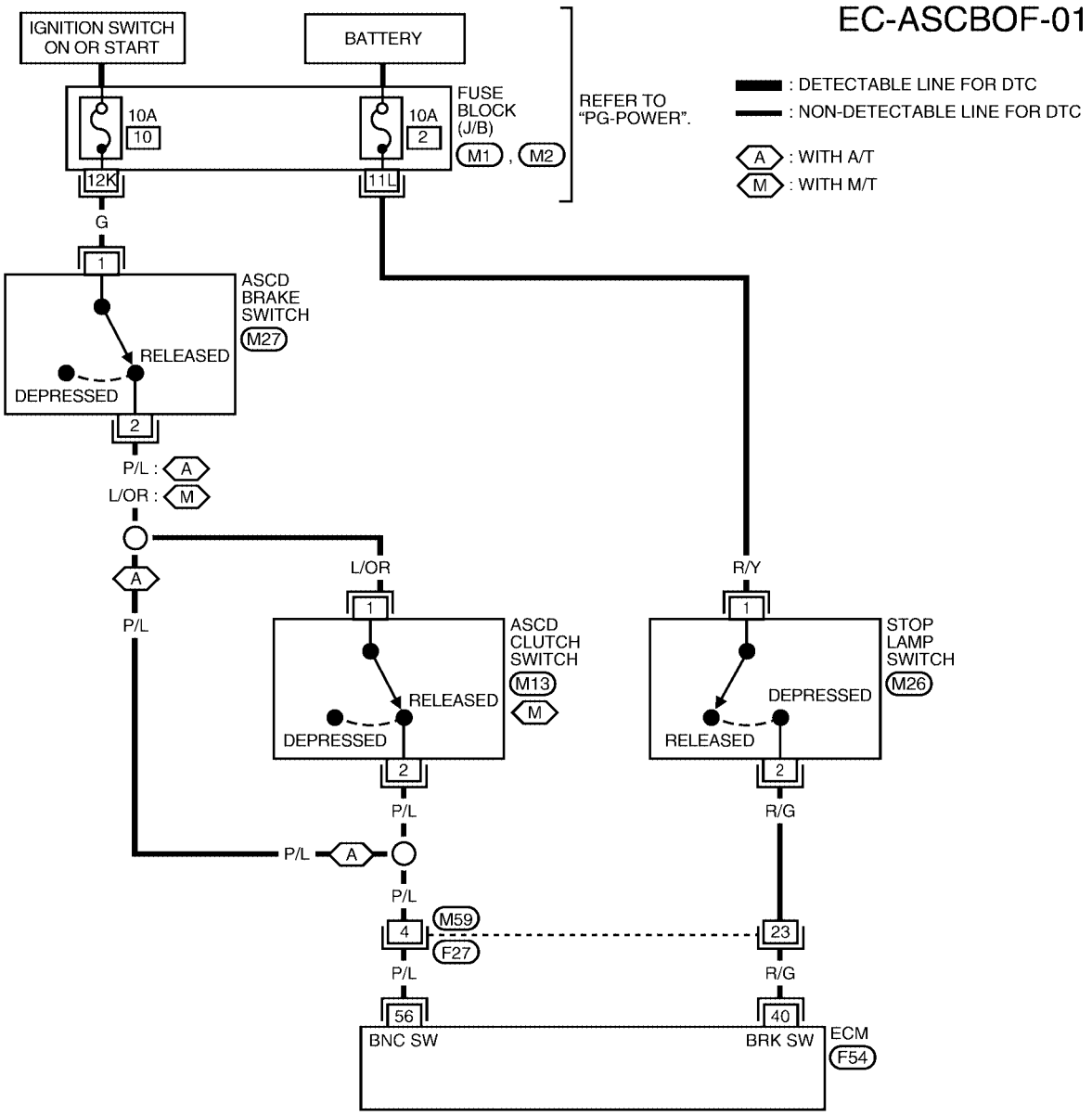
UBS002MW

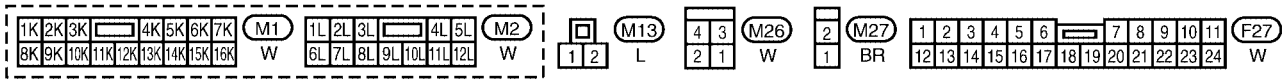
Specification data are reference values.

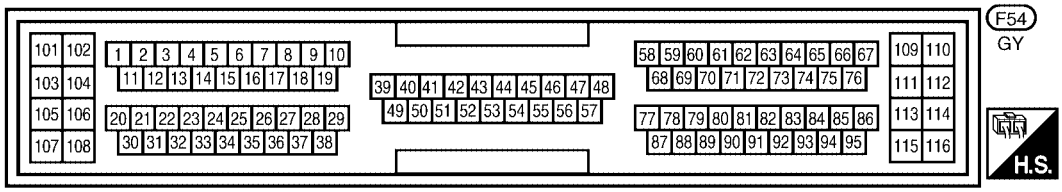
MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (ASCD brake switch)	● Ignition switch: ON	● Brake pedal: Fully released	ON
		● Brake pedal: Slightly	OFF
BRAKE SW2 (Stop lamp switch)	● Ignition switch: ON	● Brake pedal: Fully released	OFF
		● Brake pedal: Depressed	ON

Wiring Diagram

UBS002MX







BBWA0425E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
56	P/L	ASCD brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed ● Clutch pedal is depressed (M/T models)	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released ● Clutch pedal is fully released (M/T models)	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002MY

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

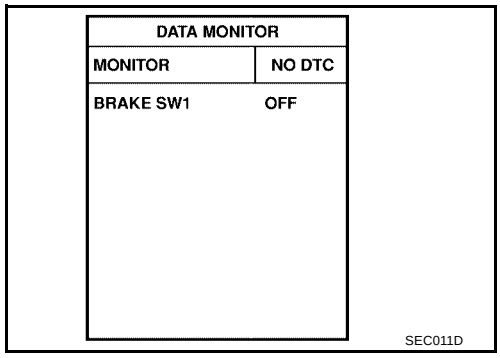
1. Turn ignition switch "ON".
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-II.
3. Check "BRAKE SW1" indication under the following conditions.

M/T models

CONDITION	INDICATION
When clutch pedal or brake pedal is depressed	OFF
When clutch pedal and brake pedal are fully released	ON

A/T models

CONDITION	INDICATION
When brake pedal is depressed	OFF
When brake pedal is fully released	ON



Without CONSULT-II

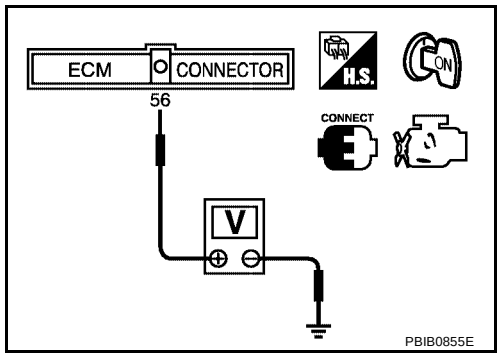
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 56 and ground under the following conditions.

M/T models

CONDITION	VOLTAGE
When clutch pedal or brake pedal is depressed	Approximately 0V
When clutch pedal and brake pedal are fully released	Battery voltage

A/T models

CONDITION	VOLTAGE
When brake pedal is depressed	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

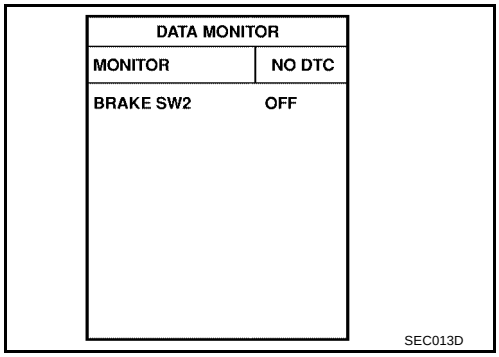
OK >> GO TO 2.
NG (M/T models) >>GO TO 3.
NG (A/T models) >>GO TO 4.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

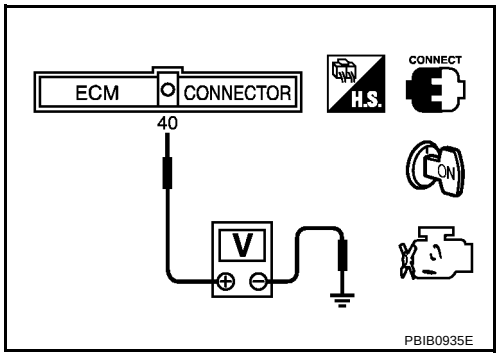
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 40 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

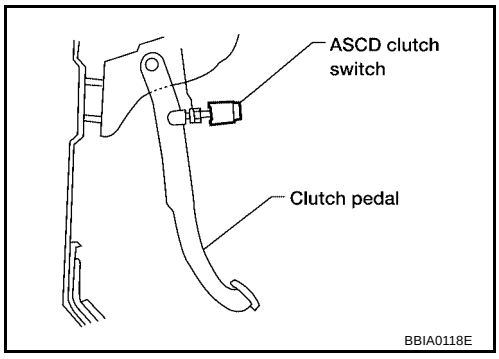


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 13.

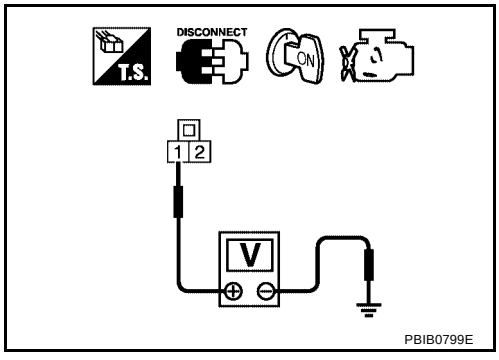
3. CHECK ASCD BRAKE SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD clutch switch terminal 1 and ground under the following conditions with CONSULT-II or tester.

CONDITION	VOLTAGE
When brake pedal is released	Battery voltage
When brake pedal is depressed	Approx. 0V

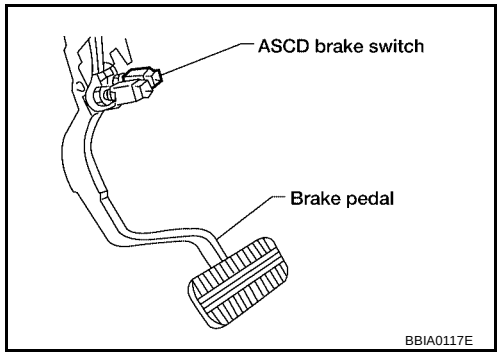


OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

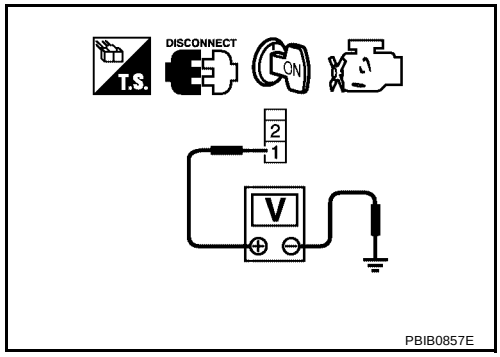
4. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK (M/T models)>>GO TO 6.
OK (A/T models)>>GO TO 7.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ASCD brake switch terminal 2 and ASCD clutch switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ASCD BRAKE SWITCH

Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD brake switch.

10. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and ASCD clutch switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and ASCD clutch switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ASCD CLUTCH SWITCH

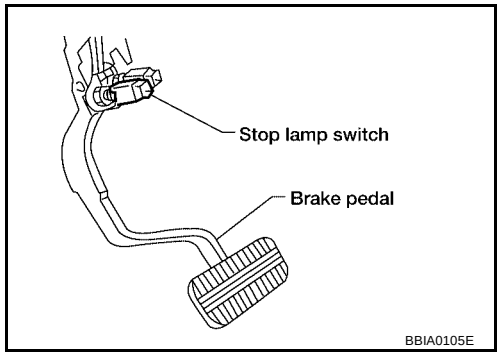
Refer to EC-1738, "Component Inspection"

OK or NG

OK >> GO TO 18.
NG >> Replace ASCD clutch switch.

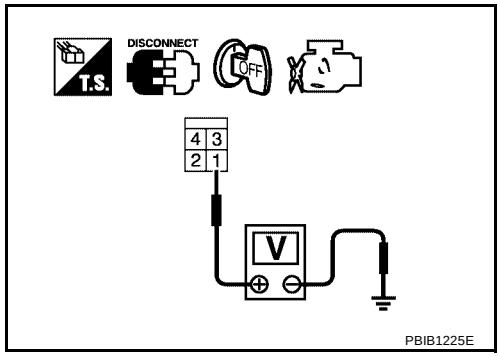
13. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT -II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 40 and stop lamp switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 17.
NG >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

17. CHECK STOP LAMP SWITCH

Refer to EC-1738, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace stop lamp switch.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

ASCD INDICATOR

PFP:24814

Component Description

UBS002MZ

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.
CRUISE indicator illuminates when CRUISE switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.
SET indicator illuminates when following conditions are met.

- CRUISE indicator is illuminated.
- SET switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET indicator remains lit during ASCD control.
Refer to EC-1860, "AUTOMATIC SPEED CONTROL DEVICE (ASCD)" for the ASCD function.

CONSULT-II Reference Value in Data Monitor Mode

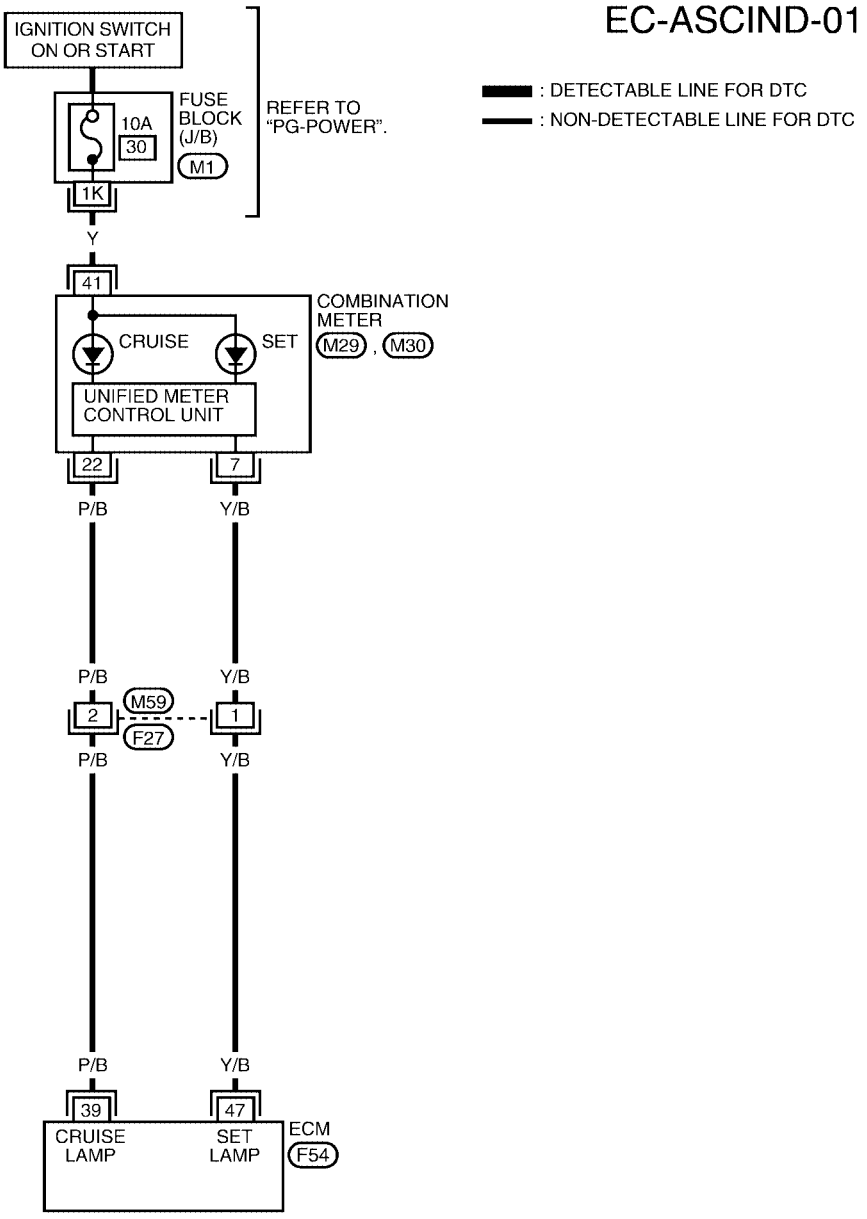
UBS002N0

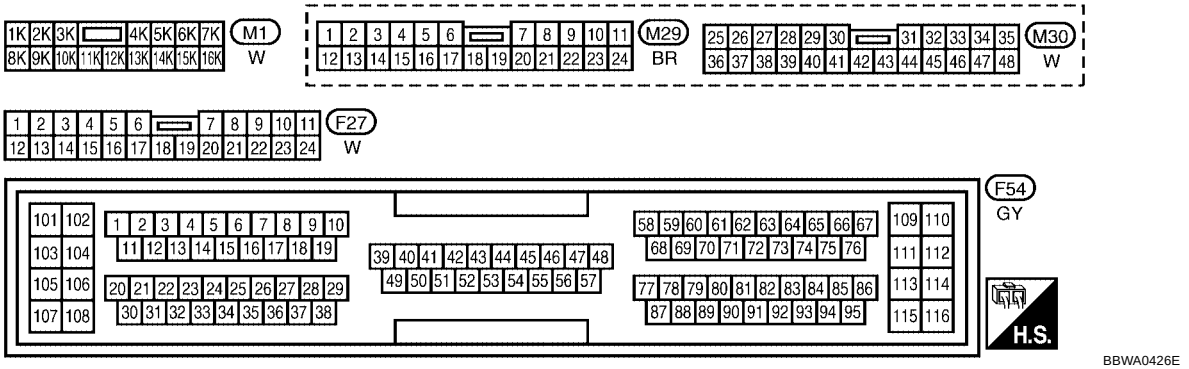
Specification data are reference value.

MONITOR ITEM	CONDITION		SPECIFICATION
CRUISE LAMP	● Ignition switch: ON	● CRUISE switch is depressed at first time → second time	ON → OFF
SET LAMP	● CRUISE switch: ON ● When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	● SET switch pressed	ON
		● ASCD control is canceled	OFF

Wiring Diagram

UBS002N1





BBWA0426E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
39	P/B	ASCD CRUISE lamp	**[Ignition switch "ON"]** ● CRUISE switch is depressed at first time → second time	Approximately 0V ↓ BATTERY VOLTAGE (11 - 14V)
47	Y/B	ASCD SET lamp	**[Engine is running]** ● SET switch is "ON". ● ASCD control is operating.	Approximately 0V
			[Engine is running] ● ASCD control is not operating.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

UBS002N2

1. CHECK OVERALL FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE lamp	● Ignition switch: ON	● CRUISE switch is depressed at first time → second time	ON → OFF
SET lamp	● CRUISE switch: ON ● When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	● SET switch pressed	ON
		● ASCD control is canceled	OFF

OK or NG

OK >> **INSPECTION END**

NG >> GO TO 2.

2. CHECK COMBINATION METER OPERATION

Does combination meter operate normally?

Yes or No

Yes >> GO TO 3.

No >> Check combination meter circuit. Refer to DI-8, "Combination Meter" .

3. CHECK ASCD INDICATOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM terminal	Combination meter terminal
39	22
47	7

Continuity should exist.

5. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

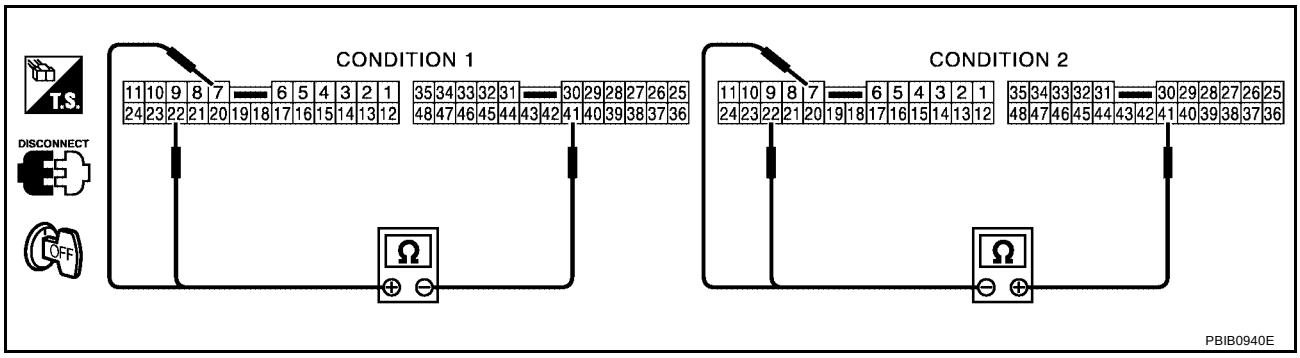
- Harness connectors M59, F27
- Harness for open and short between ECM and combination meter

>> Repair open circuit or short to ground or short to power in harness or connectors

5. CHECK COMBINATION METER

Check continuity under the following conditions.

CONDITION	Combination meter terminal No. (Polarity)	Continuity
1	7 (+) - 41 (–)	Should not exist.
	22 (+) - 41 (–)	
2	41 (+) - 7 (–)	Should exist.
	41 (+) - 22 (–)	



OK or NG

OK >> GO TO 6.
NG >> Replace combination meter. Refer to DI-8 .

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1341, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

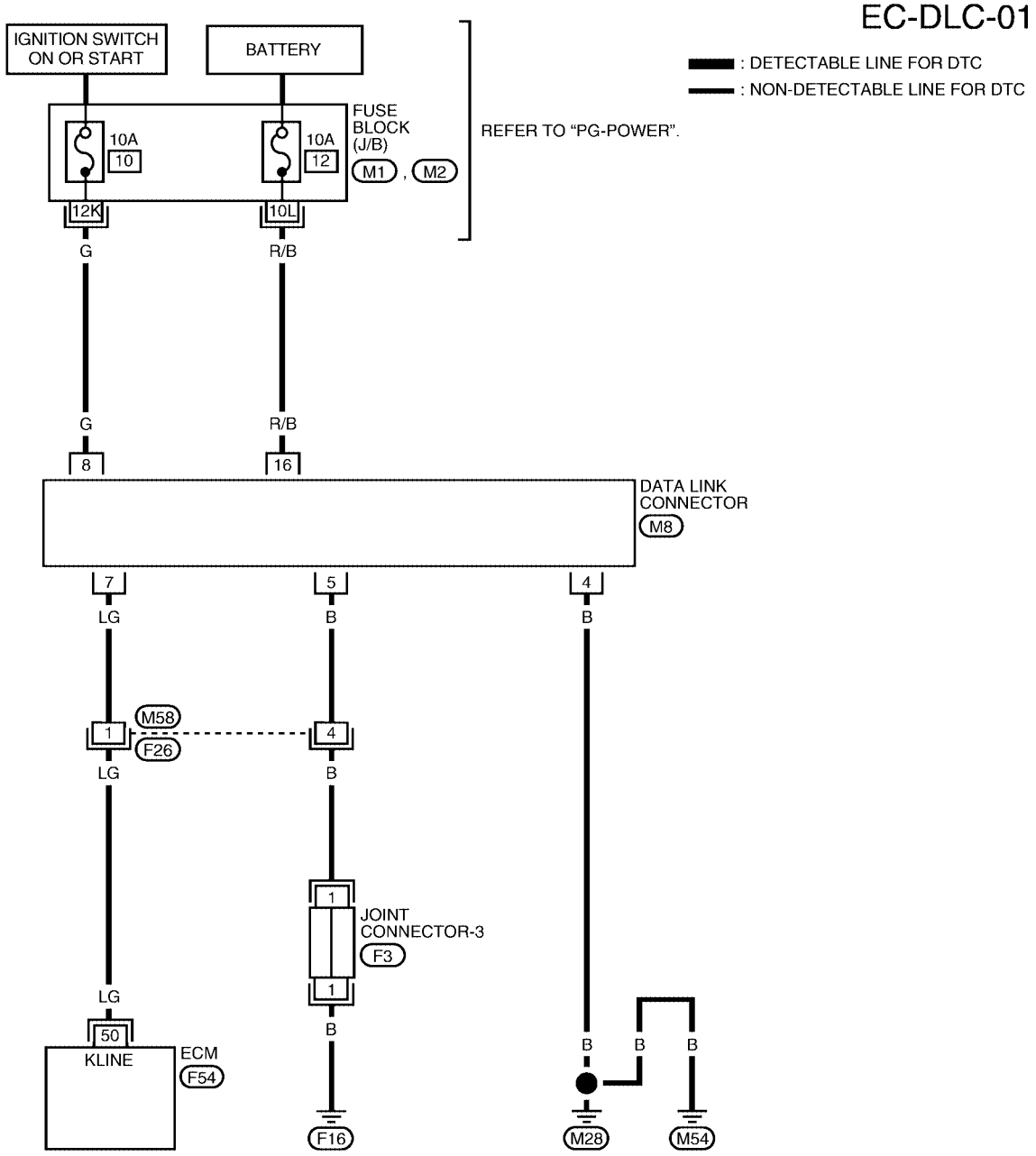
>> **INSPECTION END**

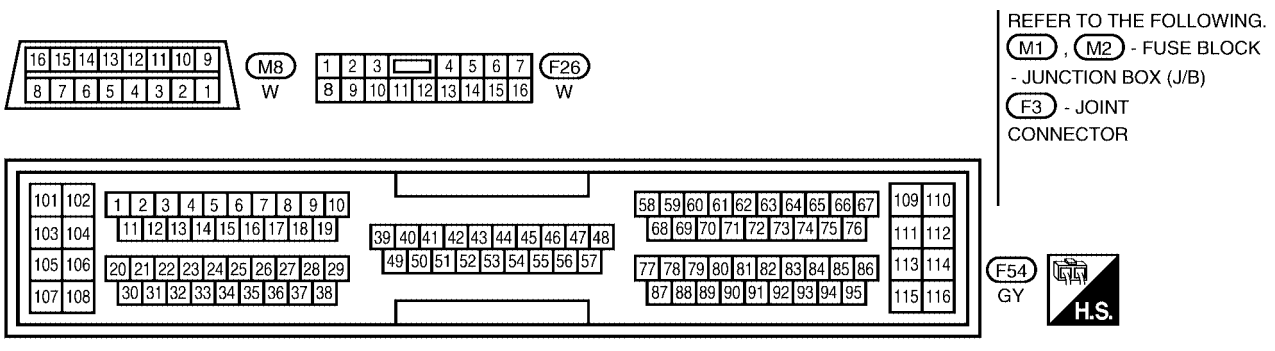
DATA LINK CONNECTOR

PFP:24814

Wiring Diagram

EBS00KLH





BBWA0427E

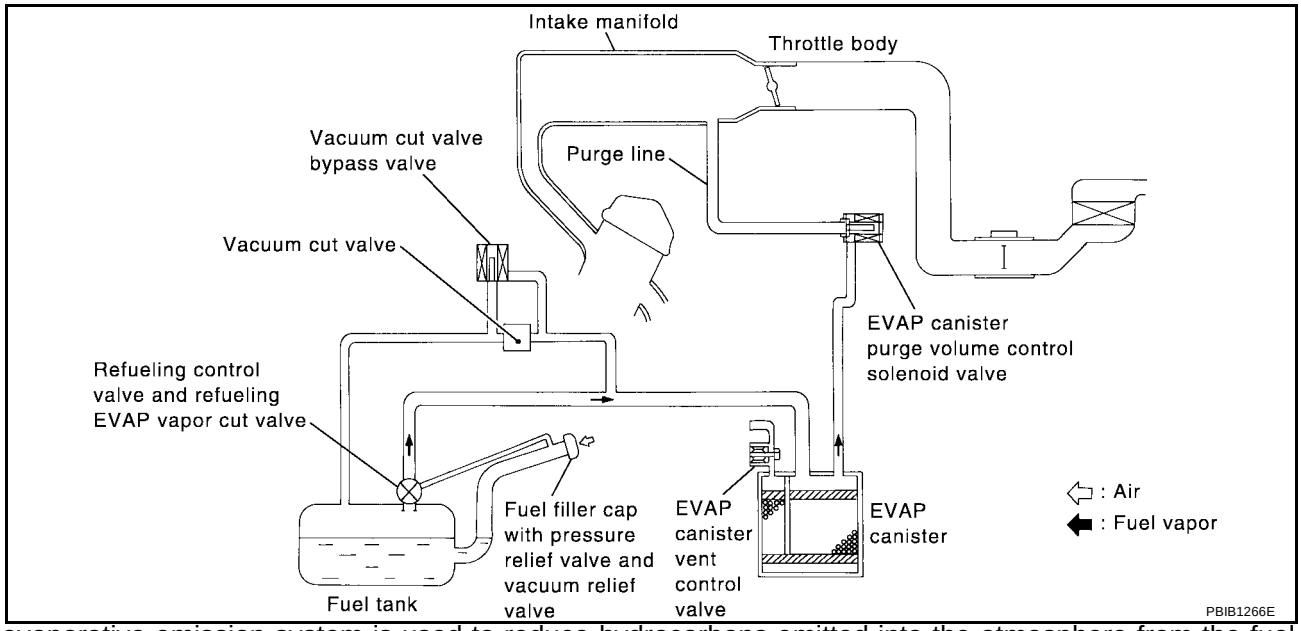
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

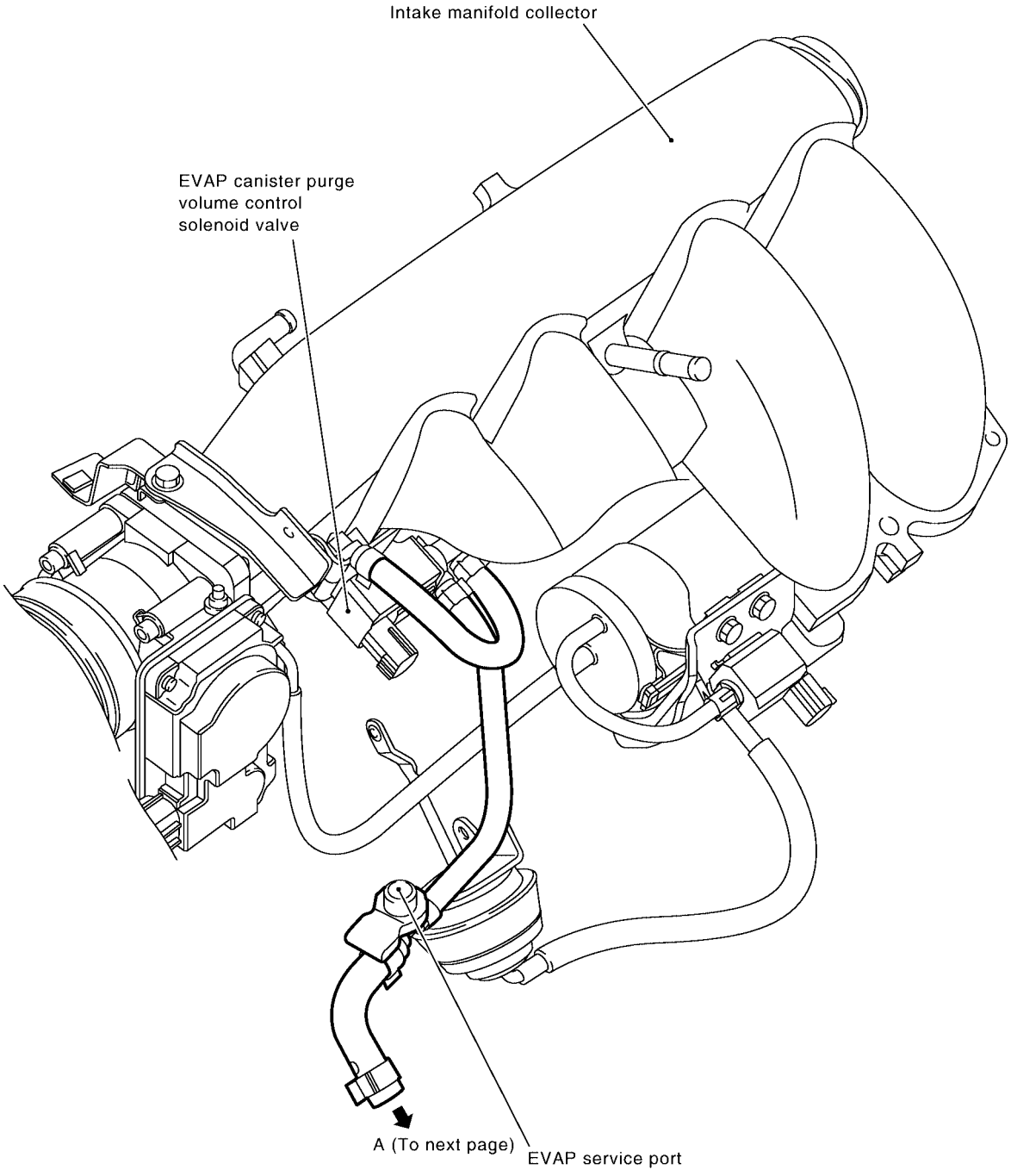
UBS002N4

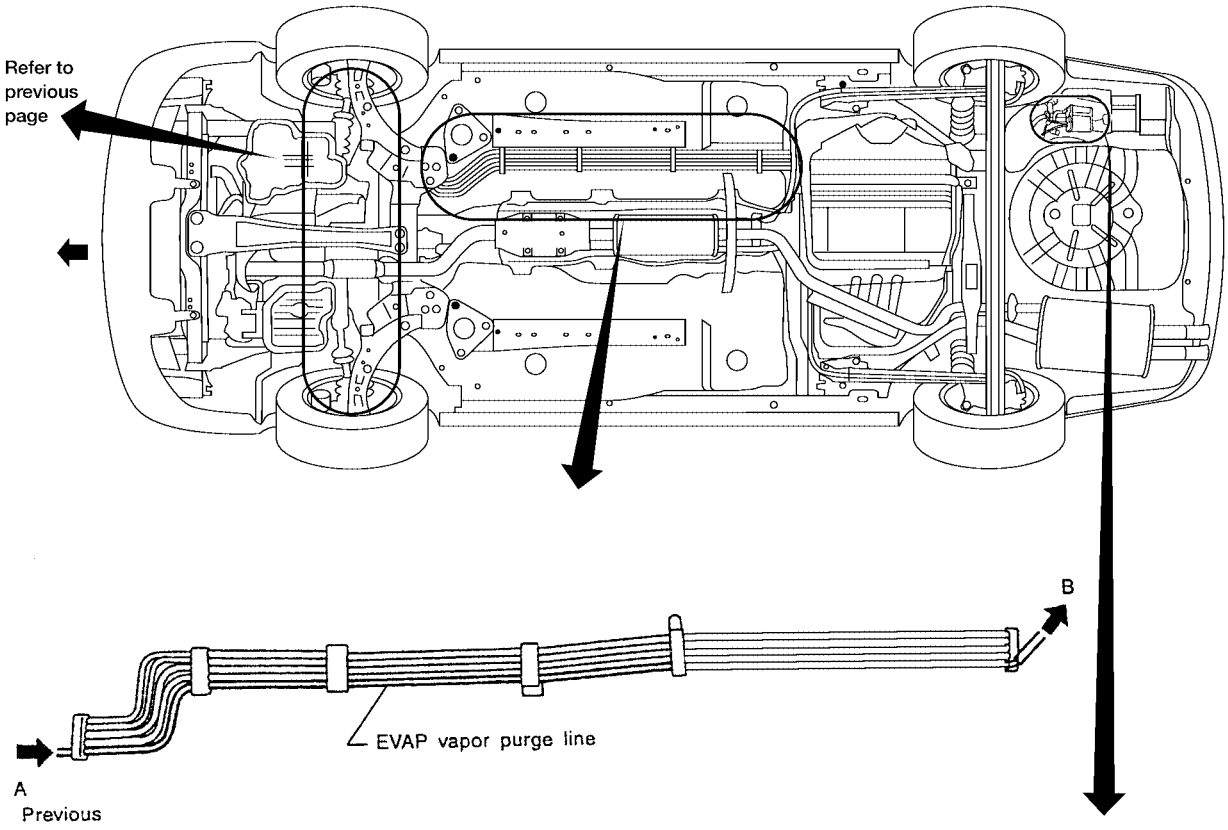
SYSTEM DESCRIPTION

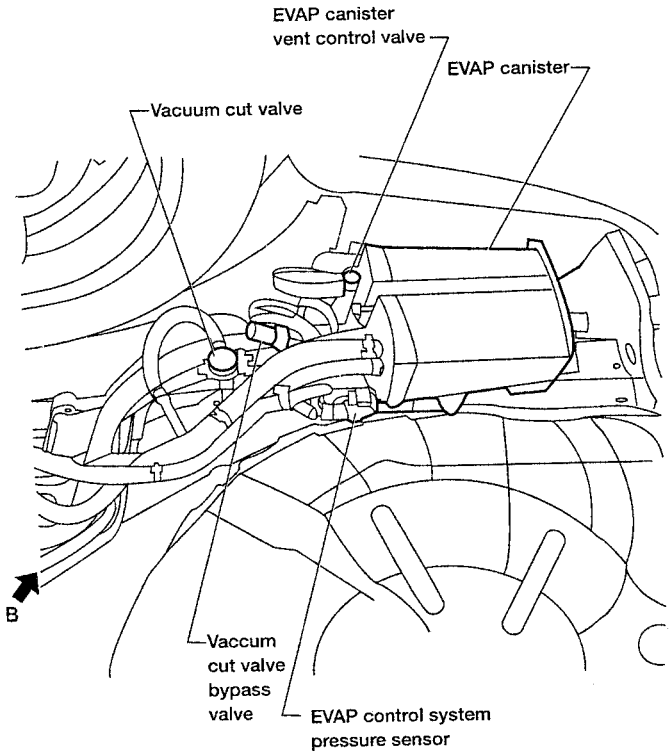


The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING




Refer to previous page
B
EVAP vapor purge line
A
Previous


EVAP canister vent control valve
EVAP canister
Vacuum cut valve
B
Vaccum cut valve bypass valve
EVAP control system pressure sensor

BBIA0212E

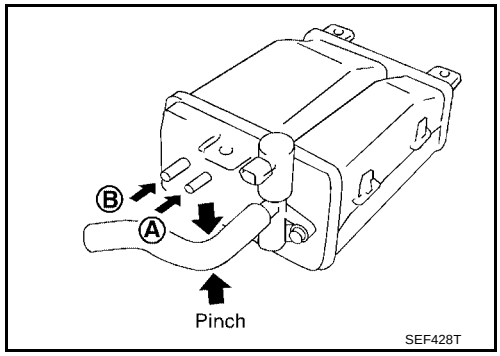
Component Inspection

UBS002N5

EVAP CANISTER

Check EVAP canister as follows:

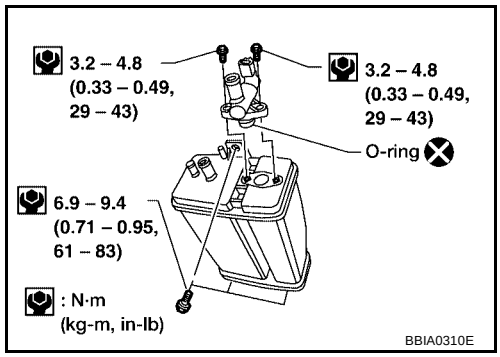
1. Pinch the fresh air hose.
2. Blow air into port **A** and check that it flows freely out of port **B** .



Tightening Torque

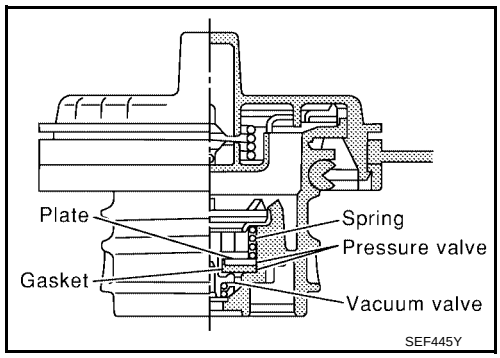
Tighten EVAP canister as shown in the figure.

Make sure new O-ring is installed properly between EVAP canister and EVAP canister vent control valve.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)

1. Wipe clean valve housing.

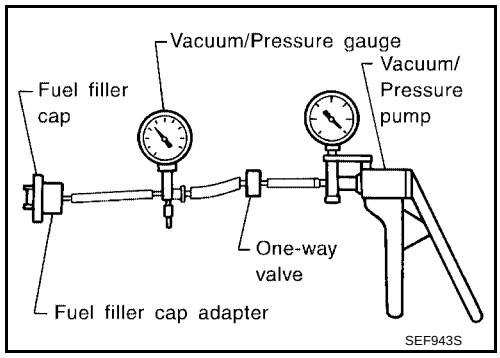


2. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa
(0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)
Vacuum: –6.0 to –3.4 kPa
(–0.061 to –0.035 kg/cm^2 , –0.87 to –0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.

CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.



VACUUM CUT VALVE AND VACUUM CUT VALVE BYPASS VALVE

Refer to EC-1712 .

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

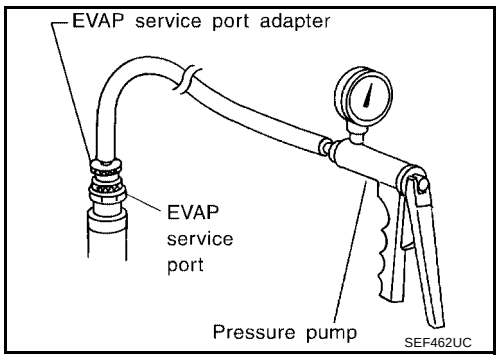
Refer to EC-1526 .

FUEL TANK TEMPERATURE SENSOR

Refer to EC-1456 .

EVAP SERVICE PORT

Positive pressure is delivered to the EVAP system through the EVAP service port. If fuel vapor leakage in the EVAP system occurs, use a leak detector to locate the leak.



How to Detect Fuel Vapor Leakage

UBS002N6

CAUTION:

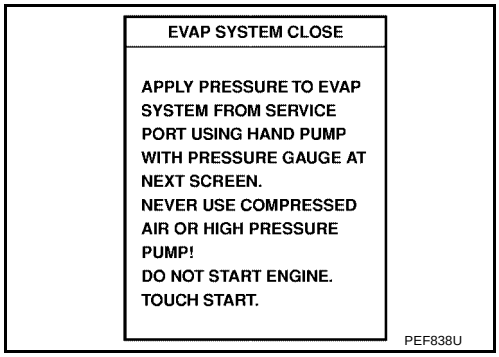
- **Never use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2 , 0.6 psi) of pressure in EVAP system.**

NOTE:

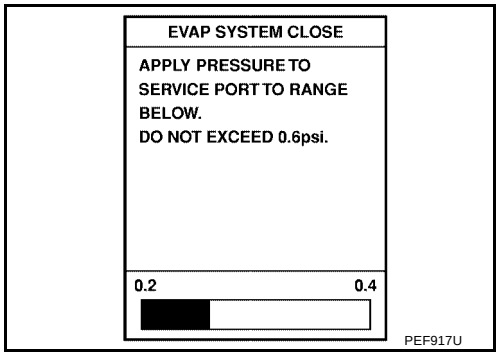
- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

WITH CONSULT-II

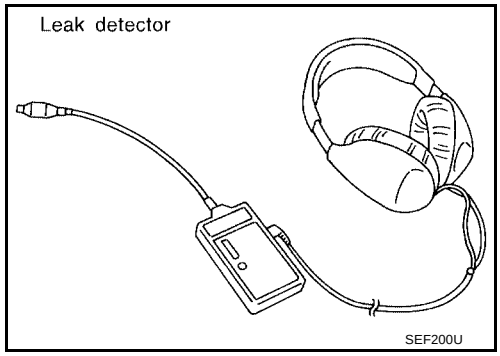
1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump and hose to the EVAP service port adapter.
3. Turn ignition switch “ON”.
4. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT MODE” with CONSULT-II.
5. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.



6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7. Remove EVAP service port adapter and hose with pressure pump.

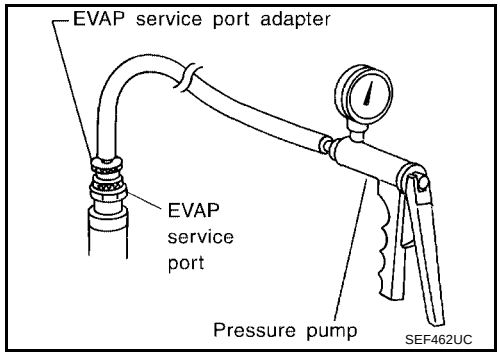


8. Locate the leak using a leak detector. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

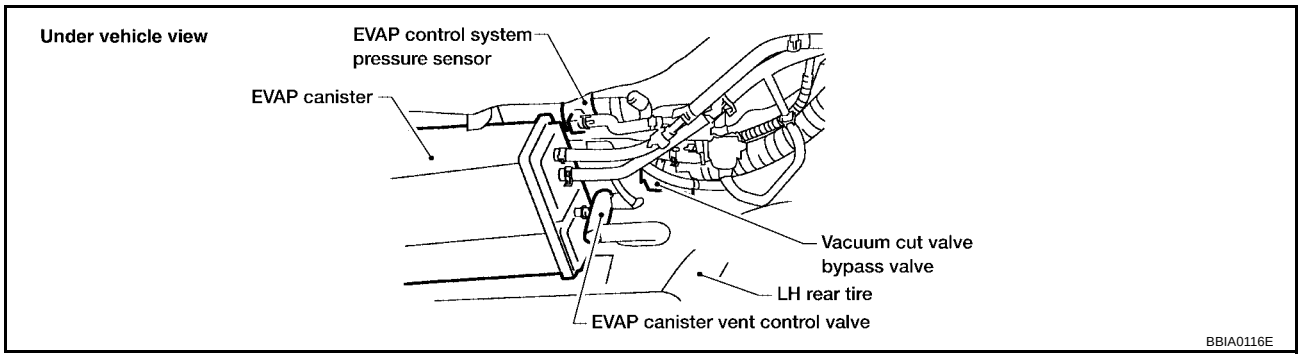


WITHOUT CONSULT-II

1. Attach the EVAP service port adapter securely to the EVAP service port.
2. Also attach the pressure pump with pressure gauge to the EVAP service port adapter.



3. Apply battery voltage to between the terminals of both EVAP canister vent control valve and vacuum cut valve bypass valve to make a closed EVAP system.



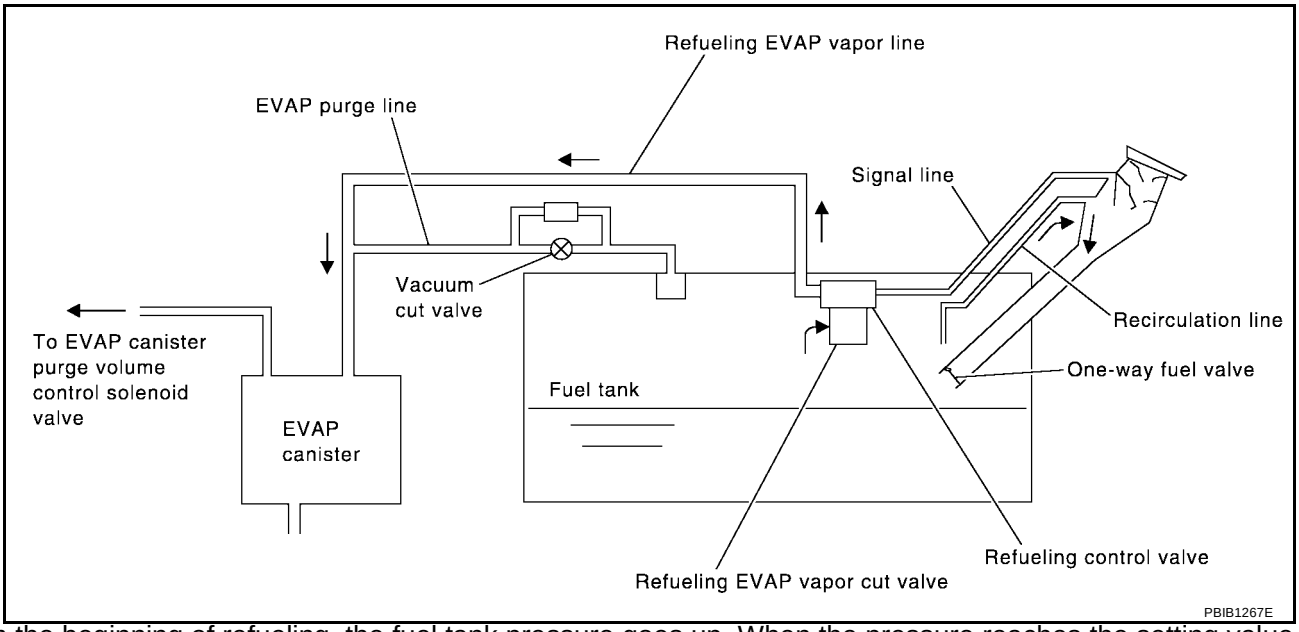
4. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2 , 0.2 to 0.4 psi).
5. Remove EVAP service port adapter and hose with pressure pump.
6. Locate the leak using a leak detector. Refer to EC-1847, "EVAPORATIVE EMISSION LINE DRAWING" .

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

PFP:00032

System Description

UBS002N7



From the beginning of refueling, the fuel tank pressure goes up. When the pressure reaches the setting value of the refueling control valve (RCV) opening pressure, the RCV is opened. After RCV opens, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve, RCV and refueling vapor line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

The RCV is always closed during driving and the evaporative emission control system is operated the same as conventional system.

WARNING:

When conducting inspections below, be sure to observe the following:

- **Put a “CAUTION: INFLAMMABLE” sign in workshop.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to furnish the workshop with a CO_2 fire extinguisher.**

CAUTION:

- **Before removing fuel line parts, carry out the following procedures:**
  - **Put drained fuel in an explosion-proof container and put lid on securely.**
  - **Release fuel pressure from fuel line. Refer to EC-1257, "FUEL PRESSURE RELEASE" .**
  - **Disconnect battery ground cable.**
- **Always replace O-ring when the fuel gauge retainer is removed.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose and clamps excessively to avoid damaging hoses.**
- **After installation, run engine and check for fuel leaks at connection.**
- **Do not attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.**

Diagnostic Procedure

UBS002N8

SYMPTOM: FUEL ODOR FROM EVAP CANISTER IS STRONG.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Weigh the EVAP canister with EVAP canister vent control valve attached.
   The weight should be less than 1.8 kg (4.0 lb).

OK or NG

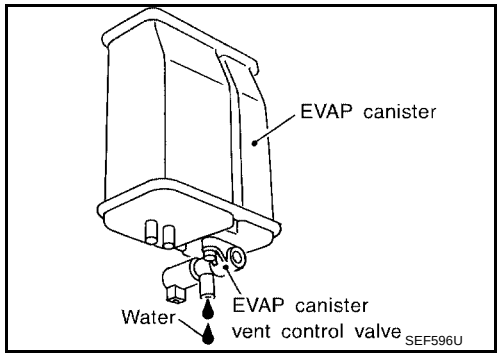
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.
No >> GO TO 5.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

5. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

6. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> **INSPECTION END**
NG >> Replace refueling control valve with fuel tank.

SYMPTOM: CANNOT REFUEL/FUEL ODOR FROM THE FUEL FILLER OPENING IS STRONG WHILE REFUELING.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Weigh the EVAP canister with EVAP canister vent control valve attached.
   The weight should be less than 1.8 kg (4.0 lb).

OK or NG

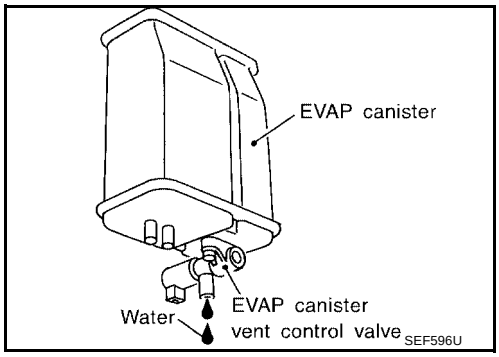
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER SATURATED WITH WATER

Does water drain from the EVAP canister?

Yes or No

Yes >> GO TO 3.
No >> GO TO 5.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

5. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kink, looseness and improper connection.

OK or NG

OK >> GO TO 6.
NG >> Repair or replace hoses and tubes.

6. CHECK FILLER NECK TUBE

Check signal line and recirculation line for clogging, dents and cracks.

OK or NG

OK >> GO TO 7.
NG >> Replace filler neck tube.

7. CHECK REFUELING CONTROL VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace refueling control valve with fuel tank.

8. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1855, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

9. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

OK or NG

OK >> GO TO 10.
NG >> Replace fuel filler tube.

10. CHECK ONE-WAY FUEL VALVE-I

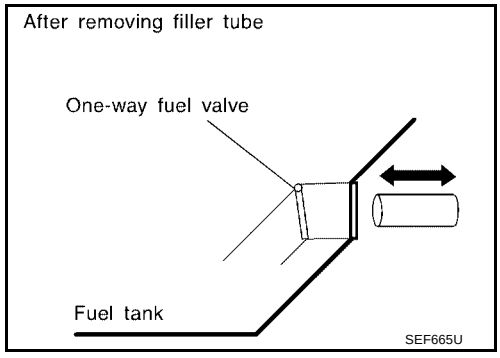
Check one-way valve for clogging.

OK or NG

OK >> GO TO 11.
NG >> Repair or replace one-way fuel valve with fuel tank.

11. CHECK ONE-WAY FUEL VALVE-II

1. Make sure that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as follows.
   When a stick is inserted, the valve should open, when removing stick it should close.
   Do not drop any material into the tank.



OK or NG

OK >> **INSPECTION END**
NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.

Component Inspection

UBS002N9

REFUELING EVAP VAPOR CUT VALVE

With CONSULT-II

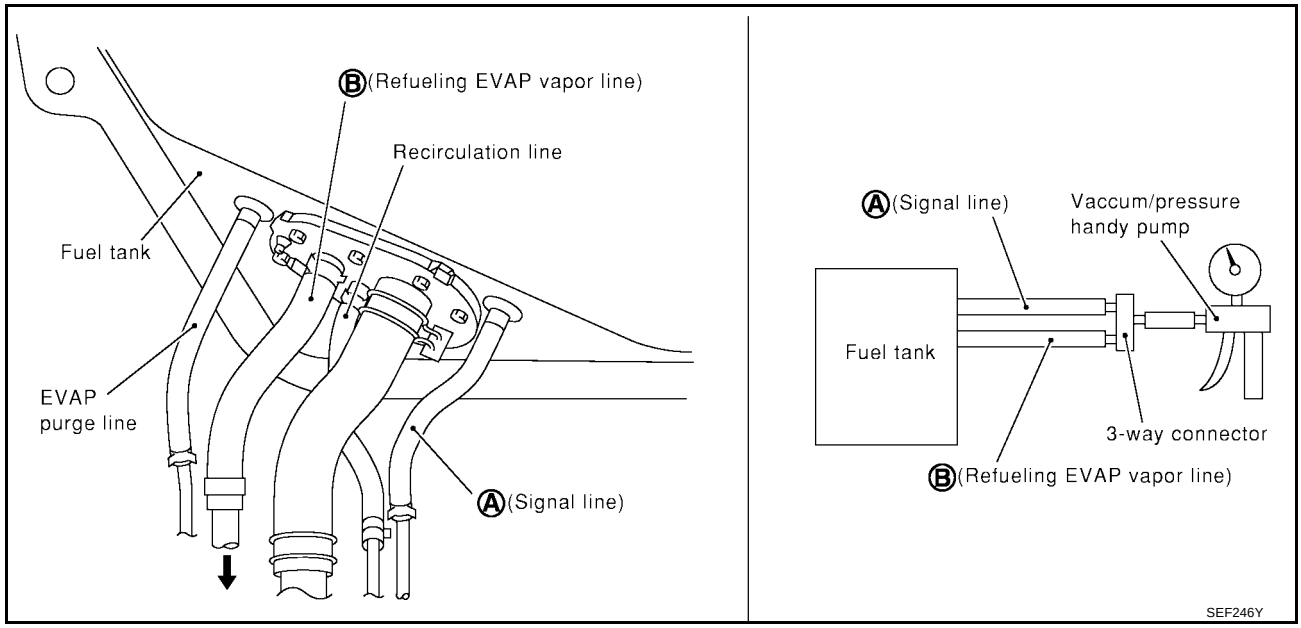
1. Remove fuel tank. Refer to FL-7, "FUEL TANK" .
2. Drain fuel from the tank as follows:

a. Remove fuel feed hose located on the fuel gauge retainer.
b. Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
c. Drain fuel using “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT-II.

3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end **B**), and check that the air flows freely into the tank.
4. Check EVAP vapor cut valve for being stuck to open as follows.

a. Connect vacuum pump to hose ends **A** and **B** using a suitable 3-way connector.
b. Remove fuel gauge retainer with fuel gauge unit.
   Always replace O-ring with new one.
c. Put fuel tank upside down.

d. Apply vacuum pressure to both hose ends **A** and **B** [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



With GST

1. Remove fuel tank. Refer to FL-7, "FUEL TANK" .
2. Drain fuel from the tank as follows:

a. Remove fuel gauge retainer.

b. Drain fuel from the tank using a hand pump into a fuel container.

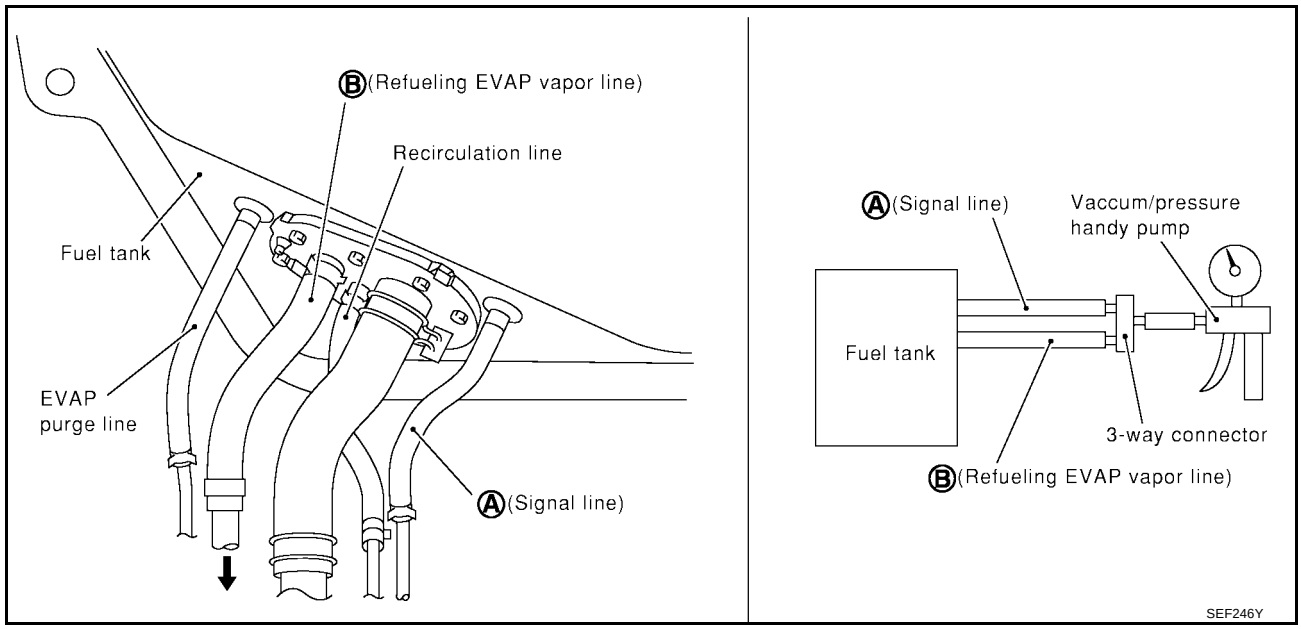
3. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from hose end **B**), and check that the air flows freely into the tank.
4. Check EVAP vapor cut valve for being stuck to open as follows.

a. Connect vacuum pump to hose ends **A** and **B** using a suitable 3-way connector.

b. Remove fuel gauge retainer with fuel gauge unit.
   Always replace O-ring with new one.

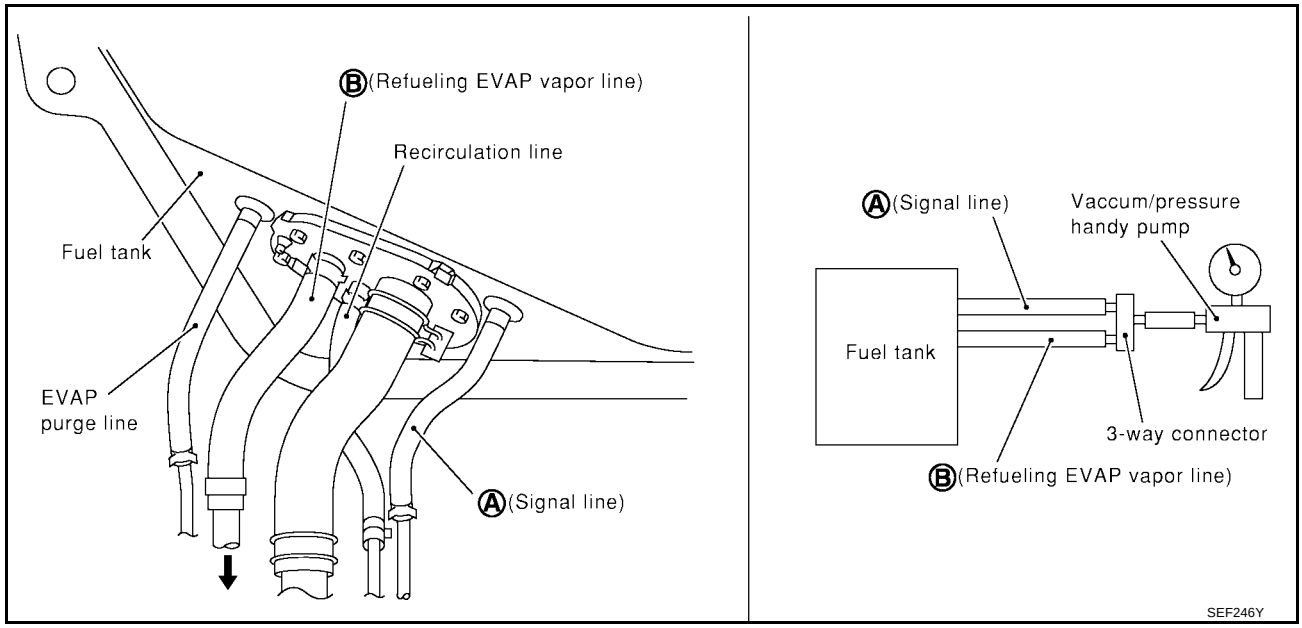
c. Put fuel tank upside down.

d. Apply vacuum pressure to both hose ends **A** and **B** [–13.3 kPa (–100 mmHg, –3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.



REFUELING CONTROL VALVE

1. Remove fuel filler cap.
2. Check air continuity between hose ends **A** and **B** .
   Blow air into the hose end **B** . Air should flow freely into the fuel tank.
3. Blow air into hose end **A** and check there is no leakage.
4. Apply pressure to both hose ends **A** and **B** [20 kPa (150 mmHg, 5.91 inHg)] using a pressure pump and a suitable 3-way connector. Check that there is no leakage.



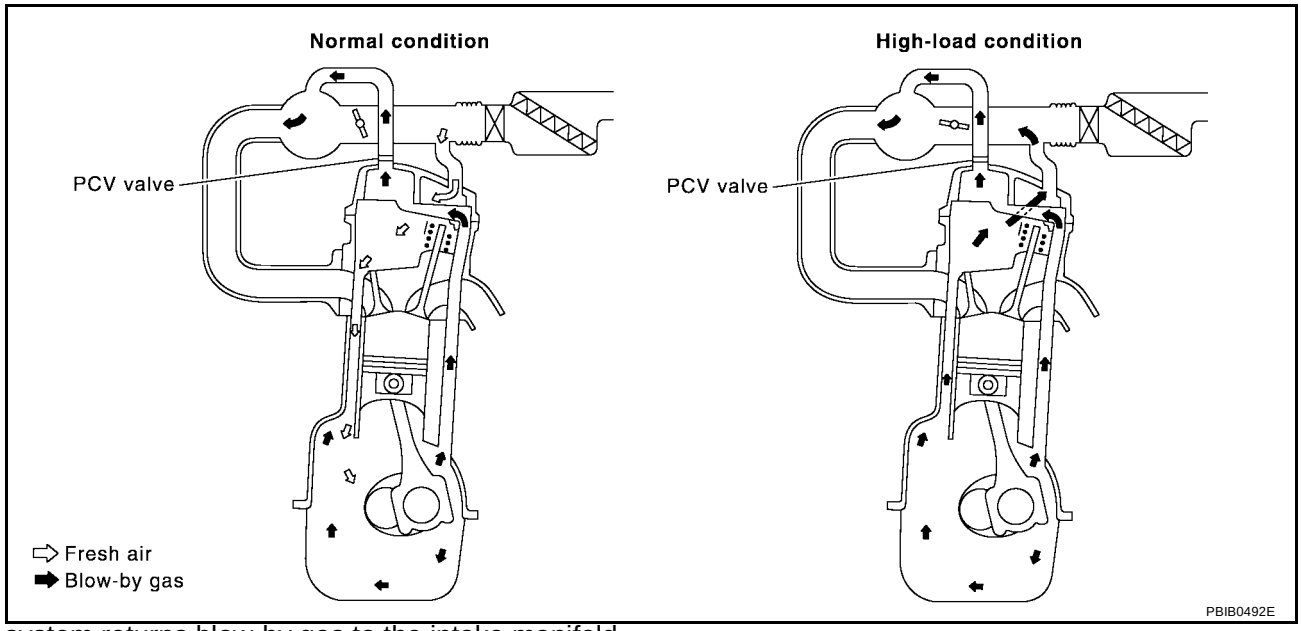
POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

UBS002NA

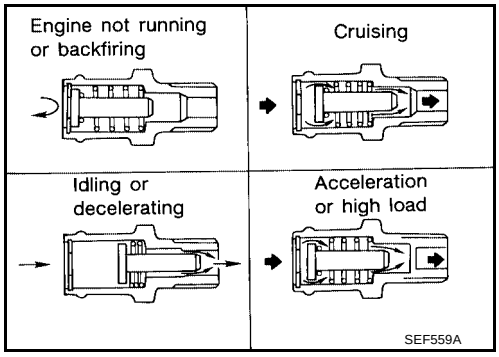
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

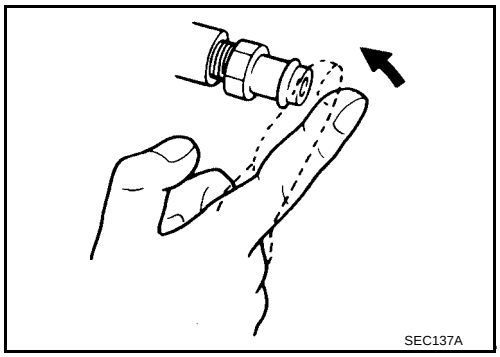


Component Inspection

UBS002NB

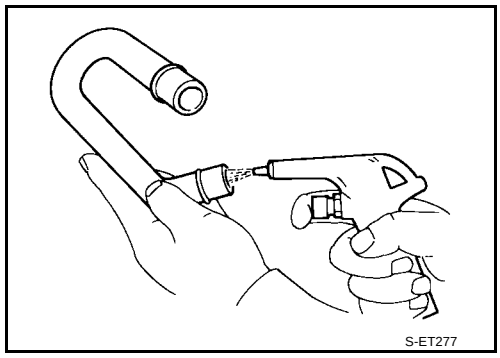
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



AUTOMATIC SPEED CONTROL DEVICE (ASCD)

PFP:18930

System Description

UBS002NC

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation	ASCD vehicle speed control	Electric throttle control actuator
Stop lamp switch	Brake pedal operation		
ASCD clutch switch (MT models)	Clutch pedal operation		
ASCD steering switch	ASCD steering switch operation		
Park/Neutral position (PNP) switch (AT models)	Gear position		
Combination meter	Vehicle speed		
TCM	Power train revolution		

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.
Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).
ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
Operation status of ASCD is indicated by CRUISE indicator and SET indicator in combination meter. If any malfunction occurs in ASCD system, it automatically deactivates control.

SET OPERATION

Press ASCD CRUISE switch (Main switch). (The CRUISE indicator in combination meter illuminates.)
When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press SET switch. (Then SET indicator in combination meter illuminates.)

ACCEL OPERATION

If the RESUME/ACCEL switch is depressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.
And then ASCD will keep the new set speed.

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is depressed
- Brake pedal is depressed
- Clutch pedal is depressed (M/T models)
- A/T selector lever is shifted to P or N position (A/T models)

If MAIN switch is turned to OFF during ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

COAST OPERATION

When the SET/COAST switch is depressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will keep the new set speed.

RESUME OPERATION

When the RESUME/ACCEL switch is depressed after cancel operation other than depressing MAIN switch is performed, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- Brake pedal is released.
- Clutch pedal is released (M/T models)
- A/T selector lever is in other than P and N positions (A/T models)
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

Component Description

UBS002ND

ASCD STEERING SWITCH

Refer to EC-1723 .

ASCD BRAKE SWITCH

Refer to EC-1730 .

ASCD CLUTCH SWITCH

Refer to EC-1730 .

STOP LAMP SWITCH

Refer to EC-1730 .

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EC-1604

ASCD INDICATOR

Refer to EC-1841 .

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

UBS002NE

Fuel pressure at idle	Approximately 350 kPa (3.57kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

UBS002NF

Target idle speed	No-load*1 (in “P” or N” position)	700±50 rpm
Air conditioner: ON	In “P” or N” position	800 rpm or more
Ignition timing	In “P” or N” position	15°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

UBS002NG

	Calculated load value % (Using CONSULT-II or GST)
At idle	10 - 35
At 2,500 rpm	10 - 35

Mass Air Flow Sensor

UBS002NH

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	1.1 - 1.5*V
Mass air flow (Using CONSULT-II or GST)	1.0 - 4.0 g·m/sec at idle* 4.0 - 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

UBS002NI

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1
80 (176)	0.31 - 0.37

Engine Coolant Temperature Sensor

UBS002NJ

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Heated Oxygen Sensor 1 Heater

UBS002NK

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Heated Oxygen Sensor 2 Heater

UBS002NL

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (POS)

UBS002NM

Refer to EC-1494, "Component Inspection" .

Camshaft Position Sensor (PHASE)

UBS002NN

Refer to EC-1500, "Component Inspection" .

Throttle Control Motor

UBS002NO

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Injector

UBS002NP

Resistance [at 20°C (68°F)]	12.1 - 12.9Ω

Fuel Pump

UBS002NQ

Resistance [at 25°C (77°F)]	Approximately 1.0Ω

SECTION EX
EXHAUST SYSTEM

CONTENTS

PREPARATION 2
Special Service Tool 2
Commercial Service Tools 2

EXHAUST SYSTEM 3
Removal and Installation 3

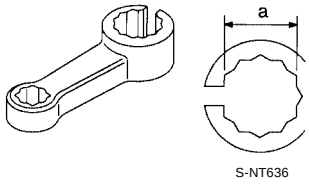
PREPARATION

PFP:00002

Special Service Tool

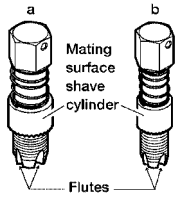
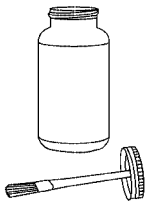
EBS00DTK

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
KV10114400 (J-38365-A) Heated oxygen sensor wrench  S-NT636	Loosening or tightening front and rear heated oxygen sensors **a: 22 mm (0.87 in)**

Commercial Service Tools

EBS00DTL

(Kent-Moore No.) Tool name	Description
(J-43897–18) (J-43897–12) Oxygen sensor thread cleaner  AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor (Use with anti-seize lubricant shown below.) **a: J-43897-18 (18 mm) for zirconia oxygen sensor** **b: J-43897-12 (12 mm) for titania oxygen sensor**
Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907)  AEM489	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads

EXHAUST SYSTEM

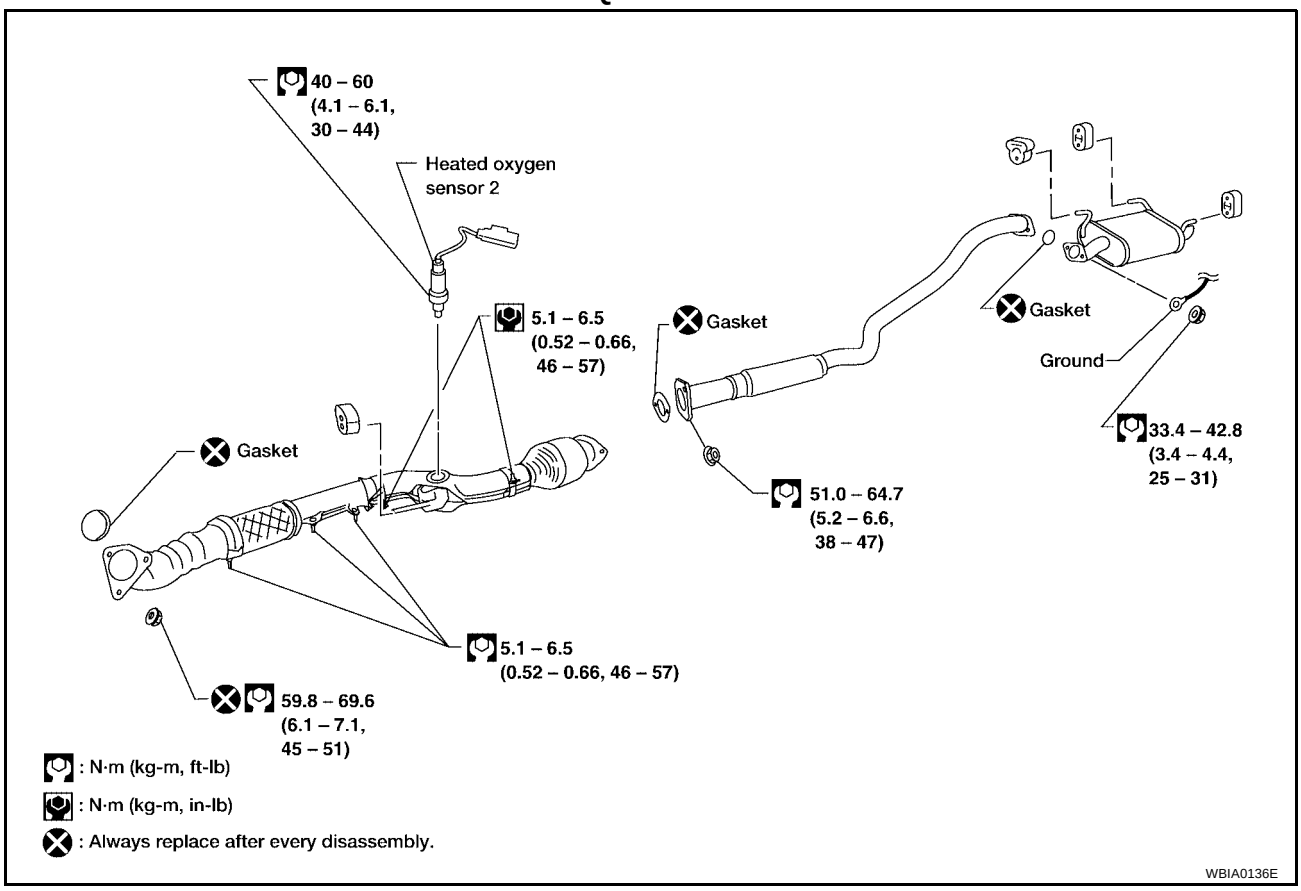
PFP:20100

Removal and Installation

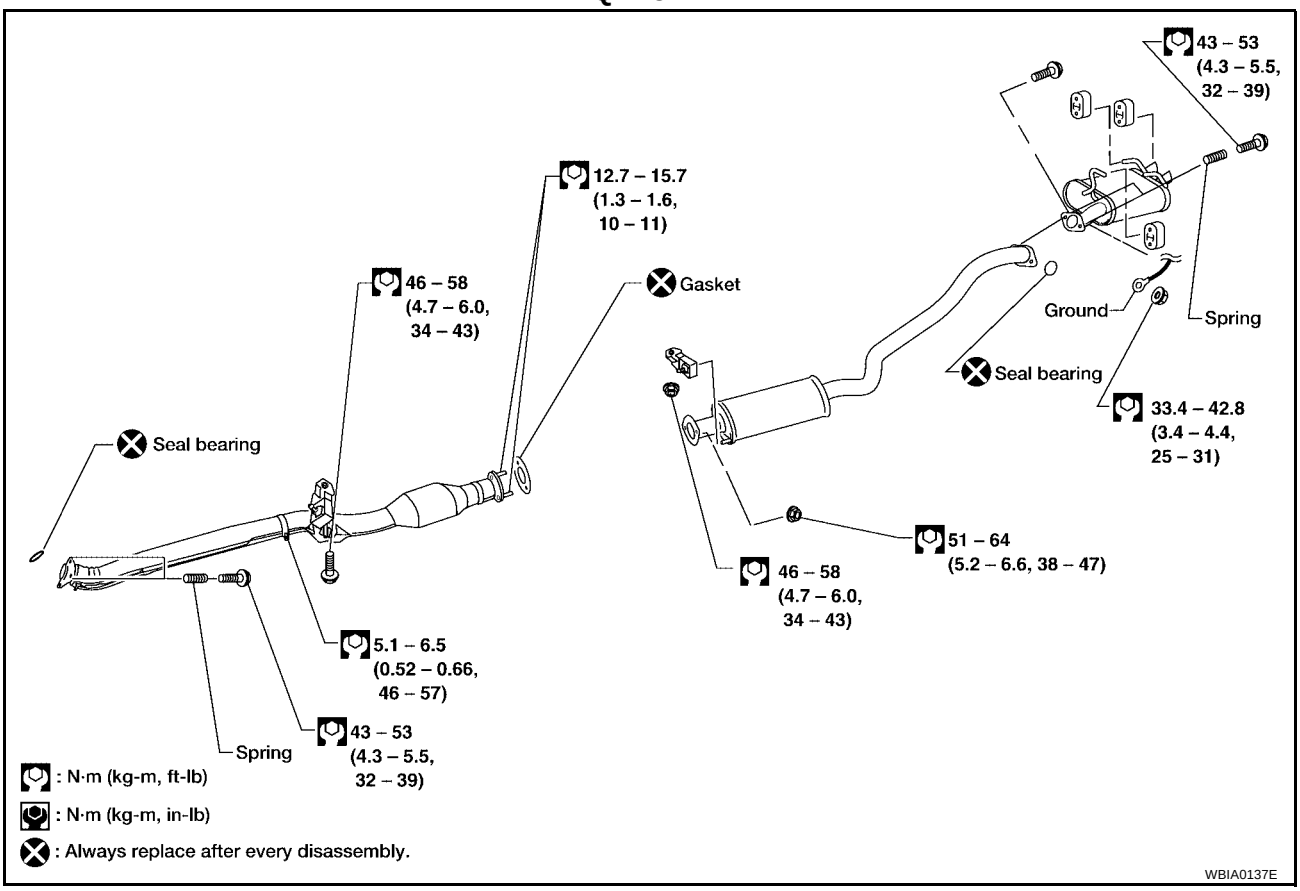
EBS00DTM

Refer to the following figures for removal and installation.

QG18DE

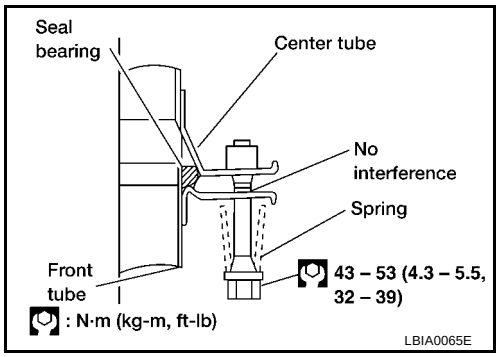


QR25DE



CAUTION:

- **Always replace exhaust gaskets with new ones when reassembling.**
- **For the QR25DE engine, install the front combination seal bearing as shown. Position the conical spring so that the wide end is against the flange as shown.**



- **With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.**
- **Check to ensure that mounting brackets and mounting insulators are installed properly and free from undue stress. Improper installation could result in excessive noise or vibration.**
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; replace it with a new one.**
- **Before installing a new oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner tool, J-43897-18 or J-43897-12, and apply anti-seize lubricant.**
- **Do not over-tighten the oxygen sensor. Doing so may cause damage to the oxygen sensor, resulting in the MIL coming on.**

SECTION FAX

FRONT AXLE

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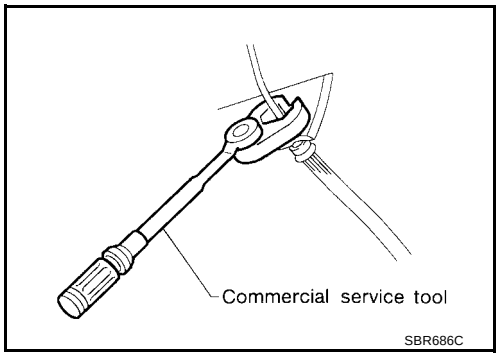
PRECAUTIONS

PFP:00001

Precautions

EDS000Q6

- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **After installing removed suspension parts, check wheel alignment and adjust if necessary.**
- **Use flare nut wrench when removing or installing brake tubes.**
- **Always torque brake lines when installing.**



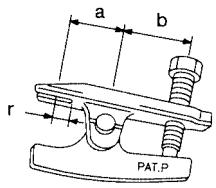
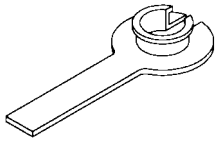
PREPARATION

PFP:00002

Special Service Tools

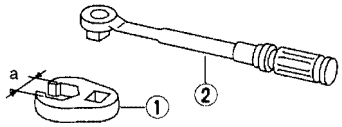
EDS000Q7

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
HT72520000 (J25730-B) Ball joint remover  NT546	Removing tie-rod outer end and lower ball joint **a: 33 mm (1.30 in)** **b: 50 mm (1.97 in)** **r: R11.5 mm (0.453 in)**
KV38106800 (J34297-1) Differential side oil seal protector  NT147	Installing drive shaft

Commercial Service Tools

EDS000Q8

Tool name	Description
1 Flare nut crowfoot 2 Torque wrench  NT360	Removing and installing each brake piping **a: 10 mm (0.39 in)**

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

EDS000Q9

Use the chart below to help you find the cause of the symptom. If necessary, repair or replace these parts.

Reference page			—	FAX-18, "Inspection"	Refer to MA-38, "WHEEL BALANCE"	FAX-8, "Installation"	FAX-5, "Front Wheel Bearing"	FAX-5, "Front Wheel Bearing"	Refer to DRIVE SHAFT in this chart.	Refer to AXLE in this chart.	Refer to FSU-4, "NVH Troubleshooting Chart"	Refer to WT-2, "NVH Troubleshooting Chart"	Refer to WT-2, "NVH Troubleshooting Chart"	Refer to BR-5, "NVH Troubleshooting Chart"	Refer to PS-6, "NVH Troubleshooting Chart"
Possible cause and SUSPECTED PARTS			Excessive joint angle	Joint sliding resistance	Imbalance	Improper installation, looseness	Parts interference	Wheel bearing damage	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES	STEERING
Symptom	DRIVE SHAFT	Noise, Vibration	×	×						×	×	×	×	×	×
		Shake	×		×					×	×	×	×	×	×
	AXLE	Noise				×	×		×		×	×	×	×	×
		Shake				×	×		×		×	×	×	×	×
		Vibration				×	×		×		×	×			×
		Shimmy				×	×				×	×	×	×	×
		Judder				×					×	×	×	×	×
		Poor quality ride or handling				×	×	×			×	×	×		

×: Applicable

ON-VEHICLE SERVICE

PFP:00000

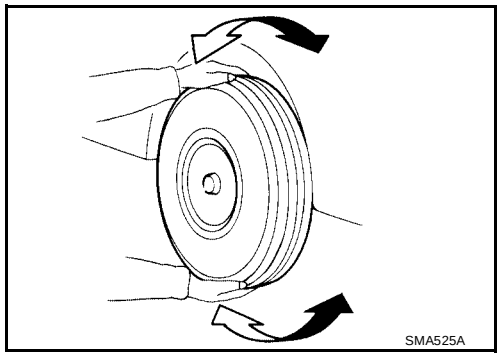
Front Axle Parts

EDS000QA

Check front axle and front suspension parts for excessive play, cracks, wear or other damage.

- Shake each front wheel to check for excessive play.
- Make sure that the cotter pin is properly installed.
- Retighten all axle and suspension nuts and bolts to the specified torque.

Tightening torque : Refer to FSU-5, "Components" .


SMA525A

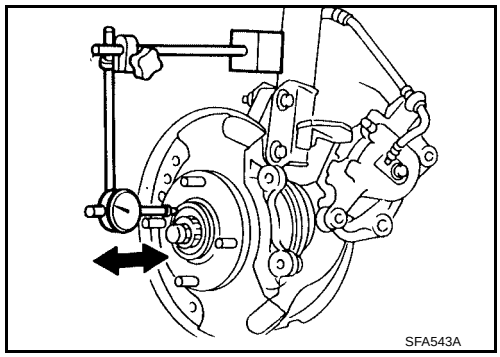
Front Wheel Bearing

EDS000QB

- Rotate wheel hub to check that wheel bearings operate smoothly.
- Check axial end play.

Axial end play : 0.05 mm (0.0020 in) or less

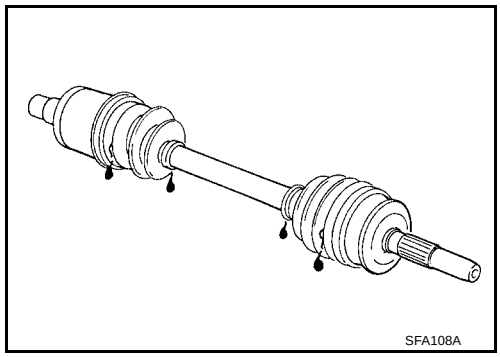
If out of specification or wheel bearing does not turn smoothly, replace wheel bearing assembly.
Refer to FAX-6, "WHEEL HUB AND KNUCKLE" .


SFA543A

Drive Shaft

EDS000QC

Check for grease leakage or other damage.

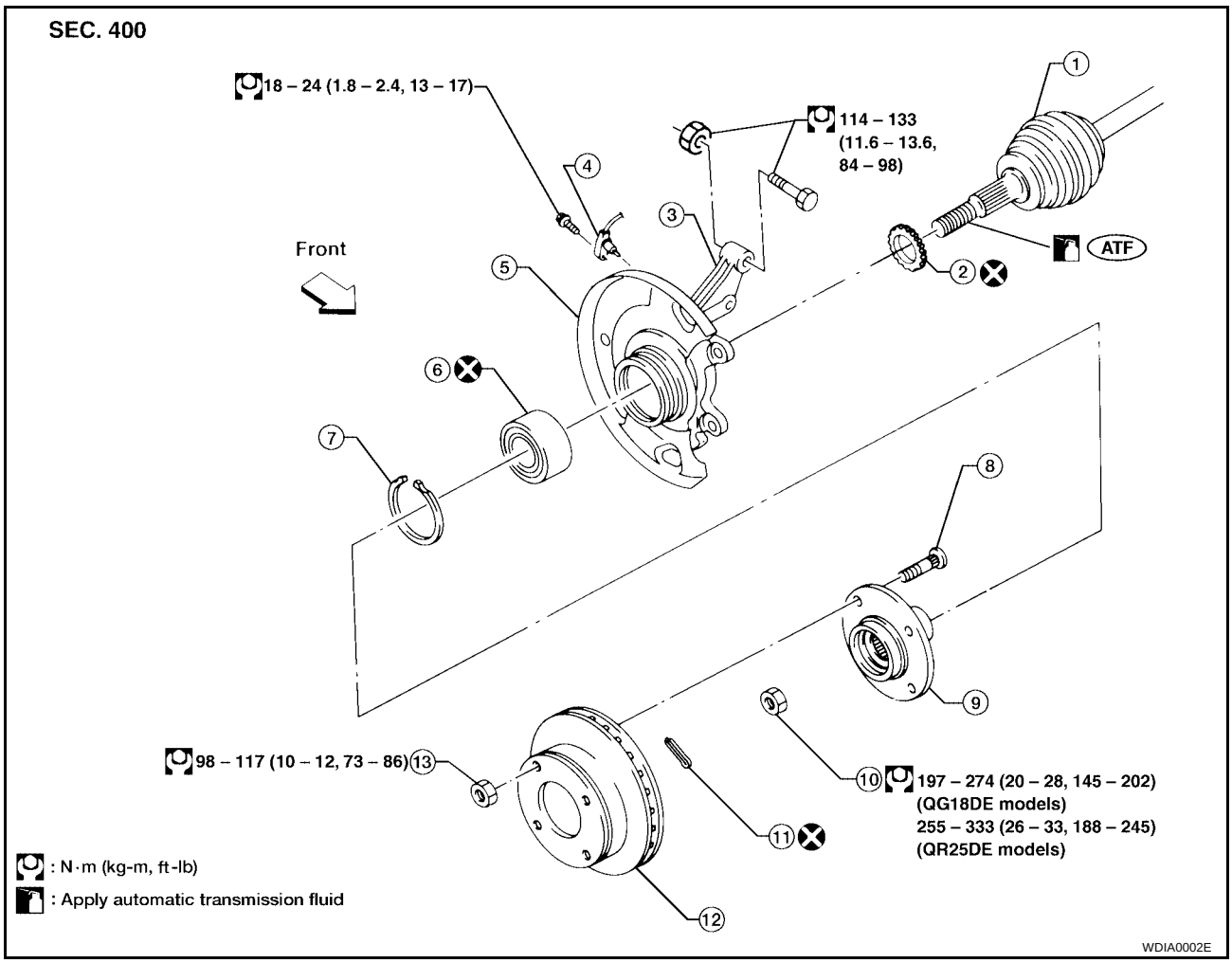

SFA108A

WHEEL HUB AND KNUCKLE

PFP:40202

Components

EDS000QD



1. Drive shaft
2. Sensor rotor (if equipped)
3. Knuckle
4. Wheel sensor (if equipped)
5. Baffle plate
6. Wheel bearing assembly
7. Snap ring
8. Wheel bolt
9. Wheel hub
10. Wheel bearing lock nut
11. Cotter pin
12. Disc rotor
13. Wheel nut

Removal

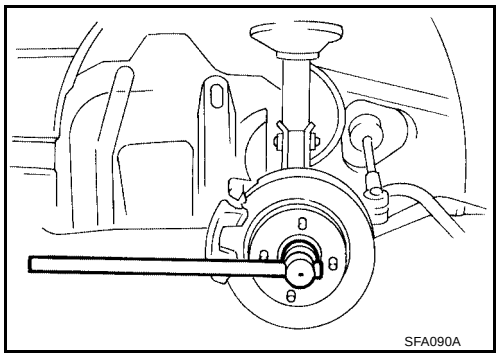
EDS000QE

CAUTION:

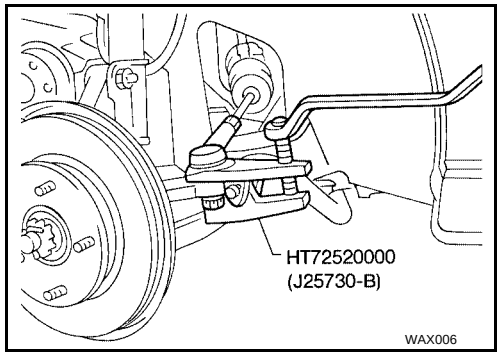
Before removing the front axle assembly, disconnect the wheel sensor from the assembly. Then move it away from the front axle assembly area.

Failure to do so may result in damage to the sensor wires and the wheel sensor becoming inoperative.

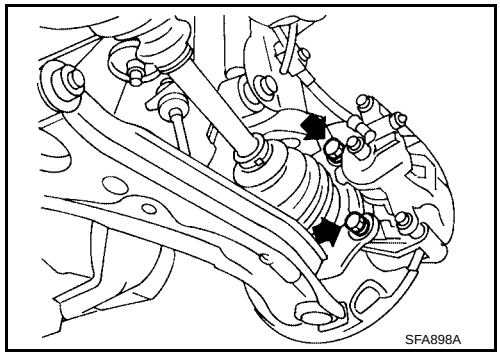
1. Remove cotter pin and wheel bearing lock nut.



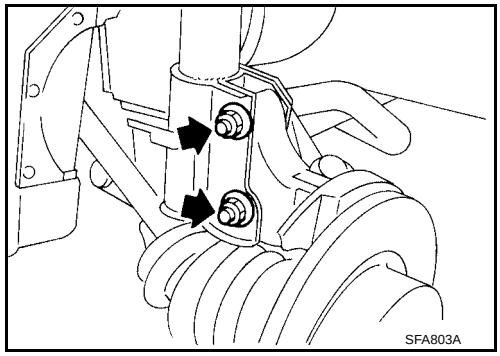
2. Separate tie-rod from knuckle with Tool.
   - **Install stud nut on stud bolt to prevent damage to stud bolt.**



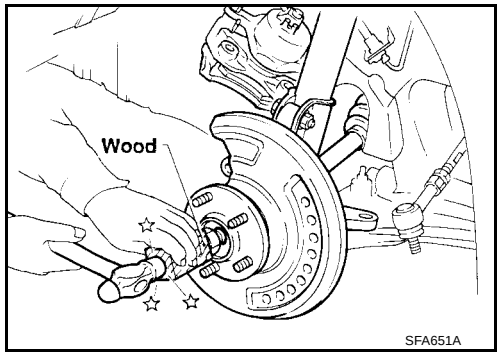
3. Remove brake caliper assembly, torque member and rotor.
   - **Brake hose need not be disconnected from brake caliper. In this case, suspend caliper assembly with wire so as not to stretch brake hose. Be careful not to depress brake pedal, or piston will pop out.**
     Make sure brake hose is not twisted.



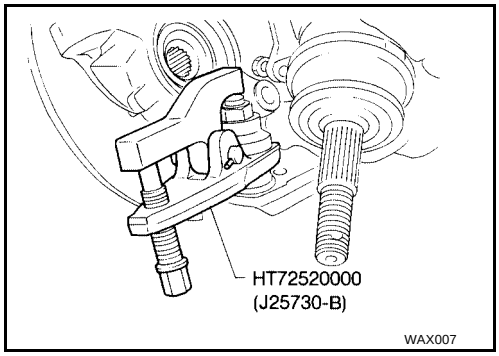
4. Remove strut lower mounting nuts and bolts.



5. Separate drive shaft from knuckle by lightly tapping it. If it is hard to remove, use a puller.
   - **Cover boots with shop towel so as not to damage them when removing drive shaft.**



6. Loosen lower ball joint nut.
7. Remove knuckle from lower ball joint stud with Tool.



Installation

EDS000QF

1. Install in reverse order of removal.
   - Install knuckle with wheel hub.
     When installing knuckle to strut, be sure to hold bolts and tighten nuts.

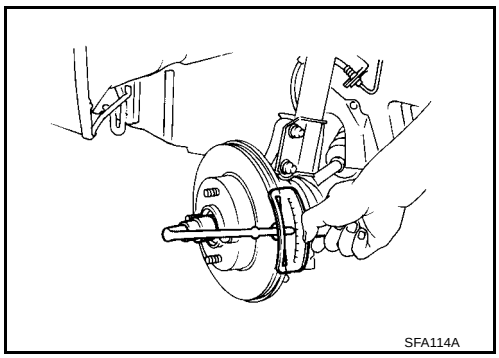
     : 114 - 133 N·m (11.6 - 13.6 kg-m, 84 - 98 ft-lb)

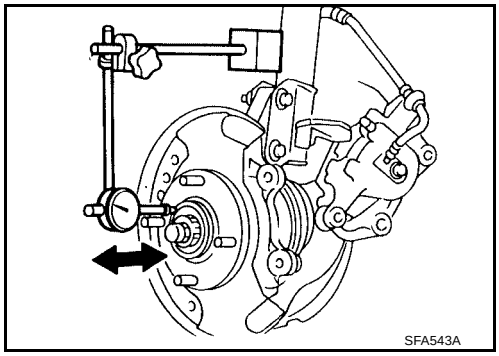
     Before tightening, apply oil to threaded portion of drive shaft.
   - Tighten wheel bearing lock nut.

     : 197 - 274 N·m (20 - 28 kg-m, 145 - 202 ft-lb) (QG18DE models)

     : 255 - 333 N·m (26 - 33 kg-m, 188 - 245 ft-lb) (QR25DE models)
   - Rotate wheel hub to check that wheel bearings operate smoothly.
   - Rotate wheel hub to check wheel bearing axial end play.

     Axial end play : 0.05 mm (0.0020 in) or less





Disassembly

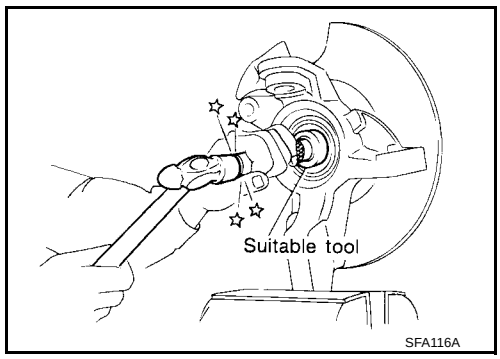
EDS000QG

CAUTION:
When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race and inner race) with a new one.
Wheel bearing does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly.

- **Growling noise is emitted from wheel bearing during operation.**
- **Wheel bearing drags or turns roughly. This occurs when turning hub by hand after bearing lock nut is tightened to specified torque.**

WHEEL HUB

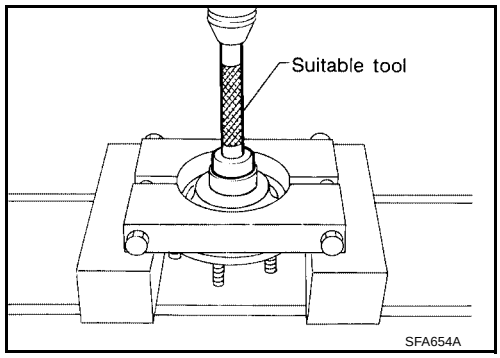
Drive out hub and inner race from knuckle with a suitable tool.



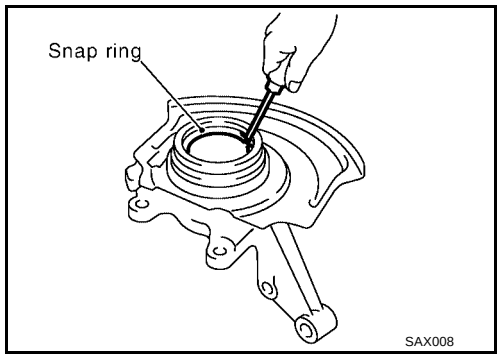
WHEEL BEARING

When replacing wheel bearing, replace complete wheel bearing assembly (inner race and outer race).

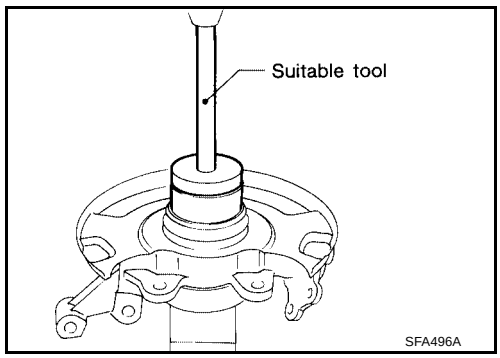
1. Remove bearing inner race.



2. Remove snap rings.



3. Press out bearing outer race.
4. Remove baffle plate, if required.



Inspection

EDS000QH

WHEEL HUB AND KNUCKLE

Check wheel hub and knuckle for cracks by using a magnetic exploration or dyeing test.

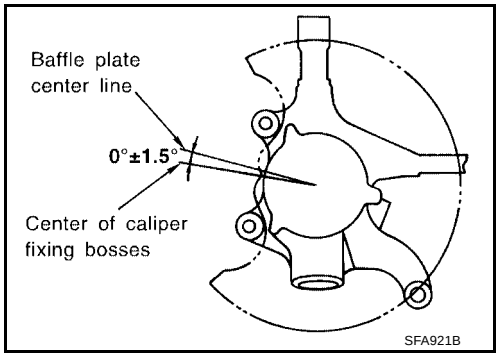
SNAP RING

Check snap ring for wear or cracks. Replace if necessary.

Assembly

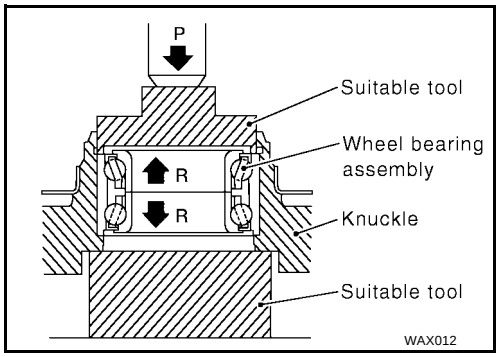
EDS000QI

- If baffle plate has been removed, replace it with a new one.
- When installing the baffle plate, press new plate so that it is in contact with knuckle wall. Refer to figure at right.



1. Press new wheel bearing assembly into knuckle until it seats against knuckle shoulder.

   Maximum load P : 29.4 kN
   (3.0 ton, 3.3 US ton, 2.95 Imp ton)



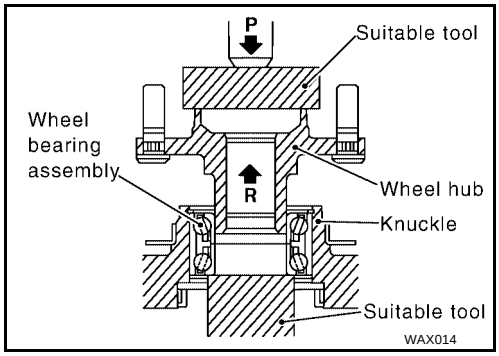
CAUTION:

- **Do not apply disassembly force in direction “R”. There is a possibility of breaking the seal. In case of separation (except range of initial clearance) and disassembling of inner race, the wheel bearing must be replaced with a new part.**
- **Do not press inner race of wheel bearing assembly or seal.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.**

2. Install outer snap ring into groove of knuckle.
3. Press wheel hub into knuckle until it stops when the end of the wheel bearing is hit.

   Maximum load P : 49.0 kN
   (5.0 ton, 5.5 US ton, 4.9 Imp ton)

   - Do not move wheel hub in direction “R”.

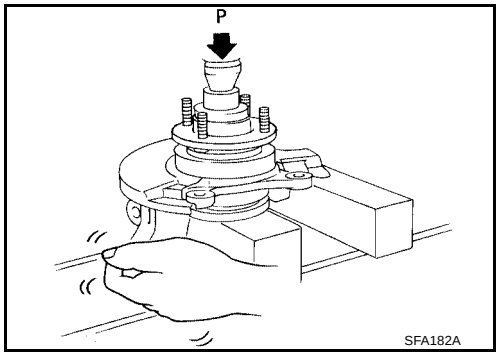


4. Check bearing operation.

a. Add load P with press.

   Load P : 34.3 - 49.0 kN
   (3.5 - 5.0 ton, 3.9 - 5.5 US ton,
   3.44 - 4.92 Imp ton)

b. Spin knuckle several turns in both directions.
c. Make sure that wheel bearings operate smoothly.



DRIVE SHAFT

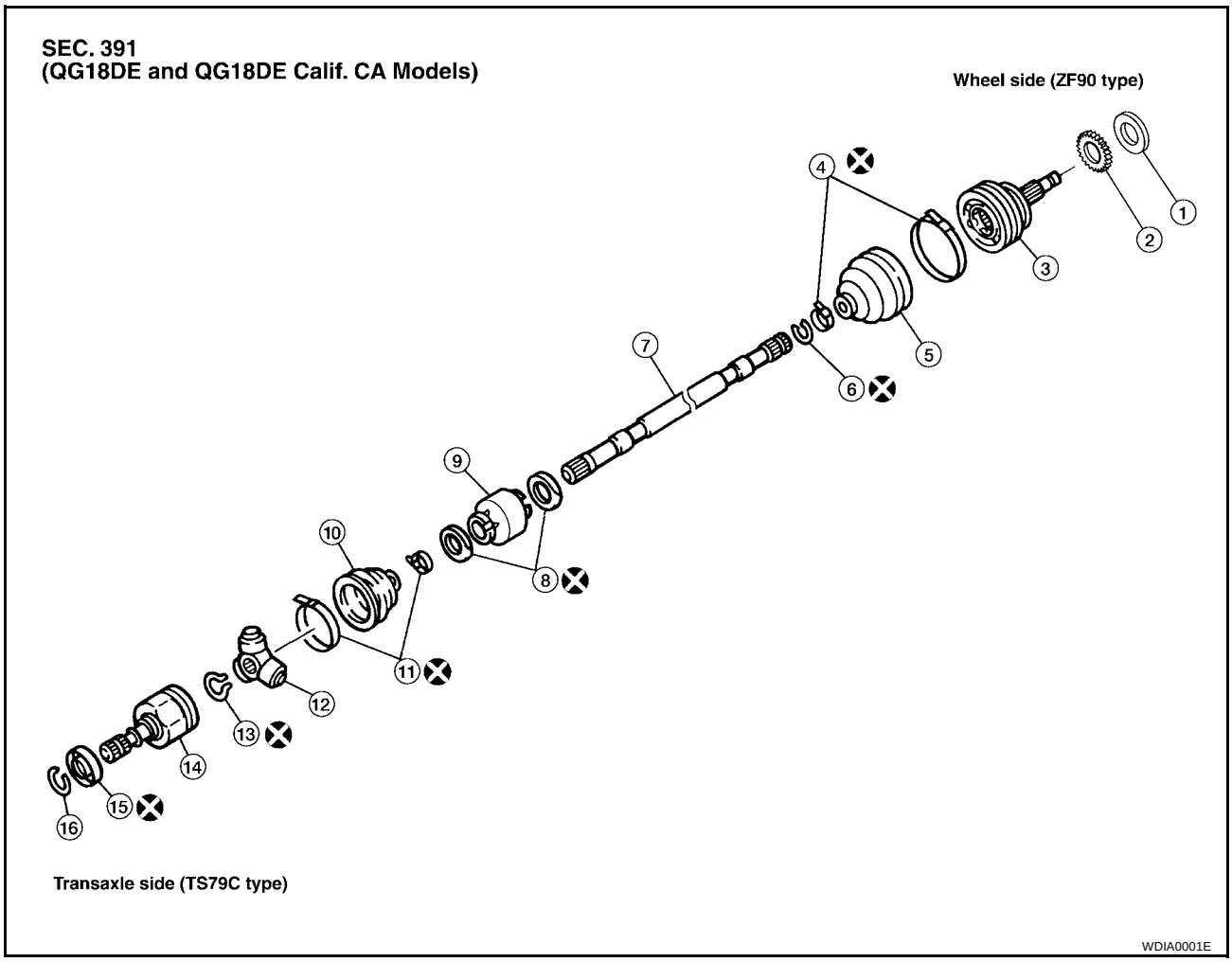
PFP:39100

Components

EDS000QJ

CAUTION:

- **Circular clips should be properly meshed with differential side gear (transaxle side) and with joint assembly (wheel side). Make sure they will not come out.**
- **Be careful not to damage boots. Use suitable protector or cloth during removal and installation.**

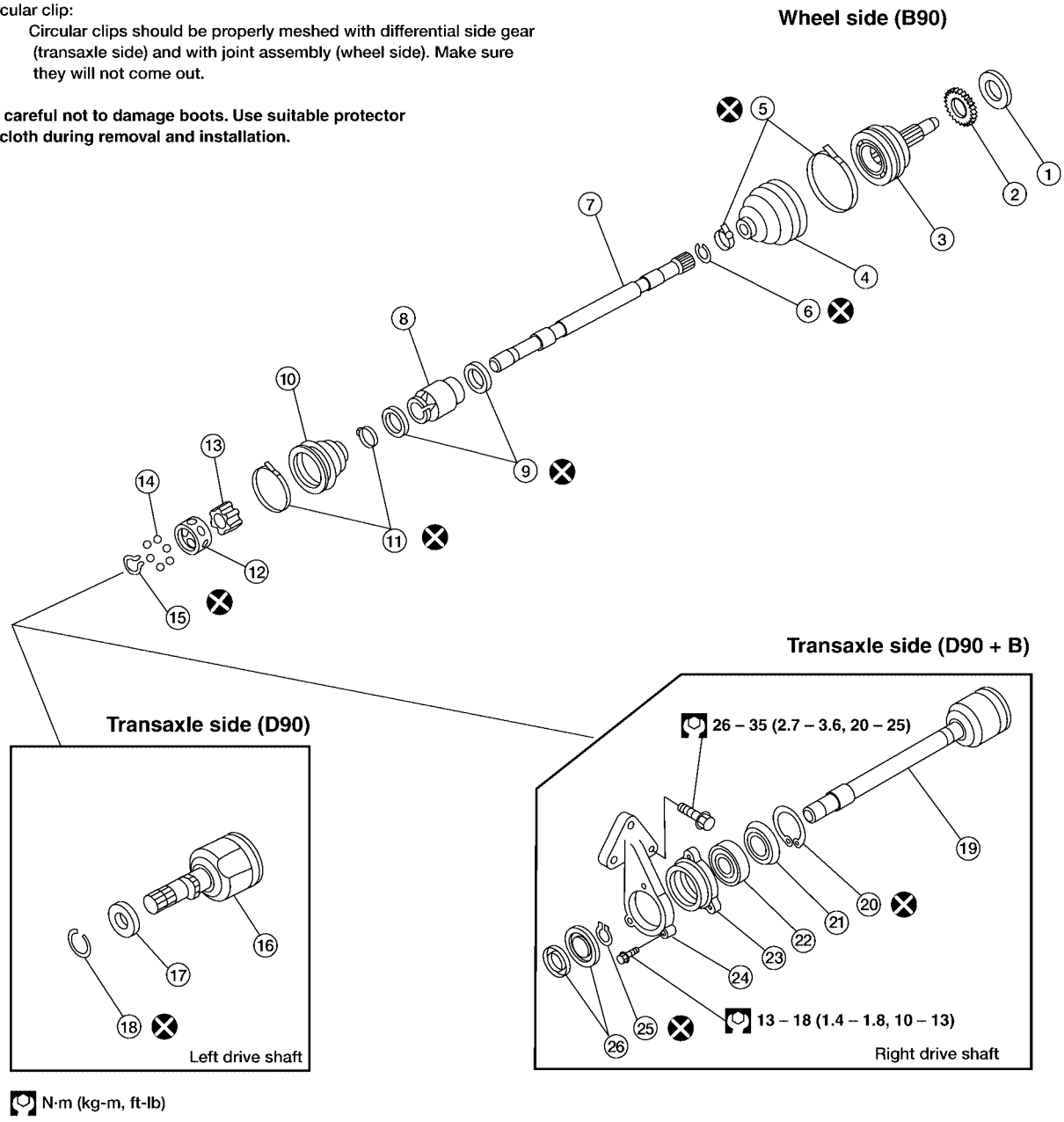


1. Dust shield	2. Sensor rotor, if equipped	3. Joint assembly
4. Boot band	5. Boot	6. Circular clip
7. Drive shaft	8. Dynamic damper band	9. Dynamic damper
10. Boot	11. Boot band	12. Spider assembly
13. Snap ring	14. Slide joint housing	15. Dust shield
16. Circular clip		

SEC. 391
(QR25DE Models)

Circular clip:
Circular clips should be properly meshed with differential side gear (transaxle side) and with joint assembly (wheel side). Make sure they will not come out.

Be careful not to damage boots. Use suitable protector or cloth during removal and installation.

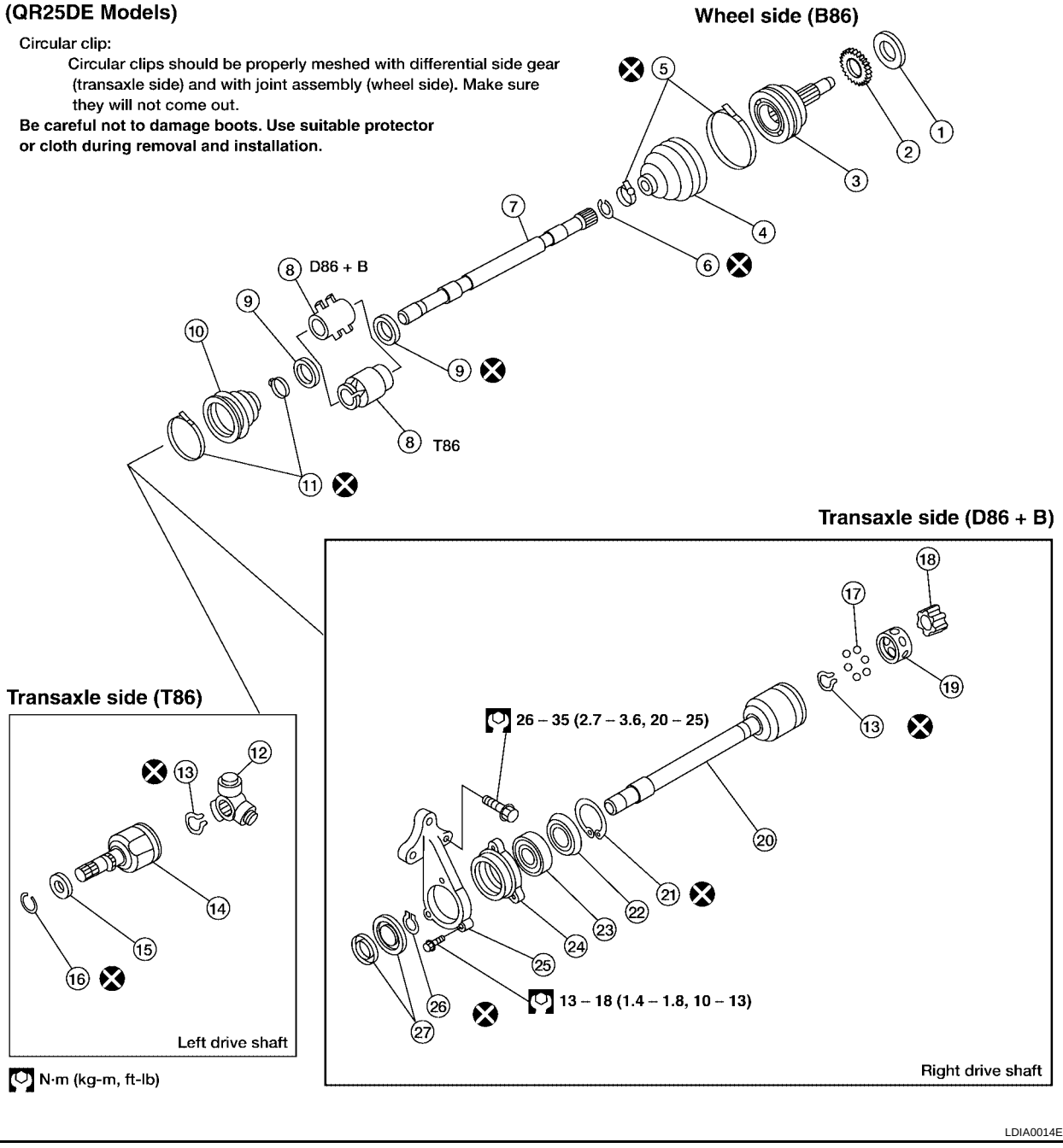


1.	Dust shield	2.	Sensor rotor, if equipped	3.	Joint assembly
4.	Boot	5.	Boot band	6.	Circular clip
7.	Drive shaft	8.	Dynamic damper	9.	Dynamic damper band
10.	Boot	11.	Boot band	12.	Cage
13.	Inner race	14.	Ball	15.	Snap ring
16.	Slide joint assembly	17.	Dust shield	18.	Circular clip
19.	Slide joint housing with extension shaft	20.	Snap ring	21.	Dust shield
22.	Support bearing	23.	Support bearing retainer	24.	Bracket
25.	Snap ring	26.	Dust shield		

SEC. 391
(QR25DE Models)

Circular clip:
Circular clips should be properly meshed with differential side gear (transaxle side) and with joint assembly (wheel side). Make sure they will not come out.

Be careful not to damage boots. Use suitable protector or cloth during removal and installation.

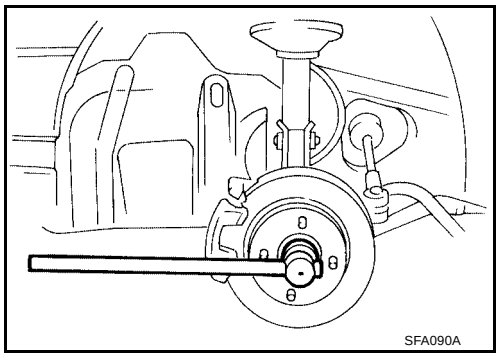


1.	Dust shield	2.	Sensor rotor, if equipped	3.	Joint assembly
4.	Boot	5.	Boot band	6.	Circular clip
7.	Drive shaft	8.	Dynamic damper	9.	Dynamic damper band
10.	Boot	11.	Boot band	12.	Spider assembly
13.	Snap ring	14.	Slide joint assembly	15.	Dust shield
16.	Circular clip	17.	Ball	18.	Inner race
19.	Cage	20.	Slide joint housing with extension shaft	21.	Snap ring
22.	Dust shield	23.	Support bearing	24.	Support bearing retainer
25.	Bracket	26.	Snap ring	27.	Dust shield

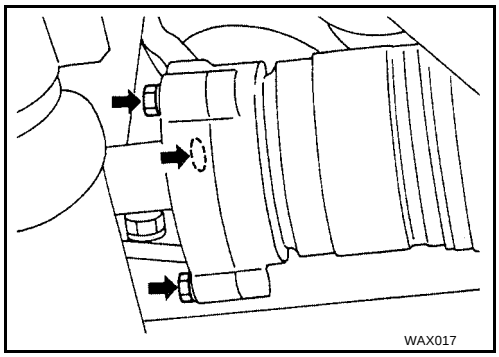
Removal

EDS000QK

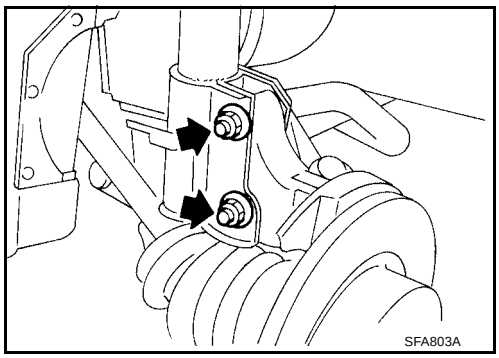
1. Remove cotter pin and wheel bearing lock nut.



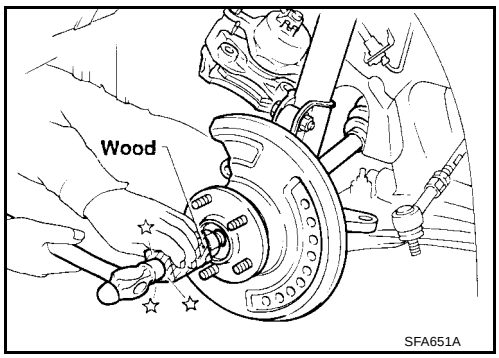
2. Remove drive shaft center support bearing bolts.



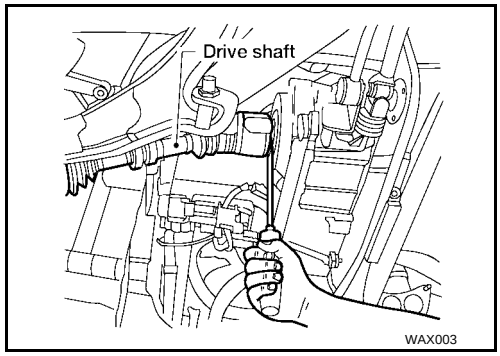
3. Remove strut lower mounting nuts and bolts.
4. Remove brake hose clip.



5. Separate drive shaft from knuckle by lightly tapping it. If it is hard to remove, use a puller.
   - **Cover boots with shop towel so as not to damage them when removing drive shaft.**



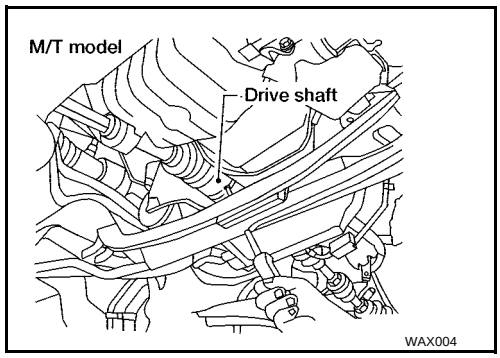
6. Remove left drive shaft from transaxle.



7. Remove right drive shaft from transaxle.

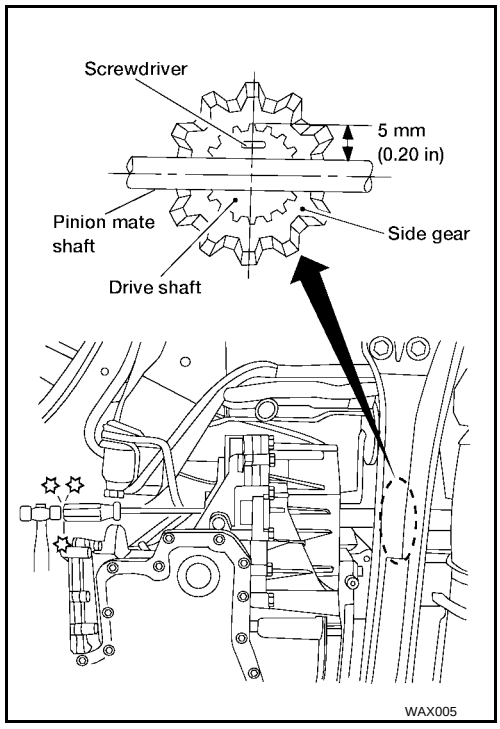
— For M/T models —

- Pry off drive shaft from transaxle as shown at right.



— For A/T models —

- Insert screwdriver into transaxle opening for right drive shaft and strike with a hammer.
- **Be careful not to damage pinion mate shaft and side gear.**

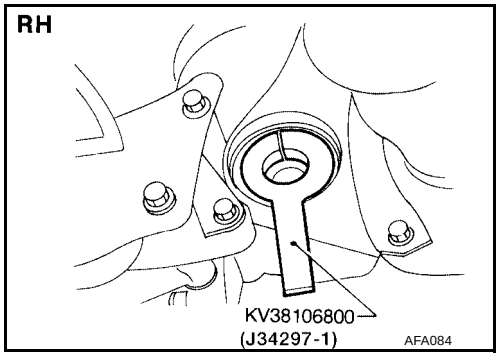


Installation

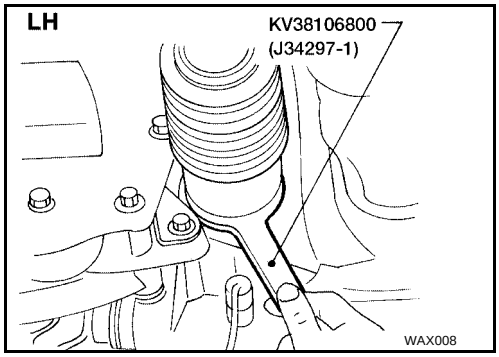
EDS000QL

TRANSAXLE SIDE

1. Drive a new oil seal to transaxle. Refer to MT-12, "SIDE OIL SEAL" , MT-77, "SIDE OIL SEAL" , MT-138, "SIDE OIL SEAL"AT-264, "Differential Side Oil Seal Replacement" , or AT-647, "Differential Side Oil Seal Replacement" .
2. Set Tool along the inner circumference of oil seal.



3. Insert drive shaft into transaxle. Be sure to properly align the serrations and then withdraw Tool.
4. Push drive shaft, then press-fit circular clip on the drive shaft into circular clip groove of side gear.
5. After its insertion, try to pull the flange out of the slide joint by hand. If it pulls out, the circular clip is not properly meshed with the side gear.



WHEEL SIDE

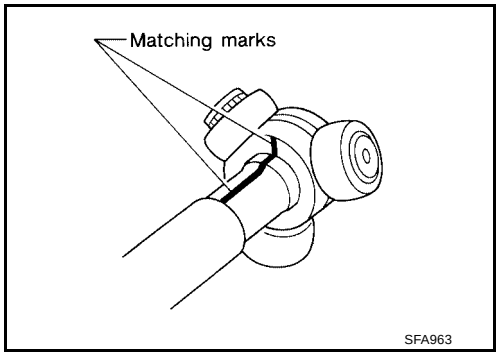
1. Install drive shaft into knuckle.
2. Tighten strut lower mounting nuts and wheel bearing lock nut.

Disassembly

EDS000QM

TRANSAXLE SIDE (TS79C AND T86 TYPE)

1. Remove boot bands.
2. Put matching marks on slide joint housing and drive shaft before separating joint assembly.
3. Put matching marks on spider assembly and drive shaft.



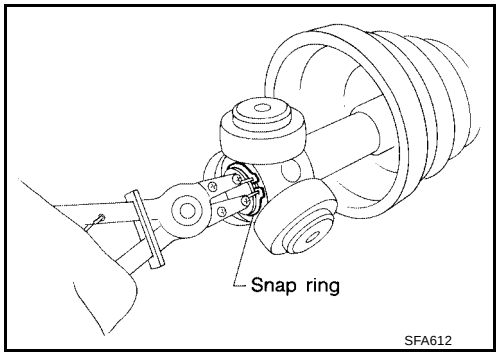
4. Remove snap ring, then remove spider assembly.

CAUTION:

Do not disassemble spider assembly.

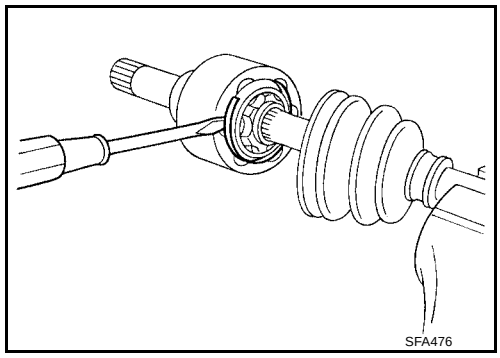
5. Draw out boot.

- **Cover drive shaft serrations with tape so as not to damage the boot.**



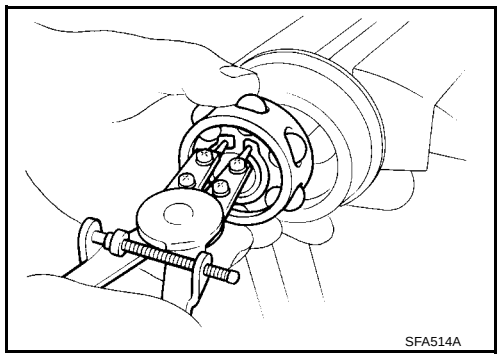
TRANSAXLE SIDE (D90,D90+B AND D86+B TYPE)

1. Remove boot bands.
2. Put matching marks on slide joint housing and drive shaft before separating joint assembly.
3. Pry off snap ring with a screwdriver, and pull out slide joint housing.



4. Put matching marks on inner race and drive shaft.
5. Remove snap ring, then remove ball cage, inner race and balls as a unit.
6. Draw out boot.

- **Cover drive shaft serrations with tape so as not to damage the boot.**



WHEEL SIDE (ZF90, B90 AND B86 TYPE)

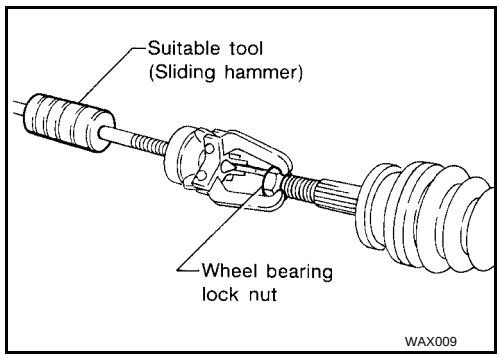
CAUTION:

The joint on the wheel side cannot be disassembled.

1. Before separating joint assembly, put matching marks on drive shaft and joint assembly.
2. Separate joint assembly with a suitable tool.

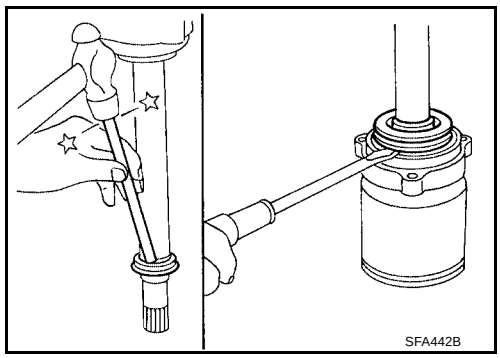
- **Be careful not to damage threads on drive shaft.**

3. Remove boot bands.

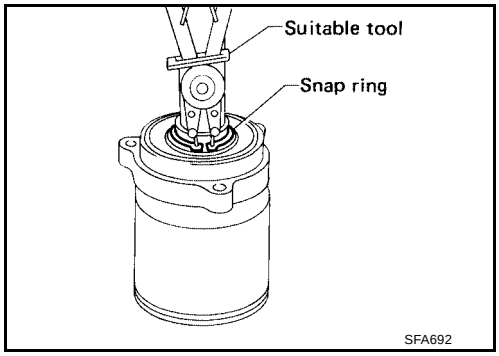


SUPPORT BEARING

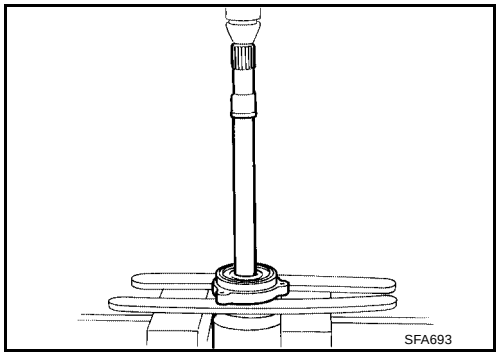
1. Remove dust shield.



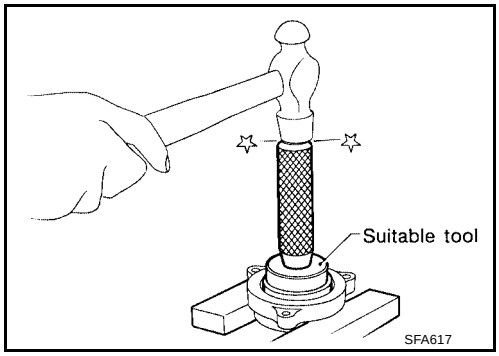
2. Remove snap ring.



3. Press support bearing assembly off drive shaft.



4. Remove snap ring.
5. Remove dust shield.
6. Separate support bearing from retainer.



Inspection

EDS000QN

Thoroughly clean all parts in cleaning solvent, then dry with compressed air. Check parts for evidence of deformation and other damage.

DRIVE SHAFT

Replace drive shaft if it is twisted or cracked.

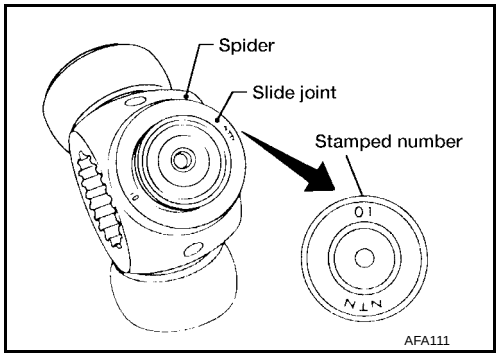
BOOT

Check boot for fatigue, cracks or wear. Replace with new boot and boot bands.

JOINT ASSEMBLY (TRANSAXLE SIDE)

TS79C AND T86 TYPE

- Check spider assembly for needle bearing and washer damage. Replace if necessary.
- Check roller surfaces for scratches, wear and other damage. Replace if necessary.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.
- When replacing only spider assembly, select a new spider assembly from among those listed in table below. Ensure that the number stamped on slide joint is the same as that stamped on new part.



Housing alone cannot be replaced. It must be replaced together with spider assembly.

Stamped number	Part No.*
01	39720-61E01
02	39720-61E02
03	39720-61E03
04	39720-61E04
05	39720-61E05
06	39720-61E06
07	39720-61E07

*: Always check with the Parts Department for the latest parts information.

D90+B TYPE

- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

JOINT ASSEMBLY (WHEEL SIDE)

Replace joint assembly if it is deformed or damaged.

SUPPORT BEARING

Make sure support bearing rolls freely and is free from noise, cracks, pitting and wear.

SUPPORT BEARING BRACKET

Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

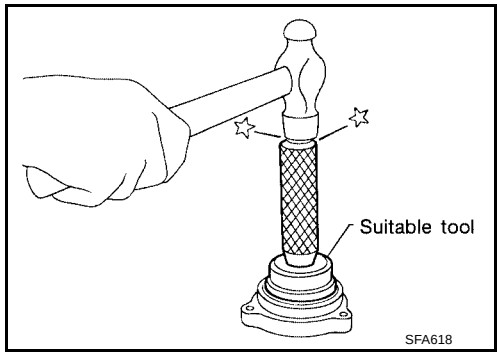
Assembly

EDS000QO

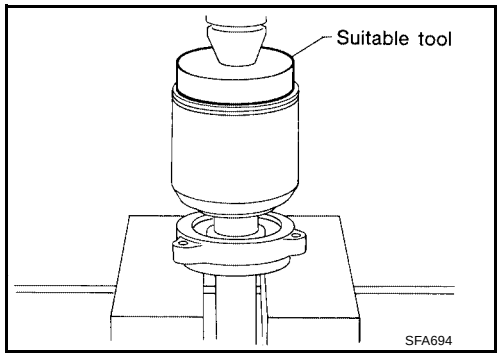
- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use Genuine NISSAN grease or equivalent after every overhaul.**

SUPPORT BEARING

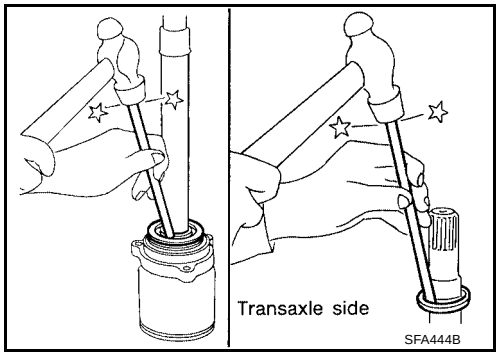
1. Install bearing into retainer.



2. Install dust shield.
3. Install snap ring.
4. Press drive shaft into bearing.



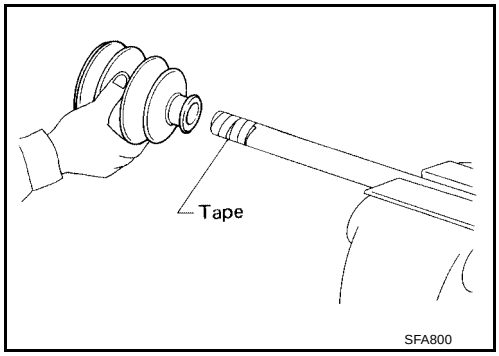
5. Install snap ring.
6. Install new dust shield.



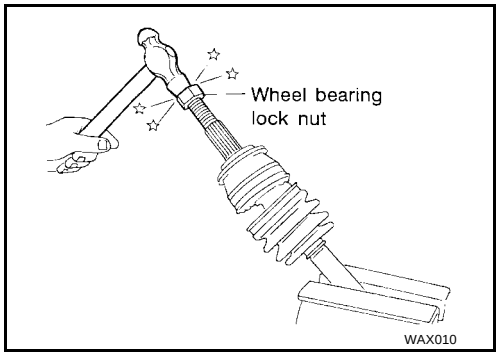
WHEEL SIDE (ZF90, B90 AND B86 TYPE)

1. Install boot and new small boot band on drive shaft.

- **Cover drive shaft serration with tape to prevent damage to boot during installation.**



2. Set joint assembly onto drive shaft by lightly tapping it.
   - **Ensure that marks which were made during disassembly are properly aligned.**

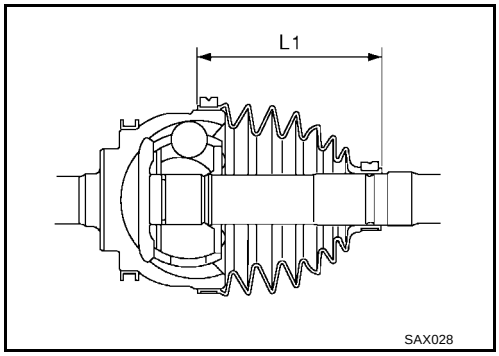


3. Pack drive shaft with specified amount of grease.

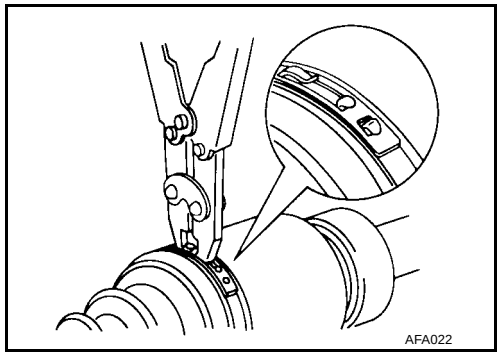
Specified amount of grease	**: QG18DE 115 - 125 g (4.06 - 4.41 oz)**
	: QR25DE A/T 120 - 140 g (4.23 - 4.94 oz)
	: QR25DE M/T 115 - 135 g (4.06 - 4.76 oz)

4. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_1 ".

Length "L_1 "	
QG18DE	**: 97 mm (3.82 in)**
QR25DE A/T	**: 115.7 mm (4.56 in)**
QR25DE M/T	**: 124.2 mm (4.89 in)**

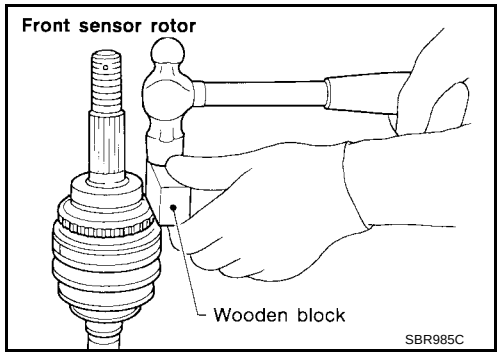


5. Lock new large and small boot bands securely with a suitable tool.



6. Install the sensor rotor, if equipped. For front sensor rotor, use a hammer and wooden block. For rear sensor rotor, use a suitable drift and press.

- Always replace sensor rotor with a new one.

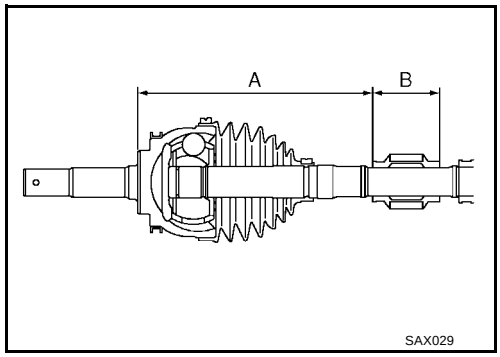


DYNAMIC DAMPER

1. Use a new damper band when reinstalling.
2. Install dynamic damper from stationary-joint side while holding it securely:

Unit: mm (in)

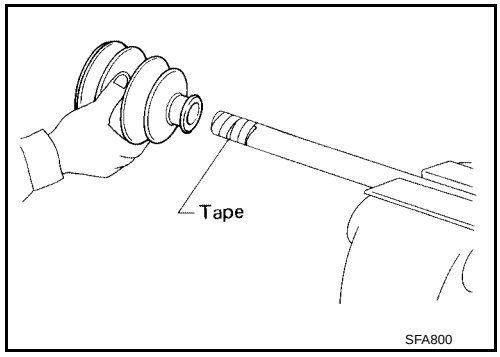
Applied model	QG18DE	
	LH	RH
"A"	175-185 (6.89 - 7.28)	420-430 (16.54 - 16.93)
"B"	70 (2.76)	64 (2.52)
	QR25DE	
"A"	173 - 179 (6.81 - 7.05)	200 - 206 (7.87 - 8.11)
"B"	50 (1.97)	68 (2.68)



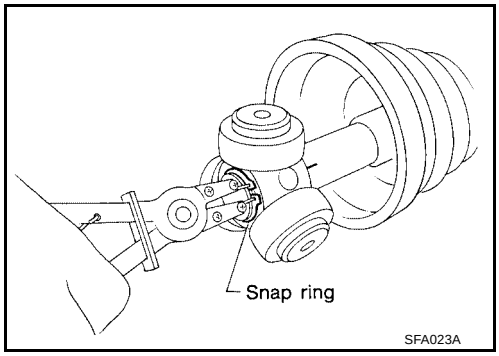
TRANSAXLE SIDE (TS79C AND T86)

1. Install boot and new small boot band on drive shaft.

- **Cover drive shaft serration with tape to prevent damage to boot during installation.**



2. Install spider assembly securely, making sure the matching marks which were made during disassembly are properly aligned.
3. Install new snap ring.



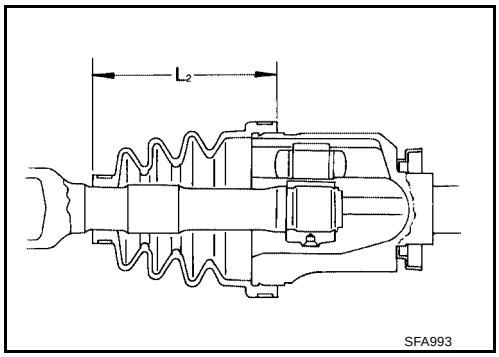
4. Pack drive shaft with specified amount of grease.

Specified amount of grease	**: QG18DE 155 - 165 g (5.47 - 5.82 oz)**
	: QR25DE A/T 145 - 165 g (5.11 - 5.82 oz)
	: QR25DE M/T D86+B 135 - 155 g (4.76 - 5.47 oz)
	: QR25DE M/T T86 140 - 160 g (4.94 - 5.64 oz)

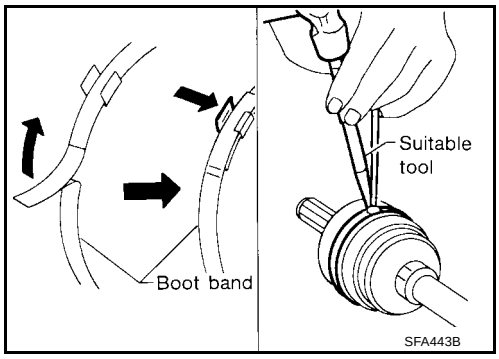
5. Install slide joint housing.
6. Set boot so that it does not swell and deform when its length is "L_2 ".

Length "L_2 "	
QG18DE	**: 102.5 mm (4.035 in)**
QR25DE A/T	**: 98 mm (3.86 in)**
QR25DE M/T D86+B	**: 98 mm (3.86 in)**
QR25DE M/T T86	**: 98.5 mm (3.88 in)**

- **Make sure the boot is properly installed on the drive shaft groove.**



7. Lock new large and small boot bands securely with a suitable tool.



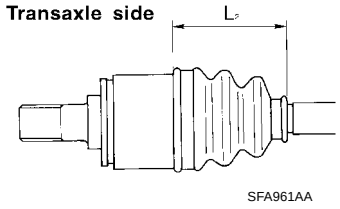
SERVICE DATA AND SPECIFICATIONS (SDS)

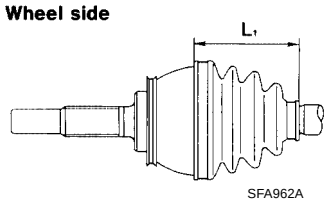
PFP:00030

Drive Shaft

EDS000QP

Applied model			QG18DE	QR25DE
Joint type	Transaxle side		TS79C	D90+B, D90, D86+B and T86
	Wheel side		ZF90	B90 and B86
Grease	Quality		Genuine NISSAN grease or equivalent	
	Capacity g (oz)	Transaxle side	TS79C 155 - 165 (5.47 - 5.82)	D90+B and D90 145 - 165 (5.11- -5.82)
				D86+B 135 - 155 (4.76 - 5.47)
				T86 140 - 160 (4.94 - 5.64)
		Wheel side	ZF90 115 - 125 (4.06 - 4.41)	B90 120 - 140 (4.23 - 4.94)
				B86 115- -135 (4.06 - 4.76)
Boot length mm (in)	Transaxle side "L_2"		TS79C 102.5 (4.035)	D90+B and D90 98 (3.86)
				D86+B 98 (3.86)
				T86 98.5 (3.88)
	Wheel side "L_1"		ZF90 97 (3.82)	B90 115.7 (4.56)
				B86 124.2 (4.89)





Wheel Bearing (Front)

EDS000QQ

Wheel bearing axial end play limit mm (in)	0.05 (0.0020 in) or less
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	197 - 274 (20 - 28, 145 - 202)
Knuckle to strut tightening torque N·m (kg-m, ft-lb)	114 - 133 (11.6 - 13.6, 84 - 98)

SECTION FL
FUEL SYSTEM

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FUEL SYSTEM 2
Checking Fuel Lines 2
General Precautions 2
FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY 3
Removal and Installation 3
REMOVAL 3
INSTALLATION 6
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REMOVAL 7
INSTALLATION 9
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Standard and Limit 10

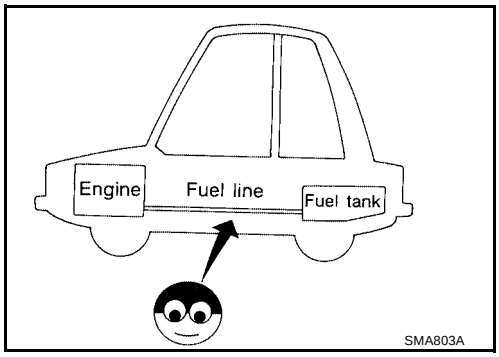
FUEL SYSTEM

PFP:17503

Checking Fuel Lines

EBS00DTF

Inspect the fuel lines, filler cap, and fuel tank for incorrect attachment, leaks, cracks, damage, loose connections, chafing, and deterioration.
If necessary, repair or replace the faulty parts.



General Precautions

EBS00DTG

WARNING:

When replacing the fuel line parts, observe the following:

- **Place a “CAUTION: FLAMMABLE” sign in the workshop.**
- **Do not smoke while servicing the fuel system. Keep open flames and sparks away from the work area.**
- **Have a CO_2 fire extinguisher in the workshop.**

CAUTION:

- **Before removing the fuel line parts, use the following procedures:**
  - **Put drained fuel in an explosion-proof container and put the lid on securely.**
  - **Release the fuel pressure from the fuel system. Refer to EC-56, "FUEL PRESSURE RELEASE" [QG18DE (ULEV)], EC-637, "FUEL PRESSURE RELEASE" [QG18DE (SULEV)], EC-1257, "FUEL PRESSURE RELEASE" (QR25DE).**
  - **Disconnect the battery ground cable.**
- **Always replace the O-ring seals with new ones.**
- **Do not kink or twist any of the hoses and tubes when installing.**
- **Do not over tighten the hose clamps to avoid damaging hoses.**
- **After installation, run the engine and check for fuel leaks at the connections.**
- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **For inspection and installation of EVAP system parts, refer to EC-33, "System Diagram" [QG18DE (ULEV)], EC-614, "System Diagram" [QG18DE (SULEV)], EC-1236, "System Diagram" (QR25DE).**
- **For inspection and installation of ORVR system parts, refer to EC-33, "System Diagram" [QG18DE (ULEV)], EC-614, "System Diagram" [QG18DE (SULEV)], EC-1236, "System Diagram" (QR25DE).**

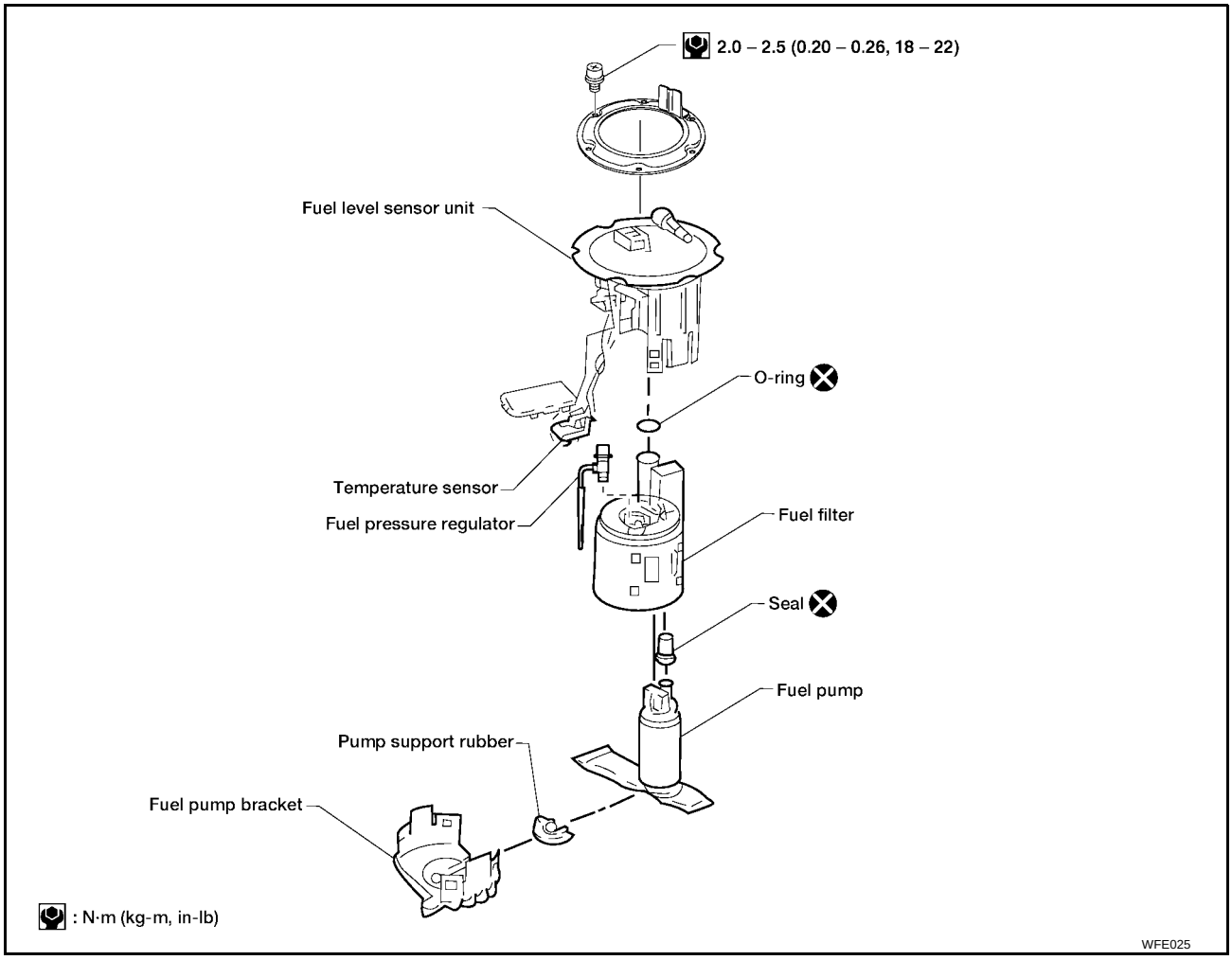
FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY

PFP:17042

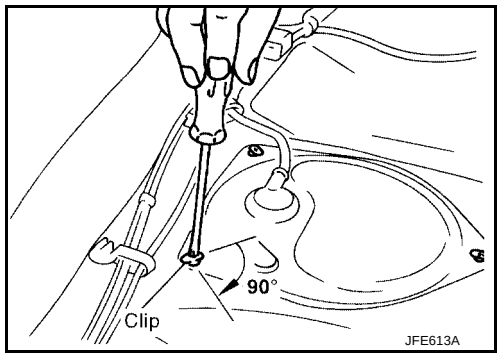
Removal and Installation

EBS00DTH

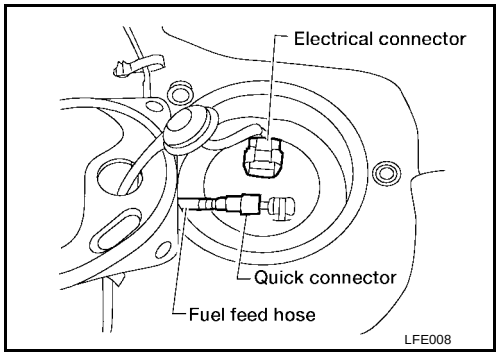
REMOVAL



1. Release the fuel pressure from the fuel line.
   Refer to EC-56, "FUEL PRESSURE RELEASE" **[QG18DE (ULEV)]** EC-637, "FUEL PRESSURE RELEASE" **[QG18DE (SULEV)],** EC-1257, "FUEL PRESSURE RELEASE" **(QR25DE).**
2. Disconnect the battery ground cable.
3. Open the fuel filler lid and filler cap.
4. Remove the rear seat cushion. Refer to SE-5, "Removal and Installation" .
5. Remove the inspection hole cover located under the rear seat cushion.



6. Disconnect the fuel pump assembly electrical connector.



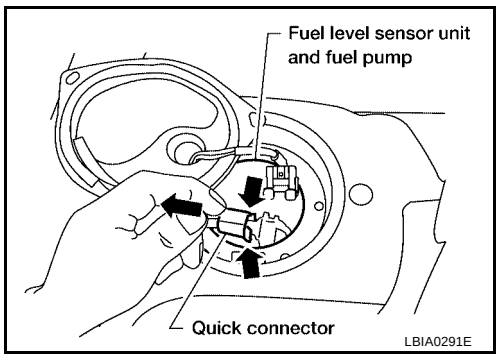
7. Disconnect the fuel feed hose quick connector as follows:

a. Align the mating marks on the fuel pump outlet and the quick connector.

b. Hold the quick connector and push in the tabs, then pull out from the fuel pump outlet that is inserted in the quick connector.

CAUTION:

- **The quick connector can be removed when the tabs are completely depressed. Do not twist the fuel hose more than necessary.**
- **Do not use any tools to remove the quick connector.**

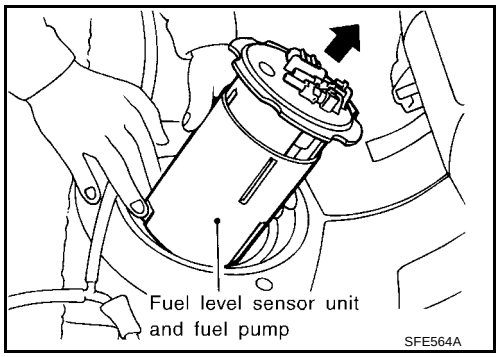


8. Remove the six retainer ring screws.

9. To remove, pull up on the fuel level sensor unit and fuel pump.

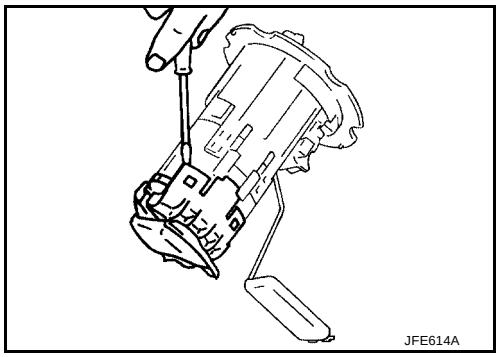
CAUTION:

Do not damage the arm of the fuel level sensor and fuel tank temperature sensor when removing.

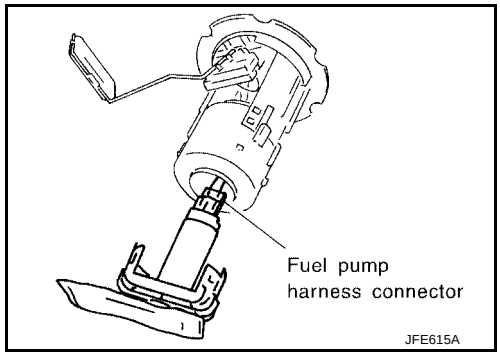


10. Remove the fuel pump as shown in the figure.

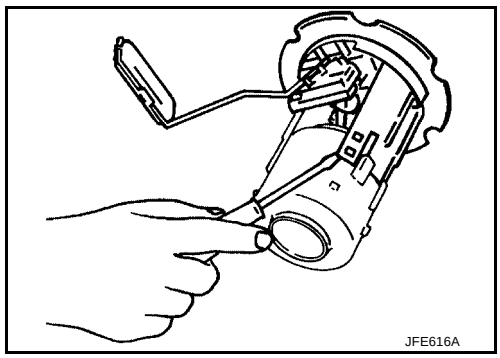
- Apply mating marks on the fuel pump and fuel filter for proper alignment for installation.



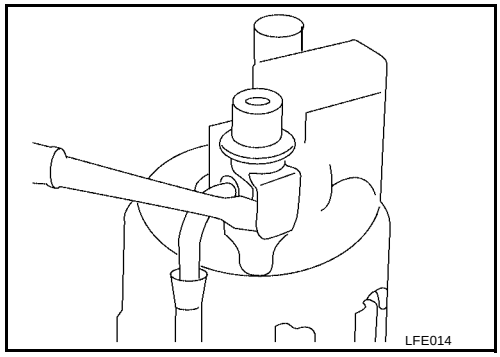
11. Disconnect the fuel pump harness connector.



12. Remove the fuel filter from fuel level sensor unit as shown.
    - Apply mating marks on fuel filter and fuel level sensor unit for proper alignment for installation.



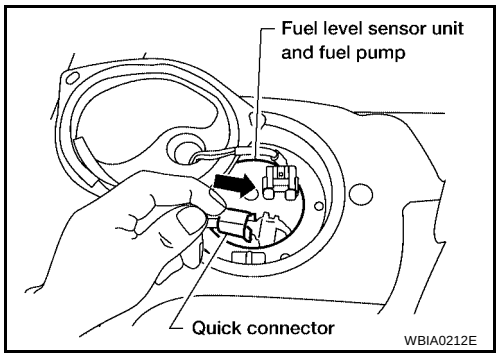
13. Remove the fuel pressure regulator from the fuel filter, if necessary.



INSTALLATION

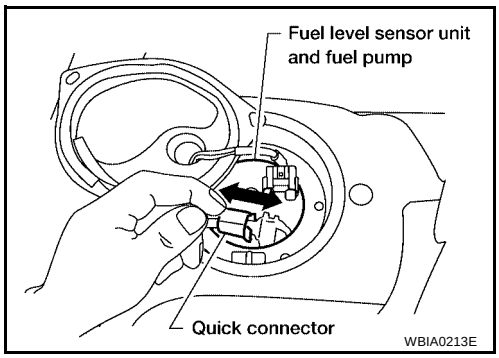
Installation is in reverse order of removal.
Connect the quick connector as follows:

1. Align the mating marks on the fuel pump outlet and quick connector for installation.
2. Align the push tabs with the quick connector slots.
3. Insert the fuel pump outlet into the center of the quick connector until you hear a click.



After connecting the quick connector, make sure the connection is fully seated as follows:

1. Pull on the quick connector to make sure it is firmly connected.
2. Apply fuel pressure to the fuel lines by turning the ignition switch ON (without starting the engine). Then check for fuel leaks at the connections
3. Start the engine and increase the engine speed, verify there are no fuel leaks.

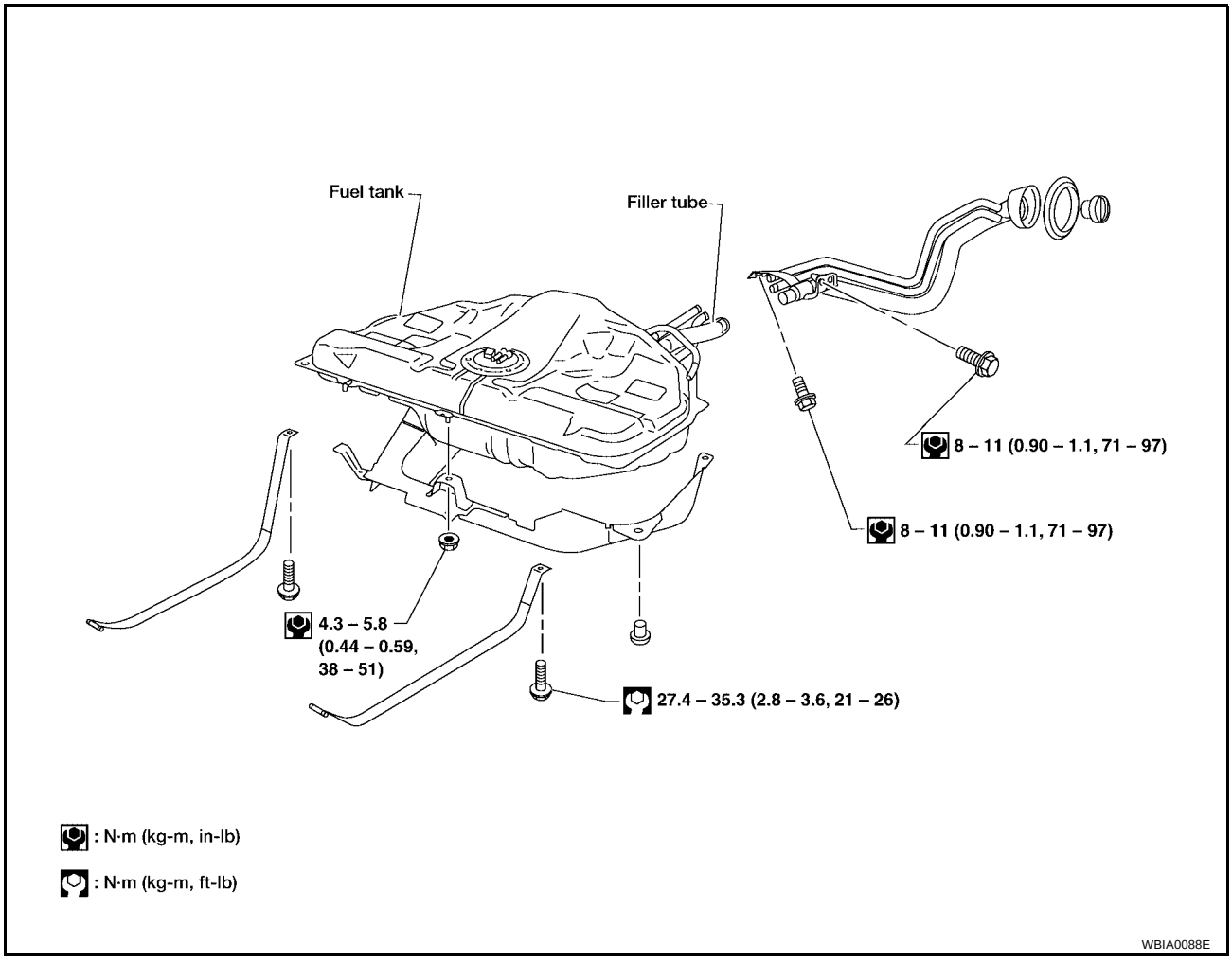


FUEL TANK

PFP:17202

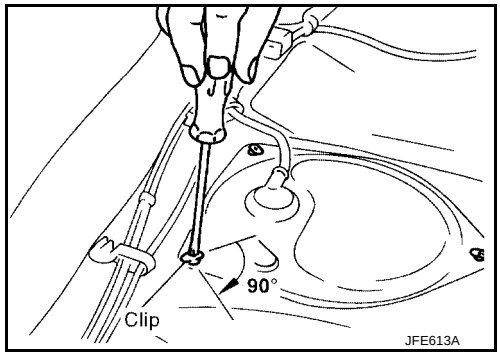
Removal and Installation

EBS00DTI

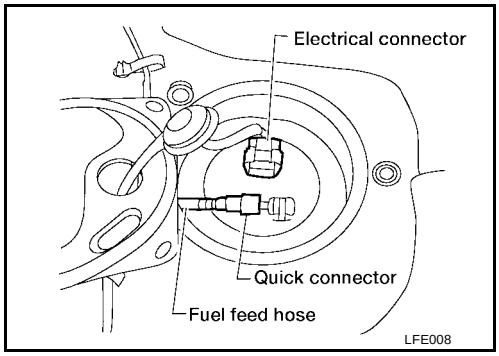


REMOVAL

1. Release the fuel pressure.
   Refer to EC-56, "FUEL PRESSURE RELEASE" [QG18DE (ULEV)], EC-637, "FUEL PRESSURE RELEASE" [QG18DE (SULEV)], EC-1257, "FUEL PRESSURE RELEASE" (QR25DE).
2. Disconnect the battery ground cable.
3. Open the fuel filler lid and filler cap.
4. Drain the fuel from fuel tank.
5. Remove the rear seat cushion. Refer to SE-5, "Removal and Installation" .
6. Remove the inspection hole cover located under rear seat.



7. Disconnect the fuel pump electrical connector.



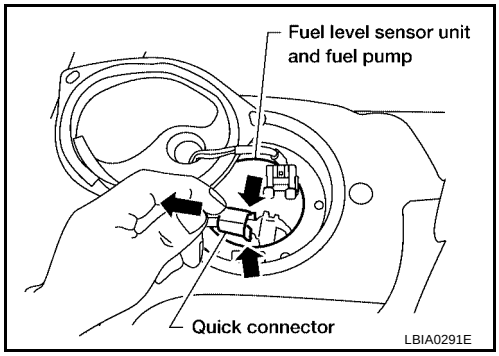
8. Disconnect the fuel feed hose quick connector as follows:

a. Apply mating marks on the fuel pump outlet and the quick connector for installation.

b. Hold the quick connector and push in the tabs, then pull out off of the fuel pump outlet that is inserted into the quick connector.

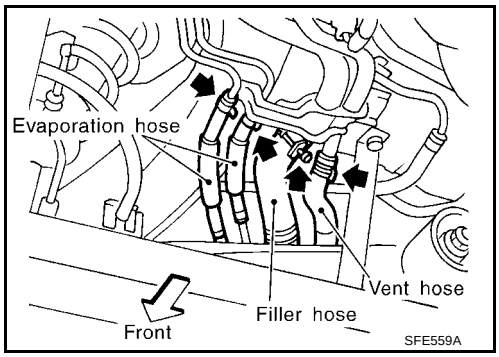
CAUTION:

- **The quick connector can be removed when the tabs are completely depressed. Do not twist the fuel feed hose more than necessary.**
- **Do not use any tools to remove the quick connector.**

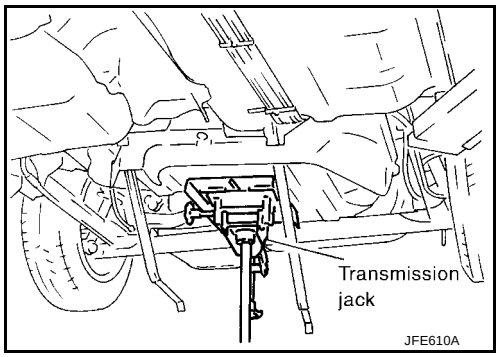


9. Remove the center exhaust tube. Refer to EX-3, "Removal and Installation" .

10. From rear left area of the fuel tank, remove the filler hose, vent hose, and evaporation hoses as shown.

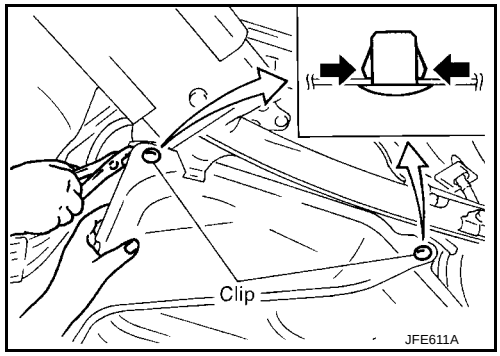


11. Support the fuel tank with a suitable transmission jack as shown.



12. Remove the fuel tank mounting band bolts while supporting the fuel tank.

13. Lower the fuel tank by 70 - 80 mm (2.76 - 3.15 in), then remove the nuts and clips holding the fuel tank protector, and remove the protector.
    - To remove the clips, use pliers to squeeze the extensions as shown by the arrows, and then remove the clip from above.

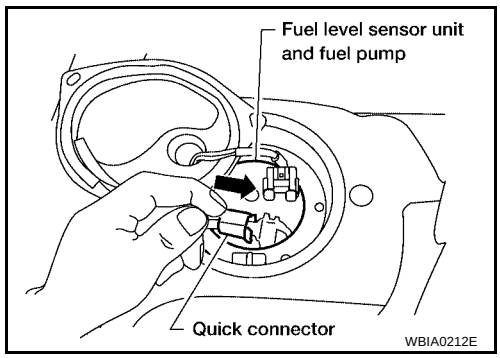


14. Remove the fuel tank.

INSTALLATION

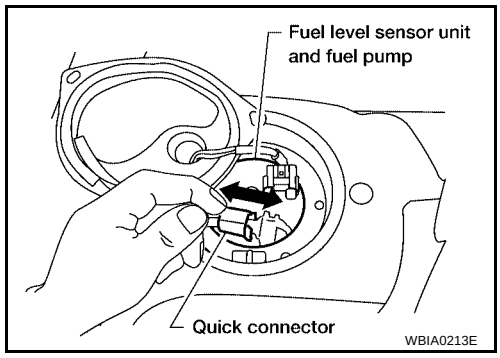
Installation is in the reverse order of removal.
Connect the quick connector as follows:

1. Align mating marks on the fuel pump outlet and the quick connector for correct installation.
2. Align the push tabs with the quick connector slots.
3. Insert the fuel pump outlet into the center of the quick connector until you hear a click.



After connecting the quick connector, check that the quick connector is fully seated as follows:

1. Pull on the quick connector to make sure it is firmly connected.
2. Apply fuel pressure to the fuel lines by turning the ignition switch ON (without starting the engine). Then check for fuel leaks at the hose connections.
3. Start the engine and increase engine speed, verify that there are no fuel leaks.



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Standard and Limit

EBS00DTJ

Fuel tank capacity	50 ℓ (13 1/4 US gal, 11 Imp gal)

SECTION FSU
FRONT SUSPENSION

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Wheelarch Height (Unladen*) 16

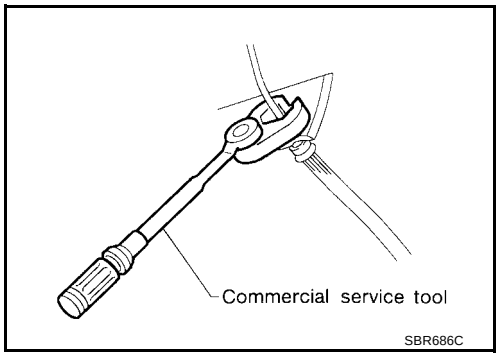
PRECAUTIONS

PFP:00001

Precautions

EES000IB

- **When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.**
  Oil will shorten the life of rubber bushings. Be sure to wipe off any spilled oil.
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **After installing removed suspension parts, check wheel alignment and adjust if necessary.**
- **Use flare nut wrench when removing or installing brake tubes.**
- **Always torque brake lines when installing.**
- **Lock nuts are unreusable parts; always use new ones.**
  When replacing, do not wipe the oil off the new lock nut before tightening.



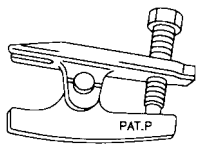
PREPARATION

PFP:00002

Special Service Tools

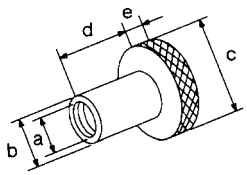
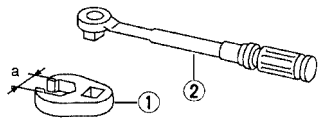
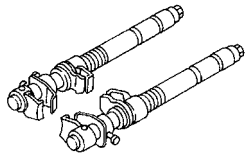
EES000IC

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
HT72520000 (J25730-B) Ball joint remover  NT146	Removing tie-rod outer end and lower ball joint

Commercial Service Tools

EES000ID

Tool name	Description
Attachment wheel alignment  NT148	Measure wheel alignment **a: Screw M24 x 1.5 pitch** **b: 35 mm (1.38 in) dia.** **c: 65 mm (2.56 in) dia.** **d: 56 mm (2.20 in)** **e: 12 mm (0.47 in)**
Equivalent to GG94310000 1 Flare nut crowfoot 2 Torque wrench  S-NT360	Removing and installing brake piping **a: 10 mm (0.39 in)**
Spring compressor  NT717	Removing and installing coil spring

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

EES000IE

Use the following chart to help you find the cause of the symptom. If necessary, repair or replace these parts.

		Reference page	Refer to FSU-5	Refer to FSU-5	Refer to FSU-5	—	Refer to FSU-16	Refer to FSU-5 , FSU-6	Refer to FSU-6	Refer to FSU-11	Refer to FSU-6	Refer to WT-4	—	—	—	—	Refer to WT-6	Refer to FAX-4	Refer to FAX-4	Refer to SUSPENSION in this chart.	Refer to TIRES in this chart.	Refer to ROAD WHEEL in this chart.	Refer to BR-5	Refer to PS-6
		Possible Cause and SUSPECTED PARTS	Improper installation, looseness	Shock absorber deformation, damage or deflection	Bushing or mounting deterioration	Parts interference	Spring fatigue	Suspension looseness	Incorrect wheel alignment	Stabilizer bar fatigue	Out-of-round	Imbalance	Incorrect air pressure	Uneven tire wear	Deformation or damage	Non-uniformity	Incorrect tire size	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES	STEERING
Symptom	SUSPENSION	Noise	×	×	×	×	×	×										×	×		×	×	×	×
		Shake	×	×	×	×		×										×	×		×	×	×	×
		Vibration	×	×	×	×	×											×	×		×			×
		Shimmy	×	×	×	×			×										×		×	×	×	×
		Judder	×	×	×														×		×	×	×	×
		Poor quality ride or handling	×	×	×	×	×		×	×									×		×	×		
	TIRES	Noise	×								×	×	×	×	×	×		×	×	×		×	×	×
		Shake	×								×	×	×	×	×		×	×	×	×		×	×	×
		Vibration											×				×	×	×	×				×
		Shimmy	×								×	×	×	×	×	×	×		×	×		×	×	×
		Judder	×								×	×	×	×	×		×		×	×		×	×	×
		Poor quality ride or handling	×								×	×	×	×	×		×		×	×		×		
	ROAD WHEEL	Noise	×								×	×			×			×	×	×	×		×	×
		Shake	×								×	×			×			×	×	×	×		×	×
		Shimmy, Judder	×								×	×			×				×	×	×		×	×
		Poor quality ride or handling	×								×	×			×				×	×	×			

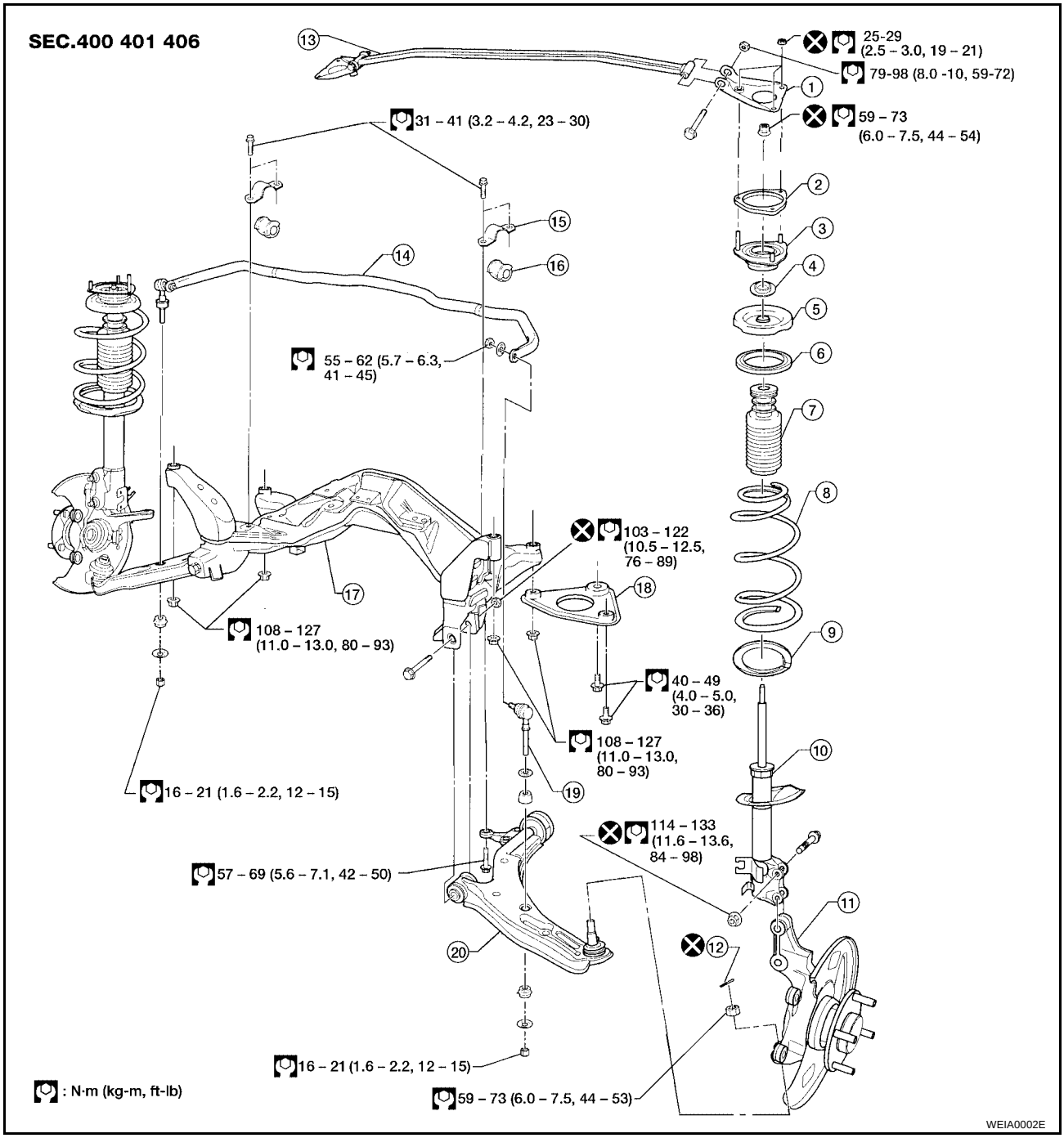
×: Applicable

FRONT SUSPENSION ASSEMBLY

PFP:54010

Components

EES000IF



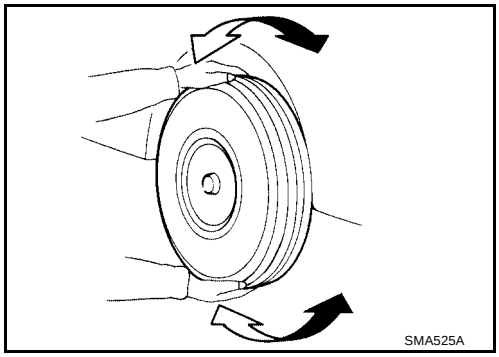
1. Strut tower bar bracket (if equipped)
2. Strut spacer
3. Strut mount bracket
4. Strut mount bearing
5. Spring upper seat
6. Upper spring rubber seat
7. Bound bumper rubber
8. Coil spring
9. Lower spring rubber seat
10. Shock absorber
11. Wheel hub and steering knuckle
12. Cotter pin
13. Strut tower bar (if equipped)
14. Stabilizer
15. Stabilizer clamp
16. Bushing
17. Suspension member
18. Rebound stopper
19. Connecting rod
20. Transverse link

On-Vehicle Service

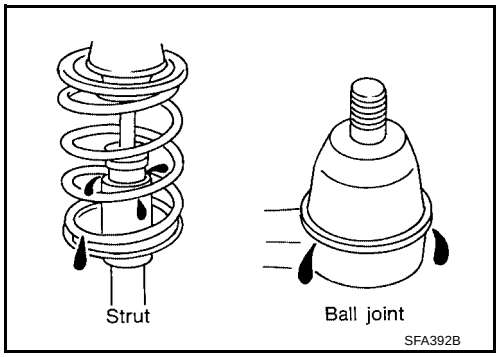
EES000IG

Check front axle and front suspension parts for excessive play, cracks, wear or other damage.

- Shake each front wheel to check for excessive play.
- Make sure that cotter pin is inserted.
- Retighten all axle and suspension nuts and bolts to the specified torque. Refer to FSU-5, "Components" .

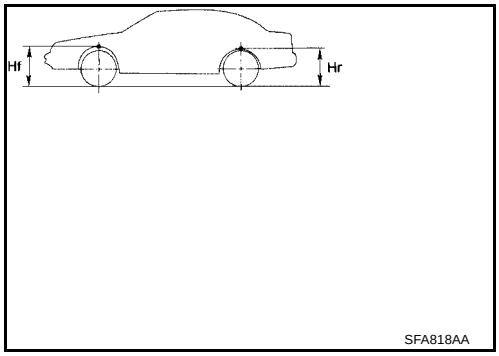


- Check strut (shock absorber) for oil leakage or other damage.
- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.
  If ball joint dust cover is cracked or damaged, replace transverse link.



- Check spring height from top of wheelarch to the ground.
  - Vehicle must be unladen*, parked on a level surface, and tires checked for proper inflation and wear (tread wear indicator must not be showing).
    *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
  - Bounce vehicle up and down several times before measuring.

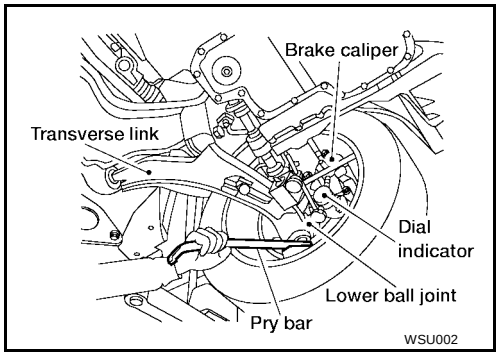
Standard height **: Refer to FSU-16, "Wheelarch Height (Unladen*)"**



  - Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.

- Check suspension ball joint end play.
  - Jack up front of vehicle and set the stands.
  - Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
  - Make sure front wheels are straight and brake pedal is depressed.
  - Place a pry bar between transverse link and inner rim of road wheel.
  - While raising and releasing pry bar, observe maximum dial indicator value.

Vertical end play **: 0 mm (0 in)**



  - If ball joint movement is beyond specifications, remove and replace it.

Front Wheel Alignment

EES000IH

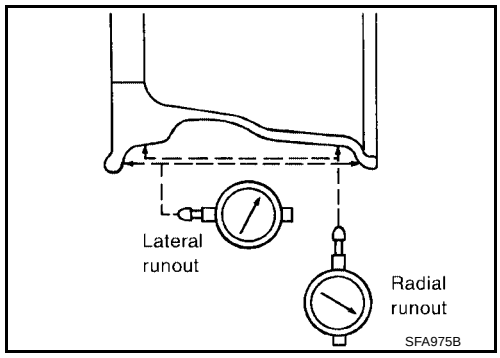
Before checking front wheel alignment, be sure to make a preliminary inspection (unladen*).
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

PRELIMINARY INSPECTION

1. Check tires for wear and improper inflation.
2. Check wheels for deformation, cracks and other damage.
   If deformed, remove wheel and check wheel runout.

a. Remove tire from wheel and mount wheel on a tire balance machine.

b. Set dial indicator as shown in the illustration.



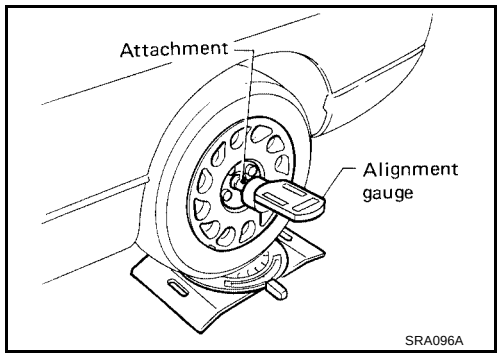
Wheel runout (Dial indicator value)	**: Refer to WT-3, "ROAD WHEEL" .**

3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work properly.
7. Check vehicle wheelarch height (unladen*). Refer to FSU-16, "Wheelarch Height (Unladen*)" .
   - *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.



Camber, caster and kingpin inclination	**: Refer to FSU-15, "Front Wheel Alignment (Unladen*1)" .**

2. If camber, caster or kingpin inclination is not within specification, inspect front suspension parts. Replace damaged or worn out parts.

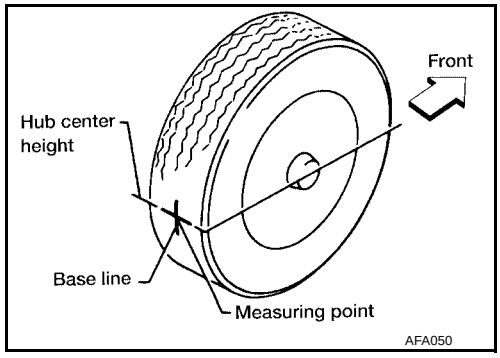
TOE-IN

Measure toe-in using the following procedure.

WARNING:

- **Always perform the following procedure on a flat surface.**
- **Make sure that no person is in front of the vehicle before pushing it.**

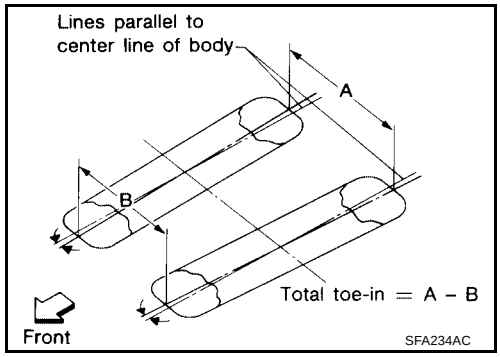
1. Bounce front of vehicle up and down to stabilize the posture.
2. Push the vehicle straight ahead about 5 m (16 ft).
3. Put a mark on base line of tread (rear side) of both tires at the same height as hub center. These are measuring points.



4. Measure distance “A” (rear side).
5. Push the vehicle slowly ahead to rotate the wheels 180 degrees (1/2 turn).

If the wheels have rotated more than 180 degrees (1/2 turn), try the above procedure again from the beginning. Never push vehicle backward.

6. Measure distance “B” (front side).



Total toe-in	**: Refer to FSU-15, "Front Wheel Alignment (Unladen*1)" .**

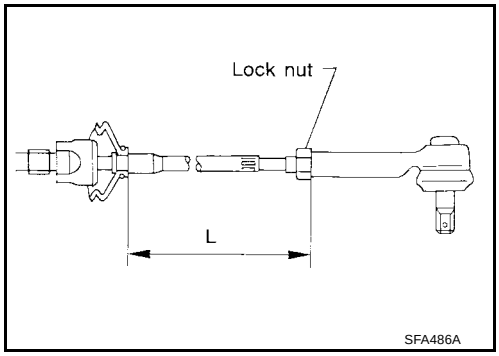
7. Adjust toe-in by varying the length of steering tie-rods.

a. Loosen lock nuts.

b. Adjust toe-in by screwing tie-rods in and out.

Standard length "L"	**: Refer to FSU-15, "Front Wheel Alignment (Unladen*1)" .**

c. Tighten lock nuts to specified torque. Refer to FSU-5, "Components" .

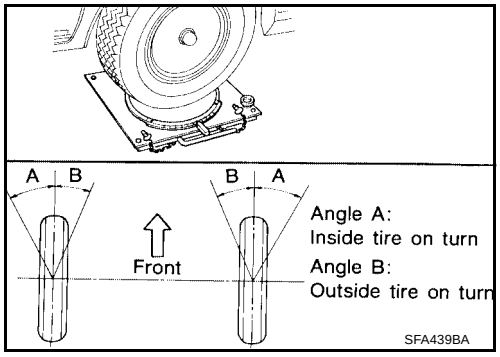


FRONT WHEEL TURNING ANGLE

1. Set wheels in straight-ahead position. Then move vehicle forward until front wheels rest on turning radius gauge properly.

2. Rotate steering wheel all the way right and left; measure turning angle.
Do not hold the steering wheel on full lock for more than 15 seconds.

Wheel turning angle (Full turn)	**: Refer to FSU-15, "Front Wheel Alignment (Unladen*1)" .**



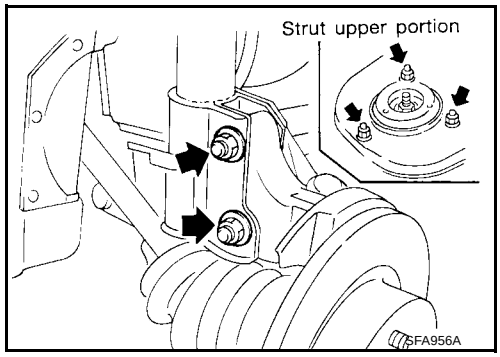
COIL SPRING AND SHOCK ABSORBER

PFP:56210

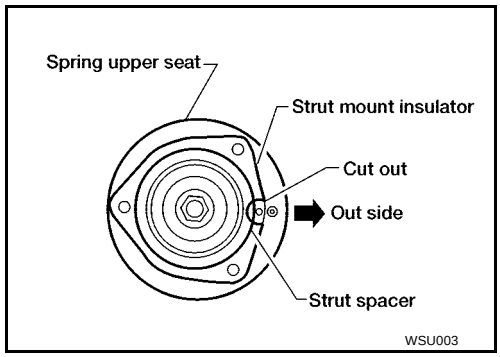
Removal and Installation

EES000II

- Remove shock absorber fixing bolt and nut (to hoodledge).
- **Do not remove piston rod lock nut on vehicle.**



- When installing strut spacer, it must be positioned as shown.



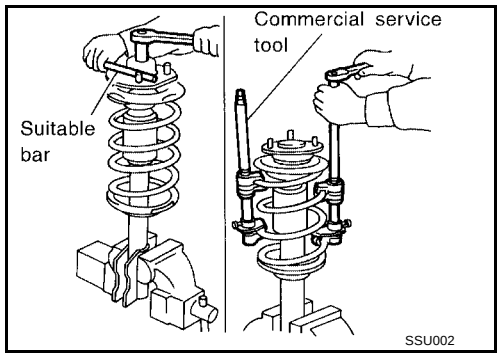
Disassembly

EES000IJ

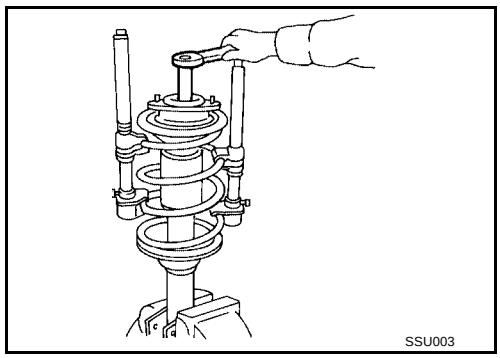
1. Set shock absorber on vise, then **loosen** piston rod lock nut.
   - **Do not remove piston rod lock nut at this time.**
2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.

   WARNING:

   Make sure that the pawls of the two spring compressors are firmly hooked on the spring. The spring compressors must be tightened alternately so as not to tilt the spring.



3. Remove piston rod lock nut.



Inspection

EES000IK

SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage and replace if necessary.

MOUNTING INSULATOR AND RUBBER PARTS

- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration and replace if necessary.

THRUST BEARING

- Check thrust bearing parts for abnormal noise or excessive rattle in axial direction and replace if necessary.

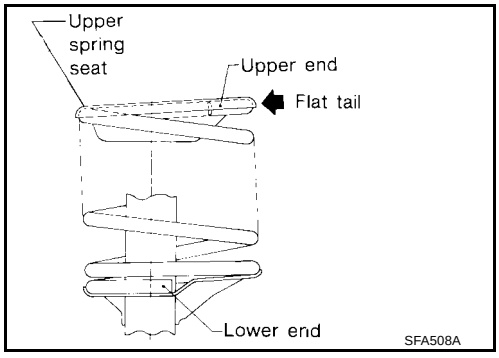
COIL SPRING

- Check for cracks, deformation or other damage and replace if necessary.

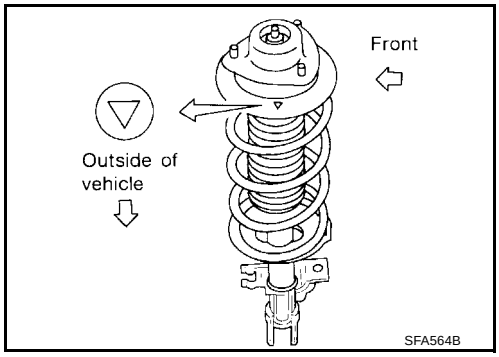
Assembly

EES000IL

- When installing coil spring on strut, it must be positioned as shown.



- Install upper spring seat with alignment mark facing the outer side of vehicle, in line with strut-to-knuckle attachment points.
- **Replace strut lower mounting nuts.**
- **When installing strut to knuckle, be sure to hold bolts and tighten nuts.**



Strut to knuckle tightening torque	**: 114 - 133 N·m (11.6 - 13.6 kg-m, 84 - 98 ft-lb)**

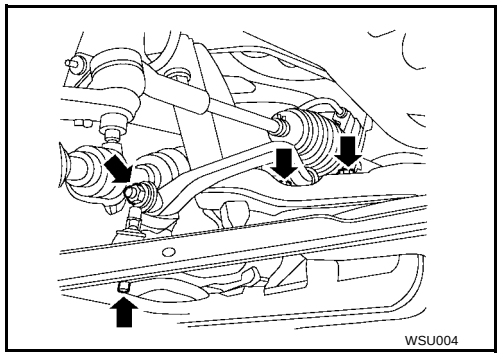
STABILIZER BAR

PFP:54611

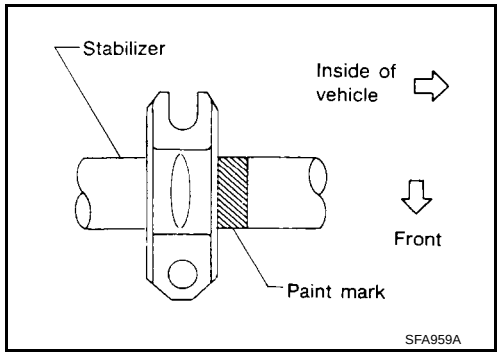
Removal and Installation

EES000IM

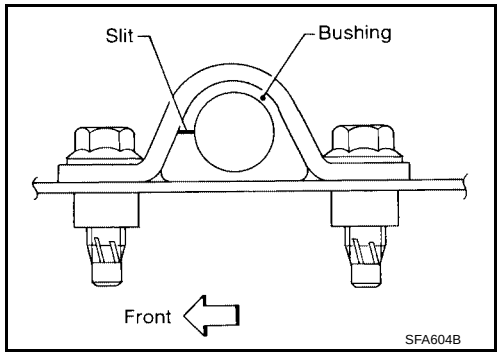
- Remove four stabilizer bar mounting nuts from each side.



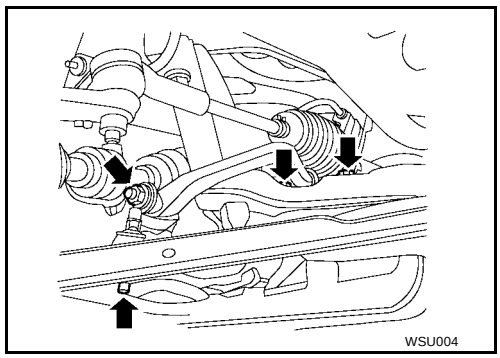
- When installing stabilizer, make sure the paint mark and clamp face in their correct directions.



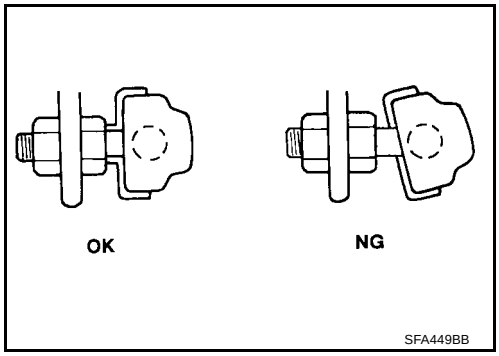
- Make sure that the slit in the bushing is in the position shown.



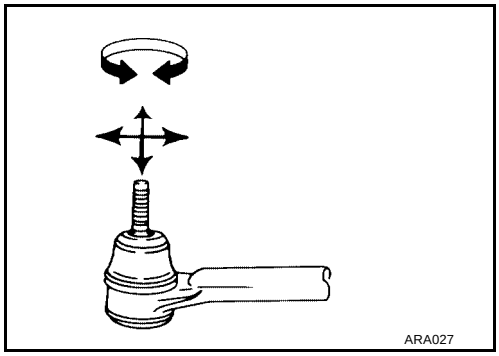
- Install four stabilizer bar mounting nuts at each side.



- Install stabilizer bar with ball joint socket properly placed.



- Check stabilizer for deformation or cracks and replace if necessary.
- Check rubber bushings for deterioration or cracks and replace if necessary.
- Check ball joint can rotate in all directions. If movement is not smooth and free, replace stabilizer bar connecting rod.



TRANSVERSE LINK AND LOWER BALL JOINT

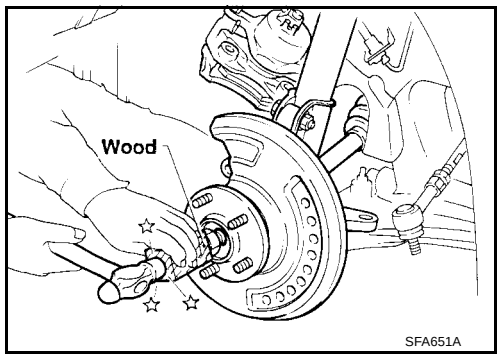
PFP:54500

Removal and Installation

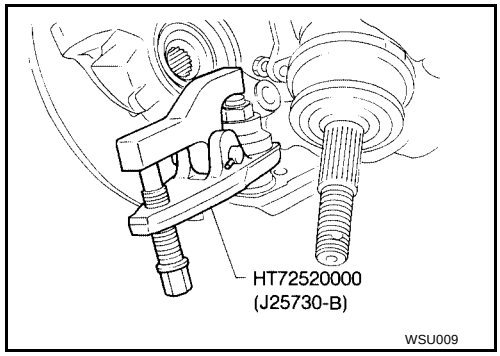
EES000IN

1. Remove wheel bearing lock nut.
2. Remove tie-rod ball joint.
3. Remove strut lower bracket fixing bolts and nuts.
4. Separate drive shaft from knuckle by slightly tapping drive shaft end.

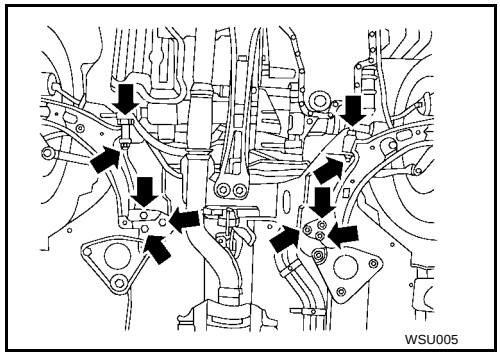
Cover boots with shop towel so as not to damage them when removing drive shaft.



5. Separate lower ball joint stud from knuckle with suitable tool.



6. Remove fixing bolts.
7. Remove transverse link and lower ball joint.
8. During installation, final tightening must be carried out at curb weight with tires on the ground. Refer to FSU-5, "Components" .
9. After installation, check wheel alignment. Refer to FSU-6, "Front Wheel Alignment" .



Inspection

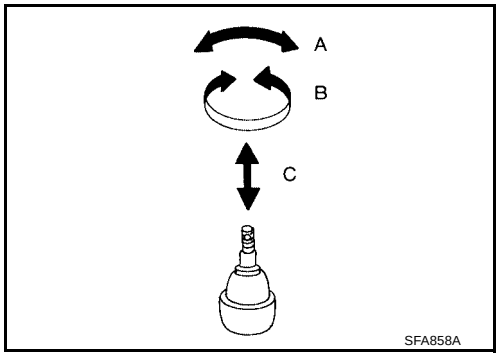
EES000IO

TRANSVERSE LINK

- Check transverse link for damage, cracks or deformation and replace if necessary.
- Check rubber bushing for damage, cracks and deformation and replace if necessary.

LOWER BALL JOINT

- Check ball joint for play. Replace transverse link assembly if any of the following cases occur: Ball stud is worn, play in axial direction is excessive or joint is hard to swing.
  Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.



Swinging force “A” (measuring point cotter pin hole of ball stud)	**: 7.8 - 77.5 N (0.8 - 7.9 kg, 1.8 - 17.4 lb)**
Turning torque “B”	**: 0.50 - 4.90 N·m (5.1 - 50 kg-cm, 4.4 - 43.4 in-lb)**
Vertical end play “C”	**: 0 mm (0 in)**

- Check dust cover for damage. Replace it and cover clamp if necessary.

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

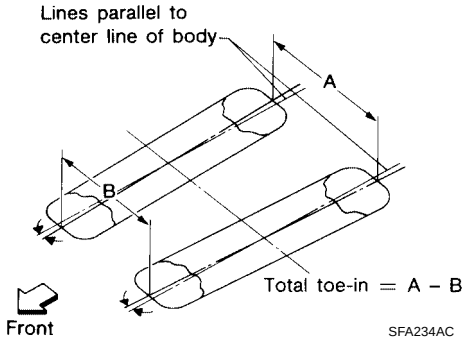
General Specifications (Front)

EES000IP

Suspension type	Independent MacPherson strut
Shock absorber type	Double-acting hydraulic
Stabilizer bar	Standard equipment

Front Wheel Alignment (Unladen*1)

EES000IQ

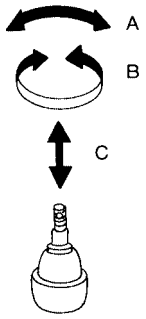


Engine			QG18DE	QR25DE
Camber Degree minute (Decimal degree)		Minimum	–1°10' (–1.17°)	–1°12' (–1.2°)
		Nominal	–0°25' (–0.42°)	–0°27' (–0.45°)
		Maximum	0°20′ (0.33°)	0°18′ (0.3°)
		Left and right difference	45′ (0.75°) or less	45′ (0.75°) or less
Caster Degree minute (Decimal degree)		Minimum	0°51′ (0.85°)	0°58′ (0.97°)
		Nominal	1°36′ (1.60°)	1°43′ (1.72°)
		Maximum	2°21′ (2.35°)	2°28′ (2.47°)
		Left and right difference	45′ (0.75°) or less	45′ (0.75°) or less
Kingpin inclination Degree minute (Decimal degree)		Minimum	13°58′ (13.97°)	14°03′ (14.05°)
		Nominal	14°43′ (14.72°)	14°46′ (14.77°)
		Maximum	15°28′ (15.47°)	15°31′ (15.52°)
Total toe-in	Distance (A – B) mm (in)	Minimum	1 (0.039”)	1 (0.039”)
		Nominal	2 (0.079”)	2 (0.079”)
		Maximum	3 (0.118”)	3 (0.118”)
	Angle (left plus right) Degree minute (Decimal degree)	Minimum	5.5′ (0.08°)	5.5′ (0.08°)
		Nominal	11′ (0.18°)	11′ (0.18°)
		Maximum	16′ (0.27°)	16′ (0.27°)
Wheel turning angle Full turn*2	Inside Degree minute (Decimal degree)	Minimum	34° (34.0°)	29° (29.0°)
		Nominal	37° (37.0°)	32° (32.0°)
		Maximum	38° (38.0°)	33° (33.0°)
	Outside Degree minute (Decimal degree)	Nominal	31° (31.0°)	27° (27.0°)

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

Lower Ball Joint

EES000IR

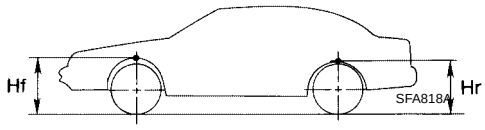


SFA858A

Swinging force “A” (Measuring point: cotter pin hole of ball stud) N (kg, lb)	7.8 - 77.5 (0.8 - 7.9, 1.8 - 17.4)
Turning torque “B” N-m (kg-cm, in-lb)	0.50 - 4.90 (5.1 - 50.0, 4.4 - 43.4)
Vertical end play “C” mm (in)	0 (0)

Wheelarch Height (Unladen*)

EES000IS



SFA818A

Engine	QG18DE	QR25DE		
Grade	XE, GXE	LE	SE-R	SPEC-V
Tire Size	P195/60HR15	P195/60HR15	P195/55HR16	P215/45ZR17
Front (Hf) mm (in)	659 (25.94)	659 (25.94)	660 (25.98)	664 (26.14)
Rear (Hr) mm (in)	653 (25.71)	653 (25.71)	652 (25.67)	655 (25.79)

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EAS000X3

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Description

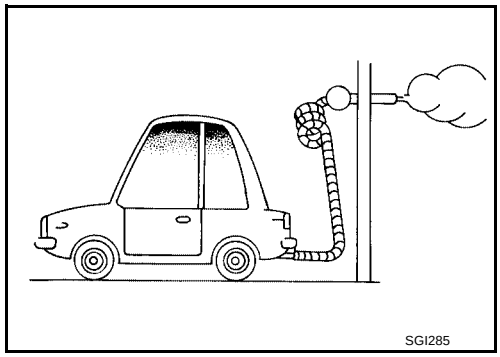
EAS000V5

Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.

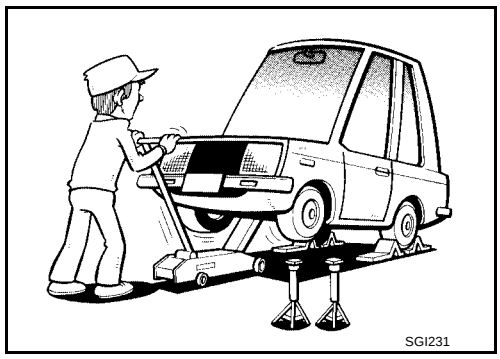
General Precautions

EAS000V6

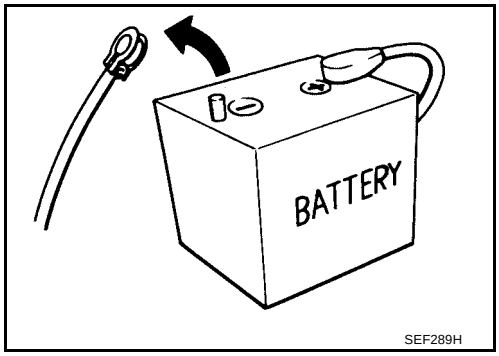
- Do not operate the engine for an extended period of time without proper exhaust ventilation.
  Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials.
  Do not smoke while working on the vehicle.


SGI285

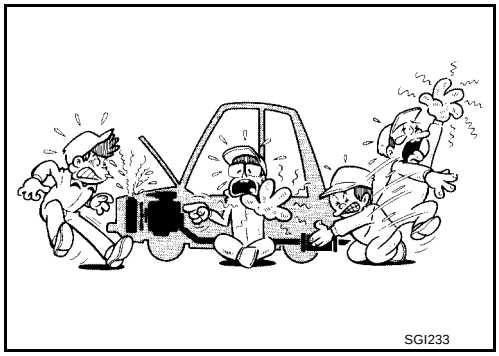
- Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting before working on the vehicle.
  These operations should be done on a level surface.
- When removing a heavy component such as the engine or transaxle/transmission, be careful not to lose your balance and drop them. Also, do not allow them to strike adjacent parts, especially the brake tubes and master cylinder.


SGI231

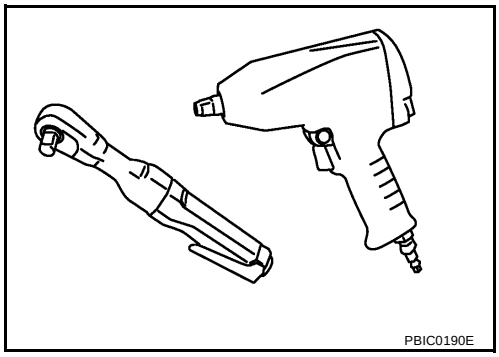
- Before starting repairs which do not require battery power:
  Turn off ignition switch.
  Disconnect the negative battery terminal.
- If the battery terminals are disconnected, recorded memory of radio and each control unit is erased.



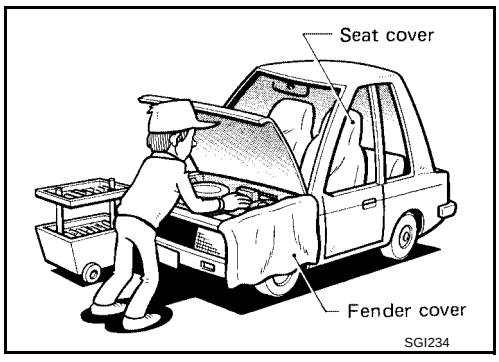
- To prevent serious burns:
  Avoid contact with hot metal parts.
  Do not remove the radiator cap when the engine is hot.
- Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.
- Do not attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically.
  Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.
- Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.



- Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
- Replace inner and outer races of tapered roller bearings and needle bearings as a set.
- Arrange the disassembled parts in accordance with their assembled locations and sequence.
- Do not touch the terminals of electrical components which use microcomputers (such as ECM).
  Static electricity may damage internal electronic components.
- After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
- Use only the fluids and lubricants specified in this manual.
- Use approved bonding agent, sealants or their equivalents when required.
- Use hand tools, power tools (disassembly only) and recommended special tools where specified for safe and efficient service repairs.
- When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.



- Before servicing the vehicle:
  Protect fenders, upholstery and carpeting with appropriate covers.
  Take caution that keys, buckles or buttons do not scratch paint.



WARNING:
To prevent ECM from storing the diagnostic trouble codes, do not carelessly disconnect the harness connectors which are related to the engine control system and TCM (transmission control module) system. The connectors should be disconnected only when working according to the WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

Precautions for NVIS/IVIS (NISSAN/INFINITI VEHICLE IMMOBILIZER SYSTEM - NATS) (If Equipped)

EAS000V7

NVIS/IVIS (NATS) will immobilize the engine if someone tries to start it without the registered key of NVIS/IVIS (NATS).
Both of the originally supplied ignition key IDs have been NVIS/IVIS (NATS) registered.
The security indicator is located on the instrument panel. The indicator blinks when the immobilizer system is functioning.
Therefore, NVIS/IVIS (NATS) warns outsiders that the vehicle is equipped with the anti-theft system.

- When NVIS/IVIS (NATS) detects trouble, the security indicator lamp lights up while ignition switch is in "ON" position.
  This lighting up indicates that the anti-theft is not functioning, so prompt service is required.
- When servicing NVIS/IVIS (NATS) (trouble diagnoses, system initialization and additional registration of other NVIS/IVIS (NATS) ignition key IDs), CONSULT-II hardware and CONSULT-II NVIS/IVIS (NATS) software is necessary.
  Regarding the procedures of NVIS/IVIS (NATS) initialization and NVIS/IVIS (NATS) ignition key ID registration, refer to CONSULT-II operation manual, NVIS/IVIS (NATS).

Therefore, CONSULT-II NVIS/IVIS (NATS) software (program card and operation manual) must be kept strictly confidential to maintain the integrity of the anti-theft function.

- When servicing NVIS/IVIS (NATS) (trouble diagnoses, system initialization and additional registration of other NVIS/IVIS (NATS) ignition key IDs), it may be necessary to re-register original key identification. Therefore, be sure to receive all keys from vehicle owner. A maximum of four or five key IDs can be registered into NVIS/IVIS (NATS).
- When failing to start the engine first time using the key of NVIS/IVIS (NATS), start as follows.

1. Leave the ignition key in "ON" position for approximately 5 seconds.
2. Turn ignition key to "OFF" or "LOCK" position and wait approximately 5 seconds.
3. Repeat step 1 and 2 again.
4. Restart the engine while keeping the key separate from any others on key-chain.

Precautions for Three Way Catalyst

EAS000V8

If a large amount of unburned fuel flows into the catalyst, the catalyst temperature will be excessively high. To prevent this, follow the instructions.

- Use unleaded gasoline only. Leaded gasoline will seriously damage the three way catalyst.
- When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
- Do not run engine when the fuel tank level is low, otherwise the engine may misfire, causing damage to the catalyst.

Do not place the vehicle on flammable material. Keep flammable material off the exhaust pipe and the three way catalyst.

Precautions for Fuel (Unleaded Regular Gasoline Recommended)

EAS000X4

Use unleaded regular gasoline with an octane rating of at least 87 AKI (Anti-Knock Index) number (Research octane number 91).

CAUTION:
Do not use leaded gasoline. Using leaded gasoline will damage the three way catalyst. Using a fuel other than that specified could adversely affect the emission control devices and systems, and could also affect the warranty coverage validity.

Precautions for Fuel (Unleaded Premium Gasoline Recommended)

EAS000X5

Use unleaded regular gasoline with an octane rating of at least 87 AKI (Anti-Knock Index) number (Research octane number 91).

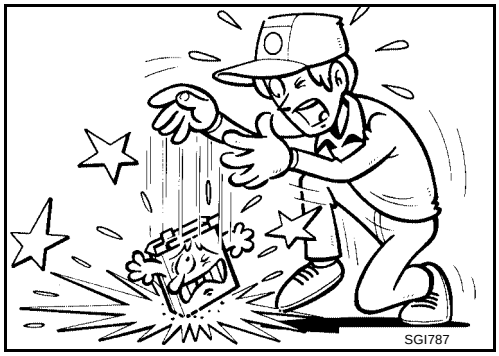
For improved vehicle performance, NISSAN/INFINITI recommend the use of unleaded premium gasoline with an octane rating of at least 91 AKI number (Research octane number 96).

CAUTION:
Do not use leaded gasoline. Using leaded gasoline will damage the three way catalyst. Using a fuel other than that specified could adversely affect the emission control devices and systems, and could also affect the warranty coverage validity.

Precautions for Multiport Fuel Injection System or Engine Control System

EAS000VA

- Before connecting or disconnecting any harness connector for the multiport fuel injection system or ECM:
  Turn ignition switch to “OFF” position.
  Disconnect negative battery terminal.
  Otherwise, there may be damage to ECM.
- Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure.
- Be careful not to jar components such as ECM and mass air flow sensor.

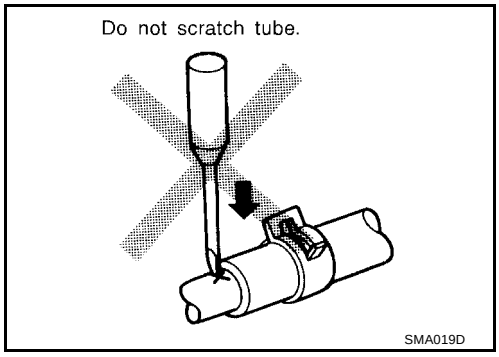

SGI787

Precautions for Hoses

EAS000VB

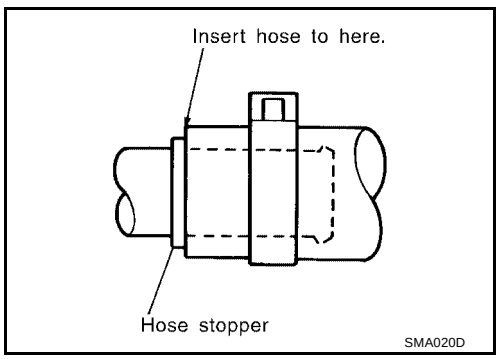
HOSE REMOVAL AND INSTALLATION

- To prevent damage to rubber hose, do not pry off rubber hose with tapered tool or screwdriver.



SMA019D

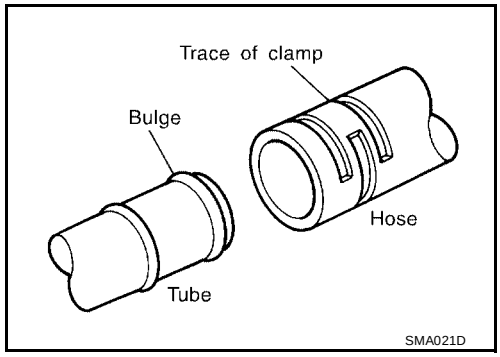
- To reinstall the rubber hose securely, make sure that hose insertion length and orientation is correct. (If tube is equipped with hose stopper, insert rubber hose into tube until it butts up against hose stopper.)



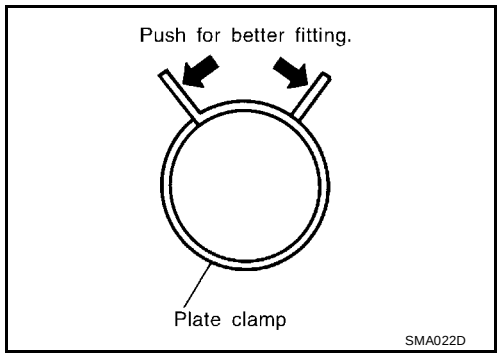
SMA020D

HOSE CLAMPING

- If old rubber hose is re-used, install hose clamp in its original position (at the indentation where the old clamp was). If there is a trace of tube bulging left on the old rubber hose, align rubber hose at that position.
- Discard old clamps; replace with new ones.



- After installing plate clamps, apply force to them in the direction of the arrow, tightening rubber hose equally all around.



Precautions for Engine Oils

EAS000VC

Prolonged and repeated contact with used engine oil may cause skin cancer. Try to avoid direct skin contact with used oil.
If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.

HEALTH PROTECTION PRECAUTIONS

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Wear protective clothing, including impervious gloves where practicable.
- Do not put oily rags in pockets.
- Avoid contaminating clothes, particularly underpants, with oil.
- Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
- First aid treatment should be obtained immediately for open cuts and wounds.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
- Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
- Do not use gasoline, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- If skin disorders develop, obtain medical advice without delay.
- Where practical, degrease components prior to handling.
- Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.

ENVIRONMENTAL PROTECTION PRECAUTIONS

Dispose of used oil and used oil filters through authorized waste disposal contractors to licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the local authority for advice on disposal facilities.
It is illegal to pour used oil on to the ground, down sewers or drains, or into water sources.
The regulations concerning pollution vary between regions.

Precautions for Air Conditioning

EAS000VD

Use an approved refrigerant recovery unit any time the air conditioning system must be discharged. Refer to ATC/MTC section “HFC-134a (R-134a) Service Procedure”, “REFRIGERANT LINES” for specific instructions.

HOW TO USE THIS MANUAL

PFP:00008

Description

EAS000VE

This volume explains “Removal, Disassembly, Installation, Inspection and Adjustment” and “Trouble Diagnoses”.

Terms

EAS000VF

- The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.
  WARNING indicates the possibility of personal injury if instructions are not followed.
  CAUTION indicates the possibility of component damage if instructions are not followed.
  BOLD TYPED STATEMENTS except **WARNING** and **CAUTION** give you helpful information.
  Standard value:Tolerance at inspection and adjustment.
  Limit value:The maximum or minimum limit value that should not be exceeded at inspection and adjustment.

Units

EAS000VG

- The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.
  “Example”

  Outer Socket Lock Nut : 59 - 78 N-m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

Contents

EAS000VH

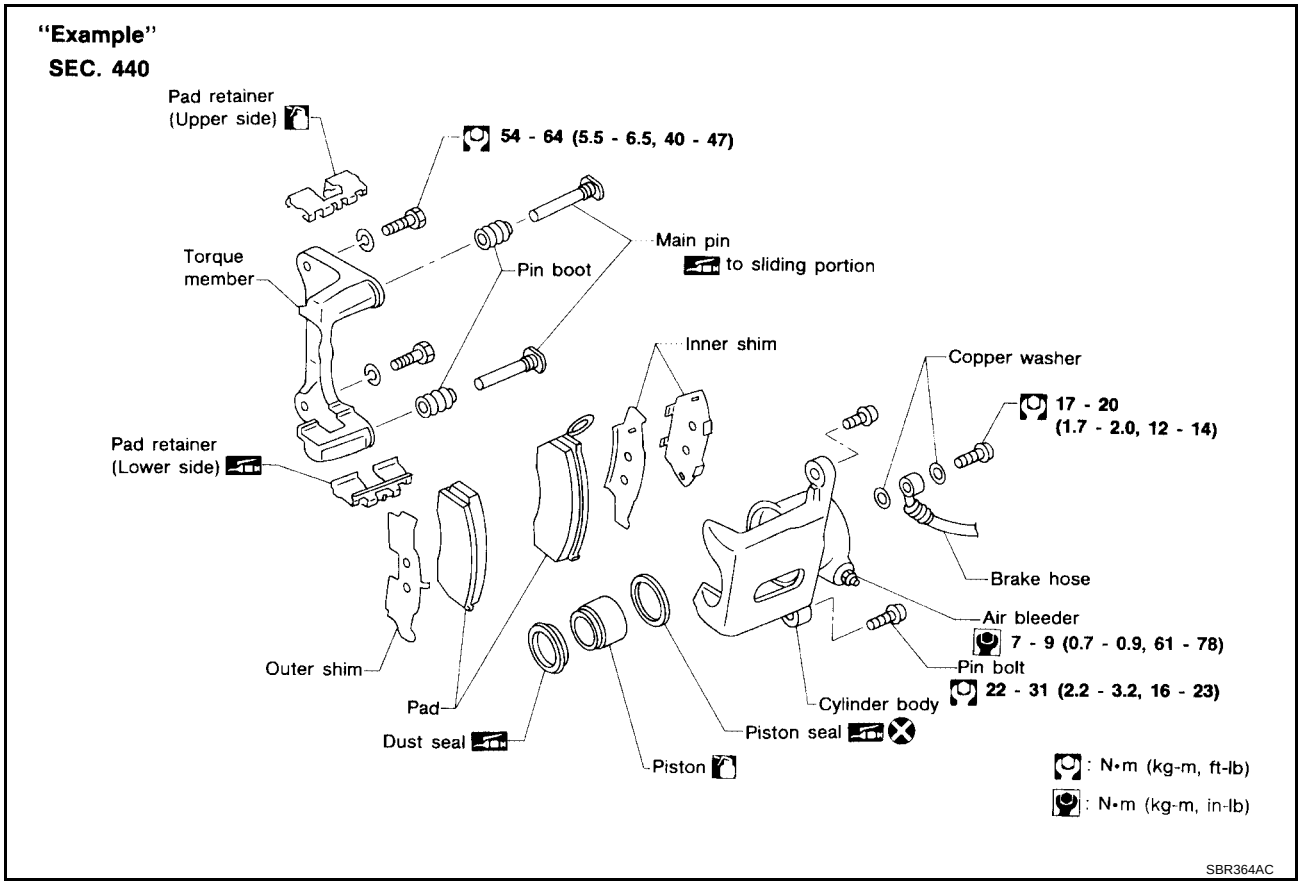
- **ALPHABETICAL INDEX** is provided at the end of this manual so that you can rapidly find the item and page you are searching for.
- **A QUICK REFERENCE INDEX**, a black tab (e.g. BR) is provided on the first page. You can quickly find the first page of each section by matching it to the section's black tab.
- **THE CONTENTS** are listed on the first page of each section.
- **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
- **THE PAGE NUMBER** of each section consists of two or three letters which designate the particular section and a number (e.g. “BR-5”).
- **THE SMALL ILLUSTRATIONS** show the important steps such as inspection, use of special tools, knacks of work and hidden or tricky steps which are not shown in the previous large illustrations.
  Assembly, inspection and adjustment procedures for the complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.

Components

EAS000VI

- **THE LARGE ILLUSTRATIONS** are exploded views (See the following) and contain tightening torques, lubrication points, section number of the **PARTS CATALOG** (e.g. SEC. 440) and other information necessary to perform repairs.

The illustrations should be used in reference to service matters only. When ordering parts, refer to the appropriate **PARTS CATALOG** .



SYMBOLS

SYMBOL	DESCRIPTION
	Tightening torque
	Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.
	Should be lubricated with oil.
	Sealing point
	Checking point
	Always replace after every disassembly.
P	Apply petroleum jelly.
ATF	Apply ATF.
★	Select with proper thickness.
☆	Adjustment is required.

How to Follow Trouble Diagnoses

EAS000VJ

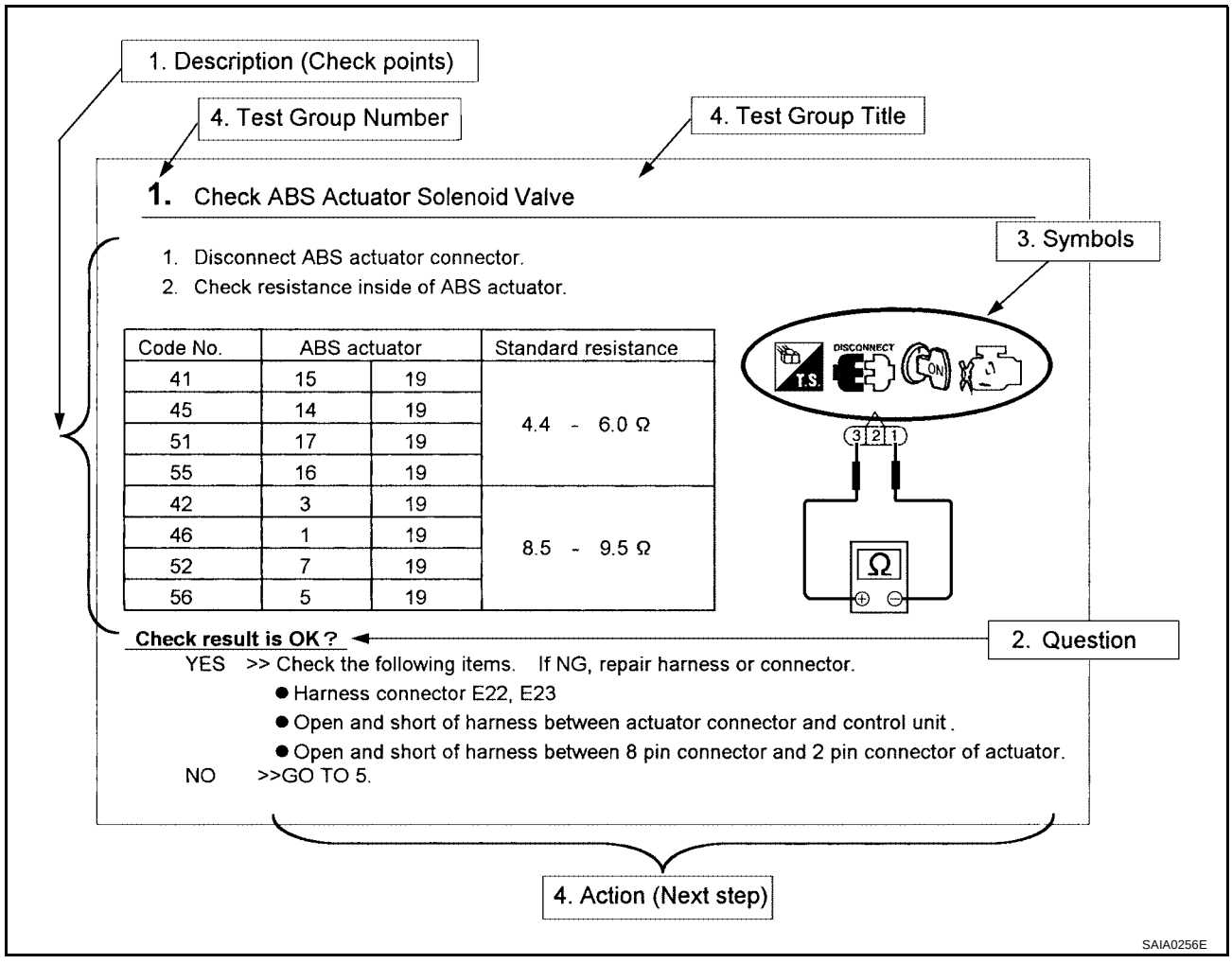
DESCRIPTION

NOTICE:

Trouble diagnoses indicate work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1. **Before performing trouble diagnoses, read the “Preliminary Check”, the “Symptom Chart” or the “Work Flow”.**
2. **After repairs, re-check that the problem has been completely eliminated.**
3. **Refer to Component Parts and Harness Connector Location for the Systems described in each section for identification/location of components and harness connectors.**
4. **Refer to the Circuit Diagram for quick pinpoint check.**
   If you need to check circuit continuity between harness connectors in more detail, such as when a sub-harness is used, refer to Wiring Diagram in each individual section and Harness Layout in PG section for identification of harness connectors.
5. **When checking circuit continuity, ignition switch should be OFF.**
6. **Before checking voltage at connectors, check battery voltage.**
7. **After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.**

HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES



1. **Work and diagnostic procedure**
   Start to diagnose a problem using procedures indicated in enclosed test groups.
2. **Questions and required results**
   Questions and required results are indicated in bold type in test group.
   The meaning of are as follows:

   a. Battery voltage → 11 - 14V or approximately 12V
   b. Voltage : Approximately 0V → Less than 1V

3. **Symbol used in illustration**

Symbols included in illustrations refer to measurements or procedures. Before diagnosing a problem, familiarize yourself with each symbol. Refer to "Connector Symbols" in GI Section and "KEY TO SYMBOLS SIGNIFYING MEASUREMENTS OR PROCEDURES" below.

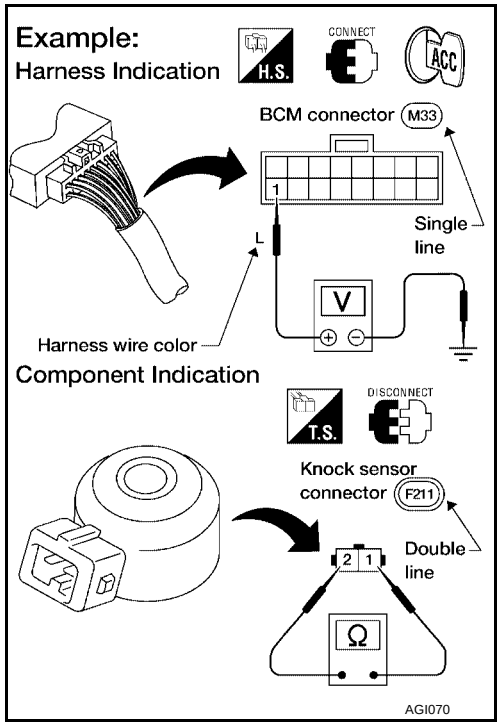
4. **Action items**
   Next action for each test group is indicated based on result of each question. Test group number is shown in the left upper portion of each test group.

HARNESS WIRE COLOR AND CONNECTOR NUMBER INDICATION

There are two types of harness wire color and connector number indication.

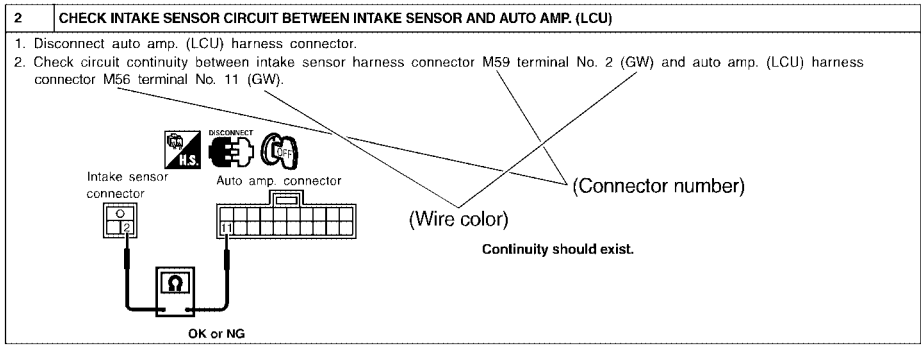
TYPE 1: Harness Wire Color and Connector Number are Shown in Illustration

- Letter designations next to test meter probe indicate harness wire color.
- Connector numbers in a single circle (e.g. M33) indicate harness connectors.
- Connector numbers in a double circle (e.g. F211) indicate component connectors.

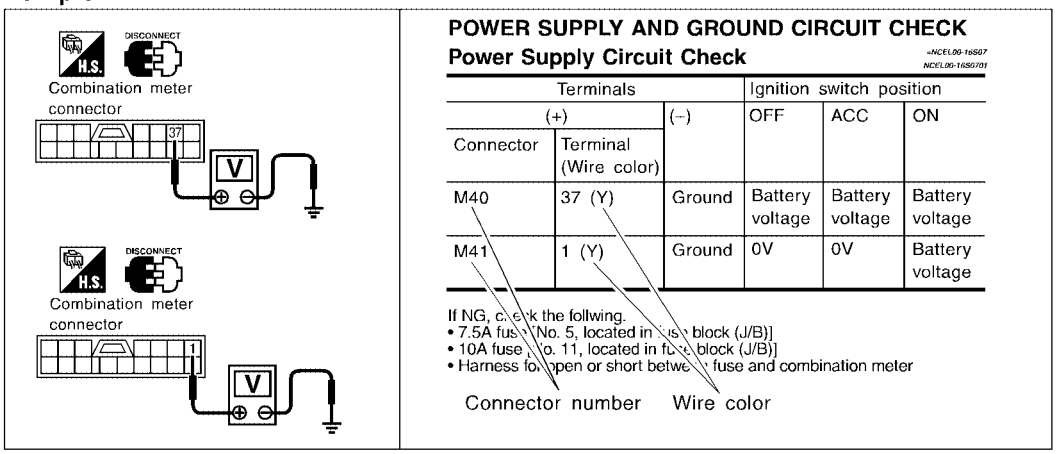


TYPE 2: Harness Wire Color and Connector Number are Shown in Text

Example 1:



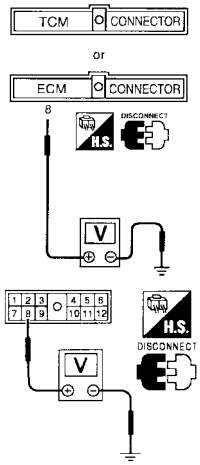
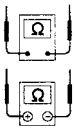
Example 2:



SGI144A

KEY TO SYMBOLS SIGNIFYING MEASUREMENTS OR PROCEDURES

Symbol	Symbol explanation	Symbol	Symbol explanation
DISCONNECT	Check after disconnecting the connector to be measured.	GST	Procedure with Generic Scan Tool (GST, OBD-II scan tool)
CONNECT	Check after connecting the connector to be measured.	NO TOOLS	Procedure without CONSULT, CONSULT-II or GST
	Insert key into ignition switch.	A/C	A/C switch is “OFF”.
	Remove key from ignition switch.	A/C	A/C switch is “ON”.
OFF	Turn ignition switch to “OFF” position.		REC switch is “ON”.
ON	Turn ignition switch to “ON” position.		REC switch is “OFF”.
ST	Turn ignition switch to “START” position.		Fan switch is “ON”. (At any position except for “OFF” position)
OFF→ACC	Turn ignition switch from “OFF” to “ACC” position.		Fan switch is “OFF”.
ACC→OFF	Turn ignition switch from “ACC” to “OFF” position.	FUSE BAT	Apply positive voltage from battery with fuse directly to components.

Symbol	Symbol explanation	Symbol	Symbol explanation
	Turn ignition switch from “OFF” to “ON” position.		Drive vehicle.
	Turn ignition switch from “ON” to “OFF” position.		Disconnect battery negative cable.
	Do not start engine, or check with engine stopped.		Depress brake pedal.
	Start engine, or check with engine running.		Release brake pedal.
	Apply parking brake.		Depress accelerator pedal.
	Release parking brake.		Release accelerator pedal.
	Check after engine is warmed up sufficiently.		Pin terminal check for SMJ type ECM and TCM connectors. **For details regarding the terminal arrangement, refer to the “ELECTRICAL UNITS” electrical reference page at the end of the manual.**
	Voltage should be measured with a voltmeter.		
	Circuit resistance should be measured with an ohmmeter.		
	Current should be measured with an ammeter.		
	Pulse signal should be checked with an oscilloscope.		
	Procedure with CONSULT-II		
	Procedure without CONSULT-II		

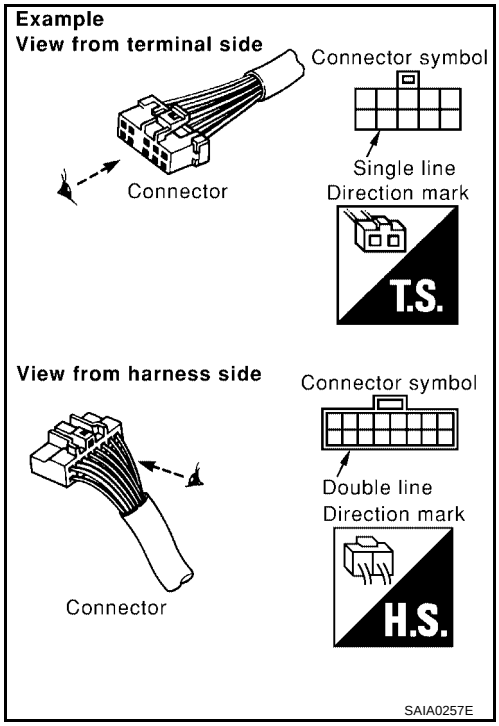
How to Read Wiring Diagrams

EAS000VK

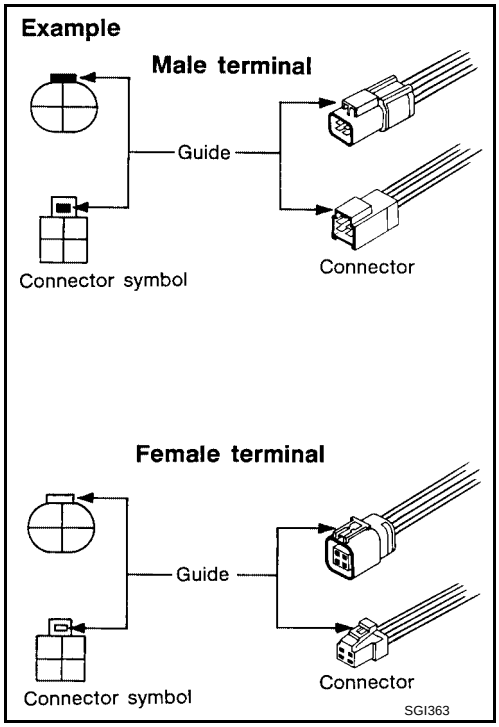
CONNECTOR SYMBOLS

Most of connector symbols in wiring diagrams are shown from the terminal side.

- Connector symbols shown from the terminal side are enclosed by a single line and followed by the direction mark.
- Connector symbols shown from the harness side are enclosed by a double line and followed by the direction mark.
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG section, “Description”, “HARNESS CONNECTOR”.

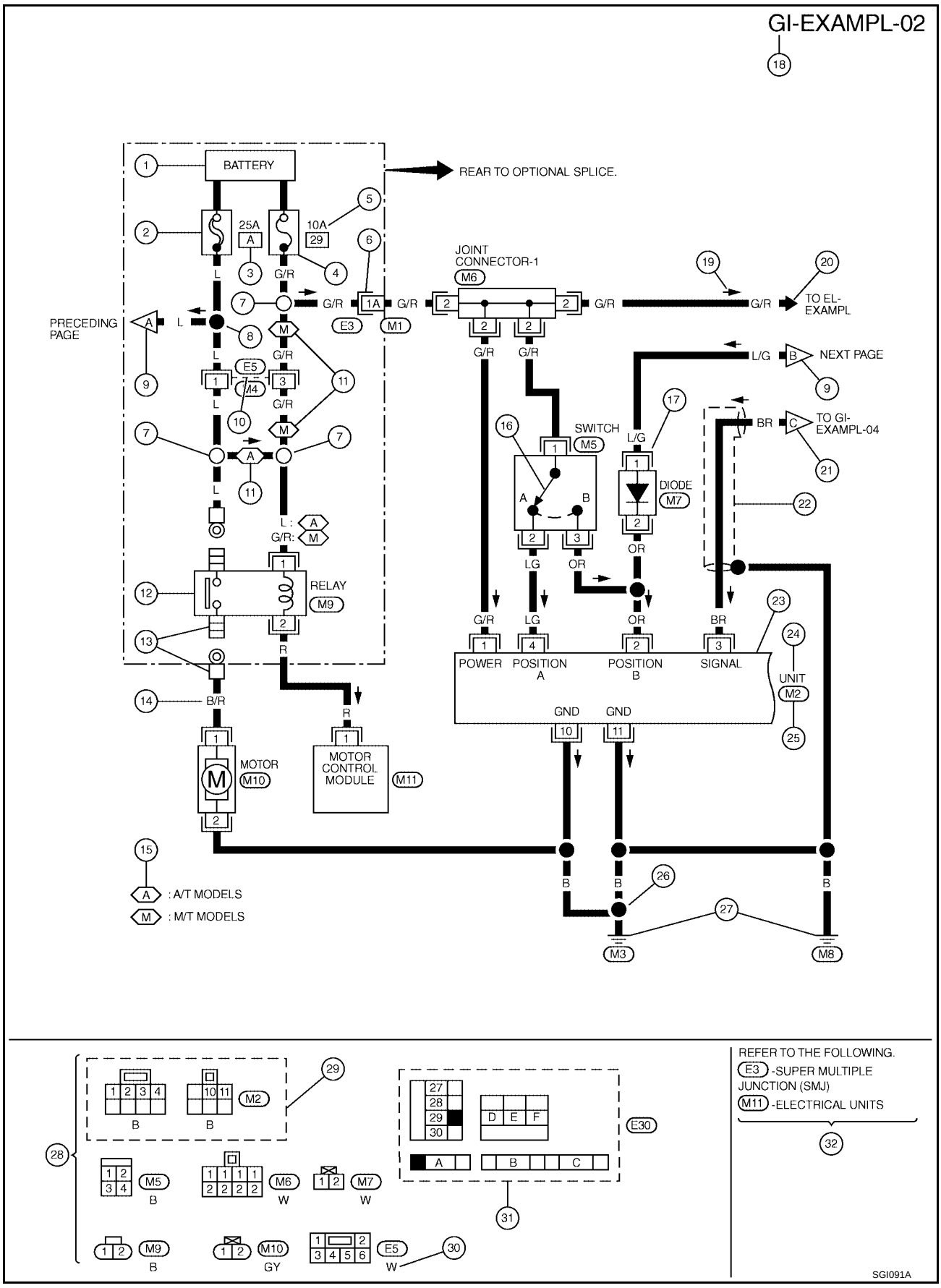


- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

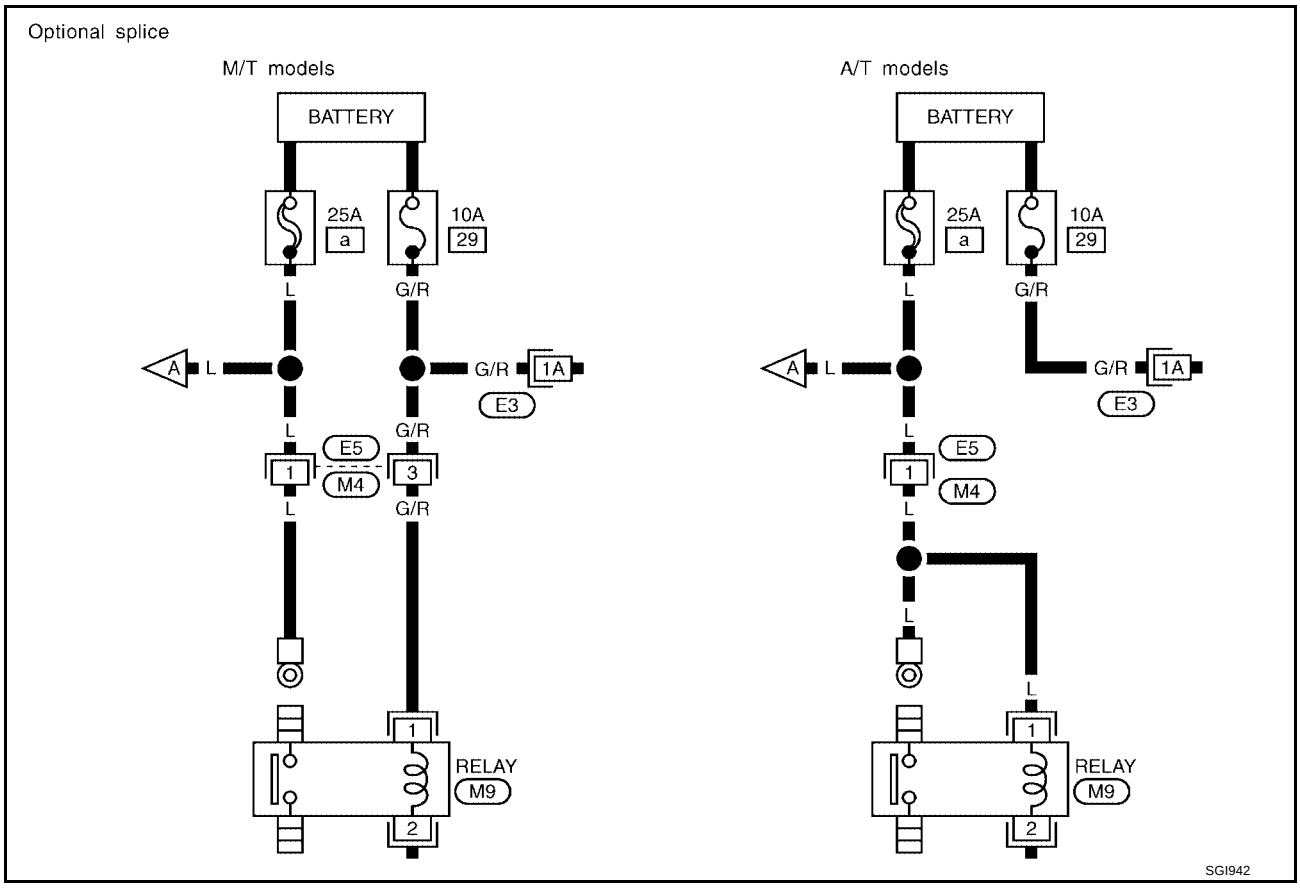


SAMPLE/WIRING DIAGRAM - EXAMPL -

- For detail, refer to following “DESCRIPTION”.



Optional Splice



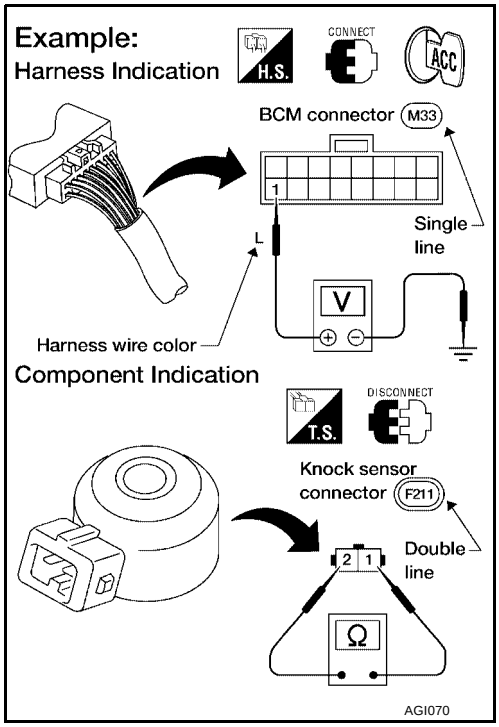
DESCRIPTION

Number	Item	Description
1	Power condition	● This shows the condition when the system receives battery positive voltage (can be operated).
2	Fusible link	● The double line shows that this is a fusible link. ● The open circle shows current flow in, and the shaded circle shows current flow out.
3	Fusible link/fuse location	● This shows the location of the fusible link or fuse in the fusible link or fuse box. For arrangement, refer to PG section, POWER SUPPLY ROUTING.
4	Fuse	● The single line shows that this is a fuse. ● The open circle shows current flow in, and the shaded circle shows current flow out.
5	Current rating	● This shows the current rating of the fusible link or fuse.
6	Connectors	● This shows that connector E3 is female and connector M1 is male. ● The G/R wire is located in the 1A terminal of both connectors. ● Terminal number with an alphabet (1A, 5B, etc.) indicates that the connector is SMJ connector. Refer to PG section, SMJ (SUPER MULTIPLE JUNCTION).
7	Optional splice	● The open circle shows that the splice is optional depending on vehicle application.
8	Splice	● The shaded circle shows that the splice is always on the vehicle.
9	Page crossing	● This arrow shows that the circuit continues to an adjacent page. ● The A will match with the A on the preceding or next page.
10	Common connector	● The dotted lines between terminals show that these terminals are part of the same connector.
11	Option abbreviation	● This shows that the circuit is optional depending on vehicle application.
12	Relay	● This shows an internal representation of the relay. For details, refer to PG section, STANDARDIZED RELAY.
13	Connectors	● This shows that the connector is connected to the body or a terminal with bolt or nut.

Number	Item	Description
14	Wire color	● This shows a code for the color of the wire.
		B = Black W = White R = Red G = Green L = Blue Y = Yellow LG = Light Green BR = Brown OR or O = Orange P = Pink PU or V (Violet) = Purple GY or GR = Gray SB = Sky Blue CH = Dark Brown DG = Dark Green
		When the wire color is striped, the base color is given first, followed by the stripe color as shown below: Example: L/W = Blue with White Stripe
15	Option description	● This shows a description of the option abbreviation used on the page.
16	Switch	● This shows that continuity exists between terminals 1 and 2 when the switch is in the A position. Continuity exists between terminals 1 and 3 when the switch is in the B position.
17	Assembly parts	● Connector terminal in component shows that it is a harness incorporated assembly.
18	Cell code	● This identifies each page of the wiring diagram by section, system and wiring diagram page number.
19	Current flow arrow	● Arrow indicates electric current flow, especially where the direction of standard flow (vertically downward or horizontally from left to right) is difficult to follow. ● A double arrow “ ↔ ” shows that current can flow in either direction depending on circuit operation.
20	System branch	● This shows that the system branches to another system identified by cell code (section and system).
21	Page crossing	● This arrow shows that the circuit continues to another page identified by cell code. ● The C will match with the C on another page within the system other than the next or preceding pages.
22	Shielded line	● The line enclosed by broken line circle shows shield wire.
23	Component box in wave line	● This shows that another part of the component is also shown on another page (indicated by wave line) within the system.
24	Component name	● This shows the name of a component.
25	Connector number	● This shows the connector number. ● The letter shows which harness the connector is located in. ● Example: **M** : main harness. For detail and to locate the connector, refer to PG section "Main Harness", “Harness Layout”. A coordinate grid is included for complex harnesses to aid in locating connectors.
26	Ground (GND)	● The line spliced and grounded under wire color shows that ground line is spliced at the grounded connector.
27	Ground (GND)	● This shows the ground connection. For detailed ground distribution information, refer to "Ground Distribution" in PG section.
28	Connector views	● This area shows the connector faces of the components in the wiring diagram on the page.
29	Common component	● Connectors enclosed in broken line show that these connectors belong to the same component.
30	Connector color	● This shows a code for the color of the connector. For code meaning, refer to wire color codes, Number 14 of this chart.
31	Fusible link and fuse box	● This shows the arrangement of fusible link(s) and fuse(s), used for connector views of "POWER SUPPLY ROUTING" in PG section. The open square shows current flow in, and the shaded square shows current flow out.
32	Reference area	● This shows that more information on the Super Multiple Junction (SMJ) and Joint Connectors (J/C) exists on the PG section. Refer to "Reference Area" for details.

Harness Indication

- Letter designations next to test meter probe indicate harness (connector) wire color.
- Connector numbers in a single circle M33 indicate harness connectors.



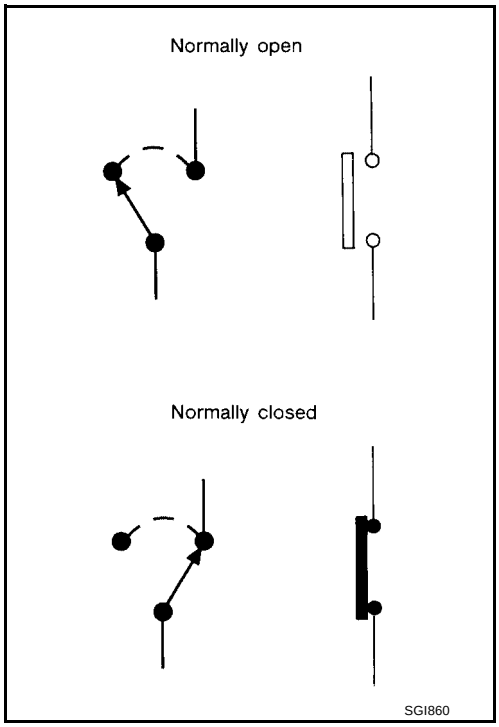
Component Indication

Connector numbers in a double circle F211 indicate component connectors.

Switch Positions

Switches are shown in wiring diagrams as if the vehicle is in the “normal” condition.
A vehicle is in the “normal” condition when:

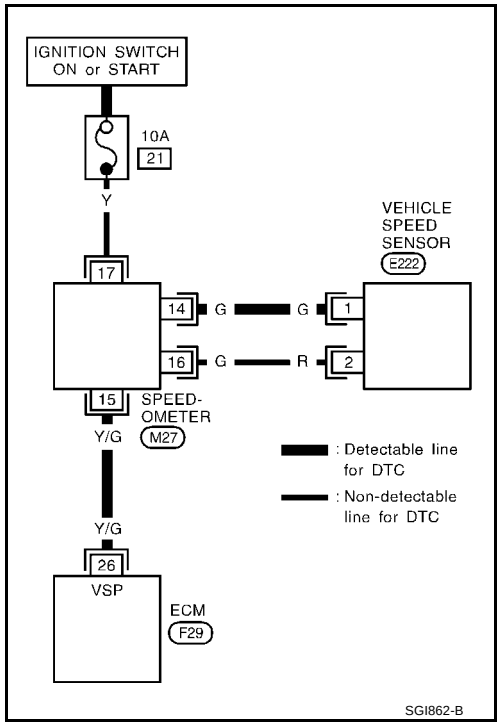
- ignition switch is “OFF”,
- doors, hood and trunk lid/back door are closed,
- pedals are not depressed, and
- parking brake is released.



Detectable Lines and Non-Detectable Lines

In some wiring diagrams, two kinds of lines, representing wires, with different weight are used.

- A line with regular weight (wider line) represents a “detectable line for DTC (Diagnostic Trouble Code)”. A “detectable line for DTC” is a circuit in which ECM can detect its malfunctions with the on board diagnostic system.
- A line with less weight (thinner line) represents a “non-detectable line for DTC”. A “non-detectable line for DTC” is a circuit in which ECM cannot detect its malfunctions with the on board diagnostic system.



Multiple Switch

The continuity of multiple switch is described in two ways as shown below.

- The switch chart is used in schematic diagrams.

- The switch diagram is used in wiring diagrams.

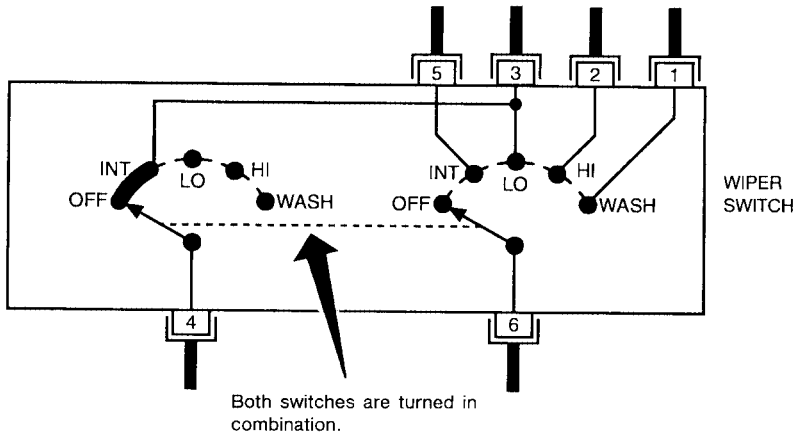
Example

(SWITCH CHART)

WIPER SWITCH

	OFF	INT	LO	HI	WASH
1					○
2				○	
3	○	○	○		
4	○	○			
5		○			
6		○	○	○	○

(SWITCH DIAGRAM)



Continuity circuit of wiper switch

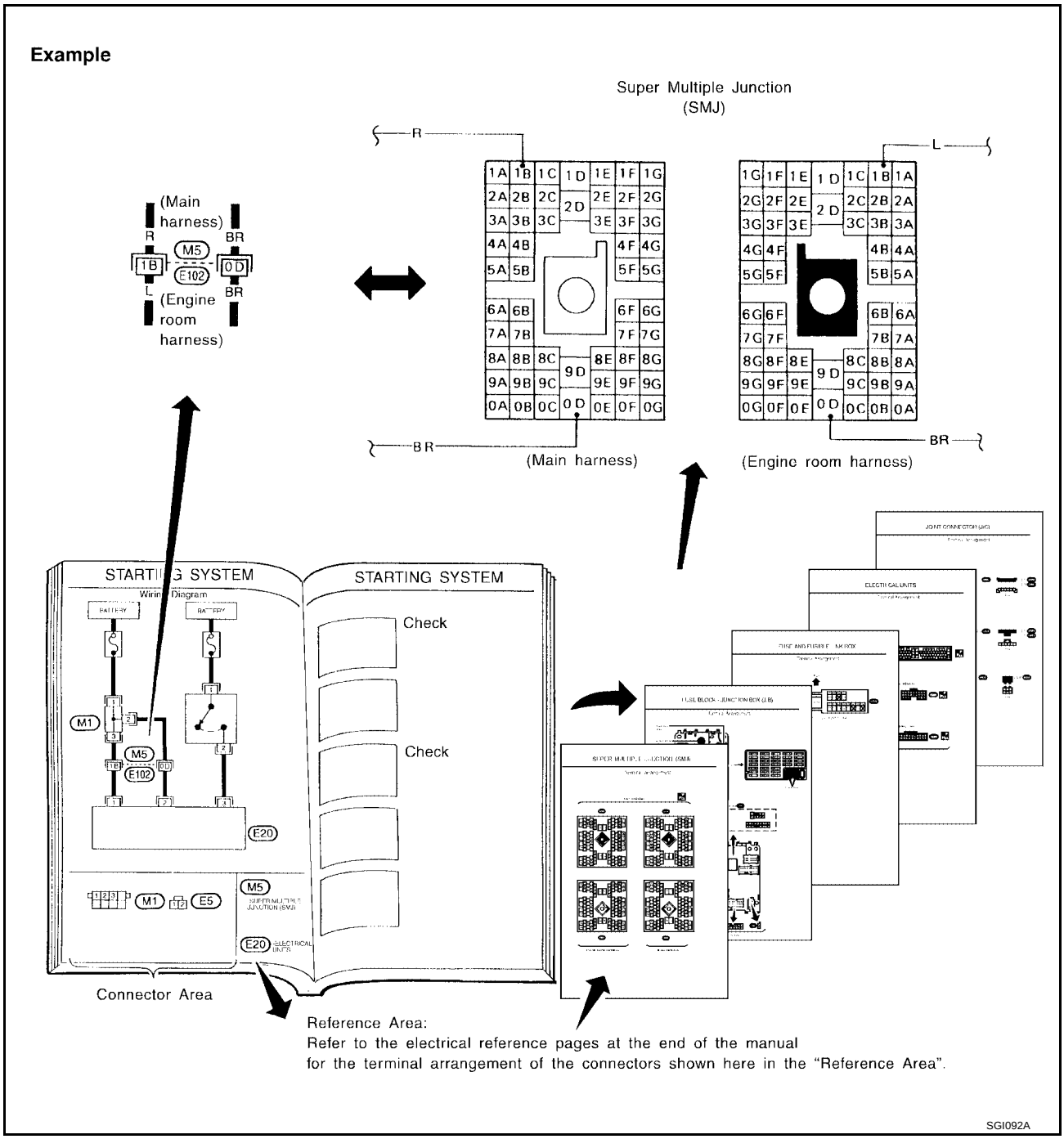
SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3-4
INT	3-4, 5-6
LO	3-6
HI	2-6
WASH	1-6

SGI875

Reference Area

The Reference Area of the wiring diagram contains references to additional electrical reference pages at the end of the manual. If connector numbers and titles are shown in the Reference Area of the wiring diagram, these connector symbols are not shown in the Connector Area.

Example



Abbreviations

EAS000VL

The following **ABBREVIATIONS** are used:

ABBREVIATION	DESCRIPTION
A/C	Air Conditioner
A/T	Automatic Transaxle/Transmission
ATF	Automatic Transmission Fluid
D_1	Drive range 1st gear
D_2	Drive range 2nd gear

ABBREVIATION	DESCRIPTION
D_3	Drive range 3rd gear
D_4	Drive range 4th gear
FR, RR	Front, Rear
LH, RH	Left-Hand, Right-Hand
M/T	Manual Transaxle/Transmission
OD	Overdrive
P/S	Power Steering
SAE	Society of Automotive Engineers, Inc.
SDS	Service Data and Specifications
SST	Special Service Tools
2WD	2-Wheel Drive
2_2	2nd range 2nd gear
2_1	2nd range 1st gear
1_2	1st range 2nd gear
1_1	1st range 1st gear

SERVICE INFORMATION FOR ELECTRICAL INCIDENT

PFP:00000

GI

How to Check Terminal

EAS000VM

CONNECTOR AND TERMINAL PIN KIT

Use the connector and terminal pin kits listed below when replacing connectors or terminals.
The connector and terminal pin kits contain some of the most commonly used NISSAN/INFINITI connectors and terminals. For detailed connector and terminal pin replacement procedures, refer to the latest NISSAN/INFINITI CONNECTOR AND TERMINAL PIN SERVICE MANUAL.

Tool number (Kent-Moore No.) Tool name	Description
- (J38751-95NI) Connector and terminal pin kit (NISSAN) - (J38751-95INF) Connector and terminal pin kit (INFINITI) - (J42992-98KIT) OBD and terminal repair kit - (J42992-2000UPD) OBD-II Connector Kit Update	J38751-95NI, J38751-95INF, J42992-98KIT, J42992-2000UPD WAIA0004E WAIA0005E

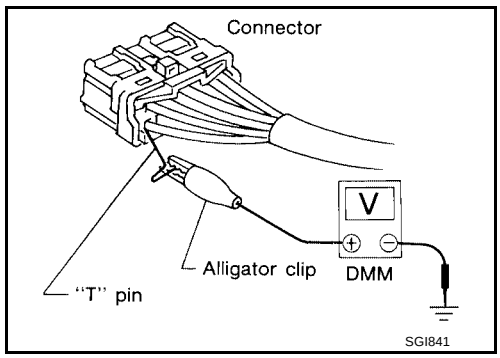
HOW TO PROBE CONNECTORS

Connector damage and an intermittent connection can result from improperly probing of the connector during circuit checks.
The probe of a digital multimeter (DMM) may not correctly fit the connector cavity. To correctly probe the connector, follow the procedures below using a “T” pin. For the best contact grasp the “T” pin using an alligator clip.

Probing from Harness Side

Standard type (not waterproof type) connector should be probed from harness side with “T” pin.

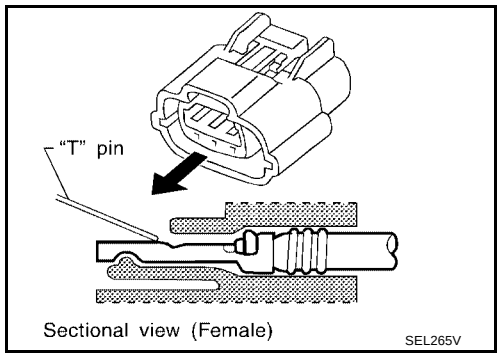
- If the connector has a rear cover such as a ECM connector, remove the rear cover before probing the terminal.
- Do not probe waterproof connector from harness side. Damage to the seal between wire and connector may result.



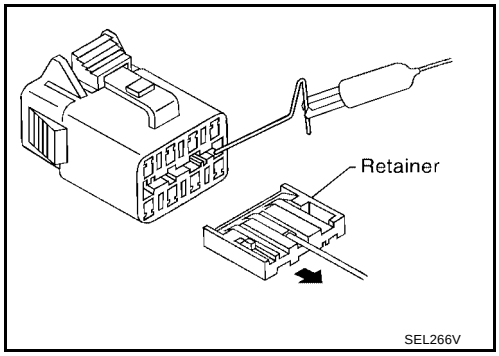
Probing from Terminal Side

FEMALE TERMINAL

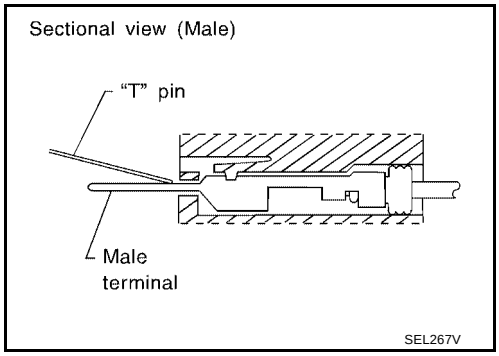
- There is a small notch above each female terminal. Probe each terminal with the “T” pin through the notch.
  Do not insert any object other than the same type male terminal into female terminal.



- Some connectors do not have a notch above each terminal. To probe each terminal, remove the connector retainer to make contact space for probing.



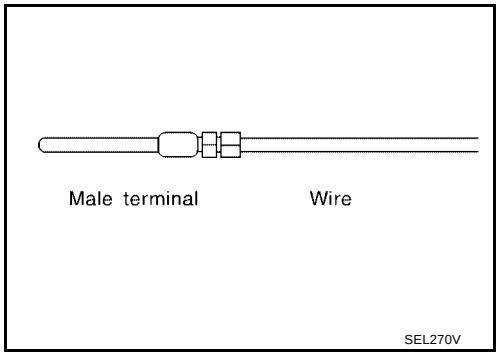
MALE TERMINAL
Carefully probe the contact surface of each terminal using a “T” pin.
Do not bend terminal.



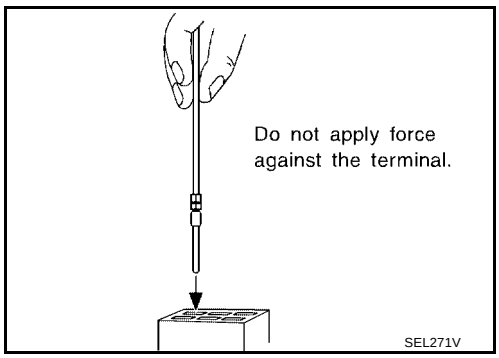
How to Check Enlarged Contact Spring of Terminal

An enlarged contact spring of a terminal may create intermittent signals in the circuit.
If the intermittent open circuit occurs, follow the procedure below to inspect for open wires and enlarged contact spring of female terminal.

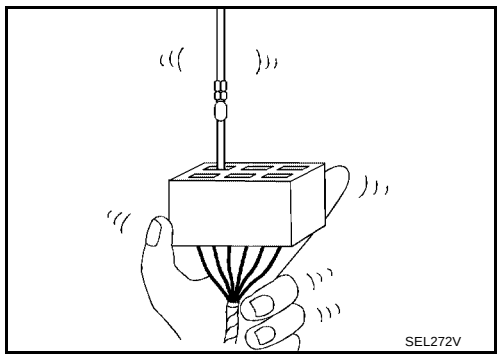
1. Assemble a male terminal and approx. 10 cm (3.9 in) of wire.
   Use a male terminal which matches the female terminal.
2. Disconnect the suspected faulty connector and hold it terminal side up.



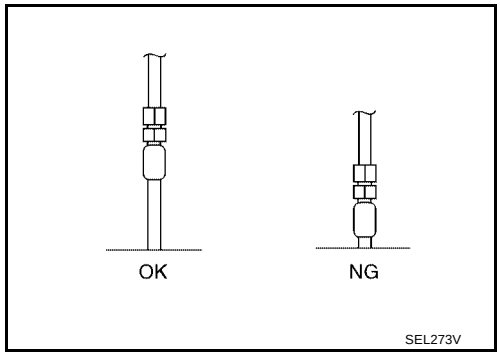
3. While holding the wire of the male terminal, try to insert the male terminal into the female terminal.
   Do not force the male terminal into the female terminal with your hands.



4. While moving the connector, check whether the male terminal can be easily inserted or not.



- If the male terminal can be easily inserted into the female terminal, replace the female terminal.

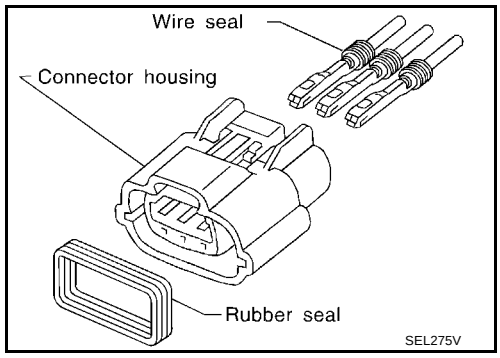


Waterproof Connector Inspection

If water enters the connector, it can short interior circuits. This may lead to intermittent problems. Check the following items to maintain the original waterproof characteristics.

RUBBER SEAL INSPECTION

- Most waterproof connectors are provided with a rubber seal between the male and female connectors. If the seal is missing, the waterproof performance may not meet specifications.
- The rubber seal may come off when connectors are disconnected. Whenever connectors are reconnected, make sure the rubber seal is properly installed on either side of male or female connector.

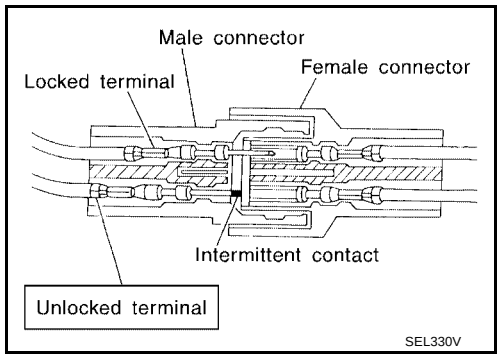


WIRE SEAL INSPECTION

The wire seal must be installed on the wire insertion area of a waterproof connector. Be sure that the seal is installed properly.

Terminal Lock Inspection

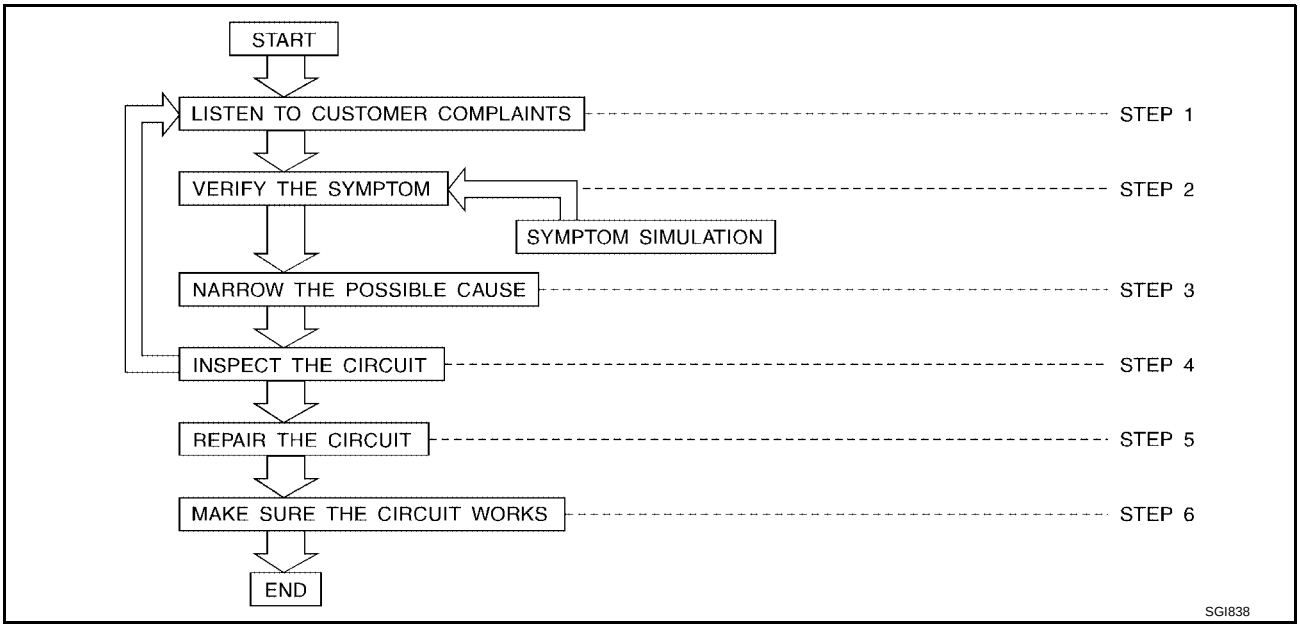
Check for unlocked terminals by pulling wire at the end of connector. An unlocked terminal may create intermittent signals in the circuit.



How to Perform Efficient Diagnosis for an Electrical Incident

EAS000VN

WORK FLOW



STEP	DESCRIPTION	
STEP 1	Get detailed information about the conditions and the environment when the incident occurred. The following are key pieces of information required to make a good analysis:	
	WHAT	Vehicle Model, Engine, Transmission/Transaxle and the System (i.e. Radio).
	WHEN	Date, Time of Day, Weather Conditions, Frequency.
	WHERE	Road Conditions, Altitude and Traffic Situation.
	HOW	System Symptoms, Operating Conditions (Other Components Interaction). Service History and if any After Market Accessories have been installed.
STEP 2	Operate the system, road test if necessary. Verify the parameter of the incident. If the problem cannot be duplicated, refer to “Incident Simulation Tests”.	
STEP 3	Get the proper diagnosis materials together including: ● Power Supply Routing ● System Operation Descriptions ● Applicable Service Manual Sections ● Check for any Service Bulletins Identify where to begin diagnosis based upon your knowledge of the system operation and the customer comments.	
STEP 4	Inspect the system for mechanical binding, loose connectors or wiring damage. Determine which circuits and components are involved and diagnose using the Power Supply Routing and Harness Layouts.	
STEP 5	Repair or replace the incident circuit or component.	
STEP 6	Operate the system in all modes. Verify the system works properly under all conditions. Make sure you have not inadvertently created a new incident during your diagnosis or repair steps.	

INCIDENT SIMULATION TESTS

Introduction

Sometimes the symptom is not present when the vehicle is brought in for service. If possible, re-create the conditions present at the time of the incident. Doing so may help avoid a No Trouble Found Diagnosis. The following section illustrates ways to simulate the conditions/environment under which the owner experiences an electrical incident.

The section is broken into the six following topics:

- Vehicle vibration
- Heat sensitive

- Freezing
- Water intrusion
- Electrical load
- Cold or hot start up

Get a thorough description of the incident from the customer. It is important for simulating the conditions of the problem.

Vehicle Vibration

The problem may occur or become worse while driving on a rough road or when engine is vibrating (idle with A/C on). In such a case, you will want to check for a vibration related condition. Refer to the following illustration.

CONNECTORS & HARNESS

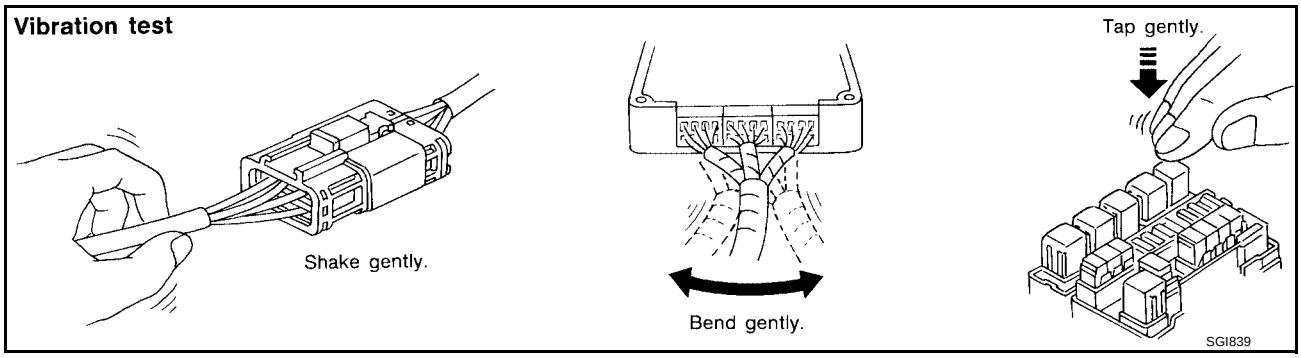
Determine which connectors and wiring harness would affect the electrical system you are inspecting. Gently shake each connector and harness while monitoring the system for the incident you are trying to duplicate. This test may indicate a loose or poor electrical connection.

HINT

Connectors can be exposed to moisture. It is possible to get a thin film of corrosion on the connector terminals. A visual inspection may not reveal this without disconnecting the connector. If the problem occurs intermittently, perhaps the problem is caused by corrosion. It is a good idea to disconnect, inspect and clean the terminals on related connectors in the system.

SENSORS & RELAYS

Gently apply a slight vibration to sensors and relays in the system you are inspecting.
This test may indicate a loose or poorly mounted sensor or relay.



ENGINE COMPARTMENT

There are several reasons a vehicle or engine vibration could cause an electrical complaint. Some of the things to check for are:

- Connectors not fully seated.
- Wiring harness not long enough and is being stressed due to engine vibrations or rocking.
- Wires laying across brackets or moving components.
- Loose, dirty or corroded ground wires.
- Wires routed too close to hot components.

To inspect components under the hood, start by verifying the integrity of ground connections. (Refer to Ground Inspection described later.) First check that the system is properly grounded. Then check for loose connection by gently shaking the wiring or components as previously explained. Using the wiring diagrams inspect the wiring for continuity.

BEHIND THE INSTRUMENT PANEL

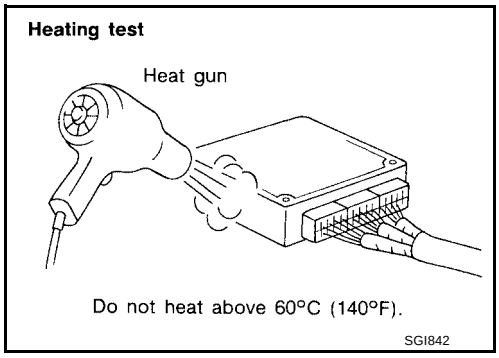
An improperly routed or improperly clamped harness can become pinched during accessory installation. Vehicle vibration can aggravate a harness which is routed along a bracket or near a screw.

UNDER SEATING AREAS

An unclamped or loose harness can cause wiring to be pinched by seat components (such as slide guides) during vehicle vibration. If the wiring runs under seating areas, inspect wire routing for possible damage or pinching.

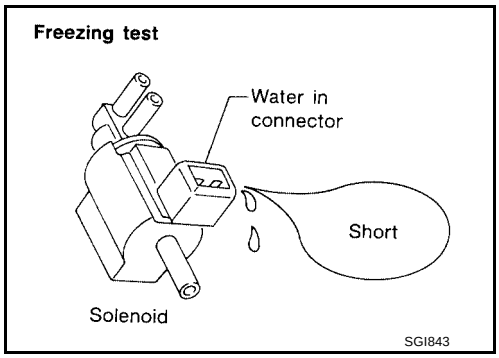
Heat Sensitive

The customer's concern may occur during hot weather or after car has sat for a short time. In such cases you will want to check for a heat sensitive condition.
To determine if an electrical component is heat sensitive, heat the component with a heat gun or equivalent.
Do not heat components above 60°C (140°F). If incident occurs while heating the unit, either replace or properly insulate the component.



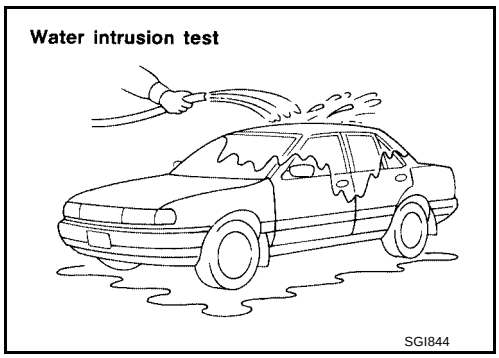
Freezing

The customer may indicate the incident goes away after the car warms up (winter time). The cause could be related to water freezing somewhere in the wiring/electrical system.
There are two methods to check for this. The first is to arrange for the owner to leave his car overnight. Make sure it will get cold enough to demonstrate his complaint. Leave the car parked outside overnight. In the morning, do a quick and thorough diagnosis of those electrical components which could be affected.
The second method is to put the suspect component into a freezer long enough for any water to freeze. Reinstall the part into the car and check for the reoccurrence of the incident. If it occurs, repair or replace the component.



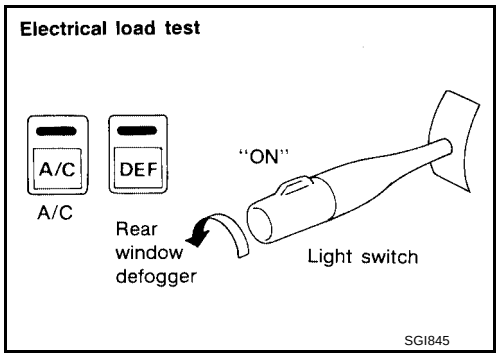
Water Intrusion

The incident may occur only during high humidity or in rainy/snowy weather. In such cases the incident could be caused by water intrusion on an electrical part. This can be simulated by soaking the car or running it through a car wash.
Do not spray water directly on any electrical components.



Electrical Load

The incident may be electrical load sensitive. Perform diagnosis with all accessories (including A/C, rear window defogger, radio, fog lamps) turned on.



Cold or Hot Start Up

On some occasions an electrical incident may occur only when the car is started cold, or it may occur when the car is restarted hot shortly after being turned off. In these cases you may have to keep the car overnight to make a proper diagnosis.

CIRCUIT INSPECTION

Introduction

In general, testing electrical circuits is an easy task if it is approached in a logical and organized method. Before beginning it is important to have all available information on the system to be tested. Also, get a thorough understanding of system operation. Then you will be able to use the appropriate equipment and follow the correct test procedure.
You may have to simulate vehicle vibrations while testing electrical components. Gently shake the wiring harness or electrical component to do this.

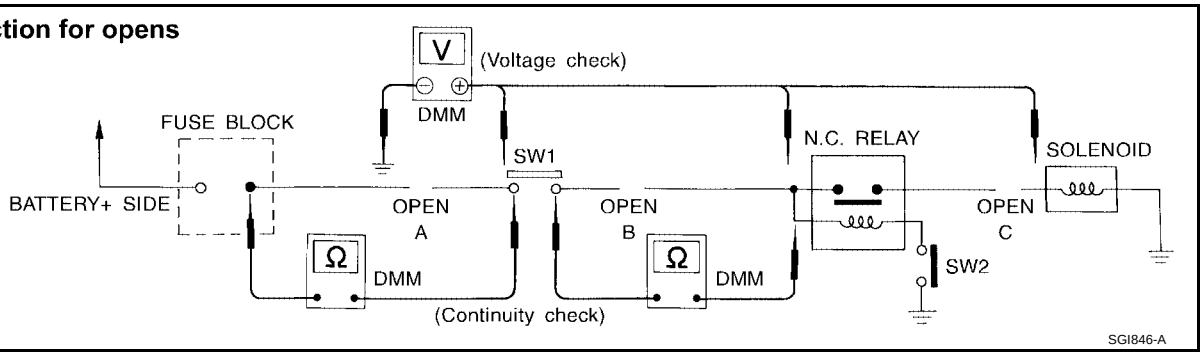
OPEN	A circuit is open when there is no continuity through a section of the circuit.	
SHORT	There are two types of shorts.	
	● SHORT CIRCUIT	When a circuit contacts another circuit and causes the normal resistance to change.
	● SHORT TO GROUND	When a circuit contacts a ground source and grounds the circuit.

NOTE:
Refer to “How to Check Terminal” to probe or check terminal.

Testing for “Opens” in the Circuit

Before you begin to diagnose and test the system, you should rough sketch a schematic of the system. This will help you to logically walk through the diagnosis process. Drawing the sketch will also reinforce your working knowledge of the system.

Inspection for opens



CONTINUITY CHECK METHOD
The continuity check is used to find an open in the circuit. The digital multimeter (DMM) set on the resistance function will indicate an open circuit as over limit (no beep tone or no ohms symbol). Make sure to always start with the DMM at the highest resistance level.
To help in understanding the diagnosis of open circuits, please refer to the previous schematic.

- Disconnect the battery negative cable.
- Start at one end of the circuit and work your way to the other end. (At the fuse block in this example)
- Connect one probe of the DMM to the fuse block terminal on the load side.
- Connect the other probe to the fuse block (power) side of SW1. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point A)
- Connect the probes between SW1 and the relay. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point B)
- Connect the probes between the relay and the solenoid. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point C)

Any circuit can be diagnosed using the approach in the previous example.

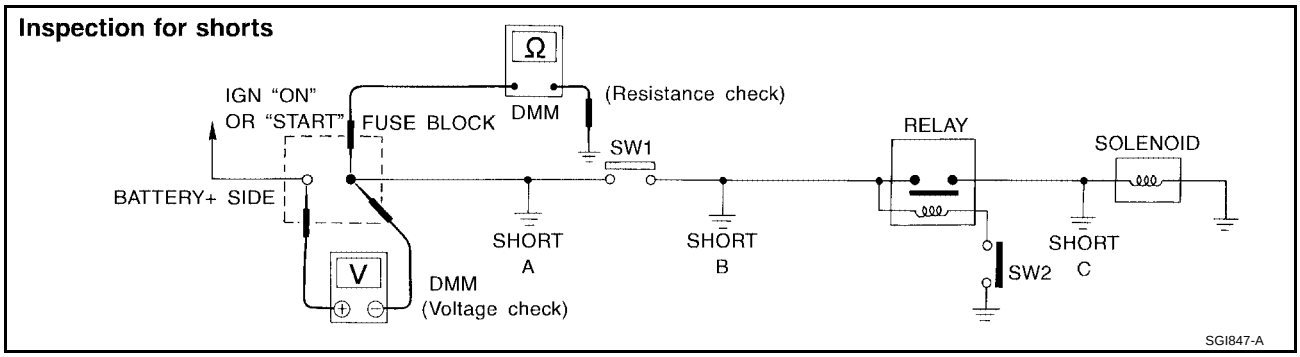
VOLTAGE CHECK METHOD
To help in understanding the diagnosis of open circuits please refer to the previous schematic.
In any powered circuit, an open can be found by methodically checking the system for the presence of voltage. This is done by switching the DMM to the voltage function.

- Connect one probe of the DMM to a known good ground.
- Begin probing at one end of the circuit and work your way to the other end.
- With SW1 open, probe at SW1 to check for voltage.
  voltage; open is further down the circuit than SW1.
  no voltage; open is between fuse block and SW1 (point A).
- Close SW1 and probe at relay.
  voltage; open is further down the circuit than the relay.
  no voltage; open is between SW1 and relay (point B).
- Close the relay and probe at the solenoid.
  voltage; open is further down the circuit than the solenoid.
  no voltage; open is between relay and solenoid (point C).

Any powered circuit can be diagnosed using the approach in the previous example.

Testing for "Shorts" in the Circuit

To simplify the discussion of shorts in the system, please refer to the following schematic.



RESISTANCE CHECK METHOD

- Disconnect the battery negative cable and remove the blown fuse.
- Disconnect all loads (SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
- Connect one probe of the DMM to the load side of the fuse terminal. Connect the other probe to a known good ground.
- With SW1 open, check for continuity.
  continuity; short is between fuse terminal and SW1 (point A).
  no continuity; short is further down the circuit than SW1.
- Close SW1 and disconnect the relay. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity.
  continuity; short is between SW1 and the relay (point B).
  no continuity; short is further down the circuit than the relay.
- Close SW1 and jump the relay contacts with jumper wire. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity.
  continuity; short is between relay and solenoid (point C).
  no continuity; check solenoid, retrace steps.

VOLTAGE CHECK METHOD

- Remove the blown fuse and disconnect all loads (i.e. SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
- Turn the ignition key to the ON or START position. Verify battery voltage at the battery + side of the fuse terminal (one lead on the battery + terminal side of the fuse block and one lead on a known good ground).
- With SW1 open and the DMM leads across both fuse terminals, check for voltage.
  voltage; short is between fuse block and SW1 (point A).
  no voltage; short is further down the circuit than SW1.
- With SW1 closed, relay and solenoid disconnected and the DMM leads across both fuse terminals, check for voltage.
  voltage; short is between SW1 and the relay (point B).

no voltage; short is further down the circuit than the relay.

- With SW1 closed, relay contacts jumped with fused jumper wire check for voltage.
  voltage; short is down the circuit of the relay or between the relay and the disconnected solenoid (point C).
  no voltage; retrace steps and check power to fuse block.

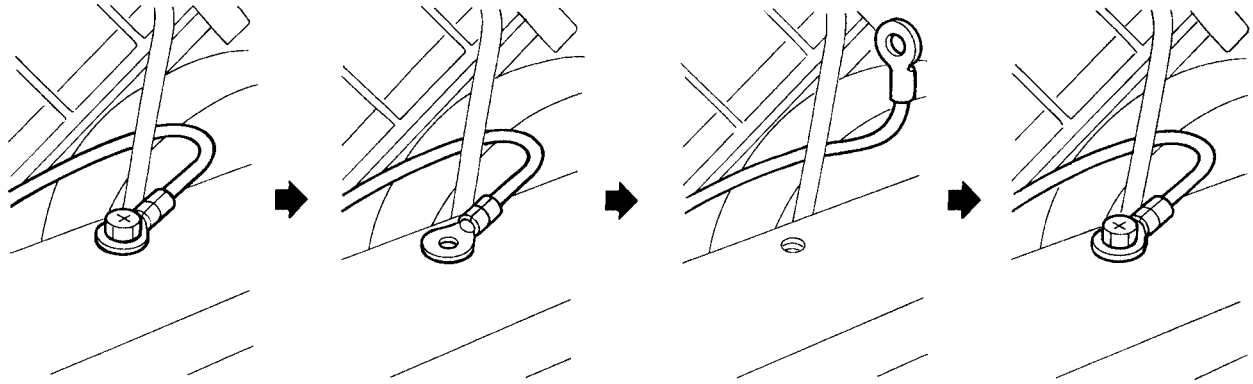
Ground Inspection

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.
Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can easily affect the circuit. Even when the ground connection looks clean, there can be a thin film of rust on the surface.
When inspecting a ground connection follow these rules:

- Remove the ground bolt or screw.
- Inspect all mating surfaces for tarnish, dirt, rust, etc.
- Clean as required to assure good contact.
- Reinstall bolt or screw securely.
- Inspect for “add-on” accessories which may be interfering with the ground circuit.
- If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are cased in one eyelet make sure no ground wires have excess wire insulation.

For detailed ground distribution information, refer to “Ground Distribution” in PG section.

Ground Inspection



Voltage Drop Tests

Voltage drop tests are often used to find components or circuits which have excessive resistance. A voltage drop in a circuit is caused by a resistance when the circuit is in operation.
Check the wire in the illustration. When measuring resistance with DMM, contact by a single strand of wire will give reading of 0 ohms. This would indicate a good circuit. When the circuit operates, this single strand of wire is not able to carry the current. The single strand will have a high resistance to the current. This will be picked up as a slight voltage drop.
Unwanted resistance can be caused by many situations as follows:

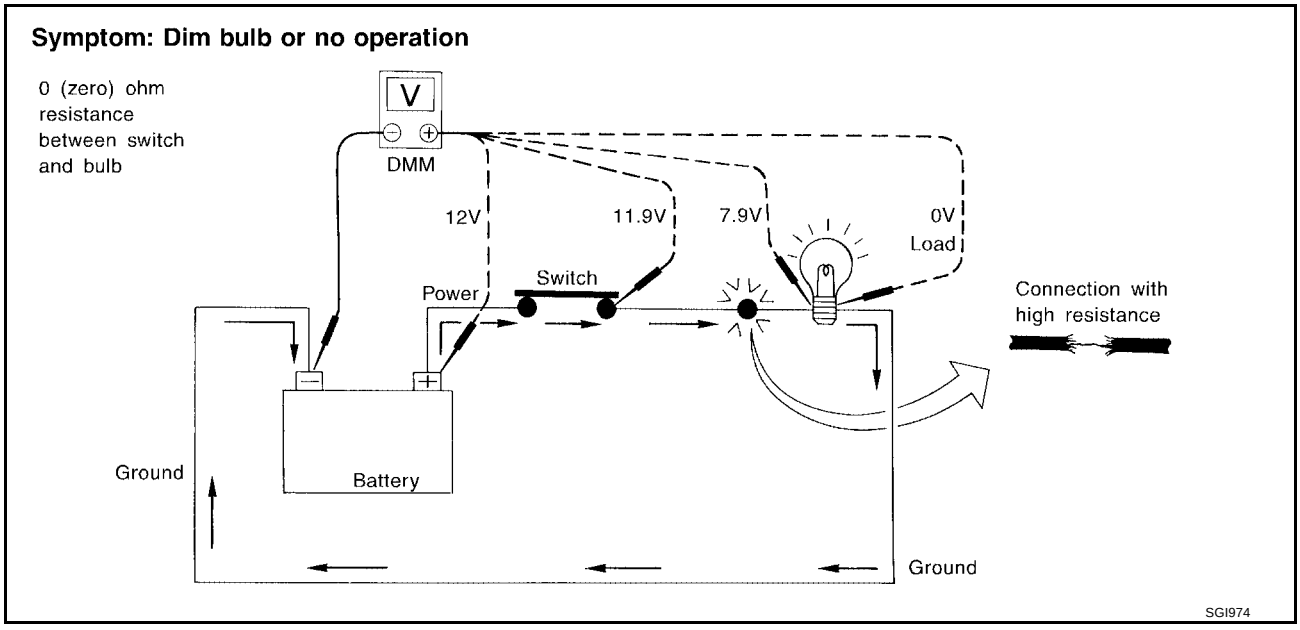
- Undersized wiring (single strand example)
- Corrosion on switch contacts
- Loose wire connections or splices.

If repairs are needed always use wire that is of the same or larger gauge.

MEASURING VOLTAGE DROP — ACCUMULATED METHOD

- Connect the DMM across the connector or part of the circuit you want to check. The positive lead of the DMM should be closer to power and the negative lead closer to ground.
- Operate the circuit.
- The DMM will indicate how many volts are being used to “push” current through that part of the circuit.

Note in the illustration that there is an excessive 4.1 volt drop between the battery and the bulb.



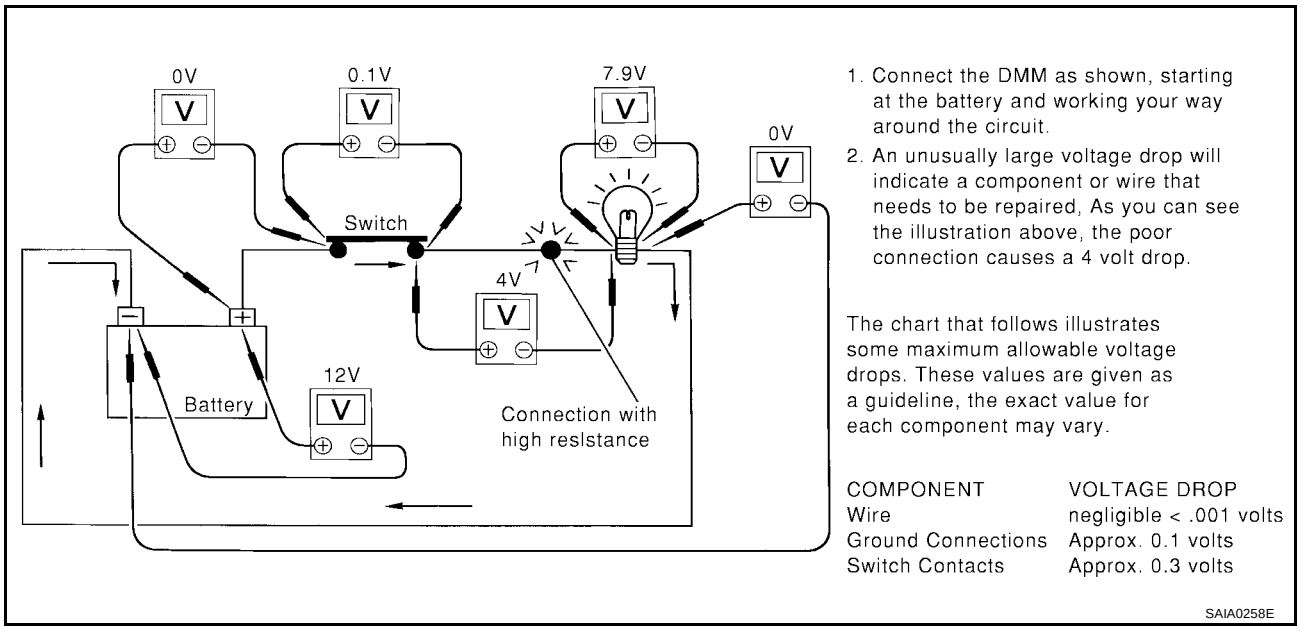
MEASURING VOLTAGE DROP — STEP-BY-STEP

The step-by-step method is most useful for isolating excessive drops in low voltage systems (such as those in “Computer Controlled Systems”).

Circuits in the “Computer Controlled System” operate on very low amperage.

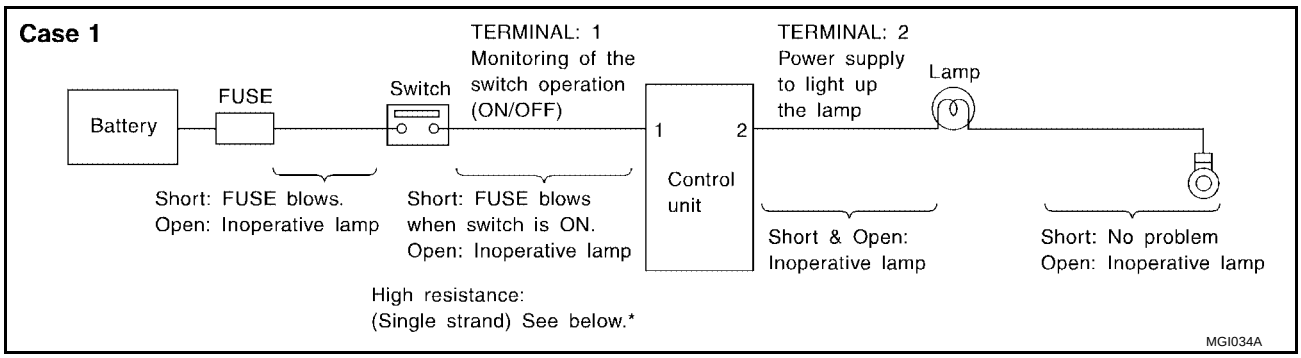
The (Computer Controlled) system operations can be adversely affected by any variation in resistance in the system. Such resistance variation may be caused by poor connection, improper installation, improper wire gauge or corrosion.

The step by step voltage drop test can identify a component or wire with too much resistance.



Control Unit Circuit Test

System Description:When the switch is ON, the control unit lights up the lamp.

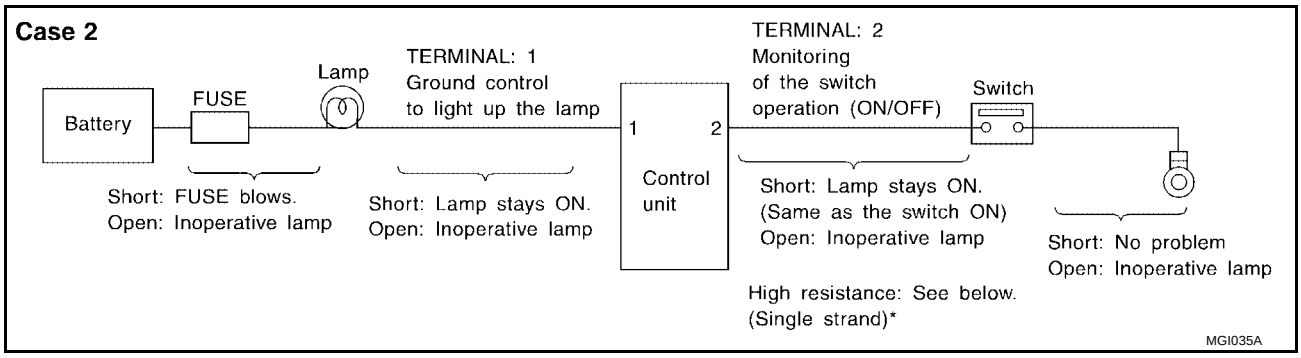


INPUT-OUTPUT VOLTAGE CHART

Pin No.	Item	Condition	Voltage value [V]	In case of high resistance such as single strand [V] *
1	Switch	Switch ON	Battery voltage	Lower than battery voltage Approx. 8 (Example)
		Switch OFF	Approx. 0	Approx. 0
2	Lamp	Switch ON	Battery voltage	Approx. 0 (Inoperative lamp)
		Switch OFF	Approx. 0	Approx. 0

The voltage value is based on the body ground.

*:If high resistance exists in the switch side circuit (caused by a single strand), terminal 1 does not detect battery voltage. Control unit does not detect the switch is ON even if the switch does not turn ON. Therefore, the control unit does not supply power to light up the lamp.



INPUT-OUTPUT VOLTAGE CHART

Pin No.	Item	Condition	Voltage value [V]	In case of high resistance such as single strand [V] *
1	Lamp	Switch ON	Approx. 0	Battery voltage (Inoperative lamp)
		Switch OFF	Battery voltage	Battery voltage
2	Switch	Switch ON	Approx. 0	Higher than 0 Approx. 4 (Example)
		Switch OFF	Approx. 5	Approx. 5

The voltage value is based on the body ground.

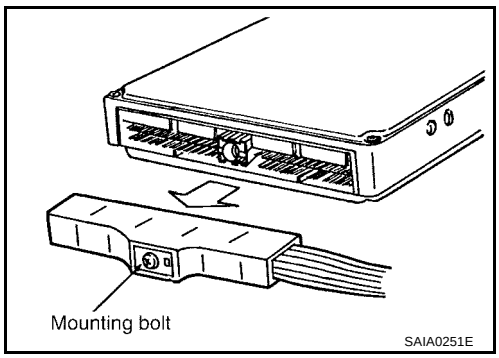
*:If high resistance exists in the switch side circuit (caused by a single strand), terminal 2 does not detect approx. 0V. Control unit does not detect the switch is ON even if the switch does not turn ON. Therefore, the control unit does not control ground to light up the lamp.

Control Units and Electrical Parts

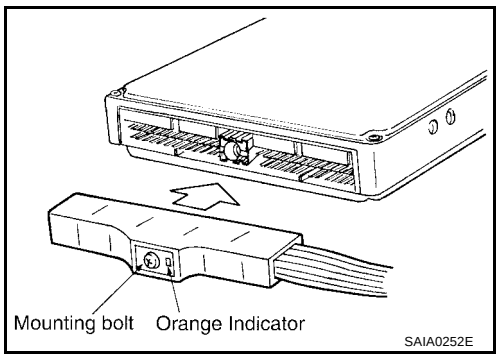
EAS000VO

PRECAUTIONS

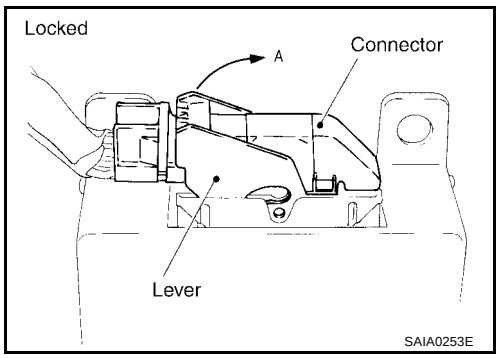
- Never reverse polarity of battery terminals.
- Install only parts specified for a vehicle.
- Before replacing the control unit, check the input and output and functions of the component parts.
- Do not apply excessive force when disconnecting a connector.
- If a connector is installed by tightening bolts, loosen bolt mounting it, then take it out by hand.



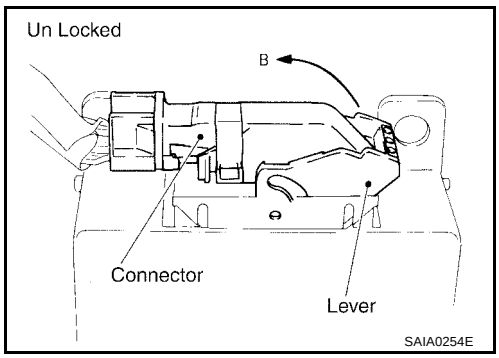
- Before installing a connector, make sure the terminal is not bent or damaged, and then correctly connect it.
  When installing a connector by tightening bolts, fix it by tightening the mounting bolt until the painted projection of the connector becomes even with the surface.



- For removal of the lever type connector, pull the lever up to the direction pointed to by the arrow A in the figure, and then remove the connector.

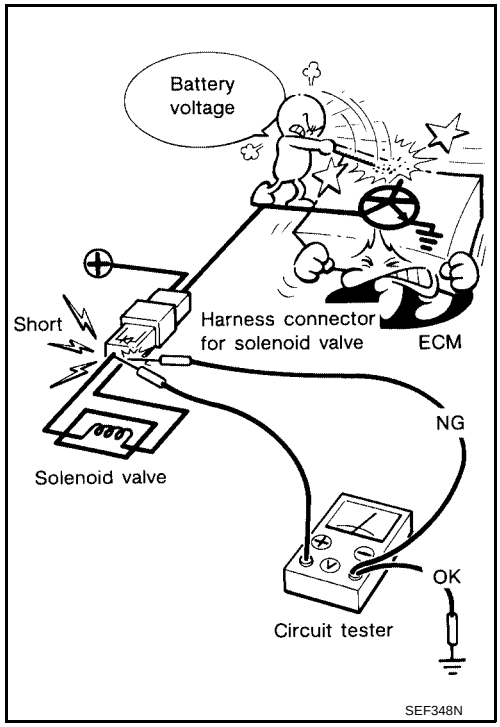


- For installation of the lever type connector, pull down the lever to the direction pointed by the arrow B in the figure, and then push the connector until a clicking noise is heard.



- Do not apply excessive shock to the control unit by dropping or hitting it.
- Be careful to prevent condensation in the control unit due to rapid temperature changes and do not let water or rain get on it. If water is found in the control unit, dry it fully and then install it in the vehicle.
- Be careful not to let oil to get on the control unit connector.
- Avoid cleaning the control unit with volatile oil.
- Do not disassemble the control unit, and do not remove the upper and lower covers.

- When using a DMM, be careful not to let test probes get close to each other to prevent the power transistor in the control unit from damaging battery voltage because of short circuiting.
- When checking input and output signals of the control unit, use the specified check adapter.



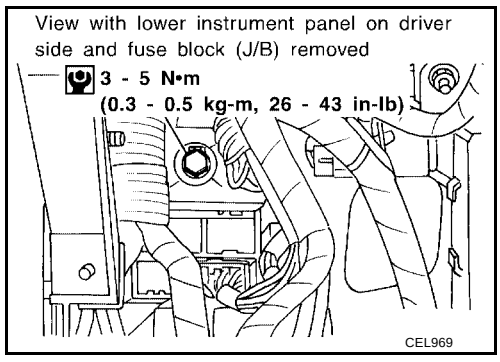
SMJ INSTALLATION

To install SMJ, tighten bolts until orange “fulltight” mark appears and then retighten to specified torque as required.

SMJ :3 - 5 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)

CAUTION:

Do not overtighten bolts, otherwise, they may be damaged.



CONSULT CHECKING SYSTEM

PFP:00000

Description

EAS000VP

- CONSULT-II is a hand-held type tester. When it is connected with a diagnostic connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests.
- Refer to “CONSULT Operator's Manual” for more information.

Function and System Application

EAS000VQ

Diagnostic test mode	Function	ENGINE	A/T	ABS	AIR BAG	SMART ENTRANCE	NVIS (NATS)*
Work support	This mode enables a technician to adjust some devices faster and more accurate by following the indications on CONSULT-II.	x	x	—	—	—	—
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	x	x	x	x	—	x
Trouble diagnostic record	Current self-diagnostic results and all trouble diagnostic records previously stored can be read.	—	—	—	x	—	—
ECU discriminated No.	Classification number of a replacement ECU can be read to prevent an incorrect ECU from being installed.	—	—	—	x	—	—
Data monitor	Input/Output data in the ECU (ECM) can be read.	x	x	x	—	—	—
DTC work support	This mode enables a technician to set operating conditions to confirm self-diagnosis status/ results.	—	x	—	—	—	—
Data monitor (Spec.)	The specified values will be displayed when an OK/NG judgement is difficult for the DATA MONITOR items by Bar Chart and Line Graph.	x	—	—	—	—	—
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECU (ECM) and also shifts some parameters in a specified range.	x	—	x	—	—	—
ECU (ECM) part number	ECU (ECM) part number can be read.	x	x	x	—	—	—
Control unit initialization	All registered ignition key IDs in NATS components can be initialized and new IDs can be registered.	—	—	—	—	—	x
Function test	Conducted by CONSULT-II instead of a technician to determine whether each system is "OK" or "NG".	x	—	—	x	—	—
SRT & DTC confirmation	The results of SRT (System Readiness Test) and the self-diagnosis status/results can be confirmed.	x	—	—	—	—	—
REMO CONT ID SET UP	A maximum of four IDs (identifications) can be registered in the memory using the remote controller. These IDs can also be confirmed and erased.	—	—	—	—	x	—

x: Applicable
*: NVIS (NATS) [Nissan Vehicle Immobilizer System (Nissan Anti-Theft System)]

Nickel Metal Hydride Battery Replacement

EAS000VR

CONSULT-II contains a nickel metal hydride battery. When replacing the battery obey the following:

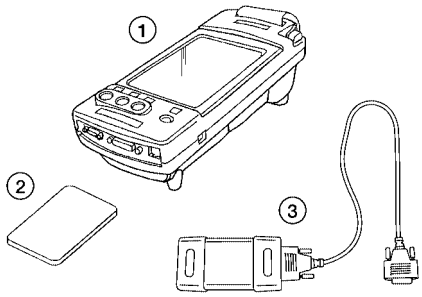
WARNING:

Replace the nickel metal hydride battery with Genuine CONSULT-II battery only. Use of another battery may present a risk of fire or explosion. The battery may present a fire or chemical burn hazard if mistreated. Do not recharge, disassemble or dispose of in fire.
Keep the battery out of reach of children and discard used battery conforming to the local regulations.

Checking Equipment

EAS00159

When ordering the below equipment, contact your NISSAN distributor.

Tool name	Description
NISSAN CONSULT-II (J-44200) 1. CONSULT-II unit (Tester internal soft: Resident version 3.3.0) and accessories 2. Program card AED03C and AEN02C (For NATS) To confirm the best combination of these softwares, refer to CONSULT-II Operation Manual. 3. CONSULT-II coverter	 LAIA0038E

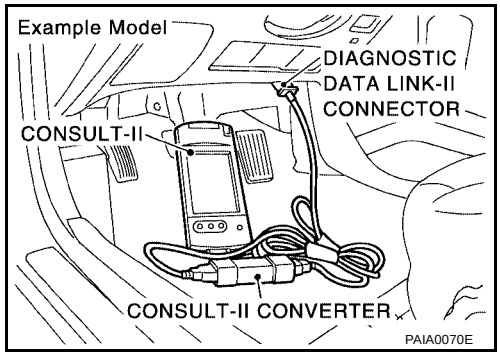
NOTE:

- The CONSULT-II must be used in conjunction with a program card. CONSULT-II does not require loading (Initialization) procedure.
- Be sure the CONSULT-II is turned off before installing or removing a program card.

CONSULT-II Start Procedure

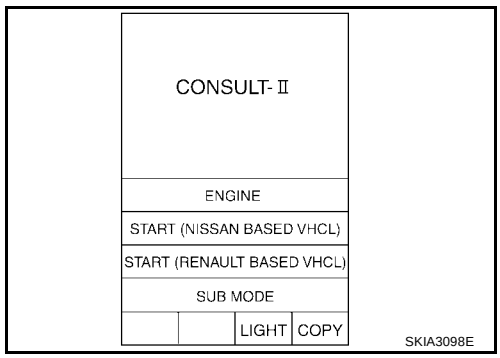
EAS0015A

1. Turn off the ignition switch.
2. Connect CONSULT-II and CONSULT-II CONVERTER to the data link connector.



PAIA0070E

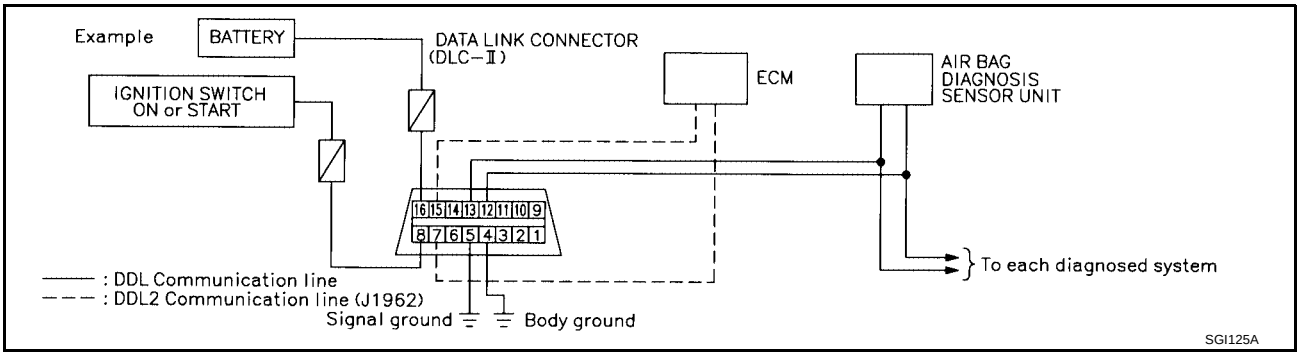
3. Turn on the ignition switch.
4. Touch “START (NISSAN BASED VECL)” or “System Shortcut” (eg: Engine) on the screen.



SKIA3098E

CONSULT-II Data Link Connector (DLC) Circuit

EAS000VU



INSPECTION PROCEDURE

If the CONSULT-II cannot diagnose the system properly, check the following items.

Symptom	Check item
CONSULT-II cannot access any system.	● CONSULT-II DLC power supply circuit (Terminal 8) and ground circuit (Terminal 4) (For detailed circuit, refer to “MIL & Data Link Connectors Wiring Diagram” in EC section.) ● CONSULT-II DLC cable
CONSULT-II cannot access individual system. (Other systems can be accessed.)	● CONSULT-II program card (Check the appropriate CONSULT-II program card for the system. Refer to "Checking Equipment".) ● Power supply and ground circuit for the control unit of the system (For detailed circuit, refer to wiring diagram for each system.) ● Open or short circuit between the system and CONSULT-II DLC (For detailed circuit, refer to wiring diagram for each system.)

NOTE:

The DDL1 and DDL2 circuits from DLC pins 12, 13, 14 and 15 may be connected to more than one system. A short in a DDL circuit connected to a control unit in one system may affect CONSULT-II access to other systems.

LIFTING POINT

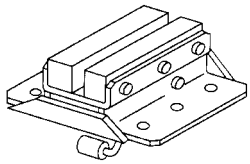
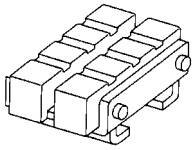
PFP:00000

EAS000VV

Lifting Points and Tow Truck Towing

SPECIAL SERVICE TOOLS

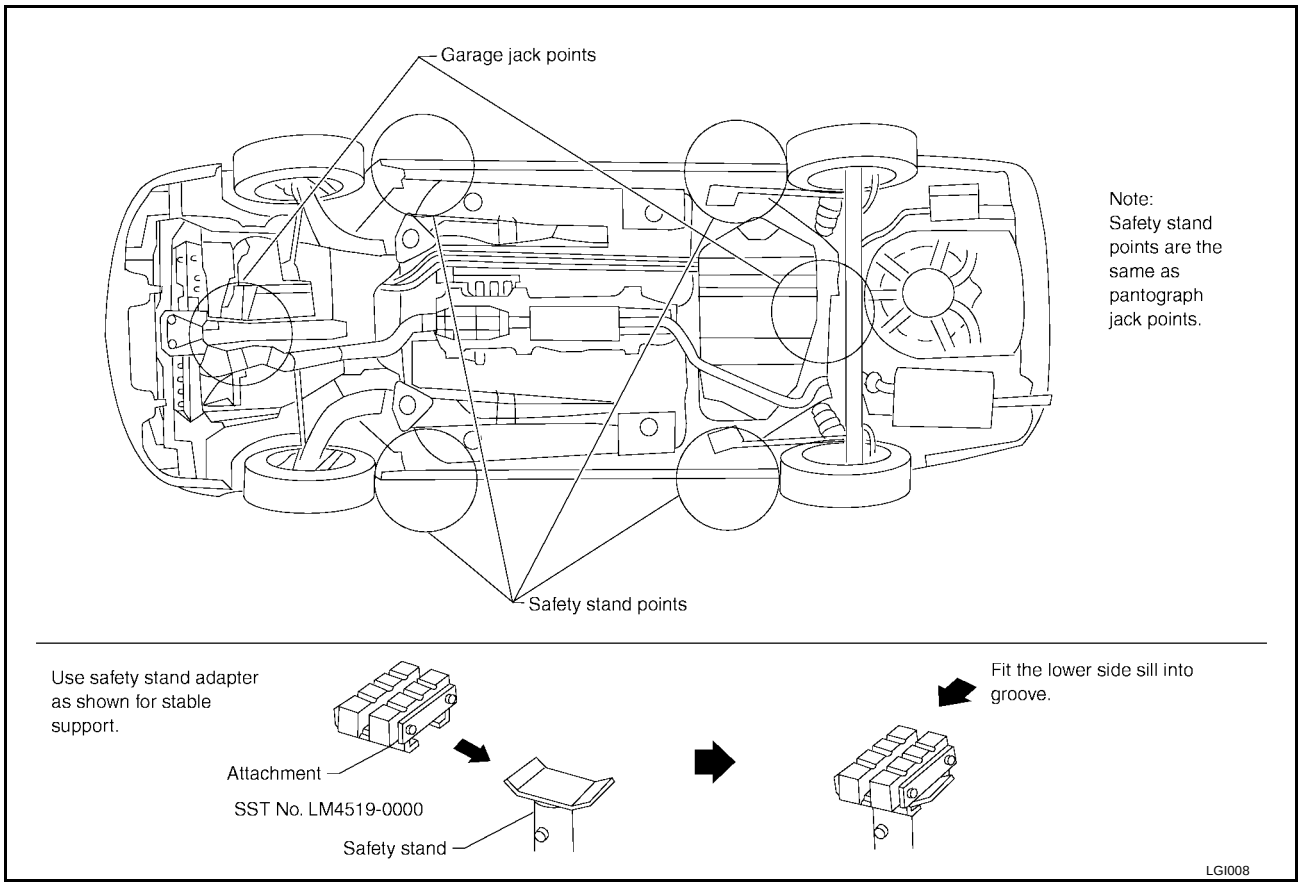
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore number) Tool name	Description
LM4086-0200 (—) Board-on attachment	 NT001
LM4519-0000 (—) Safety stand attachment	 NT002

GARAGE JACK AND SAFETY STAND

WARNING:

- **Never get under the vehicle while it is supported only by the jack. Always use safety stands when you have to get under the vehicle.**
- **Place wheel chocks at both front and back of the wheels on the ground.**

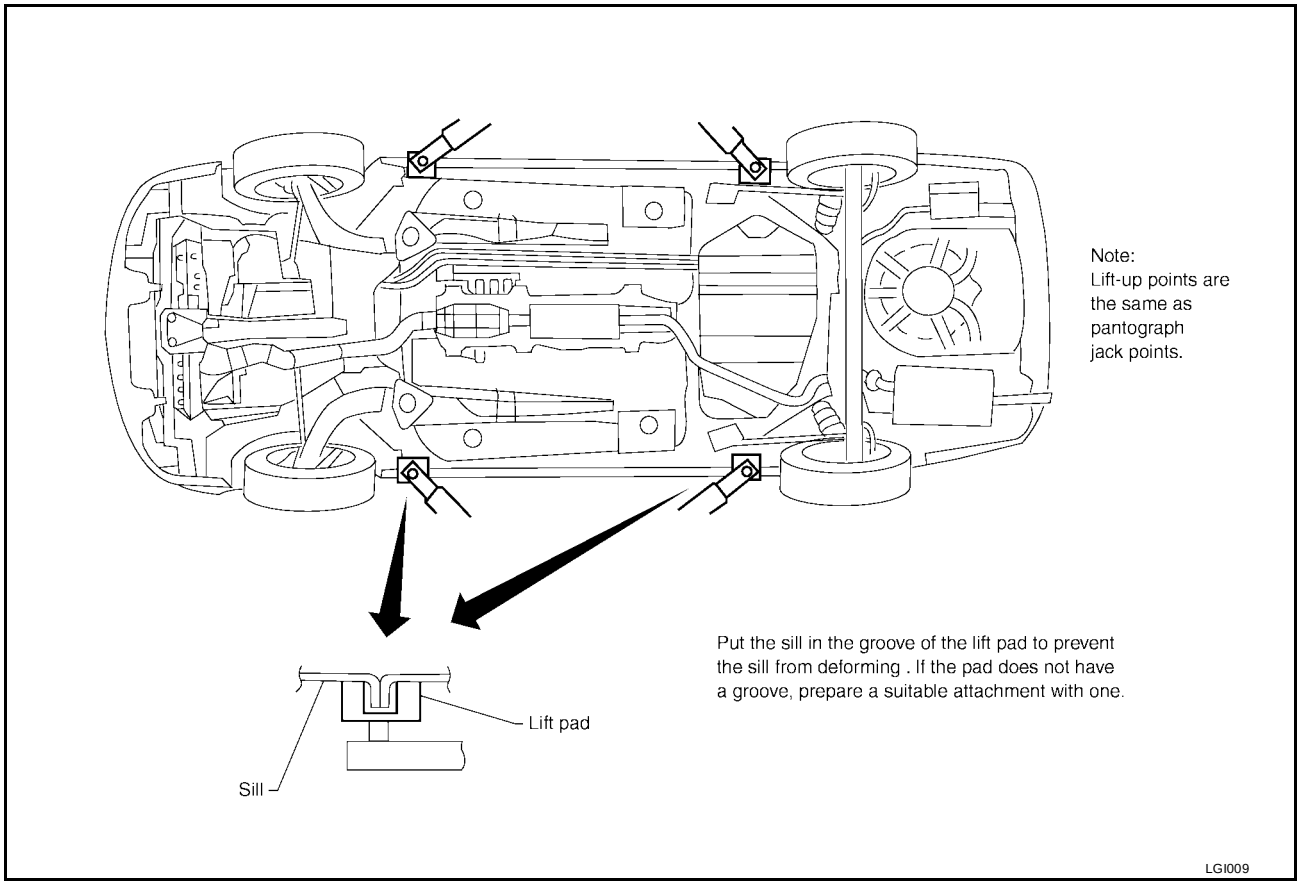


2-POLE LIFT

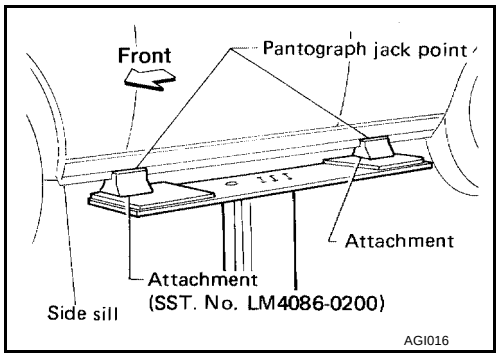
WARNING:

When lifting the vehicle, open the lift arms as wide as possible and ensure that the front and rear of the vehicle are well balanced.

When setting the lift arm, do not allow the arm to contact the brake tubes, brake cable, fuel lines and sill spoiler.



BOARD-ON LIFT



CAUTION:

Make sure vehicle is empty when lifting.

- **The board-on lift attachment (LM4086-0200) set at front end of vehicle should be set on the front of the sill under the front door opening.**
- **Position attachments at front and rear ends of board-on lift.**

TOW TRUCK TOWING

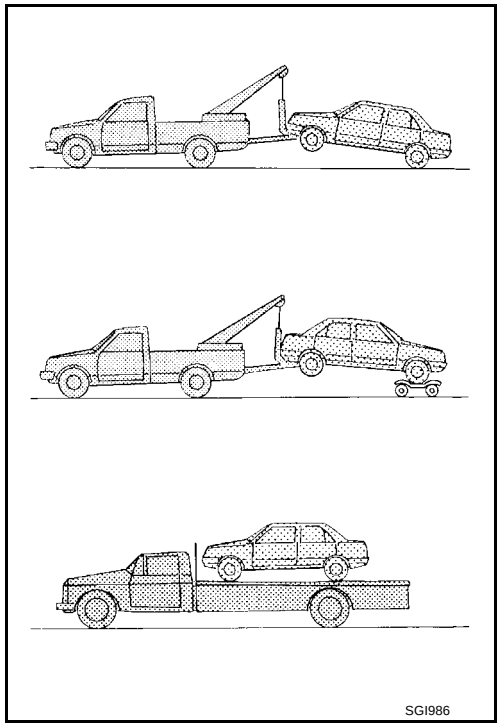
PFP:00000

EAS000VW

Tow Truck Towing

CAUTION:

- **All applicable state or Provincial (in Canada) laws and local laws regarding the towing operation must be obeyed.**
- **It is necessary to use proper towing equipment to avoid possible damage to the vehicle during towing operation. Towing is in accordance with Towing Procedure Manual at dealer.**
- **Always attach safety chains before towing.**
- **When towing, make sure that the transmission, steering system and power train are in good order. If any unit is damaged, dollies must be used.**



NISSAN recommends that the vehicle be towed with the driving (front) wheels off the ground as illustrated.

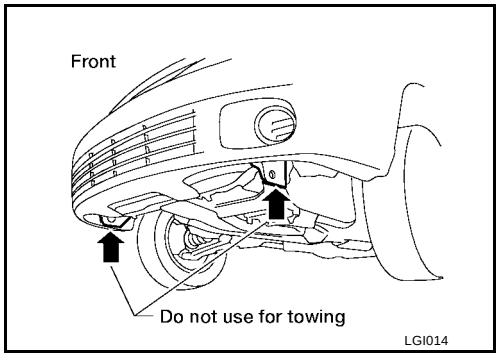
CAUTION:

- **Always release the parking brake when towing the vehicle with the front wheels raised with the rear wheels on the ground.**
- **When towing manual transaxle models with the front wheels on the ground (if a towing dolly is not used), turn the ignition key to the OFF position, and secure the steering wheel in the straight-ahead position with a rope or similar device. Never place the ignition key in the LOCK position. This will result in damage to the steering lock mechanism.**
  Move the shift lever to the N (Neutral) position.
- **Never tow an automatic transaxle model with the rear wheels raised and the front wheels on the ground. This may cause serious and expensive damage to the transaxle. If it is necessary to tow the vehicle with the rear wheels raised, always use towing dollies under the front wheels.**
- **Never tow an automatic transaxle model from the rear (that is backward) with four wheels on the ground. This may cause serious and expensive damage to the transaxle.**

Vehicle Recovery (Freeing a stuck vehicle)

EAS000VX

- **Tow chains or cables must be attached only to the main structural members of the vehicle.**
- **Pulling devices should be routed so they do not touch any part of the suspension, steering, brake or cooling systems.**
- **Always pull the cable straight out from the front of the vehicle. Never pull on the vehicle at an angle.**
- **Pulling devices such as ropes or canvas straps are not recommended for use in vehicle towing or recovery.**



TIGHTENING TORQUE OF STANDARD BOLTS

PFP:00000

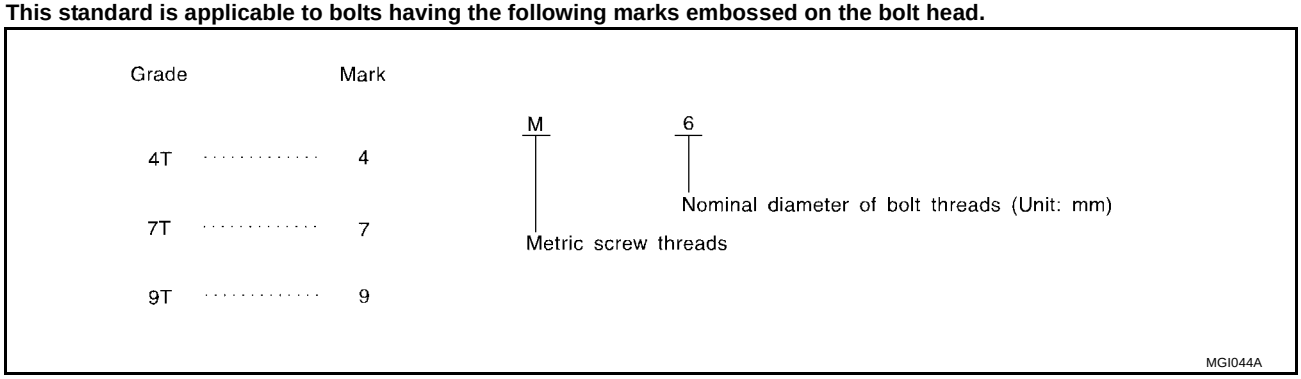
EAS000VY

Tightening Torque Table

Grade	Bolt size	Bolt diameter * mm	Pitch mm	Tightening torque (Without lubricant)							
				Hexagon head bolt				Hexagon flange bolt			
				N·m	kg-m	ft-lb	in-lb	N·m	kg-m	ft-lb	in-lb
4T	M6	6.0	1.0	5.1	0.52	3.8	45.1	6.1	0.62	4.5	53.8
	M8	8.0	1.25	13	1.3	9	—	15	1.5	11	—
			1.0	13	1.3	9	—	16	1.6	12	—
	M10	10.0	1.5	25	2.5	18	—	29	3.0	22	—
			1.25	25	2.6	19	—	30	3.1	22	—
	M12	12.0	1.75	42	4.3	31	—	51	5.2	38	—
			1.25	46	4.7	34	—	56	5.7	41	—
	M14	14.0	1.5	74	7.5	54	—	88	9.0	65	—
7T	M6	6.0	1.0	8.4	0.86	6.2	74.6	10	1.0	7	87
	M8	8.0	1.25	21	2.1	15	—	25	2.5	18	—
			1.0	22	2.2	16	—	26	2.7	20	—
	M10	10.0	1.5	41	4.2	30	—	48	4.9	35	—
			1.25	43	4.4	32	—	51	5.2	38	—
	M12	12.0	1.75	71	7.2	52	—	84	8.6	62	—
			1.25	77	7.9	57	—	92	9.4	68	—
	M14	14.0	1.5	127	13.0	94	—	147	15.0	108	—
9T	M6	6.0	1.0	12	1.2	9	—	15	1.5	11	—
	M8	8.0	1.25	29	3.0	22	—	35	3.6	26	—
			1.0	31	3.2	23	—	37	3.8	27	—
	M10	10.0	1.5	59	6.0	43	—	70	7.1	51	—
			1.25	62	6.3	46	—	74	7.5	54	—
	M12	12.0	1.75	98	10.0	72	—	118	12.0	87	—
			1.25	108	11.0	80	—	137	14.0	101	—
	M14	14.0	1.5	177	18.0	130	—	206	21.0	152	—

*: Nominal diameter

1. **Special parts are excluded.**
2. **This standard is applicable to bolts having the following marks embossed on the bolt head.**



RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS

PFP:00000

Recommended Chemical Products and Sealants

EAS000VZ

Refer to the following chart for help in selecting the appropriate chemical product or sealant.

	Product Description	Purpose	Nissan North America Part No. (USA)	Nissan Canada Part No. (Canada)	Aftermarket Cross-reference Part Nos.
1	Rear View Mirror Adhesive	Used to permanently remount rear view mirrors to windows.	999MP-AM000P	99998-50505	Permatex 81844
2	Anaerobic Liquid Gasket	For metal-to-metal flange sealing. Can fill a 0.38 mm (0.015 inch) gap and provide instant sealing for most powertrain applications.	999MP-AM001P	99998-50503	Permatex 51813 and 51817
3	High Performance Thread Sealant	Provides instant sealing on any threaded straight or parallel threaded fitting. (Thread sealant only, no locking ability.) ● Do not use on plastic.	999MP-AM002P	999MP-AM002P	Permatex 56521
4	Silicone RTV	Gasket Maker	999MP-AM003P (Ultra Grey)	99998-50506 (Ultra Grey)	Permatex Ultra Grey 82194; Three Bond 1207,1215, 1216, 1217F and 1217G; Nissan RTV Part No. 999MP-A7007
		Gasket Maker for Maxima/ Quest 5-speed automatic transmission (RE5F22A)	–	–	Three Bond 1281B or exact equivalent in its quality
5	High Temperature, High Strength Thread Locking Sealant (Red)	Threadlocker	999MP-AM004P	999MP-AM004P	Permatex 27200; Three Bond 1360, 1360N, 1305 N&P, 1307N, 1335, 1335B, 1363B, 1377C, 1386B, D&E and 1388
6	Medium Strength Thread Locking Sealant (Blue)	Threadlocker (service tool removable)	999MP-AM005P	999MP-AM005P	Permatex 24200, 24206, 24240, 24283 and 09178; Three Bond 1322, 1322N, 1324 D&N, 1333D, 1361C, 1364D, 1370C and 1374

IDENTIFICATION INFORMATION

PFP:00010

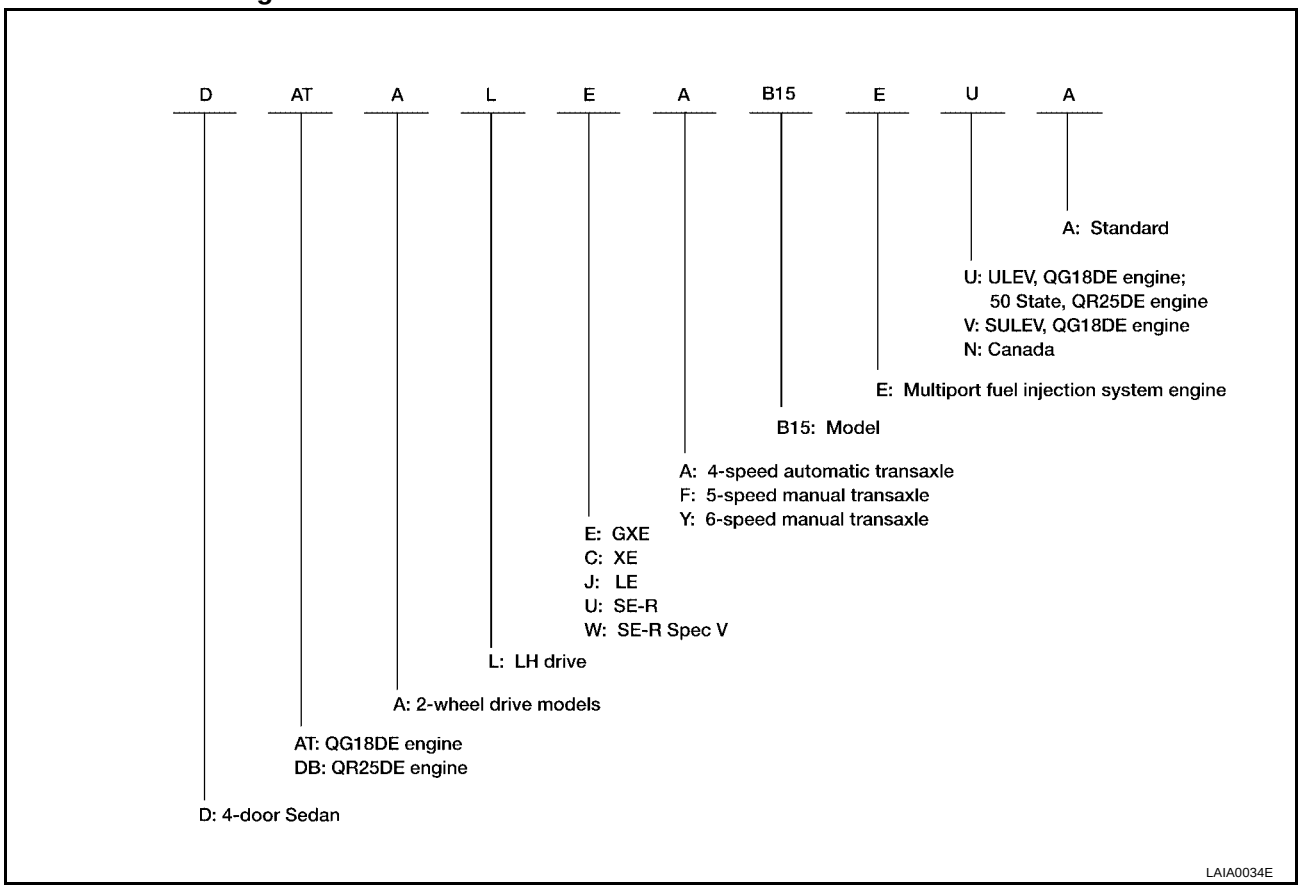
EAS000W0

Identification Information

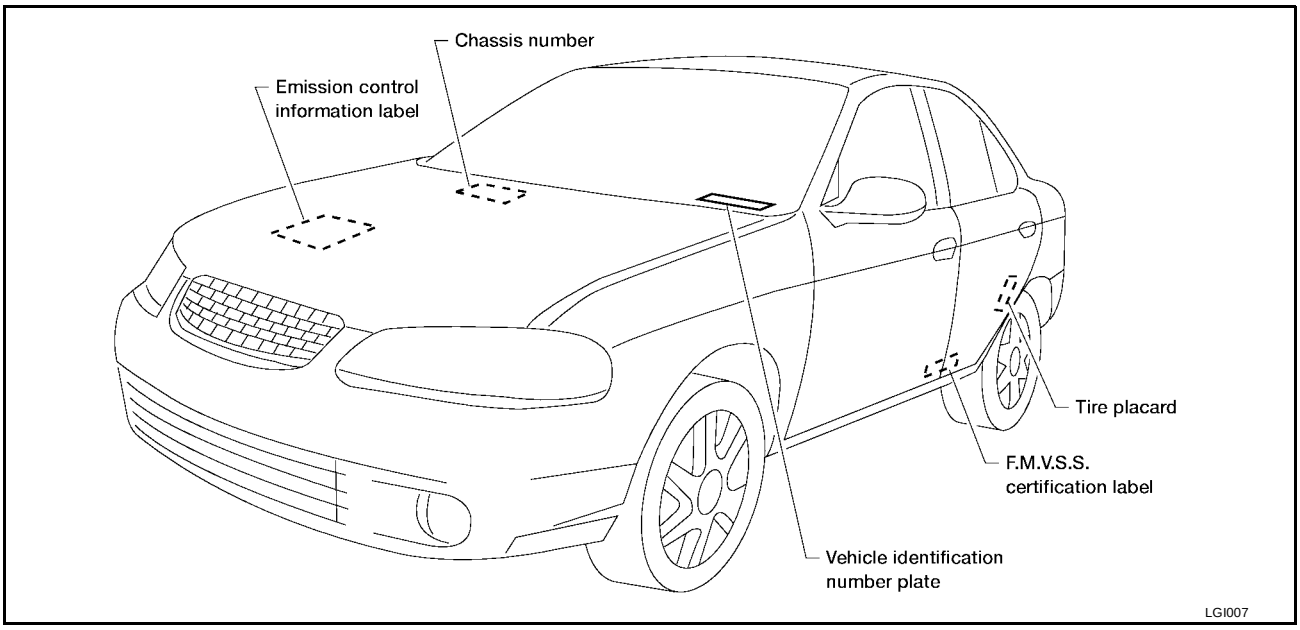
MODEL VARIATION

Body	Grade	Transaxle	Destination/Engine				
			USA			Canada	
			QG18DE (ULEV)	QG18DE (SULEV)	QR25DE	QG18DE	QR25DE
Sedan	XE	RE4F03B (A/T)	DATALCA-EUA	DATALCA-EVA	—	DATALCA-ENA	—
		RS5F70A (M/T)	DATALCF-EUA	DATALCF-EVA	—	DATALCF-ENA	—
	GXE	RE4F03B (A/T)	DATALEA-EUA	DATALEA-EVA	—	DATALEA-ENA	—
		RS5F70A (M/T)	DATALEF-EUA	DATALEF-EVA	—	DATALEF-ENA	—
	LE	RE4F04B (A/T)	—	—	DDBALJA-EUA	—	DDBALJA-ENA
	SE-R	RS5F51A (M/T)	—	—	DDBALUF-EUA	—	DDBALUF-ENA
		RE4F04B (A/T)	—	—	DDBALUA-EUA	—	DDBALUA-ENA
	SE-R SPEC V	RS6F51A (6M/T)	—	—	DDBALWY-EUA	—	DDBALWY-ENA

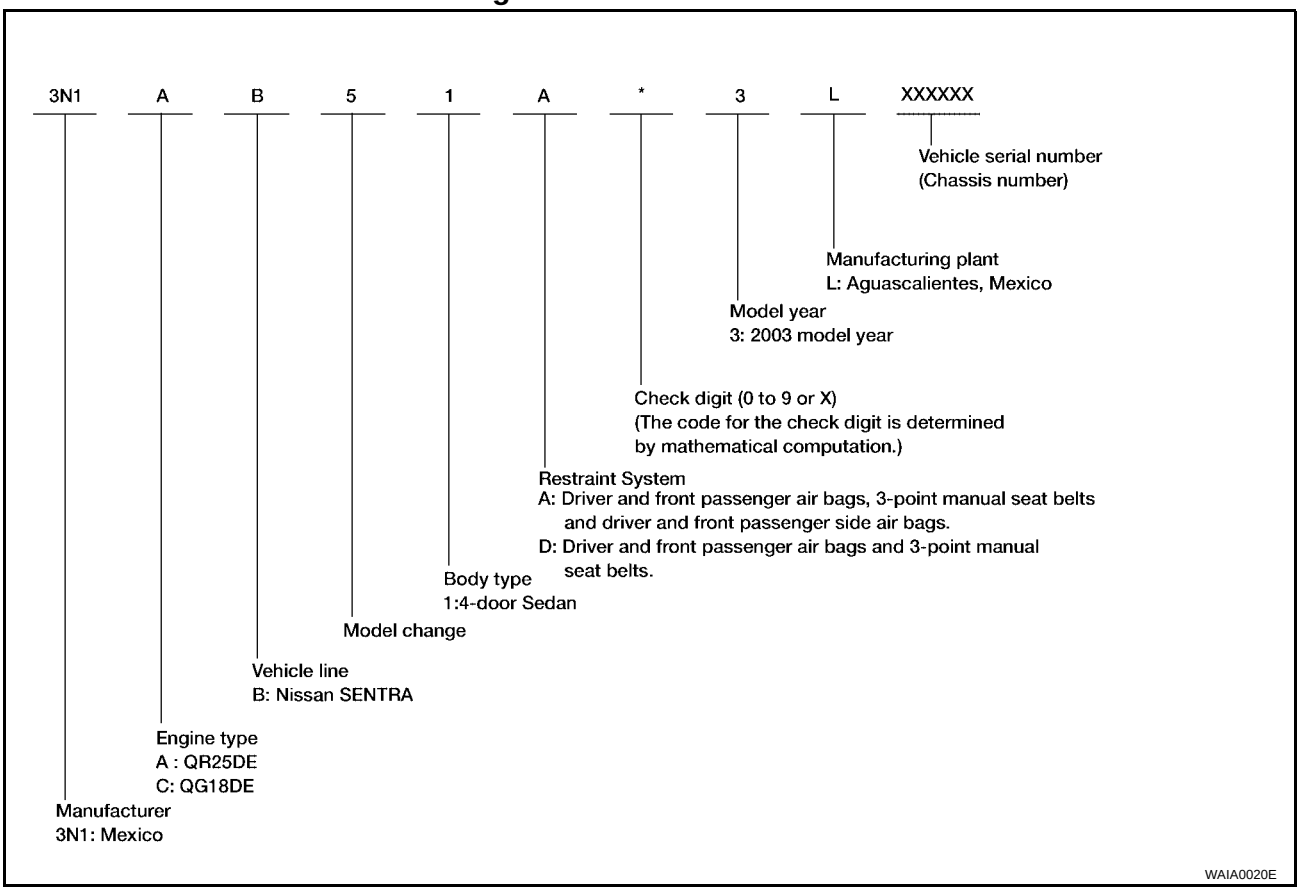
Prefix and suffix designations:



IDENTIFICATION NUMBER

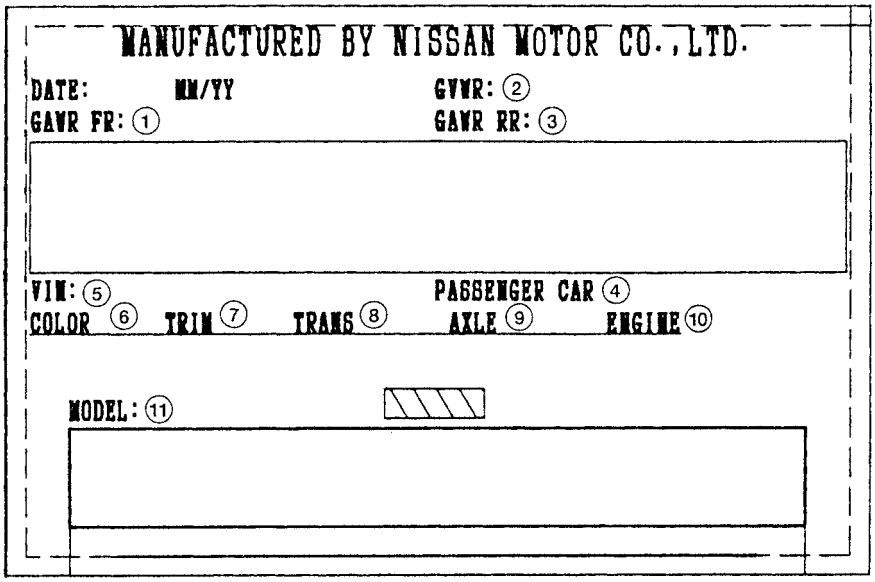


Vehicle Identification Number Arrangement



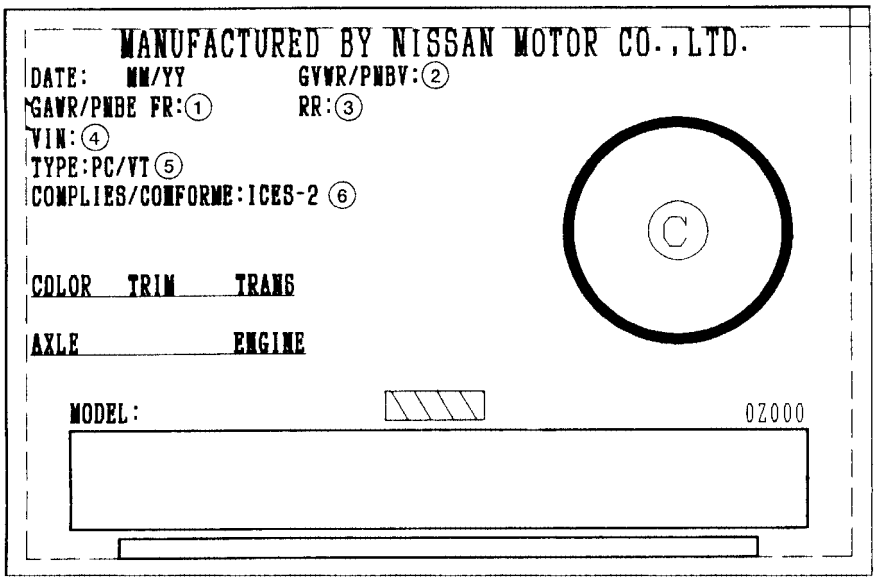
F.M.V.S.S. Certification Label

For US Vehicles



1. Gross front axle weight (in pounds)
2. Gross vehicle weight (in pounds)
3. Gross rear axle weight (in pounds)
4. Type
5. Vehicle identification number (chassis number)
6. Body color code
7. Trim color code
8. Transaxle
9. Axle model
10. Engine model
11. Model

For Canadian Vehicles

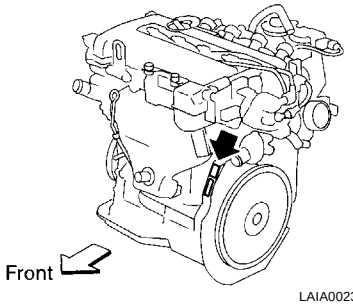


1. Gross axle weight rating front in English and French (in kilograms)
2. Gross vehicle weight rating in English and French (in kilograms)
3. Gross axle weight rating rear in English and French (in kilograms)
4. Vehicle identification number (chassis number)
5. Type of vehicle in English and French.
6. Radio frequency interference statement in English and French.

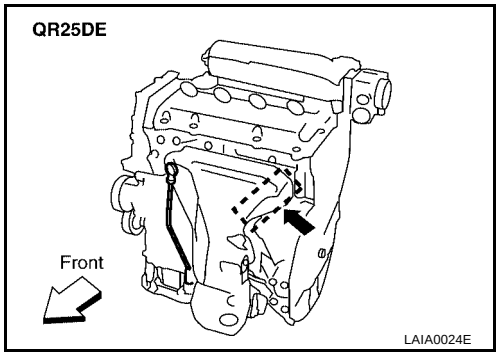
LGI013

Engine Serial Number

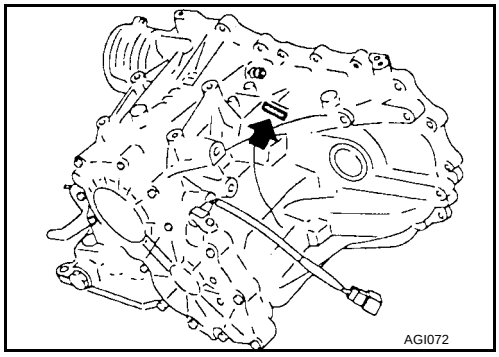
QG18DE



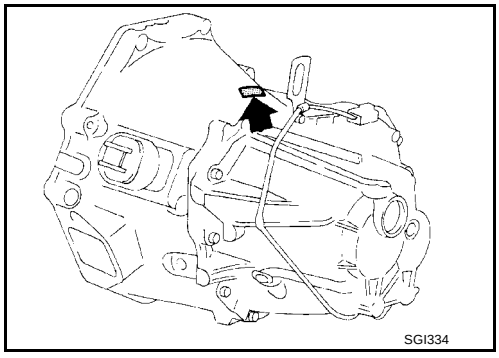
LAIA0023E



Automatic Transaxle Number



Manual Transaxle Number



DIMENSIONS

Unit: mm (in)

Overall length		4,505 (177.4)
Overall width		1,710 (67.3)
Overall height		1,410 (55.5)
Front tread 14 inch 15/16 inch 17 inch		 1,480 (58.3) 1,470 (57.9) 1466 (57.7)
Rear tread 14 inch 15/16 inch 17 inch		 1,460 (57.5) 1,450 (57.1) 1446 (56.9)
Wheelbase		2,535 (99.8)
Gross vehicle weight rating kg (lb)		See the “F.M.V.S.S. certification label” on the driver's side lock pillar.
Gross axle weight rating	Front kg (lb)	
	Rear kg (lb)	

WHEELS & TIRES

Road wheel Offset mm (in)	15 × 6JJ (steel) 45 (1.77)	15 × 6JJ (aluminum) 45 (1.77)	16 × 6JJ (aluminum) 45 (1.77)	17 x 7JJ (aluminum) 47 (1.85)
Conventional tire	P195/60HR15	P195/60HR15	P195/55HR16	P215/45ZR17
Spare tire	T125/70*14	T125/70*15	T125/70*15	T135/80D15T2

*: D or R, depending on manufacturer.

TERMINOLOGY

PFP:00011

SAE J1930 Terminology List

EAS000W1

All emission related terms used in this publication in accordance with SAE J1930 are listed. Accordingly, new terms, new acronyms/abbreviations and old terms are listed in the following chart.

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Air cleaner	ACL	Air cleaner
Barometric pressure	BARO	***
Barometric pressure sensor-BCDD	BAROS-BCDD	BCDD
Camshaft position	CMP	***
Camshaft position sensor	CMPS	Crank angle sensor
Canister	***	Canister
Carburetor	CARB	Carburetor
Charge air cooler	CAC	Intercooler
Closed loop	CL	Closed loop
Closed throttle position switch	CTP switch	Idle switch
Clutch pedal position switch	CPP switch	Clutch switch
Continuous fuel injection system	CFI system	***
Continuous trap oxidizer system	CTOX system	***
Crankshaft position	CKP	***
Crankshaft position sensor	CKPS	***
Data link connector	DLC	***
Data link connector for CONSULT-II	DLC for CONSULT-II	Diagnostic connector for CONSULT-II
Diagnostic test mode	DTM	Diagnostic mode
Diagnostic test mode selector	DTM selector	Diagnostic mode selector
Diagnostic test mode I	DTM I	Mode I
Diagnostic test mode II	DTM II	Mode II
Diagnostic trouble code	DTC	Malfunction code
Direct fuel injection system	DFI system	***
Distributor ignition system	DI system	Ignition timing control
Early fuel evaporation-mixture heater	EFE-mixture heater	Mixture heater
Early fuel evaporation system	EFE system	Mixture heater control
Electrically erasable programmable read only memory	EEPROM	***
Electronic ignition system	EI system	Ignition timing control
Engine control	EC	***
Engine control module	ECM	ECCS control unit
Engine coolant temperature	ECT	Engine temperature
Engine coolant temperature sensor	ECTS	Engine temperature sensor
Engine modification	EM	***
Engine speed	RPM	Engine speed
Erasable programmable read only memory	EPROM	***
Evaporative emission canister	EVAP canister	Canister
Evaporative emission system	EVAP system	Canister control solenoid valve
Exhaust gas recirculation valve	EGR valve	EGR valve

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Exhaust gas recirculation control-BPT valve	EGRC-BPT valve	BPT valve
Exhaust gas recirculation control-solenoid valve	EGRC-solenoid valve	EGR control solenoid valve
Exhaust gas recirculation temperature sensor	EGRT sensor	Exhaust gas temperature sensor
EGR temperature sensor		
Flash electrically erasable programmable read only memory	FEEPROM	***
Flash erasable programmable read only memory	FEPROM	***
Flexible fuel sensor	FFS	***
Flexible fuel system	FF system	***
Fuel pressure regulator	***	Pressure regulator
Fuel pressure regulator control solenoid valve	***	PRVR control solenoid valve
Fuel trim	FT	***
Heated Oxygen sensor	HO2S	Exhaust gas sensor
Idle air control system	IAC system	Idle speed control
Idle air control valve-air regulator	IACV-air regulator	Air regulator
Idle air control valve-auxiliary air control valve	IACV-AAC valve	Auxiliary air control (AAC) valve
Idle air control valve-FICD solenoid valve	IACV-FICD solenoid valve	FICD solenoid valve
Idle air control valve-idle up control solenoid valve	IACV-idle up control solenoid valve	Idle up control solenoid valve
Idle speed control-FI pot	ISC-FI pot	FI pot
Idle speed control system	ISC system	***
Ignition control	IC	***
Ignition control module	ICM	***
Indirect fuel injection system	IFI system	***
Intake air	IA	Air
Intake air temperature sensor	IAT sensor	Air temperature sensor
Knock	***	Detonation
Knock sensor	KS	Detonation sensor
Malfunction indicator lamp	MIL	Check engine light
Manifold absolute pressure	MAP	***
Manifold absolute pressure sensor	MAPS	***
Manifold differential pressure	MDP	***
Manifold differential pressure sensor	MDPS	***
Manifold surface temperature	MST	***
Manifold surface temperature sensor	MSTS	***
Manifold vacuum zone	MVZ	***
Manifold vacuum zone sensor	MVZS	***
Mass air flow sensor	MAFS	Air flow meter
Mixture control solenoid valve	MC solenoid valve	Air-fuel ratio control solenoid valve
Multiport fuel injection System	MFI system	Fuel injection control

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Nonvolatile random access memory	NVRAM	***
On board diagnostic system	OBD system	Self-diagnosis
Open loop	OL	Open loop
Oxidation catalyst	OC	Catalyst
Oxidation catalytic converter system	OC system	***
Oxygen sensor	O2S	Exhaust gas sensor
Park position switch	***	Park switch
Park/neutral position switch	PNP switch	Park/neutral switch Inhibitor switch Neutral position switch
Periodic trap oxidizer system	PTOX system	***
Positive crankcase ventilation	PCV	Positive crankcase ventilation
Positive crankcase ventilation valve	PCV valve	PCV valve
Powertrain control module	PCM	***
Programmable read only memory	PROM	***
Pulsed secondary air injection control solenoid valve	PAIRC solenoid valve	AIV control solenoid valve
Pulsed secondary air injection system	PAIR system	Air induction valve (AIV) control
Pulsed secondary air injection valve	PAIR valve	Air induction valve
Random access memory	RAM	***
Read only memory	ROM	***
Scan tool	ST	***
Secondary air injection pump	AIR pump	***
Secondary air injection system	AIR system	***
Sequential multiport fuel injection system	SFI system	Sequential fuel injection
Service reminder indicator	SRI	***
Simultaneous multiport fuel injection system	***	Simultaneous fuel injection
Smoke puff limiter system	SPL system	***
Supercharger	SC	***
Supercharger bypass	SCB	***
System readiness test	SRT	***
Thermal vacuum valve	TVV	Thermal vacuum valve
Three way catalyst	TWC	Catalyst
Three way catalytic converter system	TWC system	***
Three way + oxidation catalyst	TWC + OC	Catalyst
Three way + oxidation catalytic converter system	TWC + OC system	***
Throttle body	TB	Throttle chamber SPI body
Throttle body fuel injection system	TBI system	Fuel injection control
Throttle position	TP	Throttle position
Throttle position sensor	TPS	Throttle sensor
Throttle position switch	TP switch	Throttle switch
Torque converter clutch solenoid valve	TCC solenoid valve	Lock-up cancel solenoid Lock-up solenoid

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Transmission control module	TCM	A/T control unit
Turbocharger	TC	Turbocharger
Vehicle speed sensor	VSS	Vehicle speed sensor
Volume air flow sensor	VAFS	Air flow meter
Warm up oxidation catalyst	WU-OC	Catalyst
Warm up oxidation catalytic converter system	WU-OC system	***
Warm up three way catalyst	WU-TWC	Catalyst
Warm up three way catalytic converter system	WU-TWC system	***
Wide open throttle position switch	WOTP switch	Full switch

***: Not applicable

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LAN SYSTEM

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EKS003A9

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Precautions For Trouble Diagnosis

EKS003AA

CAN SYSTEM

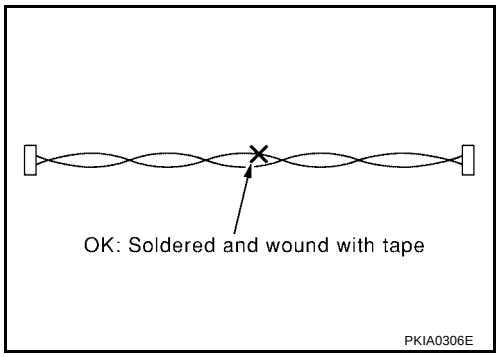
- Do not apply voltage of 7.0V or higher to the measurement terminals.
- Use the tester with its open terminal voltage being 7.0V or less.

Precautions For Harness Repair

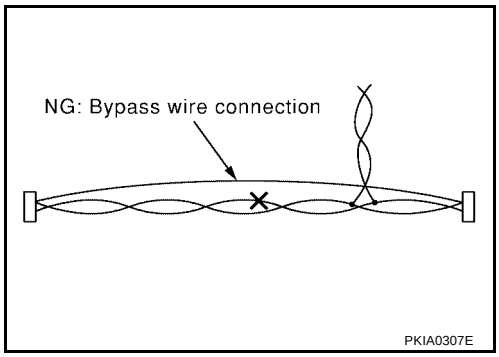
EKS003AB

CAN SYSTEM

- Solder the repaired parts, and wrap with tape. [Frays of twisted line must be within 110 mm (4.33 in).]



- Do not perform bypass wire connections for the repair parts. (The spliced wire will become separated and the characteristics of twisted line will be lost.)



CAN COMMUNICATION

PFP:23710

System Description

EKS003K5

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

CAN Communication Unit

EKS003K6

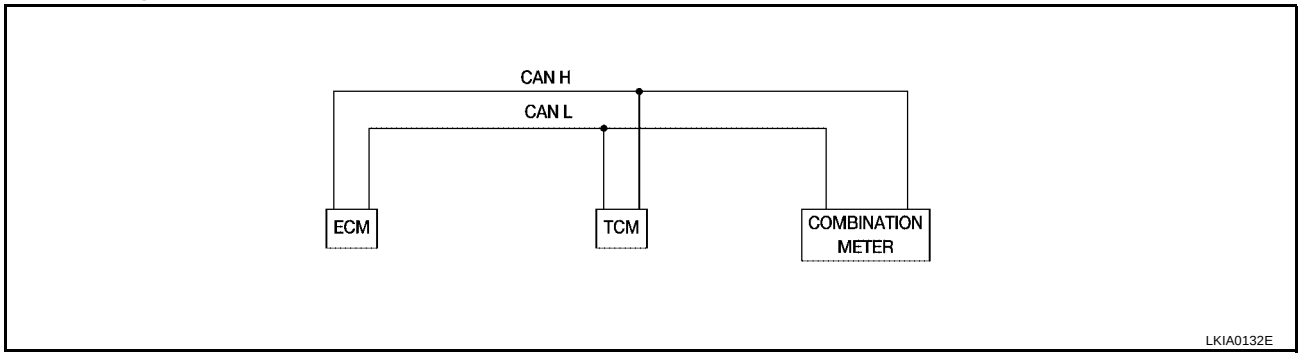
Go to CAN system, when selecting your CAN system type from the following table.

Body type	Sedan		
Axle	2WD		
Engine	QG18DE		QR25DE
Transmission	A/T	M/T	A/T
CAN system type	1	2	3
CAN system trouble diagnosis	LAN-6, "CAN SYSTEM (TYPE 1)"	LAN-16, "CAN SYSTEM (TYPE 2)"	LAN-23, "CAN SYSTEM (TYPE 3)"

×: Applicable

TYPE 1

System diagram



Input/output signal chart

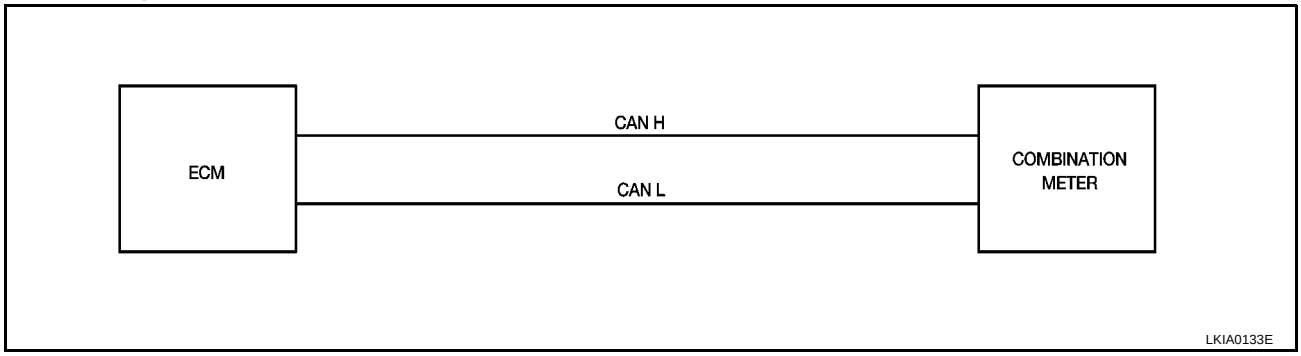
T: Transmit R: Receive

Signals	ECM	TCM	Combination Meter
Accelerator pedal position signal	T	R	
Output shaft revolution signal	R	T	
A/T self-diagnosis signal	R	T	
Closed throttle position signal	T	R	
Wide open throttle position signal	T	R	
Stop lamp switch signal		R	T
Overdrive control switch signal		R	T
O/D OFF indicator signal		T	R
Engine speed signal	T		R
Engine coolant temperature signal	T		R
Vehicle speed signal	R		T
Fuel level sensor signal	R		T
Malfunction indicator lamp signal	T		R

Signals	ECM	TCM	Combination Meter
ASCD SET lamp signal	T		R
ASCD CRUISE lamp signal	T		R

TYPE 2

System diagram



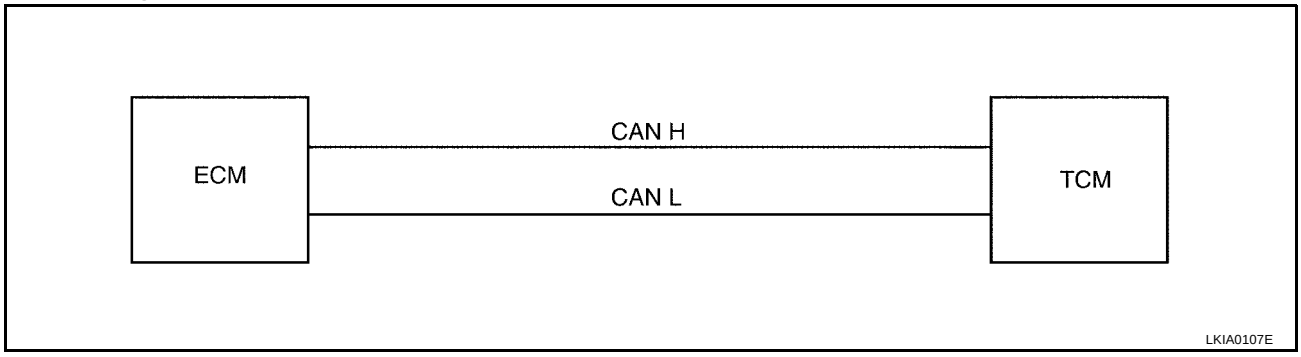
Input/output signal chart

T: Transmit R: Receive

Signals	ECM	Combination Meter
Engine speed signal	T	R
Engine coolant temperature signal	T	R
Vehicle speed signal	R	T
Fuel level sensor signal	R	T
Malfunction indicator lamp signal	T	R
ASCD SET lamp signal	T	R
ASCD CRUISE lamp signal	T	R

TYPE 3

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	TCM
Accelerator pedal position signal	T	R
Output shaft revolution signal	R	T
A/T self-diagnosis signal	R	T
Wide open throttle position signal	T	R
Overdrive cancel signal	T	R

CAN SYSTEM (TYPE 1)

PFP:23710

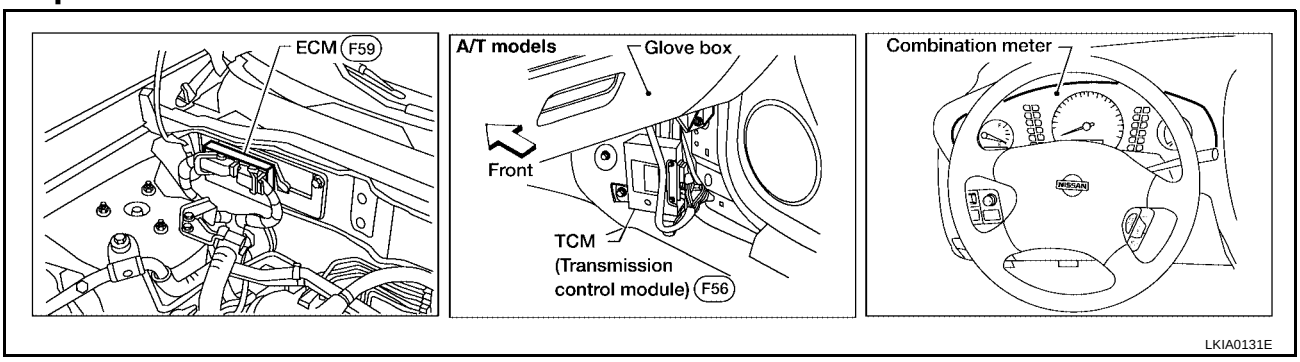
System Description

EKS003K7

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

Component Parts and Harness Connector Location

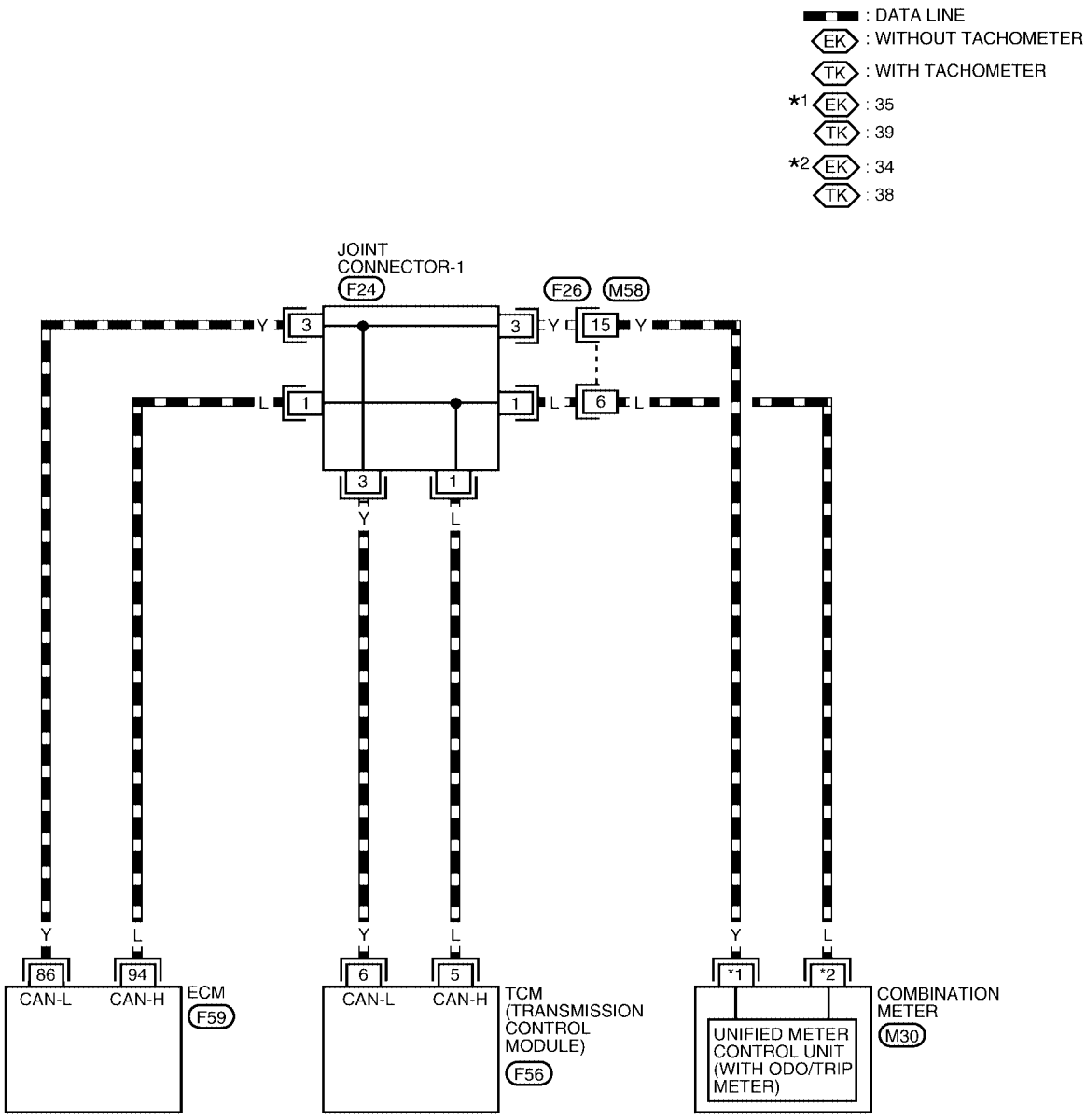
EKS003K8



Wiring Diagram — CAN —

EKS003K9

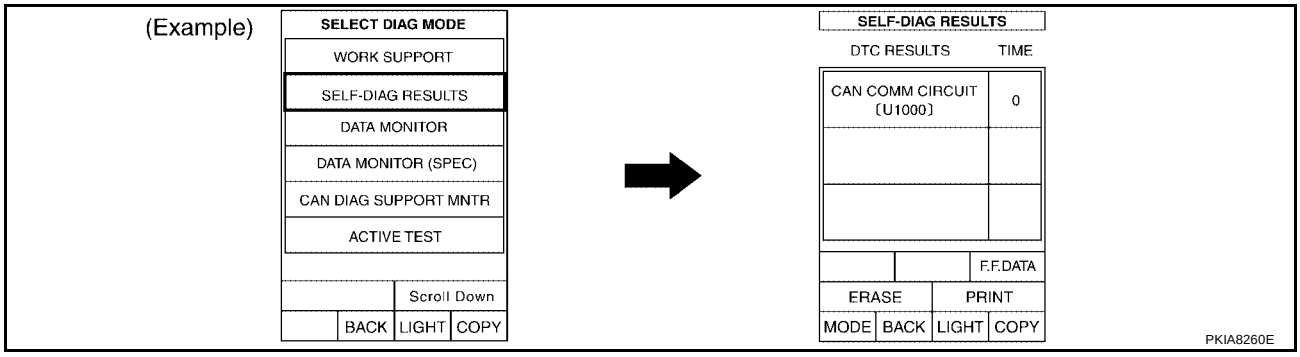
LAN-CAN-01



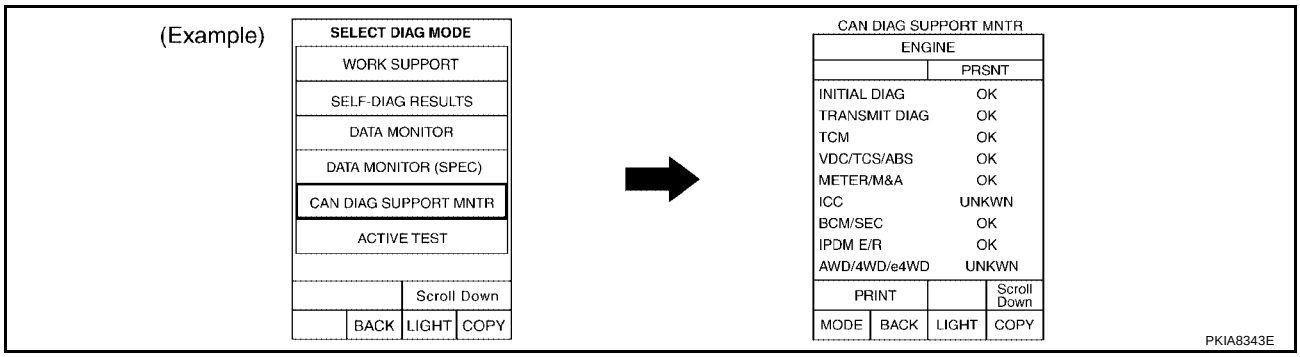
Work Flow

EKS003KA

1. Print all the data of “SELF-DIAG RESULTS” for “ENGINE” and “A/T” displayed on CONSULT-II.



2. Print all the data of “CAN DIAG SUPPORT MNTR” for “ENGINE” and “A/T” displayed on CONSULT-II.



3. Attach the printed sheet of “SELF-DIAG RESULTS” and “CAN DIAG SUPPORT MNTR” onto the check sheet. Refer to LAN-9, "CHECK SHEET" .
4. Based on the “CAN DIAG SUPPORT MNTR” results, put check marks onto the items with “UNKWN” or “NG” in the check sheet table. Refer to LAN-9, "CHECK SHEET" .

   NOTE:
   If “NG” is displayed on "INITIAL DIAG (initial diagnosis)" as “CAN DIAG SUPPORT MNTR” for the diagnosed control unit, replace the control unit.
5. According to the check sheet results (example), start inspection. Refer to LAN-10, "CHECK SHEET RESULTS (EXAMPLE)" .

CHECK SHEET

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG	UNKWN	.	UNKWN	UNKWN
A/T	NG	UNKWN	UNKWN	.	UNKWN

Symptoms:

Attach copy of ENGINE SELF-DIAG RESULTS

Attach copy of A/T SELF-DIAG RESULTS

Attach copy of ENGINE CAN DIAG SUPPORT MNTR

Attach copy of A/T CAN DIAG SUPPORT MNTR

LKIA0514E

CHECK SHEET RESULTS (EXAMPLE)

Case 1

Replace ECM.

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG ✓	UNKWN	–	UNKWN	UNKWN
A/T	NG	UNKWN	UNKWN	–	UNKWN

LKIA0515E

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG	UNKWN	·	UNKWN ✓	UNKWN ✓
A/T	NG	UNKWN	UNKWN	·	UNKWN

WKIA2937E

Case 2

Replace TCM.

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG	UNKWN	·	UNKWN ✓	UNKWN
A/T	NG ✓	UNKWN	UNKWN	·	UNKWN

WKIA2938E

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG	UNKWN	·	UNKWN	UNKWN
A/T	NG	UNKWN	UNKWN ✓	·	UNKWN ✓

WKIA2939E

Case 3

Check ECM Circuit. Refer to LAN-12, "ECM Circuit Check" .

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG	UNKWN		UNKWN	UNKWN
A/T	NG	UNKWN	UNKWN		UNKWN

WKIA2940E

Case 4

Check TCM Circuit. Refer to LAN-12, "TCM Circuit Check" .

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG	UNKWN		UNKWN	UNKWN
A/T	NG	UNKWN	UNKWN		UNKWN

WKIA2941E

Case 5

Check combination meter Circuit. Refer to LAN-13, "Combination Meter Circuit Check"

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG	UNKWN		UNKWN	UNKWN
A/T	NG	UNKWN	UNKWN		UNKWN

WKIA2942E

Case 6

Check CAN communication Circuit. Refer to LAN-13, "CAN Communication Circuit Check" .

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR				
	Initial diagnosis	Transmit diagnosis	Receive diagnosis		
			ECM	TCM	METER/M&A
ENGINE	NG	UNKWN		UNKWN	UNKWN
A/T	NG	UNKWN	UNKWN		UNKWN

WKIA2943E

ECM Circuit Check

EKS003KB

1. CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Check the terminals and connector of ECM for damage, bend and loose connection (control module-side and harness-side).

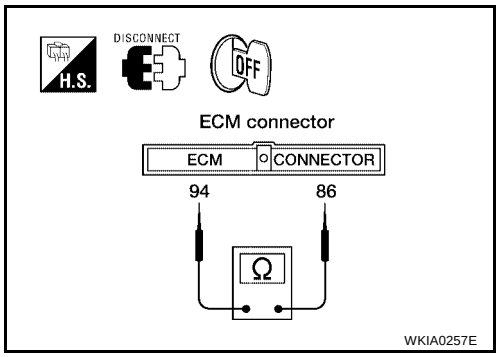
OK or NG

OK >> GO TO 2.
NG >> Repair terminal or connector.

2. CHECK HARNESS FOR OPEN CIRCUIT

1. Disconnect ECM connector.
2. Check resistance between ECM harness connector F59 terminals 94 (L) and 86 (Y).

94 (L) – 86 (Y) : Approx. 108 – 132Ω



OK or NG

OK >> Replace ECM.
NG >> Repair harness between ECM and TCM.

TCM Circuit Check

EKS003KC

1. CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Check the terminals and connector of TCM for damage, bend and loose connection (control module-side and harness-side).

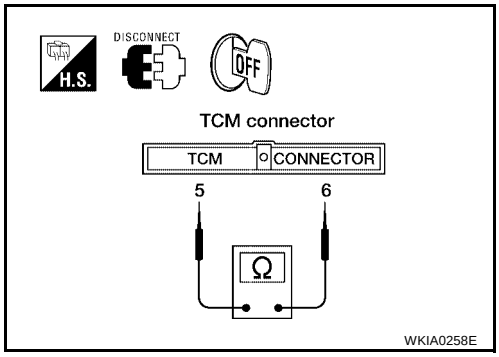
OK or NG

OK >> GO TO 2.
NG >> Repair terminal or connector.

2. CHECK HARNESS FOR OPEN CIRCUIT

1. Disconnect TCM connector.
2. Check resistance between TCM harness connector F56 terminals 5 (L) and 6 (Y).

5 (L) – 6 (Y) : Approx. 54 – 66Ω



OK or NG

OK >> Replace TCM.
NG >> Repair harness between TCM and ECM.

Combination Meter Circuit Check

EKS003KD

1. CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Check terminals and connector of combination meter for damage, bend and loose connection (meter-side and harness-side).

OK or NG

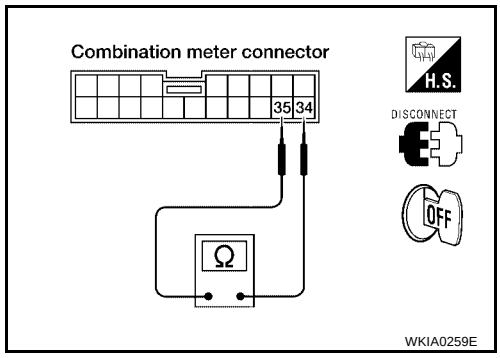
OK >> GO TO 2.
NG >> Repair terminal or connector.

2. CHECK HARNESS FOR OPEN CIRCUIT

1. Disconnect combination meter connector.
2. Check the following.

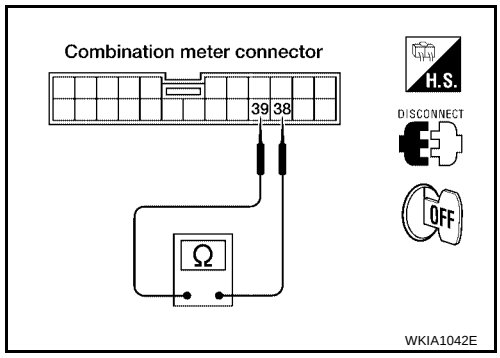
- Without tachometer:
  Resistance between combination meter harness connector M30 terminals 34 (L) and 35 (Y).

  34 (L) – 35 (Y) (Without tachometer) **: Approx. 108 – 132Ω**



- With tachometer:
  Resistance between combination meter harness connector M30 terminals 38 (L) and 39 (Y).

  38 (L) – 39 (Y) (With tachometer) **: Approx. 108 – 132Ω**



OK or NG

OK >> Replace combination meter.
NG >> Repair harness between combination meter and TCM.

CAN Communication Circuit Check

EKS003KE

1. CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Check following terminals and connector for damage, bend and loose connection (meter-side, control module-side and harness-side).

- Combination meter
- TCM
- ECM
- Between combination meter and ECM

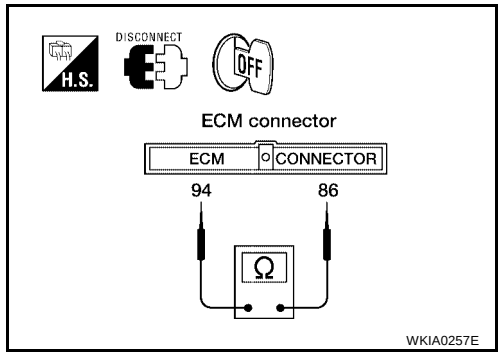
OK or NG

OK >> GO TO 2.
NG >> Repair terminal or connector.

2. CHECK HARNESS FOR SHORT CIRCUIT

1. Disconnect ECM connector, TCM connector and harness connector F26.
2. Check continuity between ECM harness connector F59 terminals 94 (L) and 86 (Y).

94 (L) – 86 (Y) : Continuity should not exist.



OK or NG

OK >> GO TO 3.

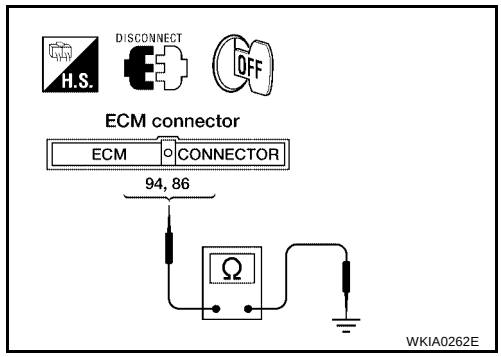
NG >> ● Repair harness between ECM and harness connector F26.
● Repair harness between ECM and TCM.

3. CHECK HARNESS FOR SHORT CIRCUIT

Check continuity between ECM harness connector F59 terminals 94 (L), 86 (Y) and ground.

94 (L) – ground : Continuity should not exist.

86 (Y) – ground : Continuity should not exist.



OK or NG

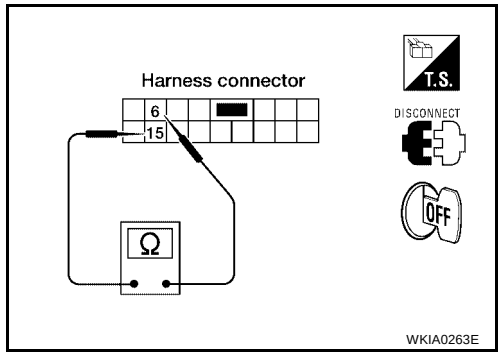
OK >> GO TO 4.

NG >> ● Repair harness between ECM and harness connector F26.
● Repair harness between ECM and TCM.

4. CHECK HARNESS FOR SHORT CIRCUIT

1. Disconnect combination meter connector.
2. Check continuity between harness connector M58 terminals 6 (L) and 15 (Y).

6 (L) – 15 (Y) : Continuity should not exist.



OK or NG

OK >> GO TO 5.

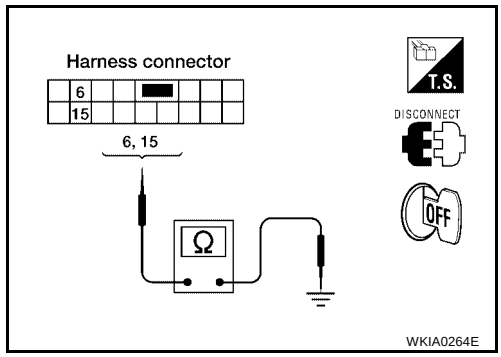
NG >> Repair harness between harness connector M58 and combination meter.

5. CHECK HARNESS FOR SHORT CIRCUIT

Check continuity between harness connector M58 terminals 6 (L), 15 (Y) and ground.

6 (L) – ground : Continuity should not exist.

15 (Y) – ground : Continuity should not exist.



OK or NG

OK >> GO TO 6.

NG >> Repair harness between harness connector M58 and combination meter.

6. ECM/COMBINATION METER INTERNAL CIRCUIT INSPECTION

Check components inspection. Refer to LAN-15, "ECM/COMBINATION METER INTERNAL CIRCUIT INSPECTION" .

OK or NG

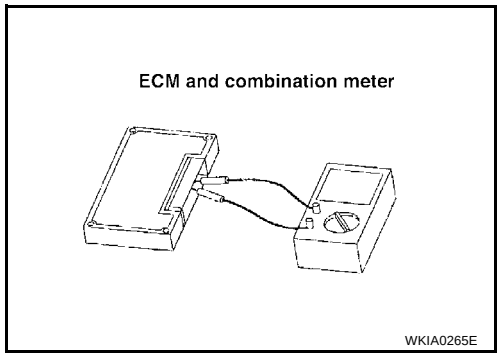
OK >> Connect all the connectors and diagnose again. Refer to LAN-8, "Work Flow" .
NG >> Replace ECM and/or combination meter.

Component Inspection

EKS003KF

ECM/COMBINATION METER INTERNAL CIRCUIT INSPECTION

- Remove ECM and combination meter from vehicle.
- Check resistance between ECM terminals 94 and 86.
- Check resistance between combination meter terminals 34 and 35 (Without tachometer).
- Check resistance between combination meter terminals 38 and 39 (With tachometer).



Unit	Terminal	Resistance value (Ω) (Approx.)
ECM	94 – 86	108 - 136
Combination meter (Without tachometer)	34 – 35	
Combination meter (With tachometer)	38 – 39	

CAN SYSTEM (TYPE 2)

PFP:23710

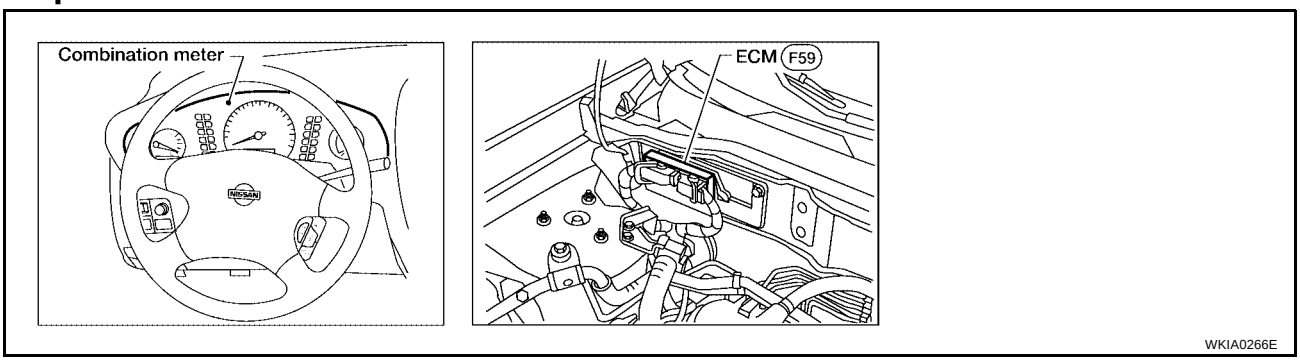
System Description

EKS003KG

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

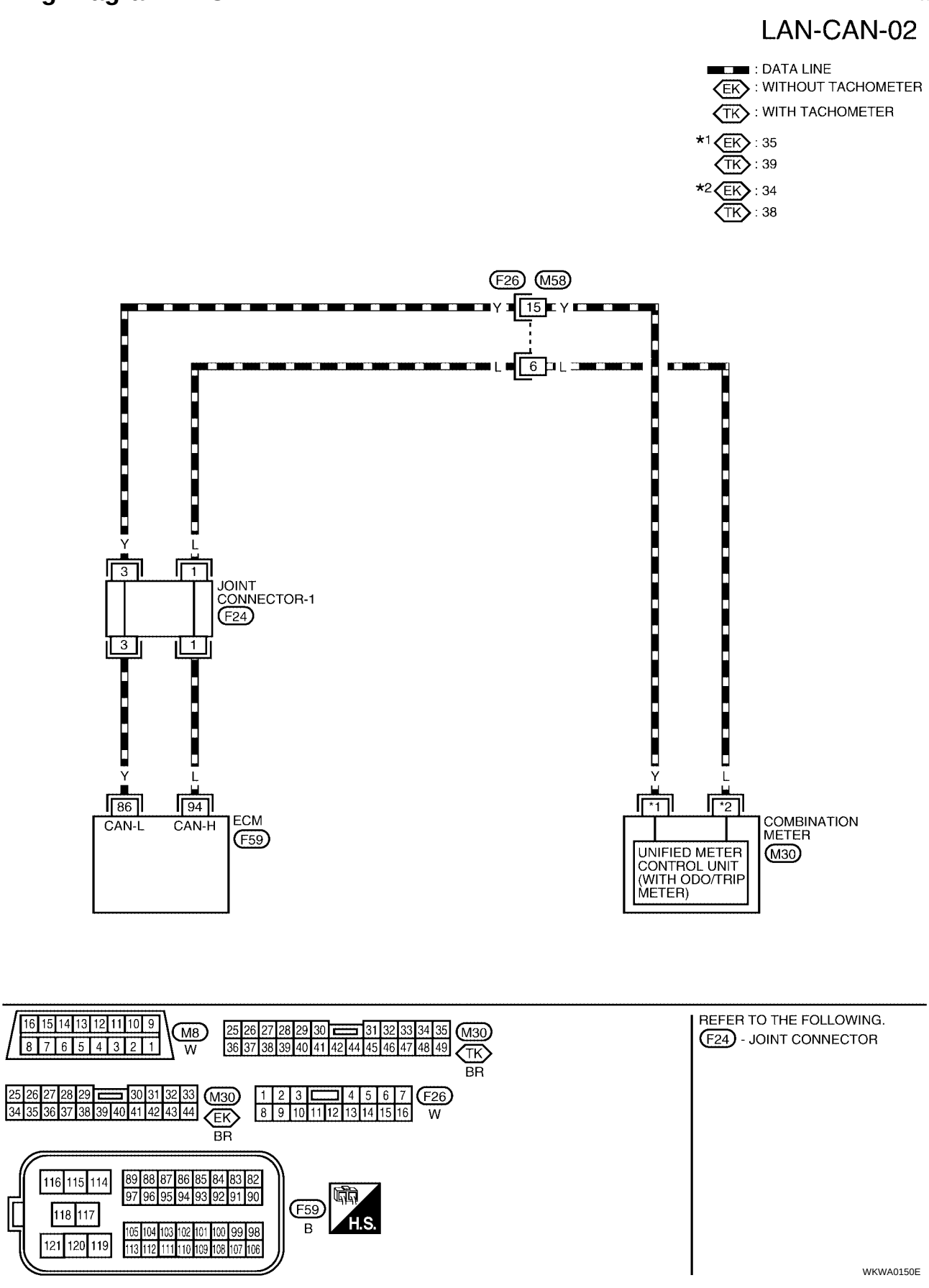
Component Parts and Harness Connector Location

EKS003KH



Wiring Diagram — CAN —

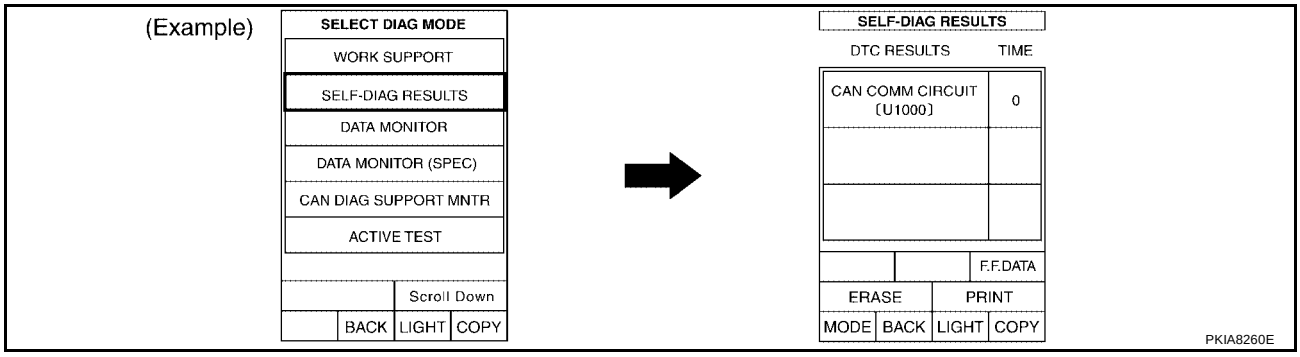
EKS003KI



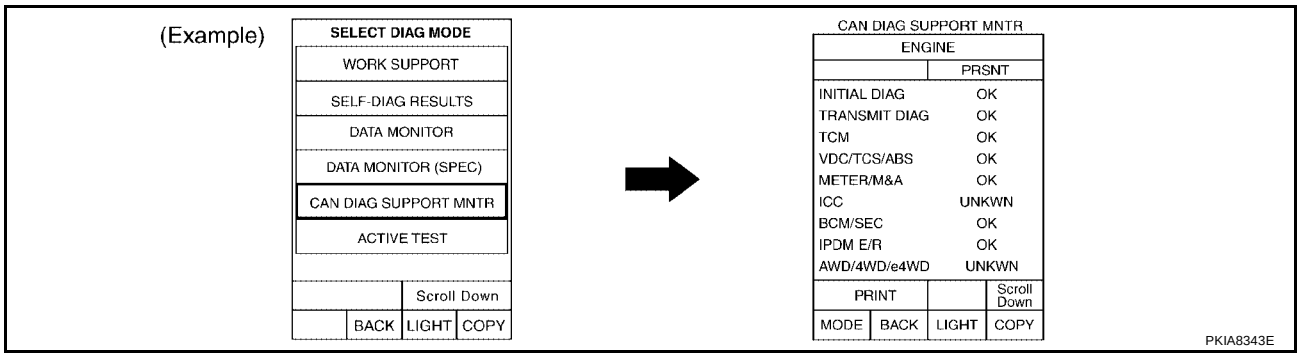
Work Flow

EKS008XT

1. Print all the data of “SELF-DIAG RESULTS” for “ENGINE” displayed on CONSULT-II.



2. Print all the data of “CAN DIAG SUPPORT MNTR” for “ENGINE” displayed on CONSULT-II.



3. Attach the printed sheet of “SELF-DIAG RESULTS” and “CAN DIAG SUPPORT MNTR” onto the check sheet. Refer to LAN-19, "CHECK SHEET" .
4. Based on the “CAN DIAG SUPPORT MNTR” results, put check marks onto the items with “UNKWN” or “NG” in the check sheet table. Refer to LAN-19, "CHECK SHEET" .

   NOTE:
   If “NG” is displayed on "INITIAL DIAG (initial diagnosis)" as “CAN DIAG SUPPORT MNTR” for the diagnosed control unit, replace the control unit.
5. According to the check sheet results (example), start inspection. Refer to LAN-19, "CHECK SHEET RESULTS (EXAMPLE)" .

CHECK SHEET

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR			
	Initial diagnosis	Transmit diagnosis	Receive diagnosis	
			ECM	METER/M&A
ENGINE	NG	UNKWN		UNKWN

Symptoms:

Attach copy of ENGINE SELF-DIAG RESULTS

Attach copy of ENGINE CAN DIAG SUPPORT MNTR

WKIA2944E

CHECK SHEET RESULTS (EXAMPLE)

Case 1

Replace ECM.

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR			
	Initial diagnosis	Transmit diagnosis	Receive diagnosis	
			ECM	METER/M&A
ENGINE	✔	UNKWN		UNKWN

WKIA2945E

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR			
	Initial diagnosis	Transmit diagnosis	Receive diagnosis	
			ECM	METER/M&A
ENGINE	NG	UNKWN	. .	UNKWN

WKIA2946E

Case 2

Check CAN communication Circuit. Refer to LAN-20, "CAN Communication Circuit Check" .

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR			
	Initial diagnosis	Transmit diagnosis	Receive diagnosis	
			ECM	METER/M&A
ENGINE	NG	UNKWN	. .	UNKWN

WKIA2947E

CAN Communication Circuit Check

EKS003KK

1. CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Check following terminals and connector for damage, bend and loose connection (meter-side, control module-side and harness-side).

- Combination meter
- ECM
- Between combination meter and ECM

OK or NG

OK >> GO TO 2.
NG >> Repair terminal or connector.

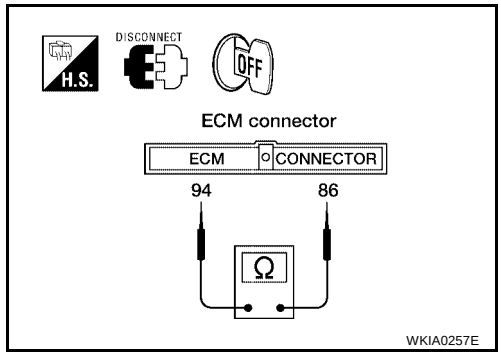
2. CHECK HARNESS FOR SHORT CIRCUIT

1. Disconnect ECM connector and harness connector F26.
2. Check continuity between ECM harness connector F59 terminals 94 (L) and 86 (Y).

94 (L) – 86 (Y) : Continuity should not exist.

OK or NG

OK >> GO TO 3.
NG >> Repair harness between ECM and harness connector F26.



WKIA0257E

3. CHECK HARNESS FOR SHORT CIRCUIT

Check continuity between ECM harness connector F59 terminals 94 (L), 86 (Y) and ground.

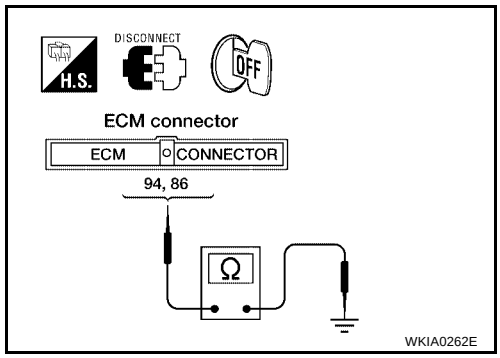
94 (L) – ground : Continuity should not exist.

86 (Y) – ground : Continuity should not exist.

OK or NG

OK >> GO TO 4.

NG >> Repair harness between ECM and harness connector F26.



4. CHECK HARNESS FOR OPEN CIRCUIT

Check continuity between ECM harness connector F59 terminals 94 (L), 86 (Y) and harness connector F26 terminals 6 (L), 15 (Y).

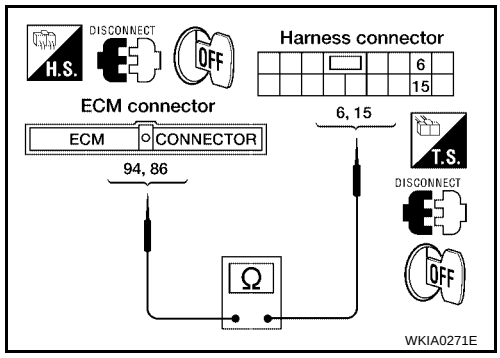
94 (L) – 6 (L) : Continuity should exist.

86 (Y) – 15 (Y) : Continuity should exist.

OK or NG

OK >> GO TO 5.

NG >> Repair harness.



5. CHECK HARNESS FOR SHORT CIRCUIT

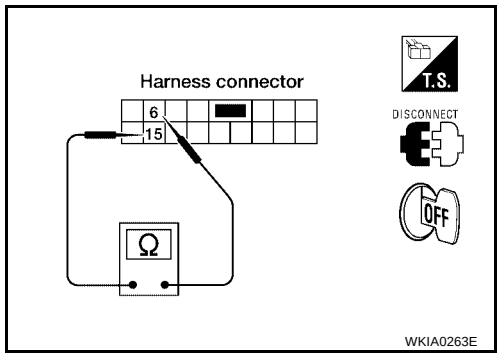
1. Disconnect combination meter connector.
2. Check continuity between harness connector M58 terminals 6 (L) and 15 (Y).

6 (L) – 15 (Y) : Continuity should not exist.

OK or NG

OK >> GO TO 6.

NG >> Repair harness between harness connector M58 and combination meter.



6. CHECK HARNESS FOR SHORT CIRCUIT

Check continuity between harness connector M58 terminals 6 (L), 15 (Y) and ground.

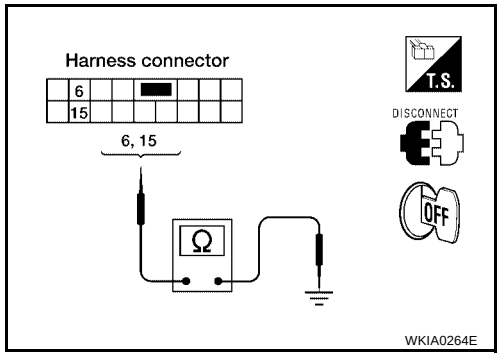
6 (L) – ground : Continuity should not exist.

15 (Y) – ground : Continuity should not exist.

OK or NG

OK >> GO TO 7.

NG >> Repair harness between harness connector M58 and combination meter.



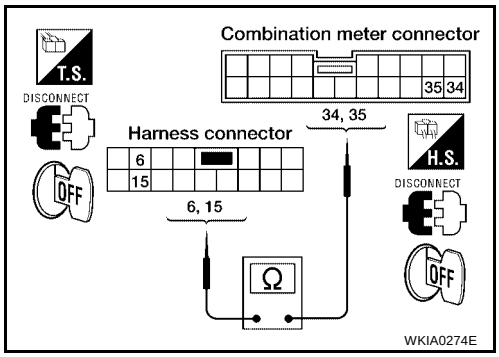
7. CHECK HARNESS FOR OPEN CIRCUIT

1. Check the following.

- Without tachometer:
  Continuity between harness connector M58 terminals 6 (L), 15 (Y) and combination meter harness connector M30 terminals 34 (L), 35 (Y).

6 (L) – 34 (L) (Without tachometer) : Continuity should exist.

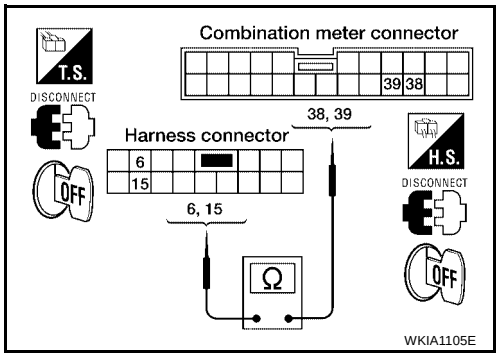
15 (Y) – 35 (Y) (Without tachometer) : Continuity should exist.



- With tachometer:
  Continuity between harness connector M58 terminals 6 (L), 15 (Y) and combination meter harness connector M30 terminals 38 (L), 39 (Y).

6 (L) – 38 (L) (With tachometer) : Continuity should exist.

15 (Y) – 39 (Y) (With tachometer) : Continuity should exist.



OK or NG

OK >> GO TO 8.
NG >> Repair harness.

8. ECM/COMBINATION METER INTERNAL CIRCUIT INSPECTION

Check components inspection. Refer to LAN-22, "ECM/COMBINATION METER INTERNAL CIRCUIT INSPECTION" .

OK or NG

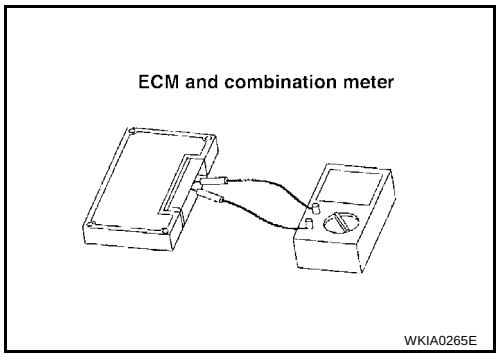
OK >> Connect all the connectors and diagnose again. Refer to LAN-18, "Work Flow" .
NG >> Replace ECM and/or combination meter.

Component Inspection

EKS003KL

ECM/COMBINATION METER INTERNAL CIRCUIT INSPECTION

- Remove ECM and combination meter from vehicle.
- Check resistance between ECM terminals 94 and 86.
- Check resistance between combination meter terminals 34 and 35 (Without tachometer).
- Check resistance between combination meter terminals 38 and 39 (With tachometer).



Unit	Terminal	Resistance value (Ω) (Approx.)
ECM	94 – 86	108 - 136
Combination meter (Without tachometer)	34 – 35	
Combination meter (With tachometer)	38 – 39	

CAN SYSTEM (TYPE 3)

PFP:23710

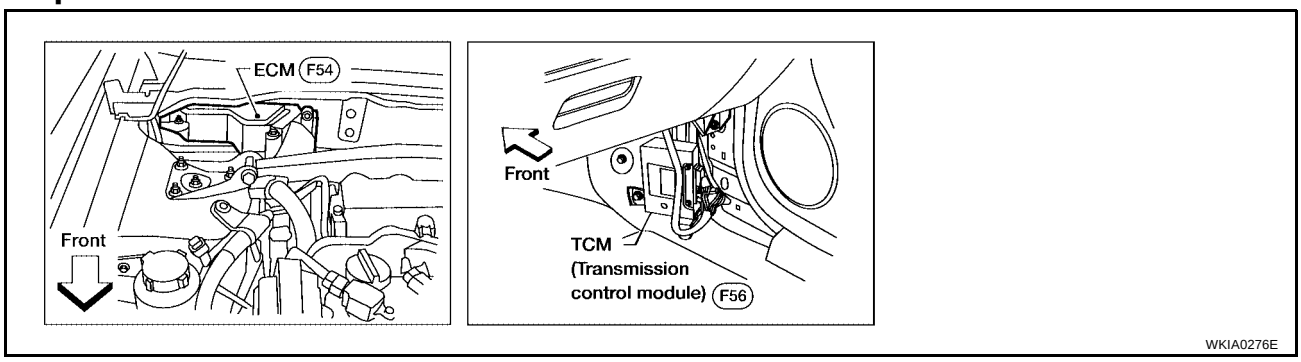
System Description

EKS003KM

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

Component Parts and Harness Connector Location

EKS003KN

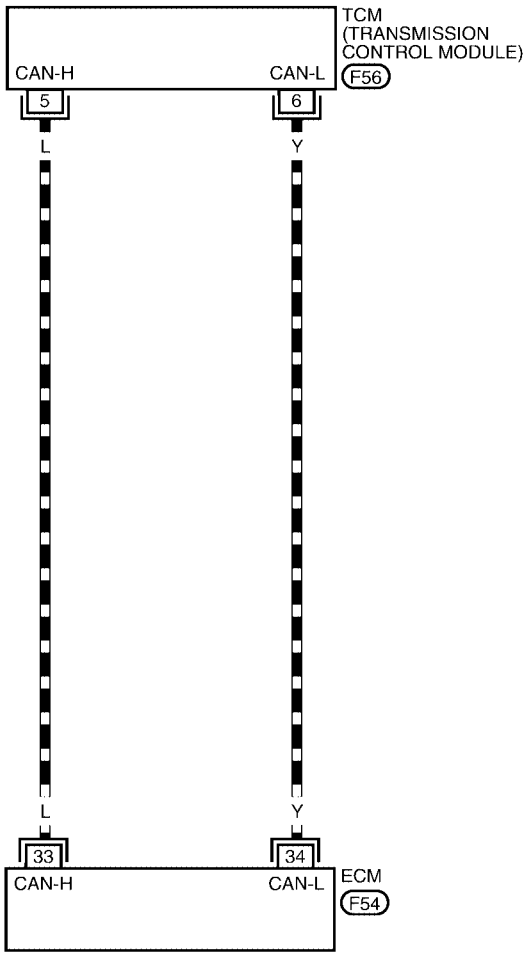


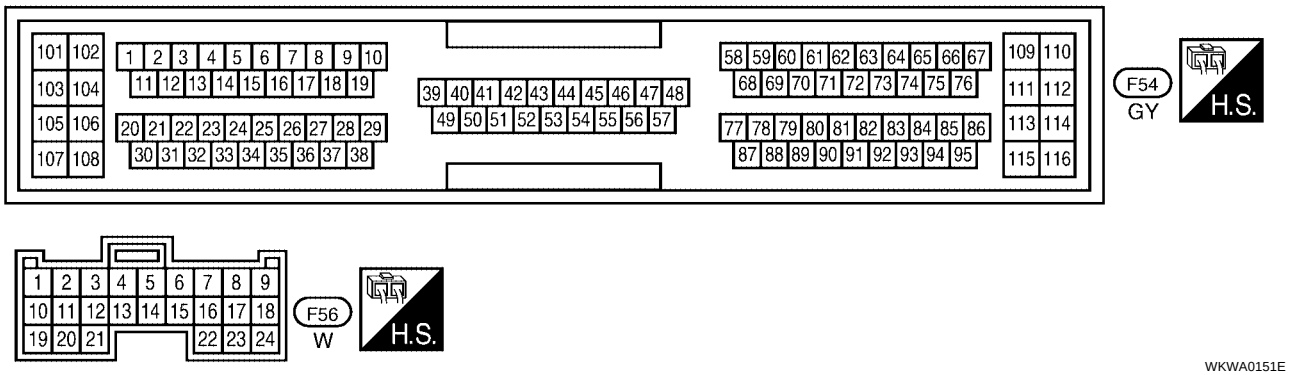
Wiring Diagram — CAN —

EKS003KO

LAN-CAN-03

: DATA LINE



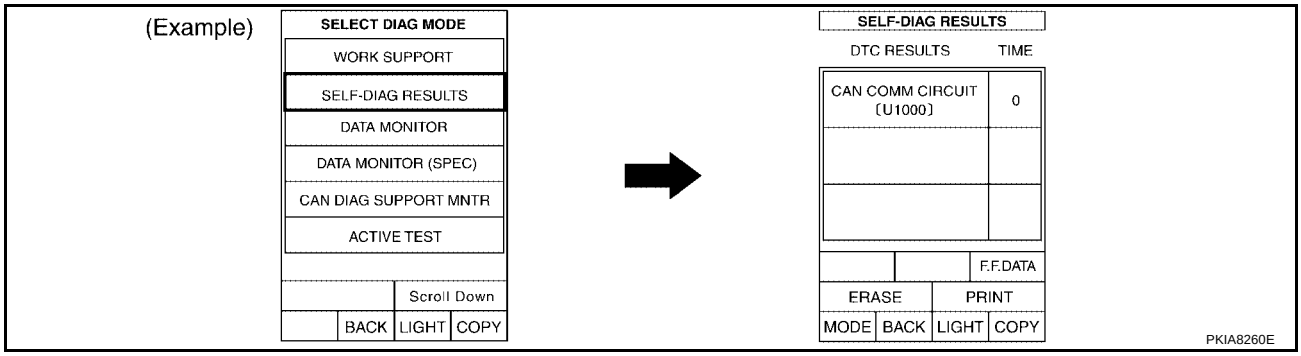


WKWA0151E

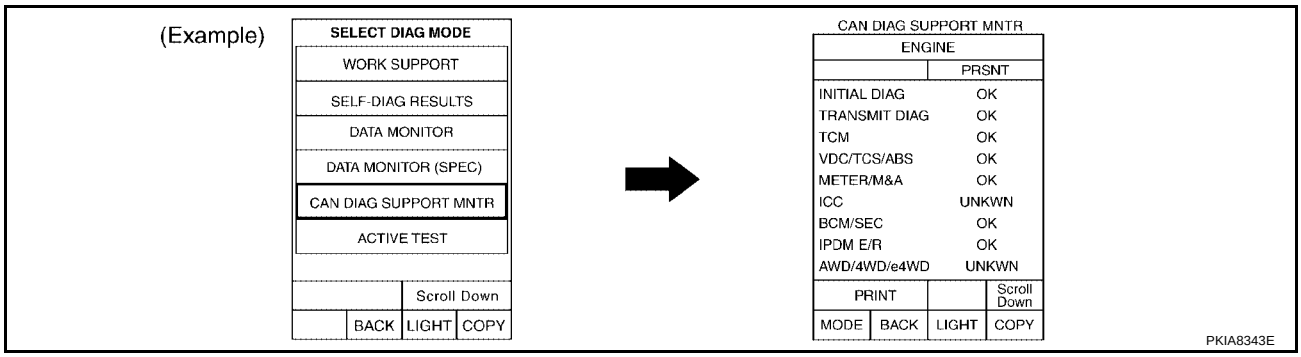
Work Flow

EKS008XU

1. Print all the data of “SELF-DIAG RESULTS” for “ENGINE” and “A/T” displayed on CONSULT-II.



2. Print all the data of “CAN DIAG SUPPORT MNTR” for “ENGINE” and “A/T” displayed on CONSULT-II.



3. Attach the printed sheet of “SELF-DIAG RESULTS” and “CAN DIAG SUPPORT MNTR” onto the check sheet. Refer to LAN-26, "CHECK SHEET" .
4. Based on the “CAN DIAG SUPPORT MNTR” results, put check marks onto the items with “UNKWN” or “NG” in the check sheet table. Refer to LAN-26, "CHECK SHEET" .

   NOTE:
   If “NG” is displayed on "INITIAL DIAG (initial diagnosis)" as “CAN DIAG SUPPORT MNTR” for the diagnosed control unit, replace the control unit.
5. According to the check sheet results (example), start inspection. Refer to LAN-27, "CHECK SHEET RESULTS (EXAMPLE)" .

CHECK SHEET

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR			
	Initial diagnosis	Transmit diagnosis	Receive diagnosis	
			ECM	TCM
ENGINE	NG	UNKWN		UNKWN
A/T	NG	UNKWN	UNKWN	

Symptoms:

Attach copy of ENGINE SELF-DIAG RESULTS

Attach copy of A/T SELF-DIAG RESULTS

Attach copy of ENGINE CAN DIAG SUPPORT MNTR

Attach copy of A/T CAN DIAG SUPPORT MNTR

WKIA2948E

CHECK SHEET RESULTS (EXAMPLE)

Case 1

Replace ECM.

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR			
	Initial diagnosis	Transmit diagnosis	Receive diagnosis	
			ECM	TCM
ENGINE	NG ✓	UNKWN	–	UNKWN
A/T	NG	UNKWN	UNKWN	–

WKIA2949E

Case 2

Replace TCM.

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR			
	Initial diagnosis	Transmit diagnosis	Receive diagnosis	
			ECM	TCM
ENGINE	NG	UNKWN	–	UNKWN ✓
A/T	NG ✓	UNKWN	UNKWN	–

WKIA2950E

Case 3

Check Can communication Circuit. Refer to LAN-27, "CAN Communication Circuit Check" .

SELECT SYSTEM screen	CAN DIAG SUPPORT MNTR			
	Initial diagnosis	Transmit diagnosis	Receive diagnosis	
			ECM	TCM
ENGINE	NG	UNKWN ✓	–	UNKWN ✓
A/T	NG	UNKWN ✓	UNKWN ✓	–

WKIA2951E

CAN Communication Circuit Check

EKS003KQ

1. CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Check following terminals and connector for damage, bend and loose connection (control module-side and harness-side).

- TCM
- ECM

OK or NG

OK >> GO TO 2.
NG >> Repair terminal or connector.

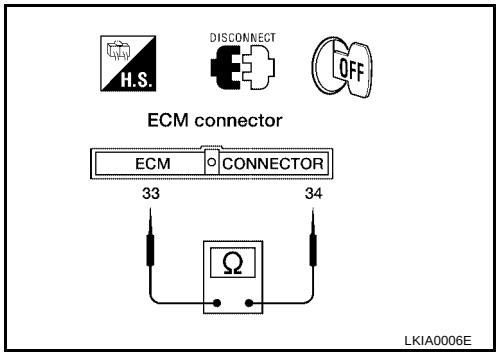
2. CHECK HARNESS FOR SHORT CIRCUIT

1. Disconnect ECM connector and TCM connector.
2. Check continuity between ECM harness connector F54 terminals 33 (L) and 34 (Y).

33 (L) – 34 (Y) : Continuity should not exist.

OK or NG

OK >> GO TO 3.
NG >> Repair harness between ECM and TCM.



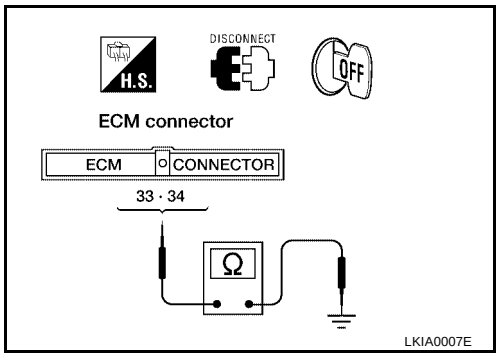
3. CHECK HARNESS FOR SHORT CIRCUIT

Check continuity between ECM harness connector F54 terminals 33 (L), 34 (Y) and ground.

33 (L) – ground : Continuity should not exist.
34 (Y) – ground : Continuity should not exist.

OK or NG

OK >> GO TO 4.
NG >> Repair harness between ECM and TCM.



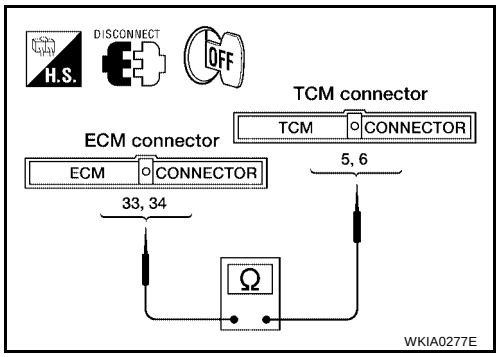
4. CHECK HARNESS FOR OPEN CIRCUIT

Check continuity between ECM harness connector F54 terminals 33 (L), 34 (Y) and TCM harness connector F56 terminals 5 (L), 6 (Y).

33 (L) – 5 (L) : Continuity should exist.
34 (Y) – 6 (Y) : Continuity should exist.

OK or NG

OK >> GO TO 5.
NG >> Repair harness.



5. ECM/TCM INTERNAL CIRCUIT INSPECTION

Check components inspection. Refer to LAN-29, "ECM/TCM INTERNAL CIRCUIT INSPECTION" .

OK or NG

OK >> Connect all the connectors and diagnose again. Refer to LAN-25, "Work Flow" .
NG >> Replace ECM and/or TCM.

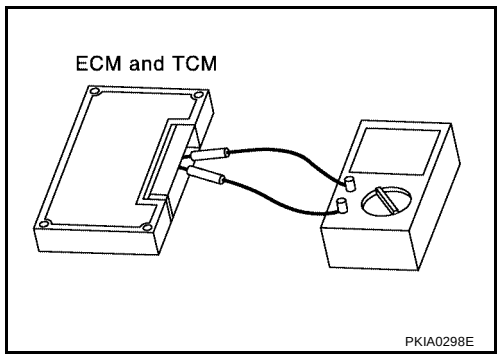
Component Inspection

EKS003KR

ECM/TCM INTERNAL CIRCUIT INSPECTION

- Remove ECM and TCM from vehicle.
- Check resistance between ECM terminals 33 and 34.
- Check resistance between TCM terminals 5 and 6.

Unit	Terminal	Resistance value (Ω) (Approx.)
ECM	33 – 34	108 - 136
TCM	5 – 6	



SECTION LT
LIGHTING SYSTEM

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EKS00650

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Wiring Diagrams and Trouble Diagnosis

EKS00385

When you read wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams"
- PG-2, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"

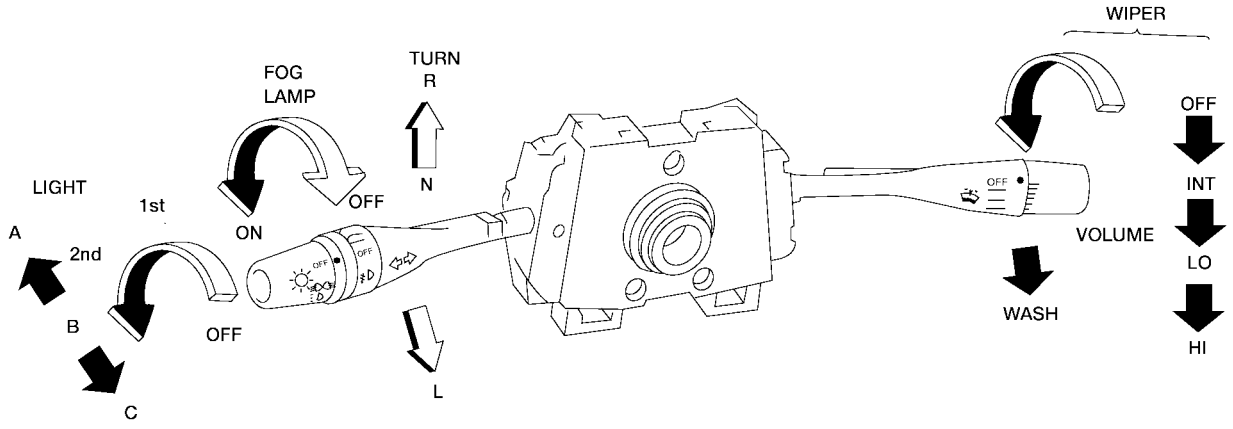
Check for any Service bulletins before servicing the vehicle.

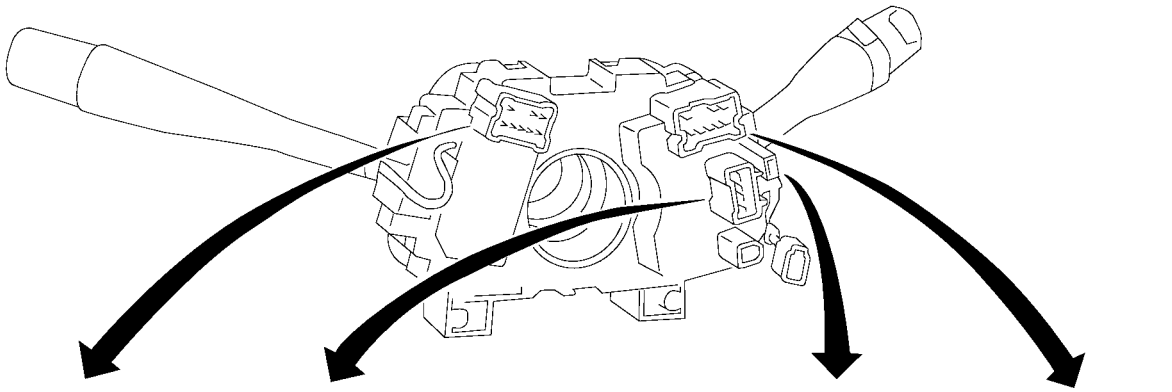
COMBINATION SWITCH

PFP:25567

Check

EKS00386





FRONT WIPER AND WASHER SWITCH
(WITH INTERMITTENT OPERATION)

	LO	AUTO STOP	AMP	WASH	HI	EARTH
OFF	○	○				
INT	○	○	○			○
LO	○					○
HI					○	○
WASH				○		○

VARIABLE INTERMITTENT WIPER VOLUME

WIPER AMP.

14 15 13 16 17 18

WIPER SWITCH (WITHOUT INTERMITTENT OPERATION)

	OFF	LO	HI	WASH
13	○			
14	○	○		
16			○	
17		○	○	
18				○

LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○		○
7								○	
8			○			○	○	○	○
9			○			○	○		○
10								○	
11				○	○	○	○	○	○
12				○	○	○	○	○	○

TURN SIGNAL LAMP SWITCH

	R	N	L
1	○		○
2	○		
3			○

FRONT FOG LAMP SWITCH

	OFF	ON
1		○
2		○

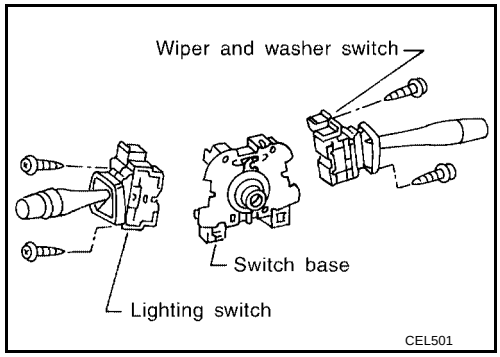
LEL576

Replacement

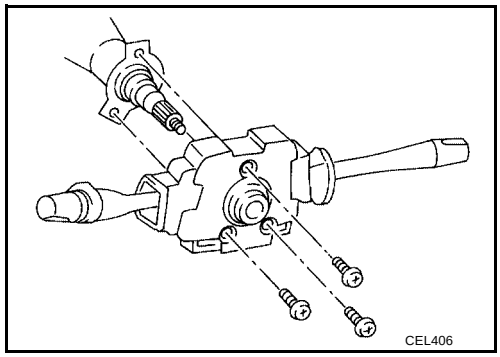
EKS00387

For removal and installation of spiral cable, refer to SRS-42, "Removal and Installation" .

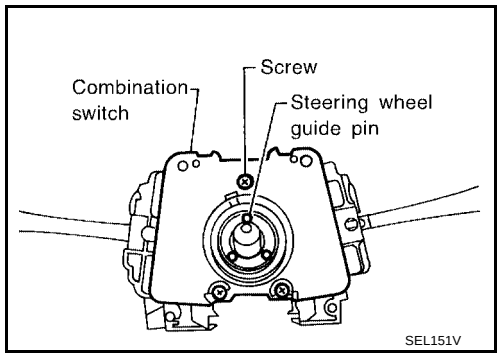
- Each switch can be replaced without removing switch base.



- To remove switch base, remove switch base attaching screws.



- Before installing the steering wheel, align the steering wheel guide pins with the screws which secure the combination switch as shown in the figure.



HEADLAMP (FOR USA)

PFP:26010

System Description

EKS00388

The headlamps are controlled by the lighting switch which is built into the combination switch. Power is supplied at all times:

- to lighting switch terminal 5
- through 15A fuse (No. 39, located in the fuse and fusible link box), and
- to lighting switch terminal 8
- through 15A fuse (No. 40, located in the fuse and fusible link box).

LOW BEAM OPERATION

When the lighting switch is turned to headlamp “ON” (2ND) position, “LOW BEAM” (B), power is supplied:

- from lighting switch terminal 10
- to terminal LO of the LH headlamp, and
- from lighting switch terminal 7
- to terminal LO of the RH headlamp.

Ground is supplied:

- to RH and LH headlamp terminal E
- through body grounds E7 and E37.

With power and ground supplied, the headlamps will illuminate.

HIGH BEAM OPERATION/FLASH-TO-PASS OPERATION

When the lighting switch is turned to headlamp “ON” (2ND) position, “HIGH BEAM” (A) or “FLASH TO PASS” (C) position, power is supplied:

- from lighting switch terminal 9
- to terminal HI of the LH headlamp, and
- from lighting switch terminal 6
- to terminal HI of the RH headlamp, and
- to combination meter terminal 2 (with tachometer), 12 (without tachometer) for the high beam indicator.

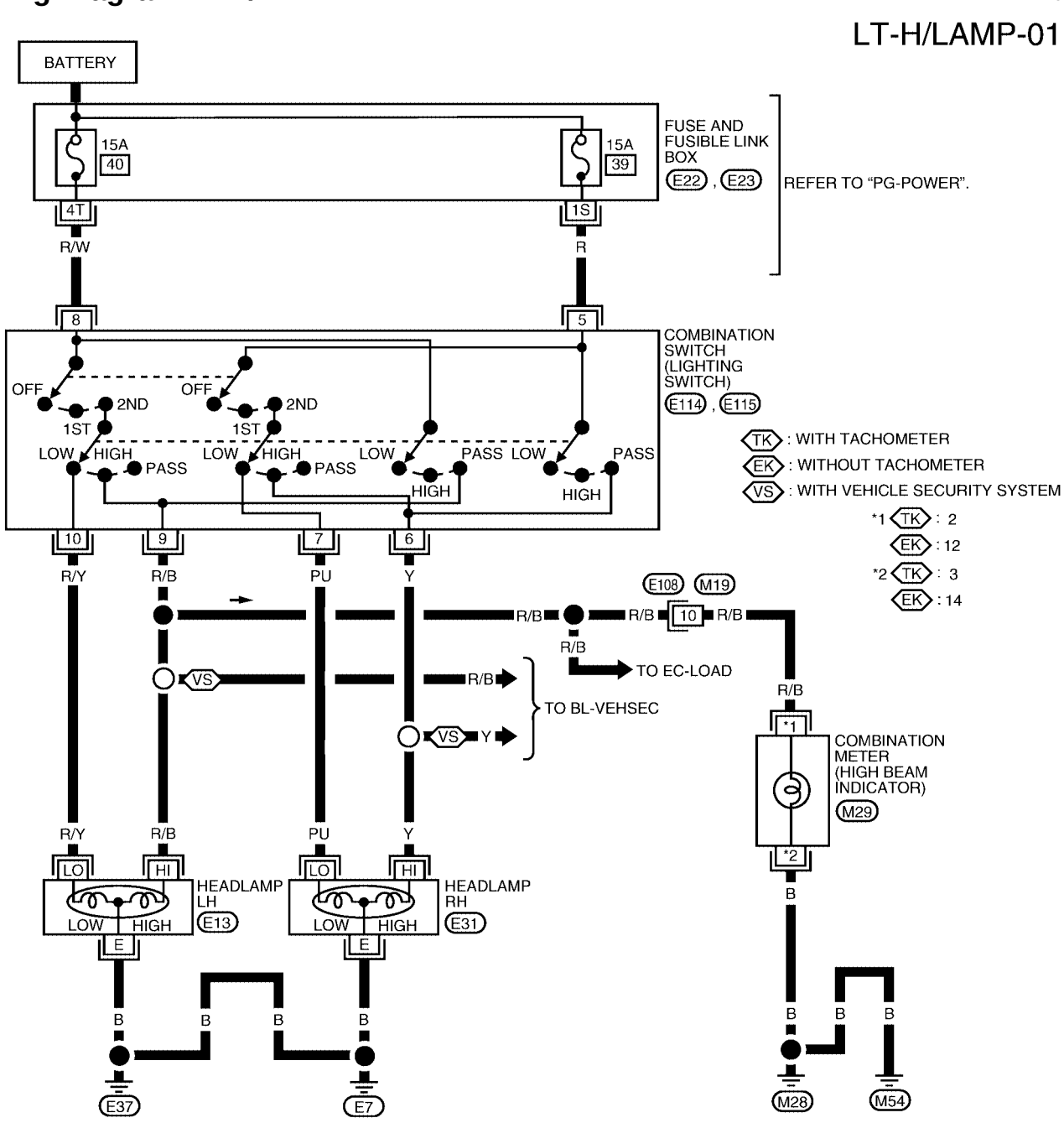
Ground is supplied to terminal 3 (with tachometer), 14 (without tachometer) of the combination meter through body grounds M28 and M54.
With power and ground supplied, the high beams and the high beam indicator illuminate.

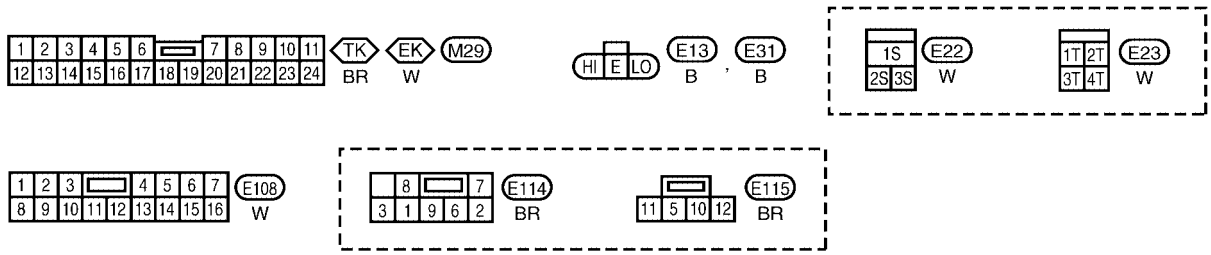
VEHICLE SECURITY SYSTEM

The vehicle security system will flash the high beams if the system is triggered. Refer to BL-64, "VEHICLE SECURITY (THEFT WARNING) SYSTEM" .

Wiring Diagram — H/LAMP —

EKS00389





WKWA0525E

Trouble Diagnoses

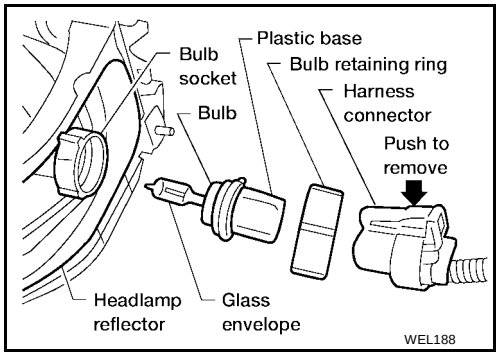
EKS0038A

Symptom	Possible cause	Repair order
LH headlamp does not operate.	1. Bulb 2. Grounds E7 and E37 3. 15A fuse 4. Lighting switch	1. Check bulb. 2. Check grounds E7 and E37. 3. Check 15A fuse (No. 40, located in fuse and fusible link box.) Verify battery positive voltage is present at terminal 8 of lighting switch. 4. Check lighting switch.
RH headlamp does not operate.	1. Bulb 2. Grounds E7 and E37 3. 15A fuse 4. Lighting switch	1. Check bulb. 2. Check grounds E7 and E37. 3. Check 15A fuse (No. 39, located in fuse and fusible link box). Verify battery positive voltage is present at terminal 5 of lighting switch. 4. Check lighting switch.
LH high beam does not operate, but LH low beam operates.	1. Bulb 2. Open in LH high beam circuit 3. Lighting switch	1. Check bulb. 2. Check R/B wire between lighting switch and LH headlamp for an open circuit. 3. Check lighting switch.
LH low beam does not operate, but LH high beam operates.	1. Bulb 2. Open in LH low beam circuit 3. Lighting switch	1. Check bulb. 2. Check R/Y wire between lighting switch and LH headlamp for an open circuit. 3. Check lighting switch.
RH high beam does not operate, but RH low beam operates.	1. Bulb 2. Open in RH high beam circuit 3. Lighting switch	1. Check bulb. 2. Check Y wire between lighting switch and RH headlamp for an open circuit. 3. Check lighting switch.
RH low beam does not operate, but RH high beam operates.	1. Bulb 2. Open in RH low beam circuit 3. Lighting switch	1. Check bulb. 2. Check PU wire between lighting switch and RH headlamp for an open circuit. 3. Check lighting switch.
High beam indicator does not work.	1. Bulb 2. Grounds M28 and M54 3. Open in high beam circuit	1. Check bulb in combination meter. 2. Check grounds M28 and M54. 3. Check R/B wire between lighting switch and combination meter for an open circuit.

Bulb Replacement

EKS006AP

The headlamp is a semi-sealed beam type which uses a replaceable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.



- **Grasp only the plastic base when handling the bulb. Never touch the glass envelope.**

1. Disconnect the battery cable.
2. Disconnect the harness connector from the back side of the headlamp bulb.
3. Turn the bulb retaining ring counterclockwise and remove.
4. Remove the bulb by pulling it straight out of the headlamp assembly. Do not shake the bulb when removing it.
5. Install in the reverse order of removal.

CAUTION:

Do not leave headlamp reflector without bulb for a long period of time. Dust, moisture, smoke, etc. entering headlamp body may affect the performance of the headlamp. Remove headlamp bulb from the headlamp reflector just before a replacement bulb is installed.

Aiming Adjustment

EKS006AQ

For details, refer to the regulations in your own country.

NOTE:

By regulation, no means for horizontal adjustment is provided from the factory on a finished vehicle. Horizontal aim will only be serviced in the case of headlamp replacement. After initial aim is set on the replacement headlamp, access to the horizontal adjusting screw must be prevented by installation of the headlamp aim locking cap that is provided with the replacement headlamp assembly.

Before performing aiming adjustment, check the following.

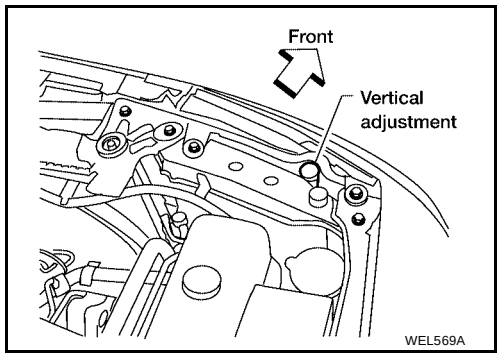
1. Inflate all tires to correct pressures.
2. Place vehicle on flat surface.
3. See that the vehicle is unloaded (except for full levels of coolant, engine oil and fuel, and spare tire, jack, and tools). Have the driver or equivalent weight placed in the driver's seat.

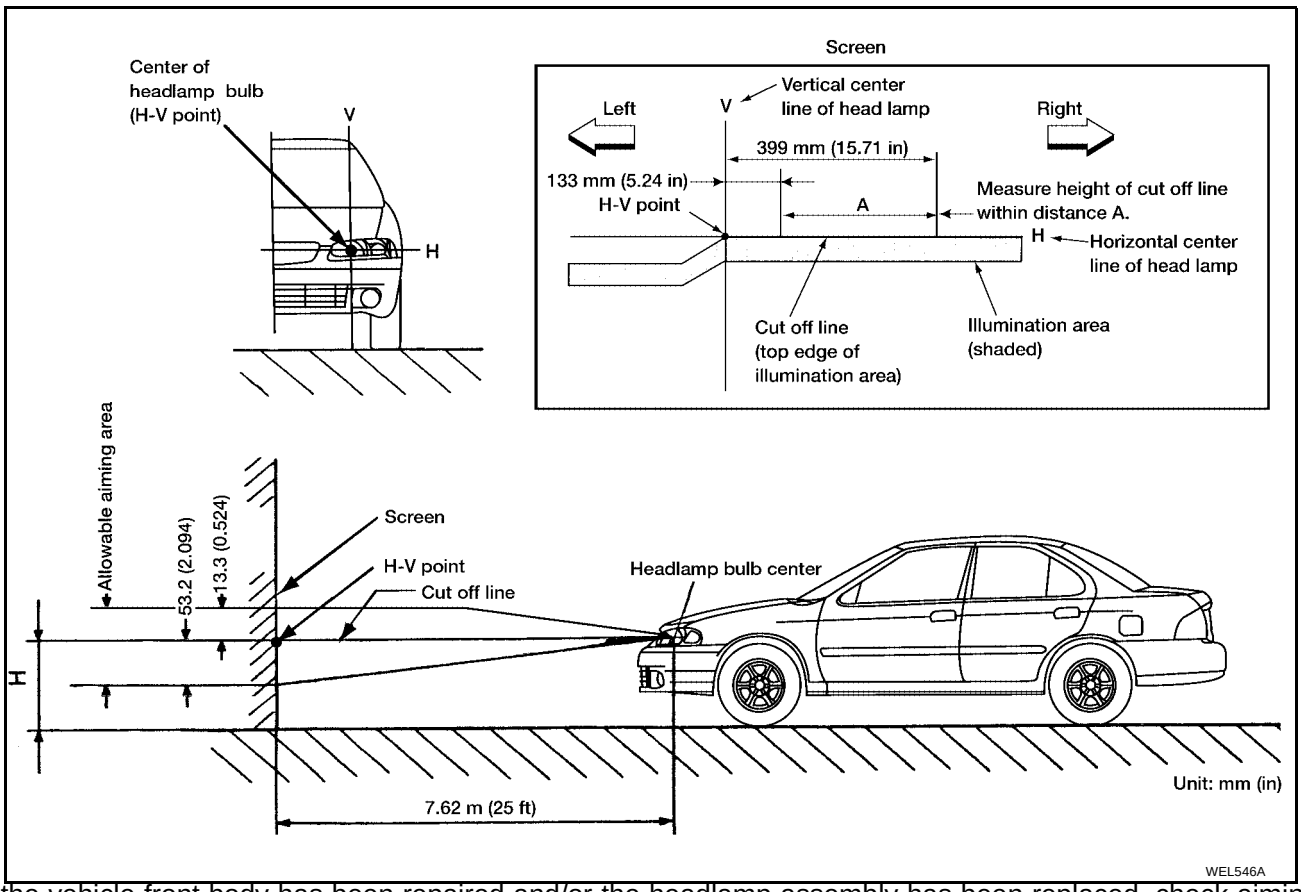
LOW BEAM

1. Turn headlamp low beam on.
2. Use adjusting screw to perform aiming adjustment.

CAUTION:

Do not tighten adjusting screw beyond a torque of 1.67 N-m (17 kg-cm, 14.8 in-lb) or damage may occur.





If the vehicle front body has been repaired and/or the headlamp assembly has been replaced, check aiming. Use the aiming chart shown in the figure.

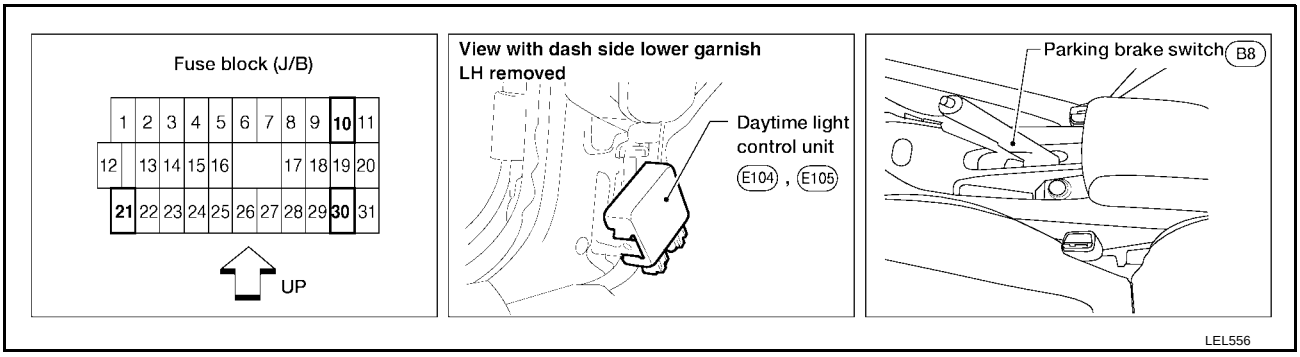
- **Basic illuminating area for adjustment should be within the range shown on the aiming chart. Adjust headlamps accordingly.**

HEADLAMP (FOR CANADA) — DAYTIME LIGHT SYSTEM —

PFP:26010

Component Parts and Harness Connector Location

EKS0038D



System Description

EKS0038E

The headlamp system for Canada vehicles contains a daytime light control unit. This unit activates the high beam headlamps at approximately half illumination whenever the engine is running. If the parking brake is applied before the engine is started, daytime lights will not be illuminated. The daytime lights will illuminate once the parking brake is released. Thereafter, the daytime lights will continue to operate when the parking brake is applied. If the daytime light control unit receives a ground signal from the generator, the daytime lights will not be illuminated. The daytime lights will illuminate once a battery positive voltage signal is sent to the daytime light control unit from the generator.

Power is supplied at all times:

- through 15A fuse (No. 39, located in the fuse and fusible link box)
- to daytime light control unit terminal 2 and
- to lighting switch terminal 5.

Power is also supplied at all times:

- through 15A fuse (No. 40, located in the fuse and fusible link box)
- to daytime light control unit terminal 3 and
- to lighting switch terminal 8.

With the ignition switch in the ON or START position, power is supplied:

- through 10A fuse (No. 10, located in the fuse block [J/B])
- to daytime light control unit terminal 12.

With the ignition switch in the START position, power is supplied:

- through 10A fuse (No. 21, located in the fuse block [J/B])
- to daytime light control unit terminal 1.

Ground is supplied to daytime light control unit terminal 9 through body grounds E7 and E37.

HEADLAMP OPERATION

Low Beam Operation

When the lighting switch is turned to headlamp “ON” (2ND) position, “LOW BEAM” (B) position, power is supplied:

- from lighting switch terminal 7
- to RH headlamp terminal LO.

Ground is supplied:

- to RH headlamp terminal E
- through body grounds E7 and E37.

Also, when the lighting switch is moved to headlamp “ON” (2ND) position, “LOW BEAM” (B) position, power is supplied:

- from lighting switch terminal 10
- to LH headlamp terminal LO.

Ground is supplied:

- to LH headlamp terminal E

- from daytime light control unit terminal 7
- through daytime light control unit terminal 9
- through body grounds E7 and E37.

With power and ground supplied, the low beam headlamps illuminate.

High Beam Operation/Flash-to-pass Operation

When the lighting switch is moved to headlamp “ON” (2ND) position, “HIGH BEAM” (A) or “FLASH TO PASS” (C) position, power is supplied:

- from lighting switch terminal 6
- to RH headlamp terminal HI, and
- from lighting switch terminal 9
- to daytime light control unit terminal 5, and
- to combination meter terminal 2 (with tachometer), 12 (without tachometer) for the high beam indicator
- through daytime light control unit terminal 6
- to LH headlamp terminal HI.

Ground is supplied in the same manner as low beam operation.
Ground is supplied to terminal 3 (with tachometer), 14 (without tachometer) of the combination meter through body grounds M28 and M54.
With power and ground supplied, the high beam headlamps and high beam indicator illuminate.

DAYTIME LIGHT OPERATION

With the engine running and the lighting switch in the “OFF” or parking lamp (1ST) position and parking brake released, power is supplied:

- to daytime light control unit terminal 3
- through daytime light control unit terminal 6
- to LH headlamp terminal HI
- through LH headlamp terminal E
- to daytime light control unit terminal 7
- through daytime light control unit terminal 8
- to RH headlamp terminal HI.

Ground is supplied:

- to RH headlamp terminal E
- through body grounds E7 and E37.

Because the high beam headlamps are wired in series during daytime light operation, they operate at half illumination.

OPERATION (FOR CANADA)

The headlamps' high beams automatically turn on after starting the engine with the lighting switch in the “OFF” or parking lamp (1st) position. All other lighting switch functions operate the same as conventional light systems.

Engine		With engine stopped									With engine running								
Lighting switch		OFF			1ST			2ND			OFF			1ST			2ND		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	X	X	O	X	X	O	O	X	O	*	*	O	*	*	O	O	X	O
	Low beam	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	O	X
Front parking and tail lamp		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O
License and instrument illumination lamp		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O

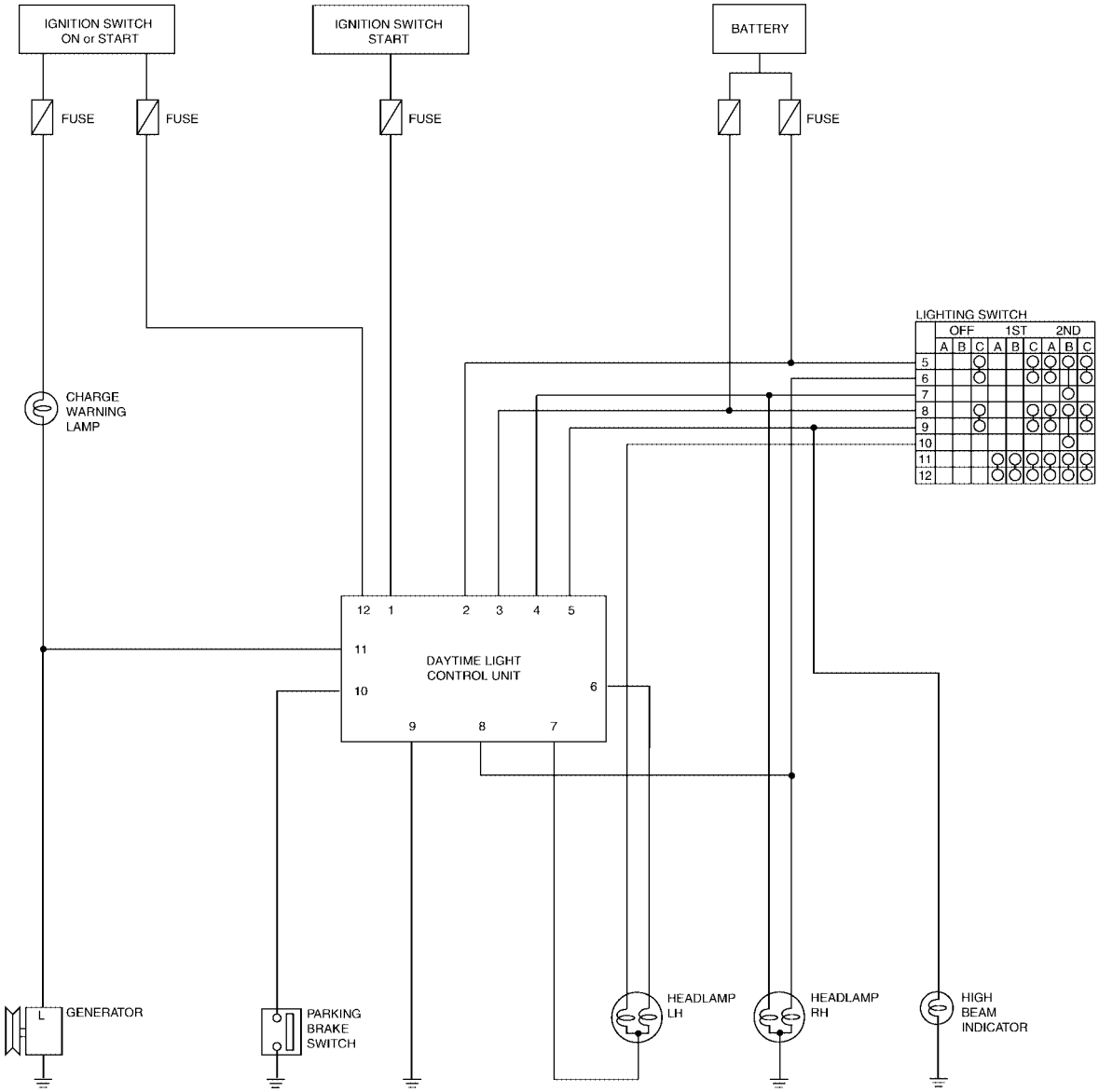
- A: “HIGH BEAM” position
- B: “LOW BEAM” position
- C: “FLASH TO PASS” position
- O : Lamp ON
- X : Lamp OFF
- : Lamp on at half brightness
- *: When starting the engine with the parking brake released, the daytime light will come ON.
  When starting the engine with the parking brake applied, the daytime light will not come ON. Once the parking brake is released, the daytime light will come ON. Thereafter, the daytime light will continue to operate when the parking brake is applied. If the daytime light control unit receives a ground signal from the generator, the daytime light will not come ON. The daytime light will come ON when battery voltage is sent to the daytime light control unit from the generator (engine is running).

VEHICLE SECURITY SYSTEM

The vehicle security system will flash the high beams if the system is triggered. Refer to BL-64, "VEHICLE SECURITY (THEFT WARNING) SYSTEM" .

Schematic

EKS0038F

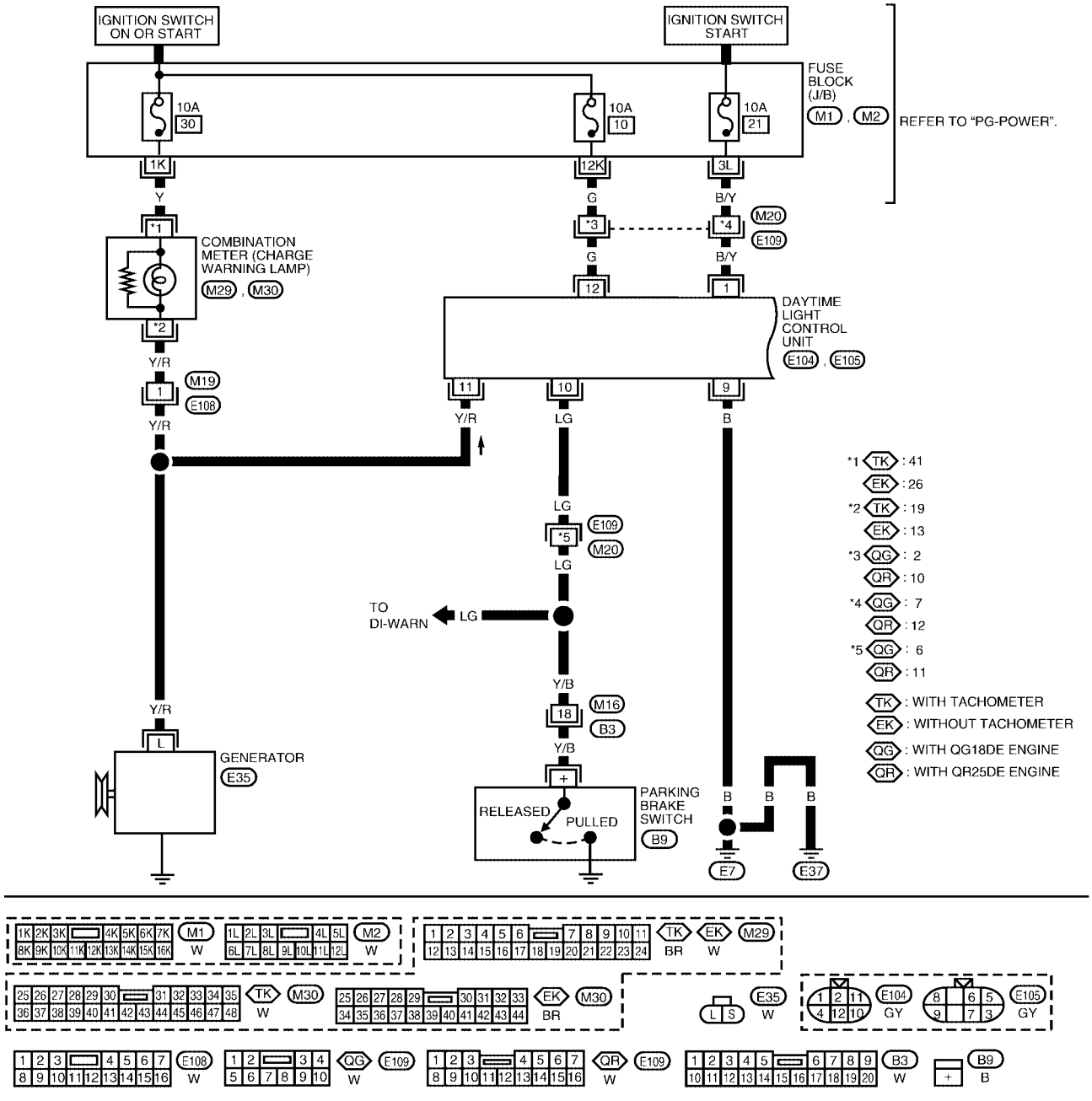


WKWA0526E

Wiring Diagram — DTRL —

EKS0038G

LT-DTRL-01



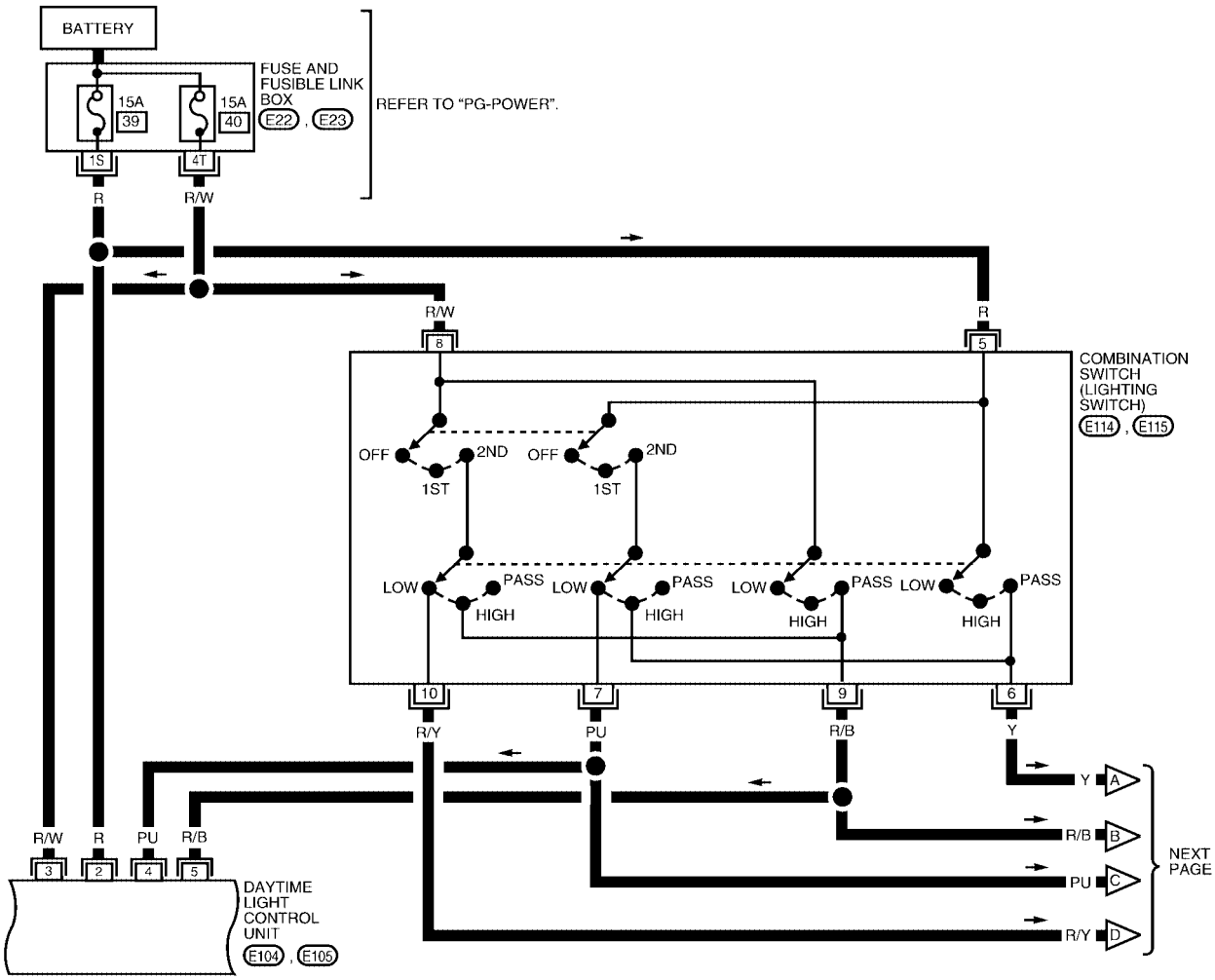
WKWA0527E

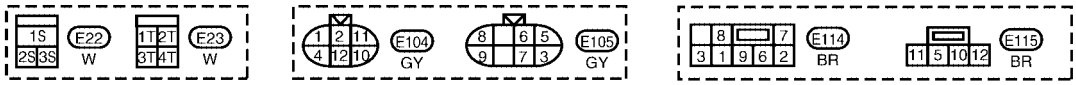
DAYTIME LIGHT CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
1	B/Y	IGNITION SWITCH (START)	WHEN TURNING IGNITION SWITCH TO START POSITION	BATTERY VOLTAGE
9	B	DAYTIME LIGHT CONTROL UNIT GROUND	—	—
10	LG	PARKING BRAKE SWITCH	WHEN PARKING BRAKE IS RELEASED	BATTERY VOLTAGE
			WHEN PARKING BRAKE IS APPLIED	1.5V OR LESS
11	Y/R	GENERATOR	WHEN TURNING IGNITION SWITCH TO ON POSITION	4.6V OR LESS
			WHEN ENGINE IS RUNNING	B+ VOLTAGE
			WHEN TURNING IGNITION SWITCH TO OFF POSITION	1V OR LESS
12	G	IGNITION SWITCH (ON OR START)	WHEN TURNING IGNITION SWITCH TO ON POSITION	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO START POSITION	BATTERY VOLTAGE

LEL592

LT-DTRL-02





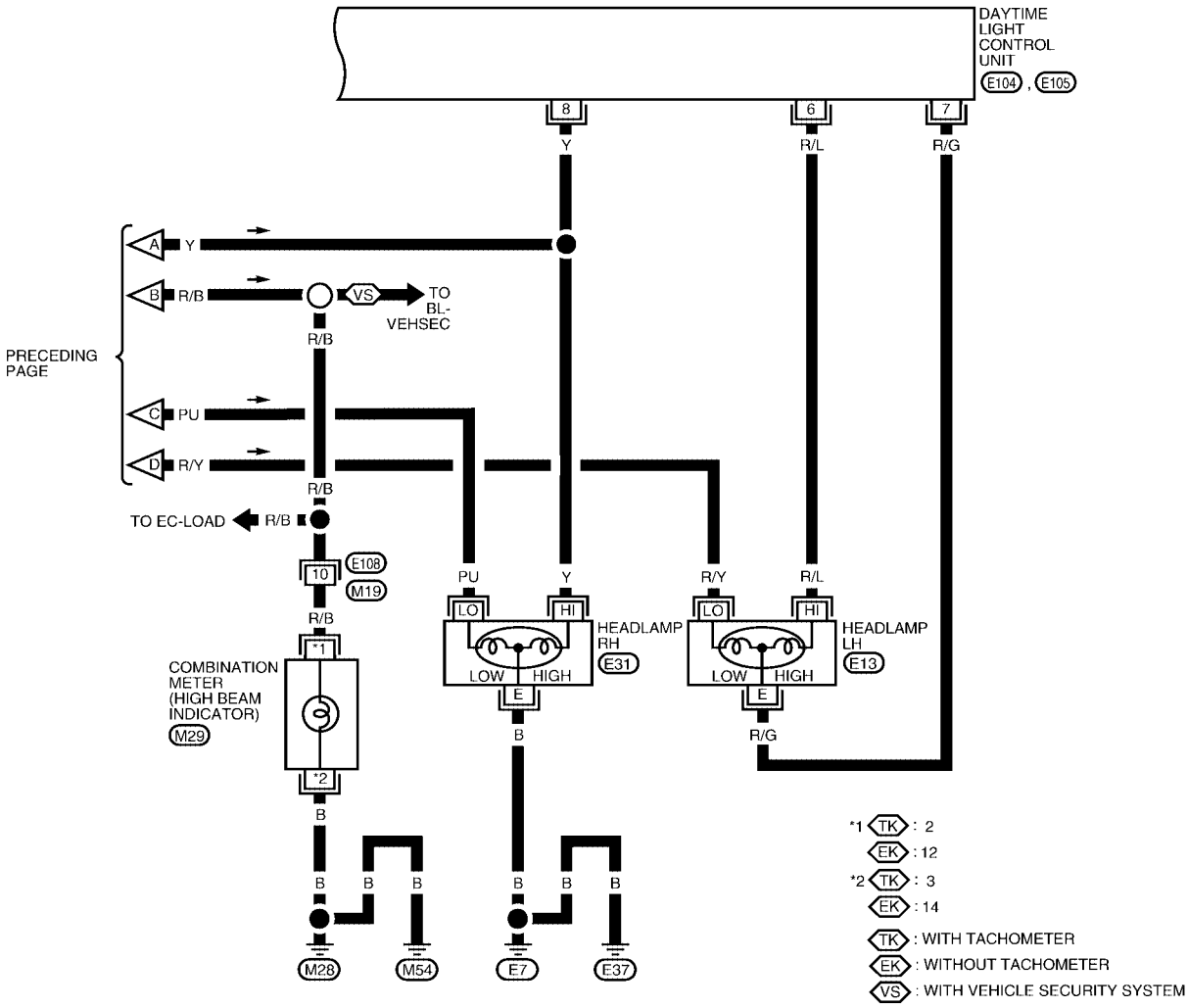
WKWA0076E

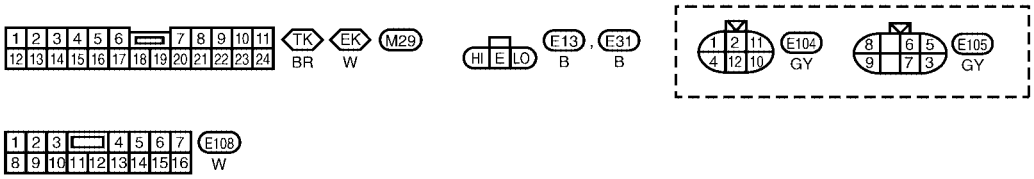
DAYTIME LIGHT CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
2	R	POWER SOURCE	WHEN TURNING IGNITION SWITCH TO ON POSITION	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO OFF POSITION	BATTERY VOLTAGE
3	R/W	POWER SOURCE	WHEN TURNING IGNITION SWITCH TO ON POSITION	BATTERY VOLTAGE
			WHEN TURNING IGNITION SWITCH TO OFF POSITION	BATTERY VOLTAGE
4	PU	LIGHTING SWITCH (LOW BEAM)	WHEN TURNING LIGHTING SWITCH TO HEADLAMP ON (2ND) POSITION, LOW BEAM	BATTERY VOLTAGE
5	R/B	LIGHTING SWITCH (HIGH BEAM)	WHEN TURNING LIGHTING SWITCH TO HIGH (A)	BATTERY VOLTAGE
			WHEN TURNING LIGHTING SWITCH TO FLASH TO PASS	BATTERY VOLTAGE

LEL593

LT-DTRL-03





WKWA0528E

DAYTIME LIGHT CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

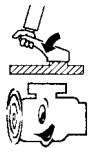
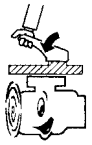
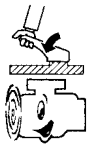
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
6	R/L	LH HIGH BEAM	WHEN TURNING LIGHTING SWITCH TO HIGH (A)	BATTERY VOLTAGE
			WHEN RELEASING PARKING BRAKE WITH ENGINE RUNNING AND TURNING LIGHTING SWITCH TO OFF (DAYTIME LIGHT OPERATION) **CAUTION: BLOCK WHEELS AND ENSURE SELECTOR LEVER IS IN N OR P POSITION**	BATTERY VOLTAGE
7	R/G	LH HEADLAMP CONTROL (GROUND)	WHEN LIGHTING SWITCH IS TURNED TO HEADLAMP ON (2ND) POSITION, LOW BEAM	1V OR LESS
			WHEN RELEASING PARKING BRAKE WITH ENGINE RUNNING AND TURNING LIGHTING SWITCH TO OFF (DAYTIME LIGHT OPERATION) **CAUTION: BLOCK WHEELS AND ENSURE SELECTOR LEVER IS IN N OR P POSITION.**	APPROX. HALF OF BATTERY VOLTAGE
8	Y	RH HIGH BEAM	WHEN TURNING LIGHTING SWITCH TO HIGH (A)	BATTERY VOLTAGE
			WHEN RELEASING PARKING BRAKE WITH ENGINE RUNNING AND TURNING LIGHTING SWITCH TO OFF (DAYTIME LIGHT OPERATION) **CAUTION: BLOCK WHEELS AND ENSURE SELECTOR LEVER IS IN N OR P POSITION.**	APPROX. HALF OF BATTERY VOLTAGE

LEL594

Trouble Diagnoses

EKS0038H

DAYTIME LIGHT CONTROL UNIT INSPECTION TABLE

Terminal No.	Wire color	Item	Condition		Voltage (Approx. values)
1	B/Y	Start signal		When turning ignition switch to ST	Battery voltage
				When turning ignition switch to ON from ST	Less than 1V
				When turning ignition switch to OFF	Less than 1V
2	R	Power source		When turning ignition switch to ON	Battery voltage
				When turning ignition switch to OFF	Battery voltage
3	R/W	Power source		When turning ignition switch to ON	Battery voltage
				When turning ignition switch to OFF	Battery voltage
4	PU	Lighting switch (Low beam)		When turning lighting switch to headlamp ON (2ND) position, LOW BEAM	Battery voltage
5	R/B	Lighting switch (High beam)		When turning lighting switch to HIGH (A)	Battery voltage
				When turning lighting switch to FLASH TO PASS	Battery voltage
6	R/L	LH high beam		When turning lighting switch to HIGH (A)	Battery voltage
				When releasing parking brake with engine running and turning lighting switch to OFF (daytime light operation) **CAUTION:** **Block wheels and ensure selector lever is in N or P position.**	Battery voltage
7	R/G	LH headlamp control (ground)		When lighting switch is turned to headlamp ON (2ND) position, LOW BEAM	1V or less
				When releasing parking brake with engine running and turning lighting switch OFF (daytime light operation) **CAUTION:** **Block wheels and ensure selector lever is in N or P position.**	Half battery voltage
8	Y	RH high beam		When turning lighting switch to HIGH (A)	Battery positive voltage
				When releasing parking brake with engine running and turning lighting switch OFF (daytime light operation) **CAUTION:** **Block wheels and ensure selector level is in N or P position.**	Half battery voltage
9	B	Ground		—	—
10	LG	Parking brake switch		When parking brake is released	Battery voltage
				When parking brake is applied	1.5V or less

Terminal No.	Wire color	Item	Condition		Voltage (Approx. values)
11	Y/R	Generator		When turning ignition switch ON	4.6V or less
				When engine is running	Battery voltage
				When turning ignition switch OFF	1V or less
12	G	Power source		When turning ignition switch ON	Battery voltage
				When turning ignition switch to ST	Battery voltage
				When turning ignition switch OFF	1V or less

Bulb Replacement

EKS0038I

Refer to LT-18, "Bulb Replacement" .

Aiming Adjustment

EKS0038J

Refer to LT-18, "Aiming Adjustment" .

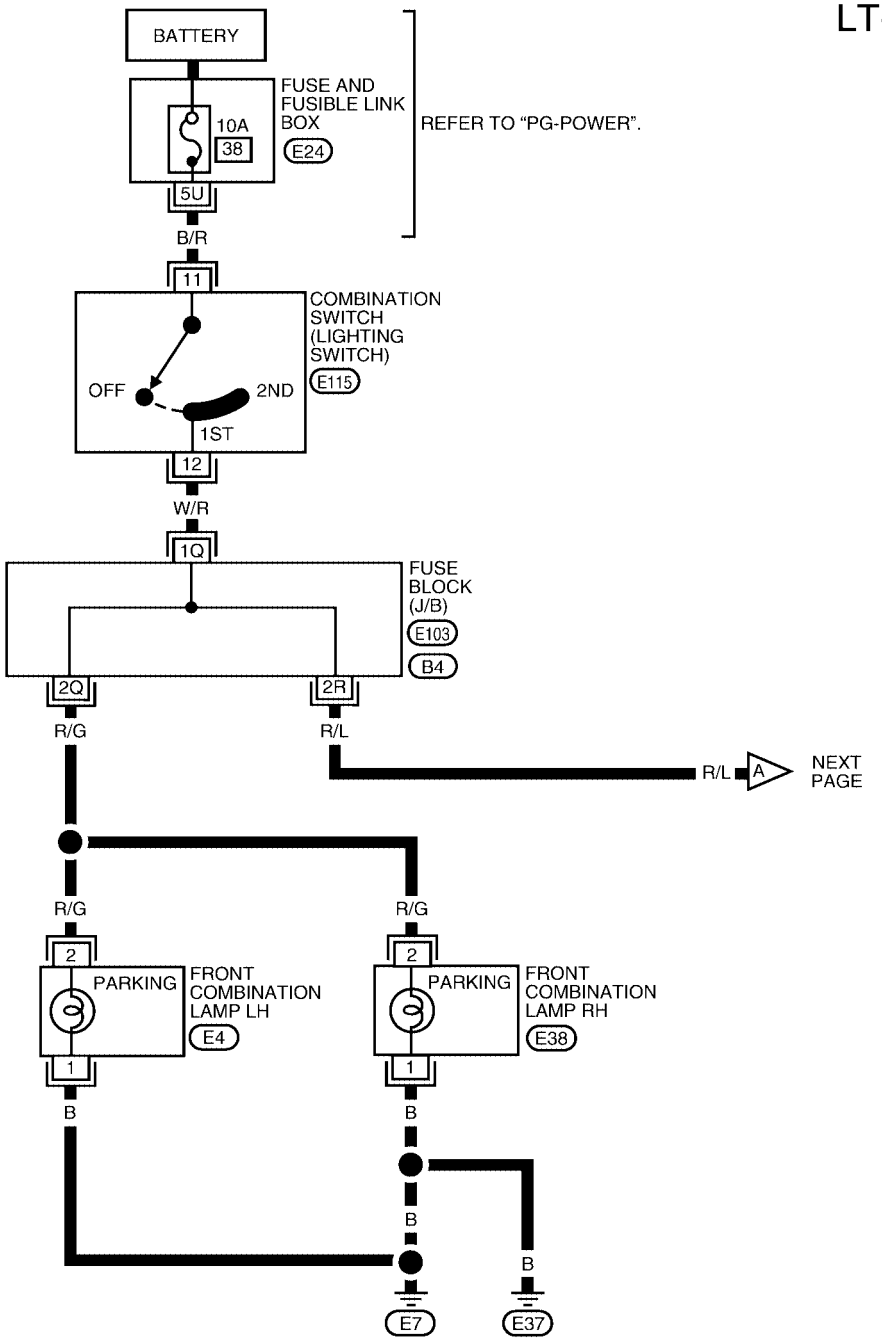
PARKING, LICENSE AND TAIL LAMPS

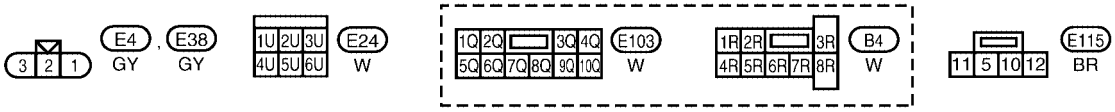
PFP:26550

Wiring Diagram — TAIL/L —

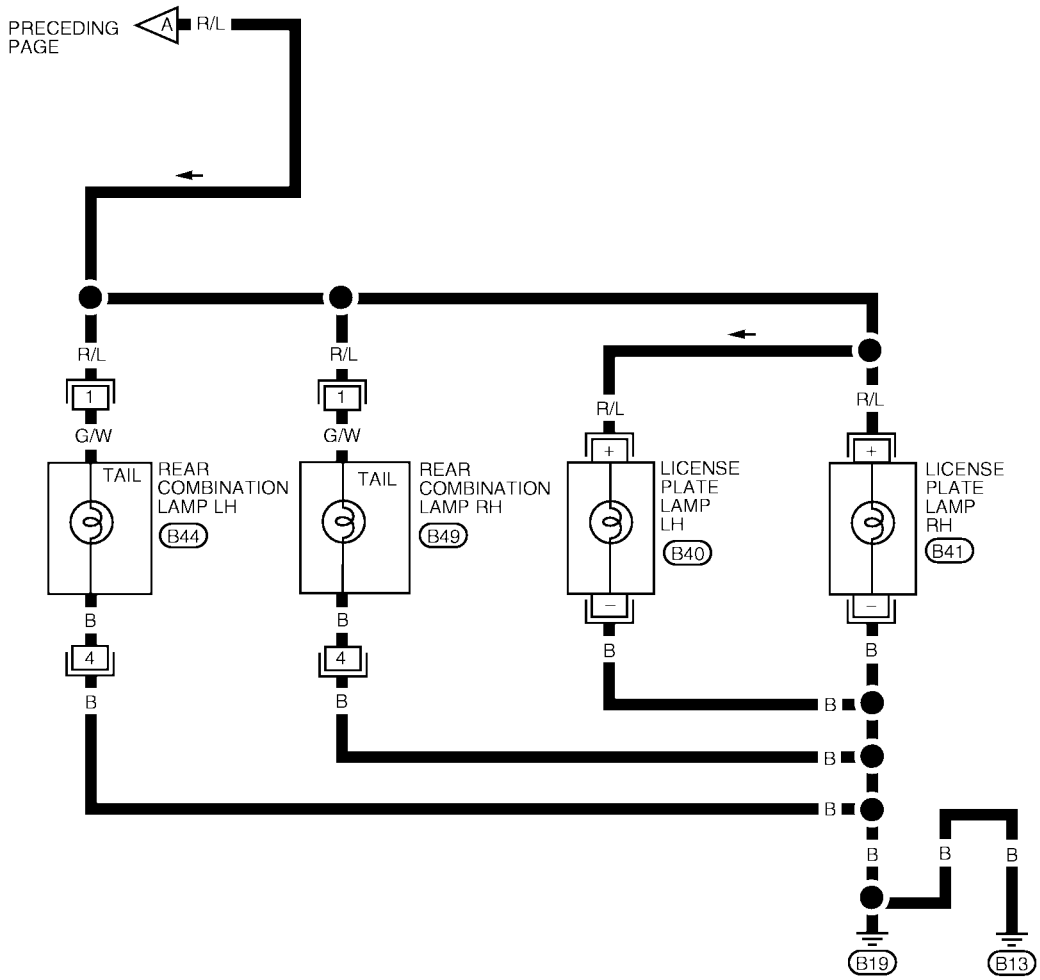
EKS0038K

LT-TAIL/L-01





WKWA0217E


PRECEDING PAGE
A
R/L
R/L
1
G/W
TAIL
REAR COMBINATION LAMP LH
B44
B
4
B
R/L
1
G/W
TAIL
REAR COMBINATION LAMP RH
B49
B
4
B
R/L
+
LICENSE PLATE LAMP LH
B40
–
B
R/L
+
LICENSE PLATE LAMP RH
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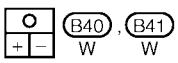
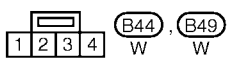
B
B
B19
B13


B40
W
B41
W


1 2 3 4
B44
W
B49
W

WKWA0021E

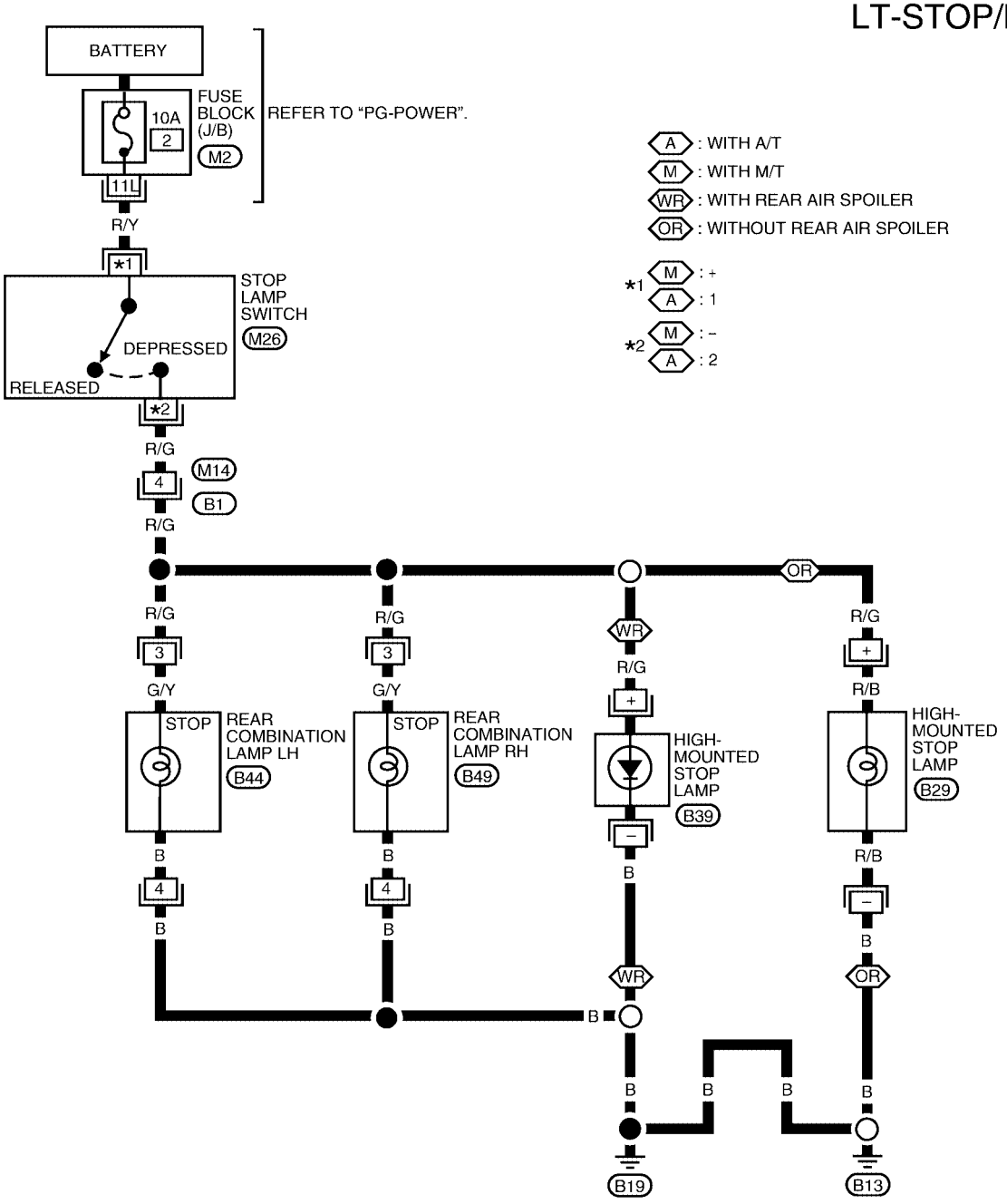
STOP LAMP

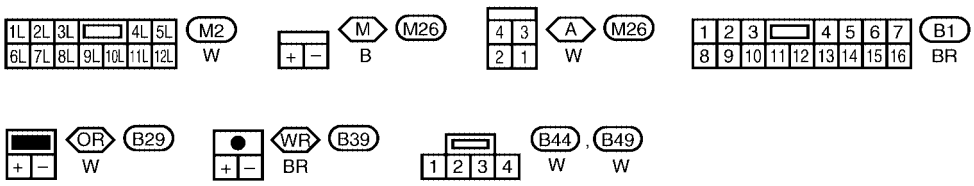
PFP:26550

Wiring Diagram — STOP/L —

EKS0038L

LT-STOP/L-01





WKWA0218E

BACK-UP LAMP

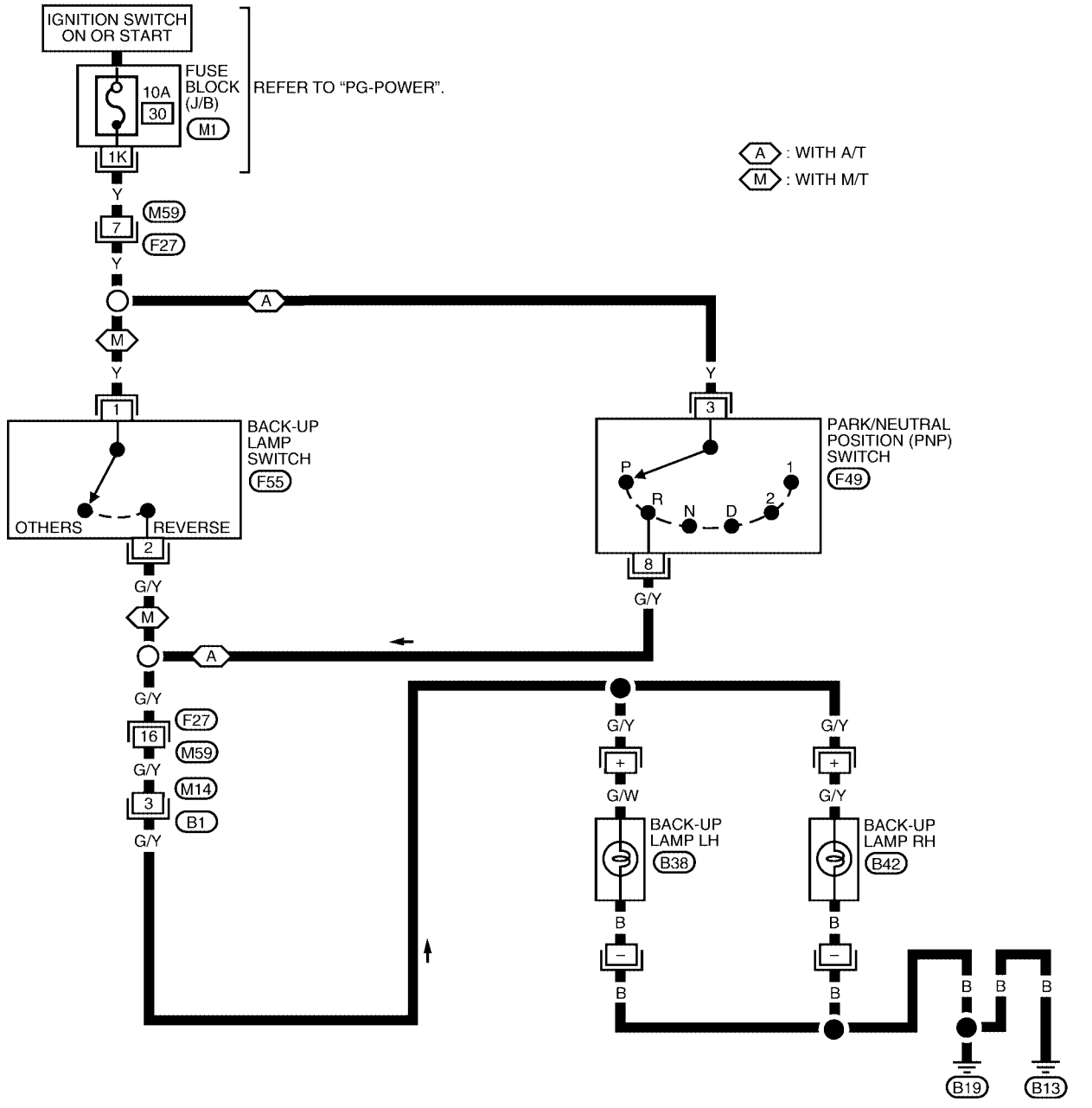
PFP:26550

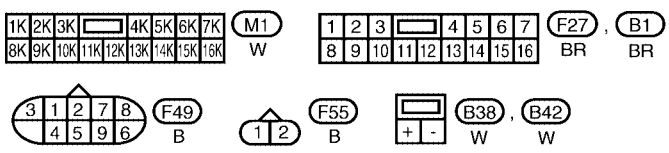
Wiring Diagram — BACK/L —

EKS0038M

QG18DE

LT-BACK/L-01

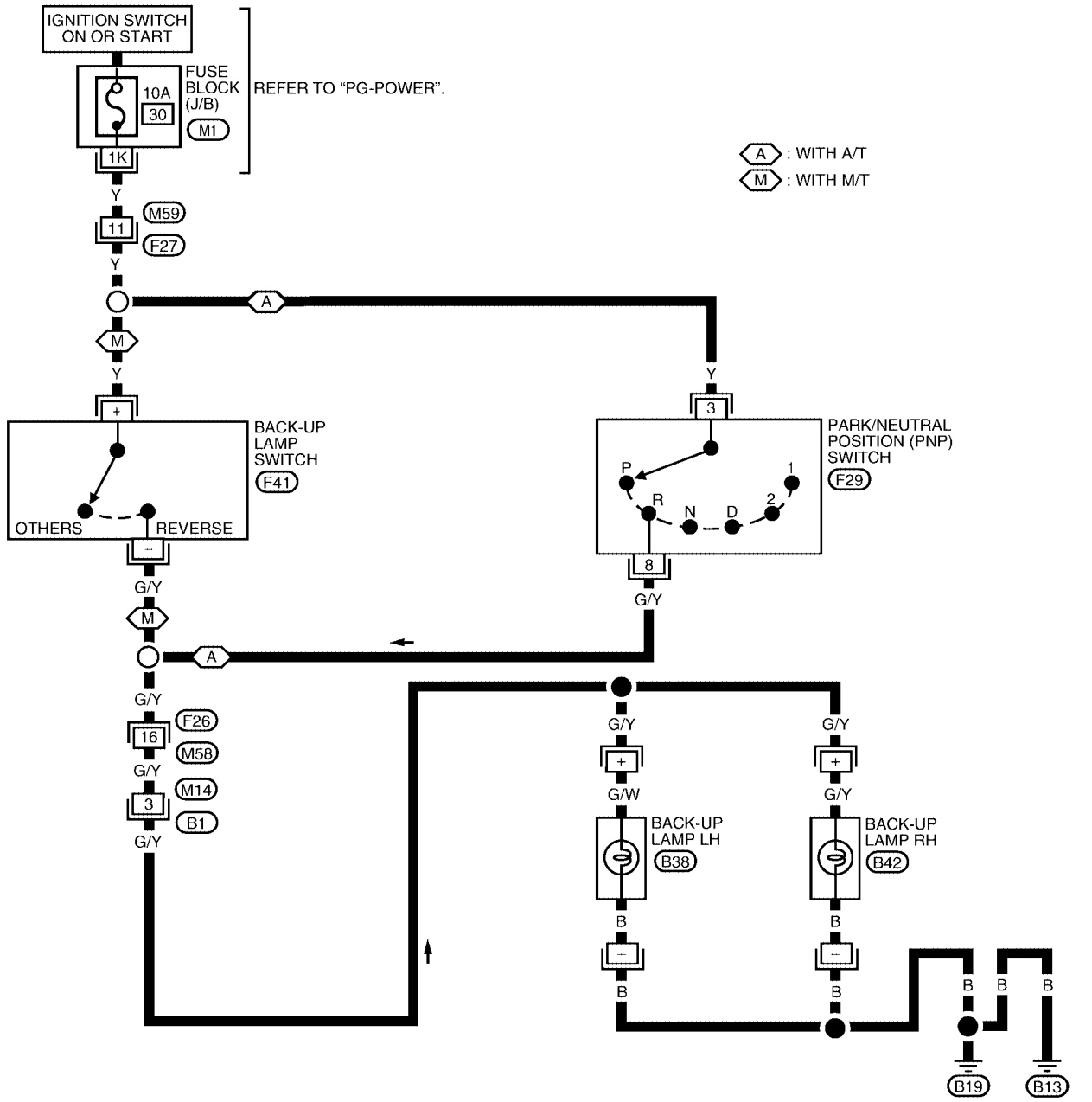


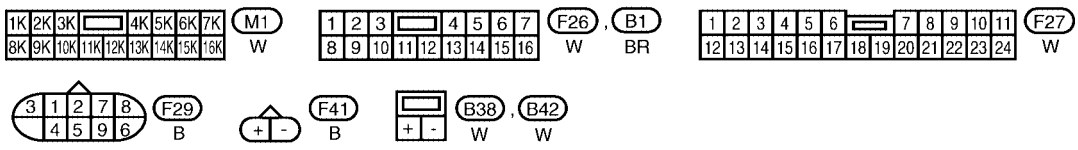


WKWA0515E

QR25DE

LT-BACK/L-02





WKWA0516E

FRONT FOG LAMP

PFP:26150

System Description

EKS006AJ

Power is supplied at all times to front fog lamp relay terminal 5 through:

- 15A fuse (No. 43, located in the fuse and fusible link box.)

With the lighting switch in headlamp “ON” (2ND) position, “LOW BEAM” (B) position, power is supplied:

- through 15A fuse (No. 39, located in the fuse and fusible link box)
- to lighting switch terminal 5
- through terminal 7 of the lighting switch
- to front fog lamp relay terminal 1.

FOG LAMP OPERATION

The front fog lamp switch is built into the combination switch. The lighting switch must be in headlamp “ON” (2ND) position and “LOW BEAM” (B) position for fog lamp operation.
With the front fog lamp switch in the ON position ground is supplied:

- to front fog lamp relay terminal 2
- through the front fog lamp switch
- to body grounds E7 and E37.

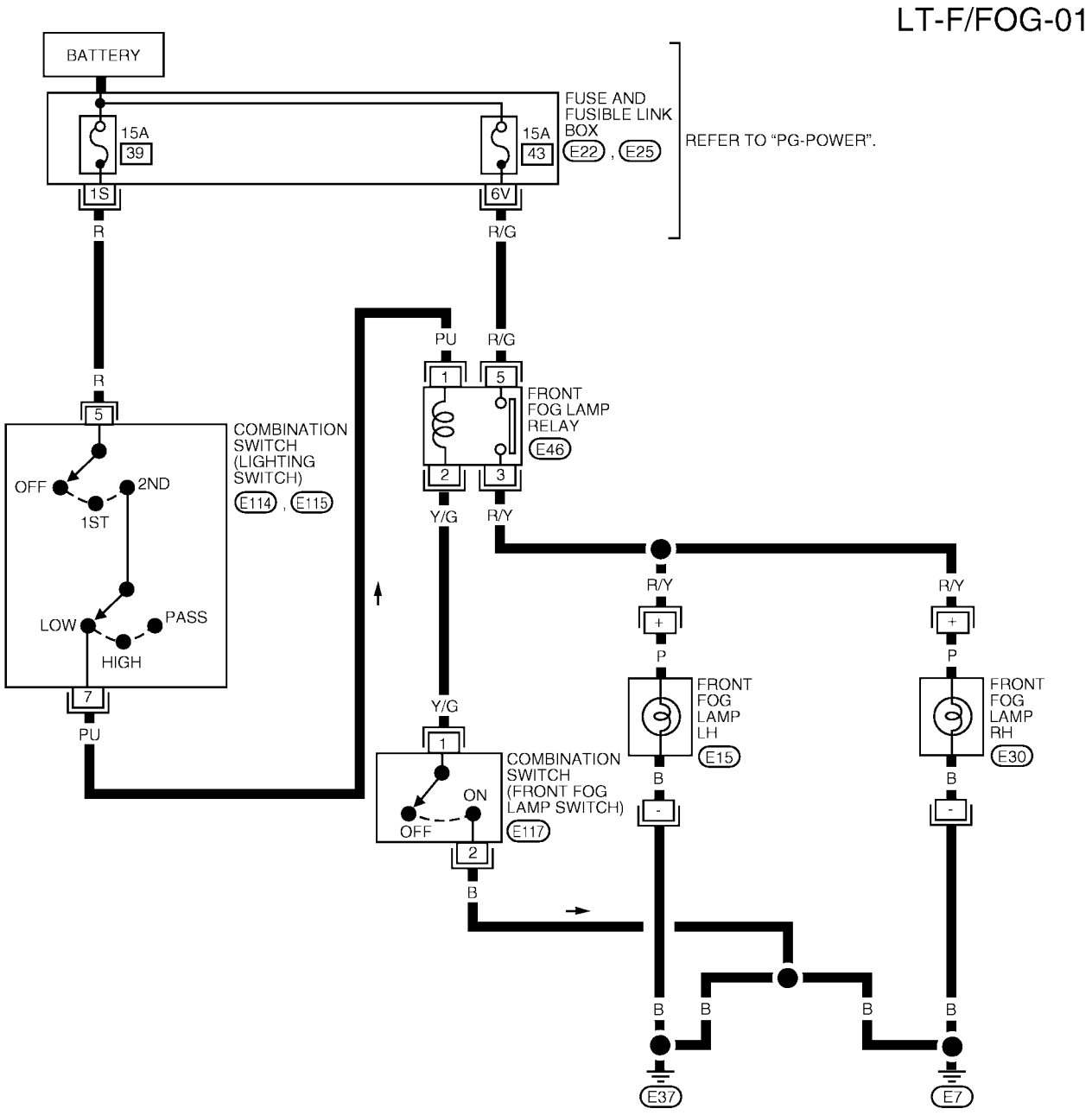
The front fog lamp relay is energized and power is supplied:

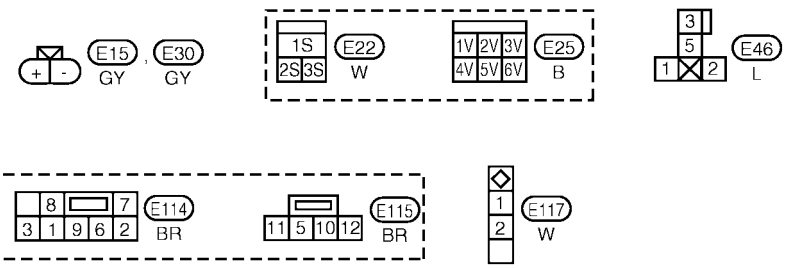
- from front fog lamp relay terminal 3
- to terminal + of each front fog lamp.

Ground is supplied to terminal - of each front fog lamp through body grounds E7 and E37.
With power and ground supplied, the front fog lamps illuminate.

Wiring Diagram — F/FOG —

EKS006AK





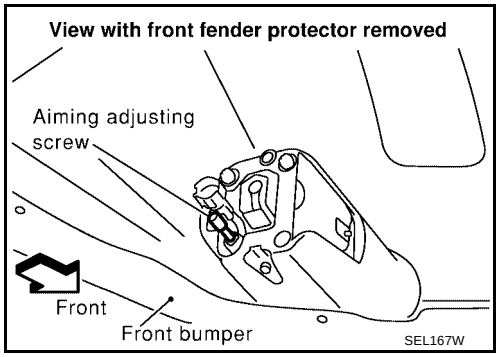
WKWA0024E

Aiming Adjustment

EKS006AL

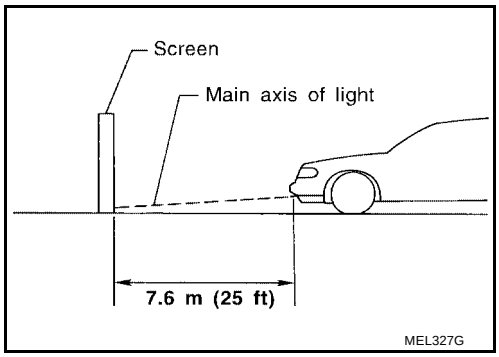
Before performing aiming adjustment, make sure of the following.

1. Inflate all tires to correct pressure.
2. Place vehicle on level ground.
3. See that vehicle is unloaded (except for full levels of coolant, engine oil and fuel, and spare tire, jack, and tools). Have the driver or equivalent weight placed in driver's seat.

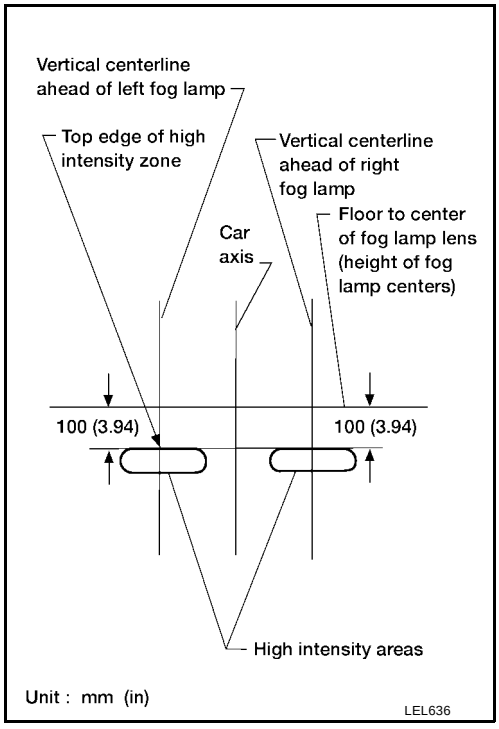


Adjust aiming in the vertical direction by turning the adjusting screw.

1. Set the distance between the screen and the center of the fog lamp lens as shown.



2. Turn front fog lamps ON.
3. Adjust front fog lamps so that the top edge of the high intensity zone is 100 mm (3.94 in) below the height of the fog lamp centers as shown.
   - When performing adjustment, if necessary, cover the headlamps and opposite fog lamp.



TURN SIGNAL AND HAZARD WARNING LAMPS

PFP:26120

System Description

EKS0038Q

TURN SIGNAL OPERATION

With the hazard switch in the OFF position and the ignition switch in the ON or START position, power is supplied:

- through 10A fuse [No. 26, located in the fuse block (J/B)]
- to hazard switch terminal 2
- through terminal 1 of the hazard switch
- to combination flasher unit terminal B
- through terminal L of the combination flasher unit
- to turn signal switch terminal 1.

Ground is supplied to combination flasher unit terminal E through body grounds M28 and M54.

LH Turn

When the turn signal switch is moved to the LH position, power is supplied from turn signal switch terminal 3 to:

- front combination lamp LH terminal 3
- combination meter terminal 35 (with tachometer) or 40 (without tachometer)
- rear combination lamp LH terminal 2.

Ground is supplied to the front combination lamp LH terminal 1 through body grounds E7 and E37.
Ground is supplied to the rear combination lamp LH terminal 4 through body grounds B13 and B19.
Ground is supplied to combination meter terminal 12 (with tachometer) or 39 (without tachometer) through body grounds M28 and M54.
With power and ground supplied, the combination flasher unit controls the flashing of the LH turn signal lamps.

RH Turn

When the turn signal switch is moved to the RH position, power is supplied from turn signal switch terminal 2 to:

- front combination lamp RH terminal 3
- combination meter terminal 4 (with tachometer) or 41 (without tachometer)
- rear combination lamp RH terminal 2.

Ground is supplied to the front combination lamp RH terminal 1 through body grounds E7 and E37.
Ground is supplied to the rear combination lamp RH terminal 4 through body grounds B13 and B19.
Ground is supplied to combination meter terminal 12 (with tachometer) or 39 (without tachometer) through body grounds M28 and M54.
With power and ground supplied, the combination flasher unit controls the flashing of the RH turn signal lamps.

HAZARD LAMP OPERATION

Power is supplied at all times to hazard switch terminal 3 through:

- 15A fuse [No. 5, located in the fuse block (J/B)].

With the hazard switch in the ON position, power is supplied:

- through terminal 1 of the hazard switch
- to combination flasher unit terminal B
- through terminal L of the combination flasher unit
- to hazard switch terminal 4.

Ground is supplied to combination flasher unit terminal E through body grounds M28 and M54.
Power is supplied through terminal 5 of the hazard switch to:

- front combination lamp LH terminal 3
- combination meter terminal 35 (with tachometer) or 40 (without tachometer)
- rear combination lamp LH terminal 2.

Power is supplied through terminal 6 of the hazard switch to:

- front combination lamp RH terminal 3

- combination meter terminal 4 (with tachometer) or 41 (without tachometer)
- rear combination lamp RH terminal 2.

Ground is supplied to terminal 1 of each front combination lamp through body grounds E7 and E37.
Ground is supplied to terminal 4 of each rear combination lamp through body grounds B13 and B19.
Ground is supplied to combination meter terminal 12 (with tachometer) or 39 (without tachometer) through body grounds M28 and M54.
With power and ground supplied, the combination flasher unit controls the flashing of the hazard warning lamps.

REMOTE KEYLESS ENTRY SYSTEM OPERATION

Power is supplied at all times:

- through 15A fuse [No. 5, located in the fuse block (J/B)]
- to remote keyless entry relay terminals 1, 6 and 3.

Ground is supplied to remote keyless entry relay terminal 2, when the remote keyless entry system is triggered through the smart entrance control unit.
Refer to BL-34, "REMOTE KEYLESS ENTRY SYSTEM" .
The remote keyless entry relay is energized.
Power is supplied through terminal 5 of the remote keyless entry relay:

- to front combination lamp LH terminal 3
- to combination meter terminal 35 (with tachometer) or 40 (without tachometer)
- to rear combination lamp LH terminal 2.

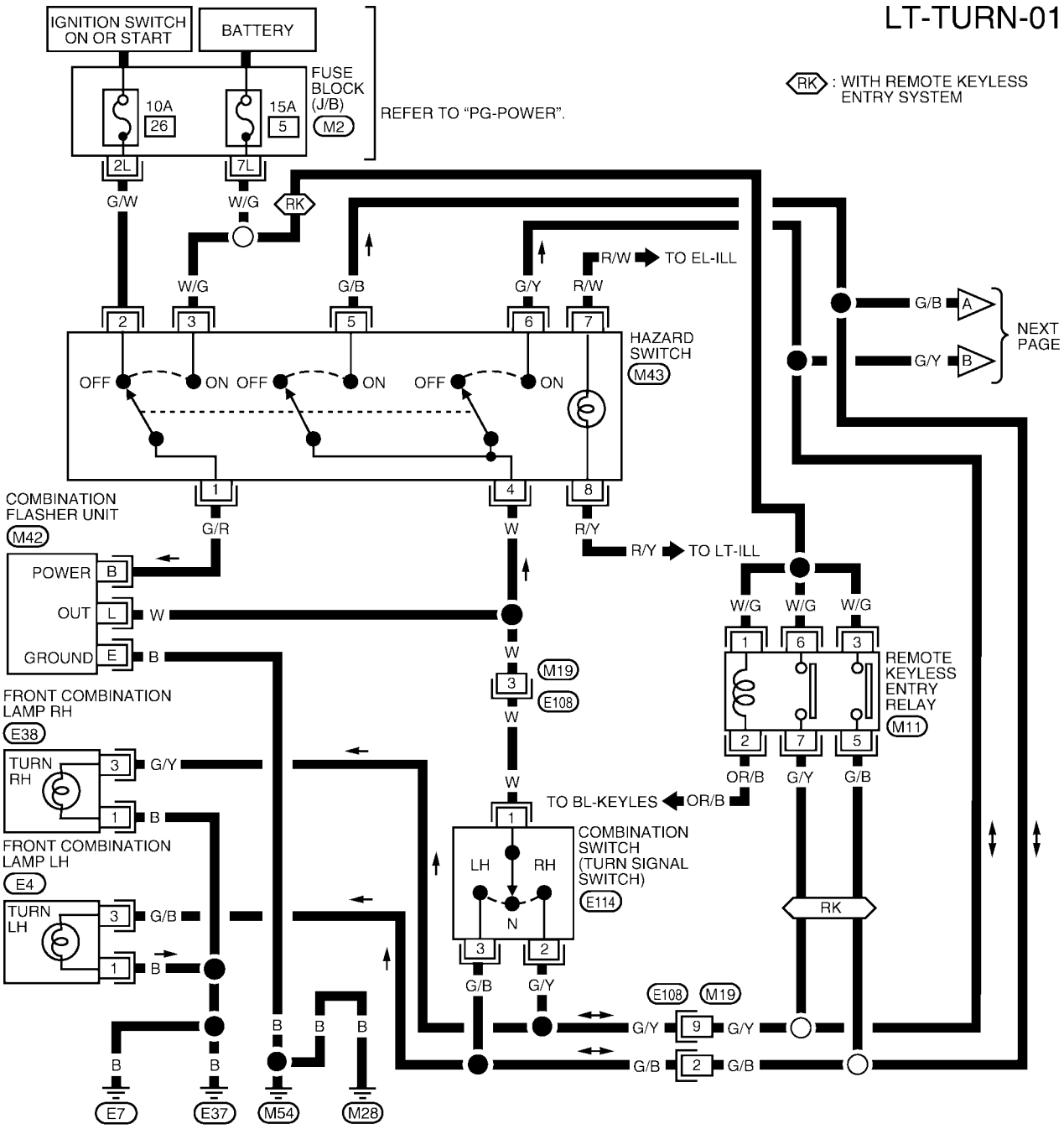
Power is supplied through terminal 7 of the remote keyless entry relay:

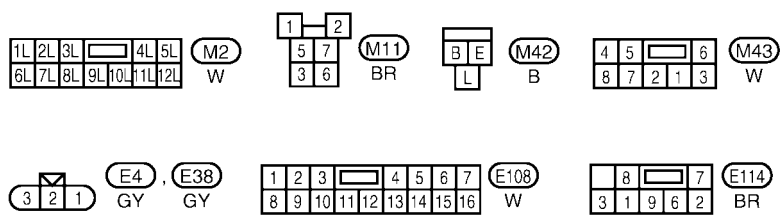
- to front combination lamp RH terminal 3
- to combination meter terminal 4 (with tachometer) or 41 (without tachometer)
- to rear combination lamp RH terminal 2.

Ground is supplied to terminal 1 of each front combination lamp through body grounds E7 and E37.
Ground is supplied to terminal 4 of each rear combination lamp through body grounds B13 and B19.
Ground is supplied to combination meter terminal 12 (with tachometer) or 39 (without tachometer) through body grounds M28 and M54.
With power and ground supplied, the smart entrance control unit controls the flashing of the hazard warning lamps.

Wiring Diagram — TURN —

EKS0038R

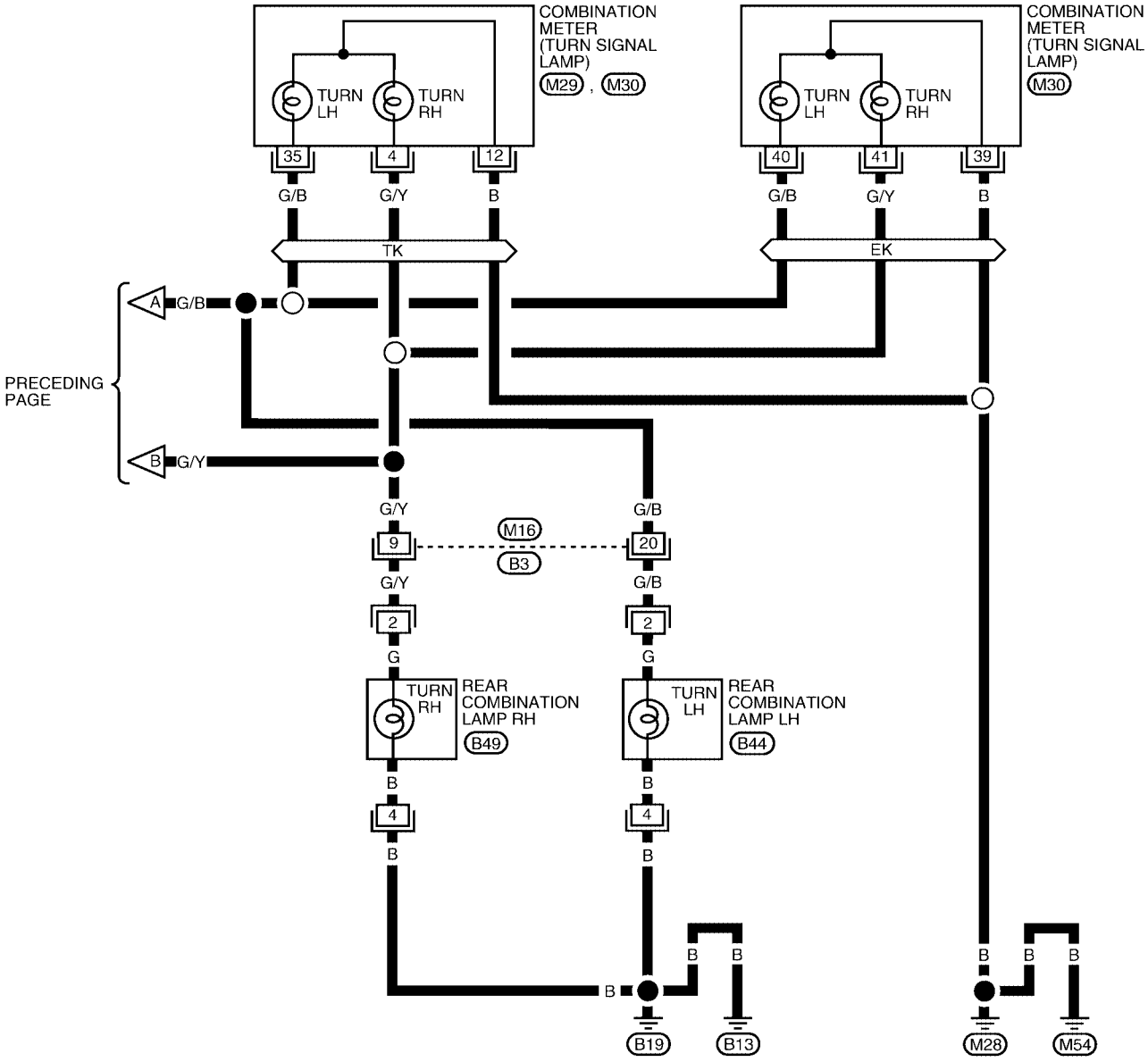


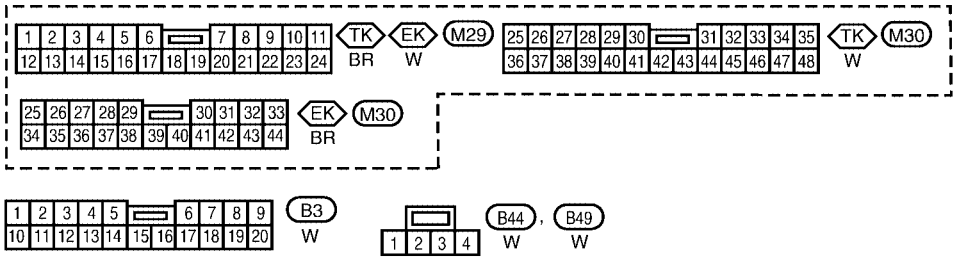


WKWA0221E

LT-TURN-02

TK : WITH TACHOMETER
EK : WITHOUT TACHOMETER





WKWA0222E

Trouble Diagnoses

EKS0038S

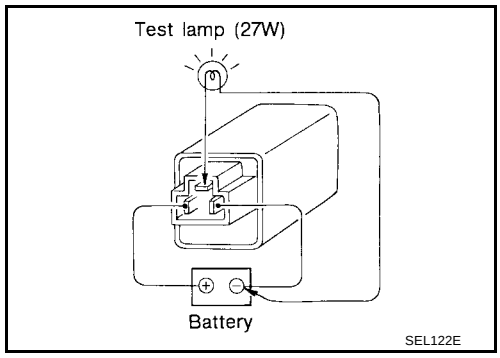
Symptom	Possible cause	Repair order
Turn signal and hazard warning lamps do not operate.	1. Hazard switch 2. Combination flasher unit 3. Open in combination flasher unit circuit	1. Check hazard switch. 2. Refer to combination flasher unit check. 3. Check wiring to combination flasher unit for open circuit.
Turn signal lamps do not operate but hazard warning lamps operate.	1. 10A fuse 2. Hazard switch 3. Turn signal switch 4. Open in turn signal switch circuit	1. Check 10A fuse [No. 26, located in fuse block (J/B)]. Turn ignition switch ON and verify battery positive voltage is present at terminal 2 of hazard switch. 2. Check hazard switch. 3. Check turn signal switch. 4. Check the wire between combination flasher unit terminal L and turn signal switch terminal 1 for open circuit.
Hazard warning lamps do not operate but turn signal lamps operate.	1. 15A fuse 2. Hazard switch 3. Open in hazard switch circuit	1. Check 15A fuse [No. 5, located in fuse block (J/B)]. Verify battery positive voltage is present at terminal 3 of hazard switch. 2. Check hazard switch. 3. Check the wire between combination flasher unit terminal L and hazard switch terminal 4 for open circuit.
Front turn signal lamp LH or RH does not operate.	1. Bulb 2. Grounds E7 and E37 3. Open in front combination lamp circuit	1. Check bulb. 2. Check grounds E7 and E37. 3. Check the wire between combination switch terminal 3 (LH) or terminal 2 (RH) and front combination lamp terminal 3.
Rear turn signal lamp LH or RH does not operate.	1. Bulb 2. Grounds B13 and B19 3. Open in rear combination lamp circuit	1. Check bulb. 2. Check grounds B13 and B19. 3. Check the wire between combination switch terminal 3 (LH) or terminal 2 (RH) and rear combination lamp terminal 2.
LH and RH turn indicators do not operate.	1. Ground	1. Check grounds M28 and M54.
LH or RH turn indicator does not operate.	1. Bulb 2. Turn indicator circuit	1. Check bulb in combination meter. 2. Check the wire between combination switch and combination meter.

Electrical Components Inspection

EKS0038T

COMBINATION FLASHER UNIT CHECK

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.



ILLUMINATION

PFP:27545

System Description

EKS0038U

Power is supplied at all times:

- through 10A fuse (No. 38, located in the fuse and fusible link box)
- to lighting switch terminal 11.

The lighting switch must be in parking lamp (1ST) or headlamp “ON” (2ND) position for illumination. The illumination control switch controls the amount of current to the illumination system. As the amount of current increases, the illumination becomes brighter.
The following chart shows the power and ground connector terminals for the components included in the illumination system.

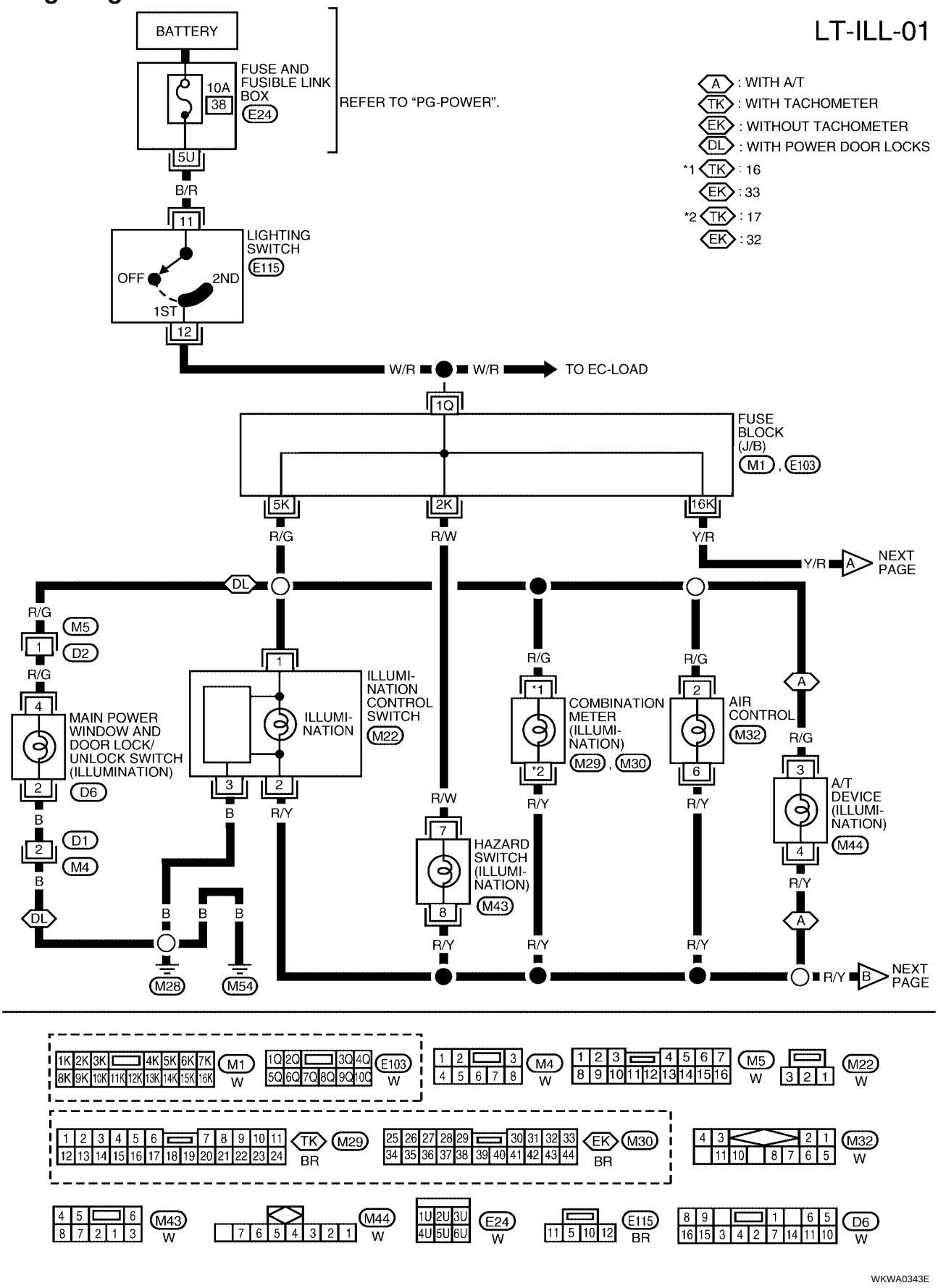
Component	Connector No.	Power terminal	Ground terminal
Illumination control switch	M22	1	3
Combination meter	M29 or M30	16 or 33	17 or 32
Hazard switch	M43	7	8
Air control	M32	2	6
A/T device indicator*	M44	3	4
Main power window and door lock/unlock switch*	D6	4	2
Audio unit	M45	8	7
CD changer*	M47, M48	23	25

* If equipped.

The ground for all of the components is controlled through terminals 2 and 3 of the illumination control switch to body grounds M28 and M54.

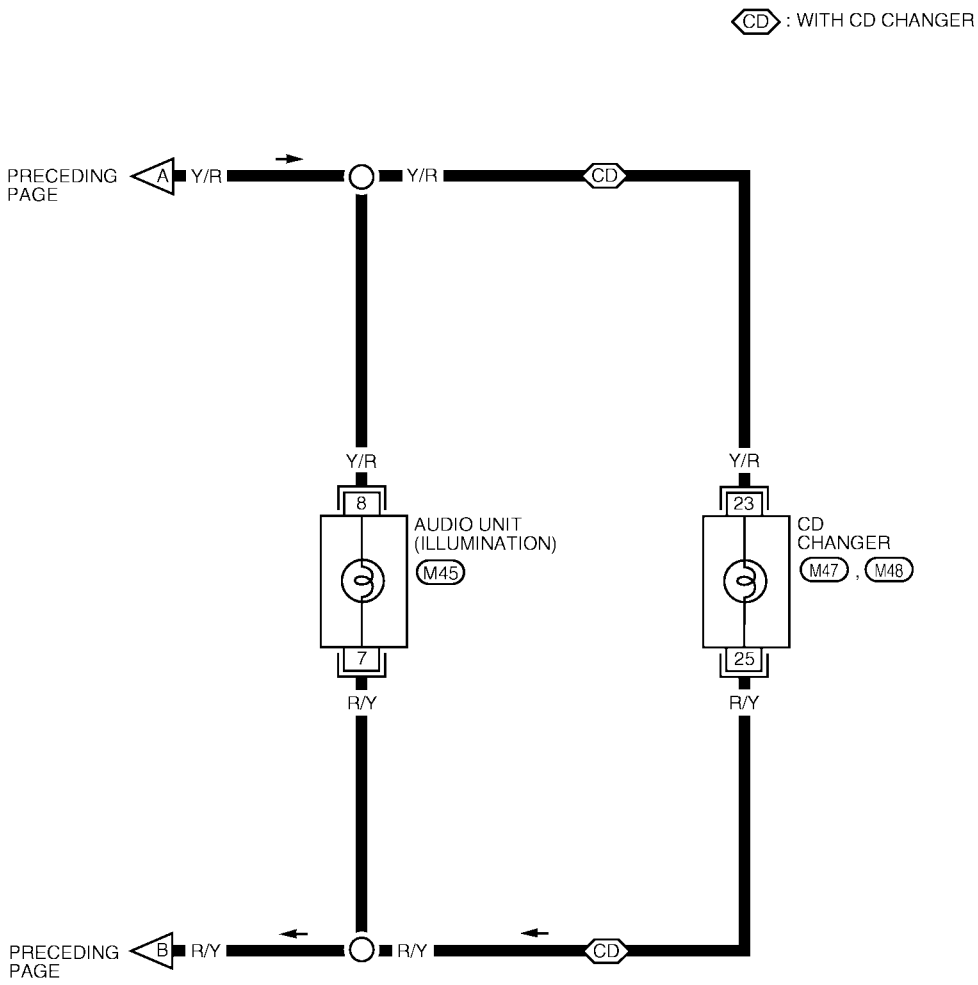
Wiring Diagram — ILL —

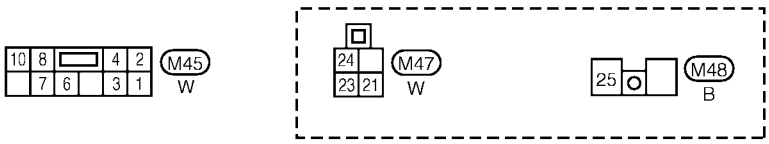
EKS0038V



WKWA0343E

LT-ILL-02





WKWA0028E

INTERIOR, MAP, VANITY AND TRUNK ROOM LAMPS

PFP:26410

System Description

EKS0038W

WITHOUT POWER DOOR LOCKS

Power Supply and Ground

Power is supplied at all times:

- through 10A fuse [No. 13, located in the fuse block (J/B)]
- to interior lamp terminal +.

Switch Operation

When interior lamp switch is in the DOOR position and any door is opened, ground is supplied to interior lamp through the door switches.
When interior lamp switch is in the ON position, ground is supplied:

- through case ground of interior lamp
- to interior lamp.

WITH POWER DOOR LOCKS

Power Supply and Ground

Power is supplied at all times:

- through 10A fuse (No. 37, located in the fuse and fusible link box)
- to smart entrance control unit terminal 10.

Power is supplied at all times:

- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to key switch terminal 2 and
- through 10A fuse [No. 13, located in the fuse block (J/B)]
- to trunk room lamp terminal 1.

When the key is removed from ignition key cylinder, power is interrupted:

- through key switch terminal 1
- to smart entrance control unit terminal 32.

With the ignition key switch in the ON or START position, power is supplied:

- through 10A fuse [No. 10, located in the fuse block (J/B)]
- to smart entrance control unit terminal 33.

Ground is supplied:

- to smart entrance control unit terminal 16
- through body grounds M28 and M54.

Switch Operation

When map lamp (LH and/or RH) is ON, ground is supplied:

- through body grounds M28 and M54
- to map lamp terminal –.

Power is supplied:

- to map lamp terminal +
- from smart entrance control unit terminal 17.

When vanity lamp (LH and/or RH) is ON, ground is supplied:

- through body grounds M28 and M54
- to vanity lamps (LH and RH) terminal 2.

Power is supplied:

- to vanity lamps (LH and RH) terminal 1
- from smart entrance control unit terminal 17.

When trunk room lamp switch is ON (trunk lid is opened), ground is supplied:

- through body grounds B13 and B19
- to trunk room lamp switch terminal –

- from trunk room lamp switch terminal +
- to trunk room lamp terminal 2

With power and ground supplied, interior lamps turn ON.

Battery Saver

The lamps turn off automatically when interior lamp, map lamp and/or vanity lamps are illuminated with the ignition key in OFF position, if the lamp remains lit by the door switch open signal or if the lamp switch is in ON position for approximately 10 minutes.
After lamps turn OFF by the battery saver system, the lamps illuminate again when:

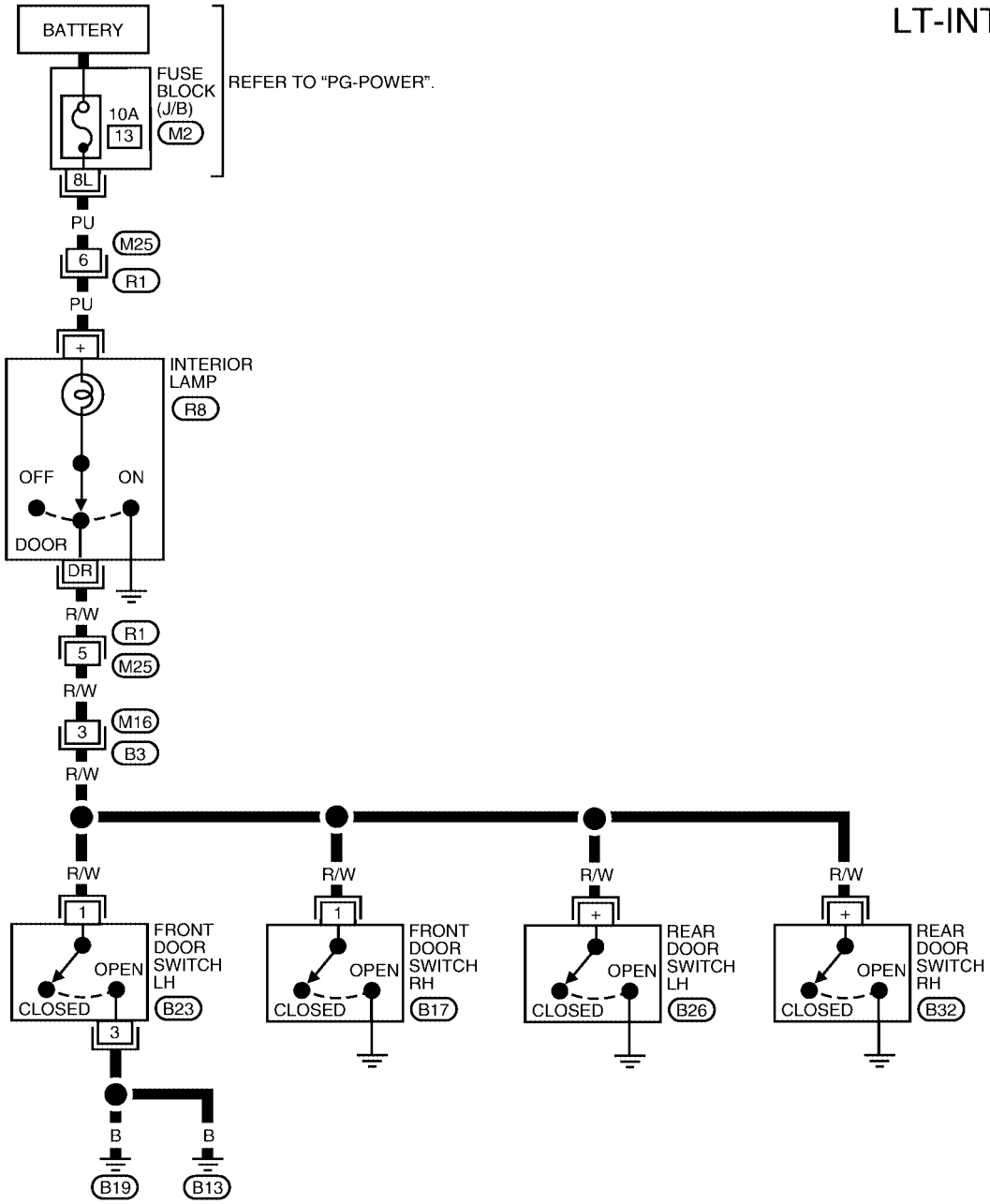
- driver door is locked or unlocked,
- door is opened or closed,
- key is inserted in or removed from ignition key cylinder.

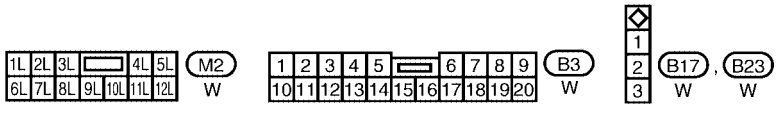
Wiring Diagram — INT/L —

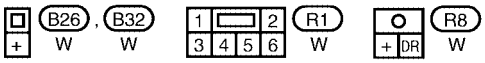
EKS0038X

WITHOUT POWER DOOR LOCKS

LT-INT/L-01

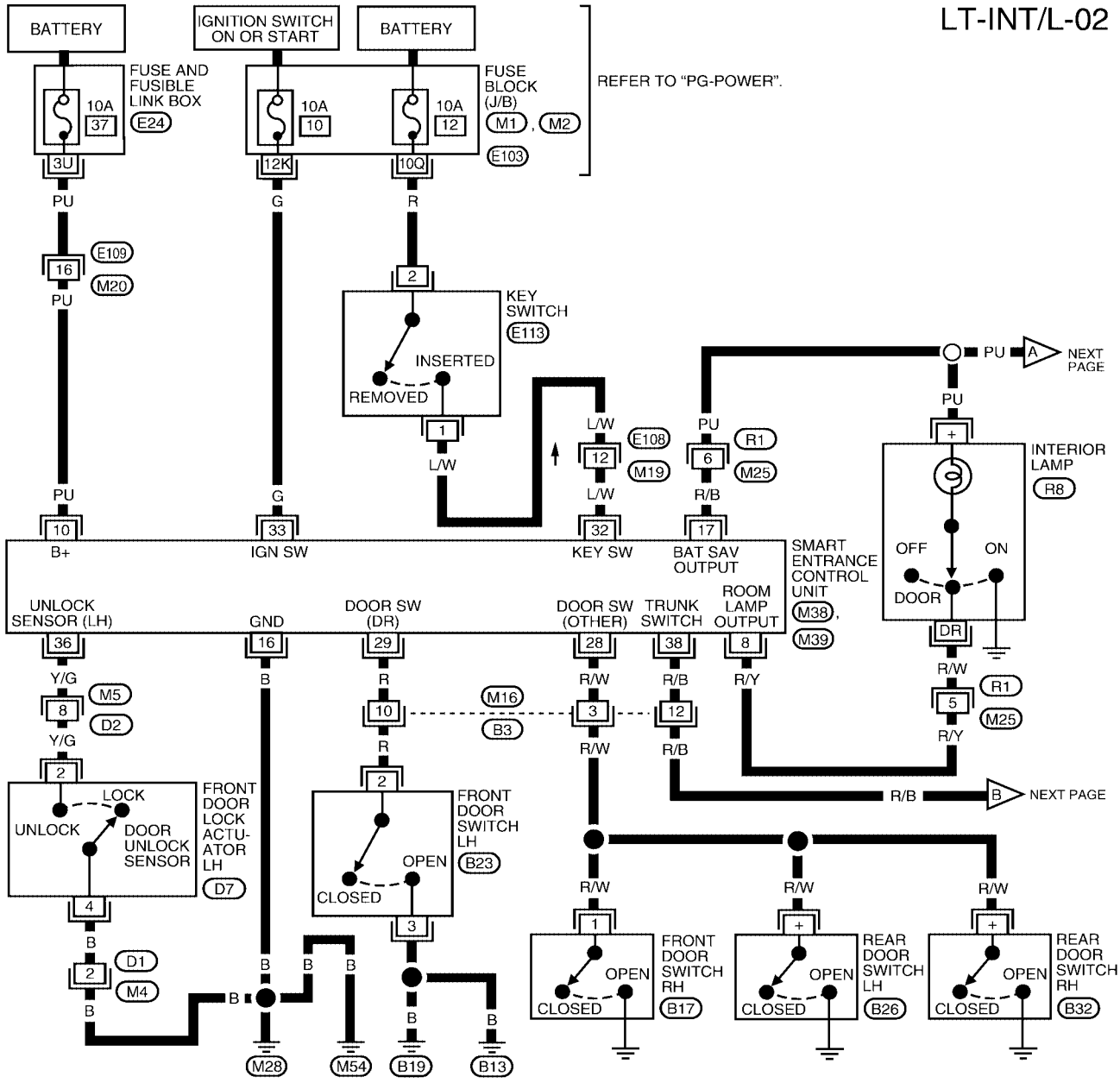


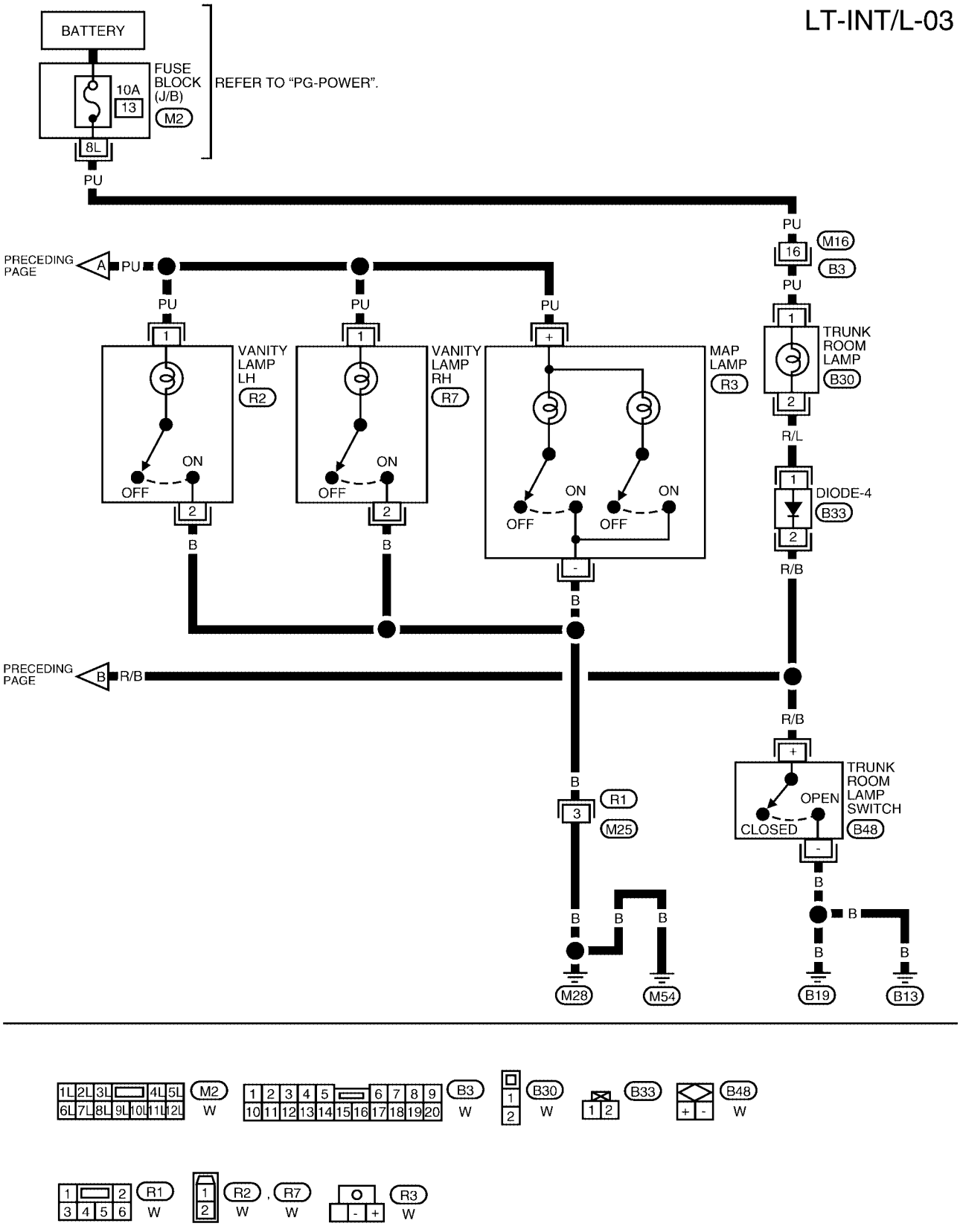




WKWA0529E

WITH POWER DOOR LOCKS





WKWA0531E

SMART ENTRANCE CONTROL UNIT TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

INTERIOR, MAP, VANITY AND TRUNK ROOM LAMPS

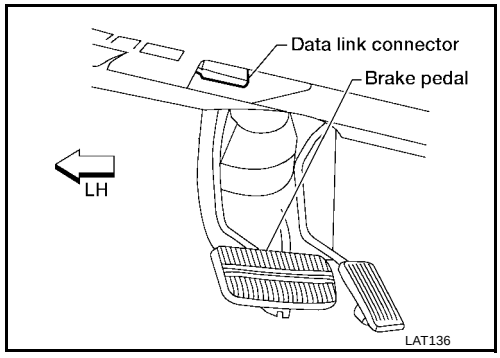
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
8	R/Y	INTERIOR LAMP	LAMP SWITCH IN DOOR POSITION	12V
10	PU	POWER SOURCE (FUSE)	—	12V
16	B	GROUND	—	—
17	R/B	BATTERY SAVER (INTERIOR LAMP)	BATTERY SAVER DOES NOT OPERATE	12V
			BATTERY SAVER OPERATES	0V
28	R/W	OTHER DOOR SWITCHES	OFF (CLOSED)	5V
			ON (OPEN)	0V
29	R	FRONT DOOR SWITCH LH	OFF (CLOSED)	5V
			ON (OPEN)	0V
32	L/W	IGNITION KEY SWITCH (INSERT)	IGNITION KEY IS INSERTED	12V
			IGNITION KEY IS REMOVED	0V
33	G	IGNITION SWITCH (ON)	IGNITION KEY IS IN ON POSITION	12V
		IGNITION SWITCH (START)	IGNITION KEY IS IN START POSITION	12V
36	Y/G	DOOR UNLOCK SENSOR LH	DRIVER DOOR: LOCKED	5V
			DRIVER DOOR: UNLOCKED	0V
38	R/B	TRUNK ROOM LAMP SWITCH	ON (OPEN)	0V
			OFF (CLOSED)	12V

CONSULT-II Inspection Procedure (With Power Door Locks)

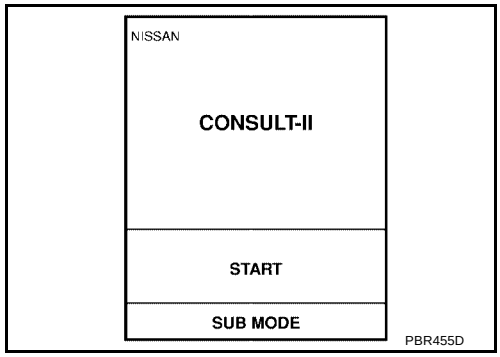
EKS0038Y

“INT LAMP”/“BATTERY SAVER”

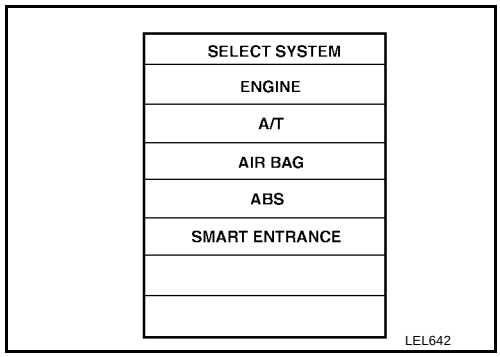
1. Turn ignition switch “OFF”.
2. Connect “CONSULT-II” to the data link connector.



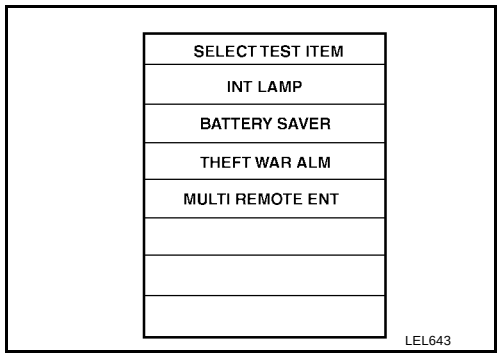
3. Turn ignition switch “ON”.
4. Touch “START”.



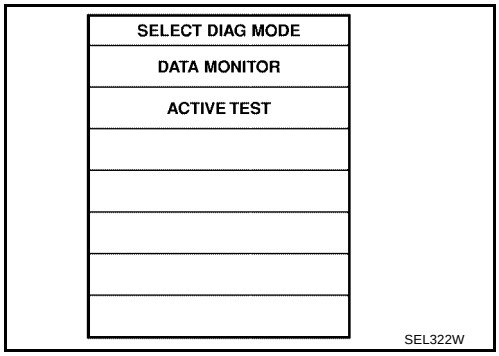
5. Touch “SMART ENTRANCE”.



6. Touch “INT LAMP” or “BATTERY SAVER”.



7. Select diagnosis mode.
"DATA MONITOR" and "ACTIVE TEST" are available for "INT LAMP" and "BATTERY SAVER".



CONSULT-II Application Items (With Power Door Locks)

EKS0038Z

"INT LAMP"

Data Monitor

Monitored Item	Description
IGN ON SW	Indicates [ON/OFF] condition of ignition switch.
KEY ON SW	Indicates [ON/OFF] condition of key switch.
DOOR SW DR	Indicates [ON/OFF] condition of front door switch LH.
DOOR SW-ALL	Indicates [ON/OFF] condition of door switch (All).
LOCK SIG DR	Indicates [ON/OFF] condition of front door unlock sensor LH.
UN BUTTON/SIG	Indicates [ON/OFF] condition of unlock signal from remote controller.

Active Test

Test Item	Description
INT LAMP	This test enables to check interior lamp, map lamp, and vanity lamps operations. When touch "ON" on CONSULT-II screen. ● Interior lamp turns on when the switch is in DOOR or ON. (Smart entrance control unit supplies power and ground to interior lamp.) ● Map lamp and vanity lamps turn on when the switch is in ON. (Smart entrance control unit supplies power to map lamp and vanity lamps.)

"BATTERY SAVER"

Data Monitor

Monitored Item	Description
IGN ON SW	Indicates [ON/OFF] condition of ignition switch.
KEY ON SW	Indicates [ON/OFF] condition of key switch.
DOOR SW DR	Indicates [ON/OFF] condition of front door switch LH.
DOOR SW-ALL	Indicates [ON/OFF] condition of door switch (ALL).
LOCK SIG DR	Indicates [ON/OFF] condition of front door unlock sensor LH.
TRUNK SW	Indicates [ON/OFF] condition of trunk room lamp switch.

Active Test

Test Item	Description
BATTERY SAVER	This test enables to check interior lamp, map lamp, and vanity lamp operations. When touch "ON" on CONSULT-II screen. ● Interior lamp turns on when the switch is in ON. (Smart entrance control unit supplies power to interior lamp.) ● Map lamp and vanity lamps turn on when the switch is in ON. (Smart entrance control unit supplies power to map lamps and vanity lamps.)

Trouble Diagnoses for Interior Lamp Timer (With Power Door Locks)

EKS00391

DIAGNOSTIC PROCEDURE 1 (SYMPTOM: INTERIOR LAMP TIMER DOES NOT OPERATE PROPERLY)

1. CHECK IGNITION ON SIGNAL

With CONSULT-II

Check ignition switch ON signal (“IGN ON SW”) in “DATA MONITOR” mode with CONSULT-II.

DATA MONITOR	
MONITOR	
IGN ON SW	ON

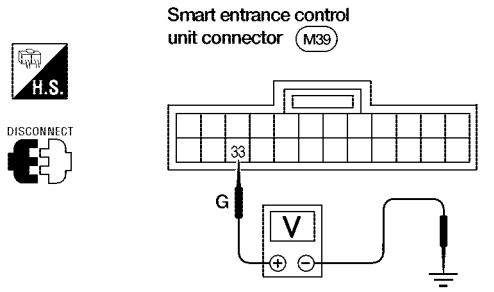
When ignition switch is ON:
IGN ON SW ON

When ignition switch is OFF:
IGN ON SW OFF

SEL318W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 33 and ground.



Terminals		Ignition switch position		
(+)	(–)	OFF	ACC	ON
33	Ground	0V	0V	Battery voltage

LEL450

OK or NG

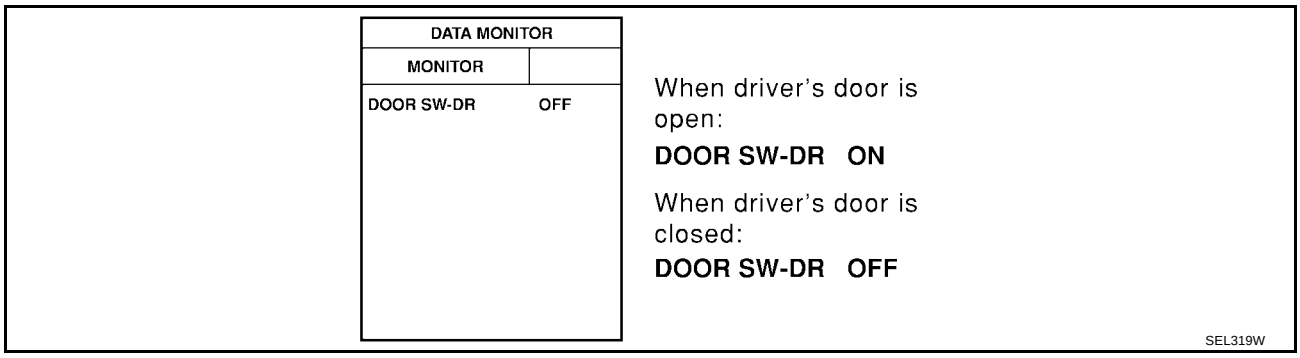
OK >> GO TO 2.
NG >> Check the following.

- 10A fuse [No. 10, located in fuse block (J/B)]
- Harness for open or short between smart entrance control unit and fuse

2. CHECK DOOR SWITCH INPUT SIGNAL

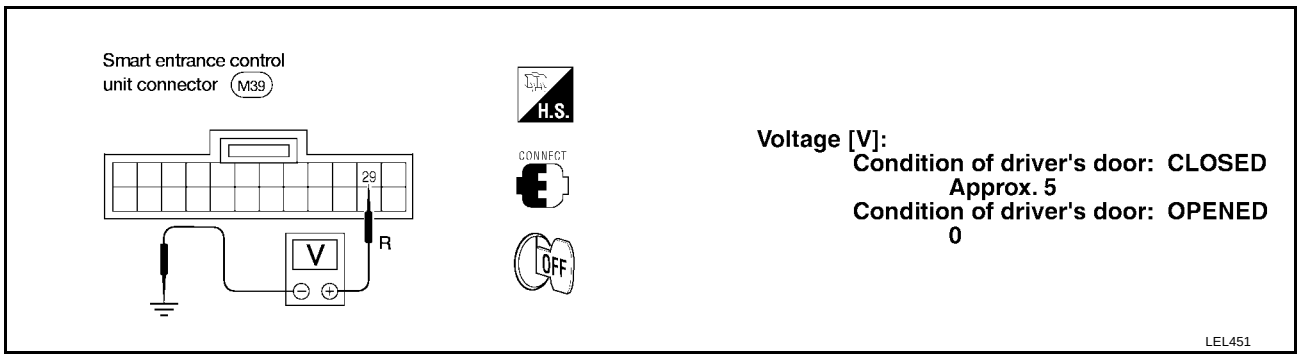
With CONSULT-II

Check driver door switch signal (“DOOR SW-DR”) in “DATA MONITOR” mode with CONSULT-II.



Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 29 and ground.

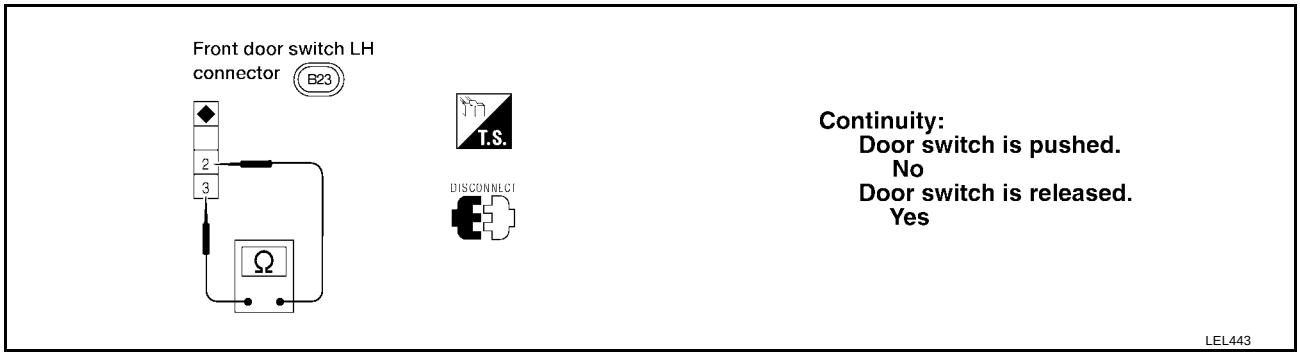


OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. CHECK FRONT DOOR SWITCH LH

Check continuity between front door switch LH terminals 2 and 3.



OK or NG

OK >> Check the following.
- Front door switch LH ground circuit and condition
- Harness for open or short between smart entrance control unit and front door switch LH

NG >> Replace front door switch LH.

4. CHECK DOOR UNLOCK SENSOR LH INPUT SIGNAL

With CONSULT-II

Perform “LOCK SIG DR” in “DATA MONITOR” mode with CONSULT-II.

DATA MONITOR	
MONITOR	
LOCK SIG DR	OFF

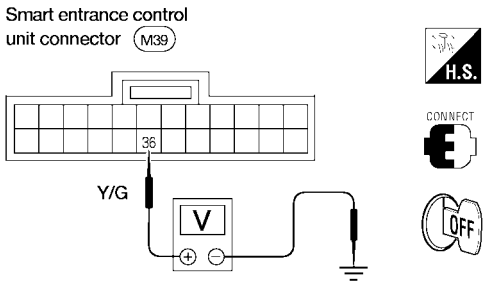
When front LH door is locked:
LOCK SIG DR OFF

When front LH door is unlocked:
LOCK SIG DR ON

SEL344W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 36 and ground.



	Terminals		Condition	Voltage [V]
	(+)	(−)		
Front LH door	36	Ground	Locked	Approx. 5
			Unlocked	0

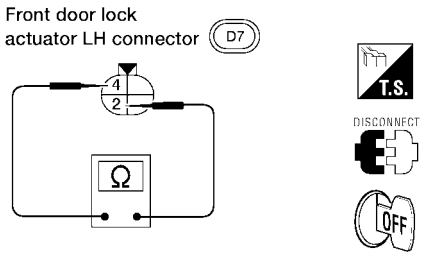
LEL452

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. CHECK DOOR UNLOCK SENSOR LH

1. Disconnect door unlock sensor LH harness connector.
2. Check continuity between door unlock sensor LH terminals.



Continuity:
Condition: Locked
No
Condition: Unlocked
Yes

WEL497

OK or NG

OK >> Check the following.
- Door unlock sensor LH ground circuit
- Harness for open or short between smart entrance control unit and door unlock sensor LH

NG >> Replace door unlock sensor LH.

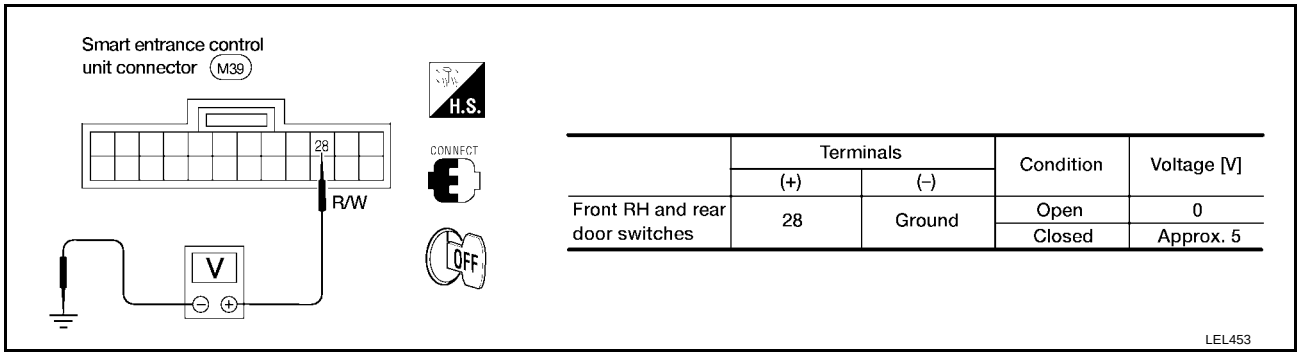
6. CHECK DOOR SWITCHES INPUT SIGNAL

With CONSULT-II

Check door switches (“DOOR SW-ALL”) in “DATA MONITOR” mode with CONSULT-II.

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 28 and ground.



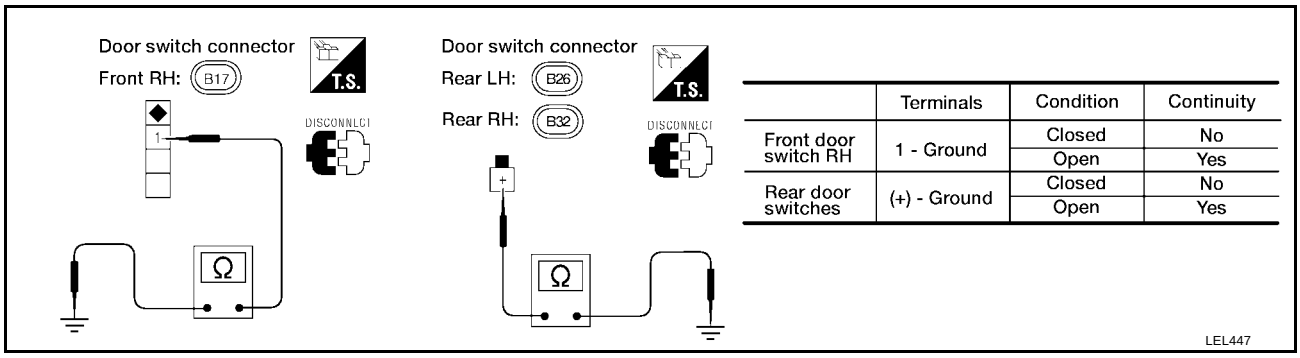
	Terminals		Condition	Voltage [V]
	(+)	(–)		
Front RH and rear door switches	28	Ground	Open	0
			Closed	Approx. 5

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. CHECK DOOR SWITCHES

1. Disconnect door switch harness connector.
2. Check continuity between door switch terminals 1, + and ground.



	Terminals	Condition	Continuity
Front door switch RH	1 - Ground	Closed	No
		Open	Yes
Rear door switches	(+) - Ground	Closed	No
		Open	Yes

OK or NG

OK >> Check the following.
- Door switch ground circuit or door switch ground condition
- Harness for open or short between smart entrance control unit and door switch

NG >> Replace door switch.

8. CHECK KEY SWITCH INPUT SIGNAL

With CONSULT-II

Check key switch ("KEY ON SW") in "DATA MONITOR" mode with CONSULT-II.

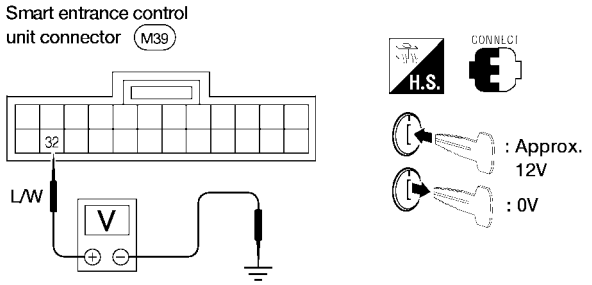
DATA MONITOR	
MONITOR	
KEY ON SW	ON

When key is inserted to ignition key cylinder:
KEY ON SW ON
When key is removed from ignition key cylinder:
KEY ON SW OFF

SEL315W

Without CONSULT-II

Check voltage between smart entrance control unit harness connector terminal 32 and ground.



Voltage [V]:
Condition of key switch: Key is inserted.
Approx. 12
Condition of key switch: Key is removed.
0

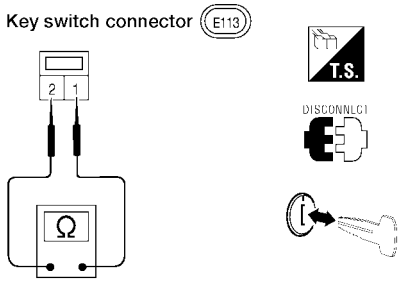
LEL454

OK or NG

OK >> Replace smart entrance control unit.
NG >> GO TO 9.

9. CHECK KEY SWITCH

Check continuity between terminals 1 and 2.



Continuity:
Condition of key switch: Key is inserted.
Yes
Condition of key switch: Key is removed.
No

LEL449

OK or NG

OK >> Check the following.
- 10A fuse [No. 12, located in fuse block (J/B)]
- Harness for open or short between key switch and fuse
- Harness for open or short between smart entrance control unit and key switch

NG >> Replace key switch.

BULB SPECIFICATIONS

PFP:26297

Bulb Specifications

EKS006AM

HEADLAMP

Item	Wattage (W)	Bulb No.*
High/Low	65/55	9007 (HB5)

*Always check with the Parts Department for the latest parts information.

EXTERIOR LAMP

Item		Wattage (W)	Bulb No.*
Front parking and turn signal lamp		8/27	3157AK
Fog light		55	H3
Rear combination lamp	Turn signal	27	1156A
	Stop/Tail	27/8	1157
Back-up		18	921
License plate lamp		5	194
High-mounted stop lamp (parcel shelf mount)		18	921
High-mounted stop lamp (rear air spoiler mount)		*	*

*Always check with the Parts Department for the latest parts information.

INTERIOR LAMP

Item	Wattage (W)	Bulb No.*
Interior lamp	8	*
Map lamp	8	*
Trunk lamp	3.4	158

*Always check with the Parts Department for the latest parts information.

SECTION LU

ENGINE LUBRICATION SYSTEM

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QG18DE

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PRECAUTIONS

PFP:00001

Precautions for Liquid Gasket

EBS00EYP

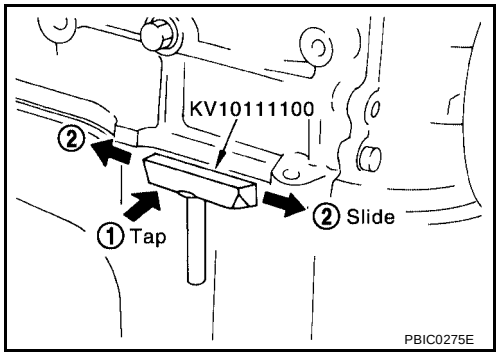
REMOVAL OF LIQUID GASKET SEALING

- After removing the mounting bolts and nuts, disconnect and remove the sealant using a seal cutter.

CAUTION:
Be careful not to damage the mating surfaces.

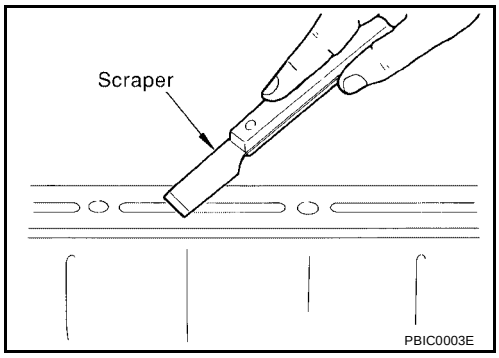
- In areas where the cutter is difficult to use, use a plastic hammer to lightly tap the areas where the sealant is applied.

CAUTION:
If for some unavoidable reason a tool such as a flat-bladed screwdriver is used, be careful not to damage the mating surfaces.

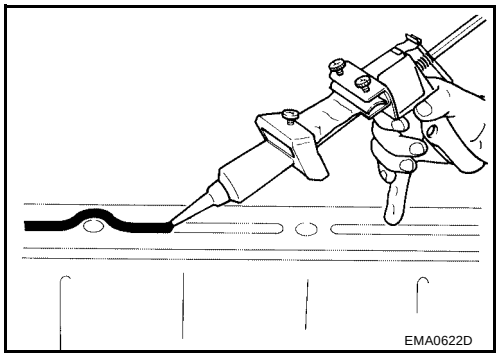


LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper, remove the old sealant adhering to the gasket application surface and the mating surface.
   - Remove the old sealant completely from the groove of the gasket application surface, mounting bolts, and bolt holes.
2. Clean the mating surface to remove dirt, moisture, grease, and foreign material.
3. Attach the sealant tube to the tube presser.
   Use Genuine RTV Silicone Sealant or equivalent. Refer to **GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"** **.**

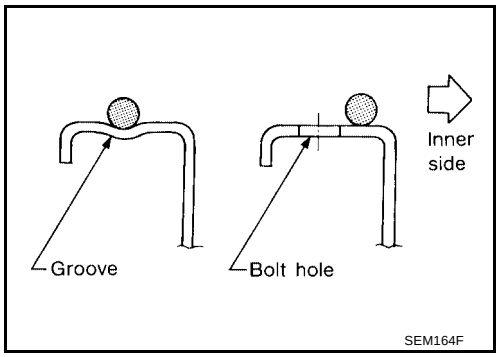


4. Apply the sealant without breaks to the specified location with the specified dimensions.
   - If there is a groove for the sealant application, apply the Sealant to the groove.
   - As for the bolt holes, normally apply the sealant inside the holes. Occasionally, it should be applied outside the holes.



   - Within five minutes of sealant application, install the mating component.
   - If the sealant protrudes, wipe it off immediately.
   - Do not retighten after the installation.
   - After 30 minutes or more have passed after installation, fill the engine with oil and coolant.

CAUTION:
If there are specific instructions in the service manual, observe them.



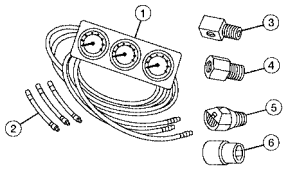
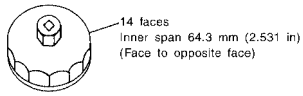
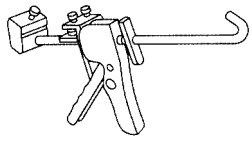
PREPARATION

PFP:00002

Special Service Tools

EBS00CGC

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

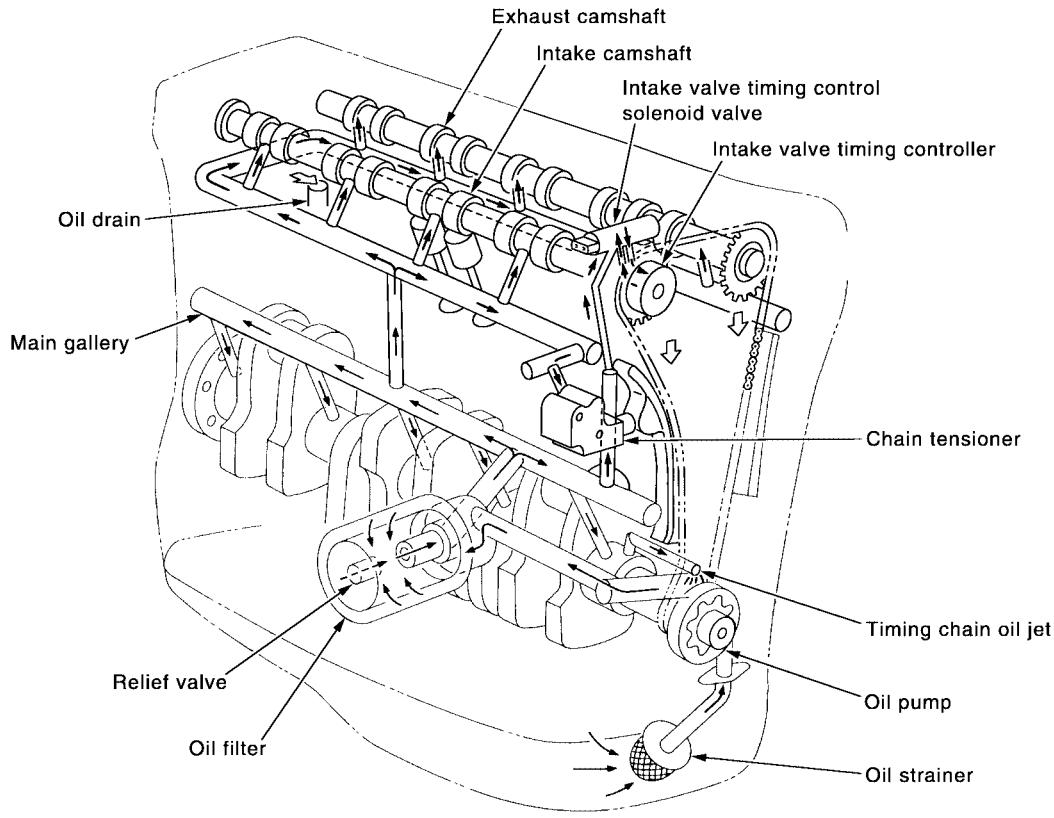
Tool number (Kent-Moore No.) Tool name	Description
(J34301-C) Oil pressure gauge set 1. (J34301-1) Oil pressure gauge 2. (J34301-2) Hoses 3. (J34298) Adapter 4. (J34282-1) Adapter 5. (790-301-1230-A) 60° adapter 6. (J34301-15) Square socket  AAT896	Measuring oil pressure **Maximum measuring range:** **1,373 kPa (14 kg/cm^2 , 199 psi)**
KV10115800 (J-37140-A) Oil filter wrench  S-NT772	Removing oil filter
WS39930000 (—) Tube presser  S-NT052	Pressing the tube of liquid gasket

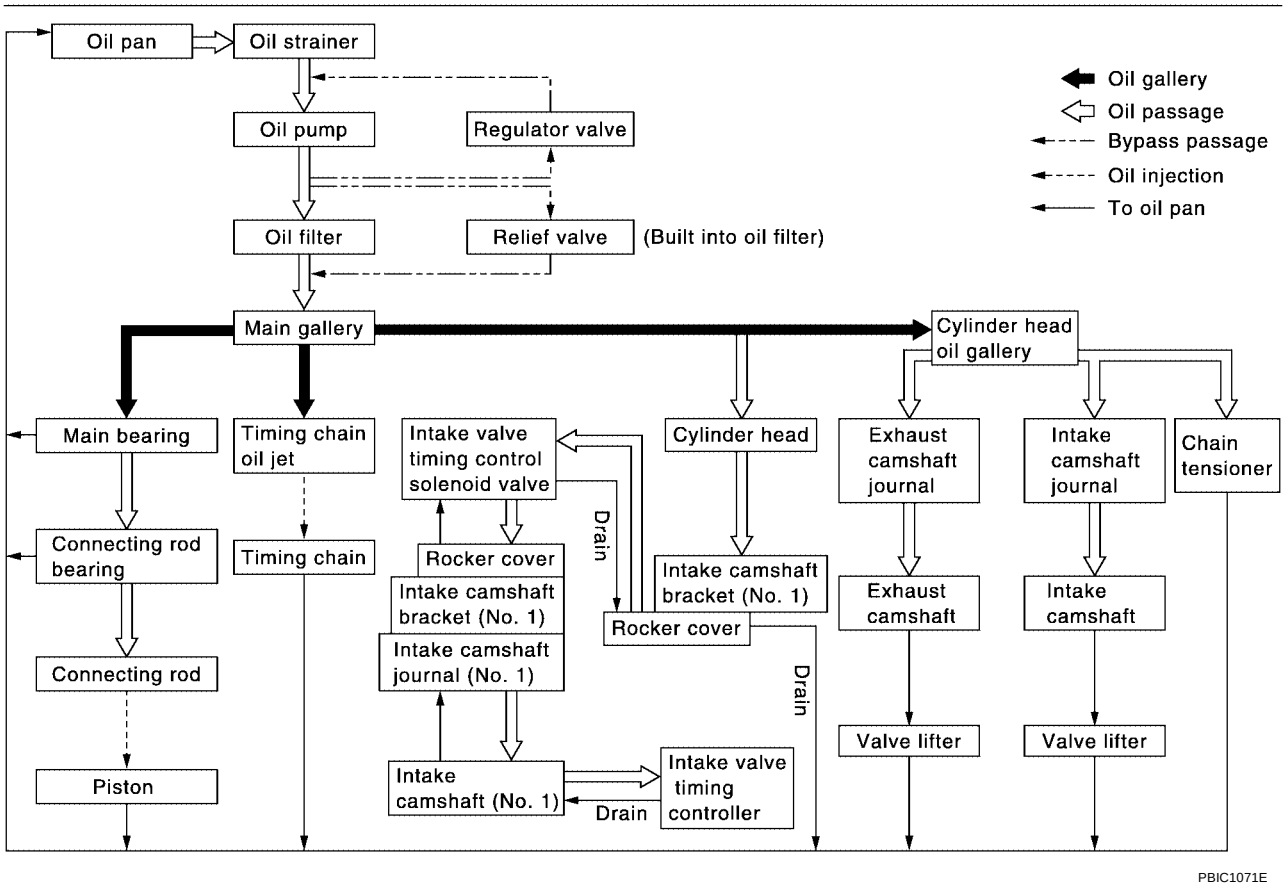
LUBRICATION SYSTEM

PFP:15010

Lubrication Circuit

EBS00CGD





PBIC1071E

ENGINE OIL

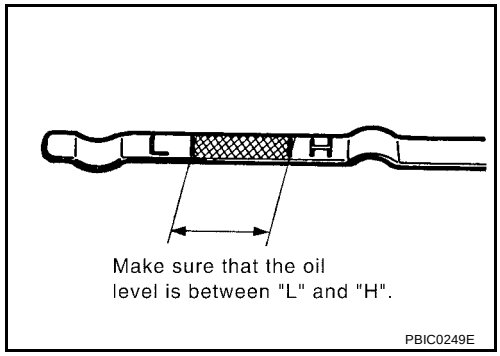
PFP:KLA92

Inspection

EBS00CGE

OIL LEVEL AND MUDDINESS

- Ensure the vehicle is on a level surface with engine off, then check the oil level. If the engine is already started, stop it and allow 10 minutes before checking.
- Check that the oil level is within the range shown in the figure.
- If it is out of range, add oil as necessary. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .
- Check the oil for white turbidity or remarkable contamination.
- If the oil becomes turbid and white, it is highly probable that it is contaminated with coolant. Diagnose the problem and correct as necessary.



OIL LEAKAGE

Check for oil leakage around the following areas.

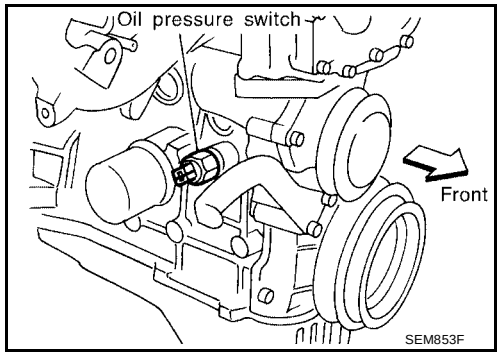
- Oil pan
- Oil pan drain plug
- Oil pressure switch
- Oil filter
- Front cover
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Crankshaft oil seal.

OIL PRESSURE CHECK

WARNING:

- **Be careful not to burn yourself, as the engine oil may be hot.**
- **For M/T models, put gearshift lever in Neutral. For A/T models, put the selector lever in Park "P" position.**

1. Check the oil level.
2. Remove the oil pressure switch.
3. Connect the oil pressure gauge using the Tool.
4. After warming up the engine to the normal operating temperature, check that oil pressure corresponding to the engine speed is produced.



Engine oil pressure [Oil temperature is 80°C (176°F)]

Engine speed (rpm)	Idle speed	2,000	6,000
Engine pressure kPa (kg/cm^2 , psi)	Approx. 98 (1.0, 14) or more	Approx. 294 (3.0, 43) or more	Approx. 392 (4.0, 57) or more

5. After checking, install the oil pressure switch as follows.

a. Remove old sealant adhering to the switch and engine.

b. Apply thread sealant. Tighten switch to specification.
Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

Oil pressure switch : 12 - 17 N·m (1.22 - 1.73 kg-m, 8.8 - 12.5 ft-lb)

Changing Engine Oil

EBS00CGF

WARNING:

- **Be careful not to burn yourself, as the engine oil may be hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer: try to avoid direct skin contact with used oil. if skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**

1. Warm up engine, and check for oil leakage from engine components.
2. Stop engine and wait for 10 minutes.
3. Remove drain plug and oil filler cap to drain the oil.
4. Remove the oil filter and install a new filter.
5. Install the oil pan drain plug with a new washer.

CAUTION:

- **Be sure to clean the drain plug and install with new washer.**

Oil pan drain plug : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

- **The refill capacity depends on the oil temperature and drain time. Use these specifications for reference only.**
  Always use the dipstick to determine that the proper amount of oil is in the engine.

6. Fill the engine with oil.

Oil specification and viscosity

- Refer to MA-13, "Fluids and Lubricants" .

Oil capacity (Approximate):

Drain and refill	With oil filter change	2.7 ℓ (2-7/8 US qt, 2-3/8 Imp qt)
	Without oil filter change	2.5 ℓ (2-5/8 US qt, 2-1/4 Imp qt)
Dry engine (engine overhaul)		3.1 ℓ (3-1/4 US qt, 2-3/4 Imp qt)

7. Warm up the engine and check the area around the drain plug and oil filter for oil leakage.
8. Stop the engine and wait for 10 minutes.
9. Check the oil level. Refer to LU-5, "ENGINE OIL" .

OIL FILTER

PFP:15208

Removal and Installation

EBS00CGG

REMOVAL

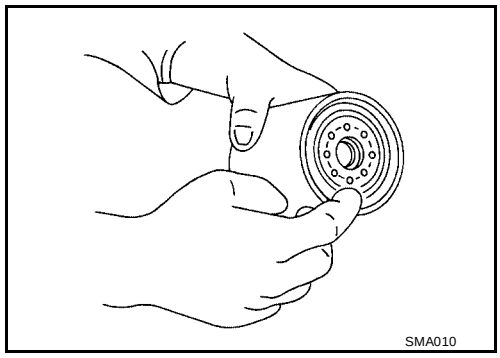
1. Remove the RH engine under cover.
2. Using an oil filter wrench, remove the oil filter.

CAUTION:

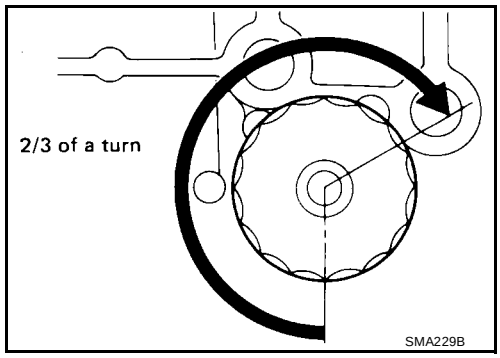
- **Be careful not to get burned when the engine and engine oil are hot.**
- **When removing, prepare a shop cloth to absorb any oil leakage or spillage.**
- **Do not allow engine oil to adhere to the drive belts.**
- **Completely wipe off any oil that adheres to the engine and the vehicle.**

INSTALLATION

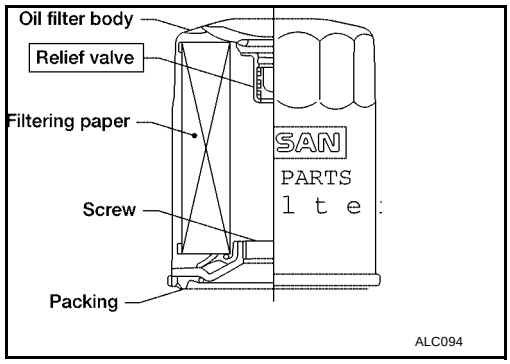
1. Remove foreign materials adhering to the oil filter installation surface.
2. Apply engine oil to the oil seal circumference of the new oil filter.



3. Screw the oil filter manually until it touches the installation surface, then tighten it by 2/3 turn.



4. After warming up the engine, check for engine oil leakage.
5. Check oil level with the dipstick and add engine oil as necessary. Refer to LU-5, "ENGINE OIL" .
6. Install the RH engine under cover.



OIL PUMP

PFP:15010

Removal and Installation

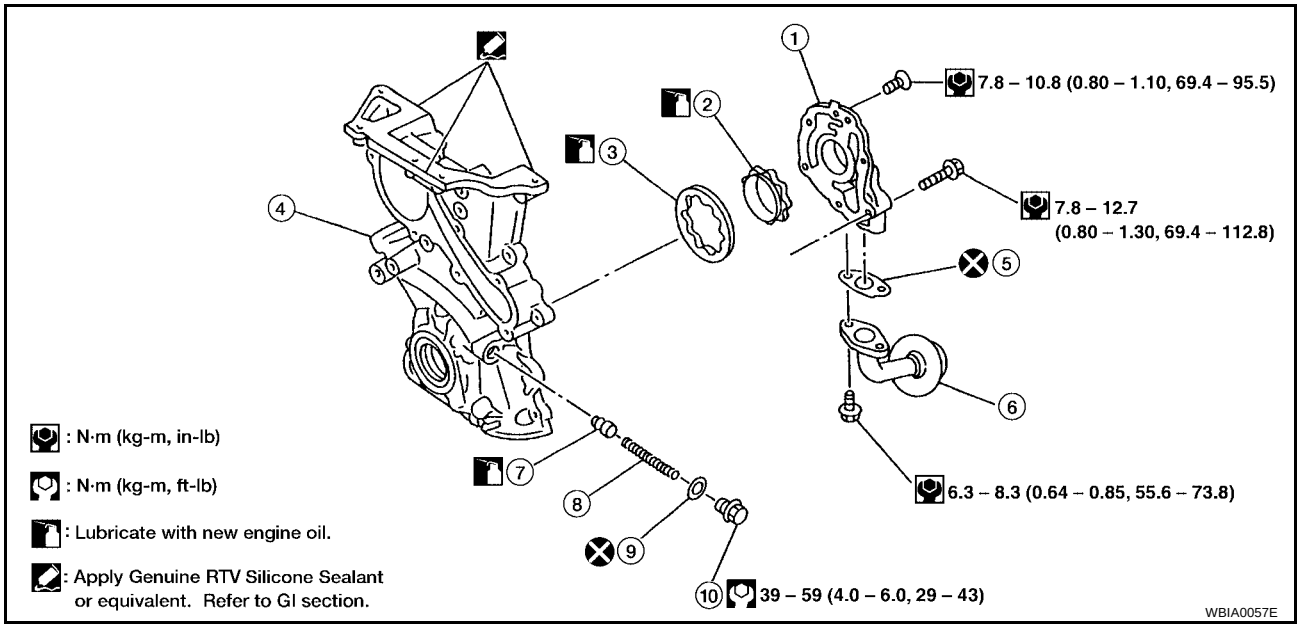
EBS00CGH

- **When installing the oil pump, apply clean engine oil to the rotor.**
- **Make sure that O-ring seal is fitted properly.**
- **Use a scraper to remove the old sealant from the mating surface of the front cover.**
- **Also remove all traces of the old sealant from the mating surface of the engine block.**

1. Remove the drive belts.
2. Remove the oil pan. Refer to EM-16, "Removal" .
3. Remove the oil strainer.
4. Remove the front cover. Refer to EM-40, "Removal" .
5. Install the front cover, applying a continuous bead of Genuine RTV Silicone Sealant or equivalent to mating surface of front cover assembly. Refer to LU-2, "LIQUID GASKET APPLICATION PROCEDURE" .
6. Installation is in the reverse order of removal.

Disassembly and Assembly

EBS00CGI

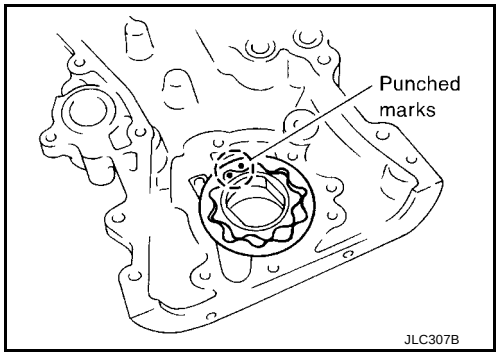


1. Oil pump cover
2. Inner rotor
3. Outer rotor
4. Front cover
5. Gasket
6. Oil strainer
7. Regulator valve
8. Spring
9. Washer
10. Plug

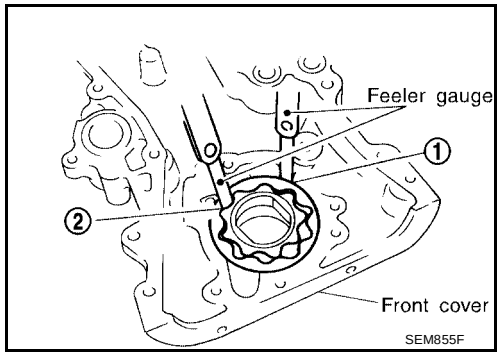
Inspection

EBS00CGJ

- Install the oil pump rotors with the punch marks on the oil pump cover side, as shown.



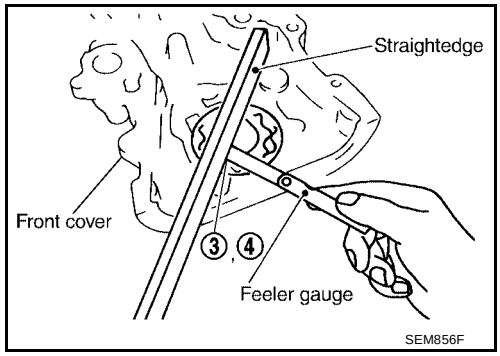
- Using a feeler gauge, check the following clearances.



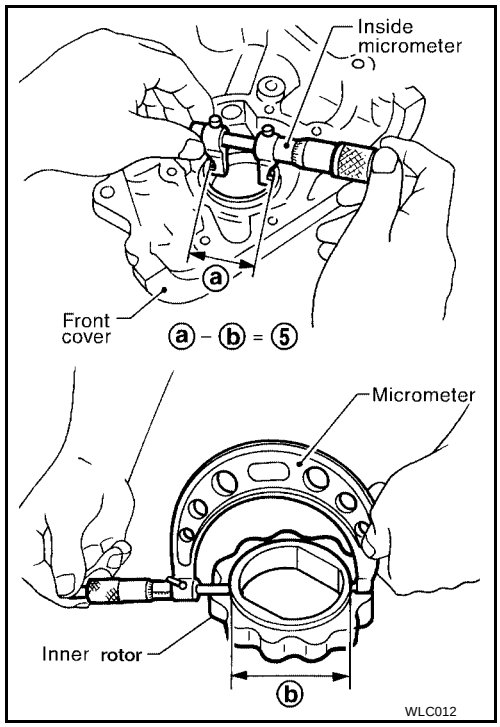
Standard clearance:

Unit: mm (in)

Body to outer rotor radial clearance **1**	0.114 - 0.200 (0.0045 - 0.0079)
Inner rotor to outer rotor tip clearance **2**	Below 0.18 (0.0071)
Body to inner rotor clearance **3**	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance **4**	0.030 - 0.090 (0.0012 - 0.0035)
Inner rotor to brazed portion of housing clearance **5**	0.045 - 0.091 (0.0018 - 0.0036)



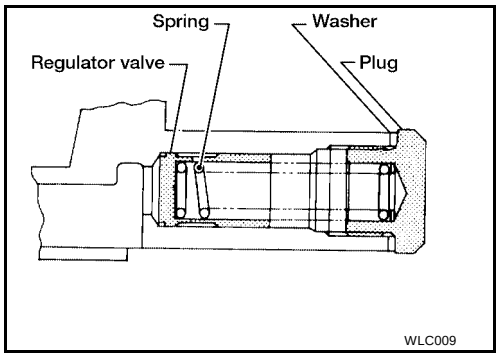
- If the tip clearance (2) exceeds the limit, replace the rotor set.
- If the body to rotor clearances (1, 3, 4, 5) exceed the limit, replace the front cover assembly.



Regulator Valve Inspection

EBS00CGK

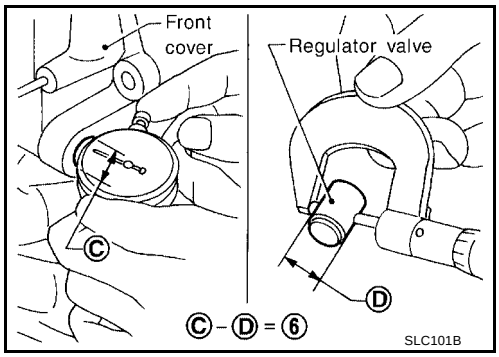
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil.
   - Check that the regulator valve falls smoothly into the valve hole by its own weight and gravity.
   - If damaged, replace the regulator valve set or front cover assembly.



4. Check regulator valve to front cover clearance.

   Clearance : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

   - If the valve exceeds the specification, replace the front cover assembly.



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Oil Pressure

EBS00CGL

Engine speed (rpm)	Approximate discharge pressure kPa (kg/cm^2 , psi)
Idle speed	Approx. 98 (1.0, 14) or more
2,000	Approx. 294 (3.0, 43) or more
6,000	Approx. 392 (4.0, 57) or more

Oil Pump

EBS00CGM

Unit: mm (in)

Body to outer rotor radial clearance	0.114 - 0.200 (0.0045 - 0.0079)
Inner rotor to outer rotor tip clearance	Below 0.18 (0.0071)
Body to inner rotor clearance	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance	0.030 - 0.090 (0.0012 - 0.0035)
Inner rotor to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Regulator Valve

EBS00CGN

Unit: mm (in)

Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)

Oil Capacity

EBS00EYQ

Unit: ℓ (US qt., Imp qt.)

With oil filter change	2.7 (2-7/8, 2-3/8)
Without oil filter change	2.5 (2-5/8, 2-1/4)
Dry engine (engine overhaul)	3.1 (3-1/4, 2-3/4)

PRECAUTIONS

PFP:00001

Precautions for Liquid Gasket

EBS00CGO

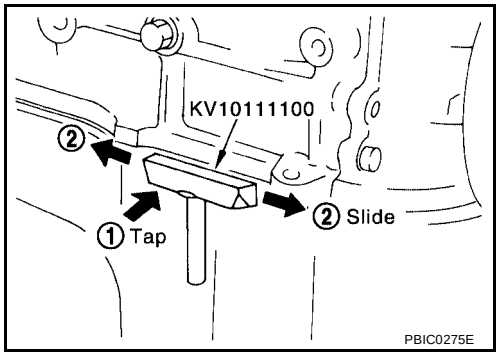
REMOVAL OF LIQUID GASKET SEALING

- After removing the mounting bolts and nuts, disconnect and remove the sealant using a seal cutter.

CAUTION:
Be careful not to damage the mating surfaces.

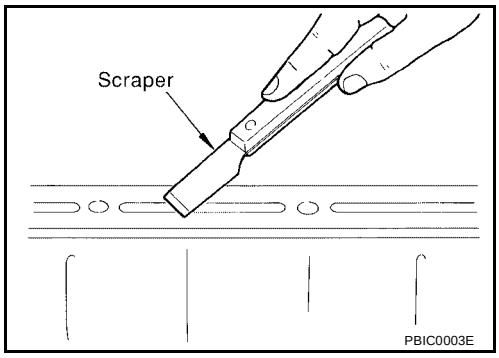
- In areas where the cutter is difficult to use, use a plastic hammer to lightly tap the areas where the sealant is applied.

CAUTION:
If for some unavoidable reason a tool such as a flat-bladed screwdriver is used, be careful not to damage the mating surfaces.

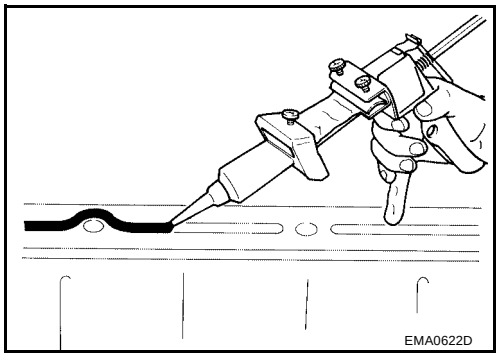


LIQUID GASKET APPLICATION PROCEDURE

1. Using a scraper, remove the old sealant adhering to the gasket application surface and the mating surface.
   - Remove the old sealant completely from the groove of the gasket application surface, mounting bolts, and bolt holes.
2. Clean the mating surface to remove dirt, moisture, grease, and foreign material.
3. Attach the sealant tube to the tube presser.
   Use Genuine RTV Silicone Sealant or equivalent. Refer to **GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"** **.**

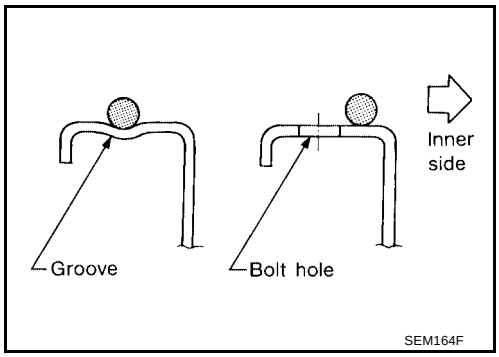


4. Apply the sealant without breaks to the specified location with the specified dimensions.
   - If there is a groove for the sealant application, apply the Sealant to the groove.
   - As for the bolt holes, normally apply the sealant inside the holes. Occasionally, it should be applied outside the holes.



   - Within five minutes of sealant application, install the mating component.
   - If the sealant protrudes, wipe it off immediately.
   - Do not retighten after the installation.
   - After 30 minutes or more have passed after installation, fill the engine with oil and coolant.

CAUTION:
If there are specific instructions in the service manual, observe them.



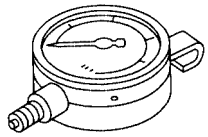
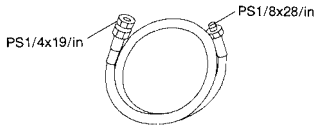
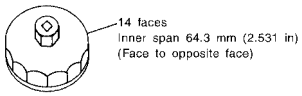
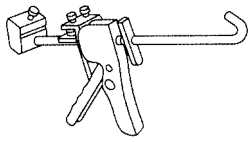
PREPARATION

PFP:00002

Special Service Tools

EBS00CGP

The actual shape of Kent-Moore tools may differ from those of special service tools illustrated here.

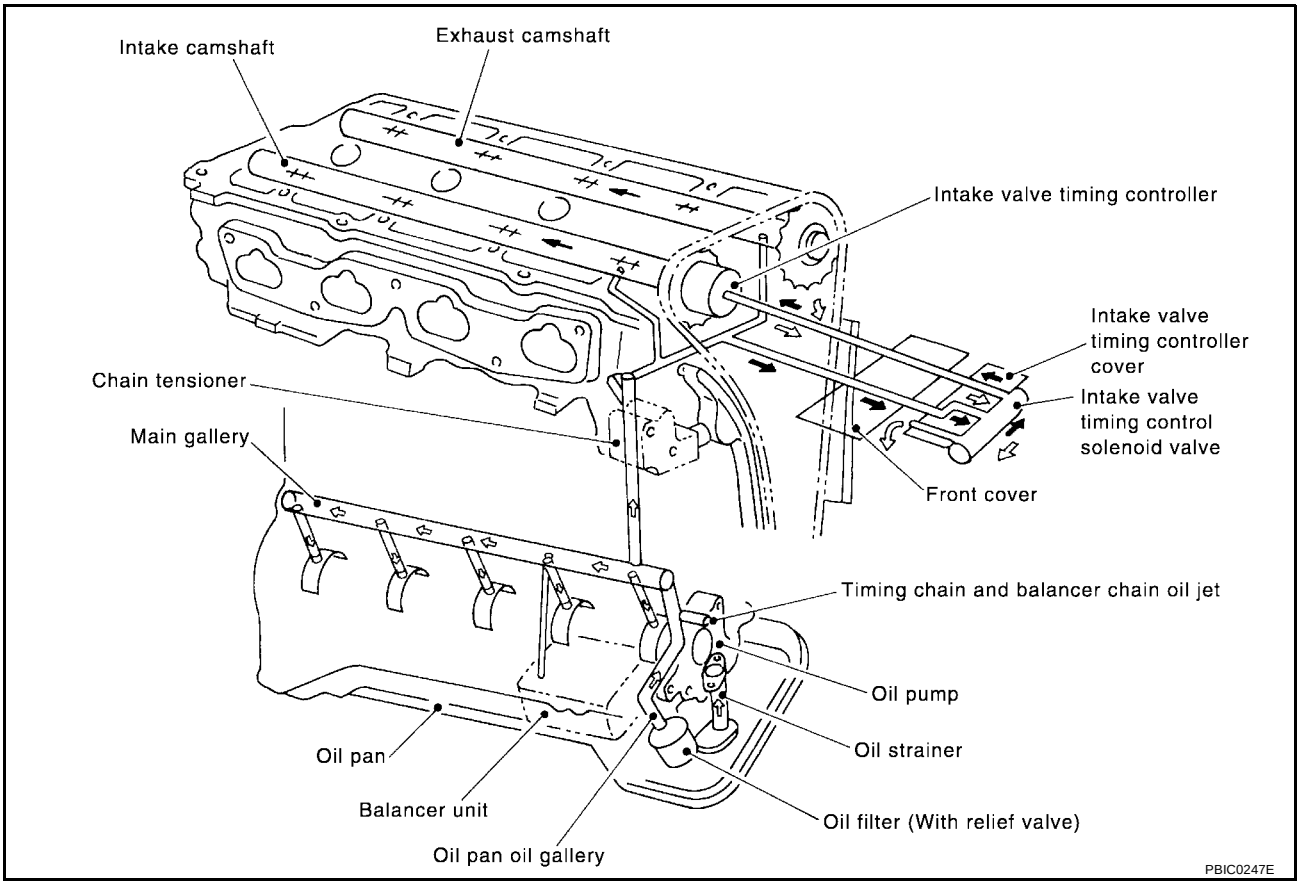
Tool number Tool name	Description
ST25051001 (J34301-1) Oil pressure gauge  S-NT050	Measuring oil pressure **Maximum measuring range:** **2,452 kPa (25 kg/cm2, 356 psi)**
ST25052000 (J34301-2) Hose  S-NT559	Adapting oil pressure gauge to cylinder block
KV10115801 (J37140-A) Oil filter wrench  S-NT772	Removing oil filter
WS39930000 (-) Tube presser  S-NT052	Pressing the tube of RTV Silicone Sealant

LUBRICATION SYSTEM

PFP:15010

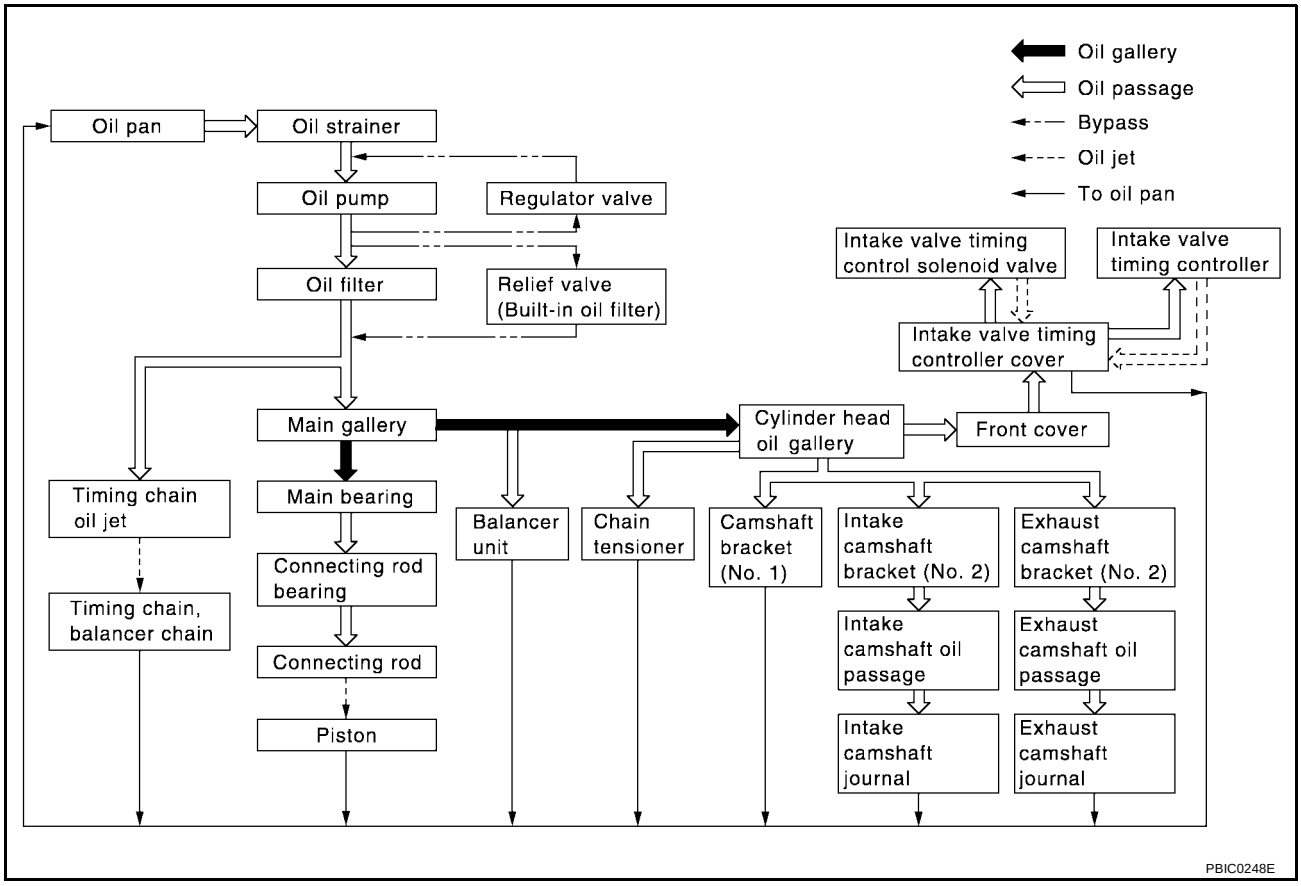
Lubrication Circuit

EBS00CGQ



System Drawing

EBS00CGR



ENGINE OIL

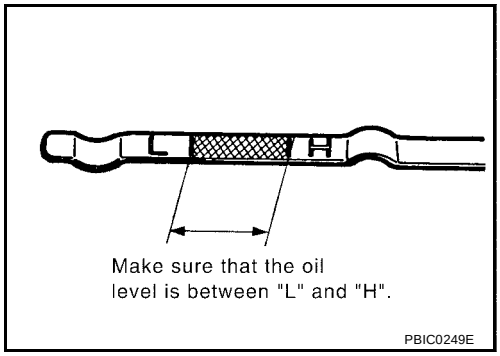
PFP:KLA92

Inspection

EBS00CGS

OIL LEVEL AND MUDINESS

- Ensure the vehicle is on a level surface with engine off, then check the oil level. If the engine is already started, stop it and allow 10 minutes before checking.
- Check that the oil level is within the range shown in the figure and adjust if necessary.
- If it is out of range, add oil as necessary. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .
- Check the oil for white turbidity or remarkable contamination.
- If the oil becomes turbid and white, it is highly probable that it is contaminated with coolant. Diagnose the problem and correct as necessary.



OIL LEAKAGE

Check for oil leakage around the following areas.

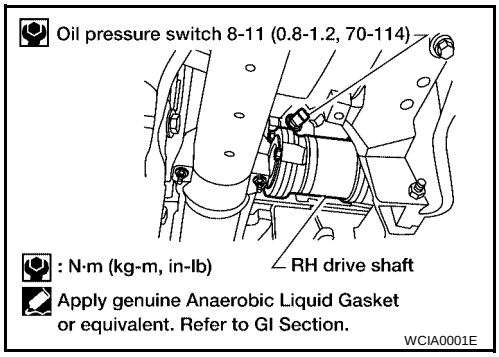
- Oil pan
- Oil pan drain plug
- Oil pressure switch
- Oil filter
- IVTC (intake valve timing control) cover
- Front cover
- Mating surface between cylinder block and cylinder head
- Mating surface between cylinder head and rocker cover
- Crankshaft oil seal

OIL PRESSURE CHECK

WARNING:

- **Be careful not to burn yourself, as the engine oil may be hot.**
- **For M/T models, put gearshift lever in Neutral position. For A/T models, put selector lever in Park "P" position.**

1. Check the oil level.
2. Remove the under cover.
3. Remove the oil pressure switch to connect the oil pressure gauge.
4. After warming up the engine to the normal operating temperature, check that oil pressure corresponding to the engine speed is produced.



Engine oil pressure [Oil temperature is 80 °C (176 °F)]

Engine speed (rpm)	Idle speed	2,000	6,000
Engine pressure kPa (kg/cm^2 , psi)	Approx. 98 (1.0, 14) or more	Approx. 294 (3.0, 43) or more	Approx. 392 (4.0, 57) or more

5. After checking, install the oil pressure switch as follows:

a. Remove the old thread sealant adhering to the switch and engine.

b. Apply thread sealant. Tighten the switch to specification.
Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

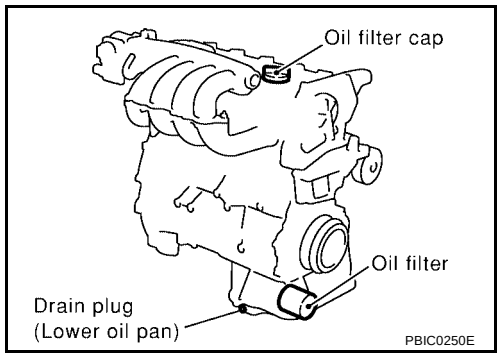
Oil pressure switch : 12.3 - 17.2 N·m (1.25 - 1.75 kg-m, 10 - 12 ft-lb)

Changing Engine Oil

EBS00CGT

WARNING:

- **Be careful not to burn yourself, as the engine oil is hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer: try to avoid direct skin contact with used oil. if skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**



1. Warm up engine, and check for oil leakage from engine components.
2. Stop the engine and wait for 10 minutes.
3. Remove the oil drain plug and oil filler cap to drain the oil.
4. Remove the oil filter and replace it with a new oil filter.
5. Install the oil drain plug using a new washer.

   Oil pan drain plug : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

   CAUTION:
   - **Clean the oil drain plug and install with a new washer.**
6. Fill the engine with the specified oil.
   - Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .

   Oil capacity (Approximate):

Drain and refill	With oil filter change	3.9 ℓ (4-1/8 US qt, 3-3/8 Imp qt)
	Without oil filter change	3.7 ℓ (3-7/8 US qt, 3-1/4 Imp qt)
Dry engine (engine overhaul)		4.4 ℓ (4-5/8 US qt, 3-7/8 Imp qt)

   - The refill capacity depends on the oil temperature and drain time. Use these specifications for reference only.
   - Always use the dipstick to the determine when the proper amount of oil is in the engine.
7. Warm up the engine and check the area around the oil drain plug and oil filter for oil leakage.
8. Stop the engine and wait for 10 minutes.
9. Check the oil level using the dipstick. Refer to LU-16, "ENGINE OIL" .

OIL FILTER

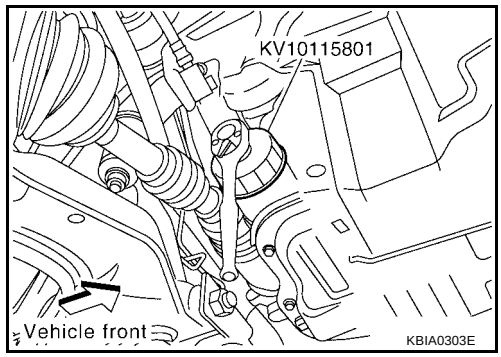
PFP:15208

Removal and Installation

EBS00CGU

REMOVAL

1. Open the oil filter installation/removal access cover on the RH engine under cover.
2. Using an oil filter wrench, remove the oil filter.

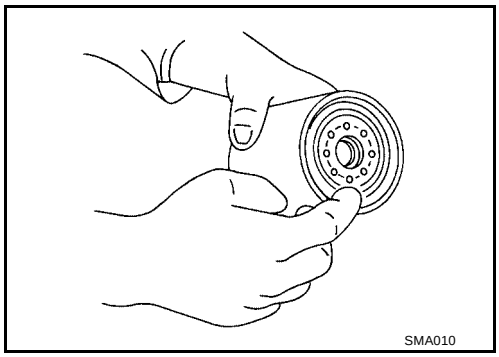


CAUTION:

- **Be careful not to get burned when the engine and engine oil are hot.**
- **When removing, prepare a shop cloth to absorb any oil leakage or spillage.**
- **Do not allow engine oil to adhere to the drive belts.**
- **Completely wipe off any oil that adheres to the engine and the vehicle.**

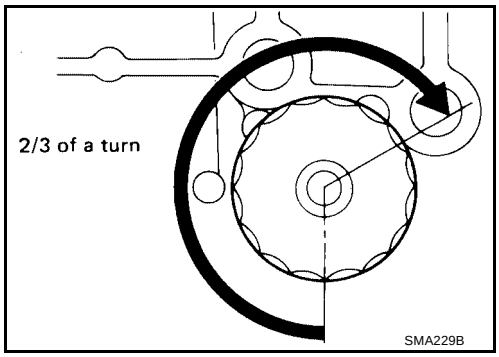
INSTALLATION

1. Remove foreign material adhering to the oil filter installation surface.
2. Apply a thin coating of engine oil to the oil seal surface of the new oil filter.

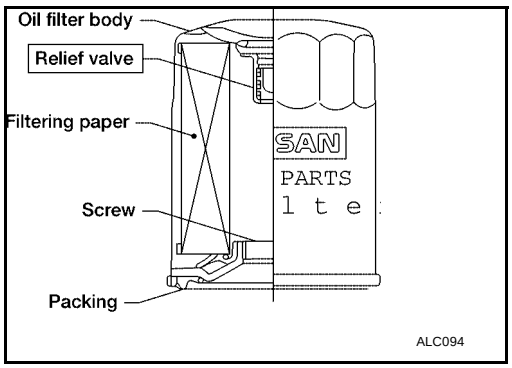


3. Screw the oil filter manually until it touches the installation surface and then tighten it by 2/3 turn. Or tighten the oil filter to the correct specification.

Oil filter :14.7 - 20.5 N·m (1.5 - 2.1 kg-m, 11 - 15 ft-lb)



4. After warming up the engine, check for engine oil leakage.
5. Check the oil level and adjust the engine oil level as necessary. Refer to LU-16, "ENGINE OIL" .



OIL PUMP

PFP:15010

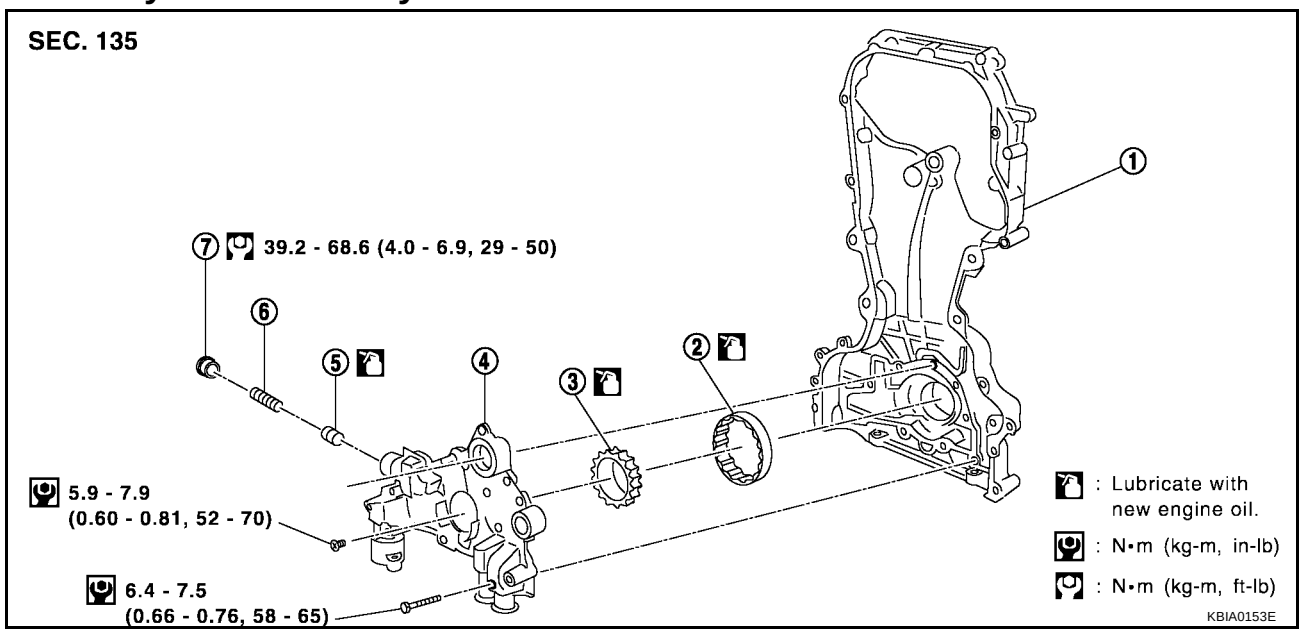
Removal and Installation

EBS00CGV

1. To remove the oil pump, remove the front cover. Refer to EM-134, "TIMING CHAIN" .
   - Only perform the steps necessary to remove the front cover.
2. Installation is in the reverse order of removal.

Disassembly and Assembly

EBS00CGW



1. Front cover
2. Outer rotor
3. Inner rotor
4. Oil pump cover
5. Regulator valve
6. Regulator valve spring
7. Regulator plug

CAUTION:

Before installation, apply new engine oil to the parts as instructed in the figure.

DISASSEMBLY

1. Remove the oil pump cover.
2. Remove the inner rotor and the outer rotor from the front cover.
3. After removing the regulator plug, remove the regulator valve spring and the regulator valve.

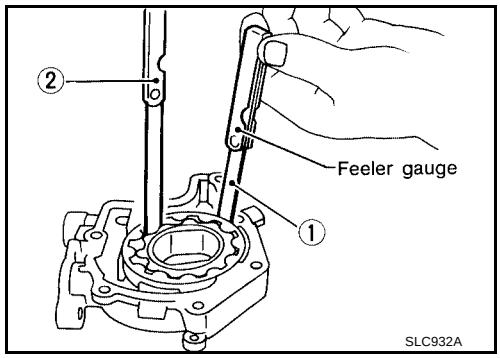
INSPECTION AFTER DISASSEMBLY

1. Measuring the internal clearance of the oil pump components.
   - Measure the clearance with a feeler gauge.
     Clearance between outer rotor and oil pump body (position 1):

     Standard clearance : 0.114 - 0.179 mm (0.0045 - 0.0070 in)

     Tip clearance between inner rotor and outer rotor (position 2):

     Standard clearance : Less than 0.220 mm (0.0087 in)



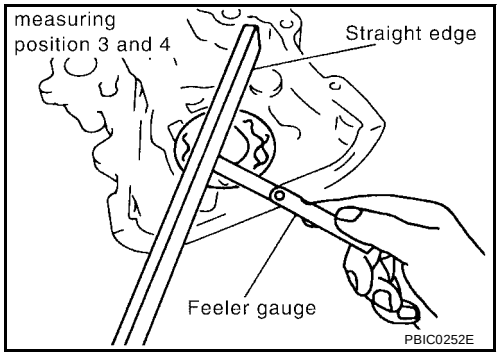
- Measure clearance with feeler gauge and straightedge.
  Side clearance between inner rotor and oil pump body (position 3):

  Standard clearance : 0.030 - 0.070 mm (0.0012 - 0.0028 in)

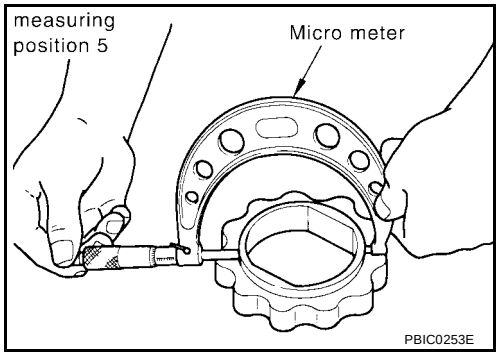
- Side clearance between outer rotor and oil pump body (position 4):

  Standard clearance : 0.060 - 0.110 mm (0.0024 - 0.0043 in)

- Calculate the clearance between inner rotor and oil pump body as follows.

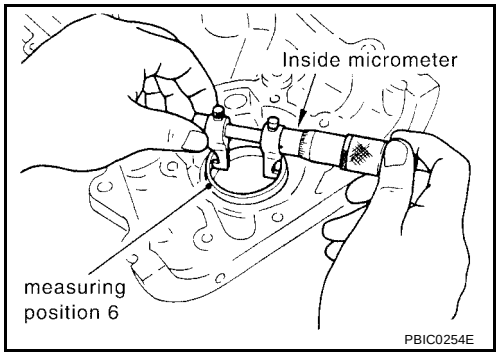


2. Measure the outer diameter of protruded portion of inner rotor (Position 5).



3. Measure the inner diameter of oil pump body with an inside micrometer (Position 6).
   (Clearance) = (Inner diameter of oil pump body) – (Outer diameter of inner rotor):

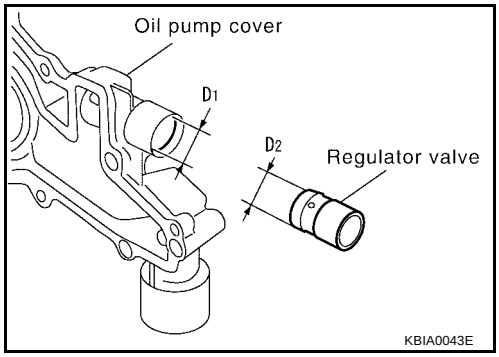
   Standard clearance : 0.035 - 0.070 mm (0.0014 - 0.0028 in)



4. Measure the regulator valve clearance.
   - (Clearance) = D1(Valve hole diameter) – D2 (Outer diameter of valve):

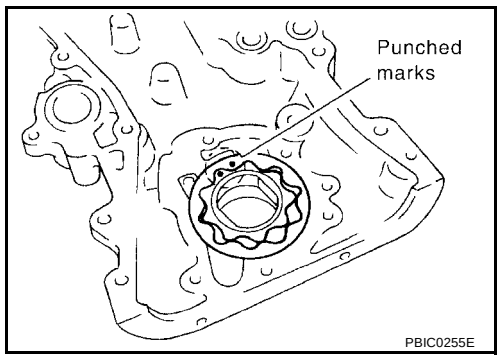
     Standard clearance : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

     CAUTION:
     Coat the regulator valve with engine oil.
     Check that it falls smoothly into the valve hole by its own weight.



ASSEMBLY

- Assembly is in the reverse order of disassembly.
- Install the inner rotor and outer rotor with the punched marks on the oil pump cover side.



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Oil Pressure

EBS00CGX

Engine speed (rpm)	Approximate discharge pressure kPa (kg/cm^2 , psi)
Idle speed	Approx. 98 (1.0, 14) or more
2,000	Approx. 294 (3.0, 43) or more
6,000	Approx. 392 (4.0, 57) or more

Oil Pump

EBS00CGY

Unit: mm (in)

Body to outer rotor radial clearance	0.114 - 0.179 (0.0045-0.0070)
Inner rotor to outer rotor tip clearance	Less than 0.220 (0.0087)
Body to inner rotor axial clearance	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance	0.060 - 0.110 (0.0024 - 0.0043)
Inner rotor to brazed portion of housing clearance	0.035 - 0.070 (0.0014 - 0.0028)

Regulator Valve

EBS00CGZ

Unit: mm (in)

Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)

Oil Capacity

EBS00CH0

Unit: ℓ (US qt., Imp qt.)

With oil filter change	Approximately 3.9 (4-1/8, 3-3/8)
Without oil filter change	Approximately 3.7 (3-7/8, 3-1/4)
Dry engine (engine overhaul)	Approximately 4.4 (4-5/8, 3-7/8)

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MAINTENANCE

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

ELS000IF

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

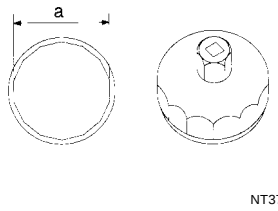
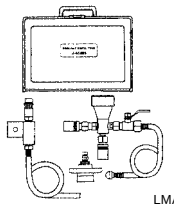
PREPARATION

PFP:00002

Special Service Tool

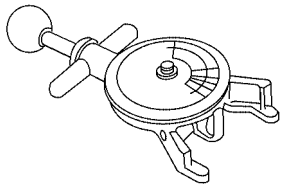
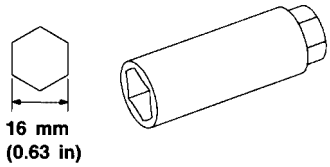
ELS000IG

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
KV10115801 (J-37140-A) Oil filter cap wrench  NT375	Removing oil filter **a: 64.3 mm (2.531 in)**
— (J-45695) Coolant refill tool  LMA053	Refilling engine coolant

Commercial Service Tool

ELS000IH

Tool name (Kent-Moore No.)	Description
Belt tension gauge (BT3373-F)  AMA126	Checking drive belt tension of QG18DE engine
Spark plug wrench  S-NT047	Removing and installing spark plugs

GENERAL MAINTENANCE

PFP:00000

Explanation of General Maintenance

ELS000II

General Maintenance

ELS000IJ

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform checks and inspections themselves or they can have their NISSAN dealers do them.

OUTSIDE THE VEHICLE

The maintenance items listed here should be performed from time to time, unless otherwise specified.

Item		Reference page
Tires	Check the pressure including the spare, at least once a month and always prior to a long distance trip. Adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	—
Wheel nuts	When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	—
Windshield	Clean the windshield on a regular basis. Check the windshield at least every six months for cracks or other damage. Repair as necessary.	—
Tire rotation	Tires should be rotated every 12,000 km (7,500 miles).	MA-31, "Tire Rotation"
Wheel alignment and balance	If the vehicle pulls to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.	FSU-6, "Front Wheel Alignment" and MA-31, "Balancing Wheels"
Windshield wiper blades	Check for cracks or wear if they do not wipe properly.	—
Doors and engine hood	Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. Also make sure that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check lubrication frequently.	MA-36, "Lubricating Locks, Hinges and Hood Latches"
Lamps	Make sure that the headlamps, stop lamps, tail lamps, turn signal lamps, and other lamps are all operating properly and installed securely. Also check headlamp aim. Clean the headlamps on a regular basis.	—

INSIDE THE VEHICLE

The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, and cleaning the vehicle.

Item		Reference page
Warning lamps and buzzers/chimes	Make sure that all warning lamps and buzzers/chimes are operating properly.	—
Windshield wiper and washer	Check that the wipers and washer operate properly and that the wipers do not streak.	—
Windshield defroster	Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioning.	—
Steering wheel	Check that it has the specified play. Be sure to check for changes in the steering condition, such as excessive play, hard steering or strange noises. **Free play: Less than 35 mm (1.38 in)**	—
Seats	Check seat position controls such as seat adjusters, seat back recliner, etc. to make sure they operate smoothly and that all latches lock securely in every position. Check that the head restraints move up and down smoothly and that the locks (if equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seat backs.	—
Seat belts	Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly and are installed securely. Check the belt webbing for cuts, fraying, wear or damage.	SB-7, "Seat Belt Inspection"
Accelerator pedal	Check the pedal for smooth operation and make sure the pedal does not catch or require uneven effort. Keep the floor mats away from the pedal.	—

Item		Reference page
Clutch pedal	Make sure the pedal operates smoothly and check that it has the proper free play.	CL-7, "CLUTCH PEDAL INSPECTION AND ADJUSTMENT"
Brakes	Check that the brake does not pull the vehicle to one side when applied.	—
Brake pedal and booster	Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function. Be sure to keep floor mats away from the pedal.	BR-12, "BRAKE PEDAL HEIGHT" and BR-16, "OPERATING CHECK"
Parking brake	Check that the lever has the proper travel and make sure that the vehicle is held securely on a fairly steep hill when only the parking brake is applied.	PB-2, "Inspection"
Automatic transaxle "Park" mechanism	Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that the vehicle is held securely with the selector lever in the "P" position without applying any brakes.	—

UNDER THE HOOD AND VEHICLE

The maintenance items listed here should be checked periodically (e.g. each time you check the engine oil or refuel).

Item		Reference page	
		QG18DE	QR25DE
Windshield washer fluid	Check that there is adequate fluid in the tank.	—	
Engine coolant level	Check the coolant level when the engine is cold.	CO-7, "CHECKING COOLING SYSTEM FOR LEAKS"	CO-24, "System Check"
A/C condenser, radiator and hoses	Check the front of the condenser and radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the radiator hoses have no cracks, deformation, deterioration or loose connections.	—	
Brake and clutch fluid levels	Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoirs.	MA-32, "Checking Brake Fluid Level and Leaks" and MA-29, "Checking Clutch Fluid Level and Leaks"	
Battery	Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines. Vehicles operated in high temperatures or under severe conditions require frequent checks of the battery fluid level.	—	
Engine drive belts	Make sure that no belt is frayed, worn, cracked or oily.	MA-16, "Checking Drive Belts"	MA-23, "Checking Drive Belts"
Engine oil level	Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.	—	—
Power steering fluid level and lines	Check the level is between the "MAX" and "MIN" lines on the reservoir with the engine off. Check the lines for improper attachment, leaks, cracks, etc.	MA-34, "Checking Power Steering Fluid and Lines"	
Automatic transaxle fluid level	Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	MA-30, "Checking A/T Fluid"	
Exhaust system	Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.	MA-29, "Checking Exhaust System"	
Underbody	The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate.	—	
Fluid leaks	Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.	—	

PERIODIC MAINTENANCE

PFP:00026

Introduction of Periodic Maintenance

ELS000IK

Two different maintenance schedules are provided, and should be used, depending upon the conditions in which the vehicle is mainly operated. **After 60,000 miles (96,000 km) or 48 months, continue the periodic maintenance at the same mileage/time intervals.**

Schedule 1	Follow Periodic Maintenance Schedule 1 if your driving habits frequently includes one or more of the following driving conditions: ● Repeated short trips of less than 5 miles (8 km). ● Repeated short trips of less than 10 miles (16 km) with outside temperatures remaining below freezing. ● Operating in hot weather in stop-and-go “rush hour” traffic. ● Extensive idling and/or low speed driving for long distances, such as police, taxi or door-to-door delivery use. ● Driving in dusty conditions. ● Driving on rough, muddy, or salt spread roads. ● Towing a trailer, using a camper or a car-top carrier.	Emission Control System Maintenance	MA-7, "EMISSION CONTROL SYSTEM MAINTENANCE"
		Chassis and Body Maintenance	MA-10, "CHASSIS AND BODY MAINTENANCE"
Schedule 2	Follow Periodic Maintenance Schedule 2 if none of the driving conditions shown in Schedule 1 apply to your driving habits.	Emission Control System Maintenance	MA-11, "EMISSION CONTROL SYSTEM MAINTENANCE"
		Chassis and Body Maintenance	MA-12, "CHASSIS AND BODY MAINTENANCE"

Schedule 1

ELS000IL

EMISSION CONTROL SYSTEM MAINTENANCE

Abbreviations: R = Replace. I = Inspect. Correct or replace if necessary. []: At the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference Section - Page or - Content Title	
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	3.75 (6) 3	7.5 (12) 6	11.25 (18) 9	15 (24) 12	18.75 (30) 15	22.5 (36) 18	26.25 (42) 21	30 (48) 24	QG18DE	QR25DE
Drive belt	NOTE (1)									MA-16, "Checking Drive Belts"	MA-23, "Checking Drive Belts"
Air cleaner filter	NOTE (2)								[R]	MA-19, "Changing Air Cleaner Filter"	MA-26, "Changing Air Cleaner Filter"
EVAP vapor lines									I*	MA-22, "Checking EVAP Vapor Lines"	MA-28, "Checking EVAP Vapor Lines"

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference Section - Page or - Content Title	
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	3.75 (6) 3	7.5 (12) 6	11.25 (18) 9	15 (24) 12	18.75 (30) 15	22.5 (36) 18	26.25 (42) 21	30 (48) 24	QG18DE	QR25DE
Fuel lines									I*	MA-19, "Checking Fuel Lines"	MA-25, "Checking Fuel Lines"
Fuel filter	NOTE (3)									—	
Engine coolant	NOTE (4)									MA-16, "Changing Engine Coolant"	MA-23, "Changing Engine Coolant"
Engine oil		R	R	R	R	R	R	R	R	MA-20, "Changing Engine Oil"	MA-26, "Changing Engine Oil"
Engine oil filter (Use part No. 15208-65F01, 15208-9E000 or equiv.)		R	R	R	R	R	R	R	R	MA-20, "Changing Oil Filter"	—
Engine oil filter (Use part No. 15208-9E000 or equiv.)		R	R	R	R	R	R	R	R	—	MA-27, "Changing Oil Filter"
Spark plugs (Double PLATINUM-TIPPED type)		Replace every 105,000 miles (169,000 km)								MA-21, "Changing Spark Plugs (Double Platinum - Tipped Type)"	MA-27, "Changing Spark Plugs (Double Platinum - Tipped Type)"
Intake and exhaust valve clearance	NOTE (5)*									EM-35, "Valve Clearance"	—

Abbreviations: R = Replace. I = Inspect. Correct or replace if necessary. []: At the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference Section - Page or - Content Title	
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	33.75 (54) 27	37.5 (60) 30	41.25 (66) 33	45 (72) 36	48.75 (78) 39	52.5 (84) 42	56.25 (90) 45	60 (96) 48	QG18DE	QR25DE
Drive belt	NOTE (1)								I*	MA-16, "Checking Drive Belts"	MA-23, "Checking Drive Belts"
Air cleaner filter	NOTE (2)								[R]	MA-19, "Changing Air Cleaner Filter"	MA-26, "Changing Air Cleaner Filter"
EVAP vapor lines									I*	MA-22, "Checking EVAP Vapor Lines"	MA-28, "Checking EVAP Vapor Lines"

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference Section - Page or - Content Title	
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	33.75 (54) 27	37.5 (60) 30	41.25 (66) 33	45 (72) 36	48.75 (78) 39	52.5 (84) 42	56.25 (90) 45	60 (96) 48	QG18DE	QR25DE
Fuel lines									I*	MA-19, "Checking Fuel Lines"	MA-25, "Checking Fuel Lines"
Fuel filter	NOTE (3)									—	
Engine coolant	NOTE (4)								R*	MA-16, "Changing Engine Coolant"	MA-23, "Changing Engine Coolant"
Engine oil		R	R	R	R	R	R	R	R	MA-20, "Changing Engine Oil"	MA-26, "Changing Engine Oil"
Engine oil filter (Use part No. 15208-65F01, 15208-9E000 or equiv.)		R	R	R	R	R	R	R	R	MA-20, "Changing Oil Filter"	—
Engine oil filter (Use part No. 15208-9E000 or equiv.)		R	R	R	R	R	R	R	R	—	MA-27, "Changing Oil Filter"
Spark plugs (Double PLATINUM-TIPPED type)		Replace every 105,000 miles (169,000 km)								MA-21, "Changing Spark Plugs (Double Platinum - Tipped Type)"	MA-27, "Changing Spark Plugs (Double Platinum - Tipped Type)"
Intake and exhaust valve clearance	NOTE (5)*									EM-35, "Valve Clearance"	—

NOTE:

- (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months. Replace the drive belt if found damaged or if the auto belt tensioner reading (for QR25DE engine) reaches the maximum limit.
- (2) If operating mainly in dusty conditions, more frequent maintenance may be required.
- (3) Maintenance-free item.
- (4) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.
- (5) If valve noise increases, inspect valve clearance.

Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

CHASSIS AND BODY MAINTENANCE

Abbreviations: R = Replace. I = Inspect. Correct or replace if necessary. L = Lubricate.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference Section - Page or - Content Title
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	3.75 (6) 3	7.5 (12) 6	11.25 (18) 9	15 (24) 12	18.75 (30) 15	22.5 (36) 18	26.25 (42) 21	30 (48) 24	
Brake lines & cables					I				I	MA-32
Brake pads, rotors, drums & linings (QG18DE)			I		I		I		I	MA-32 and MA-33
Brake pads & rotors (QR25DE)			I		I		I		I	MA-32
Manual transaxle oil or automatic transaxle fluid	NOTE (1)				I				I	MA-29 or MA-31
Steering gear & linkage, axle & suspension parts			I		I		I		I	MA-34, MA-35
Tire rotation	NOTE (2)									MA-31
Front drive shaft boots			I		I		I		I	MA-36
Exhaust system			I		I		I		I	MA-29
In-cabin microfilter					R				R	MTC-77

Abbreviations: R = Replace. I = Inspect. Correct or replace if necessary. L = Lubricate.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference Section - Page or - Content Title
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	33.75 (54) 27	37.5 (60) 30	41.25 (66) 33	45 (72) 36	48.75 (78) 39	52.5 (84) 42	56.25 (90) 45	60 (96) 48	
Brake lines & cables					I				I	MA-32
Brake pads, rotors, drums & linings (QG18DE)			I		I		I		I	MA-32 and MA-33
Brake pads & rotors (QR25DE)			I		I		I		I	MA-32
Manual transaxle oil or automatic transaxle fluid	NOTE (1)				I				I	MA-29 or MA-31
Steering gear & linkage, axle & suspension parts			I		I		I		I	MA-34, MA-35
Tire rotation	NOTE (2)									MA-31
Front drive shaft boots			I		I		I		I	MA-36
Exhaust system			I		I		I		I	MA-29
In-cabin microfilter					R				R	MTC-77

NOTE:

- (1) If towing a trailer, using a camper or a car-top carrier, or driving on rough or muddy roads, change (not just inspect) oil (exc. LSD) at every 30,000 miles (48,000 km) or 24 months, and change LSD gear oil every 15,000 miles (24,000 km) or 12 months.
- (2) Refer to “Tire rotation” under the “GENERAL MAINTENANCE” heading earlier in this section.

Schedule 2

ELS000IM

EMISSION CONTROL SYSTEM MAINTENANCE

Abbreviations: R = Replace. I = Inspect. Correct or replace if necessary. []: At the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference Section - Page or - Content Title	
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	7.5 (12) 6	15 (24) 12	22.5 (36) 18	30 (48) 24	37.5 (60) 30	45 (72) 36	52.5 (84) 42	60 (96) 48	QG18DE	QR25DE
Drive belt	NOTE (1)								I*	MA-16, "Checking Drive Belts"	MA-23, "Checking Drive Belts"
Air cleaner filter					[R]				[R]	MA-19, "Changing Air Cleaner Filter"	MA-26, "Changing Air Cleaner Filter"
EVAP vapor lines					I*				I*	MA-22, "Checking EVAP Vapor Lines"	MA-28, "Checking EVAP Vapor Lines"
Fuel lines					I*				I*	MA-19, "Checking Fuel Lines"	MA-25, "Checking Fuel Lines"
Fuel filter	NOTE (2)									—	
Engine coolant	NOTE (3)								R*	MA-16, "Changing Engine Coolant"	MA-23, "Changing Engine Coolant"
Engine oil		R	R	R	R	R	R	R	R	MA-20, "Changing Engine Oil"	MA-26, "Changing Engine Oil"
Engine oil filter (Use part No. 15208-65F01, 15208-9E000 or equivalent.)		R	R	R	R	R	R	R	R	MA-20, "Changing Oil Filter"	—
Engine oil filter (Use part No. 15208-9E000 or equiv.)		R	R	R	R	R	R	R	R	—	MA-26, "Changing Engine Oil"
Spark plugs (Double PLATINUM-TIPPED type)		Replace every 105,000 miles (169,000 km)								MA-21, "Changing Spark Plugs (Double Platinum - Tipped Type)"	MA-27, "Changing Spark Plugs (Double Platinum - Tipped Type)"
Intake and exhaust valve clearance)	NOTE (4)*									EM-35, "Valve Clearance"	—

NOTE:

Replace the drive belt if found damaged or if the auto belt tensioner reading reaches the maximum limit.

- (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months. Replace the drive belt if found damaged or if the auto belt tensioner reading (for QR25DE engine) reaches the maximum limit.
- (2) Maintenance-free item.
- (3) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.
- (4) If valve noise increases, inspect valve clearance.

Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

CHASSIS AND BODY MAINTENANCE

Abbreviations: R = Replace. I = Inspect. Correct or replace if necessary. L = Lubricate.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								Reference Section - Page or - Content Title
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	7.5 (12) 6	15 (24) 12	22.5 (36) 18	30 (48) 24	37.5 (60) 30	45 (72) 36	52.5 (84) 42	60 (96) 48	
Brake lines & cables			I		I		I		I	MA-32
Brake pads, rotors, drums & linings (QG18DE)			I		I		I		I	MA-32, MA-33
Brake pads & rotors (QR25DE)			I		I		I		I	MA-32
Manual transaxle oil or automatic transaxle fluid			I		I		I		I	MA-29 or MA-31
Steering gear & linkage, axle & suspension parts					I				I	MA-34, MA-35
Tire rotation	NOTE (1)									MA-31
Front drive shaft boots			I		I		I		I	MA-36
Exhaust system					I				I	MA-29
In-cabin microfilter			R		R		R		R	MTC-77

NOTE:

- (1) Refer to "Tire rotation" under the "GENERAL MAINTENANCE" heading earlier in this section.

RECOMMENDED FLUIDS AND LUBRICANTS

PFP:00000

Fluids and Lubricants

ELS000IN

QG18DE		Capacity (Approximate)			Recommended Fluids/Lubricants
		US measure	Imp measure	Liter	
Engine oil Drain and refill	With oil filter change	2 7/8 qt	2 3/8 qt	2.7	● API Certification Mark*1 ● API grade SL, Energy Conserving*1 ● ILSAC grade GF-III*1
	Without oil filter change	2 5/8 qt	2 1/4 qt	2.5	
Dry engine (engine overhaul)		3 1/4 qt	2 3/4 qt	3.1	
Cooling system (with reservoir)	M/T	7 1/8 qt	5 7/8 qt	6.7	Genuine NISSAN Long Life Anti-freeze coolant or equivalent
	A/T	7 qt	5 7/8 qt	6.6	
Manual transaxle fluid	RS5F70A	3 1/8 qt	2 5/8 qt	3.0	Genuine NISSAN Manual Transmission Fluid (MTF) HQ multi 75W-85
Automatic transaxle fluid	RE4F03B	7 3/8 qt	6 1/8 qt	7.0	NISSAN Matic “D” (Continental U.S. and Alaska) or Canada NISSAN Automatic Transmission Fluid*2
Power steering fluid (PSF)		2 1/8 pt	1 3/4 pt	1.0	Genuine NISSAN PSF or equivalent*4
Brake and clutch fluid		—	—	—	Genuine NISSAN Super Heavy Duty Brake Fluid*3 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose grease		—	—	—	NLGI No. 2 (Lithium soap base)
Windshield washer fluid		—	—	—	Genuine NISSAN Windshield Washer Concentrate Cleaner & Anti-freeze or equivalent
Air conditioning system refrigerant		0.99 - 1.21 lb	0.99 - 1.21 lb	0.45 - 0.55 kg	HFC-134a (R-134a)*5
Air conditioning system lubricant		6.1 fl oz	6.3 fl oz	180 m ℓ	Genuine NISSAN A/C System Lubricant Type R or equivalent*5

*1: For further details, see “SAE Viscosity Number”.

*2: DEXRON™ III / MERCON™ , or equivalent may also be used. Outside the continental United States and Alaska contact a NISSAN dealership for more information regarding suitable fluids, including recommended brand(s) of DEXRON™ III / MERCON™ Automatic Transmission Fluid.

*3: Available in mainland U.S.A. through your NISSAN dealer.

*4: Genuine NISSAN PSF, Canada NISSAN Automatic Transmission Fluid, DEXRON™ III / MERCON™ or equivalent ATF may also be used.

*5: For further details, see “Air conditioner specification label”.

QR25DE		Capacity (Approximate)			Recommended Fluids/Lubricants
		US measure	Imp measure	Liter	
Engine oil Drain and refill	With oil filter change	4 1/8 qt	3 3/8 qt	3.9	● API Certification Mark*1 ● API grade SL, Energy Conserving*1 ● ILSAC grade GF-III*1
	Without oil filter change	3 7/8 qt	3 1/4 qt	3.7	
Dry engine (engine overhaul)		4 5/8 qt	3 7/8 qt	4.4	
Cooling system (with reservoir)	M/T	7 3/16 qt	6 qt	6.8	Genuine NISSAN Long Life Anti-freeze coolant or equivalent
	A/T	7 1/8 qt	5 7/8 qt	6.7	
Manual transaxle fluid	RS5F51A RS6F51H	2 3/8 qt	2 qt	2.3	Genuine NISSAN Manual Transmission Fluid (MTF) HQ multi 75W-85
Automatic transaxle fluid	RE4F04B	9 qt	7.5 qt	8.5	NISSAN Matic “D” (Continental U.S. and Alaska) or Canada NISSAN Automatic Transmission Fluid*2
Power steering fluid (PSF)		2 1/8 pt	1 3/4 pt	1.0	Genuine NISSAN PSF or equivalent*4

QR25DE	Capacity (Approximate)			Recommended Fluids/Lubricants
	US measure	Imp measure	Liter	
Brake and clutch fluid	—	—	—	Genuine NISSAN Super Heavy Duty Brake Fluid*3 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose grease	—	—	—	NLGI No. 2 (Lithium soap base)
Windshield washer fluid	—	—	—	Genuine NISSAN Windshield Washer Concentrate Cleaner & Anti-freeze or equivalent
Air conditioning system refrigerant	0.99 - 1.21 lb	0.99 - 1.21 lb	0.45 - 0.55 kg	HFC-134a (R-134a)*5
Air conditioning system lubricant	6.1 fl oz	6.3 fl oz	180 m ℓ	Genuine NISSAN A/C System Lubricant Type R or equivalent*5

*1: For further details, see “SAE Viscosity Number”.

*2: DEXRON™ III / MERCON™ , or equivalent may also be used. Outside the continental United States and Alaska contact an authorized NISSAN dealership for more information regarding suitable fluids, including recommended brand(s) of DEXRON™ III / MERCON™ Automatic Transmission Fluid.

*3: Available in mainland U.S.A. through your authorized NISSAN dealer.

*4: Genuine NISSAN PSF, Canada NISSAN Automatic Transmission Fluid, DEXRON ™ III / MERCON™ or equivalent ATF may also be used.

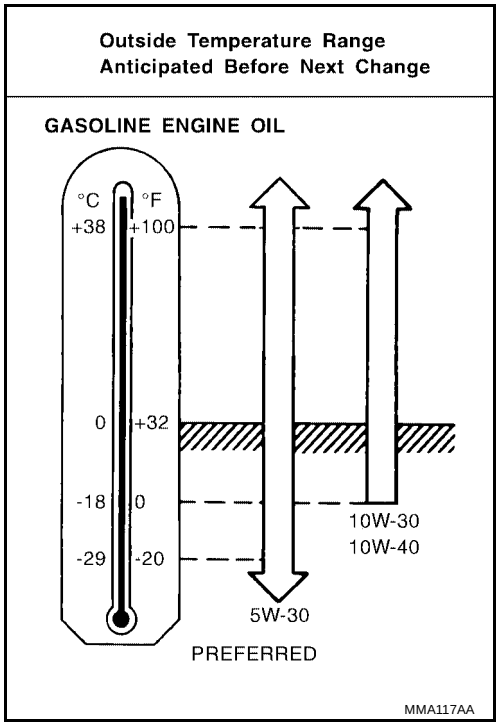
*5: For further details, see “Air conditioner specification label”.

SAE Viscosity Number

ELS000IO

SAE 5W-30 viscosity oil is preferred for all temperatures. SAE 10W-30 and 10W-40 viscosity oil may be used if the ambient temperature is above –18°C (0°F).

NOTE:
The use of a 5W-30 viscosity oil may increase fuel economy.



Anti-freeze Coolant Mixture Ratio

ELS000IP

The engine cooling system is filled at the factory with a high-quality, year-round, long life, anti-freeze coolant solution. The anti-freeze solution contains rust and corrosion inhibitors, so additional cooling system additives are not necessary.

Protection for outside temperature down to:		Genuine NISSAN Long Life Anti-freeze coolant or equivalent	Demineralized water or distilled water
°C	°F		
-35°	-30°	50%	50%

CAUTION:

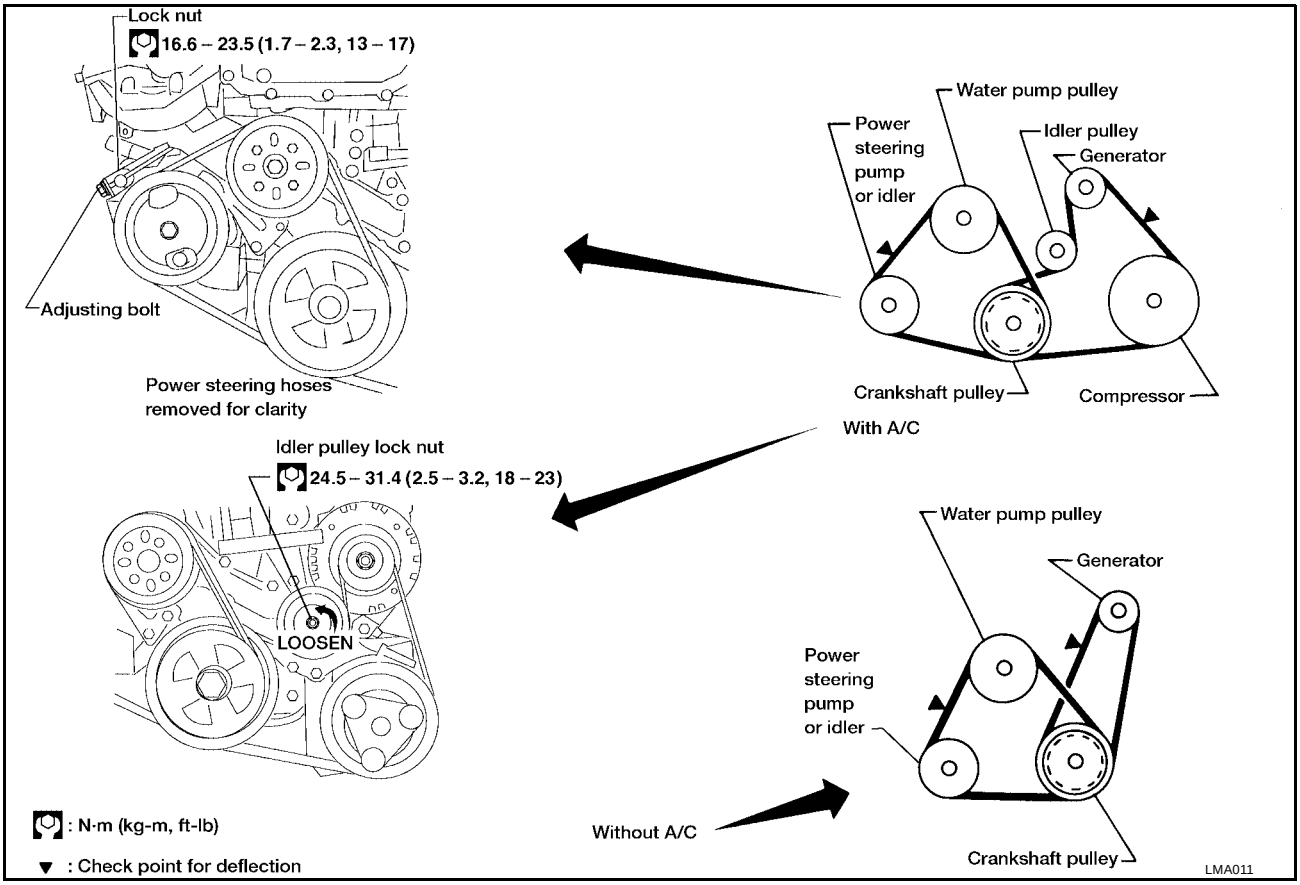
- **When adding or replacing coolant, be sure to use only a Genuine NISSAN Long Life Anti-freeze coolant or equivalent with the specified mixture ratio.**
- **The use of other types of coolant solutions may damage the engine cooling system.**

ENGINE MAINTENANCE (QG18DE ENGINE)

PFP:10001

Checking Drive Belts

ELS000IQ



1. Inspect belt for cracks, fraying, wear and oil. If necessary, replace.
2. Inspect drive belt deflection or tension at a point on the belt midway between pulleys.
   Adjust if belt deflection exceeds the limit or if belt tension is not within specifications.
   - Check belt tension using Belt Tension Gauge BT3373-F or equivalent. Refer to MA-38, "BELT DEFLECTION AND TENSION" .
   - Inspect drive belt deflection or tension when engine is cold.

Changing Engine Coolant

ELS000IR

WARNING:

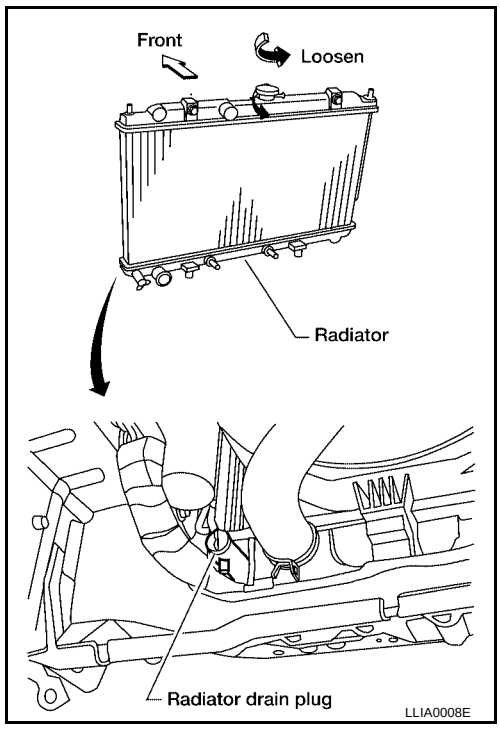
To avoid the danger of being scalded, never change the coolant when the engine is hot.

DRAINING ENGINE COOLANT

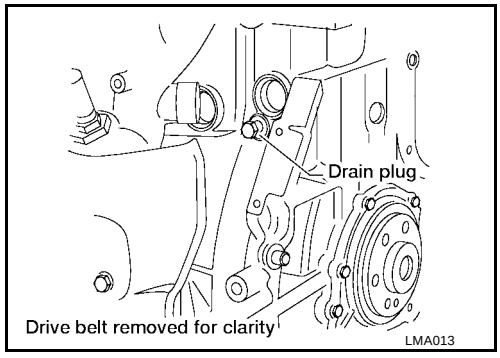
1. Set climate control system as follows to prevent coolant from remaining in the system.
   - Turn ignition switch “ON” and set temperature controller to maximum hot position.
   - Wait 10 seconds before turning ignition switch "OFF".

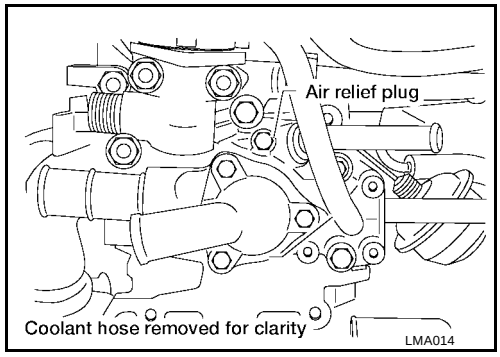
2. Open radiator drain plug at the bottom of the radiator, and remove radiator filler cap.

CAUTION:
Be careful not to allow coolant to contact drive belts.



3. Remove cylinder block drain plug and air relief plug.





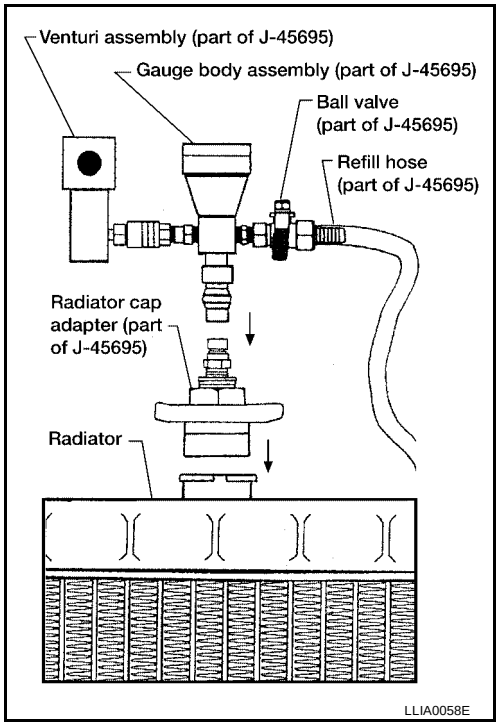
4. Check drained coolant for contaminants such as rust, corrosion or discoloration. If contaminated, flush engine cooling system. Refer to MA-18, "FLUSHING COOLING SYSTEM" .

REFILLING ENGINE COOLANT

1. Close radiator drain plug. Install the reservoir tank and cylinder block drain plug, if removed for a total system drain for engine removal or repair.
   - The radiator must be completely empty of coolant and water.
   - Apply sealant to the threads of the cylinder block drain plugs. Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

Cylinder block drain plug : 34.3 - 44.1 N·m (3.5 - 4.5 kg-m, 26 - 32 ft-lb)

2. If disconnected, reattach the upper radiator hose at the engine side.
3. Set the vehicle heater controls to the full HOT and heater ON position. Turn the vehicle ignition ON with the engine OFF as necessary to activate the heater mode.
4. Install the Tool by installing the radiator cap adapter onto the radiator neck opening. Then attach the gauge body assembly with the refill tube and the venturi assembly to the radiator cap adapter.
5. Insert the refill hose into the coolant mixture container that is placed at floor level. Make sure the ball valve is in the closed position.
   - Use Genuine NISSAN Long Life Anti-freeze coolant or equivalent, mixed 50/50 with distilled water or demineralized water. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .



Coolant capacity (without reservoir tank)

M/T : 6.0 ℓ (6 3/8 US qt, 5 1/4 Imp qt)

A/T : 5.9 ℓ (6 1/4 US qt, 5 1/4 Imp qt)

Reservoir tank capacity (for MAX level) : 0.7 ℓ (3/4 US qt, 5/8 Imp qt)

6. Install an air hose to the venturi assembly, the air pressure must be within specification.

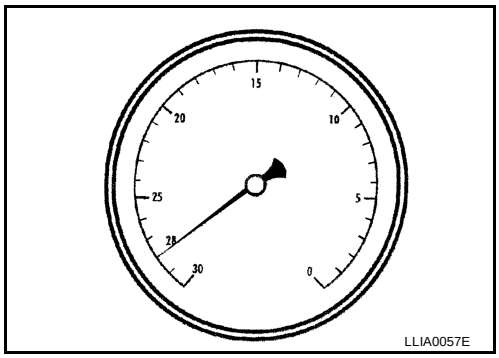
Compressed air supply pressure : 5.7 - 8.5 kPa (5.6 - 8.4 kg/cm^2, 80 - 120 psi)

CAUTION:

The compressed air supply must be equipped with an air dryer.

7. The vacuum gauge will begin to rise and there will be an audible hissing noise. During this process open the ball valve on the refill hose slightly. Coolant will be visible rising in the refill hose. Once the refill hose is full of coolant, close the ball valve. This will purge any air trapped in the refill hose.
8. Continue to draw the vacuum until the gauge reaches 28 inches of vacuum. The gauge may not reach 28 inches in high altitude locations, refer to the vacuum specifications based on the altitude above sea level.

Altitude above sea level	Vacuum gauge reading
0 - 100 m (328 ft)	: 28 inches of vacuum
300 m (984 ft)	: 27 inches of vacuum
500 m (1,641 ft)	: 26 inches of vacuum
1,000 m (3,281 ft)	: 24 - 25 inches of vacuum



9. When the vacuum gauge has reached the specified amount, disconnect the air hose and wait 20 seconds to see if the system loses any vacuum. If the vacuum level drops, perform any necessary repairs to the system and repeat steps 6 - 8 to bring the vacuum to the specified amount. Recheck for any leaks.
10. Place the coolant container (with the refill hose inserted) at the same level as the top of the radiator. Then open the ball valve on the refill hose so the coolant will be drawn up to fill the cooling system. The cooling system is full when the vacuum gauge reads zero.

CAUTION:

Do not allow the coolant container to get too low when filling, to avoid air from being drawn into the cooling system.

11. Remove the Tool from the radiator neck opening.
12. Fill the cooling system reservoir tank to the specified level and install the radiator cap. Run the engine to warm up the cooling system and top up the system as necessary.

FLUSHING COOLING SYSTEM

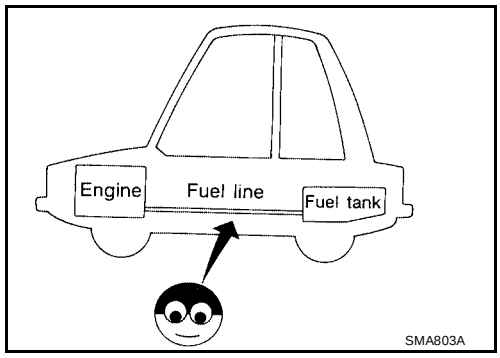
1. Open air relief plug.

2. Fill radiator with water until water spills from the air relief hole, then close air relief plug. Fill radiator and reservoir tank with water and reinstall radiator cap.
3. Run engine and warm it up to normal operating temperature.
4. Rev engine two or three times under no-load.
5. Stop engine and wait until it cools down.
6. Drain water.
7. Repeat steps 1 through 6 until clear water begins to drain from radiator.

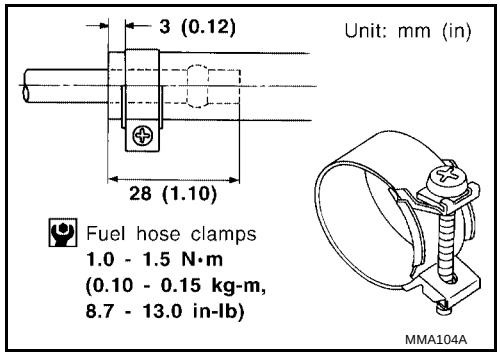
Checking Fuel Lines

ELS000IS

- Inspect fuel lines and tank for improper attachment, leaks, cracks, damage, loose connections, chafing or deterioration.



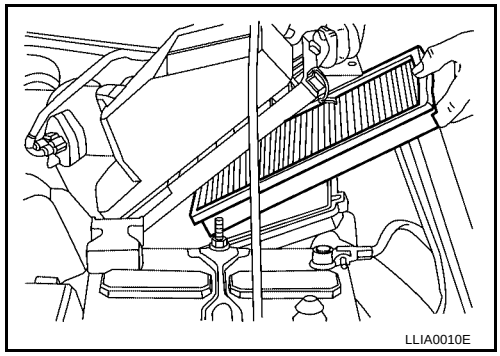
- If necessary, repair or replace faulty parts.



Changing Air Cleaner Filter

ELS000IT

Unfasten clamps to change air cleaner filter.

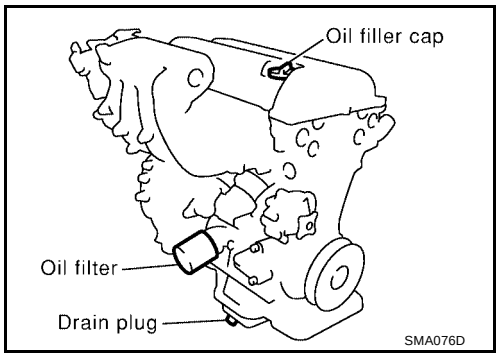


Changing Engine Oil

ELS000IU

WARNING:

- **Be careful not to burn yourself, as the engine oil is hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**



1. Warm up engine, and check for oil leakage from engine components.
2. Stop engine.
3. Remove drain plug and oil filler cap.
4. Drain oil and refill with new engine oil.

Oil pan drain plug : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

Oil Specification and Viscosity

- Refer to MA-13, "Fluids and Lubricants" .

Oil Capacity (Approximate)

Unit: ℓ (US qt., Imp qt.)

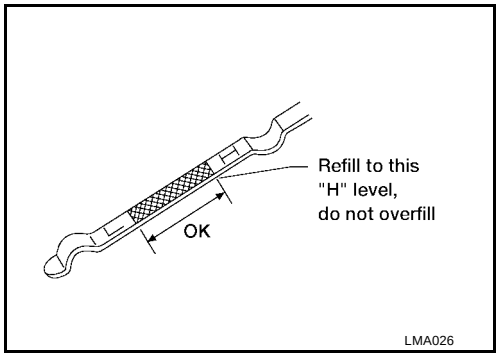
Drain and refill	With oil filter change	2.7 (2 7/8, 2 3/8)
	Without oil filter change	2.5 (2 5/8, 2 1/4)
Dry engine (engine overhaul)		3.1 (3 1/4, 2 3/4)

CAUTION:

- **Be sure to clean drain plug and install with new washer.**

Oil pan drain plug : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

- **The refill capacity depends on the oil temperature and drain time. Use these specifications for reference only.**
- **Always use the dipstick to determine when the proper amount of oil is in the engine.**



5. Warm up engine and check area around drain plug and oil filter for oil leakage.
6. Stop engine.
7. Check oil level.

Changing Oil Filter

ELS000IV

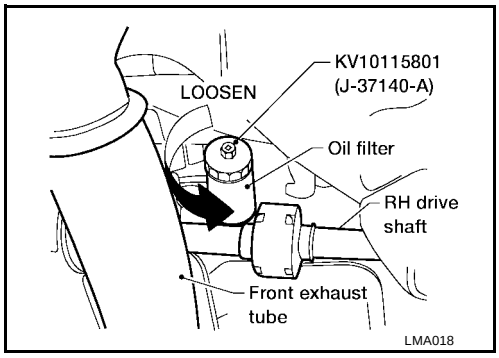
1. Remove the oil filter using Tool as shown.

WARNING:

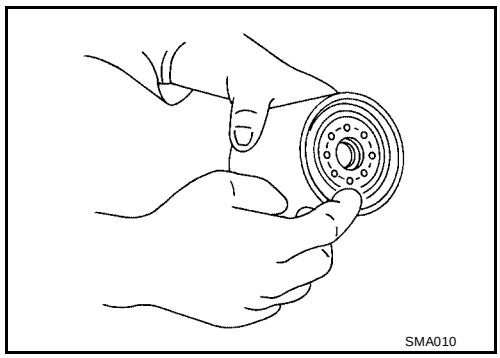
Be careful not to burn yourself, as the engine and engine oil are hot.

NOTE:

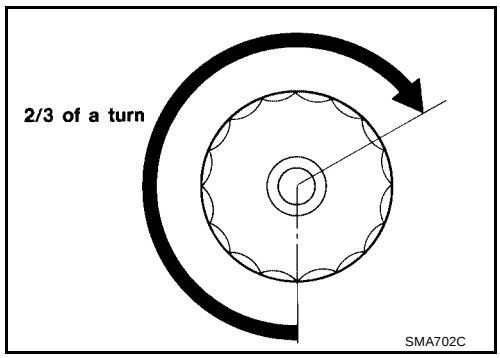
The filter is a full-flow cartridge type and is provided with a relief valve.



2. Clean oil filter mounting surface on cylinder block. Coat rubber seal of new oil filter with engine oil.



3. Screw in the oil filter until a slight resistance is felt, then tighten an additional 2/3 turn.

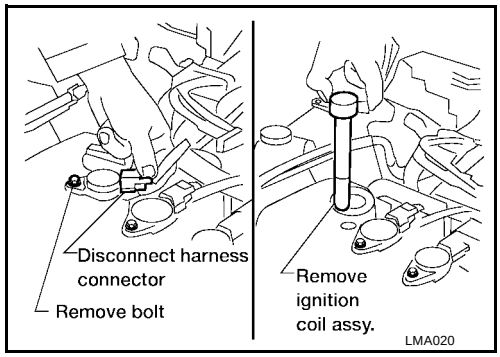


4. Add engine oil. Refer to MA-20, "Changing Engine Oil" .
   - Clean excess oil from engine.

Changing Spark Plugs (Double Platinum - Tipped Type)

ELS000IW

1. Disconnect ignition coil harness connectors.
2. Remove ignition coils.



3. Remove spark plugs with spark plug socket.

Spark Plug Types

Hot type	PLFR4A-11
Standard type	PLFR5A-11
Cold type	PLFR6A-11

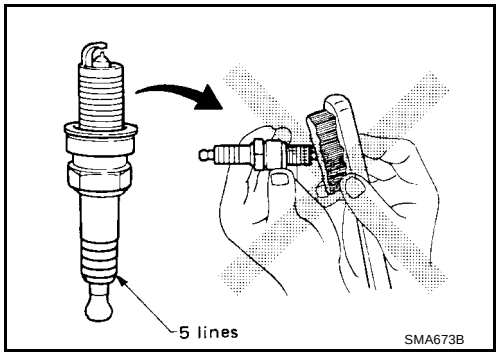
Spark plug gap (nominal) : 1.1 mm (0.043 in)

- The standard type spark plug is suitable for normal driving conditions.
- The hot type spark plug is suitable when fouling occurs with the standard type spark plug under conditions such as:
  - Frequent engine starts
  - Low ambient temperatures
- The cold type spark plug is suitable when spark knock occurs with the standard type spark plug under conditions such as:
  - Extended highway driving
  - Frequent high engine revolution

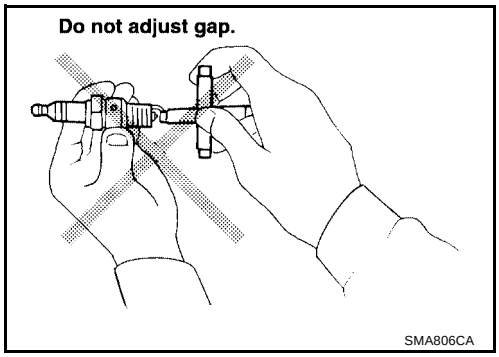
- If plug is covered with carbon, a spark plug cleaner may be used as specified.

  CAUTION:
  Do not use wire brush for cleaning. If plug is covered with carbon, spark plug cleaner may be used.

  Cleaner air pressure : Less than 588 kPa (6 kg/cm^2 , 85 psi)
  Cleaning time : less than 20 seconds



- Checking and adjusting plug gap is not required between change intervals.



4. Install the spark plugs.

   Spark plug : 20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)

5. Install the ignition coils and ignition wires.

   Ignition coil : 3.8 - 5.0 N·m (0.38 - 0.51 kg-m, 33 - 44 in-lb)

Checking EVAP Vapor Lines

ELS000IX

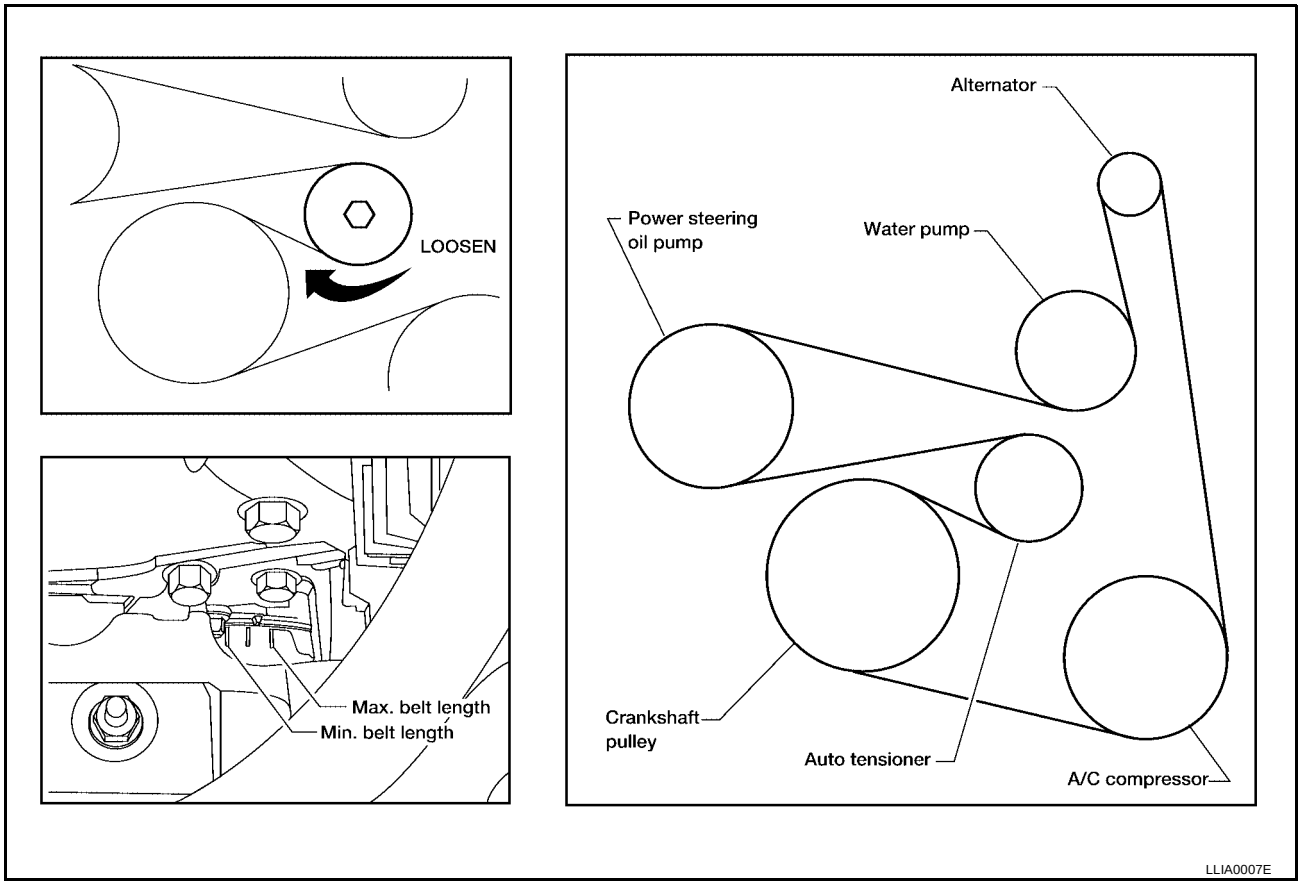
1. Visually inspect EVAP vapor lines for improper attachment, cracks, damage, loose connections, chafing or deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc. Refer to EC-586, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)" (QG18DE ULEV), EC-1208, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)" (QG18DE SULEV).

ENGINE MAINTENANCE (QR25DE ENGINE)

PFP:10001

Checking Drive Belts

ELS000IY



WARNING:

Be sure to perform when the engine is stopped.

- Make sure that indicator (single line notch) of each automatic tensioner is within the allowable working range (between three notches).

  NOTE:

  - Check the automatic tensioner indicator when the engine is cold.
  - The indicator notch is located on the moving side of the tensioner.
- Visually check entire belt for wear, damage or cracks.
- If the indicator is out of allowable working range or belt is damaged, replace the belt.
- Belt tensioning is not necessary, as it is automatically adjusted by auto belt tensioner.

Changing Engine Coolant

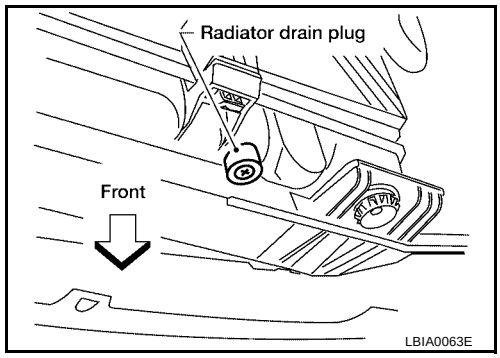
ELS000IZ

WARNING:

To avoid the danger of being scalded, never change the coolant when the engine is hot.

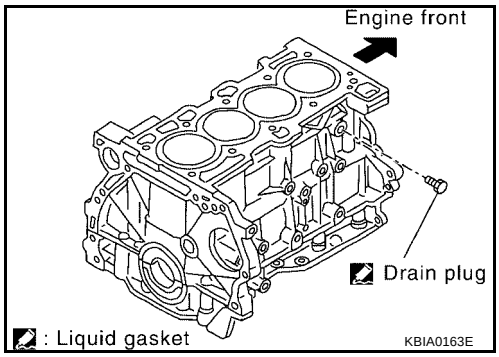
DRAINING ENGINE COOLANT

1. Open radiator drain plug at the bottom of the radiator, and remove radiator filler cap.



CAUTION:
When draining all the coolant in the system, also perform steps two and three:

2. Remove cylinder block drain plug and air relief plug.



3. Check drained coolant for contaminants such as rust, corrosion or discoloration. If contaminated, flush engine cooling system.
   Refer to MA-25, "FLUSHING COOLING SYSTEM" .

REFILLING ENGINE COOLANT

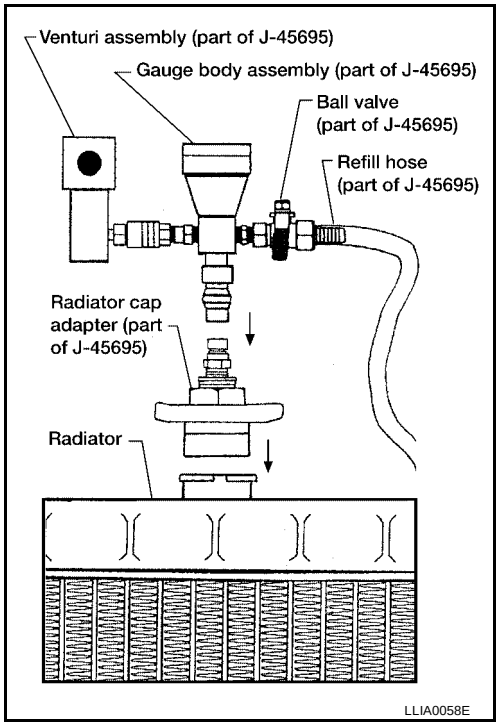
1. Install the radiator drain plug. Install the reservoir tank and cylinder block drain plug, if removed for a total system drain for engine removal or repair.
   - The radiator must be completely empty of coolant and water.
   - Apply sealant to the threads of the cylinder block drain plugs. Use Genuine High Performance Thread Sealant or equivalent. Refer to GI-44, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS" .

   Radiator drain plug : 7.8 - 11.8 N·m (0.8 - 1.2 kg-m , 69 - 104 in-lb)
   Cylinder block drain plug : 34 - 44 N·m (3.5 - 4.5 kg-m, 25 - 33 ft-lb)

2. If disconnected, reattach the upper radiator hose at the engine side.
3. Set the vehicle heater controls to the full HOT and heater ON position. Turn the vehicle ignition ON with the engine OFF as necessary to activate the heater mode.
4. Install the Tool by installing the radiator cap adapter onto the radiator neck opening. Then attach the gauge body assembly with the refill tube and the venturi assembly to the radiator cap adapter.
5. Insert the refill hose into the coolant mixture container that is placed at floor level. Make sure the ball valve is in the closed position.
   - Use Genuine NISSAN Long Life Anti-freeze coolant or equivalent, mixed 50/50 with distilled water or demineralized water. Refer to MA-14, "Anti-freeze Coolant Mixture Ratio" .

   Coolant capacity (without reservoir tank)
   M/T : 6.1 ℓ (6 1/2 US qt, 5 3/8 Imp qt)
   A/T : 6.0 ℓ (6 3/8 US qt, 5 1/4 Imp qt)

   Reservoir tank capacity (for MAX level) : 0.7 ℓ (3/4 US qt, 5/8 Imp qt)



6. Install an air hose to the venturi assembly, the air pressure must be within specification.

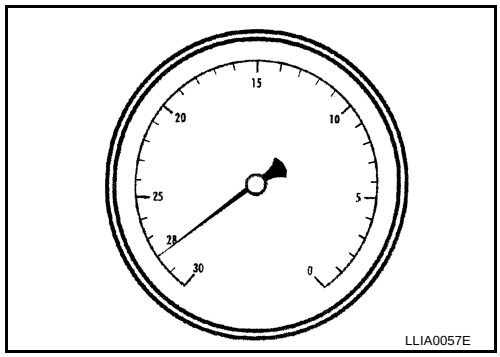
   Compressed air supply pressure : 5.7 - 8.5 kPa (5.6 - 8.4 kg/cm^2 , 80 - 120 psi)

CAUTION:
The compressed air supply must be equipped with an air dryer.

7. The vacuum gauge will begin to rise and there will be an audible hissing noise. During this process open the ball valve on the refill hose slightly. Coolant will be visible rising in the refill hose. Once the refill hose is full of coolant, close the ball valve. This will purge any air trapped in the refill hose.

8. Continue to draw the vacuum until the gauge reaches 28 inches of vacuum. The gauge may not reach 28 inches in high altitude locations, refer to the vacuum specifications based on the altitude above sea level.

Altitude Above Sea Level	Vacuum Gauge Reading
0 - 100 m (0 - 328 ft)	28 inches of vacuum
300 m (984 ft)	27 inches of vacuum
500 m (1,641 ft)	26 inches of vacuum
1,000 m (3,281 ft)	24 - 25 inches of vacuum



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9. When the vacuum gauge has reached the specified amount, disconnect the air hose and wait 20 seconds to see if the system loses any vacuum. If the vacuum level drops, perform any necessary repairs to the system and repeat steps 6 - 8 to bring the vacuum to the specified amount. Recheck for any leaks.
10. Place the coolant container (with the refill hose inserted) at the same level as the top of the radiator. Then open the ball valve on the refill hose so the coolant will be drawn up to fill the cooling system. The cooling system is full when the vacuum gauge reads zero.

    CAUTION:
    Do not allow the coolant container to get too low when filling, to avoid air from being drawn into the cooling system.
11. Remove the Tool from the radiator neck opening.
12. Fill the cooling system reservoir tank to the specified level and install the radiator cap. Run the engine to warm up the cooling system and top up the system as necessary.

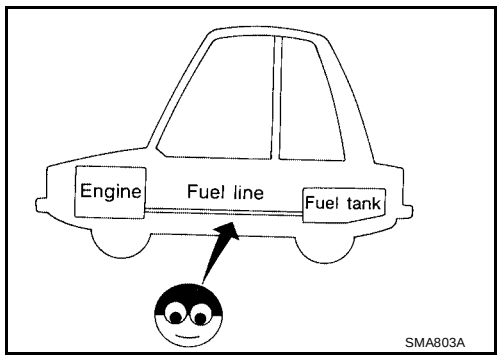
FLUSHING COOLING SYSTEM

1. Fill the radiator and reservoir tank with water and reinstall radiator cap.
2. Run the engine and warm it up to normal operating temperature.
3. Rev the engine two or three times under no-load.
4. Stop the engine and wait until it cools down.
5. Drain the water.
6. Repeat steps 1 through 5 until clear water begins to drain from radiator.

Checking Fuel Lines

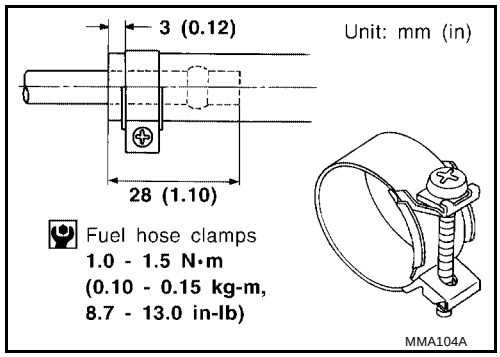
ELS000J0

- Inspect fuel lines and tank for improper attachment, leaks, cracks, damage, loose connections, chafing or deterioration.



SMA803A

- If necessary, repair or replace faulty parts.



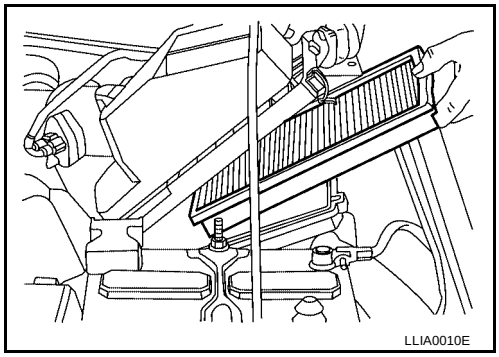
MMA104A

Changing Air Cleaner Filter

ELS000J1

Unfasten clamps to change air cleaner filter.

- The viscous paper-type filter does not need cleaning.

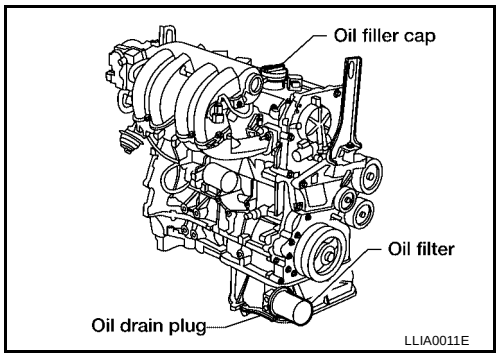


Changing Engine Oil

ELS000J2

WARNING:

- **Be careful not to burn yourself, as the engine oil is hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**



1. Warm up engine, and check for oil leakage from engine components.
2. Stop engine.
3. Remove drain plug and oil filler cap.
4. Drain oil and refill with new engine oil.

Oil Specification and Viscosity

- Refer to MA-13, "Fluids and Lubricants" .

Oil Capacity (Approximate)

Unit: ℓ (US qt., Imp qt.)

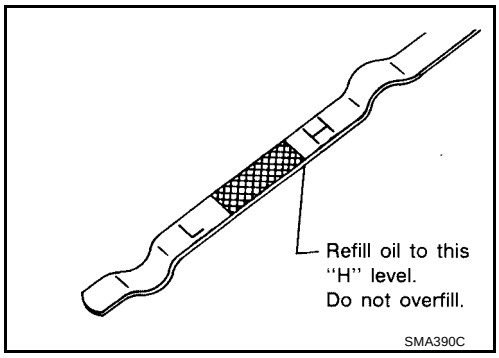
Drain and refill	With oil filter change	3.9 (4 1/8, 3 3/8)
	Without oil filter change	3.7 (3 7/8, 3 1/4)
Dry engine (engine overhaul)		4.4 (4 5/8, 3 7/8)

CAUTION:

- **Be sure to clean drain plug and install with new washer.**

Oil pan drain plug : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

- **The refill capacity depends on the oil temperature and drain time. Use these specifications for reference only.**
- **Always use the dipstick to determine when the proper amount of oil is in the engine.**



5. Warm up engine and check area around drain plug and oil filter for oil leakage.
6. Stop engine.
7. Check oil level.

Changing Oil Filter

ELS000J3

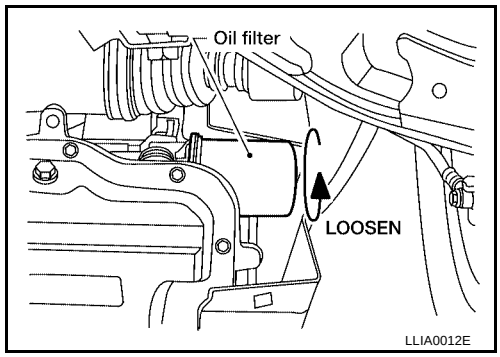
1. Remove oil filter with Tool.

WARNING:

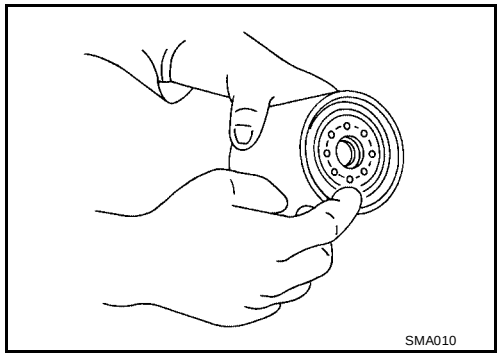
Be careful not to burn yourself, as the engine and engine oil are hot.

NOTE:

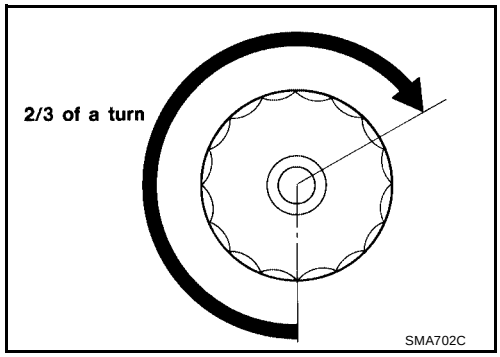
The filter is a full-flow cartridge type and is provided with a relief valve.



2. Clean oil filter mounting surface on cylinder block. Coat rubber seal of new oil filter with engine oil.



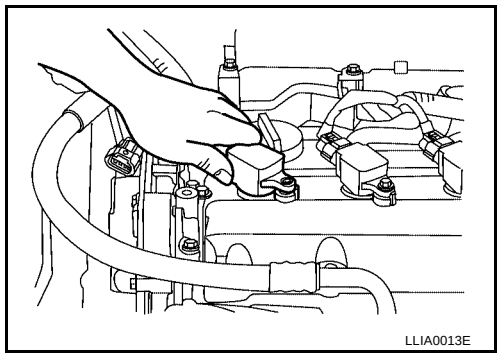
3. Screw in the oil filter until a slight resistance is felt, then tighten an additional 2/3 turn.
4. Add engine oil.Refer to MA-26, "Changing Engine Oil" .
   - Clean excess oil from engine.



Changing Spark Plugs (Double Platinum - Tipped Type)

ELS000J4

1. Disconnect ignition coil harness connectors.



2. Remove ignition coils.
3. Remove spark plugs with spark plug socket.

Spark Plug Types

Hot type	PLFR4A-11
Standard type	PLFR5A-11
Cold type	PLFR6A-11

Spark plug gap (nominal) : 1.1 mm (0.043 in)

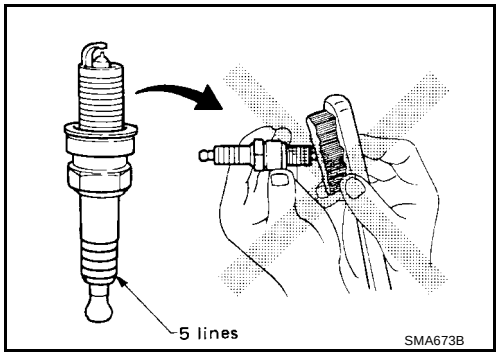
- Use standard type spark plug for normal condition.
- The hot type spark plug is suitable when fouling occurs with the standard type spark plug under conditions such as:
  - Frequent engine starts
  - Low ambient temperatures
- The cold type spark plug is suitable when spark knock occurs with the standard type spark plug under conditions such as:
  - Extended highway driving
  - Frequent high engine revolution
- If plug tip is covered with carbon, spark plug cleaner may be used.

CAUTION:

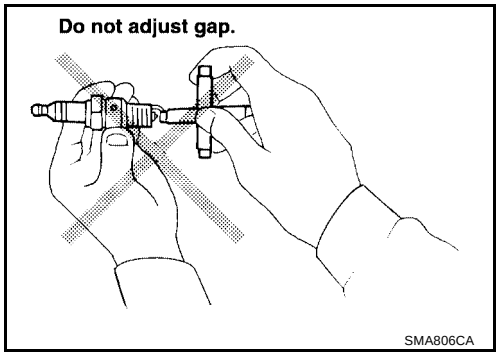
Do not use a wire brush for cleaning. If plug tip is covered with carbon, spark plug cleaner may be used.

Cleaner air pressure : Less than 588 kPa (6 kg/cm^2 , 85 psi)

Cleaning time : less than 20 seconds



- Checking and adjusting plug gap is not required between change intervals.



4. Install spark plugs.

   Spark plugs : 20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)

5. Install ignition coils and reconnect ignition wires according to numbers indicated on them.

   Ignition coils : 5.4 - 7.3 N·m (0.55 - 0.73 kg-m, 46 - 64 in-lb)

Checking EVAP Vapor Lines

ELS000J5

1. Visually inspect EVAP vapor lines for improper attachment, cracks, damage, loose connections, chafing or deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc. Refer to EC-1849, "FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FULLER CAP)" .

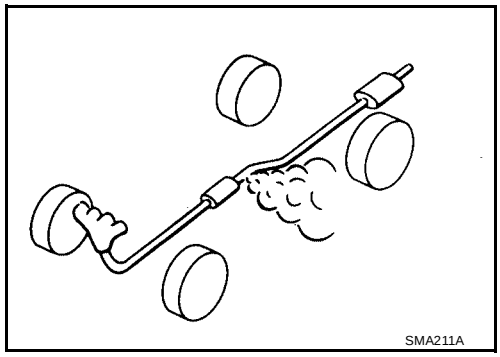
CHASSIS AND BODY MAINTENANCE

PFP:00000

Checking Exhaust System

ELS000J6

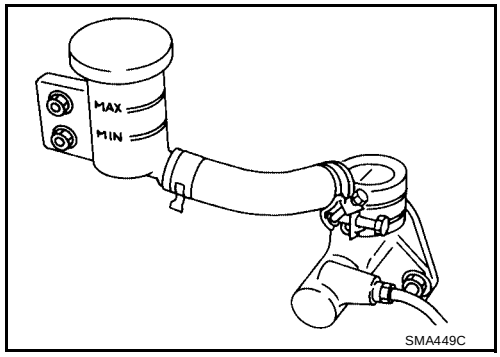
Check exhaust pipes, muffler and mounting for improper attachment, leaks, cracks, damage, loose connections, chafing or deterioration.



Checking Clutch Fluid Level and Leaks

ELS000J7

If fluid level is extremely low, check clutch system for leaks.



Checking M/T Oil

ELS000J8

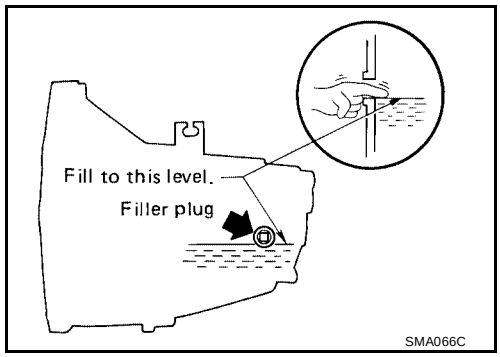
1. Check that transaxle oil is not leaking.
2. Check the transaxle oil level is at the correct level as shown.

CAUTION:
Never start the engine while checking the transaxle oil level.

Filler plug

RS5F70A (QG18DE) : **10 - 19 N·m (1.0 - 2.0 kg-m, 87 - 173 in-lb)**

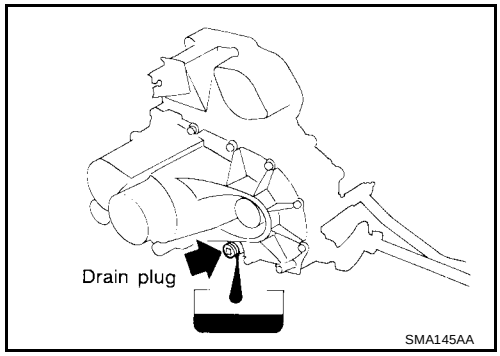
RS5F51A, RS6F51H, (QR25DE) : **30 - 39 N·m (3.1 - 4.0 kg-m, 23 - 28 lb-ft)**



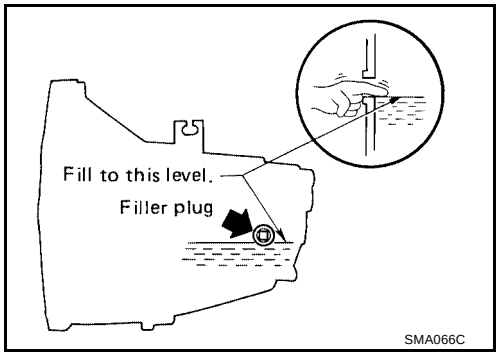
Changing M/T Oil

ELS000J9

1. Drain oil from drain plug and refill with new gear oil.



2. Check oil level.



Oil grade and viscosity : Refer to MA-13, "Fluids and Lubricants" .

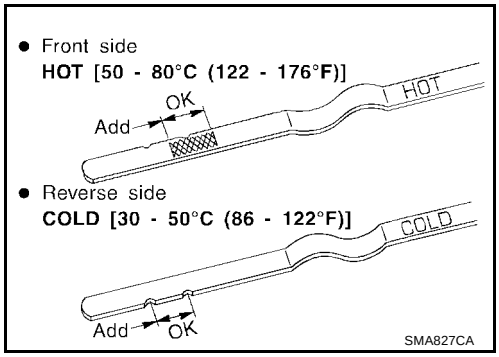
Capacity : RS5F70A (QG18DE)
3.0 ℓ (3 1/8 US qt, 2 5/8 Imp qt)
RS5F51A, RS6F51H (QR25DE)
2.3 ℓ (2 3/8 US qt, 2 Imp qt)

Drain plug : RS5F70A (QG18DE)
10 - 19 N·m (1.0 - 2.0 kg-m, 87 - 173 in-lb)
RS5F51A, RS6F51H (QR25DE)
30 - 39 N·m (3.1 - 4.0 kg-m, 23 - 28 ft-lb)

Checking A/T Fluid

ELS000JA

1. Check for any A/T fluid leakage and correct as necessary.
2. Warm up the engine.
3. Before driving, the A/T fluid level can be checked at fluid temperatures of 30° to 50°C (86° to 122°F) using the “COLD” range on dipstick.



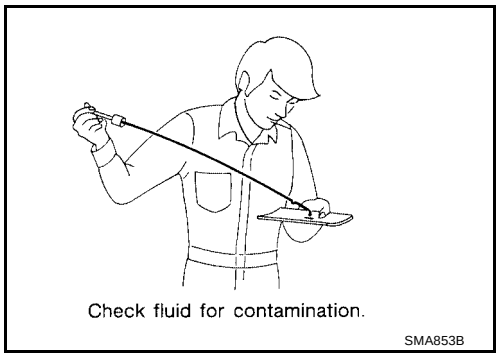
a. Park vehicle on level surface and set parking brake.
b. Start engine and move selector lever through each gear position. Leave selector lever in “P” position.
c. Check fluid level with engine idling.
d. Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

CAUTION:
Do not overfill.

e. Re-insert dipstick into charging pipe as far as it will go.
f. Remove dipstick and note reading. If reading is at low side of range, add fluid to the charging pipe.

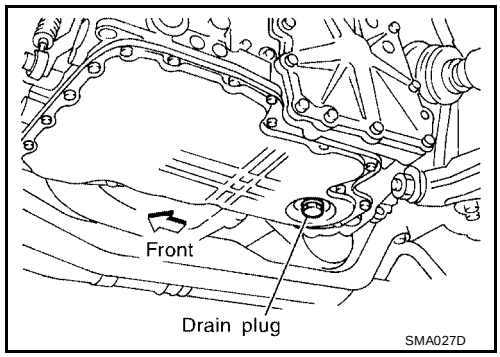
CAUTION:
Do not overfill.

4. Drive vehicle for approximately 5 minutes in urban areas.
5. Re-check fluid level at fluid temperatures of 50° to 80°C (122° to 176°F) using “HOT” range on dipstick.
6. Check the A/T fluid condition.
   - If fluid is very dark or smells burned, refer to AT-64, "FLUID CONDITION CHECK" . Flush cooling system after repair of A/T.
   - If the A/T fluid contains any frictional material (clutches, bands), replace the radiator and flush the cooler lines using cleaning solvent and compressed air after repairing the A/T. Refer to CO-13, "RADIATOR" .



Changing A/T Fluid

ELS000JB



1. Warm up A/T fluid.
2. Stop engine.
3. Drain A/T fluid from drain plug and refill with new A/T fluid. Always refill same volume with drained fluid.

Fluid grade : **NISSAN Matic "D" (Continental U.S. and Alaska) or Canada NISSAN Automatic Transmission Fluid. Refer to MA-13, "Fluids and Lubricants" .**

Fluid capacity (with torque converter) : **RE4F03B (QG18DE)**
7.0 ℓ (7 3/8 US qt, 6 1/8 Imp qt)
RE4F04B (QR25DE)
8.5 ℓ (9 US qt, 7 1/2 Imp qt)

Drain plug : **29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)**

4. Run engine at idle speed for five minutes.
5. Check fluid level and condition. Refer to MA-30, "Checking A/T Fluid" . If fluid is still dirty, repeat steps 2 through 5.

Balancing Wheels

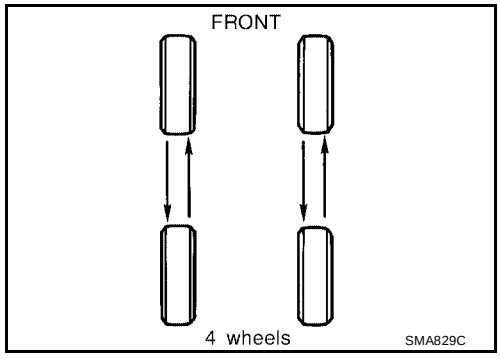
ELS000JC

Adjust wheel balance using the road wheel center.

Wheel balance (maximum allowable unbalance) : **Refer to MA-31, "Balancing Wheels" .**

Tire Rotation

ELS000JD



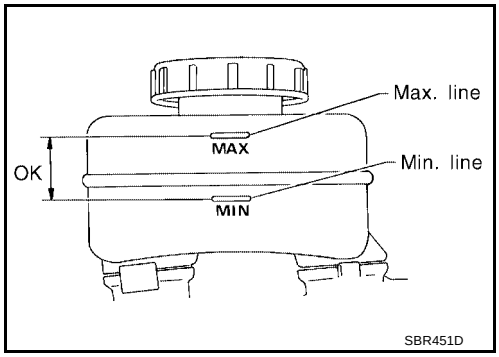
- After rotating the tires, adjust the tire pressure.
- Retighten the wheel nuts when the vehicle has been driven for the first 1,000 km (600 miles) or any time the wheel and tire assembly has been removed and installed.
- Tighten wheel nuts in a criss-cross pattern to specification, making several passes.

Wheel nuts : **98 - 127 N·m (10 - 12 kg-m, 73 - 93 ft-lb)**

Checking Brake Fluid Level and Leaks

ELS000JE

- Check fluid level in reservoir tank. It should be between MAX and MIN lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.
- Release parking brake lever and see if brake warning lamp goes off. If not, check brake system for leaks.



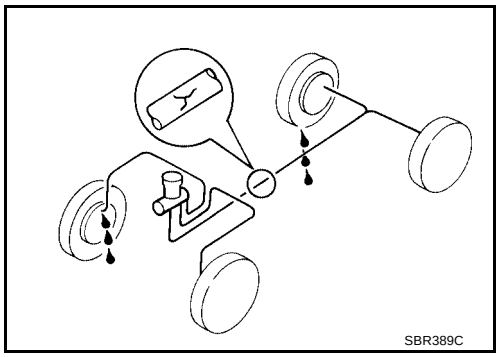
Checking Brake Lines and Cables

ELS000JF

CAUTION:

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

1. Check brake lines (tubes and hoses) for cracks, deterioration and other damage. Replace damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.



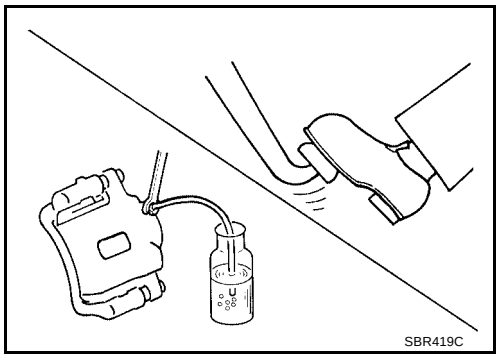
Changing Brake Fluid

ELS000JG

CAUTION:

- **Refill with new brake fluid “DOT 3”. Refer to MA-13, "Fluids and Lubricants" .**
- **Always keep fluid level higher than minimum line on reservoir tank.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**

1. Clean inside of reservoir tank, and refill with new brake fluid.
2. Connect a vinyl tube to each bleeder valve.
3. Drain brake fluid from each air bleeder valve by depressing brake pedal.
4. Refill until brake fluid comes out of each air bleeder valve. Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to BR-7, "Bleeding Brake System" .

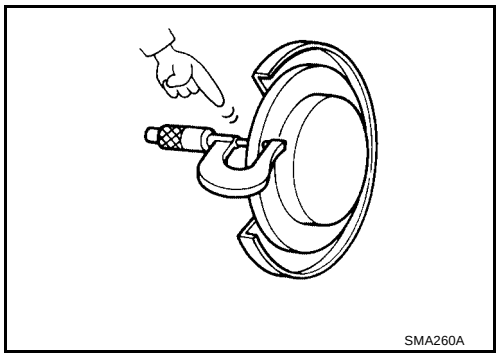


Checking Disc Brakes

ELS000JH

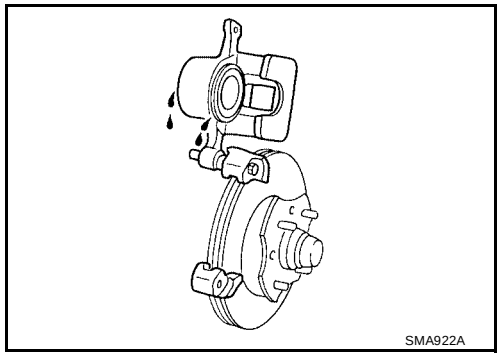
ROTOR

Check condition, wear, and damage. Refer to BR-21, "ROTOR" (front disc brake) and BR-27, "ROTOR" (rear disc brake).



CALIPER

Check for leakage. Refer to BR-21, "CALIPER" (front disc brake) and BR-27, "CALIPER" (rear disc brake).


SMA922A

PAD

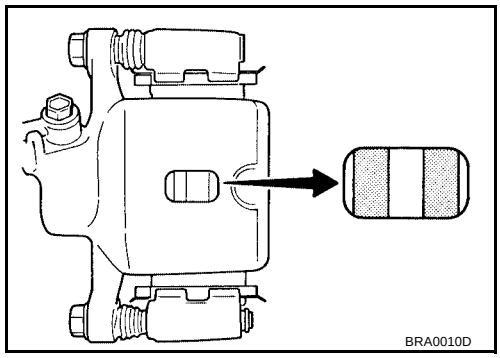
Check condition and thickness.

Standard thickness

Front	**: 22 mm (0.87 in)**
Rear	**: 9 mm (0.35 in)**

Minimum thickness

Front	**: 20 mm (0.79 in)**
Rear	**: 8 mm (0.31 in)**

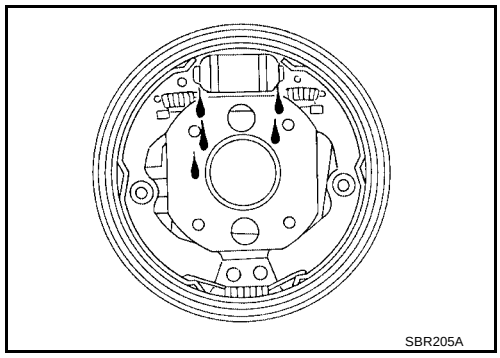

BRA0010D

ELS000JI

Checking Drum Brake

WHEEL CYLINDER

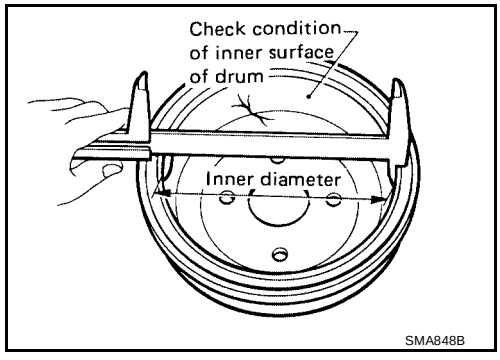
Check operation and for leakage. Refer to BR-33, "WHEEL CYLINDER" .


SBR205A

DRUM

Check condition of inner surface. Refer to BR-33, "DRUM" .

Standard diameter	**: 203.2 mm (8.000 in)**
Maximum inner diameter	**: 204.5 mm (8.051 in)**



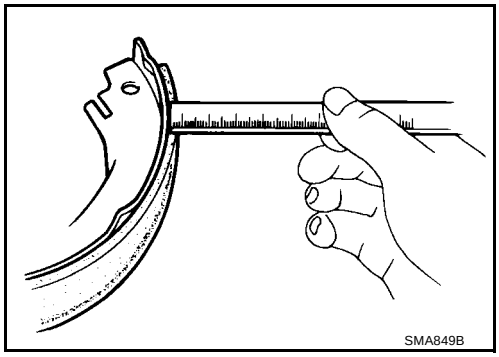
SMA848B

LINING

Measure wear and check for damage. Refer to BR-33, "LINING" .

Standard thickness : 4.5 mm (0.177 in)

Minimum thickness : 1.5 mm (0.059 in)

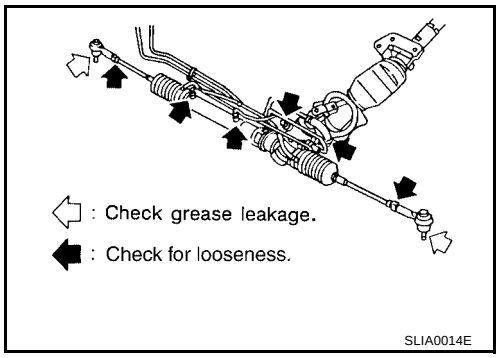

SMA849B

Checking Steering Gear and Linkage

ELS000JJ

STEERING GEAR

- Check gear housing and boots for looseness, damage and grease leakage.
- Check connection with steering column for looseness.



SLIA0014E

STEERING LINKAGE

- Check ball joint, dust cover and other component parts for looseness, wear, damage and grease leakage.

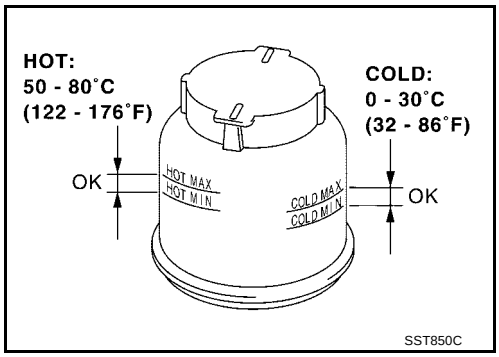
Checking Power Steering Fluid and Lines

ELS000JK

CHECKING FLUID LEVEL

- Check fluid level with engine off.
- Use the correct range of the tank depending on the fluid temperature. Use “HOT” range at fluid temperatures of 50° to 80°C (122° to 176°F). Use “COLD” range at fluid temperatures of 0° to 30°C (32° to 86°F).

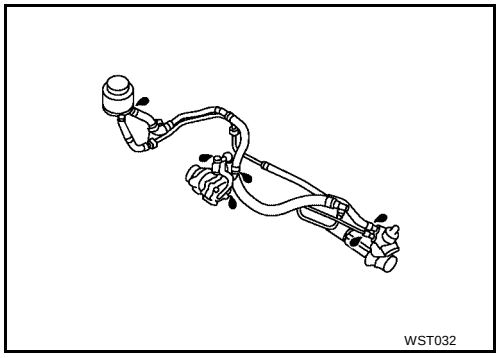
  CAUTION:
  Do not overfill.
- Recommended fluid is Genuine NISSAN PSF or equivalent. Refer to MA-13, "RECOMMENDED FLUIDS AND LUBRICANTS" .



SST850C

CHECKING LINES

- Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.
- Check rack boots for accumulation of power steering fluid.

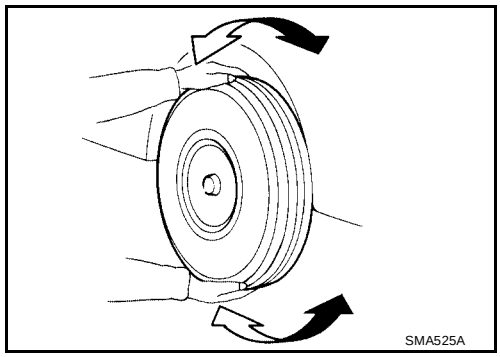

WST032

Axle and Suspension Parts

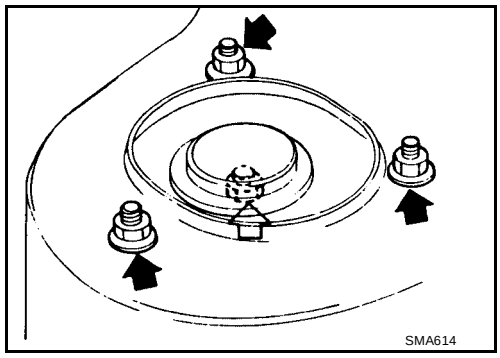
ELS000JL

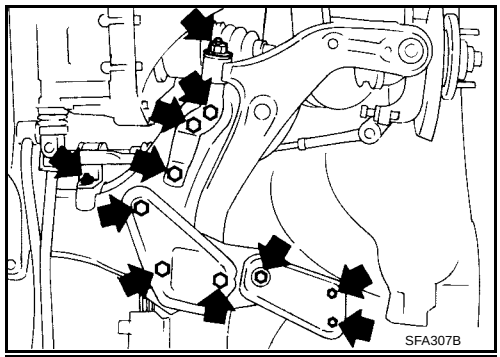
Check front and rear axle and suspension parts for excessive play, cracks, wear, or other damage.

- Shake each wheel to check for excessive play.
- Rotate each wheel to check for abnormal noise.

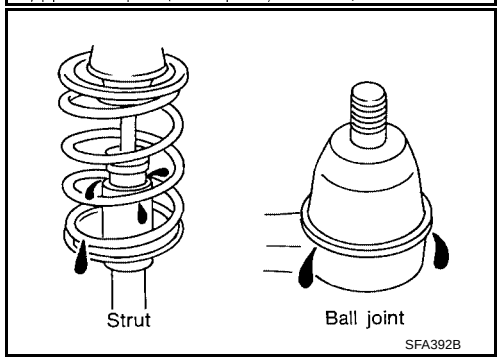

SMA525A

- Check axle and suspension nuts and bolts for looseness.


SMA614


SFA307B

- Check strut (shock absorber) for oil leakage or other damage.



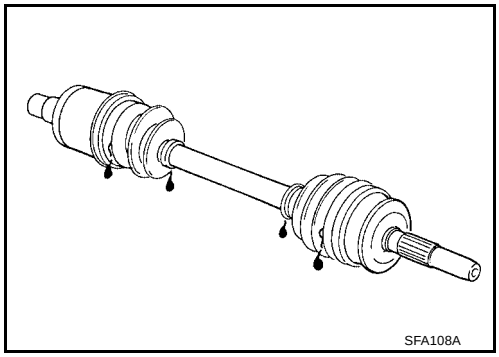
SFA392B

- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

Drive Shaft

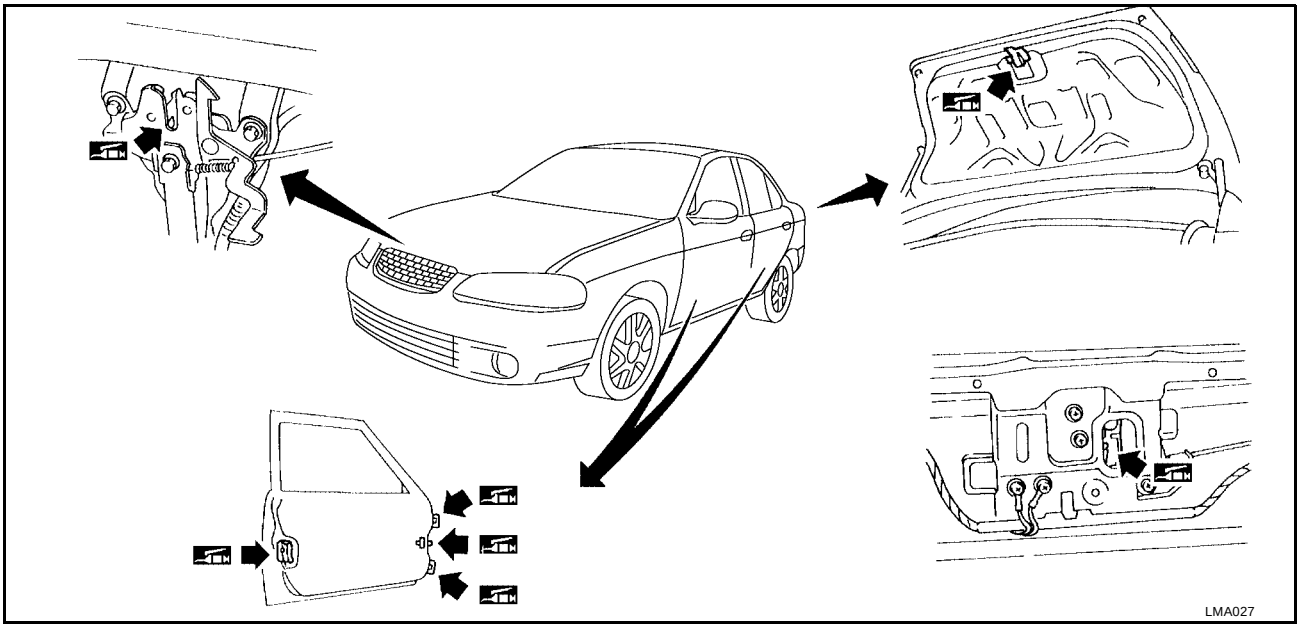
ELS000JM

- Check boot and drive shaft for cracks, wear, damage and grease leakage.



Lubricating Locks, Hinges and Hood Latches

ELS000JN



Checking Seat Belt, Buckles, Retractors, Anchors and Adjusters

ELS000JO

CAUTION:

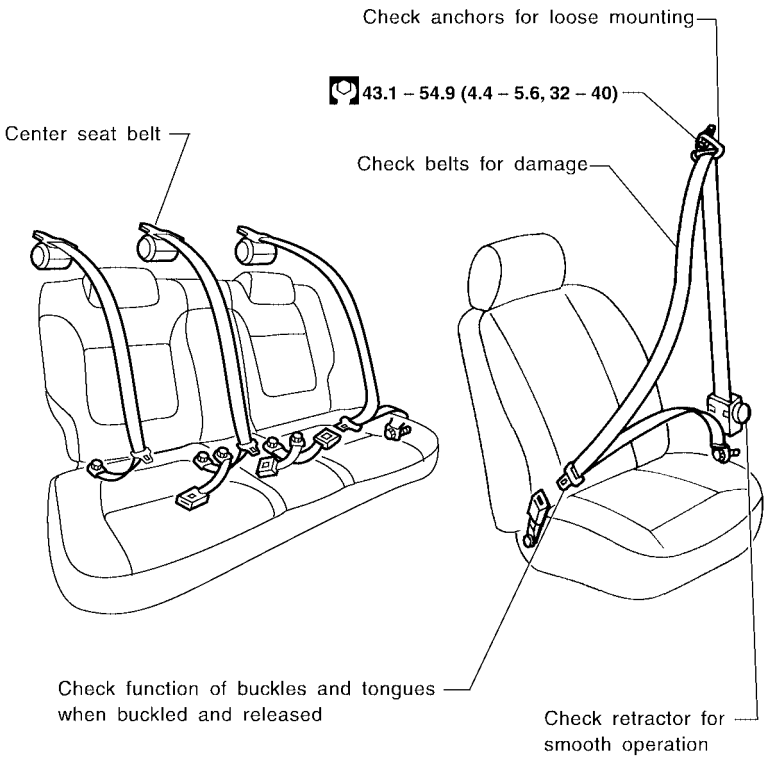
- **After any collision, inspect all seat belt assemblies, including retractors and other attached hardwares (i.e. anchor bolt, guide rail set). Nissan recommends to replace all seat belt assemblies in use during a collision, unless not damaged and properly operating after minor collision.**
  Also inspect seat belt assemblies not in use during a collision, and replace if damaged or improperly operating.
  Seat belt pre-tensioner should be replaced even if the seat belts are not in use during a frontal collision where the driver and passenger air bags are deployed.
- **If any component of seat belt assembly is questionable, do not repair. Replace as seat belt assembly.**
- **If webbing is cut, frayed, or damaged, replace belt assembly.**
- **Never oil tongue and buckle.**
- **Use a Genuine NISSAN seat belt assembly.**

For details, refer to "Seat Belt Inspection" in SB section.

Anchor bolt

43.1 – 54.9 (4.4 – 5.6, 32 – 40)

: N·m (kg-m, ft-lb)



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Engine Maintenance (QG18DE)

ELS000JP

BELT DEFLECTION AND TENSION

Component		Deflection adjustment Unit: mm (in)			Tension adjustment *1 Unit: N (kg, lb)		
		Used Belt		New Belt	Used Belt		New Belt
		Limit	After Adjustment		Limit	After Adjustment	
Generator	With air conditioner compressor	8.1 (0.319)	5.3 - 5.7 (0.209 - 0.244)	4.5 - 5.0 (0.177- 0.197)	292 (30, 66)	652 - 740 (66.5 - 75.5, 146.6 - 166.4)	789 - 877 (80.5 - 89.5, 177.4 - 197.1)
	Without air conditioner compressor	10.2 (0.402)	6.5 - 7.0 (0.256 - 0.276)	5.5 - 6.1 (0.217 - 0.240)	292 (30, 60)	652 - 740 (66.5 - 75.5, 146.6 - 166.4)	789 - 877 (80.5 - 89.5, 177.4 - 197.1)
Power steering oil pump		7.1 (0.280)	4.4 - 4.9 (0.173 - 0.193)	3.9 - 4.4 (0.154 - 0.173)	196 (20, 44)	495 - 583 (50.5 -59.5, 111.4 - 131.2)	603- 691 (61.5 - 70.5, 135.6 - 155.5)
Applied pushing force		98 N (10 kg, 22 lb)			—		

*1: If the belt tension gauge cannot be installed at check points shown, check belt tension at a different location on the belt.

SPARK PLUGS (DOUBLE PLATINUM - TIPPED)

Type	Standard	PLFR5A-11
	Hot	PLFR4A-11
	Cold	PLFR6A-11
Plug gap		Nominal: 1.1 mm (0.043 in)

Engine Maintenance (QR25DE)

ELS000JQ

BELT DEFLECTION AND TENSION

Tension of drive belts	Auto-adjustment by auto tensioner

SPARK PLUGS (DOUBLE PLATINUM - TIPPED)

Type	Standard	PLFR5A-11
	Hot	PLFR4A-11
	Cold	PLFR6A-11
Plug gap		Nominal: 1.1 mm (0.043 in)

Chassis and Body Maintenance

ELS000JR

WHEEL BALANCE

Maximum allowable unbalance	Dynamic (At rim flange) g (oz)	10 (0.35) (one side)
	Static g (oz)	20 (0.71)

SECTION MT
MANUAL TRANSAXLE

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PRECAUTIONS

PFP:00001

Caution

ECS005TD

- Do not reuse transaxle oil, once it has been drained.
- Check oil level or replace oil with vehicle on level ground.
- During removal or installation, keep inside of transaxle clear of dust or dirt.
- Check for the correct installation status prior to removal or disassembly. If mating marks are required, be certain they do not interfere with the function of the parts they are applied to.
- In principle, tighten bolts or nuts gradually in several steps working diagonally from inside to outside. If tightening sequence is specified, use it.
- Be careful not to damage sliding surfaces and mating surfaces.

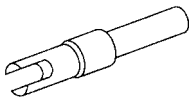
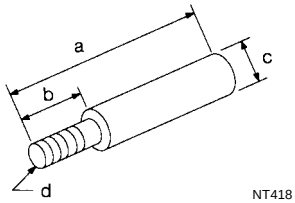
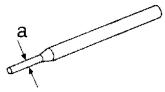
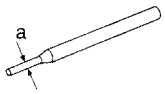
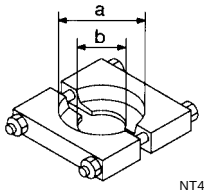
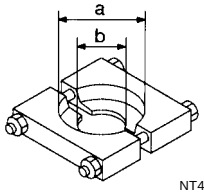
PREPARATION

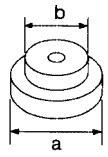
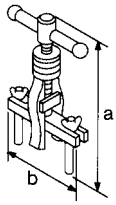
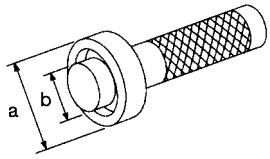
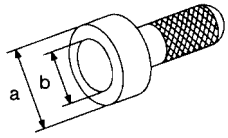
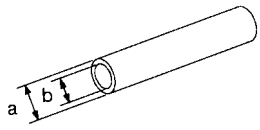
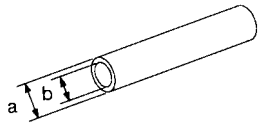
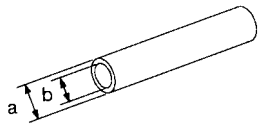
PFP:00002

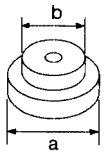
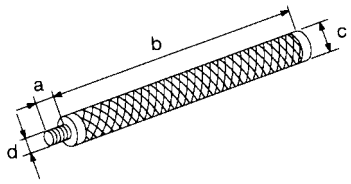
Special Service Tools

ECS005TE

The actual shapes of the Kent-Moore tools may differ from those of the special service tools illustrated here.

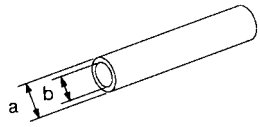
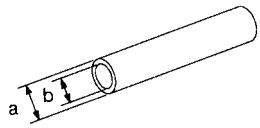
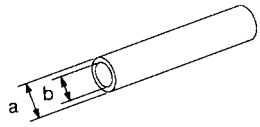
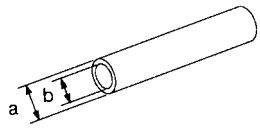
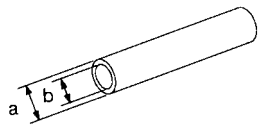
Tool number (Kent-Moore No.) Tool name	Description
KV38107700 (J39027) Preload adapter  NT087	Measuring turning torque of final drive assembly Measuring total turning torque Measuring clearance between side gear and differential case with washer Selecting differential side bearing adjusting shim [Use with KV38106000 (J34291-B).]
KV38106000 (J34291-B) Height gauge adapter (differential side bearing)  NT418	Selecting differential side bearing adjusting shim [Use with KV38107700 (J39027).] **a: 140 mm (5.51 in)** **b: 40 mm (1.57 in)** **c: 16 mm (0.63 in) dia.** **d: M8 × 1.25P**
KV32101000 (J25689-A) Pin punch  NT410	Removing and installing retaining pin Removing and installing lock pin Removing selector shaft Removing welch plug **a: 4 mm (0.16 in) dia.**
KV31100300 (J25689-A) Pin punch  NT410	Removing and installing retaining pin **a: 4.5 mm (0.177 in) dia.**
ST30031000 (J22912-O1) Puller  NT411	Removing 3rd, 5th input gear Removing 3rd & 4th and 5th & Rev synchronizer hub Removing mainshaft rear bearing Removing 2nd gear, 5th gear bush Removing 1st & 2nd synchronizer hub, 1st and 4th main gear Removing and installing differential side bearing **a: 90 mm (3.54 in) dia.** **b: 50 mm (1.97 in) dia.**
ST30021000 (J22912-O1) Puller  NT411	Removing input shaft front and rear bearing Installing input shaft front and rear bearing Installing 5th input gear, 3rd main gear and 4th main gear Installing 1st & 2nd, 3rd & 4th and 5th & Rev synchronizer hub Installing 2nd gear bush, 5th gear bush, Rev gear bush Installing mainshaft rear bearing **a: 110 mm (4.33 in) dia.** **b: 68 mm (2.68 in) dia.**

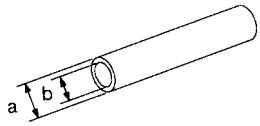
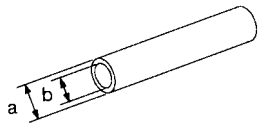
Tool number (Kent-Moore No.) Tool name	Description
ST33061000 (J8107-2) Drift  NT073	Removing differential side bearing **a: 39 mm (1.54 in) dia.** **b: 29.5 mm (1.16 in) dia.**
ST33290001 (J34286) Puller  NT414	● Removing idler gear bearing outer race **a: 250 mm (9.84 in)** **b: 160 mm (6.30 in)**
ST33230000 (J25805-O1) Drift  NT084	Removing differential oil seal Installing differential side bearing **a: 51 mm (2.01 in) dia.** **b: 28.5 mm (1.122 in) dia.**
ST30720000 (J25405) Drift  NT115	Installing differential side bearing outer race **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**
ST22350000 (J25678-O1) Drift  NT065	Installing input shaft front and rear bearing **a: 34 mm (1.34 in) dia.** **b: 28 mm (1.10 in) dia.**
ST22452000 (J34335) Drift  NT065	Installing 3rd and 4th main gear Installing 5th gear bush Installing 5th & Rev synchronizer hub Installing Rev gear bush Installing mainshaft rear bearing **a: 45 mm (1.77 in) dia.** **b: 36 mm (1.42 in) dia.**
ST37750000 (J34335) Drift  NT065	Installing input shaft oil seal Installing 5th synchronizer Installing mainshaft rear bearing Installing 5th main gear Installing 3rd & 4th synchronizer hub Installing striking rod oil seal Installing clutch housing dust seal **a: 40 mm (1.57 in) dia.** **b: 31 mm (1.22 in) dia.**

Tool number (Kent-Moore No.) Tool name	Description
ST30621000 (J35869) Drift  NT073	Installing differential side bearing outer race [Use with ST30611000 (J25742-1).] **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**
ST30611000 (J25742-1) Drift handle  NT419	Installing differential side bearing outer race [Use with ST30621000 (J35869).] **a: 15 mm (0.59 in)** **b: 335 mm (13.19 in)** **c: 25 mm (0.98 in) dia.** **d: M12 × 1.5P**

Commercial Service Tools

ECS0057F

Tool name	Description
Drift  NT065	Installing differential side bearing inner race **a: 56 mm (2.20 in) dia.** **b: 50.5 mm (1.988 in) dia.**
Drift  NT065	Removing input shaft rear bearing Removing mainshaft rear bearing **a: 22 mm (0.87 in) dia.** **b: 16 mm (0.63 in) dia.**
Drift  NT065	Installing differential oil seal (Transaxle case side) **a: 58 mm (2.28 in) dia.** **b: 50 mm (1.97 in) dia.**
Drift  NT065	Installing differential oil seal (Clutch housing side) **a: 54 mm (2.13 in) dia.** **b: 50 mm (1.97 in) dia.**
Drift  NT065	Installing 2nd gear bush **a: 38 mm (1.50 in) dia.** **b: 33 mm (1.30 in) dia.**

Tool name	Description
Drift  NT065	Installing 3rd & 4th and 1st & 2nd synchronizer hub Installing mainshaft front bearing **a: 50 mm (1.97 in) dia.** **b: 41 mm (1.61 in) dia.**
Drift  NT065	Installing input shaft oil seal Installing 5th input gear **a: 39 mm (1.54 in) dia.** **b: 30 mm (1.18 in) dia.**

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

ECS005TG

Use the chart below to help you find the cause of the symptom. The numbers indicate the order of the inspection. If necessary, repair or replace these parts.

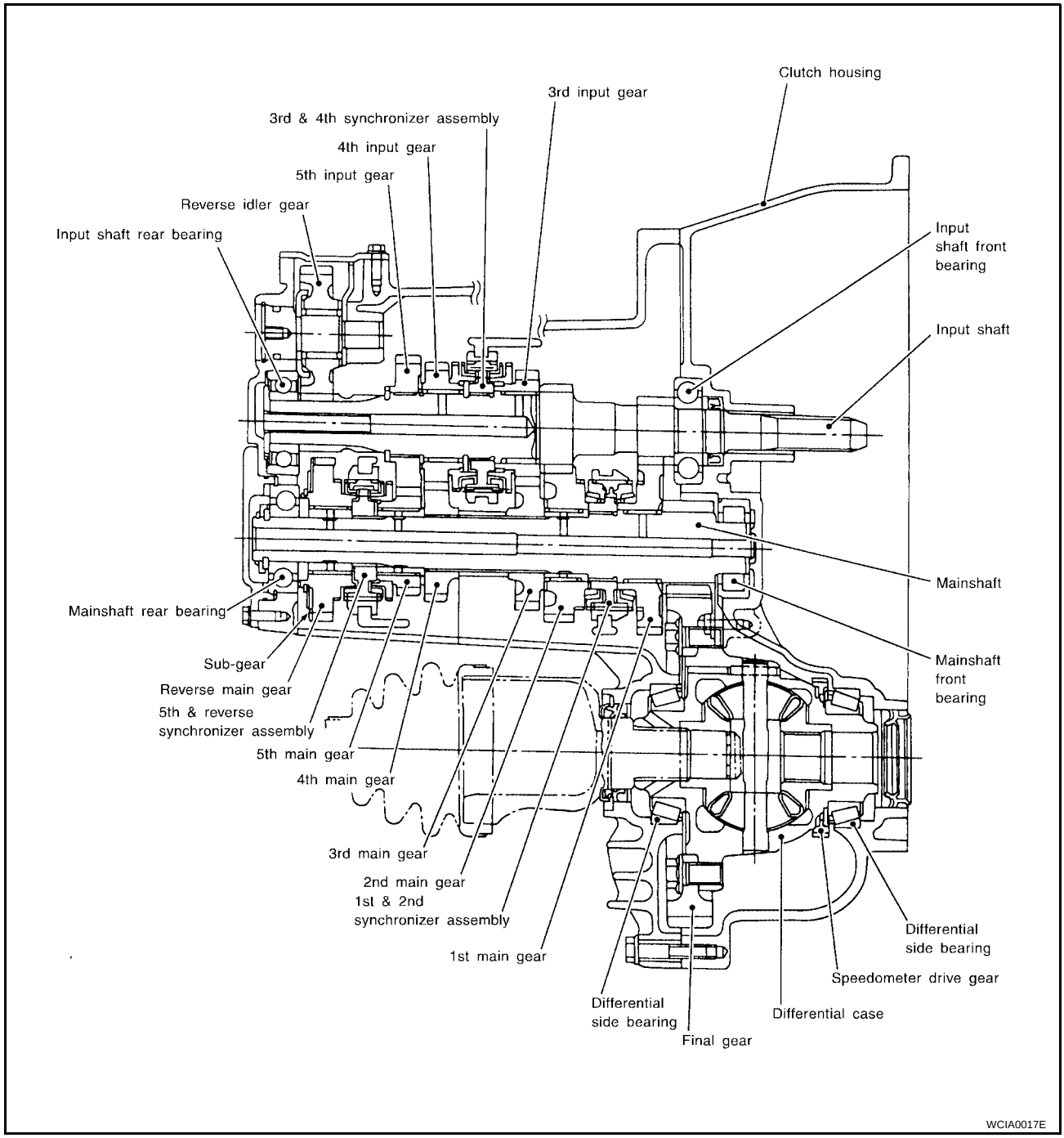
Reference page		MT-11	MT-11	MT-11	MT-20			MT-14	MT-22		MT-21, MT-23			
Suspected Parts (possible cause)		(Oil level is low)	(Wrong oil)	(Oil level is high)	Gasket (damaged)	Oil Seal (worn or damaged)	O-Ring (worn or damaged)	Control Rod (worn)	Check Plug Return Spring and Check Ball (worn or damaged)	Shift Fork (worn)	Gear (worn or damaged)	Bearing (worn or damaged)	Baulk Ring (worn or damaged)	Insert Spring, Shifting Insert (damaged)
Symptom	Noise	1	2								3	3		
	Oil leakage		3	1	2	2	2							
	Hard to shift or will not shift		1	1				2					3	3
	Jumps out of gear							1	2	3	3			

DESCRIPTION

PFP:00000

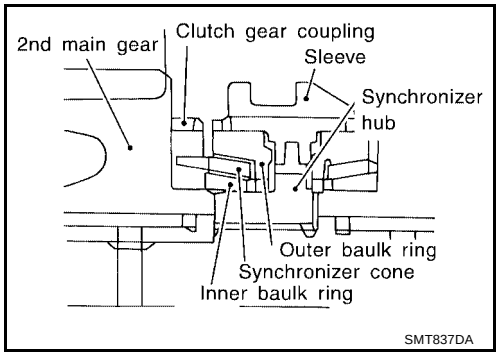
Cross-sectional View

ECS005TH



DOUBLE-CONE SYNCHRONIZER

Double-cone synchronizer is used for 1st and 2nd gears to reduce operating force of the shift lever.



M/T OIL

PFP:KLD20

Replacement

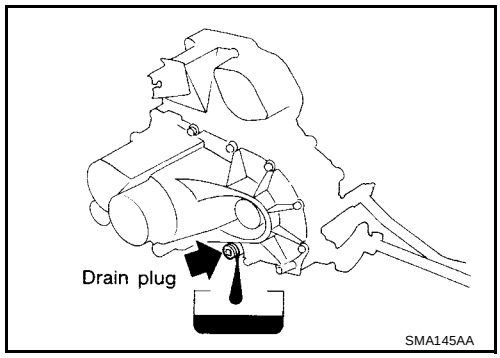
ECS005TI

DRAINING

1. Start the engine and let it run to warm up the transaxle.
2. Stop the engine. Remove drain plug and drain oil.
3. Set a gasket on the drain plug and install it on the transaxle.

Drain plug : 10 - 19 N·m (1.0 - 2.0 kg-m, 87 - 173 in-lb)

CAUTION:
Do not reuse gasket.



FILLING

1. Remove filler plug. Fill with new oil until oil level reaches the specified limit near filler plug mounting hole.

Oil grade : API GL-4
Capacity (reference) : Approximately 3.0 ℓ (3 1/8 qt)

2. After refilling oil, check oil level. Set a new gasket on the filler plug, then install it in the transaxle body.

Filler plug : 10 - 19 N·m (1.0 - 2.0 kg-m, 87 - 173 in-lb)

CAUTION:
Do not reuse gasket.

Checking

ECS005TJ

OIL LEAKAGE AND OIL LEVEL

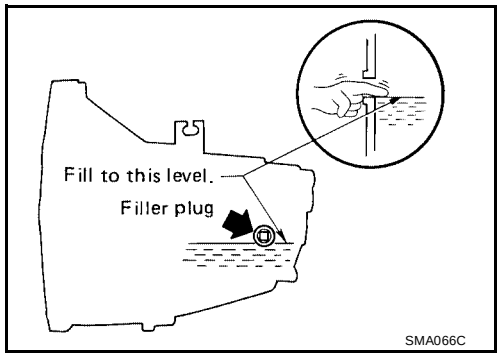
- Check that oil is not leaking from transaxle.
- Check oil level from filler plug mounting hole as shown.

CAUTION:
Never start engine while checking oil level.

- Set a new gasket on the filler plug and install it in the transaxle body.

Filler plug : 10 - 19 N·m (1.0 - 2.0 kg-m, 87 - 173 in-lb)

CAUTION:
Do not reuse gasket.



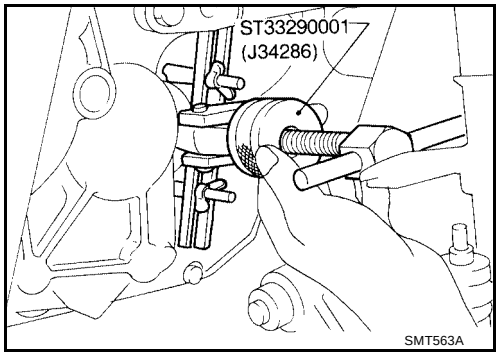
SIDE OIL SEAL

PFP:32113

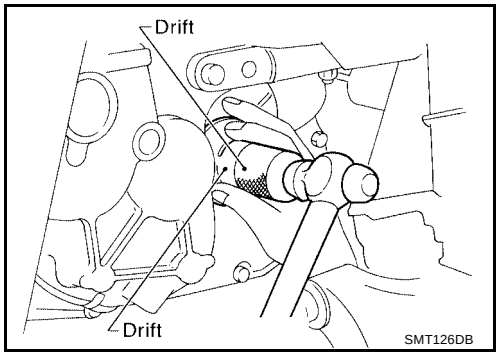
Removal and Installation

ECS005TK

1. Remove drain plug and drain the oil from transaxle. Refer to MT-11, "DRAINING" .
2. Remove drive shafts. Refer to FAX-14, "Removal" .
3. Remove differential oil seal using Tool.



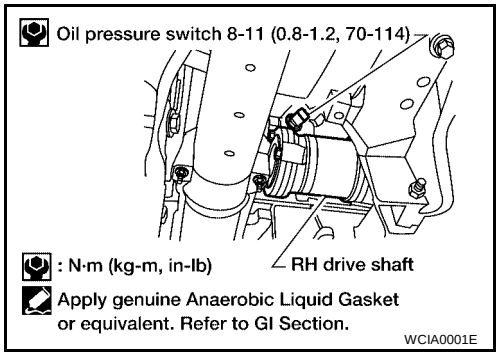
4. Install differential oil seal with a suitable tool.
   - Apply multi-purpose grease to seal lip of oil seal before installing.



5. Install drive shafts. Refer to FAX-16, "Installation" .
   - Install differential oil seal so that dimensions “A” and “B” are within specifications.

Unit: mm (in)

Model	Dimension "A"	Dimension "B"
QG18DE (RS5F70A)	0.5 (0.020) or less	5.5 - 6.5 (0.217 - 0.256)



6. Refill the transaxle oil and install the drain plug with a new gasket. Refer to MT-11, "FILLING" .

POSITION SWITCH

PFP:32005

Position Switch Check

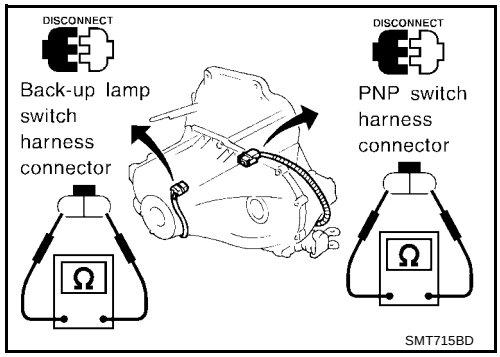
ECS005TL

NOTE:
For removal and installation of the switches. Refer to MT-20, "CASE COMPONENTS" .

BACK-UP LAMP SWITCH

- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No



PNP SWITCH

- Check continuity.

Gear position	Continuity
Neutral	Yes
Except neutral	No

CONTROL LINKAGE

PFP:34103

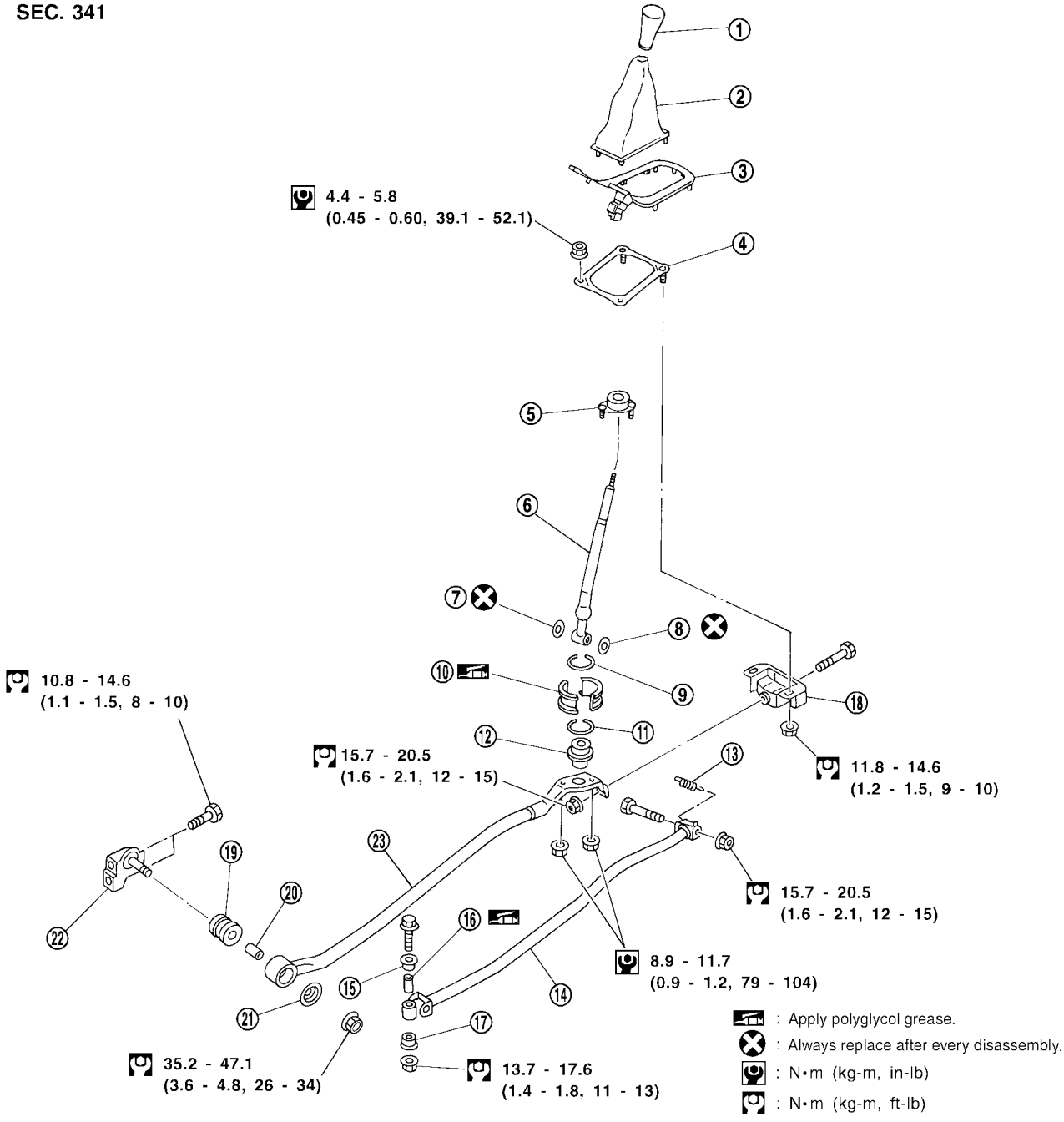
Removal and Installation

ECS005TM

TRANSAXLE GEAR CONTROL

Refer to the illustration for the removal and installation procedure.

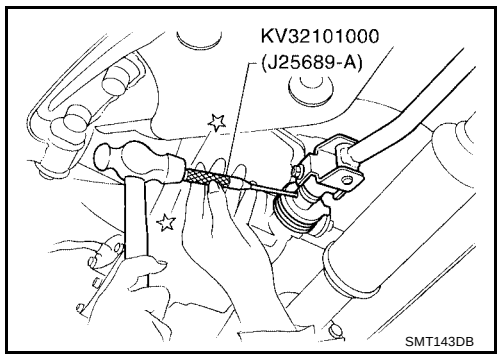
SEC. 341



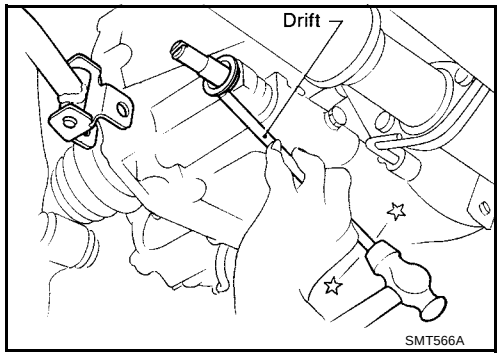
1. Control lever knob
2. Boot
3. Finisher
4. Control lever bracket
5. Socket
6. Control lever
7. O-ring
8. O-ring
9. Ring spring
10. Bearing seat
11. Ring spring
12. Seat
13. Return spring
14. Control rod
15. Bushing
16. Collar
17. Bushing
18. Bracket
19. Bushing
20. Collar
21. Washer
22. Support rod bracket
23. Support rod

STRIKING ROD OIL SEAL

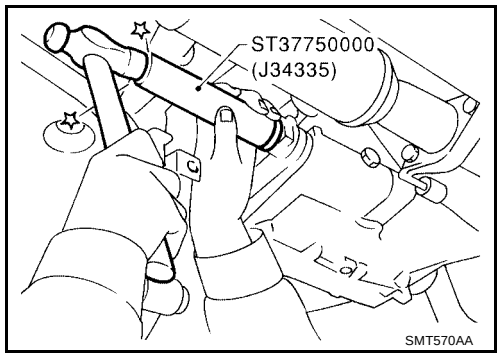
1. Remove transaxle control rod from yoke.
2. Remove retaining pin of yoke using Tool.
   - **Be careful not to damage boot.**



3. Remove the boot.
4. Remove striking rod oil seal with a suitable tool.



5. Install striking rod oil seal using Tool.
   - Apply multi-purpose grease to the seal lip of the oil seal before installing.



6. Install the boot.
7. Install yoke and retaining pin.
8. Connect the transaxle control rod to the yoke.

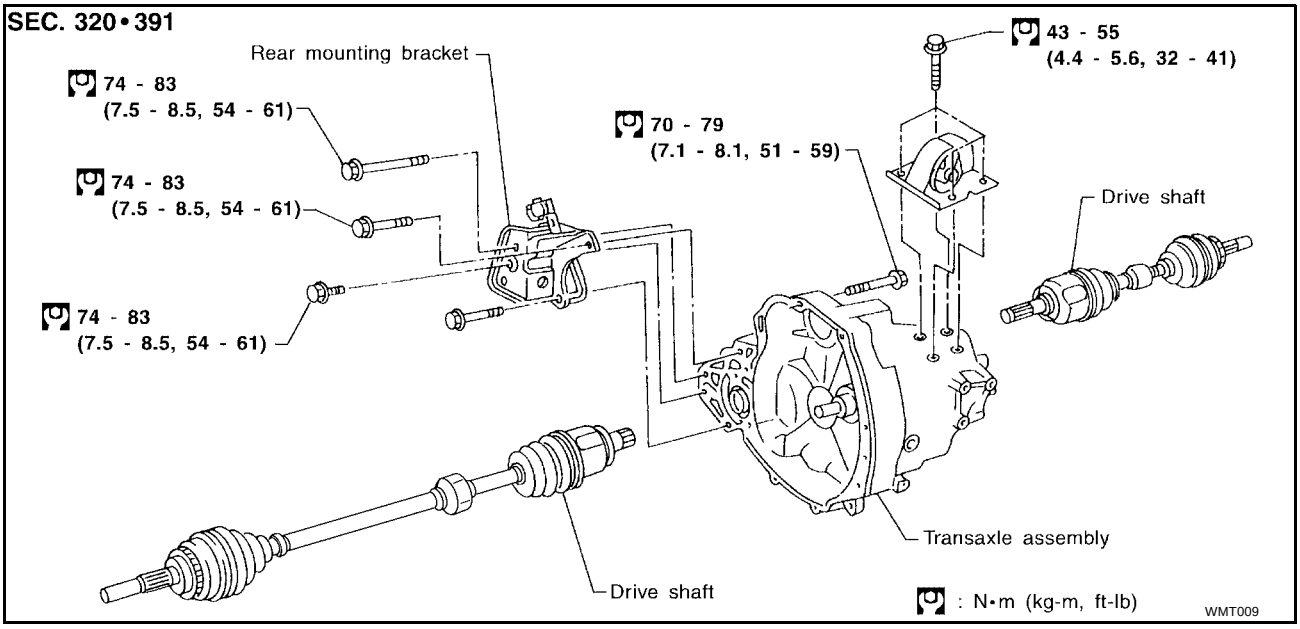
TRANSAXLE ASSEMBLY

PFP:32010

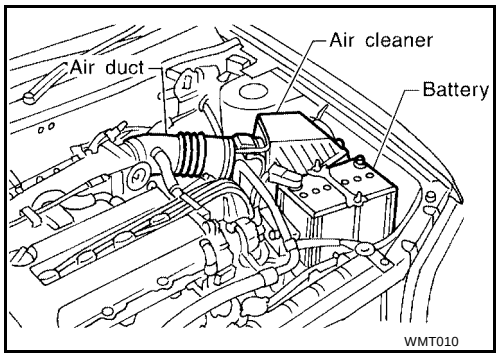
Removal and Installation

ECS005TN

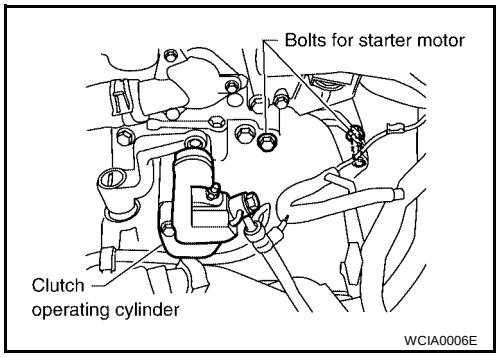
REMOVAL



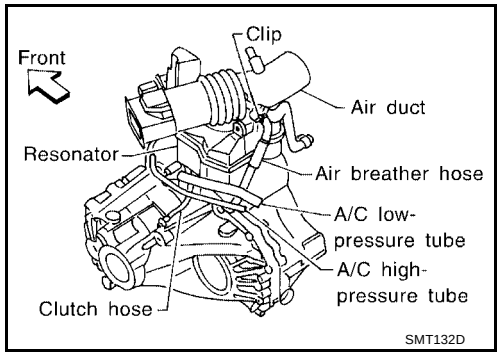
1. Remove battery negative terminal.
2. Remove air cleaner and air duct.



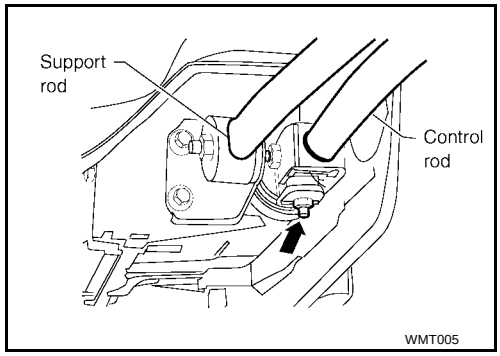
3. Remove clutch operating cylinder from transaxle. Refer to CL-11, "Removal" .
4. Disconnect back-up lamp switch, VSS sensor, PNP switch, and ground harness connectors.
5. Remove starter motor from transaxle. Refer to SC-20, "Removal" .



6. Remove air breather hose.

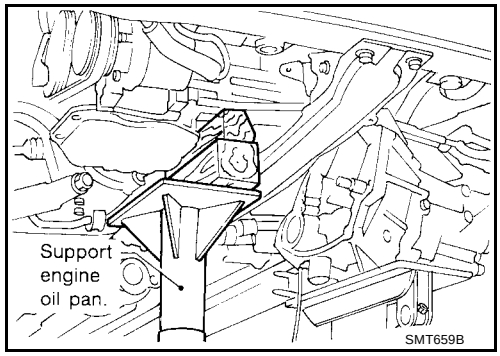


7. Remove shift control rod and support rod from transaxle.

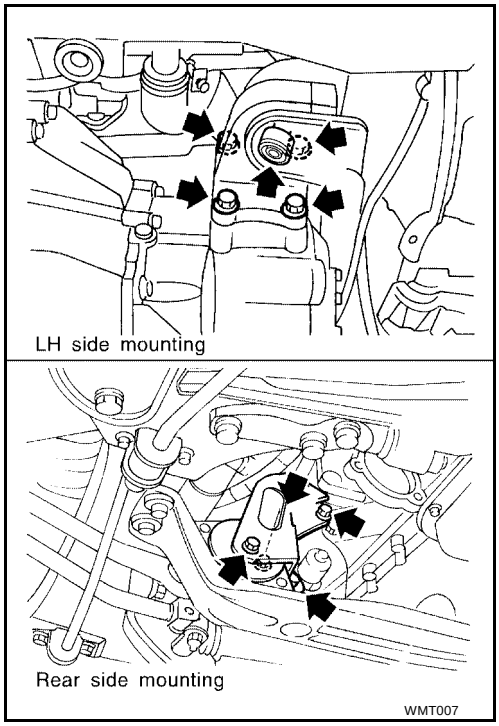


8. Remove the drain plug and drain gear oil from transaxle.
9. Remove the drive shafts from the transaxle. Refer to FAX-14, "Removal" .
10. Support engine by placing a jack under oil pan as shown.

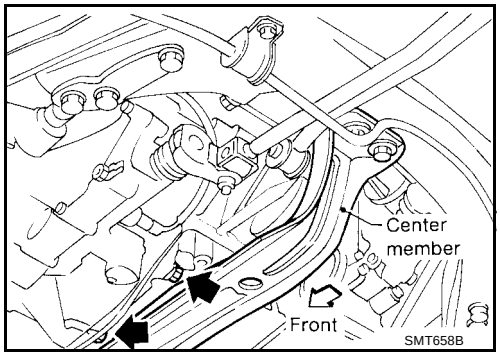
CAUTION:
Do not place jack under oil pan drain plug.



11. Remove LH side and rear side mounting bolts.



12. Remove lower housing bolts.



13. Remove bolts securing transaxle.
14. Lower transaxle while supporting it with a jack.

INSTALLATION

Installation is in the reverse order of removal.

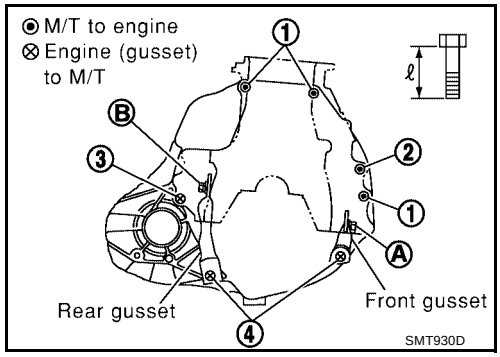
- Tighten starter motor to transaxle bolts to specification.

Starter motor to transaxle bolts : 31 - 42 N·m (3.2 - 4.3 kg-m, 23 - 31 ft-lb)

- Tighten LH and rear mounts to specification.
- Install transaxle to engine, tighten the bolts to specification.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	" ℓ "mm (in)
1	30 - 40 (3.1 - 4.1, 22 - 30)	70 (2.76)
2	30 - 40 (3.1 - 4.1, 22 - 30)	80 (3.15)
3	30 - 40 (3.1 - 4.1, 22 - 30)	30 (1.18)
4*	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)
Front gusset A to engine	30 - 40 (3.1 - 4.1, 22 - 30)	20 (0.79)
Rear gusset B to engine	16 - 21 (1.6 - 2.1, 12 - 15)	16 (0.63)

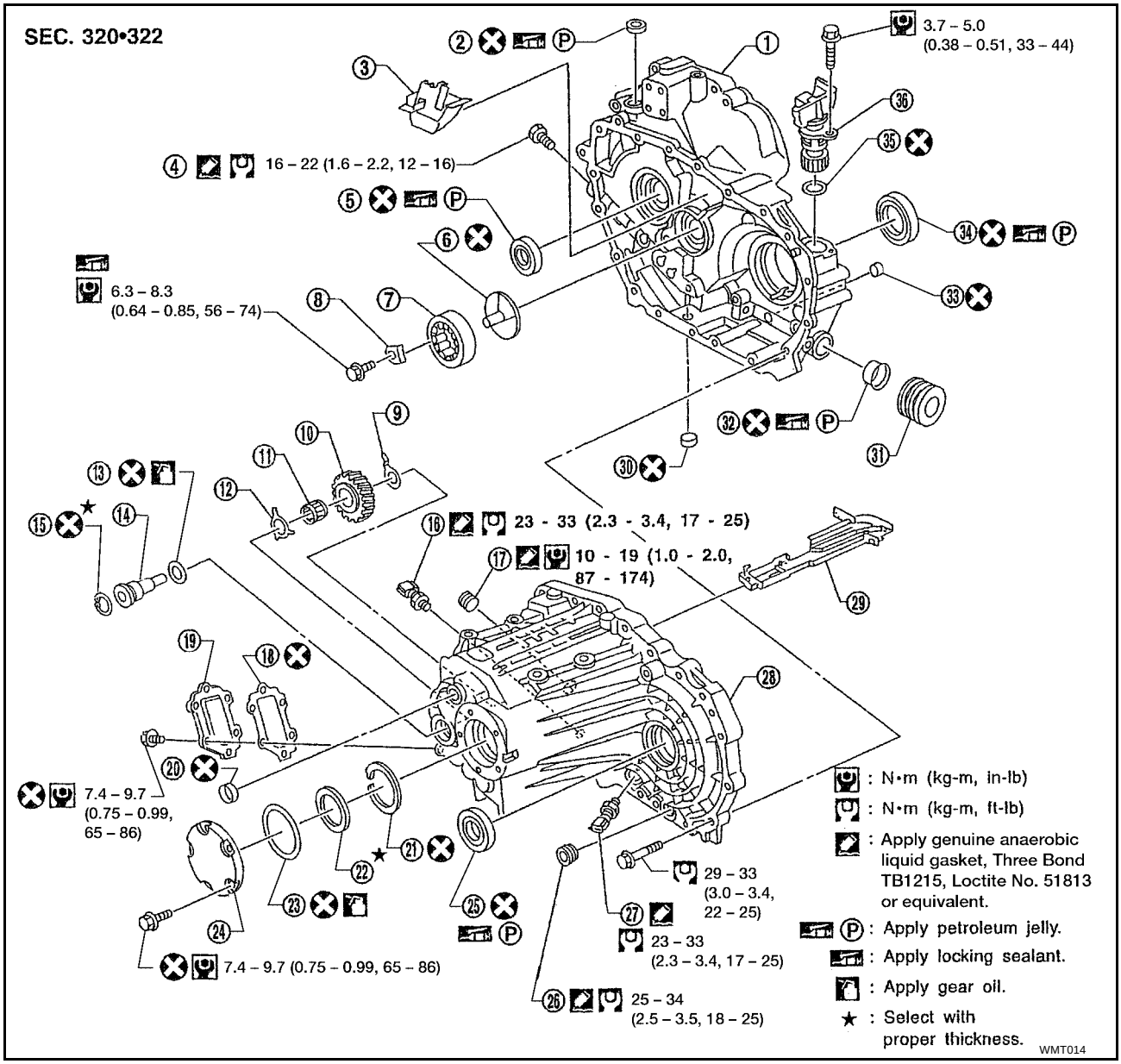
*: With gussets



Component Parts

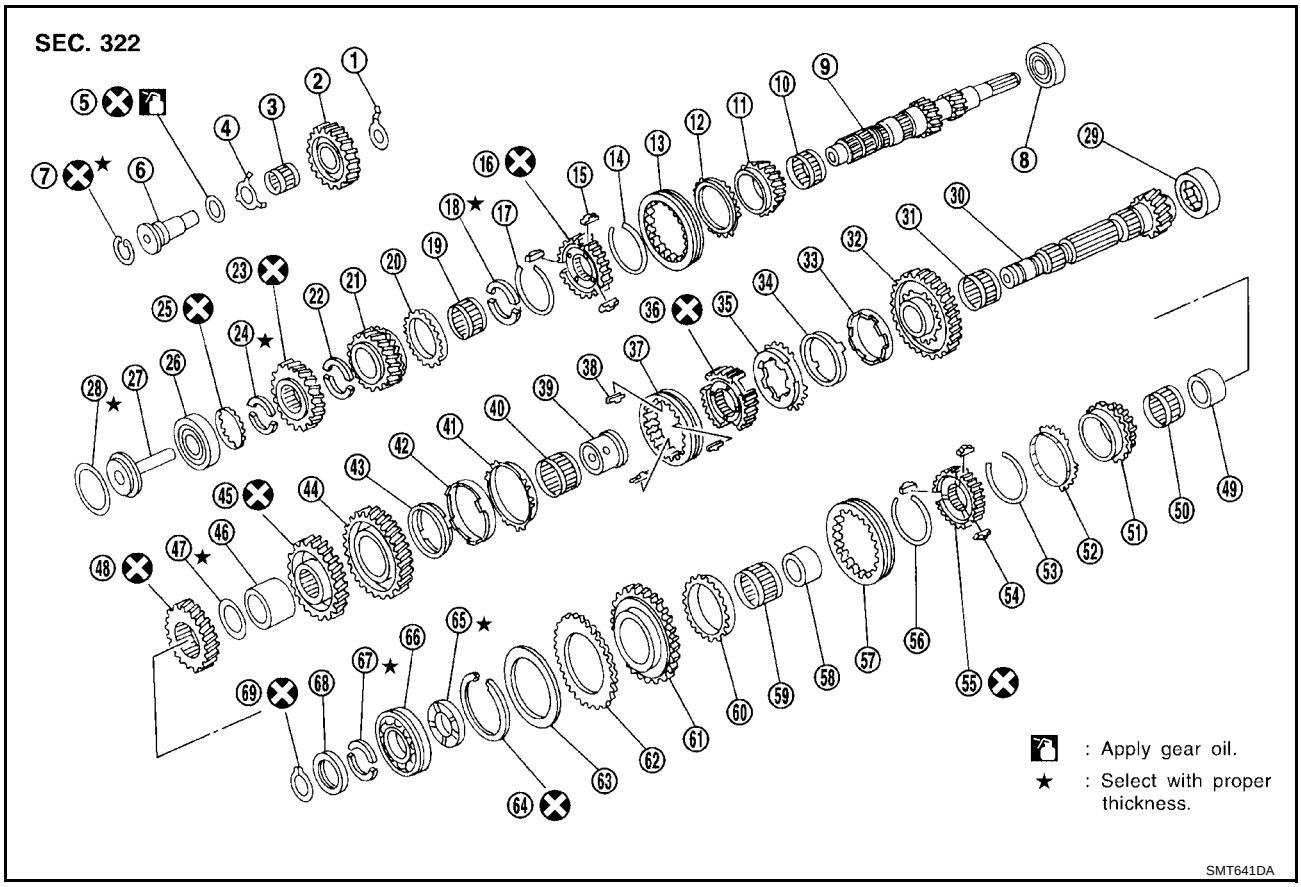
ECS005TO

CASE COMPONENTS



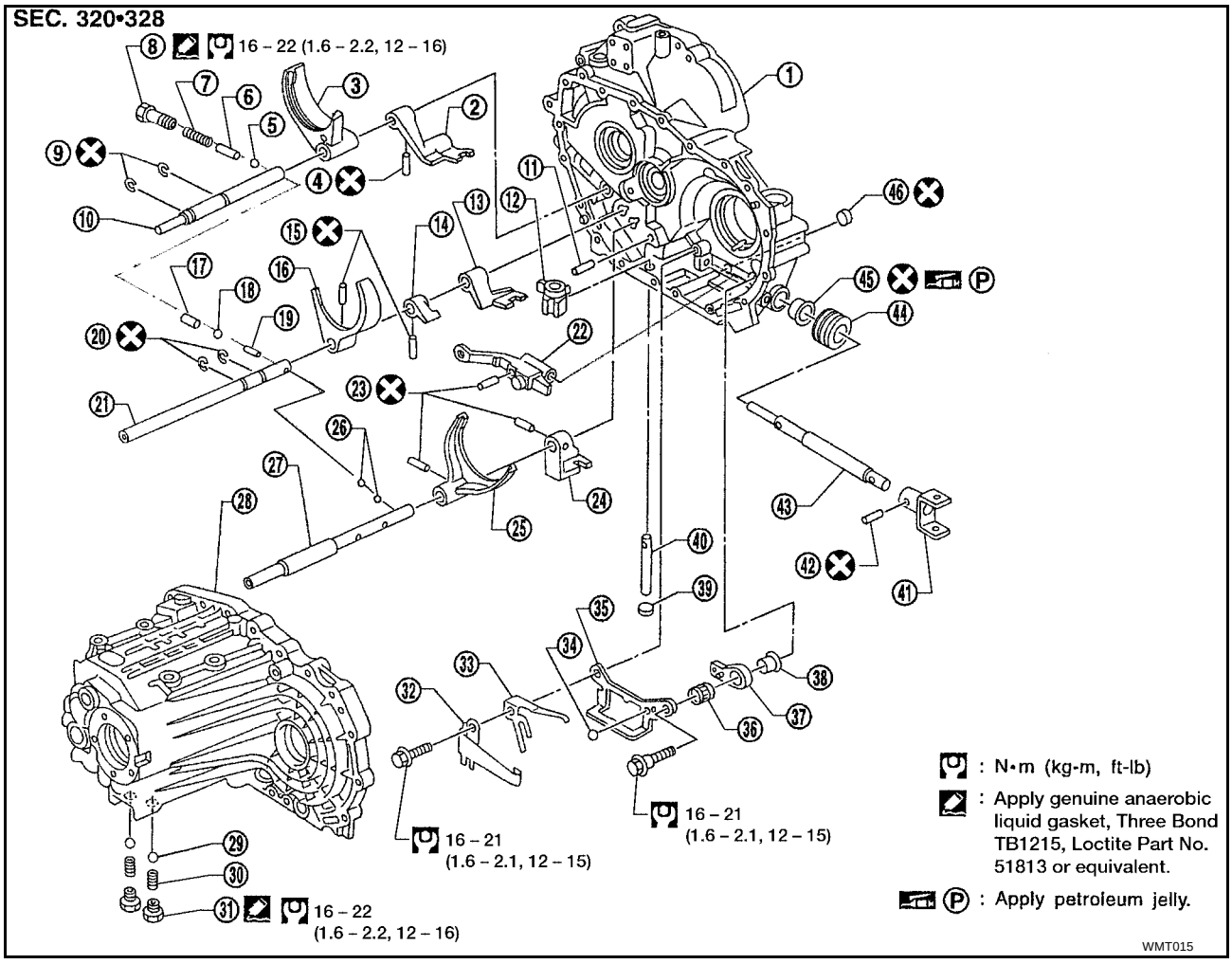
1.	Clutch housing	2.	Dust seal	3.	Oil pocket
4.	Check plug	5.	Input shaft oil seal	6.	Oil channel
7.	Mainshaft front bearing	8.	Bearing retainer	9.	Reverse idler gear front thrust washer
10.	Reverse idler gear	11.	Reverse idler gear bearing	12.	Reverse idler gear rear thrust washer
13.	O-ring	14.	Reverse idler gear shaft	15.	Snap ring
16.	Back-up lamp switch	17.	Filler plug	18.	Side cover gasket
19.	Side cover	20.	Welch plug	21.	Mainshaft bearing snap ring
22.	Mainshaft rear bearing adjusting shim	23.	O-ring	24.	Rear cover
25.	Differential oil seal	26.	Drain plug	27.	PNP switch
28.	Transmission case	29.	Oil gutter	30.	Welch plug
31.	Boot	32.	Striking rod oil seal	33.	Welch plug
34.	Differential oil seal	35.	O-ring	36.	Speedometer pinion

GEAR COMPONENTS



1.	Reverse idler gear front thrust washer	2.	Reverse idler gear	3.	Reverse idler gear bearing
4.	Reverse idler gear rear thrust washer	5.	O-ring	6.	Reverse idler gear shaft
7.	Snap ring	8.	Input shaft front bearing	9.	Input shaft
10.	3rd gear needle bearing	11.	3rd input gear	12.	3rd gear baulk ring
13.	Coupling sleeve	14.	Spread spring	15.	Shifting insert
16.	3rd & 4th synchronizer hub	17.	Spread spring	18.	4th gear C-ring
19.	4th gear needle bearing	20.	4th gear baulk ring	21.	4th input gear
22.	5th gear front C-ring	23.	5th input gear	24.	5th gear rear C-ring
25.	C-ring holder	26.	Input shaft rear bearing	27.	Oil channel
28.	Input shaft rear bearing adjusting shim	29.	Mainshaft front bearing	30.	Mainshaft
31.	1st gear needle bearing	32.	1st main gear	33.	1st inner baulk ring
34.	1st synchronizer cone	35.	1st outer baulk ring	36.	1st & 2nd synchronizer hub
37.	Coupling sleeve	38.	Insert spring	39.	2nd gear bushing
40.	2nd gear needle bearing	41.	2nd gear outer baulk ring	42.	2nd gear synchronizer cone
43.	2nd inner baulk ring	44.	2nd main gear	45.	3rd main gear
46.	Spacer	47.	Mainshaft adjusting shim	48.	4th main gear
49.	5th gear bushing	50.	5th gear needle bearing	51.	5th main gear
52.	5th gear baulk ring	53.	Spread spring	54.	Shifting insert
55.	5th & reverse synchronizer hub	56.	Spread spring	57.	Coupling sleeve
58.	Reverse gear bushing	59.	Reverse gear needle bearing	60.	Reverse gear baulk ring
61.	Reverse main gear	62.	Sub-gear	63.	Sub-gear washer
64.	Snap ring	65.	Mainshaft thrust washer	66.	Mainshaft rear bearing
67.	Mainshaft C-ring	68.	C-ring holder	69.	Snap ring

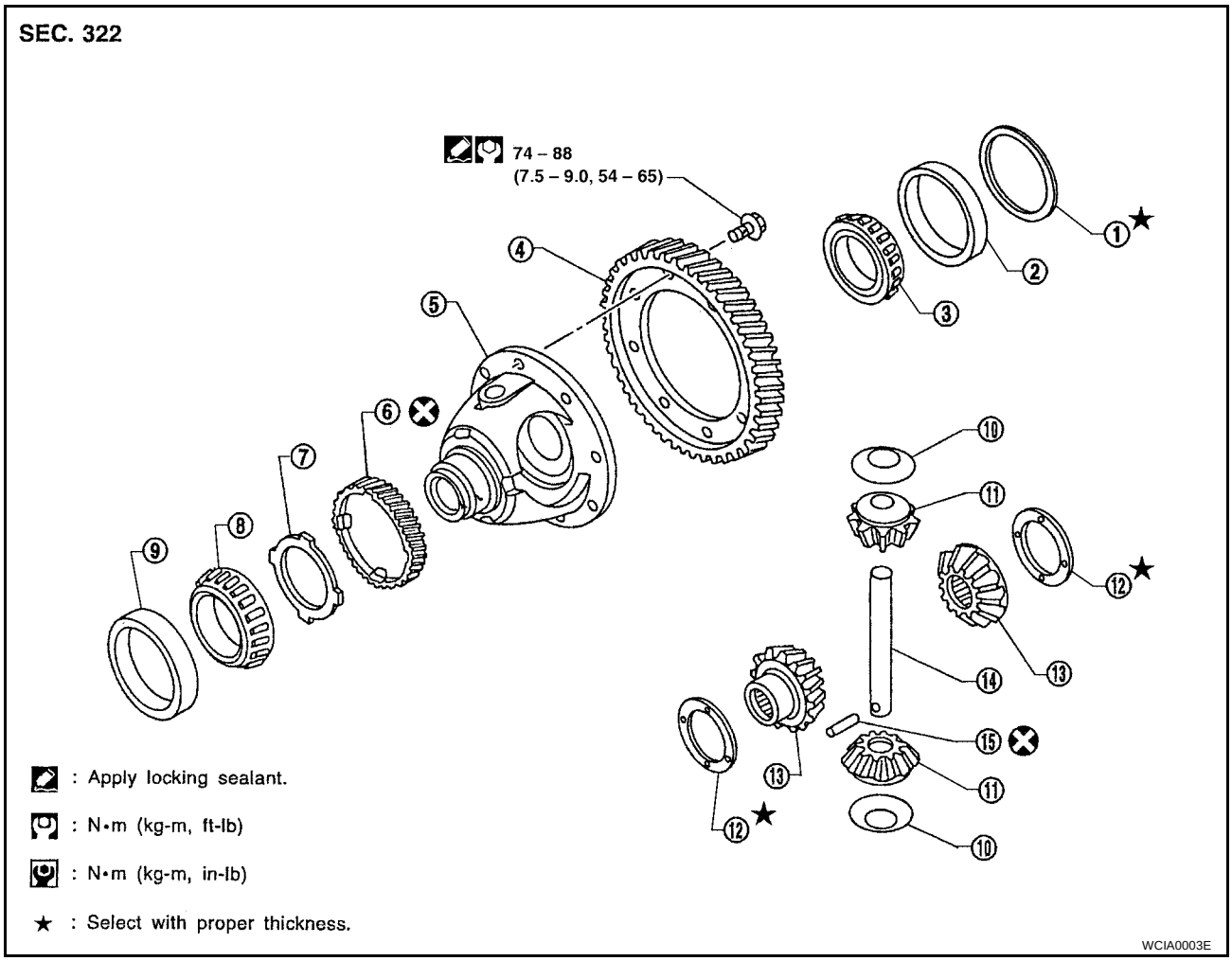
SHIFT CONTROL COMPONENTS



1. Clutch housing
2. 3rd & 4th bracket
3. 3rd & 4th shift fork
4. Retaining pin
5. Check ball
6. Check pin
7. Check spring
8. Check plug
9. Stopper ring
10. 3rd & 4th fork rod
11. Selector shaft pin
12. Selector
13. 5th & reverse bracket
14. Reverse switch bracket
15. Retaining pin
16. 5th & reverse shift fork
17. Interlock plunger
18. Check ball
19. Interlock pin
20. Stopper ring
21. 5th & reverse fork rod
22. Striking lever
23. Retaining pin
24. 1st & 2nd bracket
25. 1st & 2nd shift fork
26. Check ball
27. 1st & 2nd fork rod
28. Transaxle case
29. Check ball
30. Check spring
31. Check plug
32. Select check leaf spring
33. Return spring
34. Steel ball
35. Reverse gate
36. Return bearing
37. Selector arm
38. Bushing
39. Welch plug
40. Selector shaft
41. Striking yoke
42. Retaining pin
43. Striking rod
44. Dust boot
45. Striking rod oil seal
46. Welch plug

FINAL DRIVE COMPONENTS

SEC. 322



1. Differential side bearing adjusting shim
2. Differential side bearing outer race
3. Differential side bearing
4. Final gear
5. Differential case
6. Speedometer drive gear
7. Speedometer stopper
8. Differential side bearing
9. Differential side bearing outer race
10. Pinion mate thrust washer
11. Pinion mate gear
12. Side gear thrust washer
13. Side gear
14. Pinion mate shaft
15. Lock pin

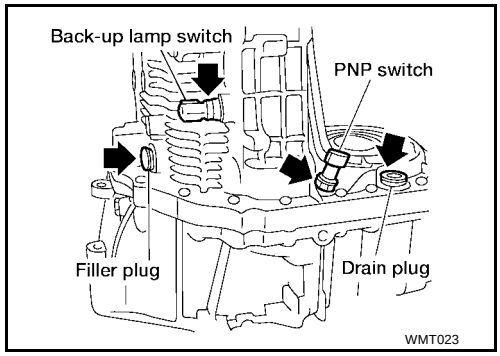
Disassembly and Assembly

ECS005TP

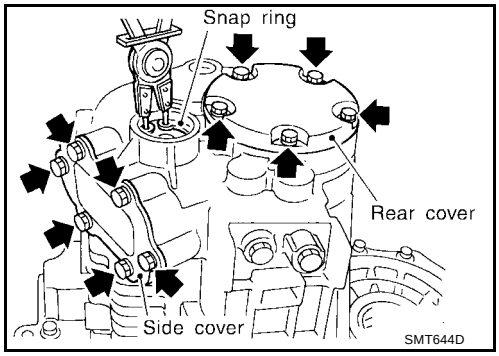
DISASSEMBLY

Transaxle Case

1. Remove back-up lamp switch, PNP switch, drain plug, and filler plug from transaxle case.

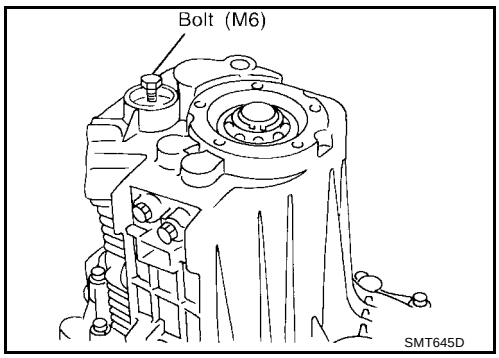


2. Remove snap ring from reverse idler shaft as shown.
3. Remove side cover and rear cover from case.

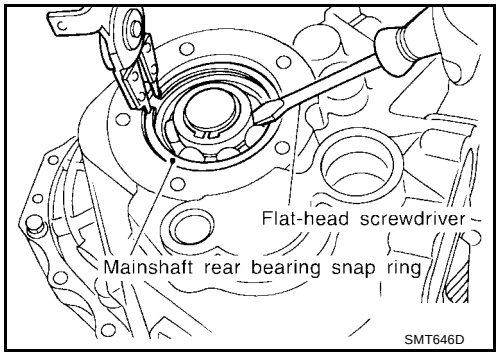


4. Remove O-ring and mainshaft bearing adjusting shim.
5. Remove reverse idler gear shaft.

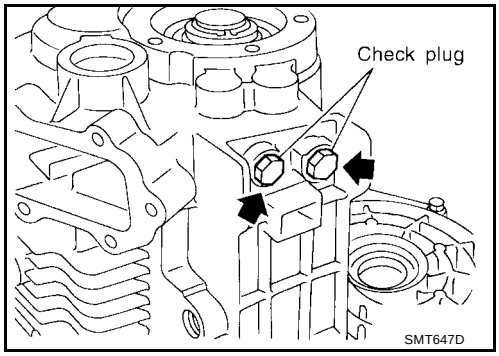
a. Attach bolt (M6) to thread of reverse idler gear shaft end as shown.
b. Pull out the attached bolt (M6), and remove reverse idler gear shaft from case.



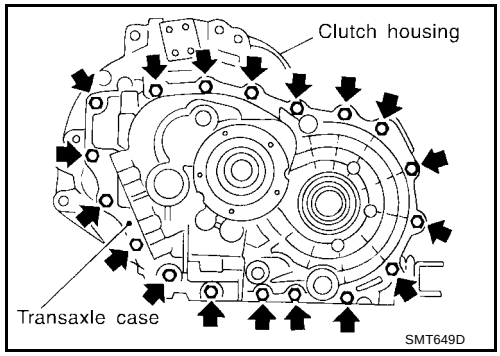
6. Remove reverse idler gear, thrust washer (front, rear), and bearing from case.
7. Remove mainshaft rear bearing snap ring from case.



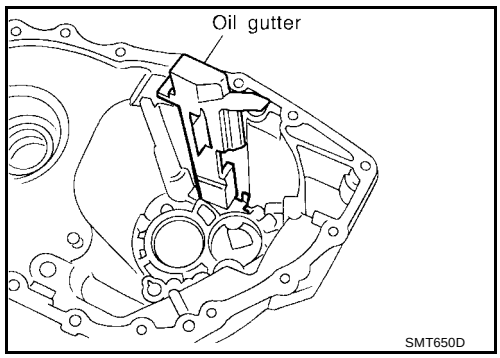
8. Remove check plugs, springs, and check balls from case.



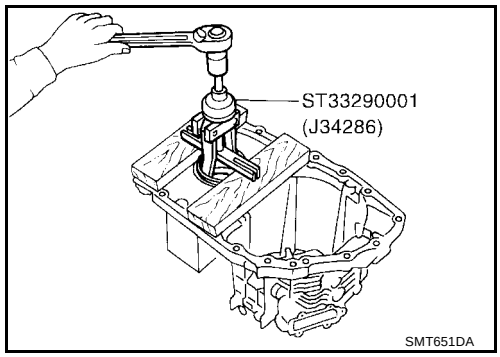
9. Remove transaxle case mounting bolts.



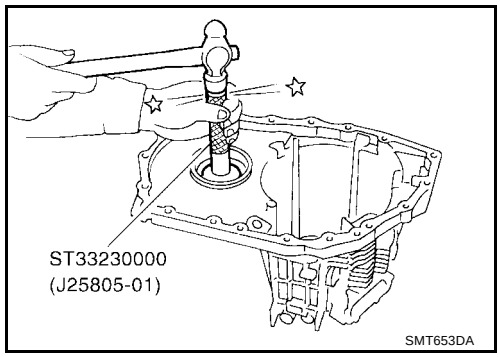
10. Remove input shaft rear bearing adjusting shim from transaxle case.
11. Remove oil gutter from transaxle case.



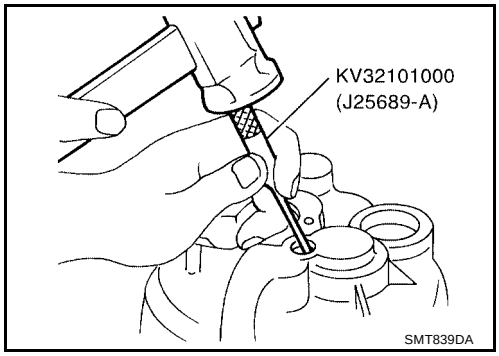
12. Remove differential side bearing outer race and adjusting shim from transaxle case using Tool.



13. Remove differential oil seal from transaxle case using Tool.

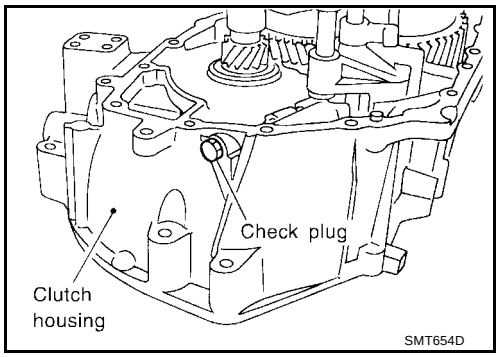


14. Remove welch plugs from transaxle case using Tool.

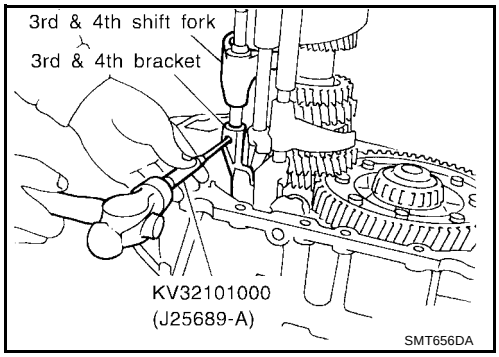


Clutch Housing

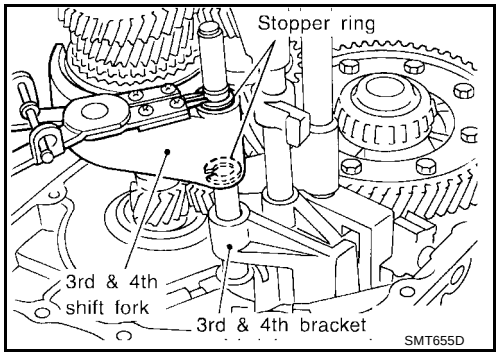
1. Remove transaxle case from clutch housing.
2. Remove check plugs, check springs, check pins, and check balls from housing.



3. Remove 3rd & 4th bracket retaining pin using Tool.

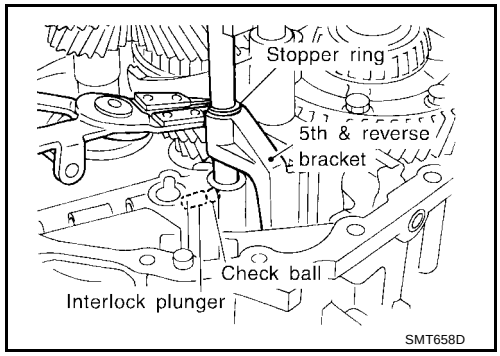


4. Remove 3rd & 4th shift fork stopper ring.

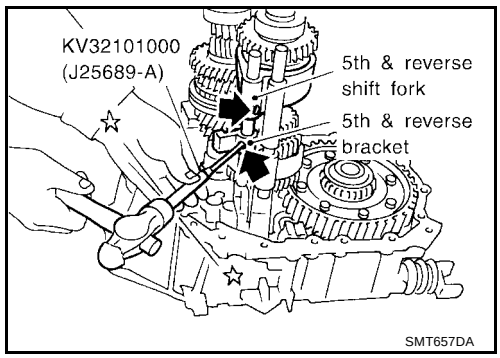


5. Remove 3rd & 4th fork rod.
6. Remove 3rd & 4th shift fork and bracket.

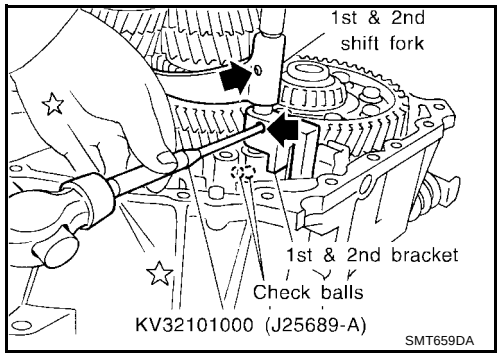
7. Remove interlock plunger and check ball.
8. Remove 5th & reverse bracket stopper ring.



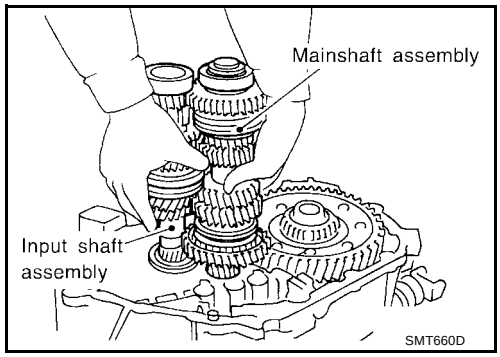
9. Remove retaining pins from 5th & reverse shift fork and 5th & reverse bracket using Tool.



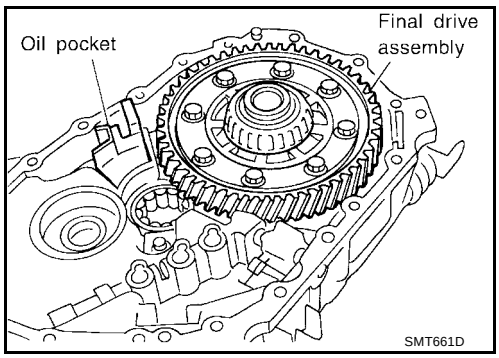
10. Remove 5th & reverse fork rod.
11. Remove interlock pin from 5th & reverse fork rod using Tool.
12. Remove reverse switch bracket and 5th & reverse bracket.
13. Remove check ball from housing.
14. Remove retaining pin for 1st & 2nd shift fork and 1st & 2nd bracket using Tool.



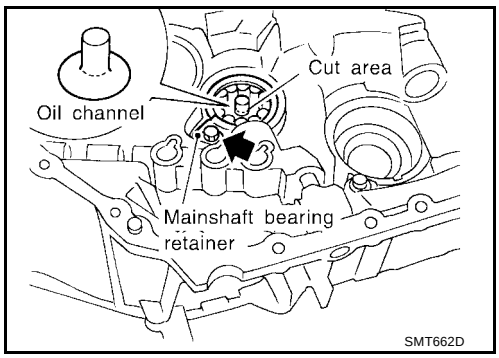
15. Remove 1st & 2nd fork rod.
16. Remove 5th & reverse and 1st & 2nd shift forks, and 1st & 2nd bracket.
17. Remove both input shaft and mainshaft assemblies from housing.



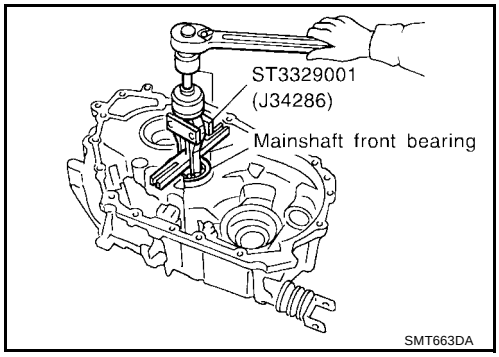
18. Remove final drive assembly from housing.
19. Remove oil pocket from housing.



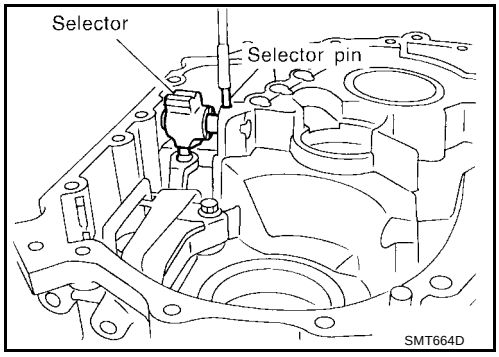
20. Remove mainshaft bearing retainer from housing.
21. Cut off oil channel using a cutter as shown.



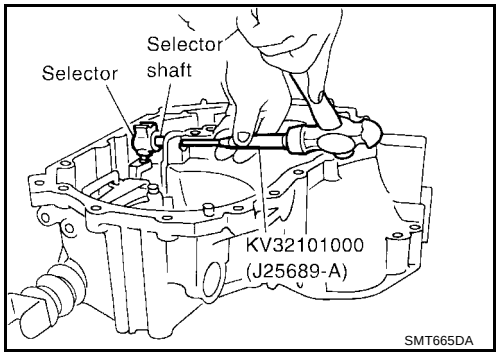
22. Remove mainshaft front bearing from housing using Tool.



23. Using a magnet or other suitable tool, remove selector pin from selector shaft.

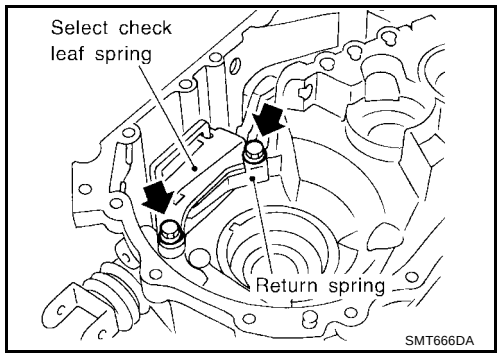


24. Remove selector shaft and plug, then remove selector using Tool.

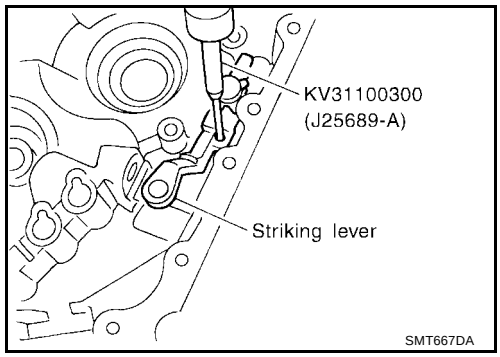


25. Remove reamer bolts, then remove select check leaf spring, return spring, steel ball, reverse gate, selector arm, bearing, and bushing.

CAUTION:
Be careful not to lose the steel ball.

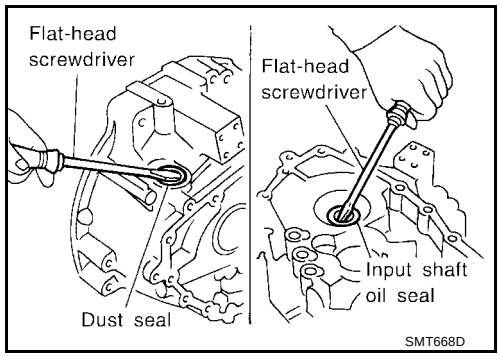


26. Remove retaining pin and plug from striking lever using Tool.

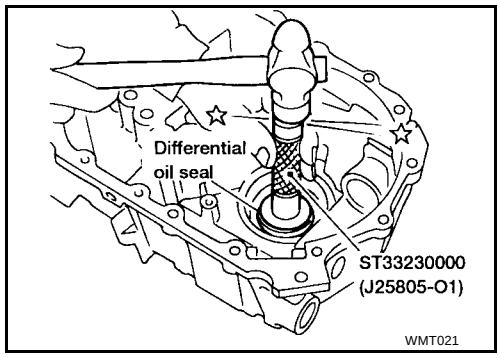


27. Remove striking rod, then striking lever from housing.
28. Using a flat-head screwdriver or other suitable tool, remove dust seal, input shaft oil seal, and striking rod oil seal from housing.

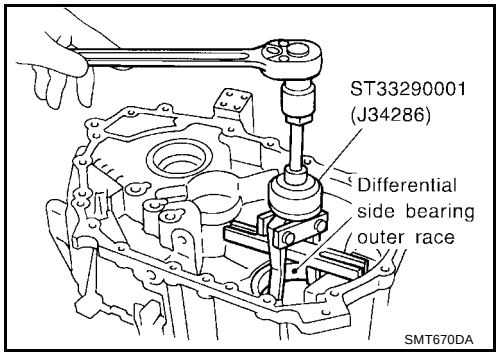
CAUTION:
When removing dust and oil seals, be careful not to damage mounting surfaces of dust seal and oil seal.



29. Remove differential oil seal from housing using Tool.



30. Remove differential side outer race from housing using Tool.

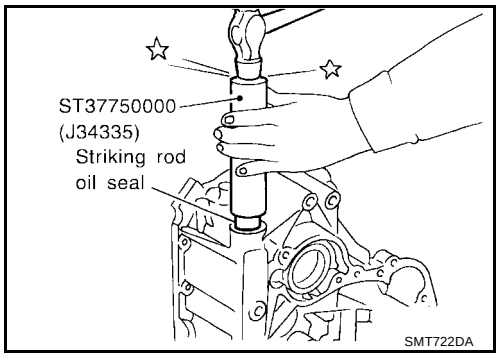


ASSEMBLY

Clutch Housing

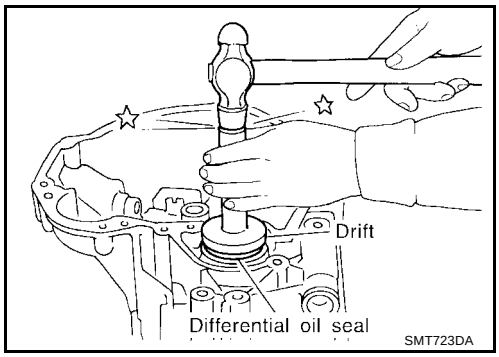
1. Hammer the new striking rod oil seal into clutch housing as far as it will go using Tool.

   CAUTION:
   Do not reuse striking rod oil seal.



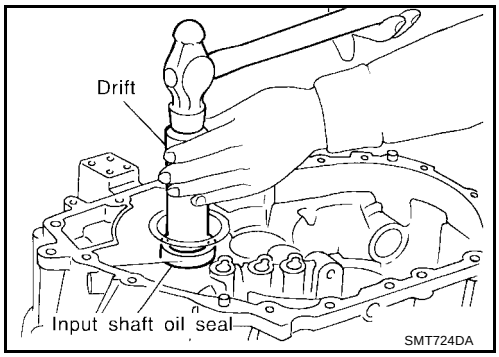
2. Hammer the differential oil seal into clutch housing with a suitable tool until it becomes flush with clutch housing end face.

   CAUTION:
   Do not reuse differential oil seal.



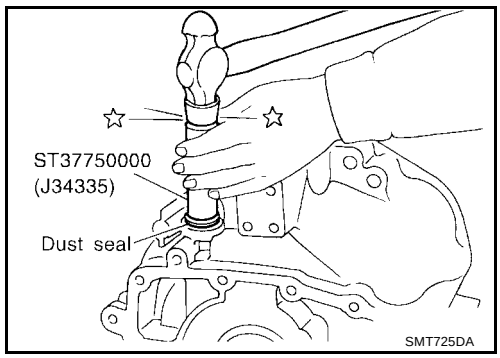
3. Hammer input shaft oil seal into clutch housing as far as it will go with a suitable tool.

   CAUTION:
   Do not reuse input shaft oil seal.

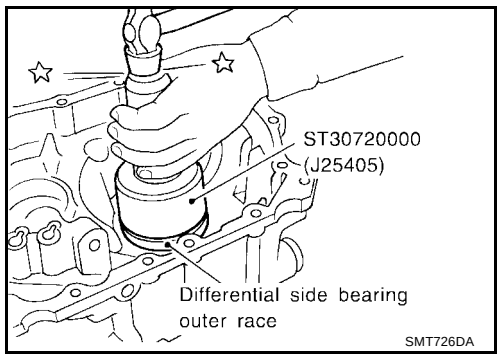


4. Hammer the dust seal into clutch housing as far as it will go using Tool.

CAUTION:
Do not reuse dust seal.

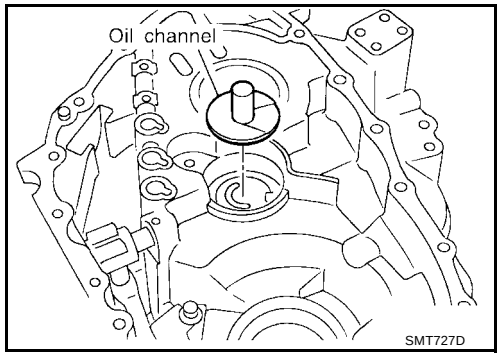


5. Install outer race of differential side bearing using Tool.

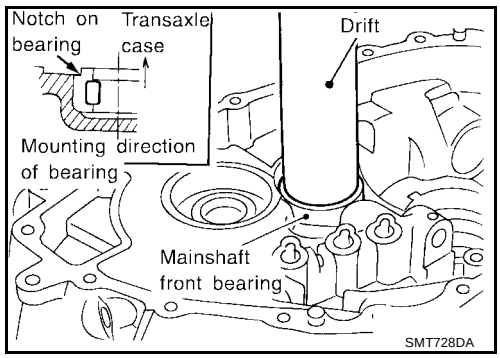


6. Install new oil channel (mainshaft).

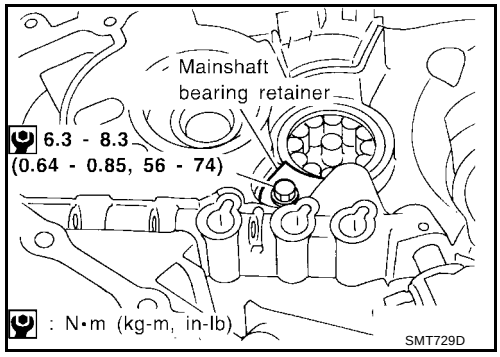
CAUTION:
Pay attention to installation direction of oil channel.



7. Align the notches on mainshaft front bearing and transaxle case. Then, install mainshaft front bearing with a suitable tool.



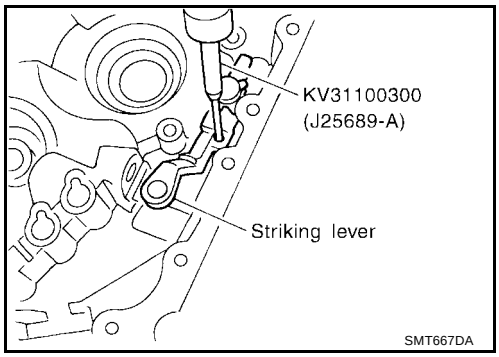
8. Install mainshaft bearing retainer, tighten bolt to specification.



9. Attach boot, striking rod, and striking lever to clutch housing. Install new retaining pin for striking lever using Tool.

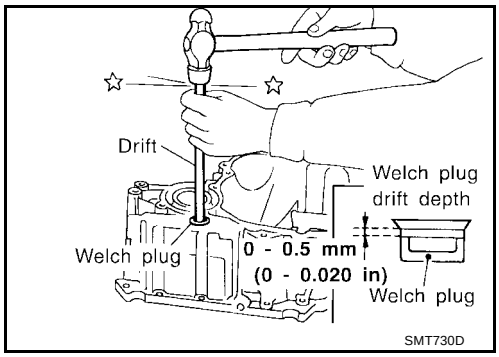
CAUTION:

- **Before installing striking rod, wrap the end with a vinyl tape or similar product to prevent oil seal from being damaged.**
- **Do not reuse retaining pin.**

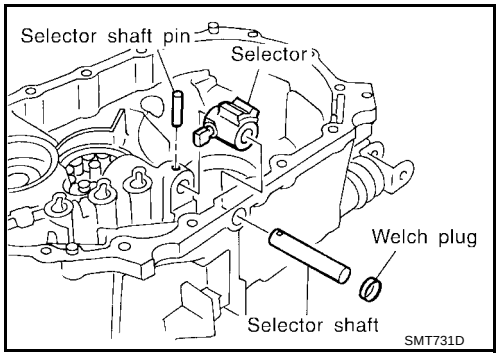


10. Hammer the new welch plug (striking lever side) with a general-purpose drift [OD: 12 mm (0.47 in)].

CAUTION:
Do not reuse welch plug.

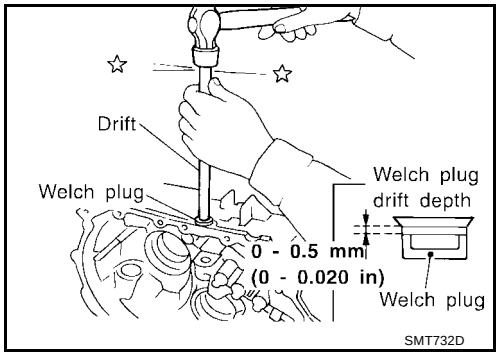


11. Install selector, selector shaft, and selector shaft pin into clutch housing.

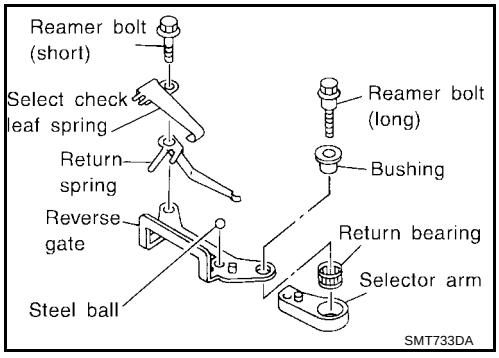


12. Hammer the new welch plug (selector shaft side) with a general-purpose drift [OD: 12 mm (0.47 in)].

CAUTION:
Do not reuse welch plug.

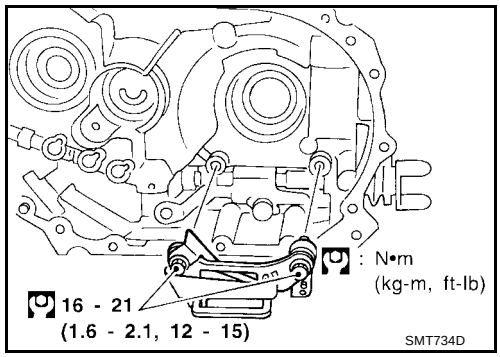


13. Install select check leaf spring, return spring, steel ball, reverse gate, selector arm, bushing, and return bearing.

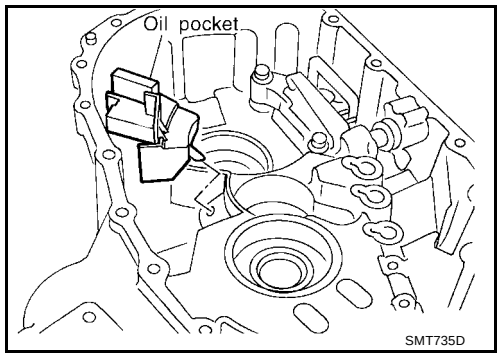


14. Tighten the two reamer bolts to specification.

CAUTION:
Use correct reamer bolts for each installation point, because each bolt has a different length.

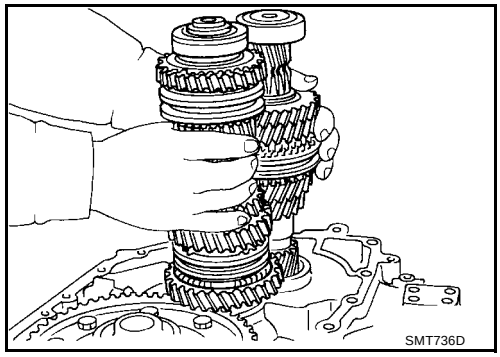


15. Install oil pocket.



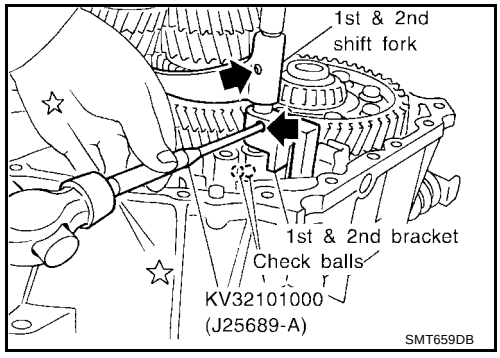
16. Install differential assembly, input shaft assembly, and mainshaft assembly into clutch housing.

CAUTION:
Be careful not to damage input shaft oil seal during installation of input shaft assembly.



17. Install 5th & reverse shift fork.
18. Install 1st & 2nd shift fork, bracket, and fork rod.
19. Install retaining pin for 1st & 2nd bracket using Tool.

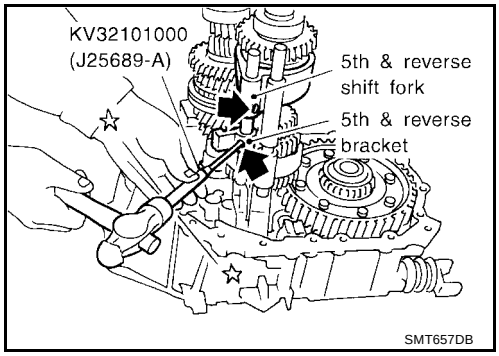
CAUTION:
Do not reuse retaining pin.



20. Install two check balls.

21. Install interlock pin into 5th & reverse fork rod using Tool.
22. Install reverse switch bracket, 5th & reverse bracket, and fork rod.
23. Install new retaining pin for 5th & reverse shift fork and reverse switch bracket using Tool.

CAUTION:
Do not reuse retaining pin.

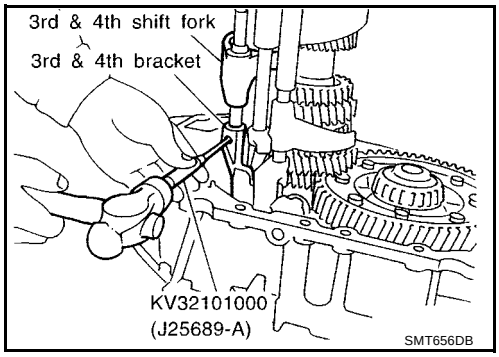


24. Install 5th & reverse bracket stopper ring.

CAUTION:
Do not reuse stopper pin.

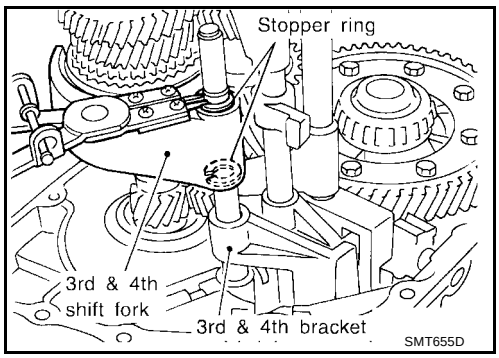
25. Install check ball and interlock plunger.
26. Install 3rd & 4th shift fork, bracket, and fork rod.
27. Install 3rd & 4th bracket retaining pin using Tool.

CAUTION:
Do not reuse retaining pin.



28. Install 3rd & 4th shift fork stopper ring.

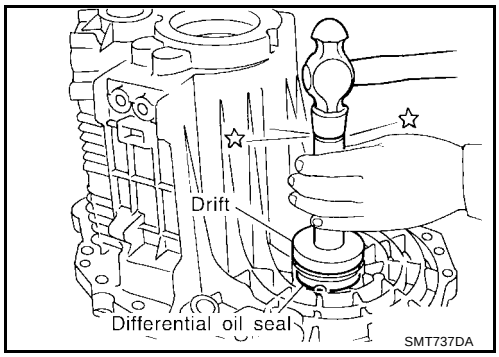
CAUTION:
Do not reuse stopper ring.



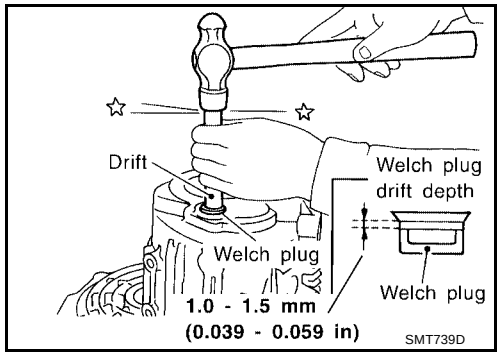
29. Install check ball, check pin, and check spring, and apply Anaerobic Liquid Gasket or equivalent onto the check plug. Then, tighten the check plug to specification.
Refer to MT-22, "SHIFT CONTROL COMPONENTS" .

Transaxle Case

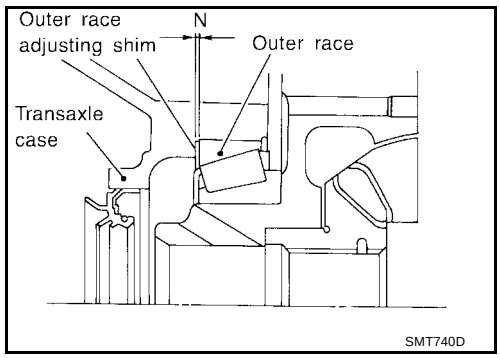
1. Insert differential oil seal into differential case with a suitable tool until it becomes flush with case end face.



2. Install welch plug into transaxle case with a suitable tool.



3. Calculate dimension “N” (thickness of adjusting shim) using the following procedure to satisfy specification of end play for differential side bearing.



End play : 0.15 - 0.21 mm (0.0059 - 0.0083 in)

Dimension “N” = (N1 – N2) + End play

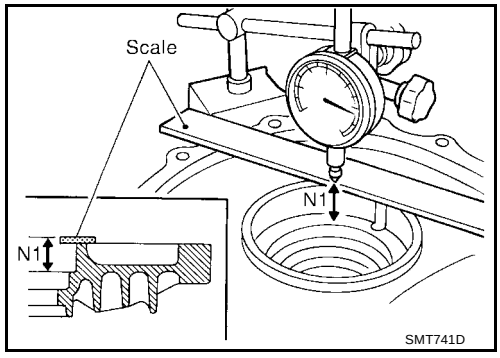
N : Thickness of adjusting shim

N1 : Distance between clutch housing case end face and mounting face of adjusting shim

N2 : Distance between differential side bearing and transaxle case

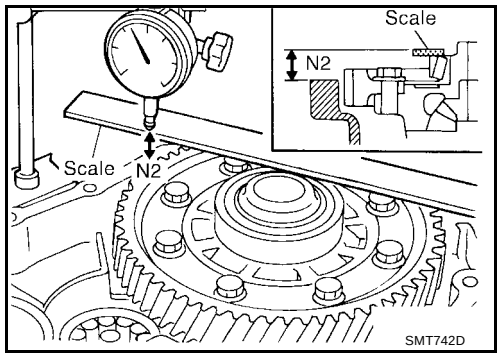
Use the "Available Shims" table for the available shim sizes. Refer to MT-68, "Available Shims — Differential Side Bearing Preload and Adjusting Shim" .

a. Using dial gauge and scale, measure dimension “N1” between clutch housing case end face and mounting face of adjusting shim.

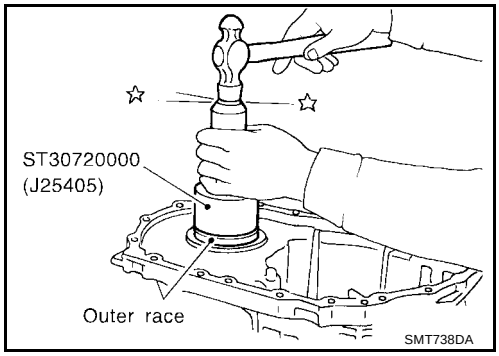


b. Install outer race onto differential side bearing on final gear side. Holding the outer race horizontally by hand, rotate the final gear five times or more (for smooth movement of bearing roller).

c. Using dial gauge and scale as shown, measure dimension “N2” between differential side bearing outer race and transaxle case end face.



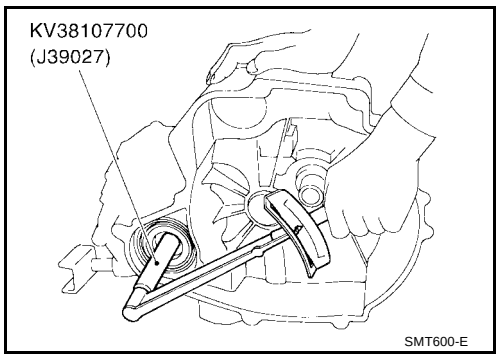
4. Install the selected shim and bearing outer race using Tool.



5. Measure the turning torque of the final drive assembly using Tool.

Turning torque of final drive assembly (New bearing): 2.9 - 6.9 N-m (30 - 70 kg-cm, 26 - 61 in-lb)

- **When the old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure turning torque is close to the specified range.**
- **Changes in turning torque of final drive assembly per revolution should be within 1.0 N-m (10 kg-cm, 8.7 in-lb) without binding.**



6. Calculate dimension “O” (thickness of adjusting shim) using the following procedure to satisfy specification of end play for input shaft rear bearing.

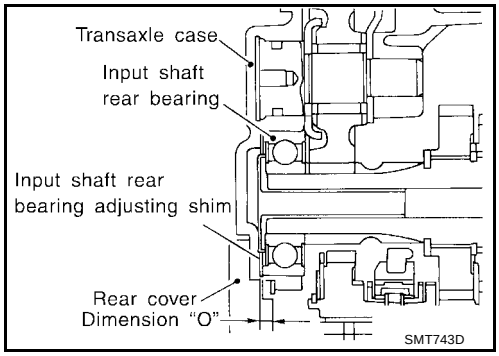
End play: 0 - 0.06 mm (0 - 0.0024 in)

Dimension “O” = (O1 – O2) + End play

O: Thickness of adjusting shim

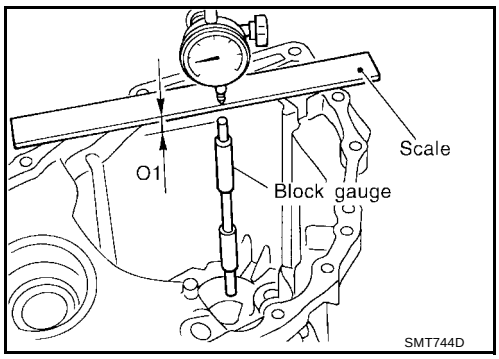
O1: Distance between transaxle case end face and mounting face of adjusting shim

O2: Distance between clutch housing case end face and end face of input shaft rear bearing

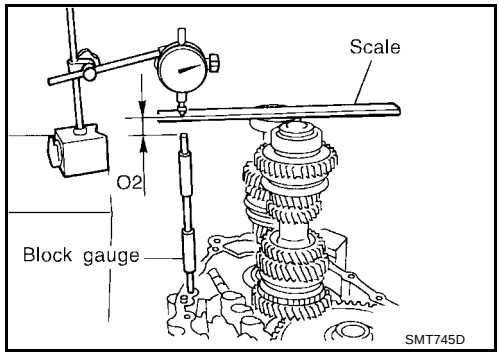


Use the "Available Shims" table for the available shim sizes. Refer to MT-65, "Available Adjusting Shims" .

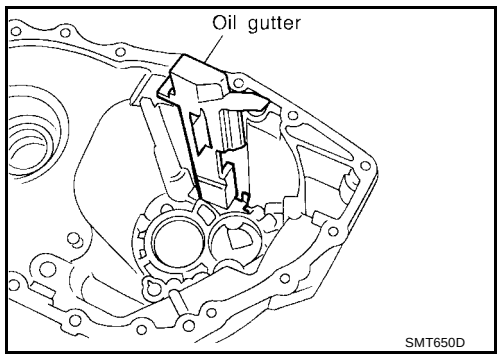
a. Using block gauge, scale, and dial gauge, measure dimension “O1” between transaxle case end face and mounting face of adjusting shim.



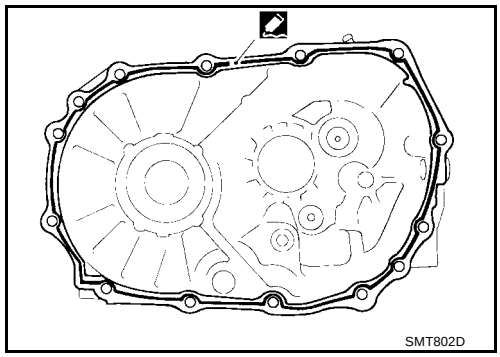
b. Using block gauge, scale, and dial gauge as shown in the figure, measure dimension “O2” between clutch housing case end face and end face of input shaft rear bearing.



7. Install selected input shaft rear bearing adjusting shim onto input shaft.
8. Install oil gutter into transaxle case.

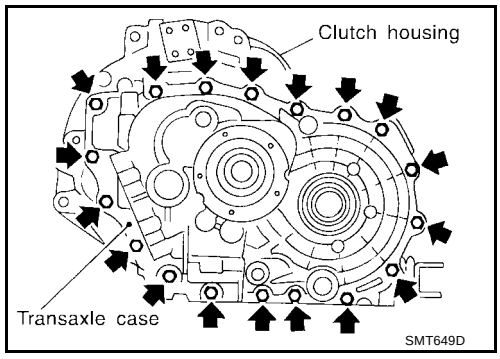


9. Clean mating surfaces of clutch housing and transaxle case. Check for cracks and damage, then apply sealant. Use Genuine Anaerobic Liquid Gasket or equivalent. Refer to GI-44, "Recommended Chemical Products and Sealants" .



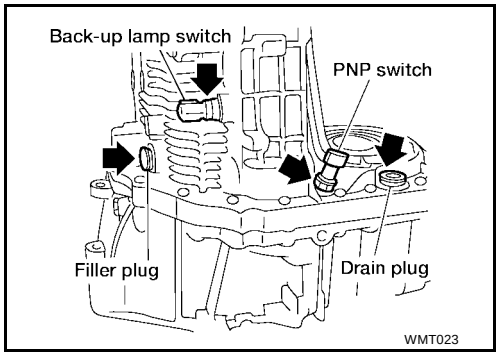
10. Install transaxle case onto clutch housing, and tighten mounting bolts with specified torque.

Transaxle case mounting bolts	**: Refer to MT-20, "CASE COMPONENTS" .**



11. Apply sealant to threads of back-up lamp switch, PNP switch, and drain plug, then install them. Use Genuine Anaerobic Liquid Gasket or equivalent. Refer to GI-44, "Recommended Chemical Products and Sealants" .

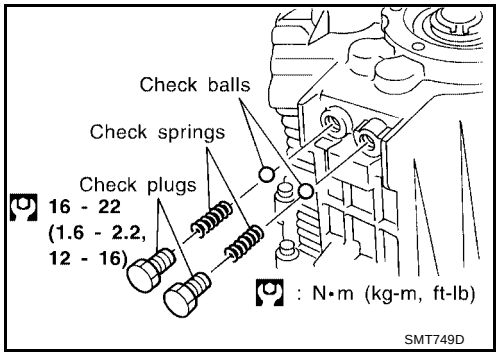
    NOTE:
    Fill the case with oil before installation of filler plug.



12. Install speedometer pinion assembly.

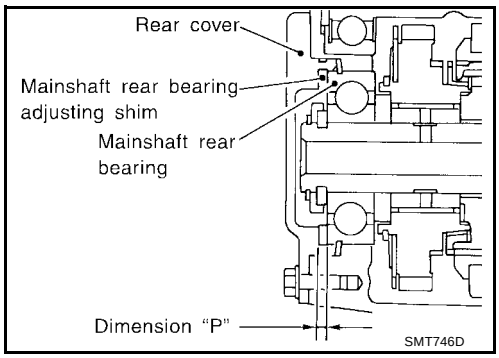
    CAUTION:
    Do not reuse O-ring.

13. Install check springs and check balls. Apply sealant to the thread on the check plug, and install it.



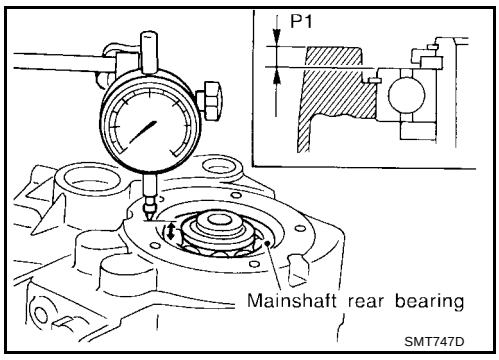
14. Calculate thickness of adjusting shim using the following procedure to satisfy specification of end play for mainshaft rear bearing.

    End play : 0 - 0.06 mm (0 - 0.0024 in)
    Dimension "P" = (P1 – P2) + End play
    P : Thickness of adjusting shim
    P1 : Distance between transaxle case end face and mainshaft rear bearing
    P2 : Distance between adjusting shim end face of rear cover and transaxle mounting face

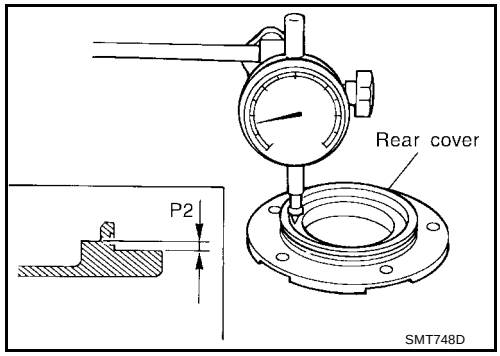


Use the "Available Shims" table for the available shim sizes. Refer to MT-65, "Available Adjusting Shims" .

a. Using dial gauge as shown in the figure, measure dimension "P1" between transaxle case end face and mainshaft rear bearing.

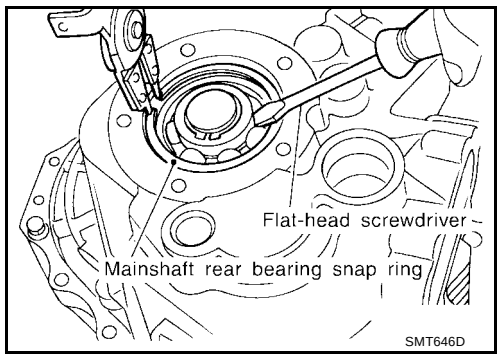


b. Using dial gauge as shown in the figure, measure dimension “P2” between adjusting shim mounting face of rear cover and transaxle mounting face.

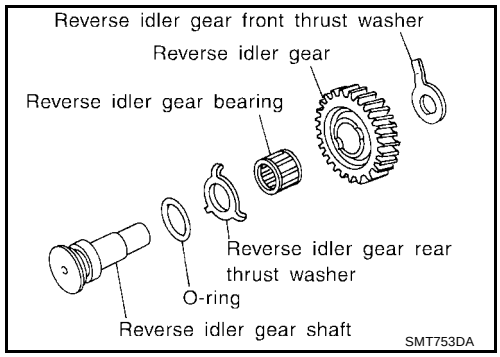


15. Using snap ring pliers and flat-head screwdriver as shown, install snap ring.

CAUTION:
Do not reuse snap ring.



16. Install selected mainshaft adjusting shim.
17. Install reverse idler gear, O-ring, thrust washers (front and rear), and bearing onto reverse idler shaft.



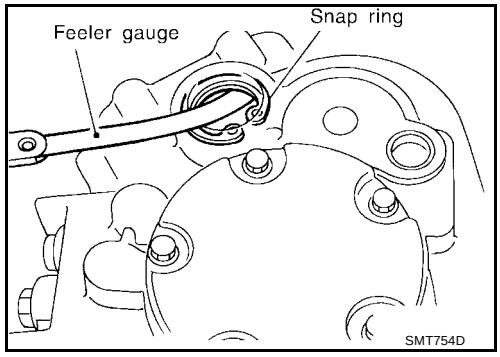
18. Install snap ring into transaxle case using snap ring pliers.

CAUTION:
- **Do not reuse snap ring.**
- **Do not reuse O-ring.**
- **Before installation, apply gear oil to O-ring.**

19. Using feeler gauge, measure the end play of snap ring, and select a snap ring suitable to satisfy the following specification.

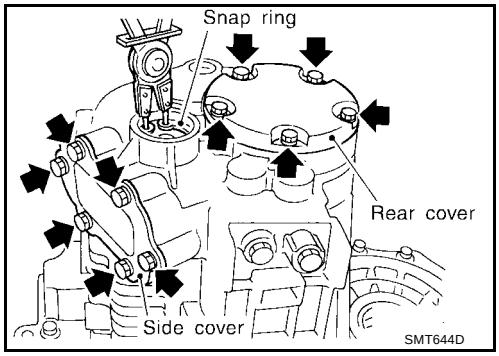
End play : 0.05 - 0.25 mm (0.0020 - 0.0098 in)

Use the "Available Shims" table for the available shim sizes. Refer to MT-64, "Available Snap Rings" .



20. Install selected snap ring with a suitable tool.

    CAUTION:
    Do not reuse snap ring.



21. Apply gear oil to rear cover O-ring, and install rear cover, side cover gasket, and side cover. Then tighten mounting bolts with specified torque.
    Use the "Available Shims" table for the available shim sizes. Refer to MT-20, "CASE COMPONENTS" .

    CAUTION:
    Do not reuse mounting bolts for rear cover and side cover.

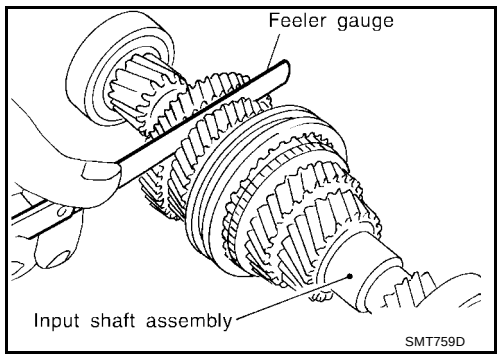
INPUT SHAFT AND GEARS

PFP:32200

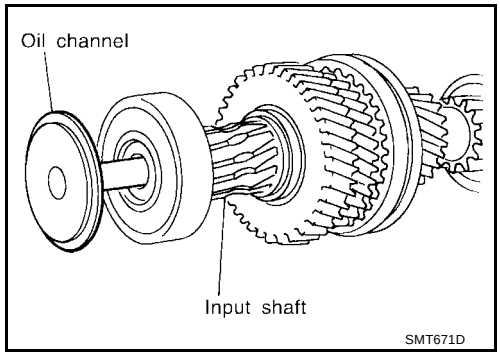
Disassembly

ECS005TQ

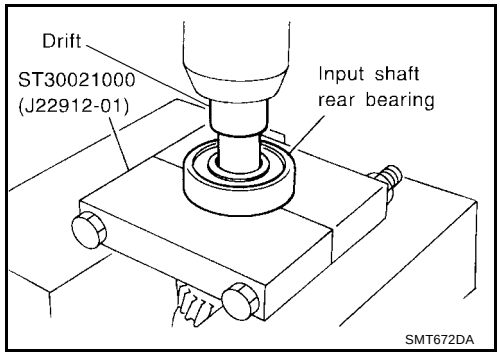
1. Before disassembly, measure the end plays of 3rd and 4th input gears with a suitable tool. Refer to MT-64, "Gear End Play" .
   - If end play is not within specification, disassemble and check the parts.



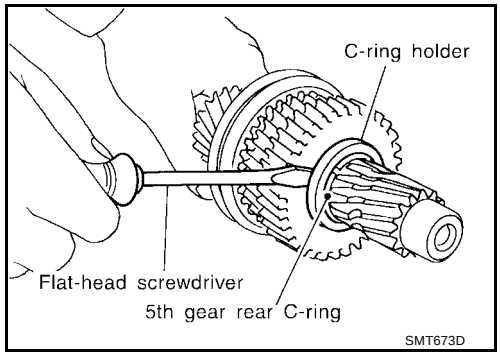
2. Remove oil channel from input shaft rear bearing.



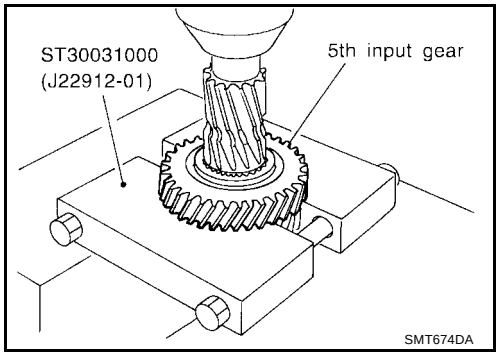
3. Press out input shaft rear bearing using Tool.



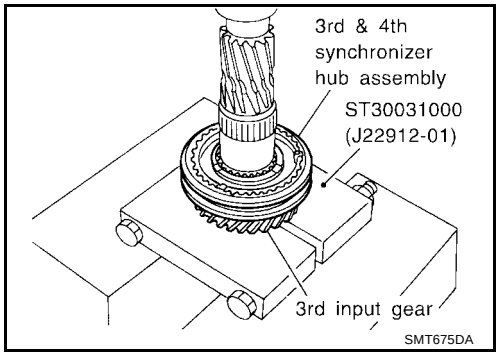
4. Remove C-ring holder.
5. Remove 5th gear rear C-ring.



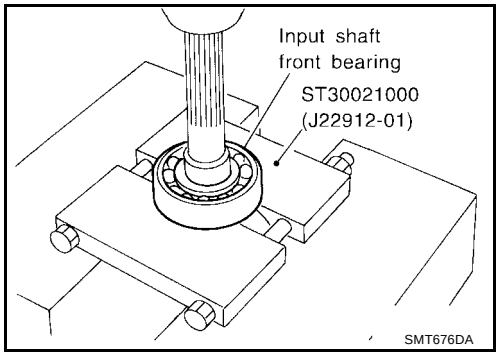
6. Remove 5th input gear from input shaft using Tool.
7. Remove 5th gear front C-ring.



8. Remove 4th input gear, baulk ring, 4th gear needle bearing, and 4th gear C-ring from input shaft.
9. Press out both 3rd & 4th synchronizer hub assembly and 3rd input gear from input shaft using Tool.
10. Remove 3rd gear needle bearing.



11. Press out input shaft front bearing from input shaft using Tool.

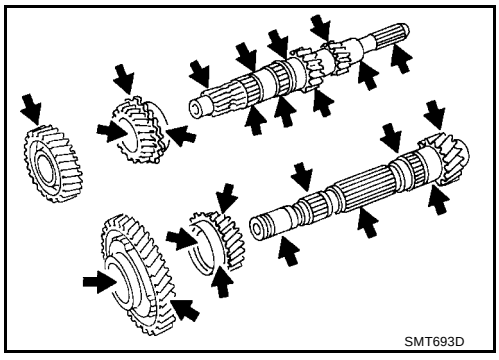


Inspection

ECS005TR

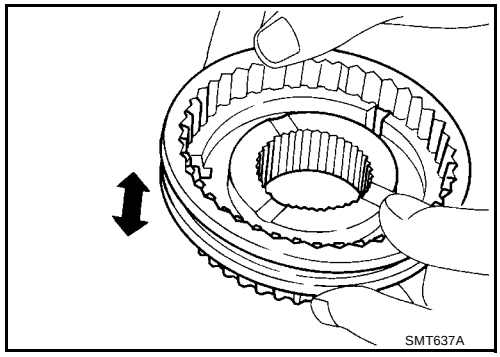
GEAR AND SHAFT

- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

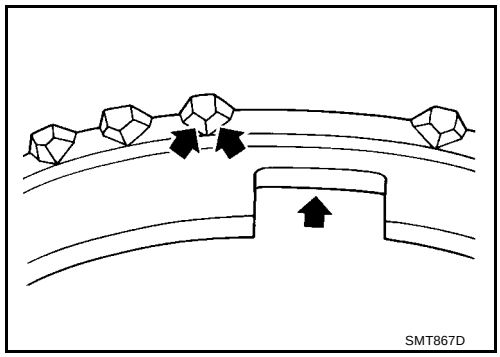


SYNCHRONIZERS

- Check spline area of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for wear or deformation.

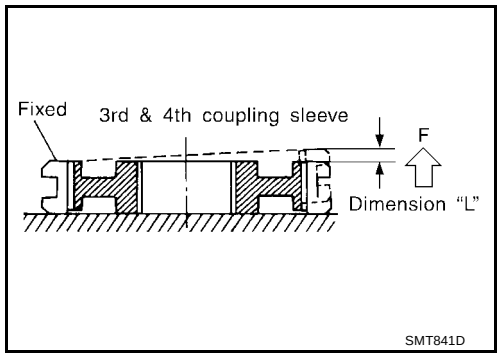


- If any crack, damage, or excessive wear is found on cam face of baulk ring or working face of insert, replace it.

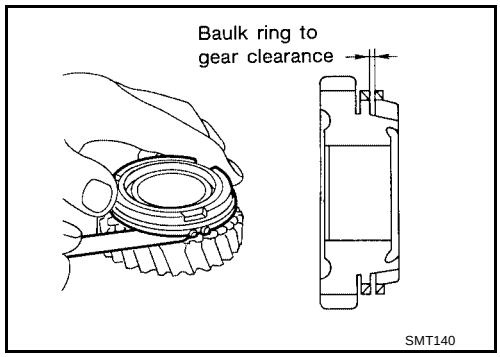


- Measure the movement (free play in dimension “L”) of 3rd & 4th coupling sleeve with the end fixed and the other end lifted as shown in the figure. If the movement exceeds specification, replace the sleeve.

Coupling sleeve	Dimension “L”
3rd & 4th	0 - 0.95 mm (0 - 0.0374 in)

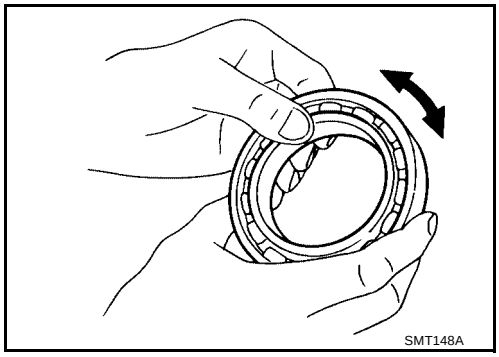


- Measure clearance between baulk ring and gear. Refer to MT-64, "Clearance Between Baulk Ring and Gear" .



BEARING

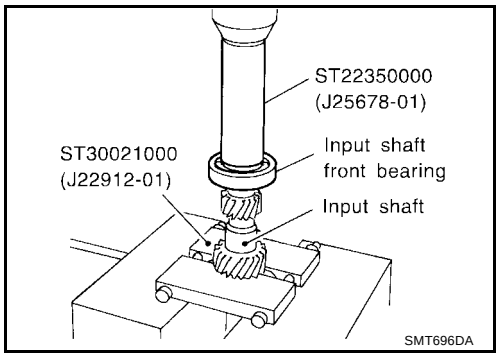
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.



Assembly

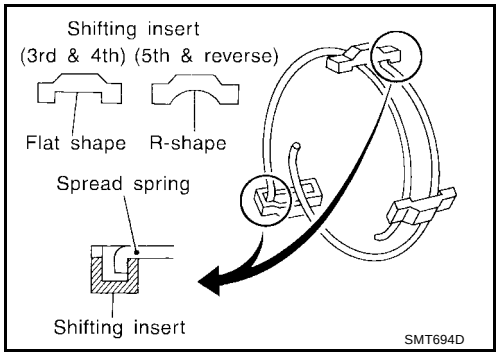
ECS005TS

1. Press on input shaft front bearing using Tool.

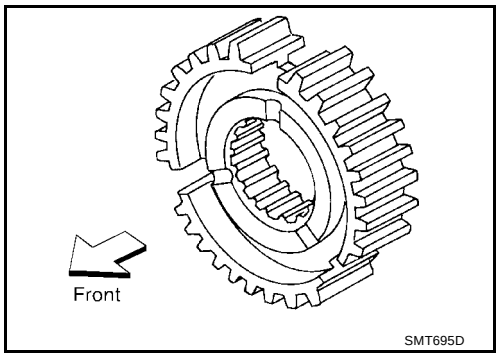


2. Install 3rd gear needle, 3rd input gear and 3rd gear baulk ring bearing to input shaft.
3. Install spread spring, shifting insert, and 3rd & 4th synchronizer hub onto 3rd & 4th coupling sleeve.
   - Pay attention to the shape of spread spring and shifting insert for correct assembly.
     Do not install spread spring hook onto the same shifting insert.

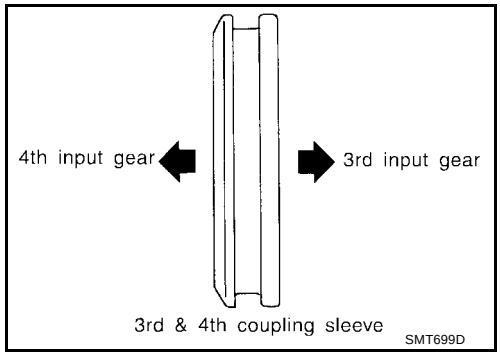
     CAUTION:
     Do not reuse 3rd & 4th synchronizer hub.



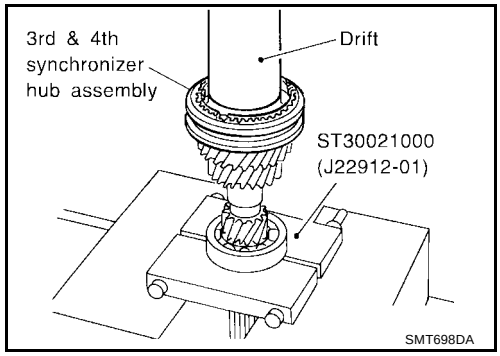
   - Install synchronizer hub with its three grooves facing the front side (3rd input gear side).



- Install 3rd & 4th coupling sleeve with its chamfered surface facing the 4th input gear side.



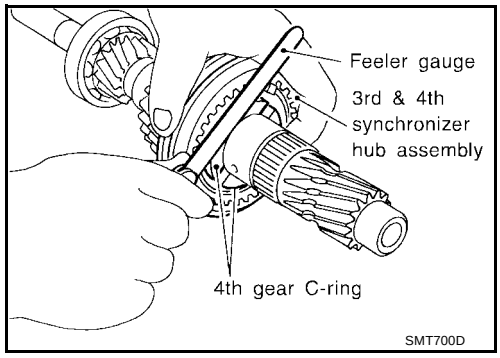
4. Position bearing replacer to the front side of input shaft front bearing.
   - Align grooves of shifting insert and 3rd gear baulk ring. Then, press it onto 3rd & 4th synchronizer hub assembly using a drift.



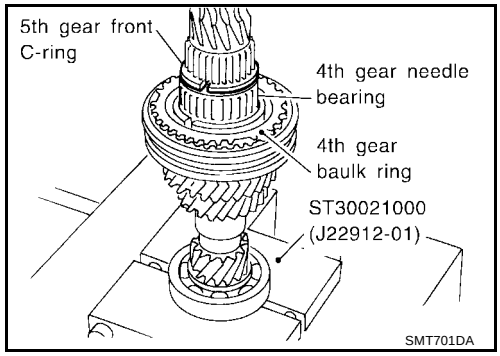
5. Install 4th gear C-ring onto input shaft using Tool.
6. Measure the end play of 3rd & 4th synchronizer hub with a suitable tool, and check if it is within allowable specification.

   End play : 0 - 0.06 mm (0 - 0.0024 in)

7. If not within specification, adjust the end play by changing thickness of 4th (input) gear C-ring. Refer to MT-64, "Available C-rings" .

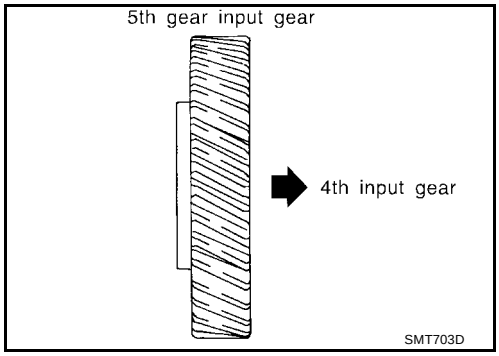


8. Install 4th gear needle bearing, 4th gear baulk ring, and 5th gear front C-ring.



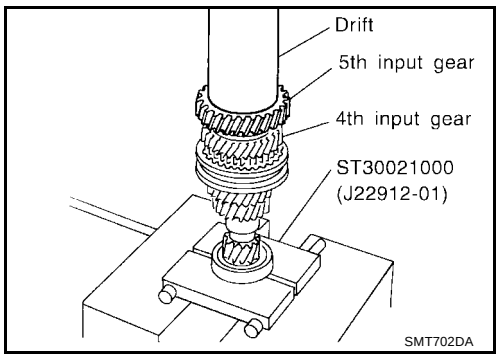
9. Install 4th input gear using Tool.

10. Position 5th input gear as shown, to install it on input shaft.



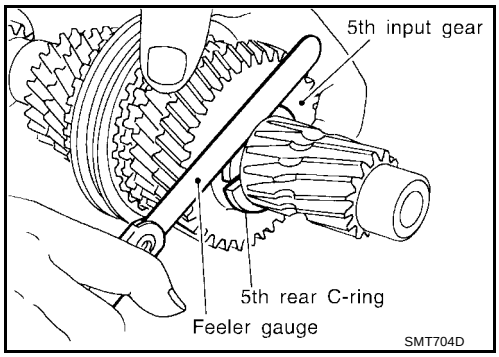
11. Install 5th input gear using Tool as shown.

CAUTION:
Do not reuse 5th input gear.



12. Install 5th gear rear C-ring onto input shaft using Tool.
13. Measure the end play of 5th input gear with a suitable tool, and check if it is within the allowable specification below.

End play : 0 - 0.06 mm (0 - 0.0024 in)

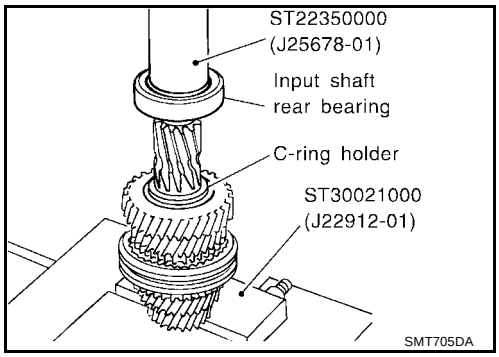


14. If not within specification, adjust the end play by changing thickness of the 5th (input gear) rear C-ring. Refer to MT-64, "Available C-rings" .
15. Install C-ring holder onto 5th gear rear C-ring using Tool.

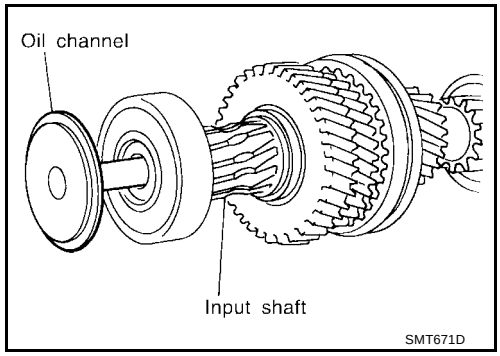
CAUTION:
Do not reuse C-ring holder.

16. Install input shaft rear bearing using Tool.

CAUTION:
Install input shaft rear bearing with its brown surface facing the input gear side.



17. Install oil channel onto input shaft.



18. Measure gear end play as a final check. Refer to MT-64, "Gear End Play" .

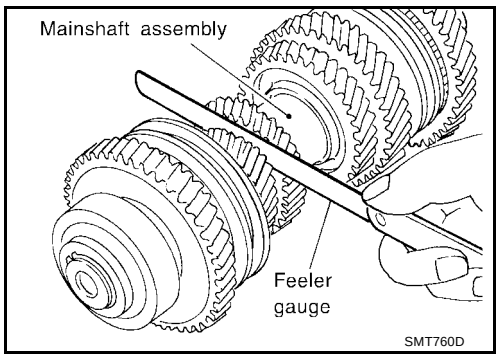
MAINSHAFT AND GEARS

PFP:32241

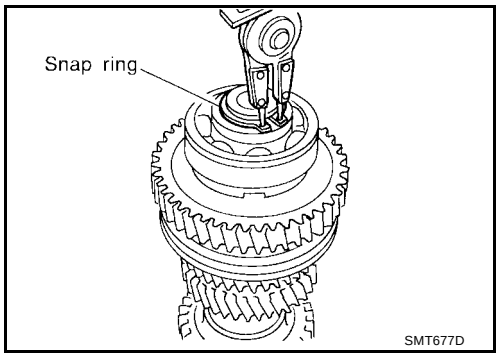
Disassembly

ECS005TT

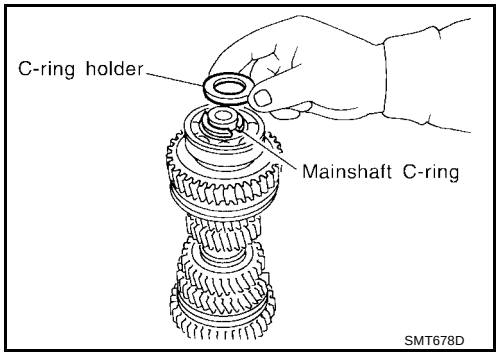
1. Before disassembly, measure gear end play with a suitable tool. Refer to MT-64, "Gear End Play" .
   - If end play is not within the specified limit, disassemble and check the parts.



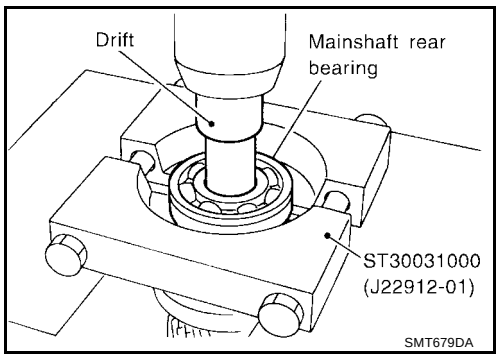
2. Remove snap ring with a suitable tool.



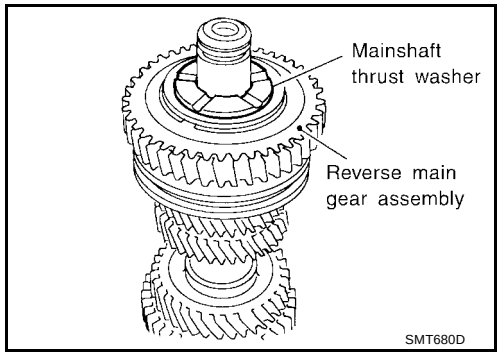
3. Remove C-ring holder and mainshaft C-ring.



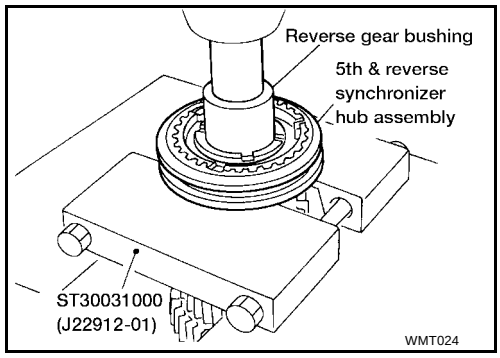
4. Press out mainshaft rear bearing from mainshaft using Tool.



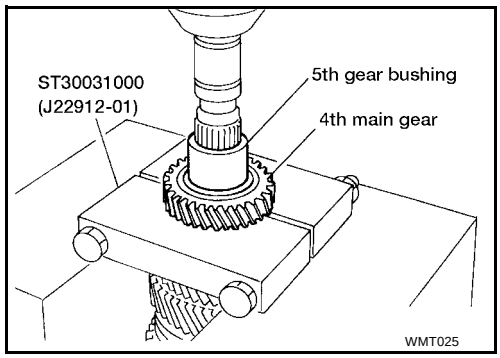
5. Remove mainshaft thrust washer.



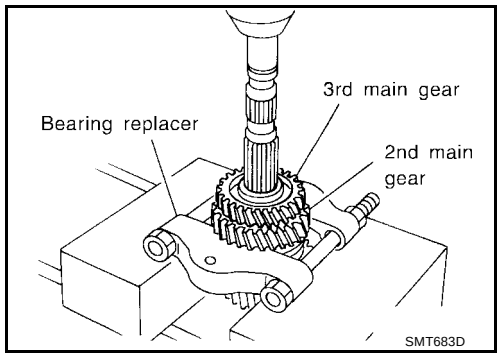
6. Remove snap ring from mainshaft. Then, remove reverse main gear assembly, reverse gear needle bearing, and reverse gear baulk ring.
7. Place bearing replacer between 5th & reverse synchronizer hub and 5th main gear, and press out both reverse gear bushing and 5th & reverse synchronizer assembly using Tool.



8. Remove 5th main gear, 5th gear baulk ring, and 5th gear needle bearing.
9. Place bearing replacer between 3rd and 4th main gears, and press out both 5th gear bushing and 4th main gear using Tool.

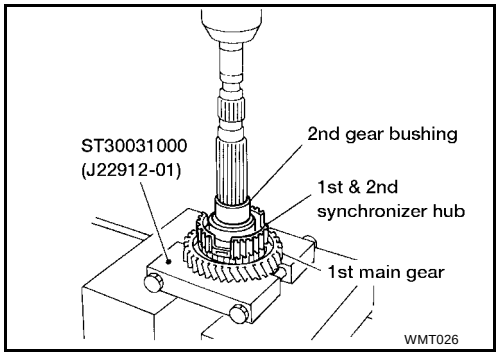


10. Remove mainshaft adjusting shim and spacer.



11. Place bearing replacer between 2nd main gear and 1st & 2nd synchronizer hub, and press out both 3rd and 2nd main gears.
12. Remove 2nd double cone assembly, 2nd gear bushing, and coupling sleeve assembly.

13. Place bearing replacer on 1st gear front side, and press out all of 2nd gear bushing, 1st & 2nd synchronizer hub, 1st main gear, and 1st double cone using Tool.



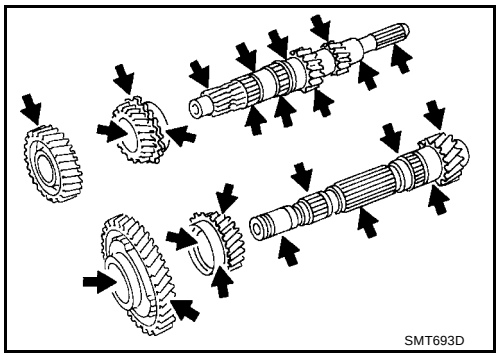
14. Remove 1st gear needle bearing.

Inspection

ECS005TU

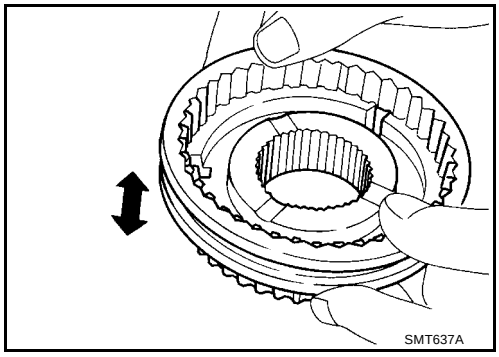
GEAR AND SHAFT

- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

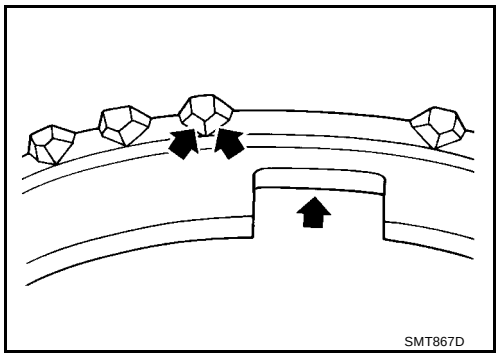


SYNCHRONIZERS

- Check spline area of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for wear or deformation.

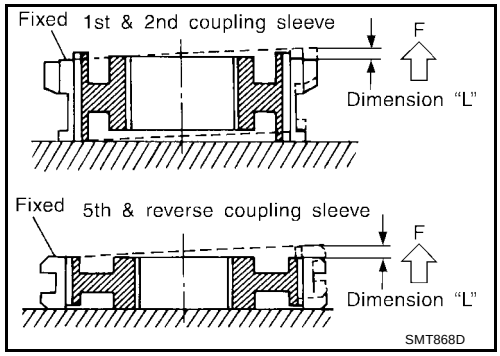


- If any crack, damage, or excessive wear is found on cam face of baulk ring or working face of insert, replace it.

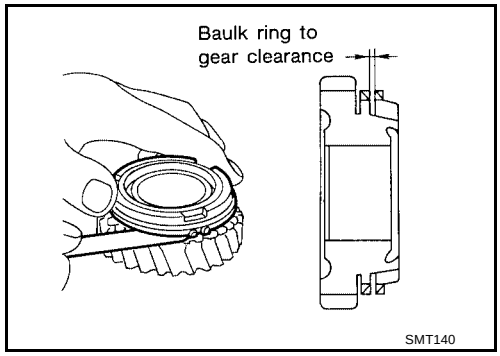


- Measure the movement (play, dimension “L”) of 1st & 2nd coupling sleeve and 5th & reverse coupling sleeve with their end fixed and the other end lifted as shown in the figure. If the movement exceeds specification, replace the sleeve.

Coupling sleeve	Length “L”
1st & 2nd	0 - 0.68 mm (0 - 0.0268 in)
5th & Reverse	0 - 0.89 mm (0 - 0.0350 in)

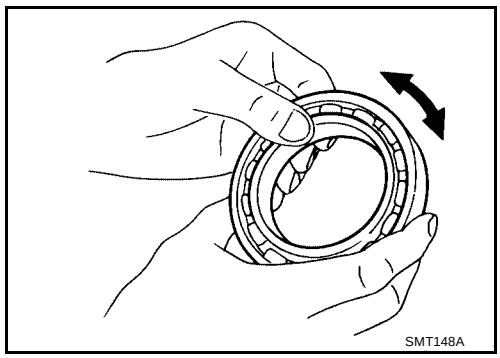


- Measure clearance between baulk ring and gear. Refer to MT-64, "Clearance Between Baulk Ring and Gear" .

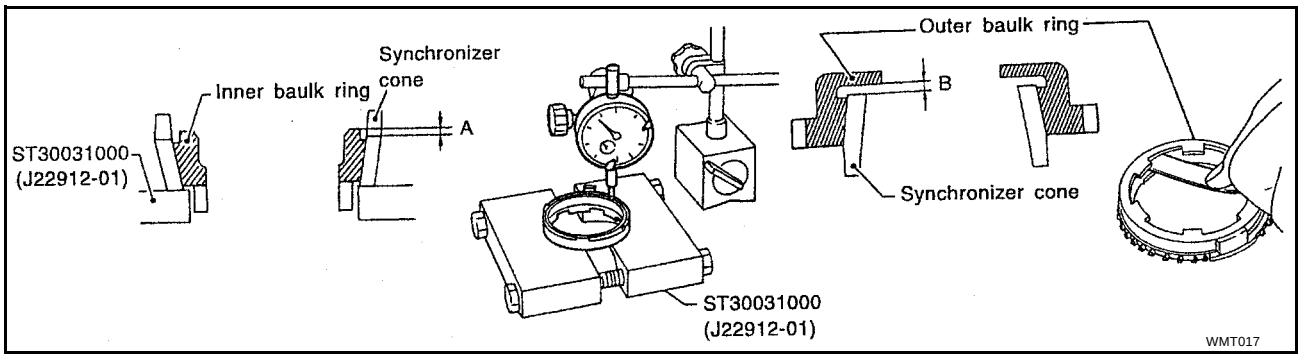


BEARING

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.



- Measure wear of inner and outer baulk ring as shown.



- Place baulk rings in position on synchronizer cone.
- While holding baulk ring against synchronizer cone as far as it will go, measure dimensions “A” and “B” using Tool.

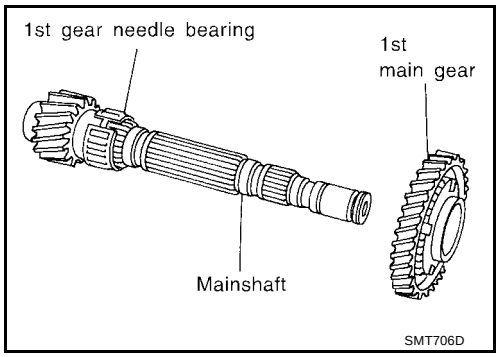
Standard **"A": 0.6 - 0.8 mm (0.024 - 0.031 in)**
"B": 0.6 - 1.1 mm (0.024 - 0.043 in)
Wear limit **: 0.2 mm (0.008 in)**

- **If dimension “A” or “B” is smaller than the wear limit, replace outer baulk ring, inner baulk ring and synchronizer cone as a set.**

Assembly

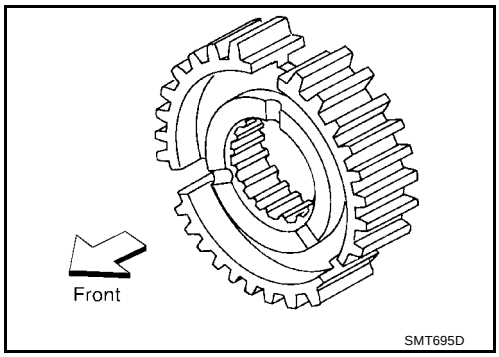
ECS005TV

1. Install 1st gear needle bearing and 1st main gear onto mainshaft.

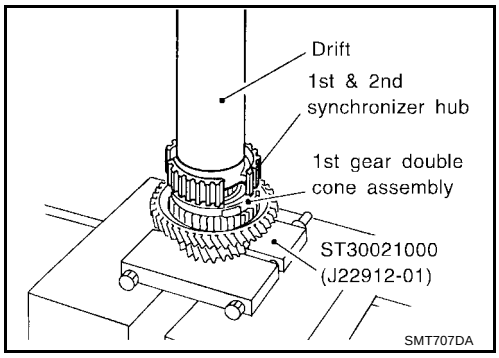


2. Install 1st double cone assembly onto mainshaft.
3. Install 1st & 2nd synchronizer hub with its three grooves facing the front side (1st main gear side) onto mainshaft.

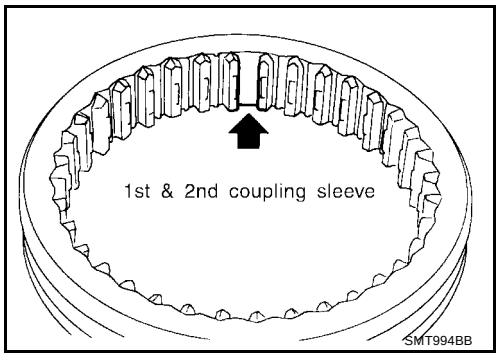
CAUTION:
Do not reuse 1st & 2nd synchronizer hub.



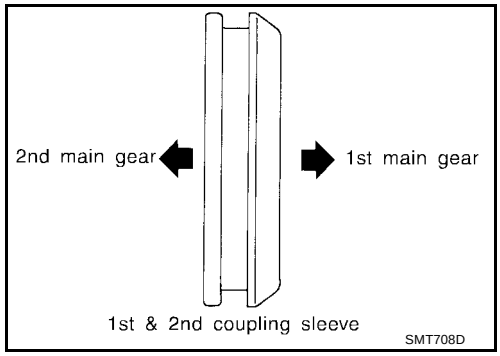
4. Install 1st & 2nd synchronizer hub using Tool.



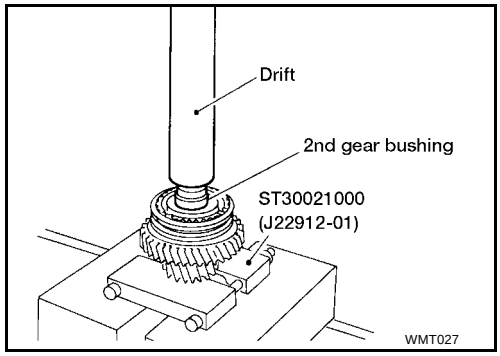
5. Install insert spring onto 1st & 2nd coupling sleeve.



6. Install 1st & 2nd coupling sleeve with its chamfered surface facing the 1st main gear side onto 1st & 2nd synchronizer hub.

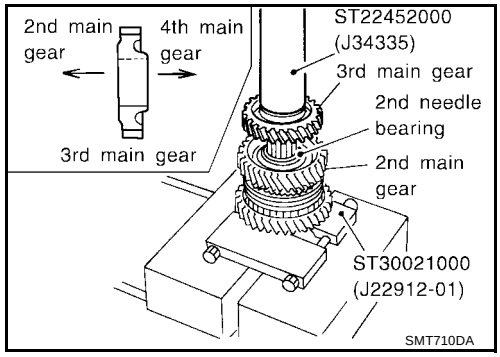


7. Install 2nd gear bushing with its flange surface facing 1st & 2nd synchronizer hub side using Tool.



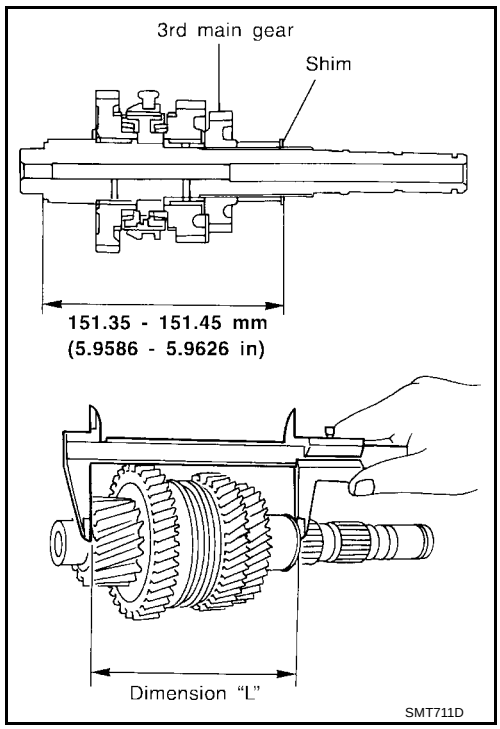
8. Install 2nd needle bearing, 2nd double cone assembly, and 2nd main gear onto mainshaft using Tool.
9. Position 3rd main gear as shown, and install it using Tool.

CAUTION:
Do not reuse 3rd main gear.

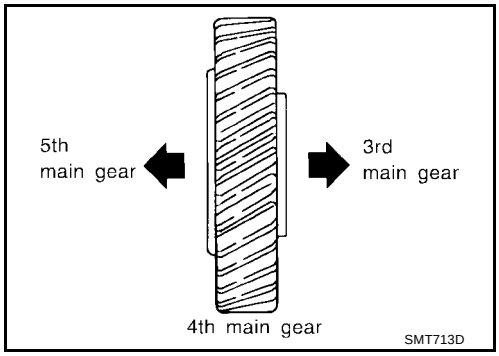


10. Install spacer and mainshaft adjusting shim onto mainshaft.
11. Select a mainshaft adjusting shim suitable to satisfy the following specification of dimension “L” and install it onto mainshaft.

Specification of dimension “L”	**: 151.35 - 151.45 mm (5.9586 - 5.9626 in)**
Mainshaft adjusting shims	**: Refer to MT-65, "Available Adjusting Shims" .**

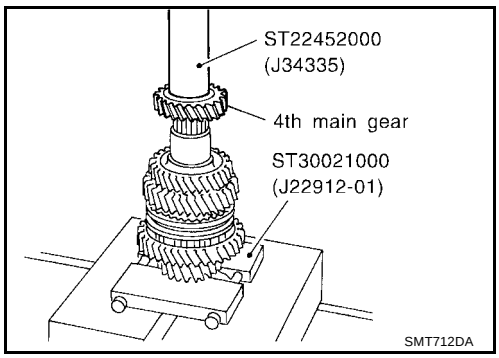


12. Position 4th main gear as shown, and install it onto mainshaft.

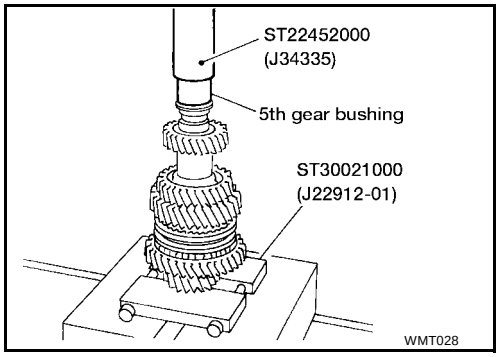


13. Install 4th main gear onto mainshaft using Tool.

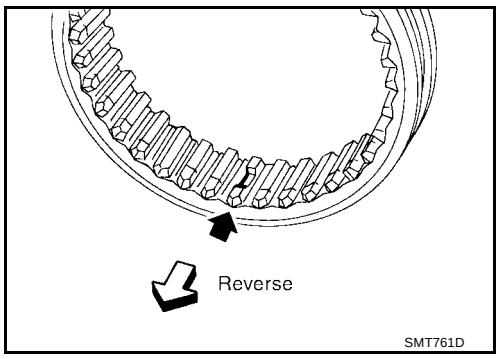
CAUTION:
Do not reuse 4th main gear.



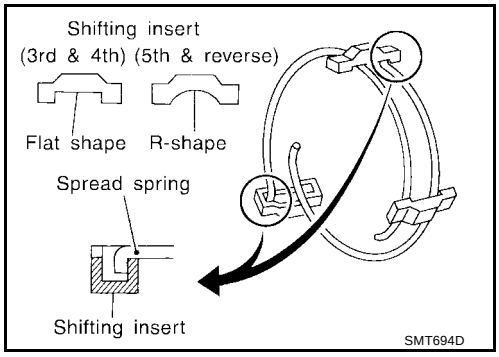
14. Install 5th gear bushing with its flange surface facing the 4th main gear side using Tool.



15. Install 5th needle bearing, 5th main gear, and 5th gear baulk ring onto mainshaft.

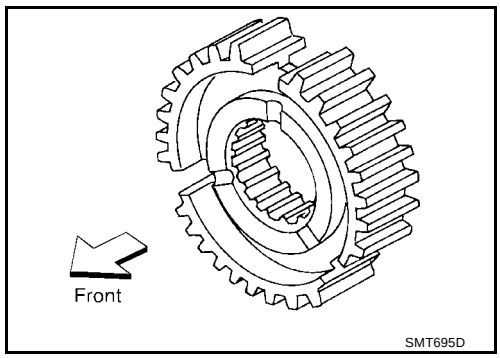


16. Being careful of the following points, install spread spring, shifting insert, and 5th & reverse synchronizer hub onto 5th & reverse coupling sleeve.

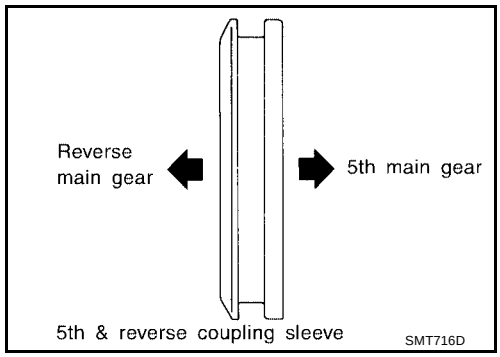


- Pay attention to the shape of spread spring and shifting insert for correct assembly.
  Do not install spread spring hook onto the same shifting insert.
- Install synchronizer hub with its three grooves facing the front side (5th main gear side).

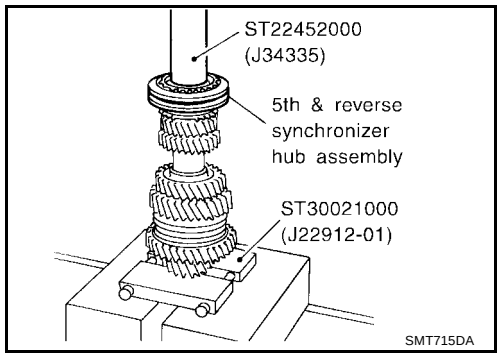
CAUTION:
Do not reuse 5th & reverse synchronizer hub.



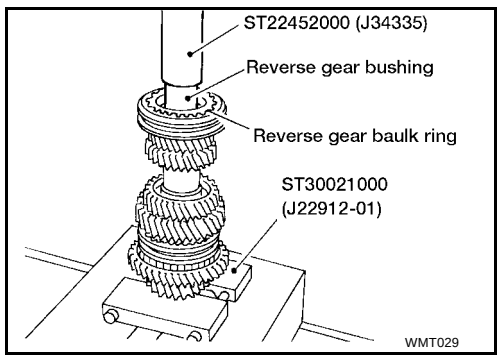
- Install 5th & reverse coupling sleeve with its chamfered surface facing the reverse main gear side.



17. Install 5th & reverse synchronizer hub assembly using Tool.

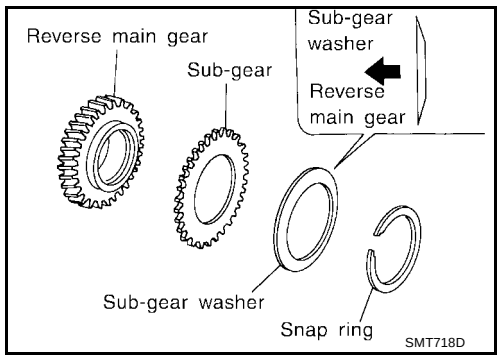


18. Install reverse gear baulk ring using Tool.
19. Install reverse gear bushing using Tool.
20. Install reverse gear needle bearing using Tool.



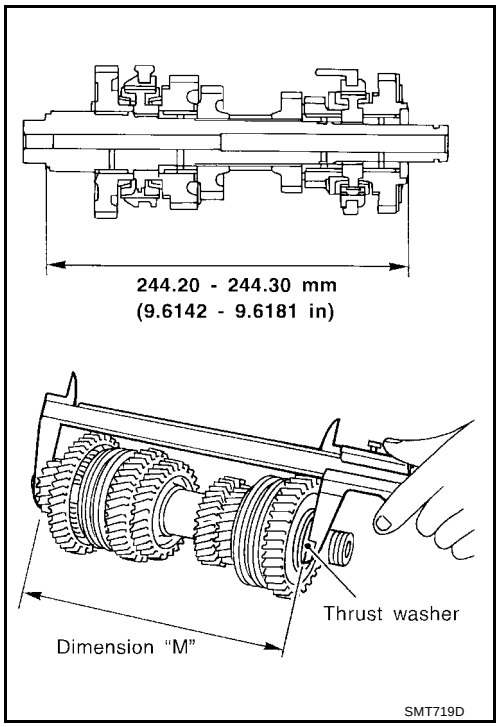
21. Install sub-gear, sub-gear washer, and snap ring onto reverse main gear.

CAUTION:
- **Pay attention to direction of sub-gear washer.**
- **Do not reuse snap ring.**

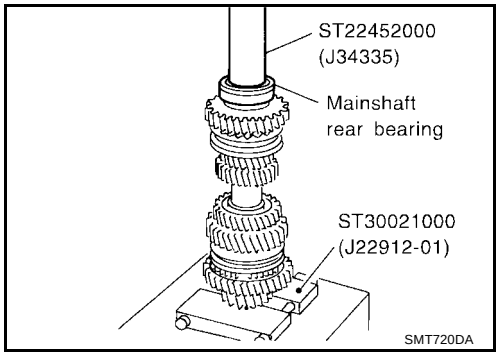


22. Install reverse main gear assembly onto mainshaft.
23. Select a thrust washer suitable to satisfy the following specification of dimension “M” as shown, and install it onto mainshaft.

Specification of dimension “M”	**: 244.20 - 244.30 mm (9.6142 - 9.6181 in)**
Available thrust washers	**: Refer to MT-67, "Available Thrust Washer" .**

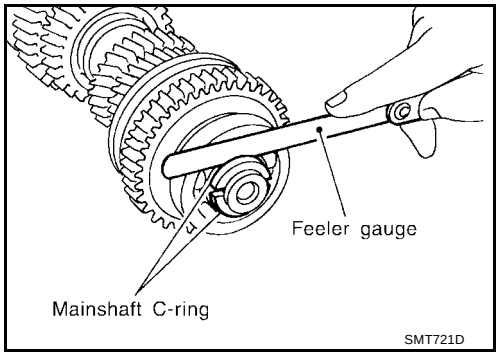


24. Install mainshaft rear bearing using Tool.

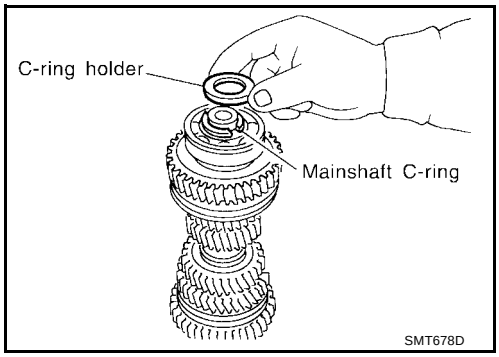


25. Install mainshaft C-ring.
26. Using feeler gauge, measure the end play of mainshaft rear bearing with a suitable tool, and check if it satisfies the following specification.

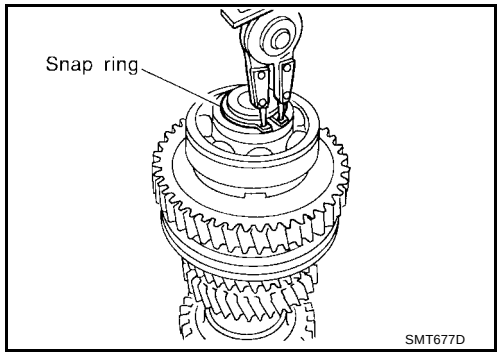
End play	**: 0 - 0.06 mm (0 - 0.0024 in)**
Mainshaft C-rings	**: Refer to MT-64, "Available C-rings" .**



27. Install C-ring holder.



28. Install snap ring with a suitable tool.



29. Measure gear end play as a final check. Refer to MT-64, "Gear End Play" .

FINAL DRIVE

PFP:38411

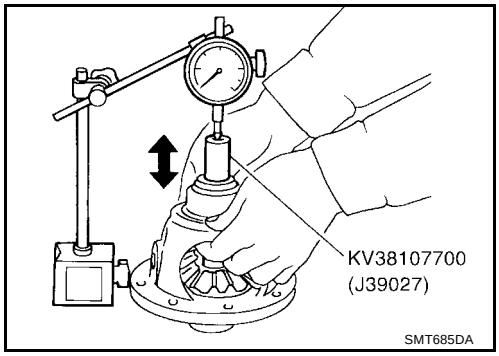
Pre-inspection

ECS005TW

DIFFERENTIAL CASE SIDE

1. Clean final drive assembly sufficiently to prevent side gear thrust washer, differential case, side gear, and other parts from sticking by gear oil.
2. Upright the differential case so that the side gear to be measured faces upward.
3. Place final drive adapter and dial gauge onto side gear. Move side gear up and down, and measure the clearance using Tool.

Clearance between side gear and differential case: 0.1 - 0.2 mm (0.004 - 0.008 in)

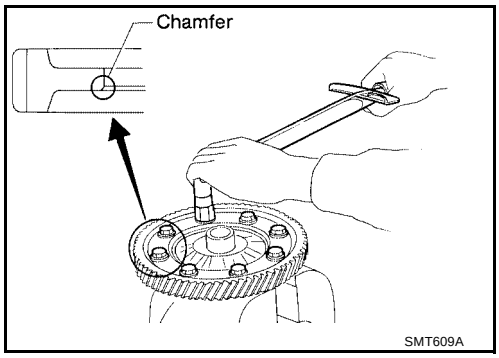


4. If not within specification, adjust the clearance by changing thrust washer thickness.
5. Turn differential case upside down, and measure the clearance between side gear and differential case on the other side in the same way using Tool.

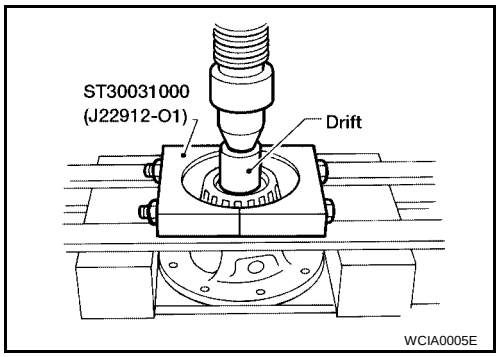
Disassembly

ECS005TX

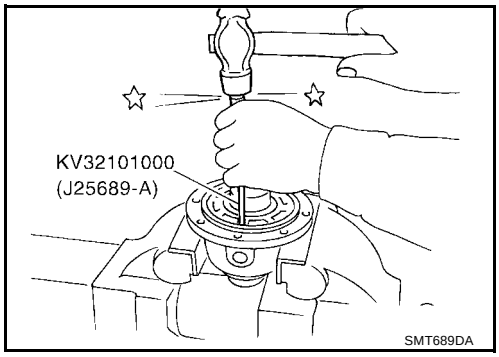
1. Remove the final gear bolts. Then, separate the final gear from differential case.
2. Make a notch and remove speedometer drive gear using a scraper or other suitable tool.
   - **Bearing replacer cannot be positioned unless speedometer drive gear is removed.**



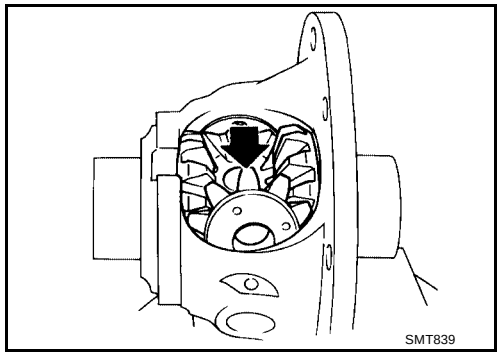
3. Remove differential side bearing of final gear side using Tool.
4. Turn differential case upside down, and remove differential side bearing of speedometer drive gear side using Tool.
   - **Be careful not to mix up the differential side bearings.**



5. Remove speedometer stopper.
6. Remove lock pins from pinion mate shaft using Tool.



7. Remove pinion mate shaft.
8. Rotate pinion mate gear, and remove pinion mate gear, pinion mate thrust washer, side gear, and side gear thrust washer from differential case.

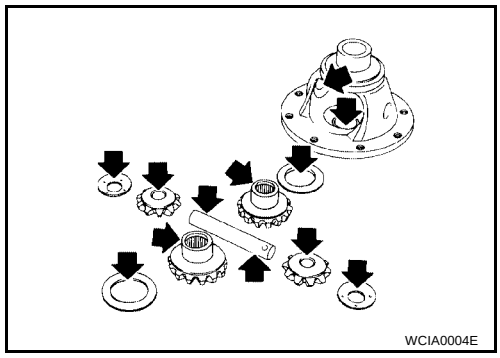

SMT839

Inspection

ECS005TY

GEAR, WASHER, SHAFT AND CASE

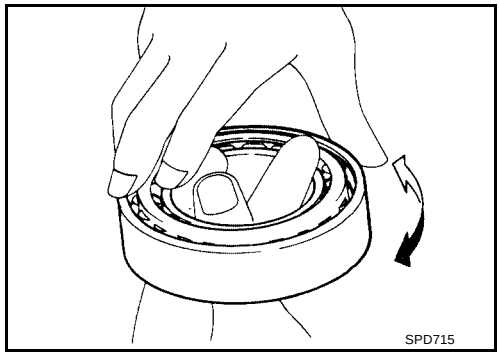
- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.


WCIA0004E

BEARING

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

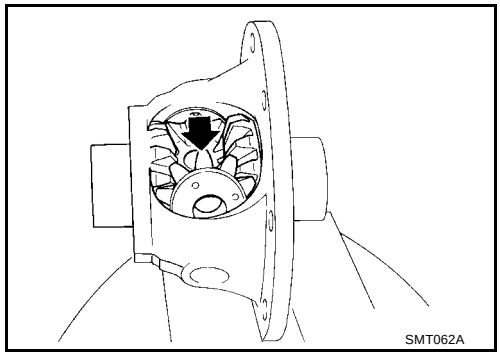
  CAUTION:
  When replacing tapered roller bearing, replace outer and inner race as a set.


SPD715

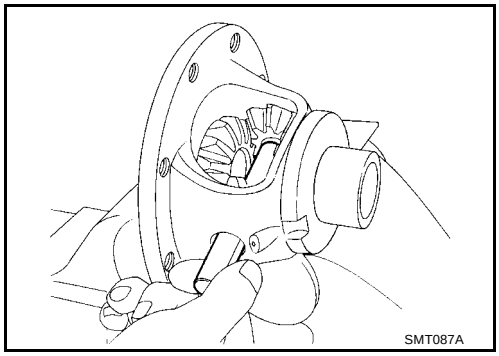
Assembly

ECS005TZ

1. Apply gear oil to sliding area of differential case, each gear, and thrust washer.
2. Install side gear thrust washer and side gear into differential case.
3. Position pinion mate gear and pinion mate thrust washer diagonally, and install them into differential case while rotating.


SMT062A

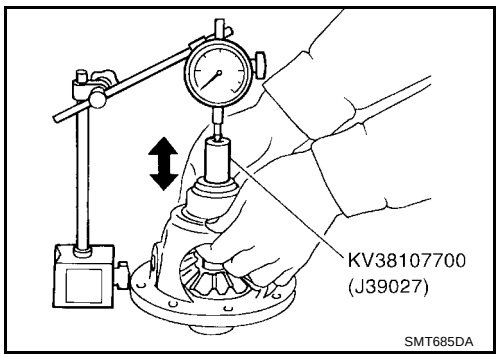
4. Insert pinion mate shaft into differential case.



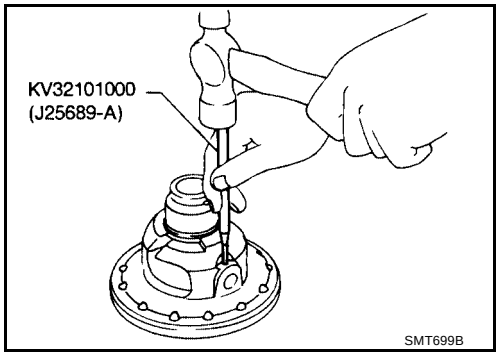
5. Upright the differential case so that its side gear to be measured faces upward.
6. Place preload adapter and dial gauge onto side gear. Move side gear up and down, and measure the clearance using Tool.
7. Turn differential case upside down, and measure the clearance between side gear and differential case on the other side in the same way using Tool.

Clearance of side gear and differential case : **0.1 - 0.2 mm (0.004 - 0.008 in)**

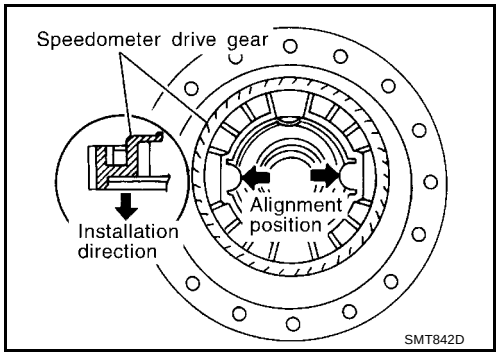
Differential side gear thrust washers : **Refer to MT-67, "Available Washers" .**



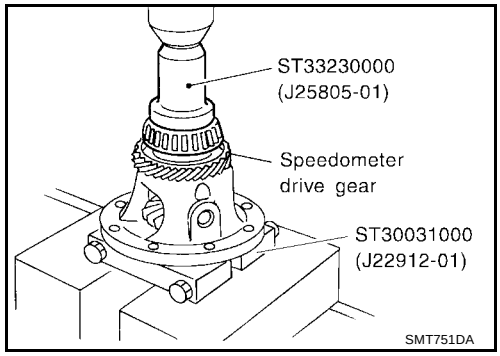
8. Install retaining pin using Tool.
   - **Make sure that retaining pin is flush with case.**



9. Align and install speedometer drive gear into differential case.
10. Install speedometer stopper.

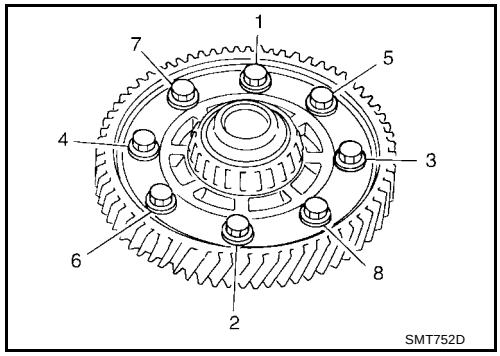


11. Install differential side bearing using Tool.
12. Turn differential case upside down, and install another differential side bearing on the other side in the same way using Tool.



13. Install the final gear into the differential case. Apply sealant onto the final gear bolts, and tighten them in the order as shown to the specified torque.

Final gear bolts **: Refer to MT-23, "FINAL DRIVE COMPONENTS" .**



SHIFT CONTROL

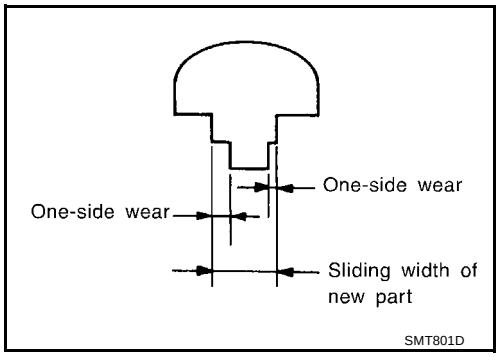
PFP:32982

Inspection

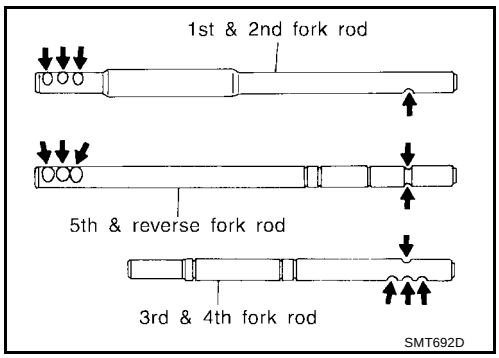
ECS005U0

- Check if the width of shift fork hook (sliding area with coupling sleeve) is within allowable specification below.

Item	One-side wear specification	Sliding width of new part
1st & 2nd	0.2 mm (0.008 in)	7.80 - 7.93 mm (0.3071 - 0.3122 in)
3rd & 4th	0.2 mm (0.008 in)	7.80 - 7.93 mm (0.3071 - 0.3122 in)
5th & reverse	0.2 mm (0.008 in)	7.80 - 7.93 mm (0.3071 - 0.3122 in)



- Check if shift check groove of fork rod or 5th & reverse check groove is worn, or has any other abnormalities.



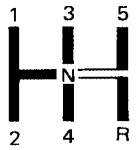
SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

ECS005U1

TRANSAXLE

Engine			QG18DE
Transaxle model			RS5F70A
Number of speeds			5
Synchromesh type			Warner
Shift pattern			
Gear ratio	1st		3.333
	2nd		1.955
	3rd		1.286
	4th		0.926
	5th		0.756
	Reverse		3.214
Number of teeth	Input gear	1st	15
		2nd	22
		3rd	28
		4th	41
		5th	45
		Rev.	14
	Main gear	1st	50
		2nd	43
		3rd	36
		4th	38
		5th	34
		Rev.	45
	Reverse idler gear		37
Oil level (Reference) mm (in)*1			75.5 - 80.5 (2.972 - 3.169)
Oil capacity ℓ (qt)			3.0 (3 1/8)
Remarks			1st & 2nd double baulk ring type synchronizer
			Reverse sub-gear

*1: Refer to MA-13, "Fluids and Lubricants" .

FINAL GEAR

Engine		QG18DE
Transaxle model		RS5F70A
Final gear ratio		4.176
Number of teeth	Final gear/Pinion	71/17
	Side gear/Pinion mate gear	16/10

Gear End Play

ECS005U2

Unit: mm (in)

Gear	End play
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd main gear	
5th main gear	
Reverse main gear	
3rd input gear	
4th input gear	0.17 - 0.44 (0.0067 - 0.0173)

Clearance Between Baulk Ring and Gear

ECS005U3

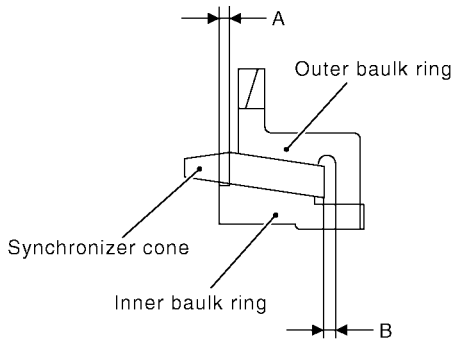
3RD, 4TH, 5TH, REVERSE BAULK RING

Unit: mm (in)

Standard		Wear limit
3rd	0.90 - 1.45 (0.0354 - 0.0571)	0.7 (0.028)
4th		
5th		
Reverse	0.9 - 1.35 (0.0354 - 0.0531)	

1ST AND 2ND BAULK RING

Unit: mm (in)



SMT906D

Dimension	Standard	Wear limit
A	0.6 - 0.8 (0.024 - 0.031)	0.2 (0.008)
B	0.6 - 1.1 (0.024 - 0.043)	

Available Snap Rings

ECS005U4

SNAP RING

End play	0.05 - 0.25 mm (0.0020 - 0.0098 in)
Thickness	Part number*
1.45 mm (0.0571 in)	32204-6J000
1.55 mm (0.0610 in)	32204-6J001
1.65 mm (0.0650 in)	32204-6J002
1.75 mm (0.0689 in)	32204-6J003
1.85 mm (0.0728 in)	32204-6J004

*: Always check with the parts department for the latest information.

Available C-rings

ECS005U5

4TH INPUT GEAR C-RING

End play	0 - 0.06 mm (0 - 0.0024 in)
Thickness	Part number*

3.00 mm (0.1181 in)	32205-6J000
3.03 mm (0.1193 in)	32205-6J001
3.06 mm (0.1205 in)	32205-6J002
3.09 mm (0.1217 in)	32205-6J003
3.12 mm (0.1228 in)	32205-6J004

*: Always check with the parts department for the latest information.

5TH INPUT GEAR REAR C-RING

End play	0 - 0.06 mm (0 - 0.0024 in)
Thickness	Part number*
2.59 mm (0.1020 in)	32205-6J005
2.62 mm (0.1031 in)	32205-6J006
2.65 mm (0.1043 in)	32205-6J007
2.68 mm (0.1055 in)	32205-6J008
2.71 mm (0.1067 in)	32205-6J009
2.74 mm (0.1079 in)	32205-6J010

*: Always check with the parts department for the latest information.

MAINSHAFT C-RING

End play	0 - 0.06 mm (0 - 0.0024 in)
Thickness	Part number*
3.48 mm (0.1370 in)	32348-6J000
3.51 mm (0.1382 in)	32348-6J001
3.54 mm (0.1394 in)	32348-6J002
3.57 mm (0.1406 in)	32348-6J003
3.60 mm (0.1417 in)	32348-6J004
3.63 mm (0.1429 in)	32348-6J005
3.66 mm (0.1441 in)	32348-6J006
3.69 mm (0.1453 in)	32348-6J007
3.72 mm (0.1465 in)	32348-6J008
3.75 mm (0.1476 in)	32348-6J009
3.78 mm (0.1488 in)	32348-6J010
3.81 mm (0.1500 in)	32348-6J011
3.84 mm (0.1512 in)	32348-6J012
3.87 mm (0.1524 in)	32348-6J013
3.90 mm (0.1535 in)	32348-6J014
3.93 mm (0.1547 in)	32348-6J015
3.96 mm (0.1559 in)	32348-6J016

*: Always check with the parts department for the latest information.

Available Adjusting Shims

ECS005U6

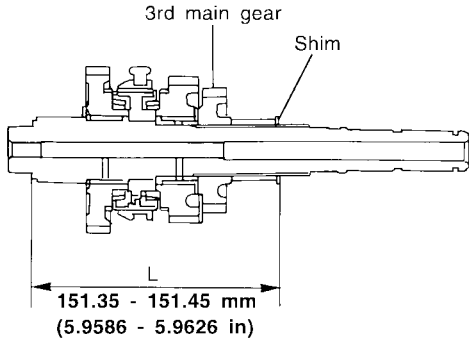
INPUT SHAFT REAR BEARING ADJUSTING SHIM

End play	0 - 0.06 mm (0 - 0.0024 in)
Thickness	Part number*
0.74 mm (0.0291 in)	32225-6J003
0.78 mm (0.0307 in)	32225-6J004
0.82 mm (0.0323 in)	32225-6J005
0.86 mm (0.0339 in)	32225-6J006

0.90 mm (0.0354 in)	32225-6J007
0.94 mm (0.0370 in)	32225-6J008
0.98 mm (0.0386 in)	32225-6J009
1.02 mm (0.0402 in)	32225-6J010
1.06 mm (0.0417 in)	32225-6J011
1.10 mm (0.0433 in)	32225-6J012
1.14 mm (0.0449 in)	32225-6J013
1.18 mm (0.0465 in)	32225-6J014
1.22 mm (0.0480 in)	32225-6J015
1.26 mm (0.0496 in)	32225-6J016
1.30 mm (0.0512 in)	32225-6J017
1.34 mm (0.0528 in)	32225-6J018
1.38 mm (0.0543 in)	32225-6J019
1.42 mm (0.0559 in)	32225-6J020
1.46 mm (0.0575 in)	32225-6J021
1.50 mm (0.0591 in)	32225-6J022
1.54 mm (0.0606 in)	32225-6J023
1.58 mm (0.0622 in)	32225-6J024
1.62 mm (0.0638 in)	32225-6J060
1.66 mm (0.0654 in)	32225-6J061

*: Always check with the parts department for the latest information.

MAINSHAFT ADJUSTING SHIM



SMT907D

Standard length “L”	151.35 - 151.45 mm (5.9586 - 5.9626 in)
Thickness	Part number*
0.48 mm (0.0189 in)	32238-6J000
0.56 mm (0.0220 in)	32238-6J001
0.64 mm (0.0252 in)	32238-6J002
0.72 mm (0.0283 in)	32238-6J003
0.80 mm (0.0315 in)	32238-6J004
0.88 mm (0.0346 in)	32238-6J005

*: Always check with the parts department for the latest information.

MAINSHAFT REAR BEARING ADJUSTING SHIM

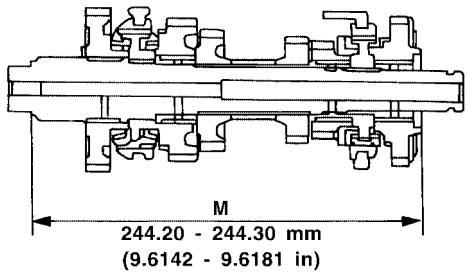
End play	0 - 0.06 mm (0 - 0.0024 in)
Thickness	Part number*
2.99 mm (0.1177 in)	32238-6J010
3.03 mm (0.1193 in)	32238-6J011

3.07 mm (0.1209 in)	32238-6J012
3.11 mm (0.1224 in)	32238-6J013
3.15 mm (0.1240 in)	32238-6J014
3.19 mm (0.1256 in)	32238-6J015
3.23 mm (0.1272 in)	32238-6J016
3.27 mm (0.1287 in)	32238-6J017
3.31 mm (0.1303 in)	32238-6J018
3.35 mm (0.1319 in)	32238-6J019
3.39 mm (0.1335 in)	32238-6J020
3.43 mm (0.1350 in)	32238-6J021
3.47 mm (0.1366 in)	32238-6J022
3.51 mm (0.1382 in)	32238-6J023

*: Always check with the parts department for the latest information.

Available Thrust Washer
MAINSHAFT THRUST WASHER

ECS005U7



SMT843D

Standard length “M”	244.20 - 244.30 mm (9.6142 - 9.6181 in)
Thickness	Part number*
6.04 mm (0.2378 in)	32246-6J000
6.12 mm (0.2409 in)	32246-6J001
6.20 mm (0.2441 in)	32246-6J002
6.28 mm (0.2472 in)	32246-6J003
6.36 mm (0.2504 in)	32246-6J004

*: Always check with the parts department for the latest information.

Available Washers
DIFFERENTIAL SIDE GEAR THRUST WASHER

ECS005U8

Clearance between side gear and differential case	0.1 - 0.2 mm (0.004 - 0.008 in)
Thickness mm (in)	Part number*
0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

*: Always check with the parts department for the latest information.

Available Shims — Differential Side Bearing Preload and Adjusting Shim

ECS005U9

BEARING PRELOAD

Unit: mm (in)

Differential side bearing preload: T*	0.15 - 0.21 (0.0059 - 0.0083)

* Install shims which are “deflection of differential case” + “T” in thickness.

DIFFERENTIAL SIDE BEARING ADJUSTING SHIMS

Thickness mm (in)	Part number*
0.44 (0.0173)	38454-M8000
0.48 (0.0189)	38454-M8001
0.52 (0.0205)	38454-M8002
0.56 (0.0220)	38454-M8003
0.60 (0.0236)	38454-M8004
0.64 (0.0252)	38454-M8005
0.68 (0.0268)	38454-M8006
0.72 (0.0283)	38454-M8007
0.76 (0.0299)	38454-M8008
0.80 (0.0315)	38454-M8009
0.84 (0.0331)	38454-M8010
0.88 (0.0346)	38454-M8011

*: Always check with the parts department for the latest information.

PRECAUTIONS

PFP:00001

Cautions

ECS005UA

- Do not reuse transaxle oil, once it has been drained.
- Check oil level or replace oil with vehicle on level ground.
- During removal or installation, keep inside of transaxle clear of dust or dirt.
- Check for the correct installation status prior to removal or disassembly. If mating marks are required, be certain they do not interfere with the function of the parts they are applied to.
- In principle, tighten bolts or nuts gradually in several steps working diagonally from inside to outside. If tightening sequence is specified, observe it.
- Be careful not to damage sliding surfaces and mating surfaces.

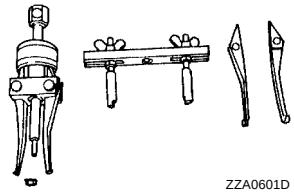
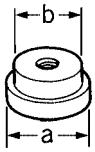
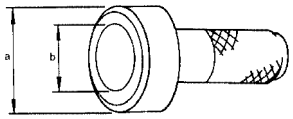
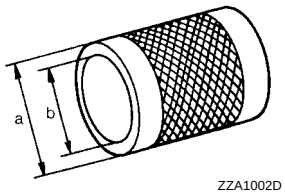
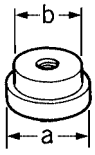
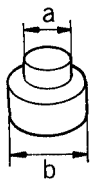
PREPARATION

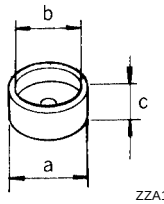
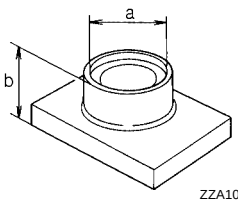
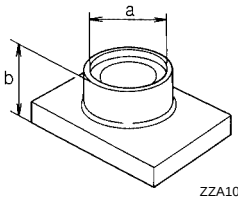
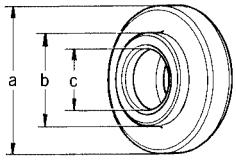
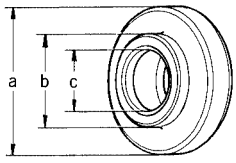
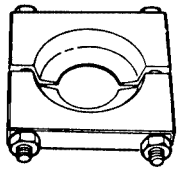
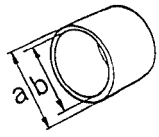
PFP:00002

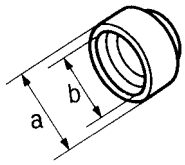
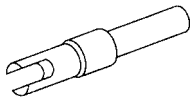
Special Service Tools

ECS005UB

The actual shapes of the Kent-Moore tools may differ from those of the special tools illustrated here.

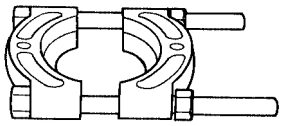
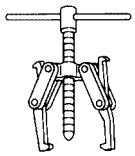
Tool number (Kent-Moore No.) Tool name	Description
KV381054S0 (J34286) Puller  ZZA0601D	Side bearing outer race removal Main shaft front bearing removal
ST35321000 (—) Drift  ZZA1000D	Input shaft oil seal installation Reverse main gear installation 1st bushing installation 1st-2nd synchronizer hub installation 2nd bushing installation 3rd main gear installation **a: 49 mm (1.93 in) dia.** **b: 41 mm 1.61 in) dia.**
ST30720000 (J25405) Drift  ZZA0811D	Differential oil seal installation Differential side bearing outer race installation Mainshaft rear bearing installation Differential side bearing installation **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**
ST33200000 (J26082) Drift  ZZA1002D	Mainshaft front bearing installation 4th main gear installation 5th main gear installation **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**
ST33061000 (J8107-2) Drift  ZZA1000D	Bore plug installation Differential side bearing removal **a: 38 mm (1.50 in) dia.** **b: 28.5 mm (1.122 in) dia.**
ST33052000 (—) Drift  ZZA1023D	Welch plug installation Input shaft rear bearing removal Input shaft bearing spacer and 5th stopper removal 5th bushing, thrust washer, 4th input gear, 4th gear bushing, 3rd-4th synchronizer hub and 3rd input gear removal Input shaft front bearing installation Mainshaft rear bearing removal 4th main gear and 5th main gear removal **a: 22 mm (0.87 in) dia.** **b: 28 mm (1.10 in) dia.**

Tool number (Kent-Moore No.) Tool name		Description
KV40105020 (—) Drift	 ZZA1133D	5th input gear and synchronizer hub removal 3rd main gear, 2nd main gear, 2nd bushing, 1st-2nd synchronizer hub, 1st main gear, reverse main gear and 1st bushing removal **a: 39.7 mm (1.563 in) dia.** **b: 35 mm (1.38 in) dia.** **c: 15 mm (0.59 in).**
KV40105710 (—) Press stand	 ZZA1058D	3rd-4th synchronizer hub installation 4th bushing installation 5th bushing installation 5th synchronizer hub installation 2nd bushing installation 3rd main gear installation **a: 46 mm (1.81 in) dia.** **b: 41 mm (1.61 in).**
ST38220000 (—) Press stand	 ZZA1058D	Reverse main gear installation 1st bushing installation 1st-2nd synchronizer hub installation **a: 63 mm (2.48 in) dia.** **b: 65 mm (2.56 in).**
ST30032000 (J26010-01) Drift	 ZZA0978D	5th stopper and input shaft bearing spacer installation Input shaft front bearing installation **a: 63 mm (2.48 in) dia.** **b: 38 mm (1.50 in) dia.** **c: 31 mm (1.22 in) dia.**
ST30901000 (J26010-01) Drift	 ZZA0978D	Input shaft rear bearing installation 4th main gear installation 5th main gear installation Mainshaft rear bearing installation **a: 79 mm (3.11 in) dia.** **b: 45 mm (1.77 in) dia.** **c: 35.2 mm (1.386 in) dia.**
ST30031000 (J22912-01) Puller	 ZZA0537D	Measuring wear of 1st and 2nd baulk ring
KV40101630 (J35870) Drift	 ZZA1003D	Reverse main gear installation **a: 68 mm (2.68 in) dia.** **b: 60 mm (2.36 in) dia.**

Tool number (Kent-Moore No.) Tool name	Description
KV38102510 (—) Drift  ZZA0838D	1st bushing installation 1st-2nd synchronizer hub installation Differential side bearing installation **a: 71 mm (2.80 in) dia.** **b: 65 mm (2.56 in) dia.**
(J39713) Preload adapter  NT087	Checking differential side gear end play

Commercial Service Tools

ECS005UC

Tool name	Description
Puller  ZZB0823D	Each bearing gear and bushing removal
Puller  NT077	Each bearing gear and bushing removal
Pin punch ZZA0815D	Each retaining pin removal and installation **Tip: 4.5 mm (0.177 in) dia.**

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

ECS005UD

Use the chart below to help you find the cause of the symptom. The numbers indicate the order of the inspection. If necessary, repair or replace these parts.

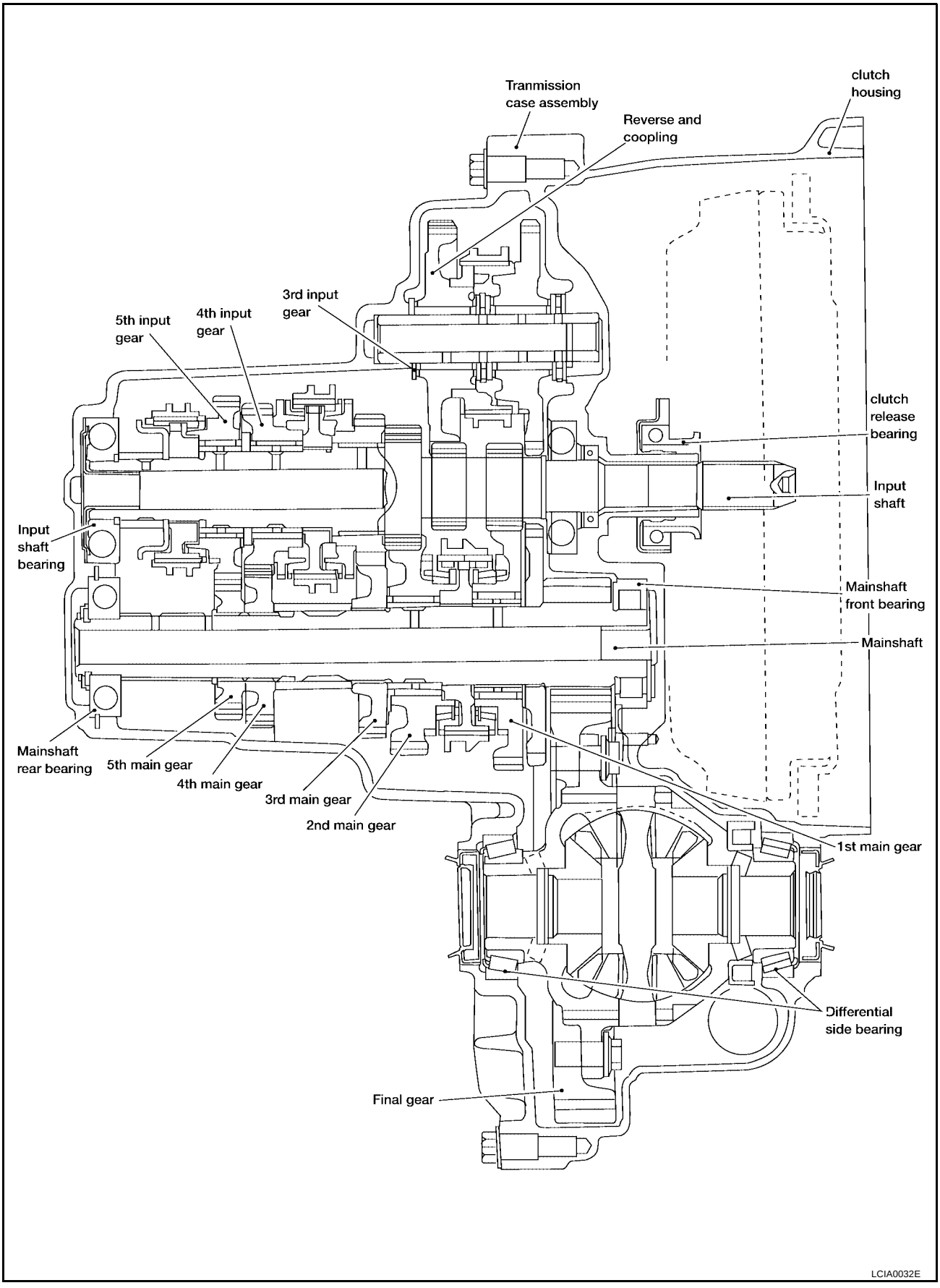
Reference page		MT-76	MT-76	MT-76	MT-84			MT-79	MT-87		MT-85, MT-88			
Suspected parts (possible cause)		(oil level is low)	(wrong oil)	(oil level is high)	Gasket (damaged)	Oil seal (worn or damaged)	O-Ring (worn or damaged)	Control device and cable (worn)	Check plug return spring and check ball (worn or damaged)	Shift fork (worn)	Gear (worn or damaged)	Bearing (worn or damaged)	Baulk ring (worn or damaged)	Insert spring, shifting insert (damaged)
Symptom	Noise	1	2								3	3		
	Oil leakage		3	1	2	2	2							
	Hard to shift or will not shift		1	1				2					3	3
	Jumps out of gear							1	2	3	3			

DESCRIPTION

PFP:00000

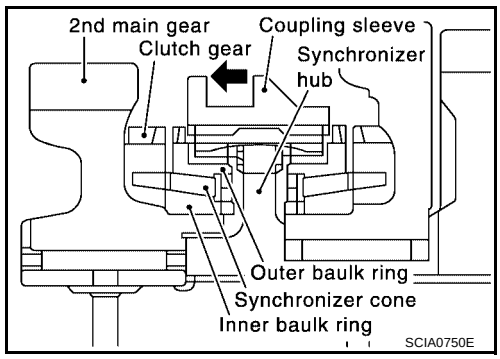
Cross-sectional View

ECS005UE



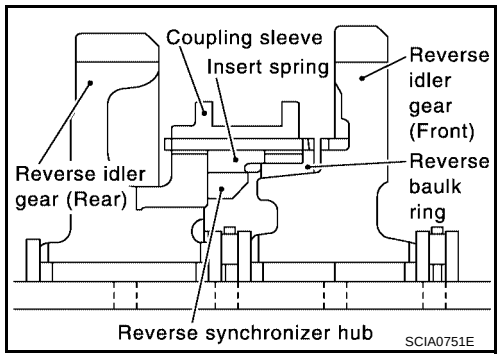
DOUBLE-CONE SYNCHRONIZER

Double-cone synchronizer is adopted for 1st and 2nd gears to reduce operating force of the shift lever.



REVERSE GEAR

Description of reverse gear components are as shown.



M/T OIL

PFP:KLD20

Replacement

ECS005UF

DRAINING

1. Start the engine and let it run to warm up the transaxle.
2. Stop the engine. Remove drain plug and drain oil.
3. Set a new gasket on the drain plug and install it on the transaxle.

Drain plug : 30 - 39 N·m (3.1 - 4.0 kg-m, 23 - 28 ft-lb)

CAUTION:
Do not reuse gasket.

FILLING

1. Remove filler plug. Fill with new oil until oil level reaches the specified limit near filler plug mounting hole.

Oil grade : API GL-4
Capacity (reference) : Approximately 2.3 ℓ (2 3/8 qt)

2. After refilling oil, check oil level. Assemble new gasket on to filler plug, then install it on the transaxle body.

Filler plug : 30 - 39 N·m (3.1 - 4.0 kg-m, 23 - 28 ft-lb)

CAUTION:
Do not reuse gasket.

Checking

ECS005UG

OIL LEAKAGE AND OIL LEVEL

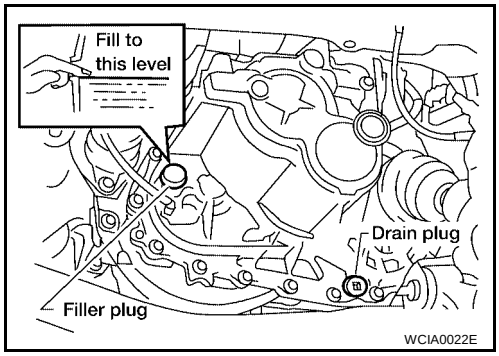
- Check that oil is not leaking from transaxle.
- Check oil level from filler plug mounting hole as shown.

CAUTION:
Never start engine while checking oil level.

- Set a new gasket on the filler plug and install it on the transaxle.

Filler plug : 30 - 39 N·m (3.1 - 4.0 kg-m, 23 - 28 ft-lb)

CAUTION:
Do not reuse gasket.



SIDE OIL SEAL

PFP:32113

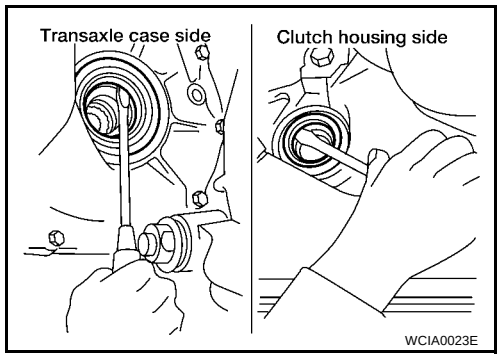
Removal and Installation

ECS005UH

REMOVAL

1. Remove the drive shaft from the transaxle body. Refer to FAX-14, "Removal" .
2. Remove oil seal with a slotted screwdriver.

CAUTION:
Be careful not to damage the case surface when removing the oil seal.

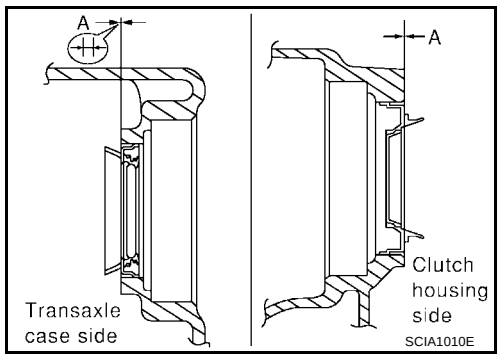


INSTALLATION

Installation is in the reverse order of removal.

- Using Tool (drift), drive the oil seal straight until it protrudes from the case end equal to dimension "A" as shown.

Dimension "A" : Within 0.5 mm (0.02 in) or flush with the case.



Special Service Tool

Drift to be used	ST30720000

CAUTION:
- **When installing oil seal, apply multi-purpose grease to oil seal lips.**
- **Oil seal is not reusable.**

- Check the oil level after installation. Refer to MT-76, "Checking" .

POSITION SWITCH

PFP:32005

Checking

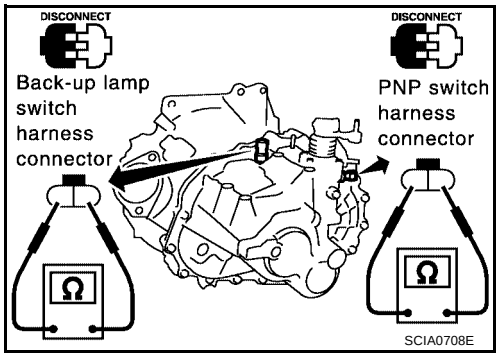
ECS005UI

NOTE:
For removal and installation of the switches. Refer to MT-84, "Component Parts" .

BACK-UP LAMP SWITCH

- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No



PARK/NEUTRAL POSITION SWITCH

- Check continuity.

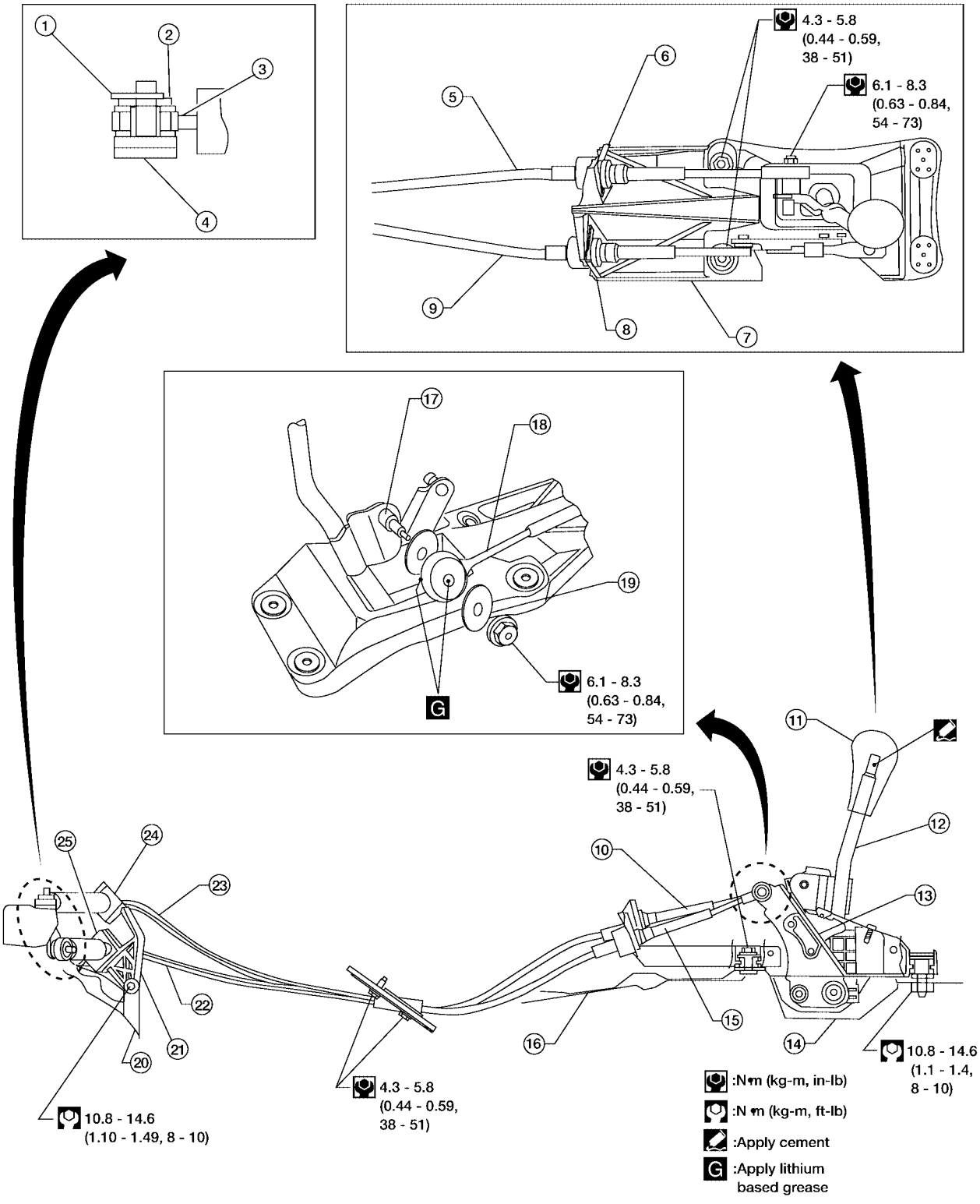
Gear position	Continuity
Neutral	Yes
Except neutral	No

CONTROL LINKAGE

PFP:34103

Removal and Installation of Control Device and Cable

ECS005UJ



WCIA0136E

1. Snap pin
2. Washer
3. Cable
4. Manual lever
5. Shift cable
6. Lock plate
7. Control device assembly
8. Lock plate
9. Select cable
10. Shift cable
11. Control lever knob
12. Control lever

13. Control device assembly
14. Cover
15. Select cable
16. Floor
17. Pin
18. Shift cable
19. Washer
20. Clutch housing
21. Cable mounting bracket
22. Select cable
23. Shift cable
24. Lock plate
25. Lock plate

CAUTION:

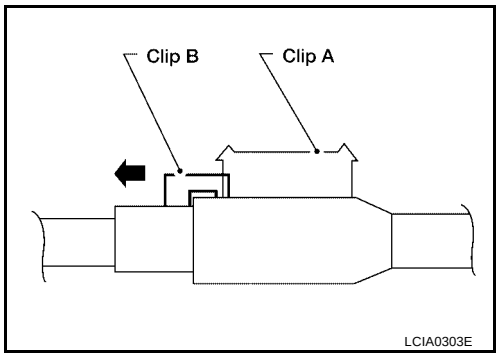
- **Note that the select side lock plate for securing the control cable is different from the one on the shift side.**
- **After assembly, make sure selector lever automatically returns to Neutral when it is moved to 1st, 2nd, or Reverse.**

Cable Adjustment

ECS0077V

NOTE:
After installation of the select cable, the cable must be adjusted for proper operation. This adjustment is performed before installing the interior console and shift boot.

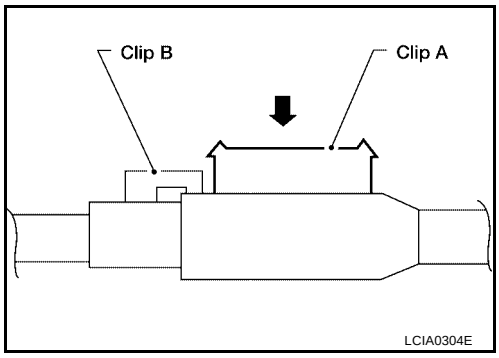
1. Slide clip “B” from under clip “A” as shown.



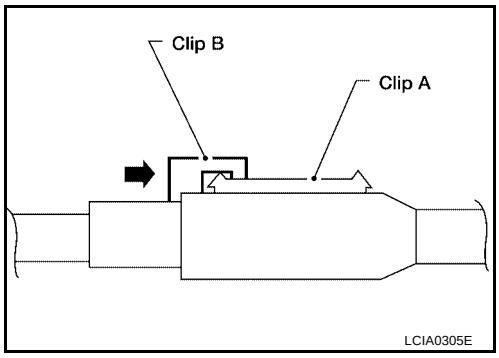
2. Shift the control lever to the neutral position.

   CAUTION:
   Do not move the control lever when adjusting the cables.

3. Push clip “A” into the cable end case until it snaps into place as shown.



4. Slide clip “B” back over clip “A” until it snaps into place and holds clip “A” in place as shown.



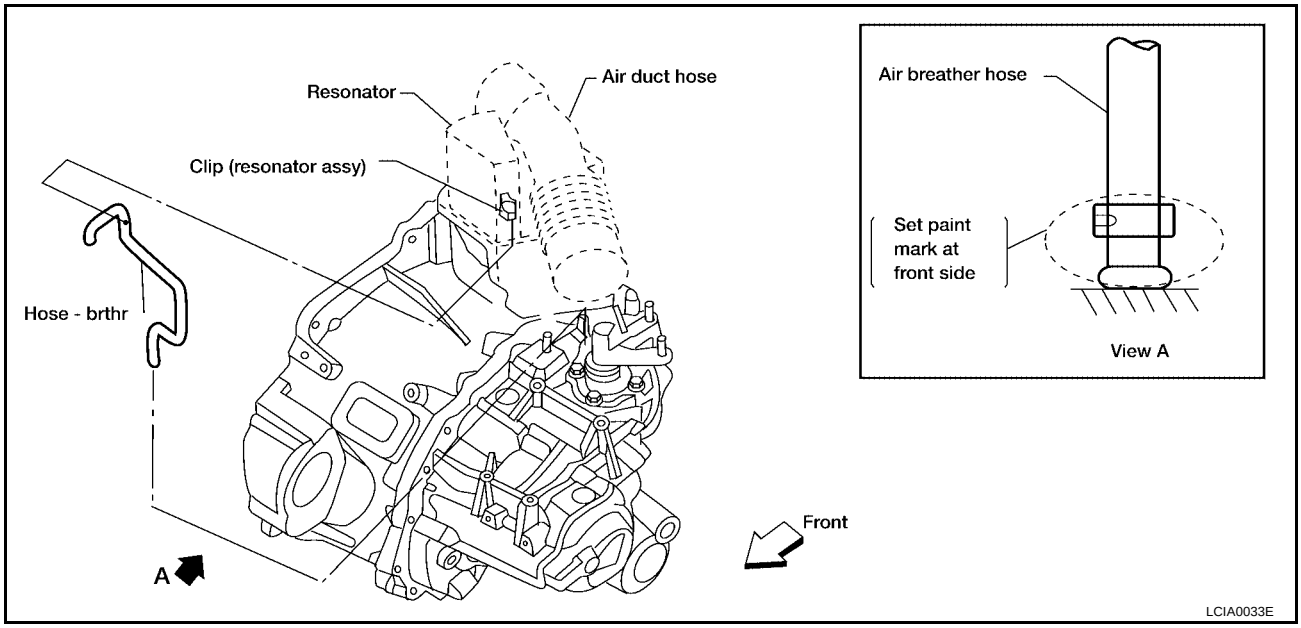
AIR BREATHER HOSE

PFP:31098

Removal and Installation

ECS005UK

Refer to the illustration for air breather hose removal and installation information.



CAUTION:

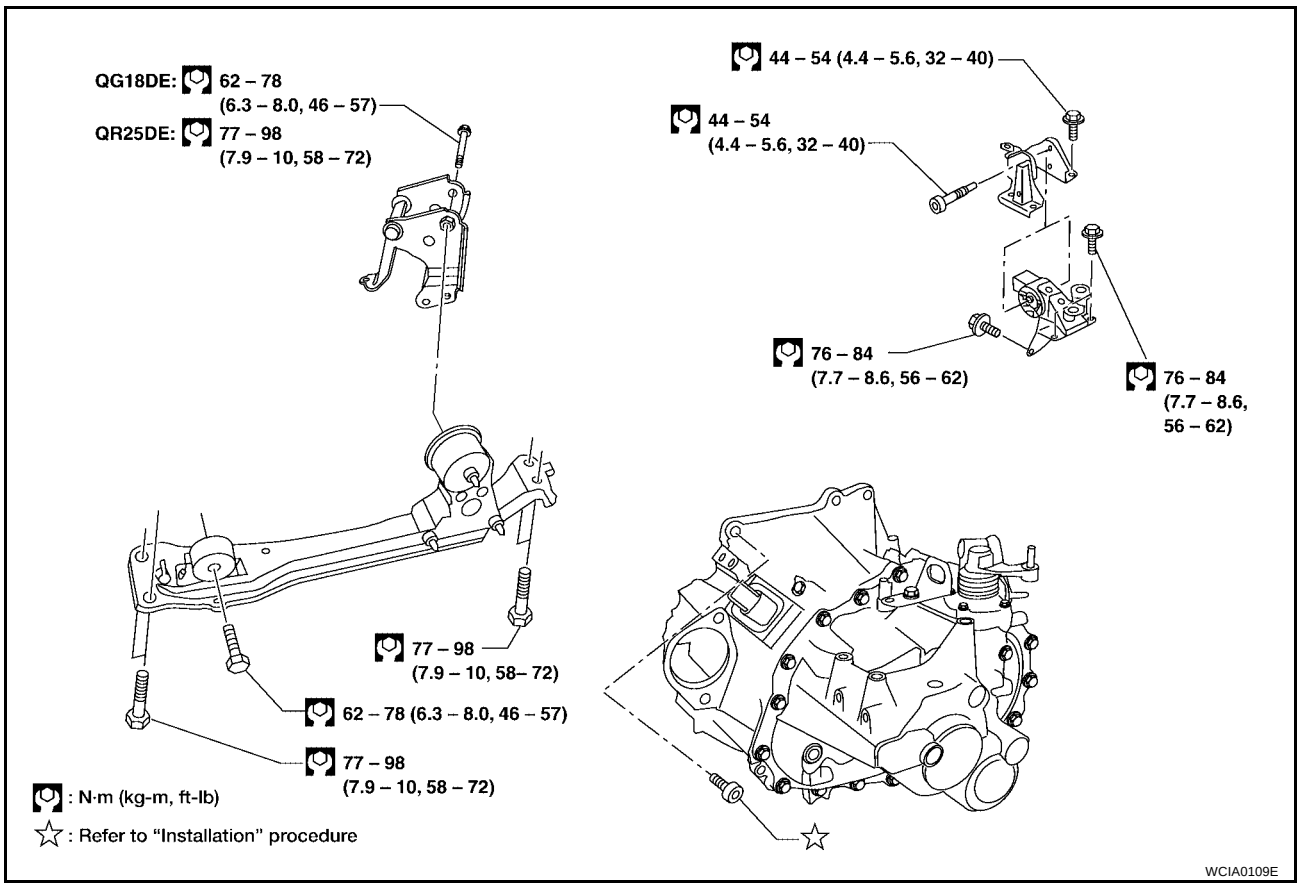
- **Make sure there are no pinched or restricted areas on the air breather hose caused by bending or winding when installing it.**
- **Be sure to insert hose into the transaxle tube until overlap area reaches the spool.**

TRANSAXLE ASSEMBLY

PFP:32010

Removal and Installation

ECS005UL



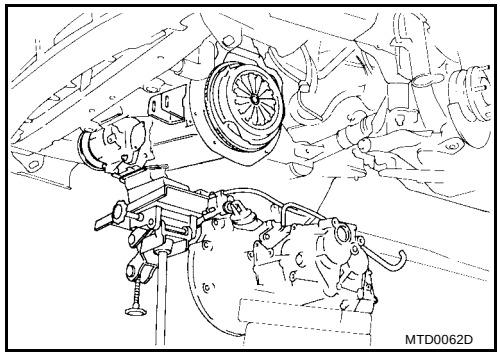
REMOVAL

1. Remove air cleaner and air duct.
2. Remove battery.
3. Remove the air breather hose. Refer to MT-81, "Removal and Installation" .
4. Remove clutch operating cylinder.

   CAUTION:
   Do not depress clutch pedal during removal procedure.
5. Remove engine under cover.
6. Remove the control cable from the transaxle. Refer to MT-79, "Removal and Installation of Control Device and Cable" .
7. Drain gear oil from transaxle. Refer to MT-76, "Replacement" .
8. Disconnect connectors and harnesses for:
   - PNP switch.
   - Speed sensor.
   - Back-up lamp switch.
   - Ground.
9. Remove the exhaust front tube. Refer to EX-3, "Removal and Installation" .
10. Remove the drive shafts. Refer to FAX-14, "Removal" .
11. Remove starter motor. Refer to SC-20, "Removal and Installation" .
12. Place a jack under the transaxle.

    CAUTION:
    When setting the jack, be careful not to bring it into contact with the switch.
13. Remove the center member, the engine insulator and the engine mount bracket.

14. Support the engine by placing a jack under the oil pan. Do not position the jack so it is in contact with the drain plug.
15. Remove the bolts that mount the engine to the transaxle.
16. Remove the transaxle from the vehicle.



INSTALLATION

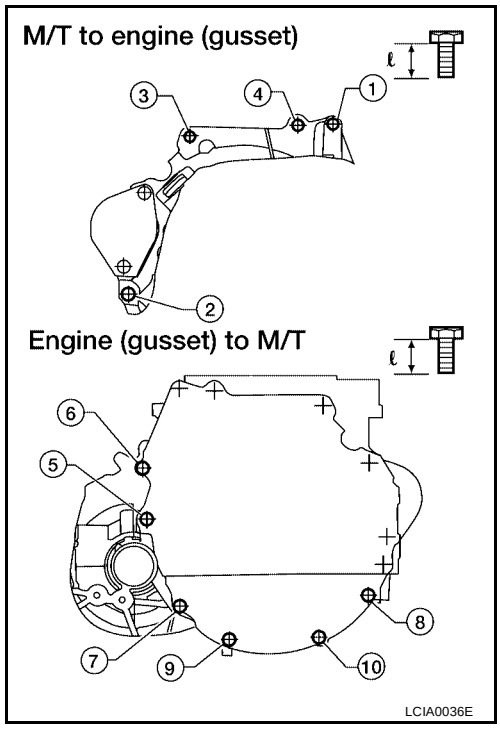
Installation is the reverse order of removal.

- When installing the transaxle to the engine, use the tightening torque and sequence shown below:

  CAUTION:
  When installing transaxle, be careful not to bring transaxle input shaft into contact with the clutch cover.

Bolt No.	1	2	3	4	5	6	7	8	9	10
"ℓ" mm (in)	40	82	47	47	52	40	40	40	30	30
Tightening torque N·m (kg-m, ft-lb)	30 - 40 (3.1 - 4.1, 22 - 29)	70 - 80 (7.1 - 8.1, 52 - 59)				30 - 40 (3.1 - 4.1, 22 - 29)				

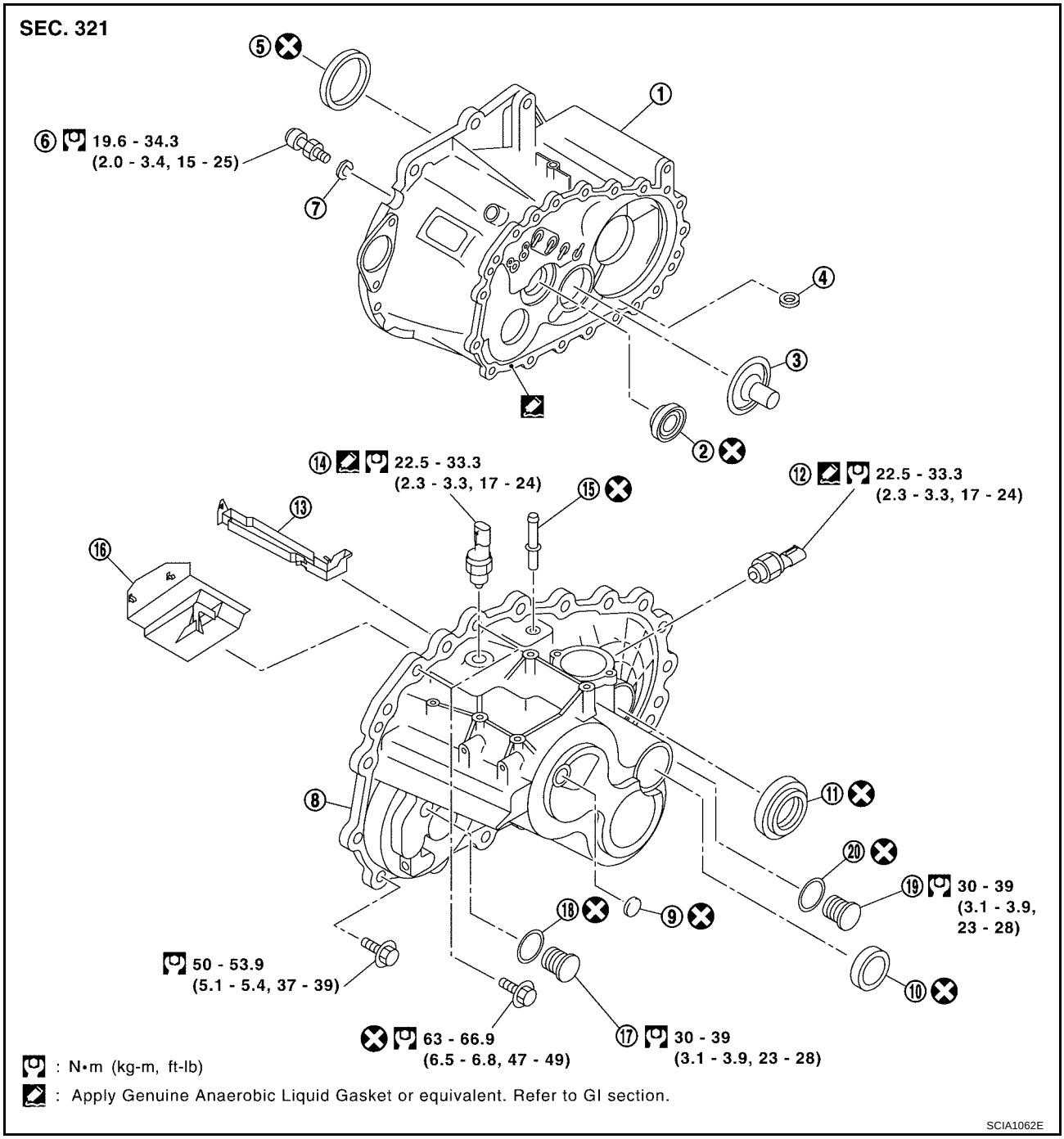
- After installation, check oil level, and look for leaks and loose mechanisms.



Component Parts

ECS005UM

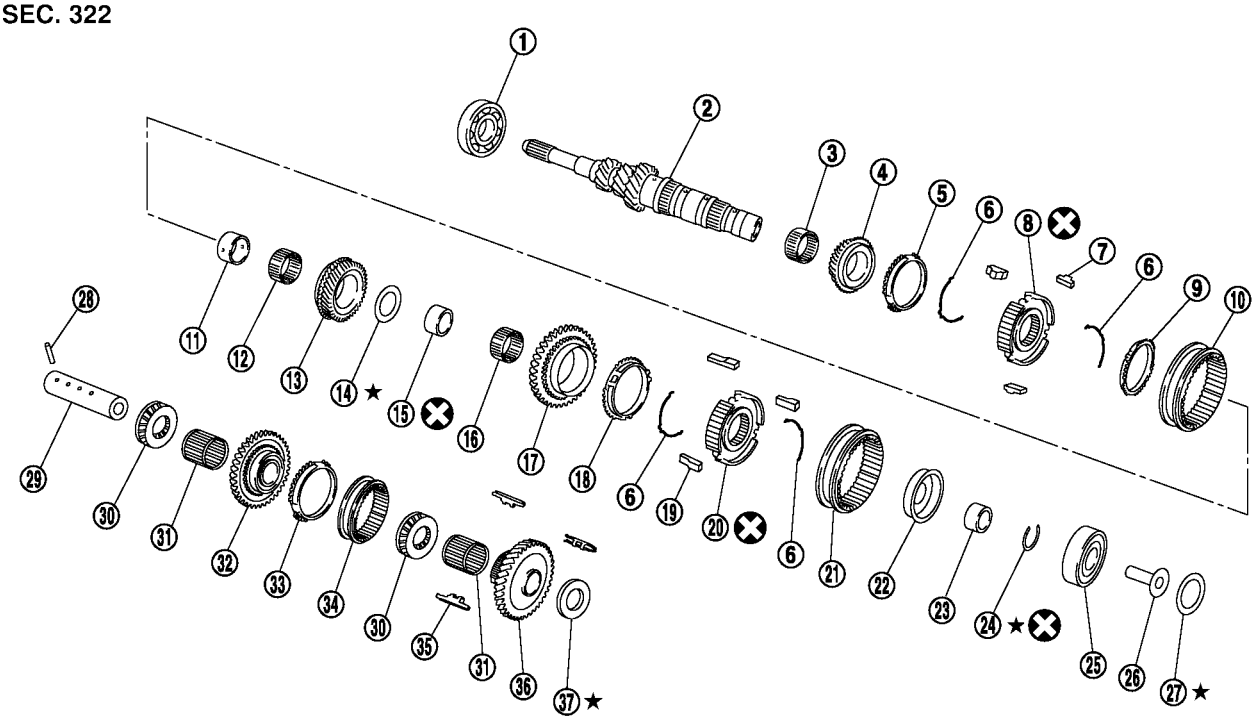
CASE AND HOUSING COMPONENTS



1.	Clutch housing	2.	Input shaft oil seal	3.	Oil channel
4.	Magnet	5.	Differential oil seal	6.	Ball pin
7.	Washer	8.	Transaxle case	9.	Welch plug
10.	Bore plug	11.	Differential oil seal	12.	Park/Neutral position switch
13.	Oil gutter	14.	Back-up lamp switch	15.	Air breather tube
16.	Baffle plate	17.	Filler plug	18.	Gasket
19.	Drain plug	20.	Gasket		

GEAR COMPONENTS

SEC. 322



★ : Select proper thickness.

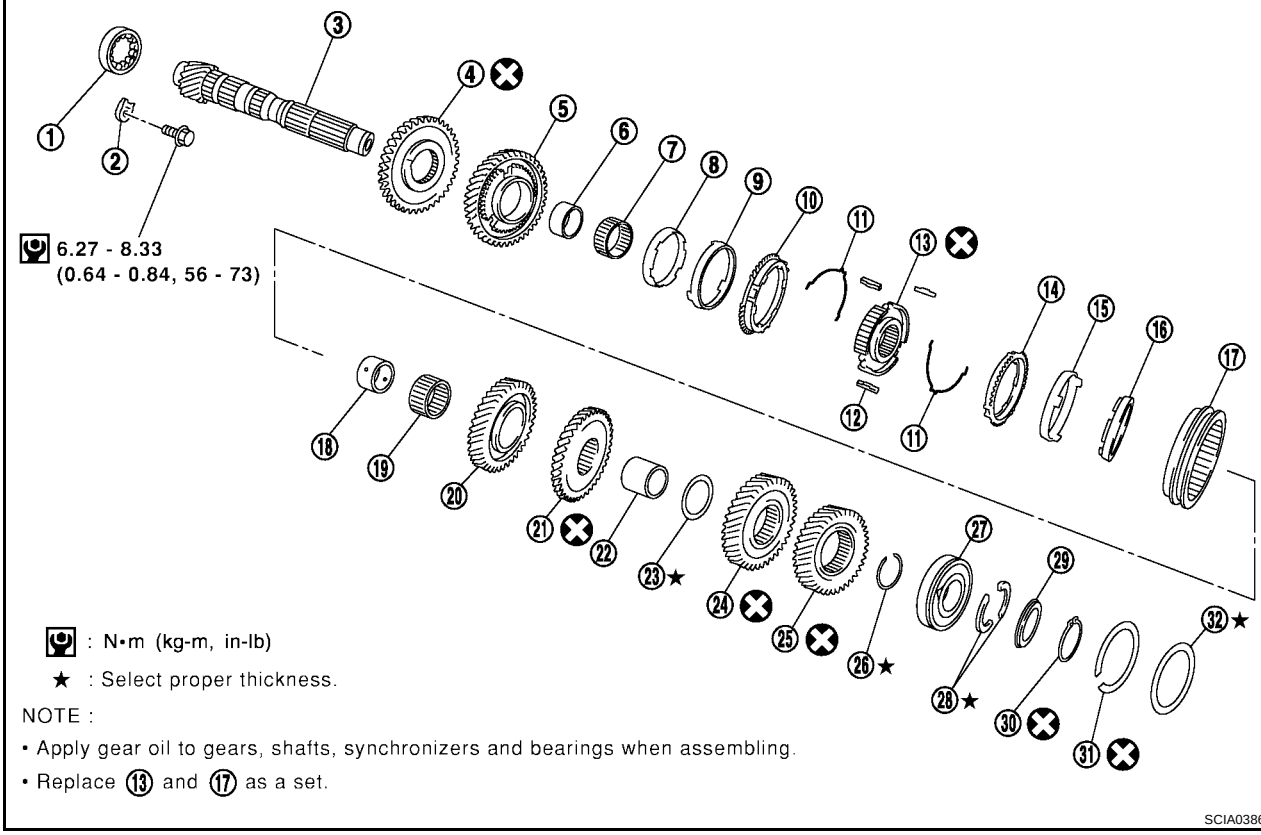
NOTE :

- Apply gear oil to gears, shafts, synchronizers and bearings when assembling.
- Replace (8) and (10), (20) and (21) as a set.

SCIA0385E

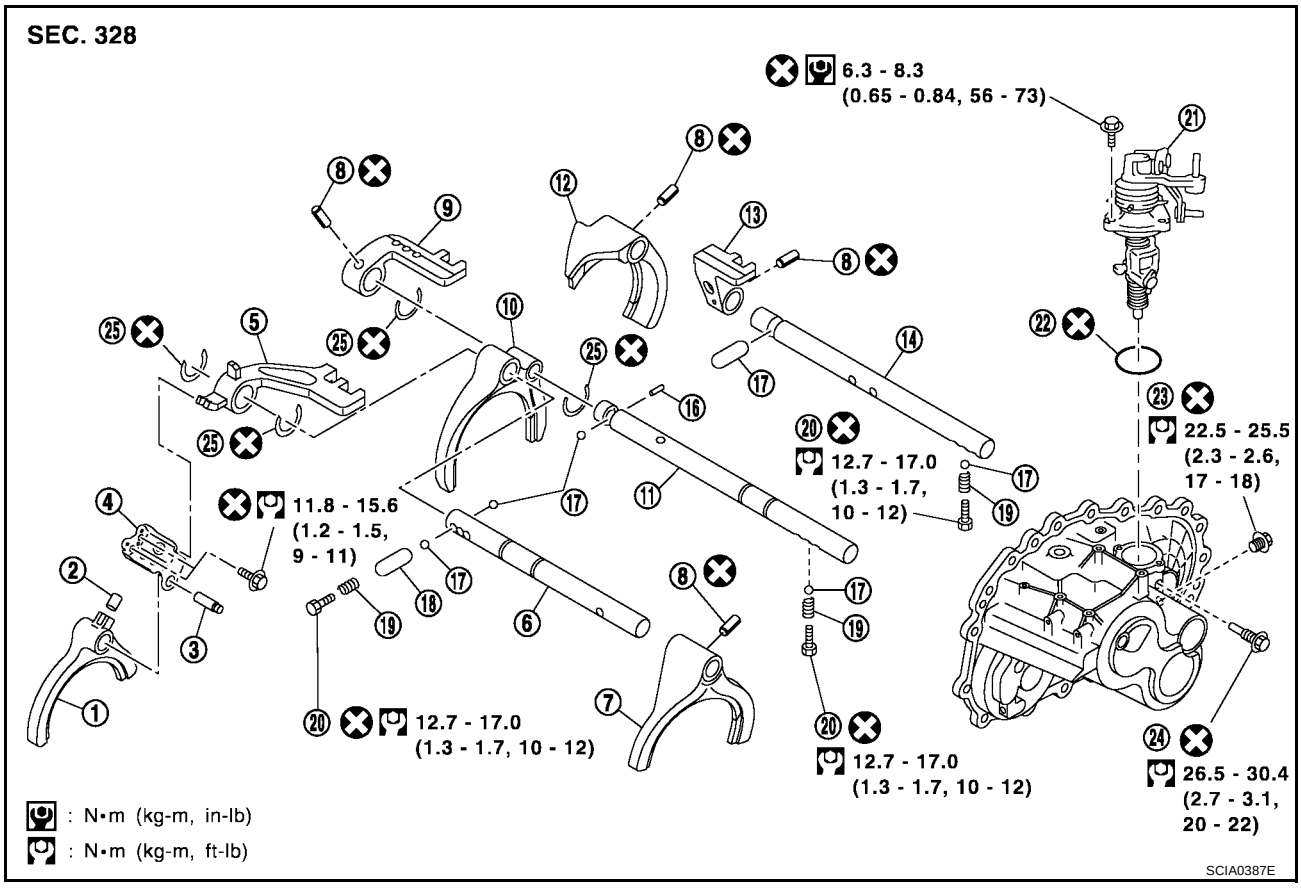
1. Input shaft front bearing
2. Input shaft
3. Needle bearing
4. 3rd input gear
5. 3rd baulk ring
6. Spread spring
7. 3rd & 4th shifting insert
8. 3rd & 4th synchronizer hub
9. 4th baulk ring
10. 3rd & 4th coupling sleeve
11. Bushing
12. Needle bearing
13. 4th input gear
14. Thrust washer
15. Bushing
16. Needle bearing
17. 5th input gear
18. 5th baulk ring
19. 5th shifting insert
20. 5th synchronizer hub
21. 5th coupling sleeve
22. 5th stopper
23. Input shaft bearing spacer
24. Snap ring
25. Input shaft rear bearing
26. Oil channel
27. Input shaft rear bearing adjusting shim
28. Lock pin
29. Reverse idler shaft
30. Thrust needle bearing
31. Needle bearing
32. Reverse idler gear (front)
33. Reverse baulk ring
34. Reverse coupling sleeve
35. Insert spring
36. Reverse idler gear (rear)
37. Reverse idler gear adjusting shim

SEC. 322



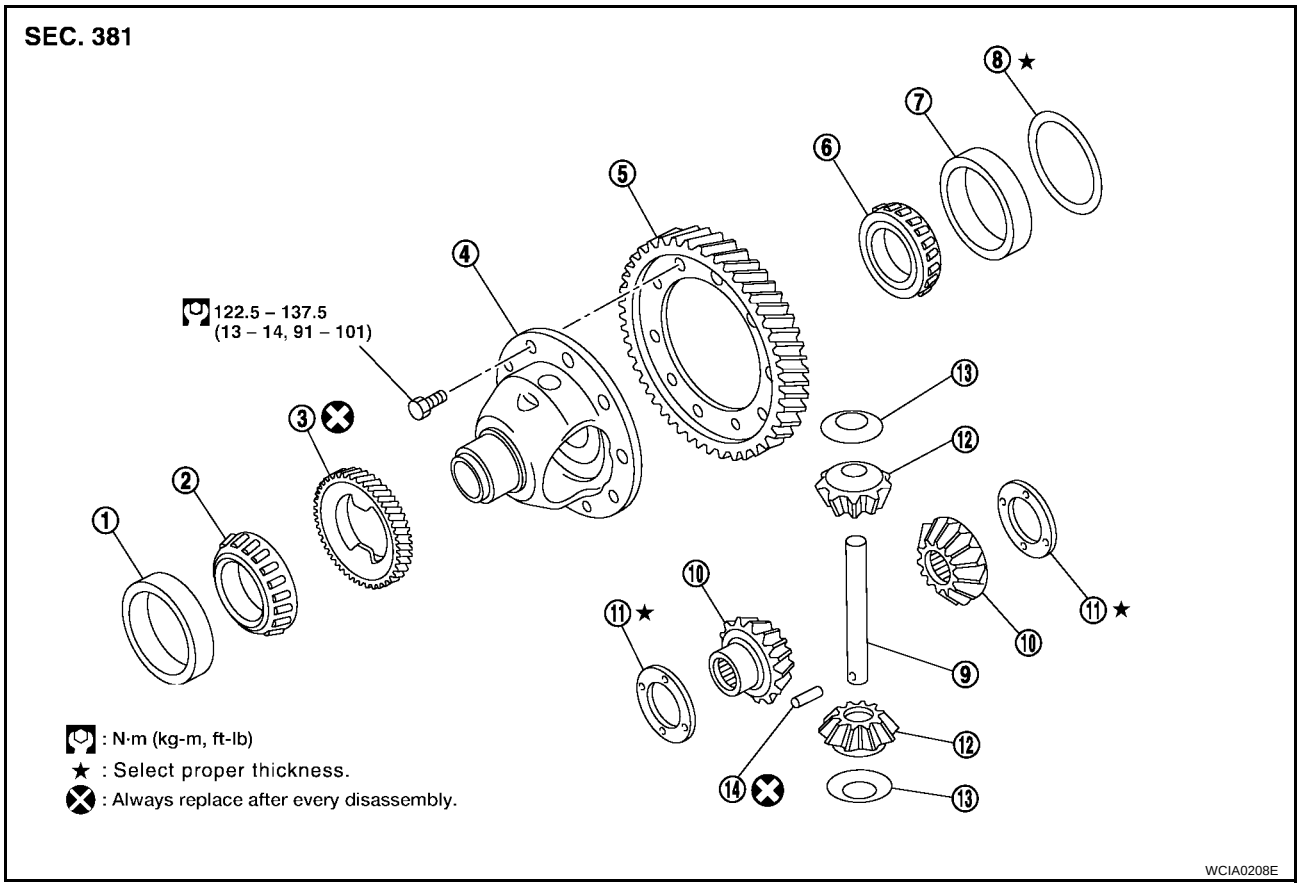
1. Mainshaft front bearing
2. Mainshaft bearing retainer
3. Mainshaft
4. Reverse main gear
5. 1st main gear
6. Bushing
7. Needle bearing
8. 1st inner baulk ring
9. 1st gear synchronizer cone
10. 1st outer baulk ring
11. Spread spring
12. 1st & 2nd shifting insert
13. 1st & 2nd synchronizer hub
14. 2nd outer baulk ring
15. 2nd gear synchronizer cone
16. 2nd inner baulk ring
17. 1st & 2nd coupling sleeve
18. Bushing
19. Needle bearing
20. 2nd main gear
21. 3rd main gear
22. 3rd & 4th mainshaft spacer
23. 4th main adjusting shim
24. 4th main gear
25. 5th main gear
26. Snap ring
27. Mainshaft rear bearing
28. Mainshaft C-ring
29. C-ring holder
30. Snap ring
31. Snap ring
32. Mainshaft rear bearing adjusting shim

SHIFT CONTROL COMPONENTS



1. Reverse shift fork
2. Shifter cap
3. Reverse fork rod
4. Reverse lever assembly
5. 5th & reverse bracket
6. 5th & reverse fork rod
7. 5th shift fork
8. Retaining pin
9. 3rd & 4th bracket
10. 3rd & 4th shift fork
11. 3rd & 4th fork rod
12. 1st & 2nd shift fork
13. 1st & 2nd bracket
14. 1st & 2nd fork rod
15. Shift check sleeve
16. Inter lock pin
17. Check ball
18. Shift check sleeve
19. Check spring
20. Check plug
21. Control rod assembly
22. O-ring
23. Shift check
24. Stopper bolt
25. Stopper ring

FINAL DRIVE COMPONENTS



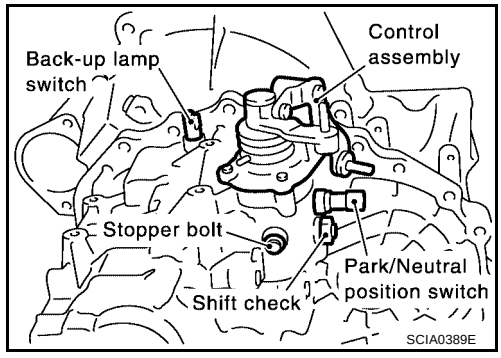
1. Differential side bearing outer race
2. Differential side bearing
3. Speedometer drive gear
4. Differential case
5. Final gear
6. Differential side bearing
7. Differential side bearing outer race
8. Differential side bearing adjusting shim
9. Pinion mate shaft
10. Side gear
11. Side gear thrust washer
12. Pinion mate gear
13. Pinion mate gear washer
14. Retaining pin

Disassembly and Assembly

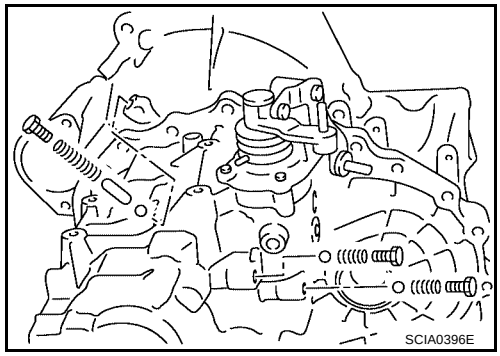
ECS005UN

DISASSEMBLY

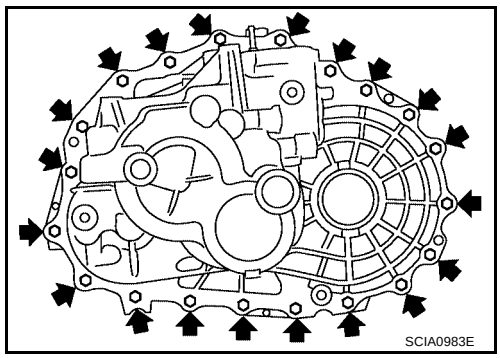
1. Remove drain plug and filler plug.
2. Remove park/neutral position switch and back-up lamp switch.
3. After removing shift check and stopper bolt, remove control assembly.



4. Remove check plugs (3 pieces), check springs (3 pieces), check balls (3 pieces) and shift check sleeve (1 piece) as shown.


SCIA0396E

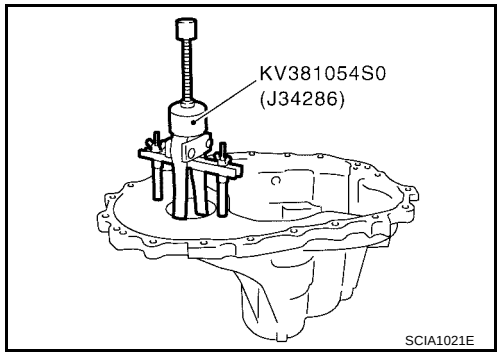
5. Remove transaxle case fixing bolts as shown.


SCIA0983E

6. Remove bore plug.

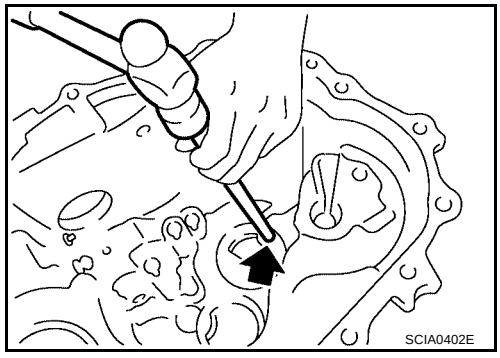
CAUTION:
Be careful not to damage transaxle case.

7. While spreading the snap ring of mainshaft rear bearing located at bore plug hole, remove transaxle case.
8. Remove oil gutter, baffle plate.
9. Remove snap ring, mainshaft rear bearing adjusting shim and input shaft rear bearing adjusting shim from transaxle case.
10. Remove differential side bearing outer race (transaxle case side) and the adjustment shim using Tool as shown.

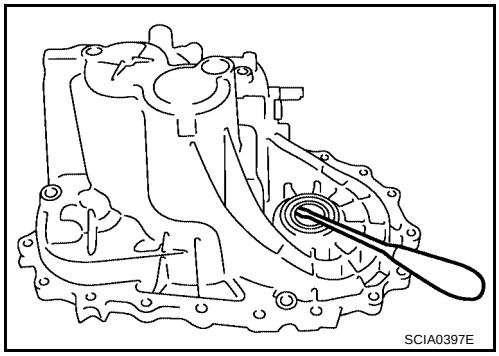


SCIA1021E

11. Remove the welch plug as shown.

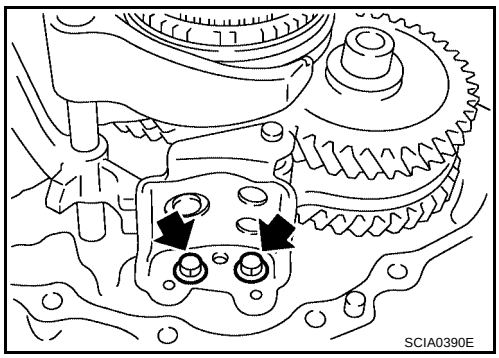

SCIA0402E

12. Remove differential oil seal as shown.

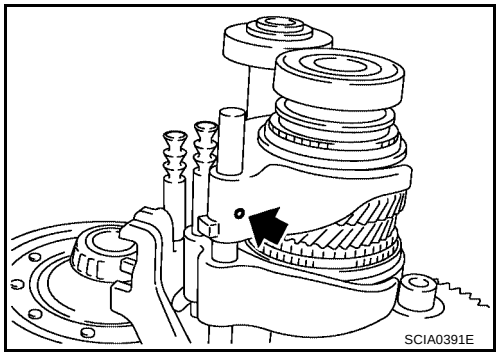

SCIA0397E

13. Remove magnet from clutch housing.
14. With shift lever in 5th position, remove the bracket bolts from the reverse lever assembly. Lift the reverse lever assembly to remove.

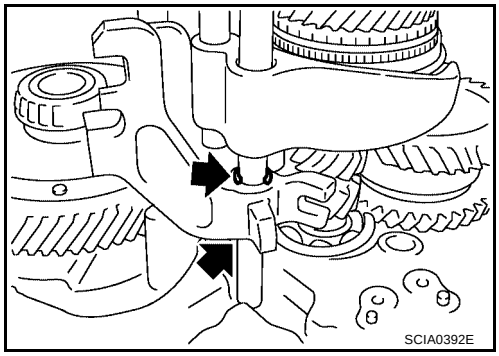
CAUTION:
Be careful not to lose shifter cap.


SCIA0390E

15. Pull out reverse fork rod then remove reverse shift fork.
16. Shift 3rd & 4th fork rod to 3rd position. Remove retaining pin of 5th shift fork using pin punch.

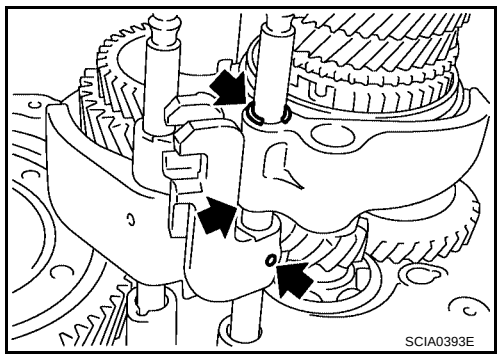

SCIA0391E

17. Remove stopper rings for 5th & reverse bracket.

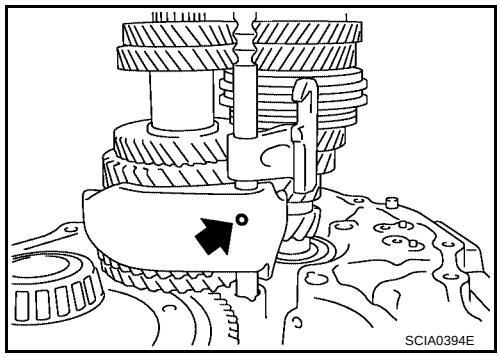

SCIA0392E

18. Pull out 5th & reverse fork rod and remove 5th shift fork and 5th & reverse bracket.
19. Remove check balls (2 pieces) and inter lock pin.

20. Remove retaining pin of 3rd & 4th bracket using pin punch.



21. Remove stopper rings for 3rd & 4th shift fork.
22. Pull out 3rd & 4th fork rod and remove 3rd & 4th shift fork and bracket.
23. Remove shift check sleeve from clutch housing.
24. Remove retaining pin of 1st & 2nd shift fork using pin punch.

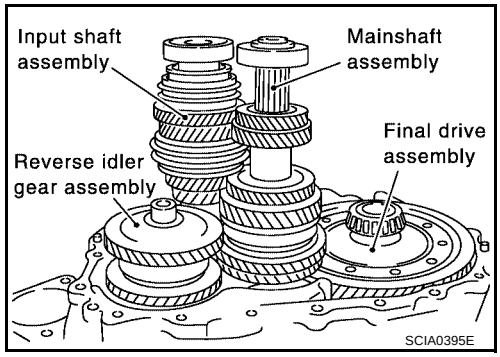


25. Pull out 1st & 2nd shift fork with bracket.
26. Remove 1st & 2nd shift fork.
27. Remove retaining pin of 1st & 2nd bracket using pin punch and separate 1st & 2nd fork rod and bracket.
28. Remove gear components from clutch housing.

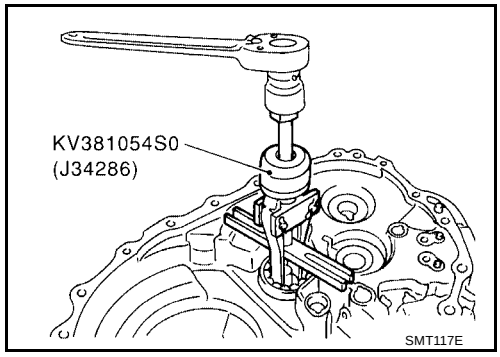
a. While tapping input shaft with plastic hammer, remove input shaft assembly, mainshaft assembly and reverse idler gear assembly as a set.

CAUTION:
Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.

b. Remove final drive assembly.

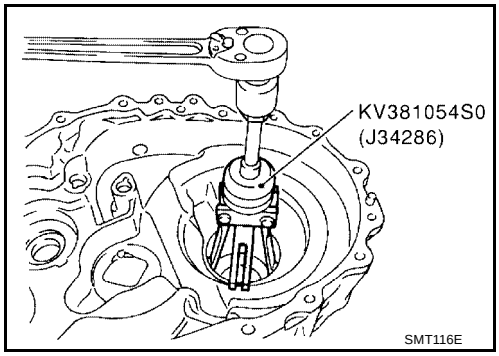


29. Remove mainshaft bearing retainer and then the mainshaft front bearing using Tool as shown.



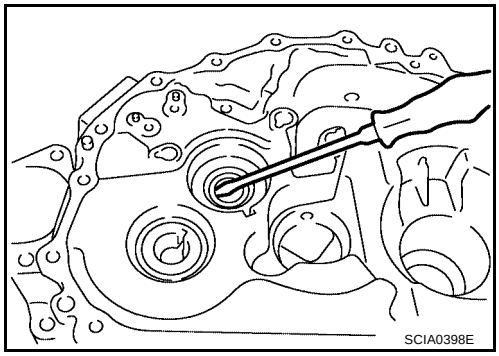
30. Remove oil channel on mainshaft side.
31. Remove differential oil seal (clutch housing side).

32. Remove differential side bearing outer race (clutch housing side).



33. Remove input shaft oil seal.

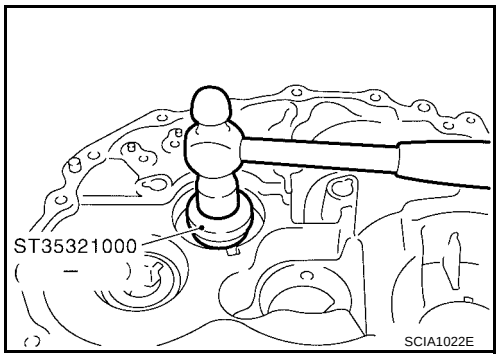
CAUTION:
Be careful not to damage clutch housing.



ASSEMBLY

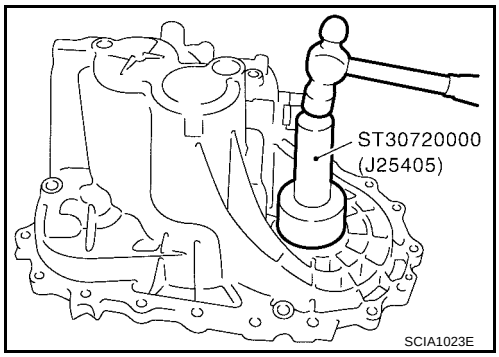
1. Install a new input shaft oil seal from the clutch housing end, to a depth of 1.8 - 2.8 mm (0.071 - 0.110 in) using Tool as shown.

CAUTION:
Oil seals are not reusable.



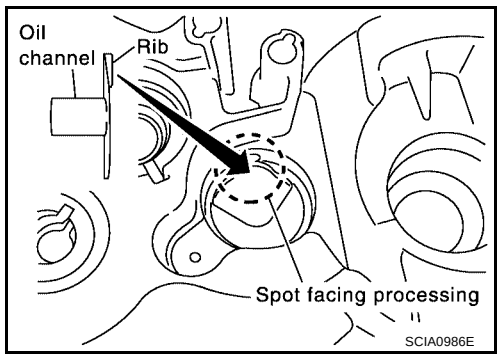
2. Install a new differential oil seal using Tool as shown.

CAUTION:
Oil seals are not reusable.



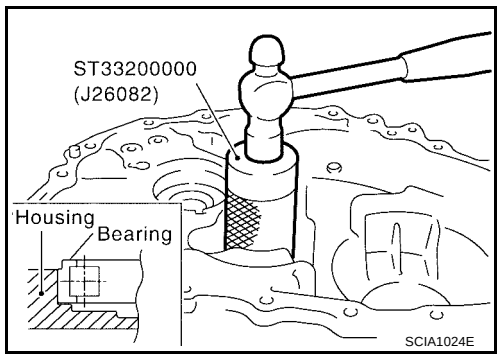
3. Install oil channel on mainshaft side.

CAUTION:
Position oil channel with specified orientation for installation as shown.



4. Install mainshaft front bearing using Tool as shown.

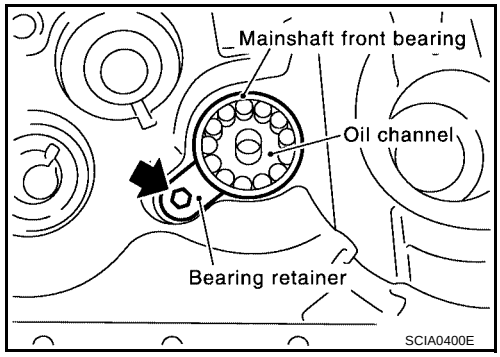
CAUTION:
Install with orientation as shown.



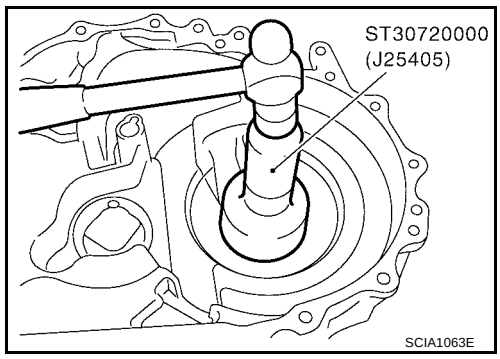
5. Install bearing retainer for mainshaft front bearing.

Bearing retainer bolt : 6.27 - 8.33 N·m (0.64 - 0.84 kg-m, 56 - 73 in-lb)

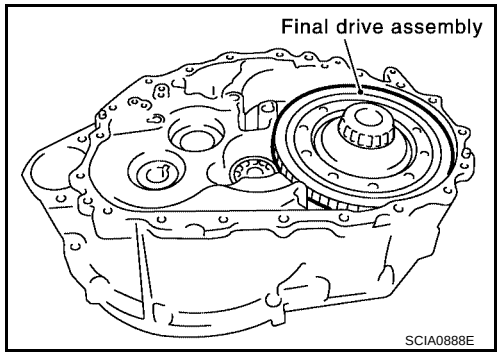
CAUTION:
Install with the punched surface facing up.



6. Install differential side bearing outer race using Tool as shown.

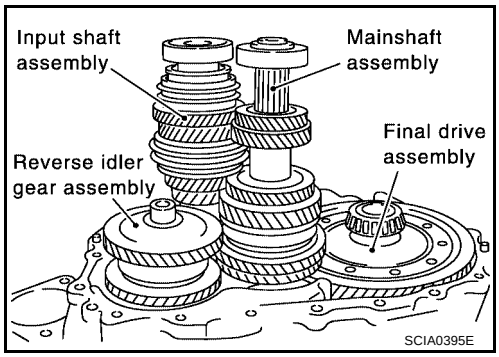


7. Install final drive assembly into clutch housing.



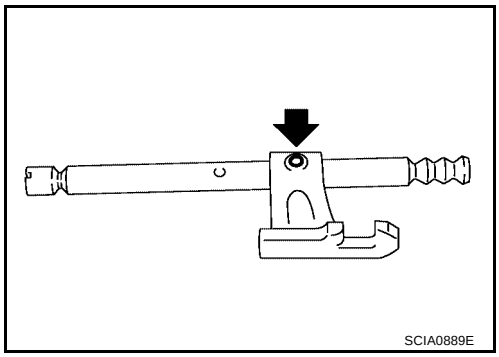
8. Install input shaft assembly, mainshaft assembly, and reverse idler gear assembly into clutch housing.

   CAUTION:
   Be sure not to damage input shaft oil seal.



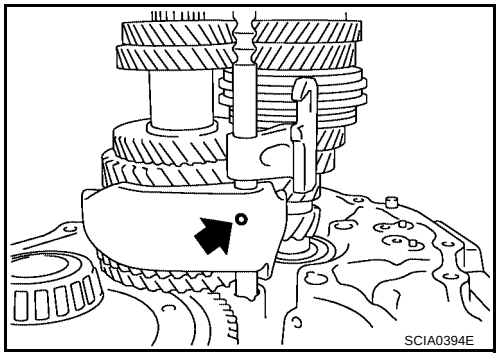
9. Install 1st-2nd fork rod bracket onto 1st-2nd fork rod, and then install a new retaining pin.

   CAUTION:
   Retaining pins are not reusable.



10. Install 1st-2nd fork rod and 1st-2nd shift fork, and then install a new retaining pin.

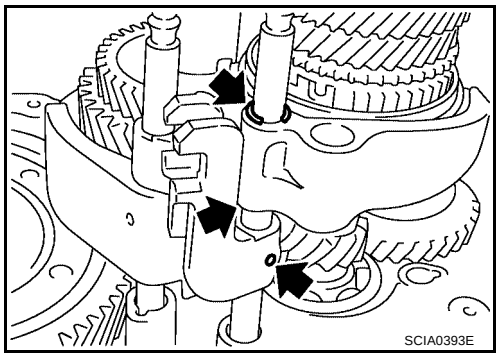
    CAUTION:
    Retaining pins are not reusable.



11. Install shift check sleeve.
12. Install 3rd-4th bracket, 3rd-4th shift fork, and 3rd-4th fork rod with interlock pin.
13. Install a new stopper ring onto 3rd-4th shift fork.

    CAUTION:
    Stopper rings are not reusable.
14. Install a new retaining pin onto 3rd-4th bracket.

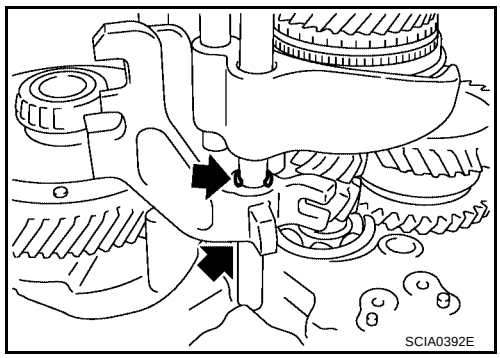
    CAUTION:
    Retaining pins are not reusable.



15. Install 2 check balls.

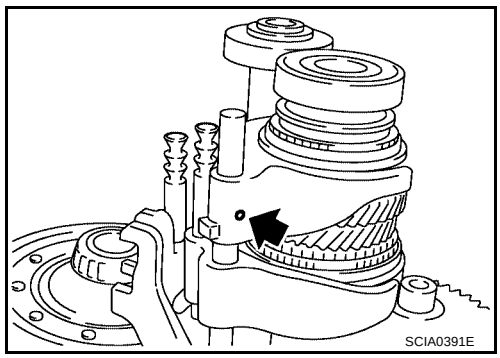
16. Install 5th-reverse bracket, 5th shift fork, and 5th-reverse fork rod.
17. Install a new stopper ring onto 5th-reverse bracket.

CAUTION:
Stopper rings are not reusable.



18. Install a new retaining pin onto 5th shift fork.

CAUTION:
Retaining pins are not reusable.

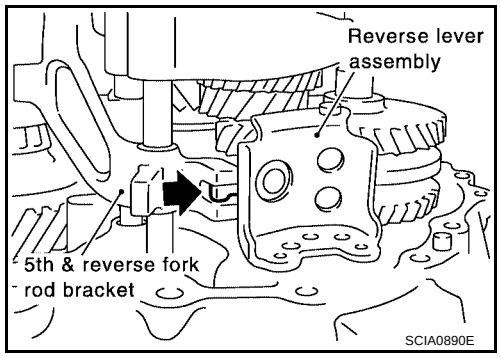


19. Install reverse shift fork and reverse fork rod.
20. Install reverse lever assembly following procedures below.

a. Install shifter cap onto reverse lever assembly cam, and then install them onto reverse shift fork.

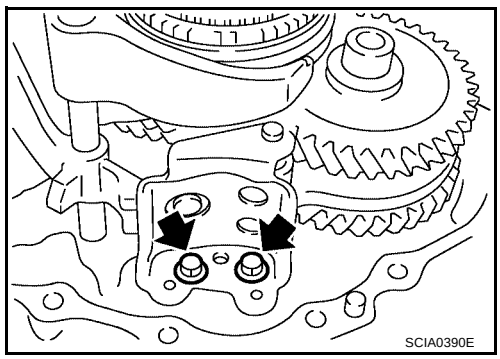
CAUTION:
Do not drop shifter cap.

b. While lifting reverse shift fork, align cam with 5th-reverse fork rod bracket.



c. Install the reverse lever assembly and tighten the reverse lever assembly bolts to specification.

Reverse lever assembly bolts	**: 11.8 - 15.6 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)**



21. Install the magnet onto clutch housing.
22. Install selected input shaft adjusting shim onto input shaft.
    - For selection of adjusting shims, refer to MT-98, "INPUTSHAFT END PLAY" .
23. Install baffle plate and oil gutter.
24. Install transaxle case following procedures below.

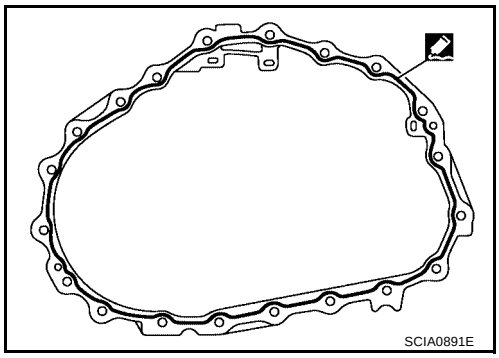
a. Install selected mainshaft rear bearing adjusting shim into transaxle case.
   - For selection of adjusting shims, refer to MT-100, "MAINSHAFT END PLAY" .

b. Temporarily install a new snap ring for the mainshaft rear bearing into transaxle case.

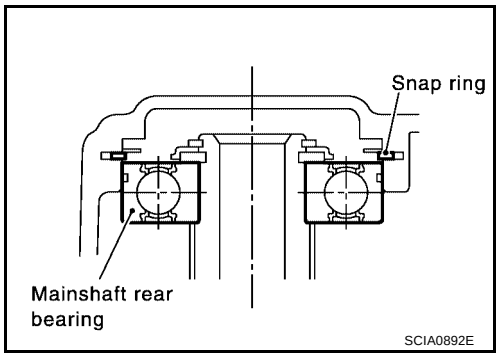
CAUTION:
Do not reuse the snap ring.

c. Apply sealant to mating surfaces of transaxle case and clutch housing. Use Genuine Anaerobic Liquid Gasket or equivalent. Refer to GI-44, "Recommended Chemical Products and Sealants" .

CAUTION:
Remove old sealant adhering to mounting surfaces. Also remove any moisture, oil, or foreign material adhering to application and mounting surfaces.


SCIA0891E

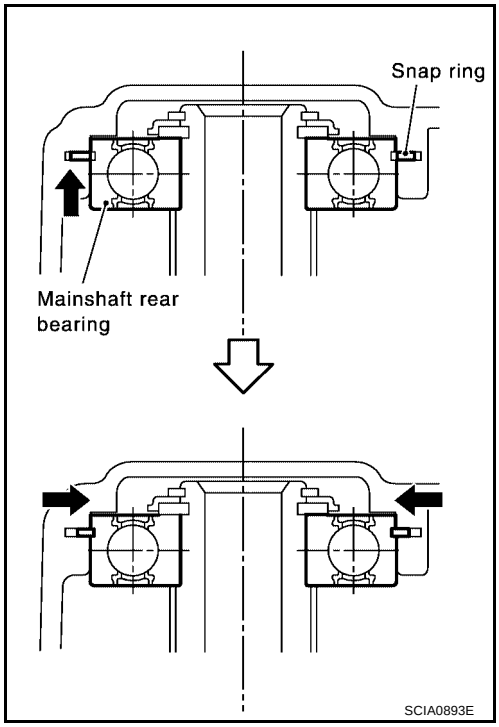
d. With snap ring of mainshaft rear bearing temporarily installed, place transaxle case over clutch housing as shown.



SCIA0892E

e. Through bore plug mounting hole, with snap ring stretched, and lift up mainshaft assembly from the control assembly mounting hole.

f. Securely install snap ring onto mainshaft rear bearing as shown.



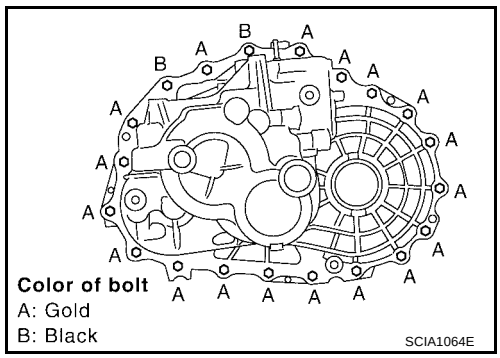
SCIA0893E

g. Tighten mounting bolts "A" and "B" to specification as shown.

Bolt A : 50.0 - 53.9 N·m (5.1 - 5.4 kg-m, 37 - 39 ft-lb)

Bolt B : 63.0 - 66.9 N·m (6.5 - 6.8 kg-m, 47 - 49 ft-lb)

CAUTION:
Always replace bolts "B" as they are self-sealing bolts.



h. Install control assembly.

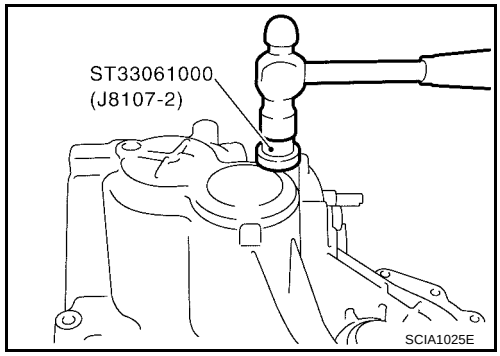
CAUTION:
Do not reuse the O-ring.

i. Install a new shift check and a new stopper bolt.

CAUTION:
Shift check and stopper bolt are not reusable.

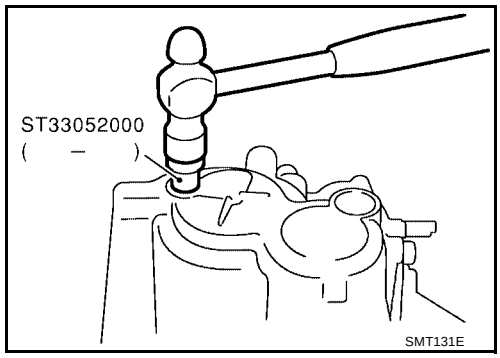
25. Install a new bore plug using Tool as shown.

CAUTION:
Bore plugs are not reusable.



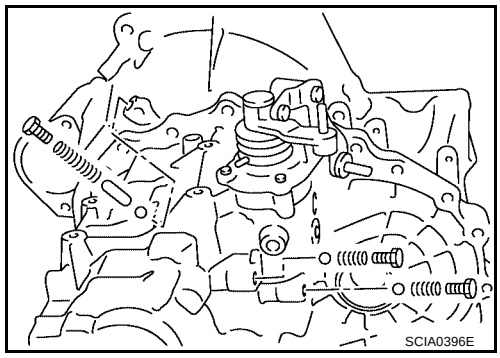
26. Install a new welch plug using Tool as shown.

CAUTION:
Do not reuse the welch plug.



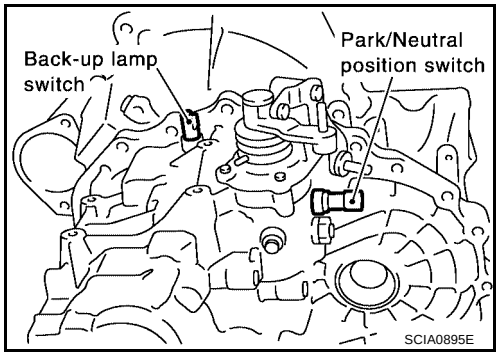
27. Install 1 shift check sleeve, 3 check balls, 3 check springs, and 3 new check ball plugs as shown.

CAUTION:
Check ball plugs are not reusable.



28. Apply sealant to threads of PNP switch and back-up lamp switch, then install them into transaxle case. Use Genuine Anaerobic Liquid Gasket or equivalent. Refer to GI-44, "Recommended Chemical Products and Sealants" .
29. Install new gaskets onto drain plug and filler plug, and then install them into transaxle case.

CAUTION:
- **Gaskets are not reusable.**
- **After oil is filled, tighten filler plug to specified torque.**



ECS005UO

Adjustment

INPUTSHAFT END PLAY

- When adjusting input shaft end play, select adjusting shim for input shaft bearing. To select adjusting shim, measure clearance between transaxle case and input shaft rear bearing.
- Calculate dimension "O" (thickness of adjusting shim) using the following procedure to meet specification of end play for input shaft rear bearing.

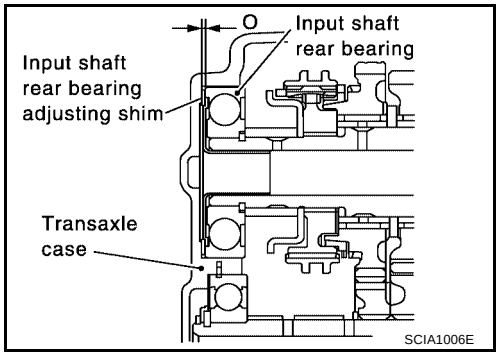
End play : 0 - 0.06 mm (0 - 0.0024 in)

Dimension "O" = (O_1 - O_2) + End play

O : Thickness of adjusting shim

O_1 : Distance between transaxle case end face and mounting face of adjusting shim

O_2 : Distance between clutch housing case end face and end face of input shaft rear bearing

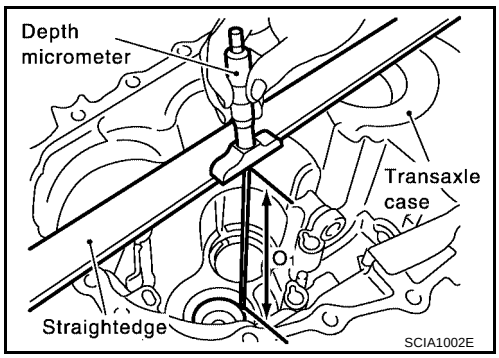


Adjusting Shim

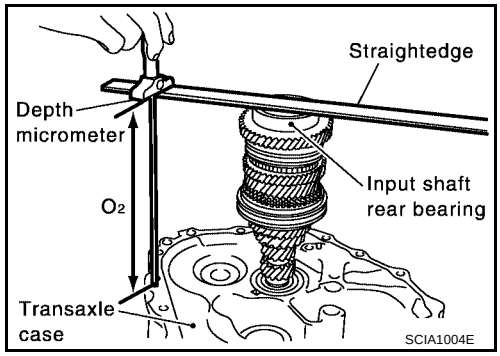
Shim thickness	Part number	Shim thickness	Part number	Shim thickness	Part number
0.40 mm (0.0157 in)	32225 8H500	0.88 mm (0.0346 in)	32225 8H512	1.36 mm (0.0520 in)	32225 8H524
0.44 mm (0.0173 in)	32225 8H501	0.92 mm (0.0362 in)	32225 8H513	1.40 mm (0.0551 in)	32225 8H560
0.48 mm (0.0189 in)	32225 8H502	0.96 mm (0.0378 in)	32225 8H514	1.44 mm (0.0567 in)	32225 8H561
0.52 mm (0.0205 in)	32225 8H503	1.00 mm (0.0396 in)	32225 8H515	1.48 mm (0.0583 in)	32225 8H562
0.56 mm (0.0220 in)	32225 8H504	1.04 mm (0.0409 in)	32225 8H516	1.52 mm (0.0598 in)	32225 8H563
0.60 mm (0.0236 in)	32225 8H505	1.08 mm (0.0425 in)	32225 8H517	1.56 mm (0.0614 in)	32225 8H564
0.64 mm (0.0252 in)	32225 8H506	1.12 mm (0.0441 in)	32225 8H518	1.60 mm (0.0630 in)	32225 8H565
0.68 mm (0.0268 in)	32225 8H507	1.16 mm (0.0457 in)	32225 8H519	1.64 mm (0.0646 in)	32225 8H566
0.72 mm (0.0283 in)	32225 8H508	1.20 mm (0.0472 in)	32225 8H520	1.68 mm (0.0661 in)	32225 8H567
0.76 mm (0.0299 in)	32225 8H509	1.24 mm (0.0488 in)	32225 8H521	1.72 mm (0.0677 in)	32225 8H568
0.80 mm (0.0315 in)	32225 8H510	1.28 mm (0.0504 in)	32225 8H522		
0.84 mm (0.0331 in)	32225 8H511	1.32 mm (0.0520 in)	32225 8H523		

CAUTION:
Only 1 adjusting shim can be selected.

1. Using depth micrometer and straight edge, measure dimension "O_1 " between transaxle case end face and mounting face of adjusting shim as shown.



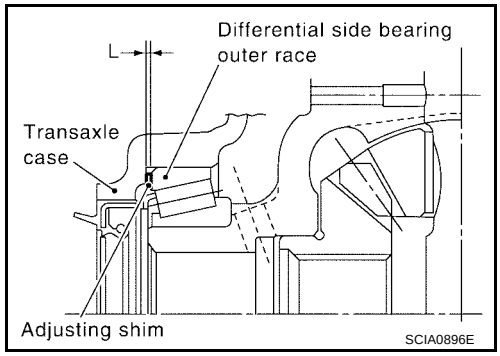
2. Using depth micrometer and straight edge, measure dimension "O_2 " between clutch housing case end face and end face of input shaft rear bearing as shown.



3. Install selected input shaft rear bearing adjusting shim onto input shaft.

DIFFERENTIAL SIDE BEARING PRELOAD

- When adjusting differential side bearing preload, select adjusting shim for differential side bearing. To select adjusting shim, measure clearance “L” between transaxle case and differential side bearing outer race.
- Calculate dimension “L” (thickness of adjusting shim) using the following procedure to meet specification of preload for differential side bearing.



Preload : 0.15 - 0.21 mm (0.0059 - 0.0083 in)

Dimension “L” = (L_1 - L_2) + Preload

L : Thickness of adjusting shim

L_1 : Distance between clutch housing case end face and mounting face of adjusting shim

L_2 : Distance between differential side bearing and transaxle case

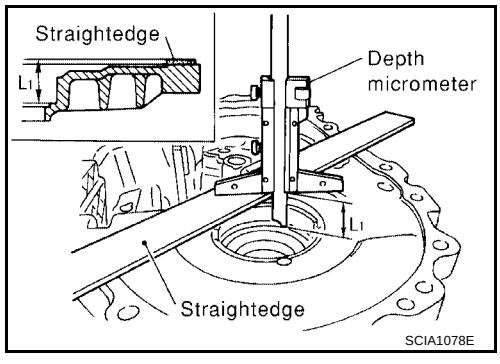
Adjusting Shim

Shim thickness	Part number
0.48 mm (0.0189 in)	31438 80X00
0.52 mm (0.0205 in)	31438 80X01
0.56 mm (0.0220 in)	31438 80X02
0.60 mm (0.0236 in)	31438 80X03
0.64 mm (0.0252 in)	31438 80X04
0.68 mm (0.0268 in)	31438 80X05
0.72 mm (0.0283 in)	31438 80X06
0.76 mm (0.0299 in)	31438 80X07
0.80 mm (0.0315 in)	31438 80X08
0.84 mm (0.0331 in)	31438 80X09
0.88 mm (0.0346 in)	31438 80X10
0.92 mm (0.0362 in)	31438 80X11

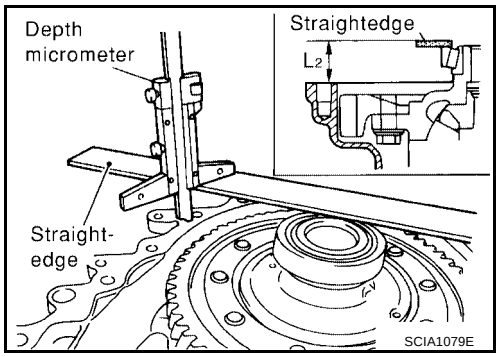
CAUTION:

Up to 2 adjusting shims can be selected.

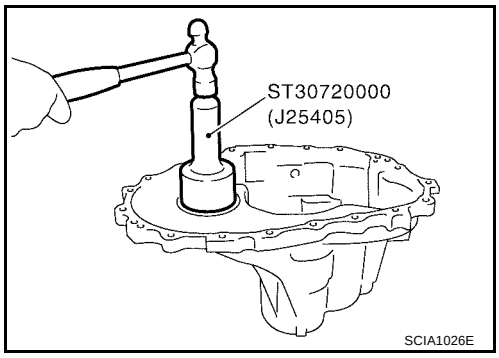
1. Using depth micrometer and straight edge, measure dimension "L_1 " between clutch housing case end face and mounting face of adjusting shim as shown.



2. Install outer race onto differential side bearing on final gear side. Holding the outer race horizontally by hand, rotate final gear five times or more (for smooth movement of bearing roller).
3. Using depth micrometer and straight edge, measure dimension "L_2 " between differential side bearing outer race and transaxle case end face as shown.



4. Install selected adjusting shim and then differential side bearing outer race using Tool as shown.



MAINSHAFT END PLAY

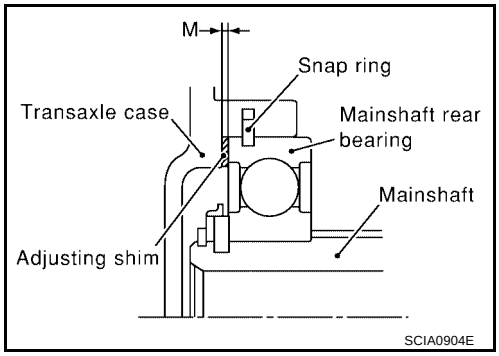
- When adjusting mainshaft end play, select adjusting shim for mainshaft rear bearing. To select adjusting shim, measure clearance “M” between transaxle case and mainshaft rear bearing.
- Calculate dimension "P" (thickness of adjusting shim) using the following procedure to meet specification of end play for mainshaft rear bearing.

End play : 0 - 0.06 mm (0 - 0.0024 in)

Dimension “P” = "M" + End play

P : Thickness of adjusting shim

M : Distance between mainshaft rear bearing and transaxle case



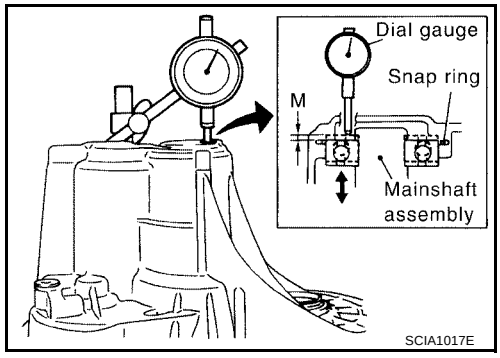
Adjusting Shim

Shim thickness	Part number
0.44 mm (0.0173 in)	32238 8H510
0.48 mm (0.0189 in)	32238 8H511
0.52 mm (0.0205 in)	32238 8H512
0.56 mm (0.0220 in)	32238 8H513
0.60 mm (0.0236 in)	32238 8H514
0.64 mm (0.0252 in)	32238 8H515
0.68 mm (0.0268 in)	32238 8H516
0.72 mm (0.0283 in)	32238 8H517
0.76 mm (0.0299 in)	32238 8H518
0.80 mm (0.0315 in)	32238 8H519
0.84 mm (0.0331 in)	32238 8H520
0.88 mm (0.0346 in)	32238 8H521
0.92 mm (0.0362 in)	32238 8H522
0.96 mm (0.0378 in)	32238 8H523
1.00 mm (0.0396 in)	32238 8H524
1.04 mm (0.0409 in)	32238 8H560
1.08 mm (0.0425 in)	32238 8H561

CAUTION:

Only 1 adjusting shim can be selected.

1. Install mainshaft assembly to clutch housing.
2. Install snap ring to transaxle case.
3. Install transaxle case to clutch housing, and temporarily assemble them with fixing bolts. Install snap ring temporarily to mainshaft rear bearing.
4. Install dial gauge to snap ring access hole, and expand snap ring. Lift mainshaft assembly through control assembly installation hole, and push it against transaxle case. This state shall be defined as base. Moving distance of mainshaft assembly, with snap ring fit on main bearing, becomes “M”.



REVERSE IDLER GEAR END PLAY

- When adjusting reverse idler gear end play, select adjusting shim for reverse idler gear. To select adjusting shim, measure clearance between transaxle case and reverse idler gear.
- Calculate dimension "Q" (thickness of adjusting shim) using the following procedure to meet specification of end play for reverse idler gear.

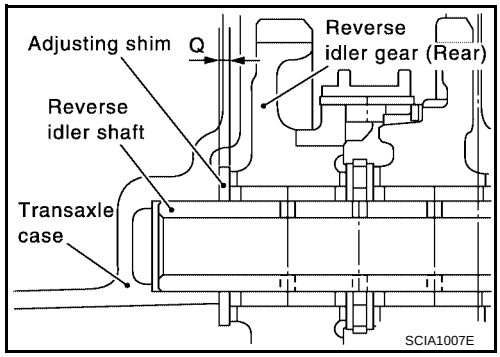
End play : 0.04 - 0.14 mm (0.0016 - 0.0055 in)

Dimension “Q” = (Q_1 - Q_2) + End play

Q : Thickness of adjusting shim

Q_1 : Distance between transaxle case end face and mounting face of adjusting shim

Q_2 : Distance between clutch housing case end face and end face of reverse idler gear



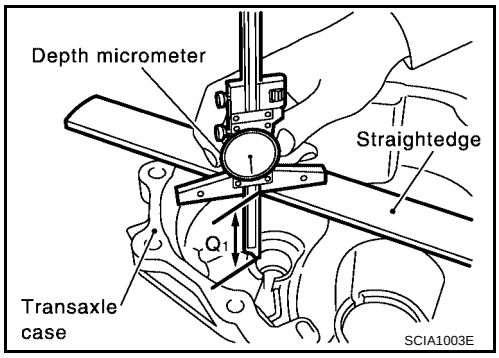
Adjusting Shim

Shim thickness	Part number
1.76 mm (0.0693 in)	32237 8H500
1.84 mm (0.0724 in)	32237 8H501
1.92 mm (0.0756 in)	32237 8H502
2.00 mm (0.0787 in)	32237 8H503
2.08 mm (0.0819 in)	32237 8H504
2.16 mm (0.0850 in)	32237 8H505
2.24 mm (0.0882 in)	32237 8H506
2.32 mm (0.0913 in)	32237 8H507
2.40 mm (0.0945 in)	32237 8H508
2.48 mm (0.0976 in)	32237 8H509
2.56 mm (0.1008 in)	32237 8H510
2.64 mm (0.1039 in)	32237 8H511

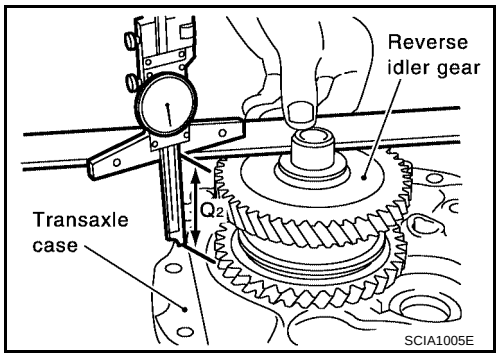
CAUTION:

Only 1 adjusting shim can be selected.

1. Using depth micrometer and straight edge, measure dimension "Q_1 " between transaxle case end face and mounting face of adjusting shim as shown.



2. Using depth micrometer and straight edge, measure dimension "Q_2 " between clutch housing case end face and end face of reverse idler gear as shown.



3. Install selected reverse idler gear adjusting shim onto reverse idler gear.

INPUT SHAFT AND GEARS

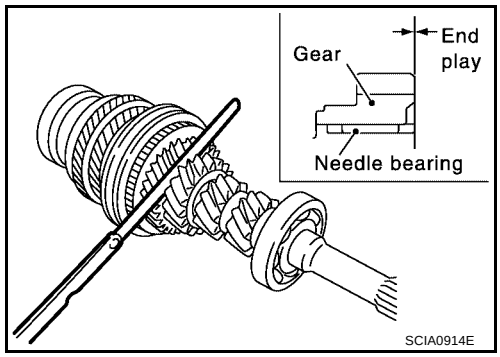
PFP:32200

Disassembly and Assembly

ECS005UP

DISASSEMBLY

1. Before disassembling, measure the end play for 3rd, 4th, and 5th input gears as shown.



End play standard range

3rd gear : 0.18 - 0.31 mm (0.0071 - 0.0122 in)

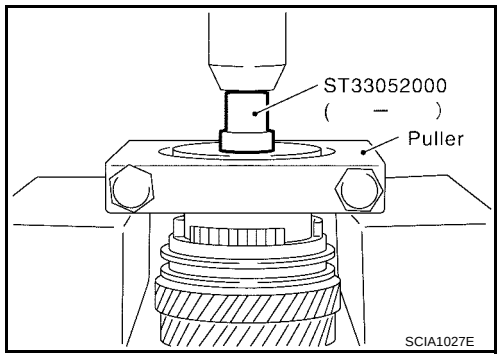
4th gear : 0.20 - 0.30 mm (0.0079 - 0.0118 in)

5th gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)

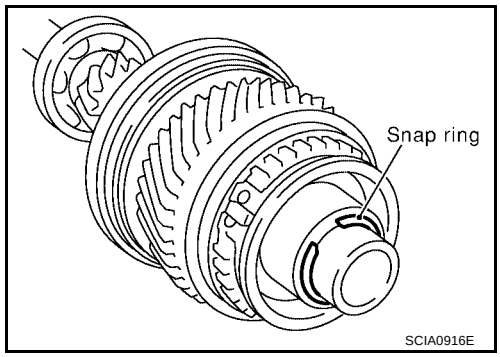
CAUTION:

If measurement is outside the standard range, disassemble to check contact surfaces of gear, shaft, and hub. Adjust with snap ring at assembly.

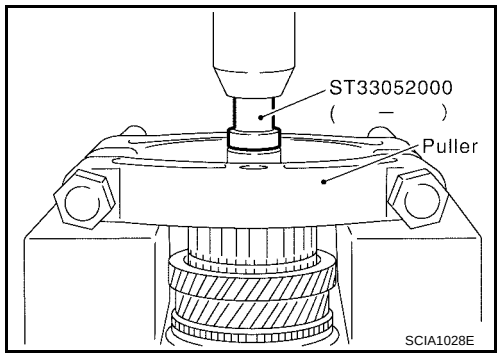
2. Remove the oil channel.
3. Remove the input shaft rear bearing using Tool as shown.



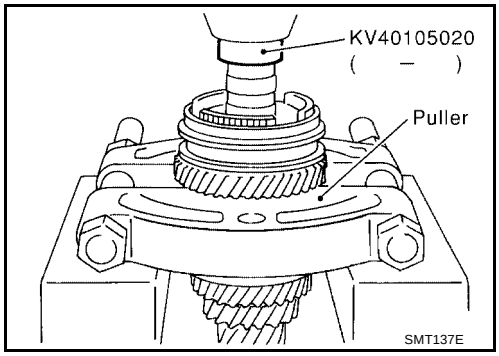
4. Remove the snap ring as shown.



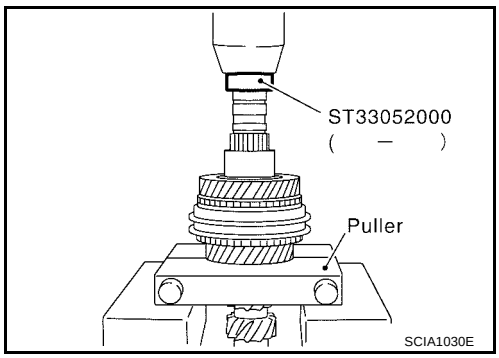
5. Remove input shaft bearing spacer and 5th stopper simultaneously using Tool as shown.



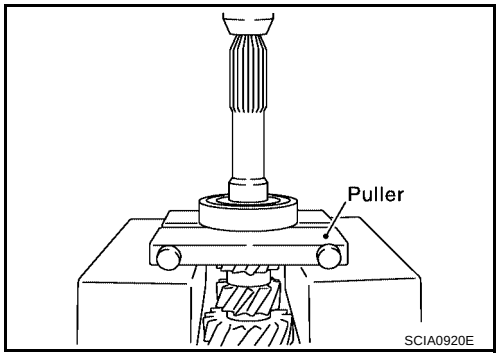
6. Remove 5th input gear and synchronizer hub assembly simultaneously using Tool as shown.
7. Remove 5th needle bearing.



8. Remove 5th bushing, thrust washer, 4th input gear, 4th needle bearing, 4th bushing, 4th baulk ring, 3rd-4th synchronizer hub assembly, 3rd baulk ring and 3rd input gear simultaneously using Tool as shown.
9. Remove 3rd needle bearing.



10. Remove input shaft front bearing using Tool as shown.

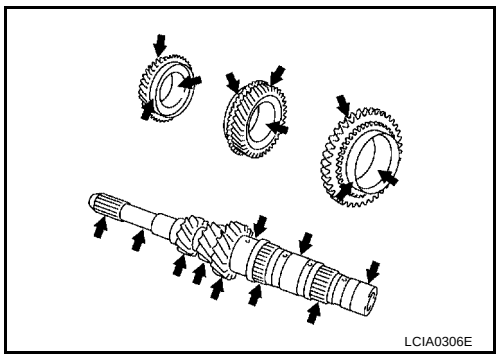


INSPECTION AFTER DISASSEMBLY

Input Shaft and Gears

Check parts for conditions listed below. If necessary, replace them with new ones.

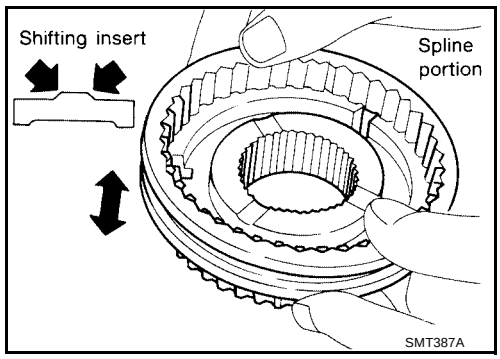
- Damage, peeling, dent, uneven wear, bending of shaft.
- Excessive wear, damage, peeling of gears.



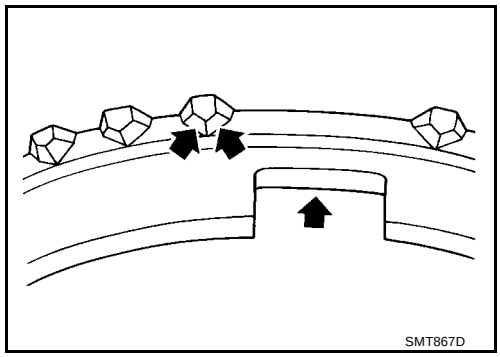
Synchronizer

Check parts for conditions listed below. If necessary, replace them with new ones.

- Damage and excessive wear of contact surfaces of coupling sleeve, synchronizer hub, and shifting insert
- Coupling sleeve and synchronizer hub must move smoothly.



- If any crack, damage, or excessive wear is found on cam face of baulk ring or working face of insert, replace it.



Baulk Ring Clearance

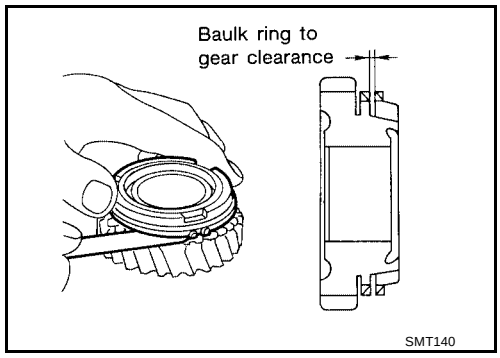
Check parts for conditions listed below. If necessary, replace them with new ones.

- Press baulk ring against cone, and measure clearance between baulk ring and cone. If measurement is below limit, replace it with a new one.

Baulk ring clearance

Standard

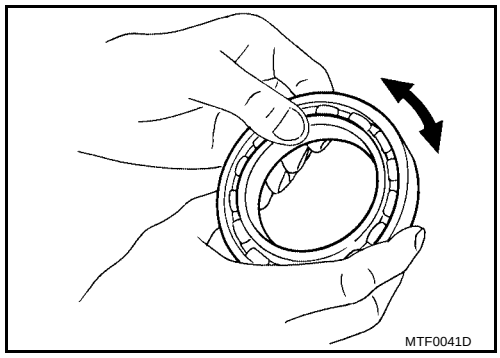
3rd and 4th	**: 0.9 - 1.45 mm (0.035 - 0.0571 in)**
5th	**: 0.95 - 1.4 mm (0.0374 - 0.055 in)**
Limit value	**: 0.7 mm (0.028 in)**



Bearing

Check parts for conditions listed below. If necessary, replace them with new ones.

- Damage and rough rotation of bearing



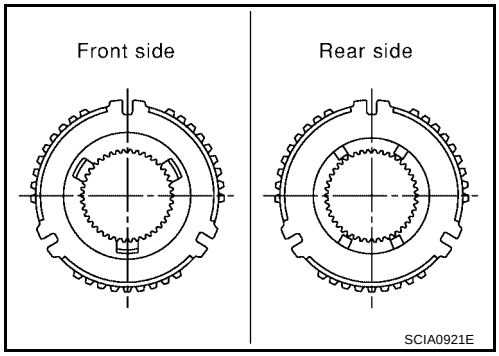
ASSEMBLY

1. Install 3rd needle bearing.
2. Install 3rd input gear and 3rd baulk ring.

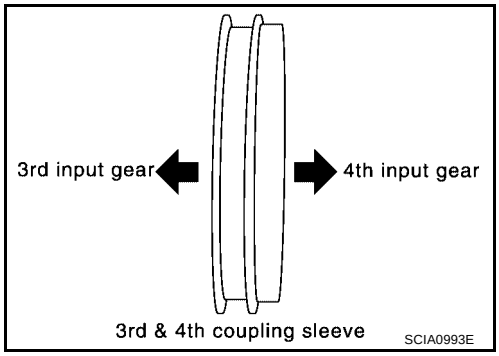
3. Install spread spring, shifting insert and new 3rd-4th synchronizer hub onto 3rd-4th coupling sleeve.

CAUTION:

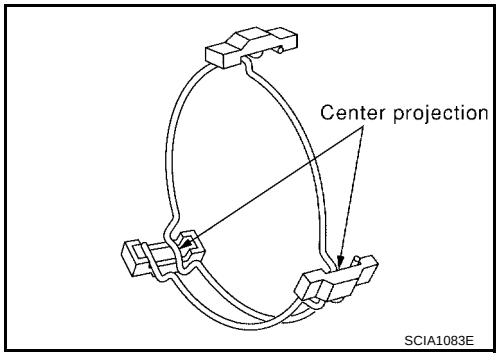
- **Install with orientation of synchronizer hub as shown.**
- **Do not reuse 3rd-4th synchronizer hub.**



- **Install with orientation of coupling sleeve as shown.**



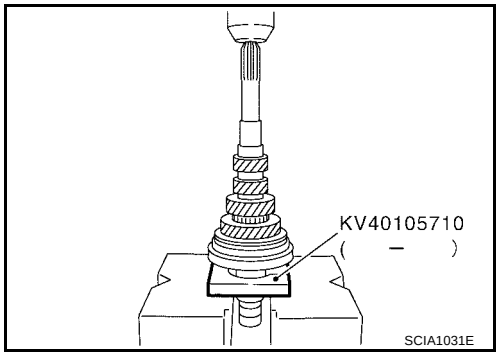
- **Do not to hook the ends of the two spread springs (front and back have two each) on the same shifting insert as shown.**



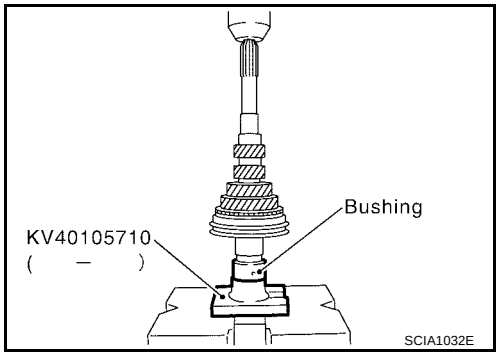
4. Install 3rd-4th synchronizer hub assembly using Tool as shown.

CAUTION:

Align the grooves of the shifting insert and 3rd baulk ring.

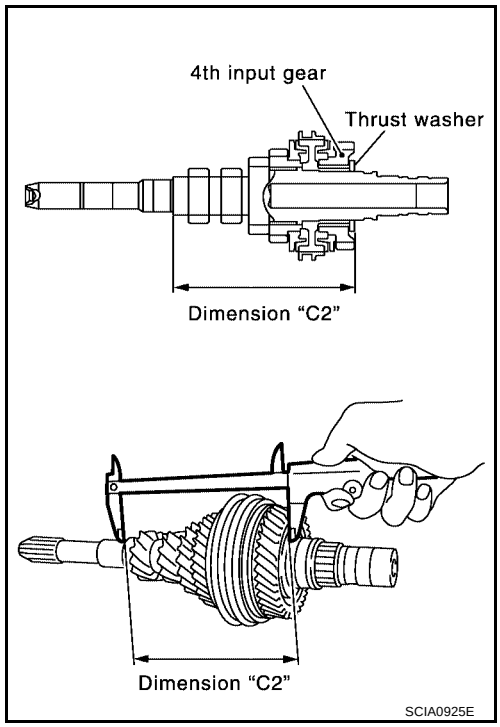


5. Install 4th bushing using Tool as shown.
6. Install 4th baulk ring.
7. Install 4th input gear and 4th needle bearing.



8. Select thrust washer so that dimension "C_2 " satisfies standard below. Then install it onto input shaft.

Standard for dimension "C_2 " : 154.7 - 154.8 mm (6.091 - 6.094 in)

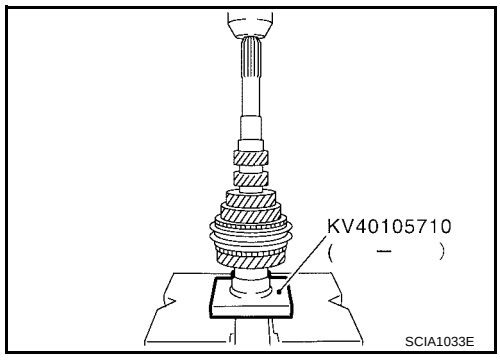


CAUTION:
Only one thrust washer can be selected.

Thrust Washer

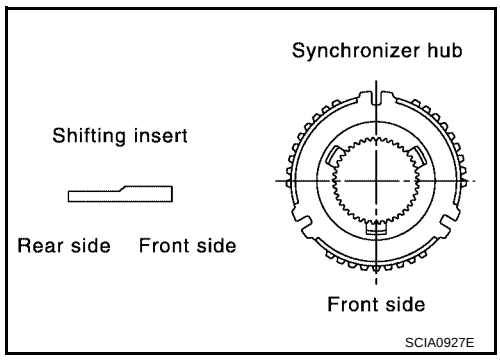
Thickness	Part number	Thickness	Part number
3.84 mm (0.1512 in)	32347 8H500	4.02 mm (0.1583 in)	32347 8H503
3.90 mm (0.1535 in)	32347 8H501	4.08 mm (0.1606 in)	32347 8H504
3.96 mm (0.1559 in)	32347 8H502	4.14 mm (0.1630 in)	32347 8H505

9. Install 5th bushing using Tool as shown.
10. Install 5th needle bearing and 5th input gear.
11. Install 5th baulk ring.

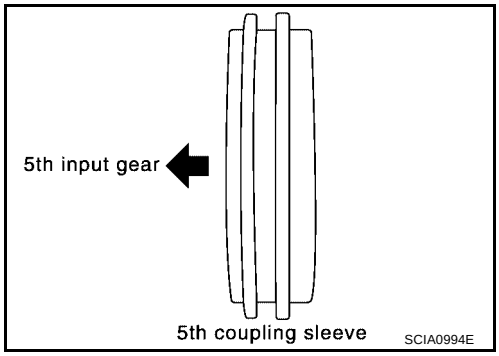


12. Install spread spring, shifting insert and 5th synchronizer hub onto 5th coupling sleeve.

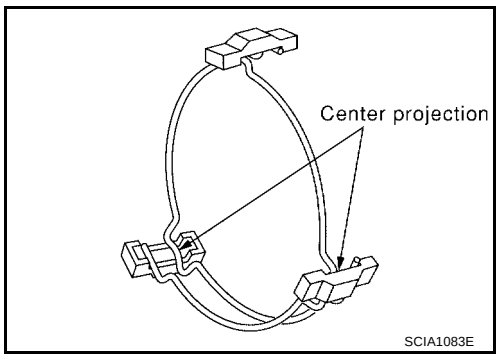
CAUTION:
- **Install with orientation of synchronizer hub and shifting insert as shown.**



- **Install with orientation of coupling sleeve as shown.**

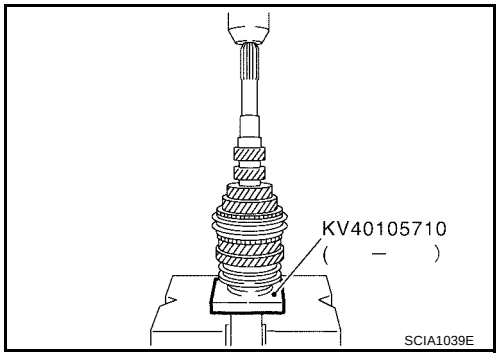


- **Do not hook the ends of the two spread springs (front and back has two each) on the same shifting insert as shown.**

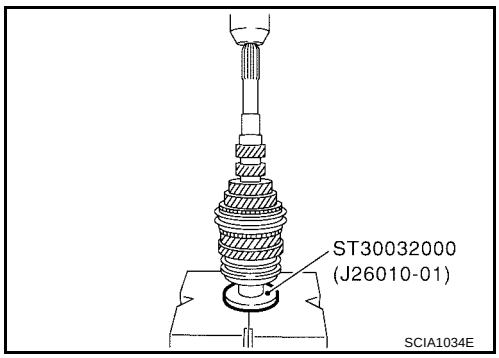


13. Install 5th synchronizer hub assembly using Tool as shown.

CAUTION:
Align the grooves of 5th shifting insert and 5th baulk ring.



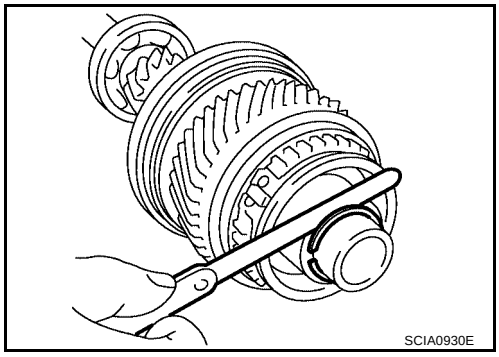
14. Install 5th stopper and then input shaft bearing spacer using Tool as shown.



15. Install snap ring onto input shaft, and check that end play (gap between snap ring and groove) of input shaft bearing spacer is within the standard value.

End play standard value : 0 - 0.1 mm (0 - 0.004 in)

- If the measurement is outside the standard value, select the required snap ring size to correct the end play.

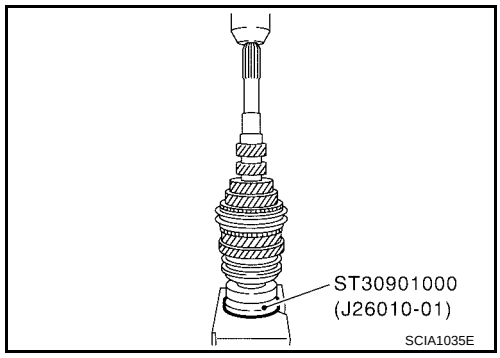


Snap Rings

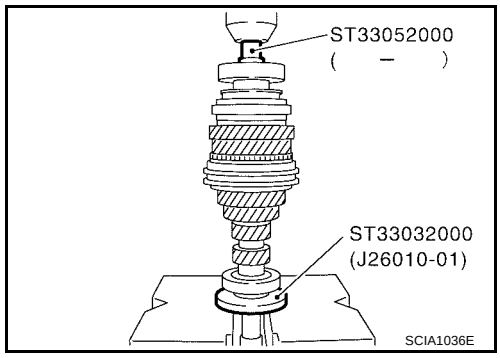
Thickness	Part number	Thickness	Part number
1.71 mm (0.0673 in)	32204 8H510	2.01 mm (0.0791 in)	32204 8H516
1.76 mm (0.0693 in)	32204 8H511	2.06 mm (0.0811 in)	32204 8H517
1.81 mm (0.0713 in)	32204 8H512	2.11 mm (0.0831 in)	32204 8H518
1.86 mm (0.0732 in)	32204 8H513	2.16 mm (0.0850 in)	32204 8H519
1.91 mm (0.0752 in)	32204 8H514	2.21 mm (0.0871 in)	32204 8H520
1.96 mm (0.0772 in)	32204 8H515	2.26 mm (0.0890 in)	32204 8H521

16. Install the input shaft rear bearing using Tool as shown.

CAUTION:
Install input shaft rear bearing with its brown surface facing the input gear side.



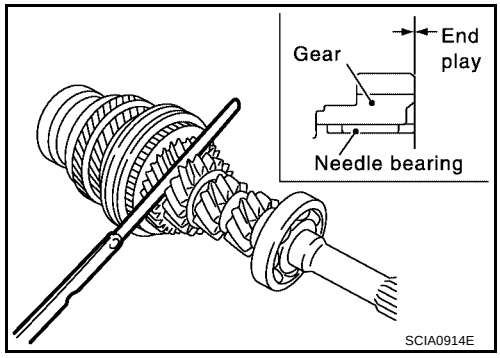
17. Install the input shaft front bearing using Tool as shown.
18. Install the oil channel onto input shaft.



19. Check the end play of 3rd, 4th, and 5th input gears.

End play standard value

3rd gear : 0.18 - 0.31 mm (0.0071 - 0.0122 in)
4th gear : 0.20 - 0.30 mm (0.0079 - 0.0118 in)
5th gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)



MAINSHAFT AND GEARS

PFP:32241

Disassembly and Assembly

ECS005UQ

DISASSEMBLY

1. Before disassembling, measure the end play of 1st and 2nd main gears.

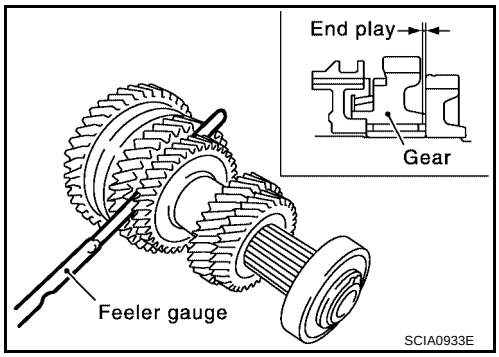
End play standard value

1st gear : 0.20 - 0.30 mm (0.0079 - 0.0118 in)

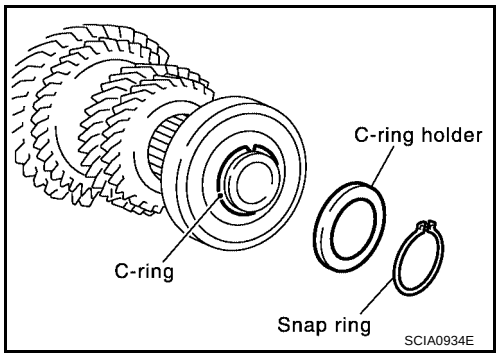
2nd gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)

CAUTION:

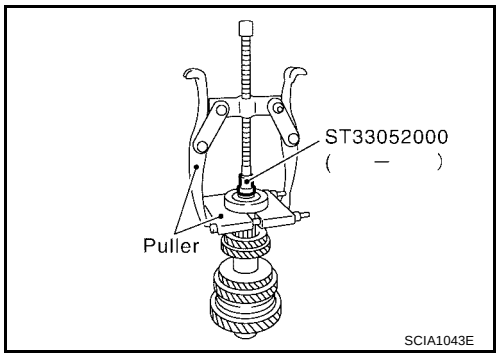
If the measurement is outside the standard value, disassemble to check the contact surfaces of the gear, shaft, and hub. Adjust with the correct snap ring size at assembly.



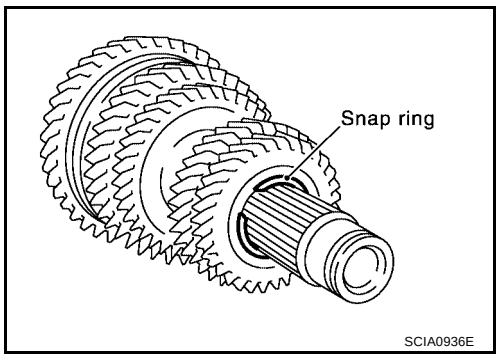
2. Remove the snap ring.
3. Remove the C-ring holder, and then mainshaft C-ring as shown.



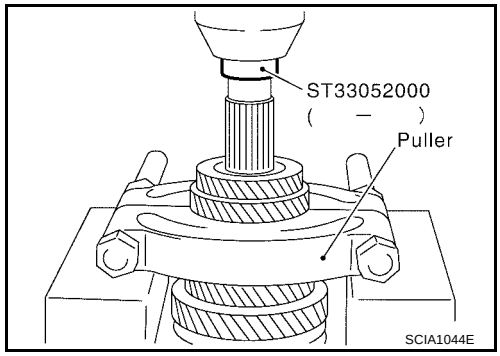
4. Remove the mainshaft rear bearing using Tool as shown.



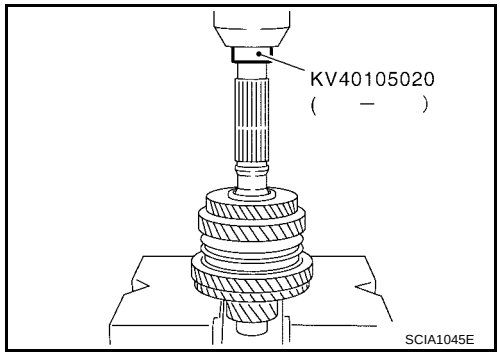
5. Remove the snap ring.



6. Remove 4th main gear and 5th main gear simultaneously using Tool as shown.
7. Remove adjusting shim.
8. Remove 3rd-4th mainshaft spacer.



9. Remove 3rd main gear, 2nd main gear, 2nd needle bearing, 2nd bushing, 1st-2nd synchronizer hub assembly, 1st main gear, reverse main gear, 1st needle bearing, and 1st bushing simultaneously using Tool as shown.

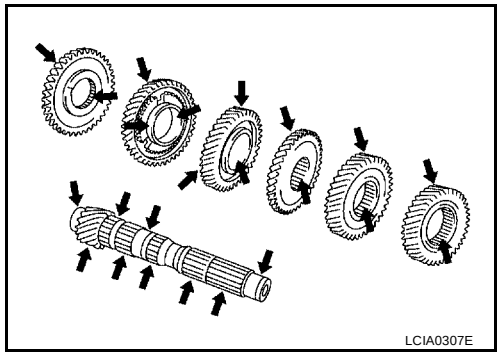


INSPECTION AFTER DISASSEMBLY

Mainshaft and Gears

Check parts listed. If necessary, replace them with new ones.

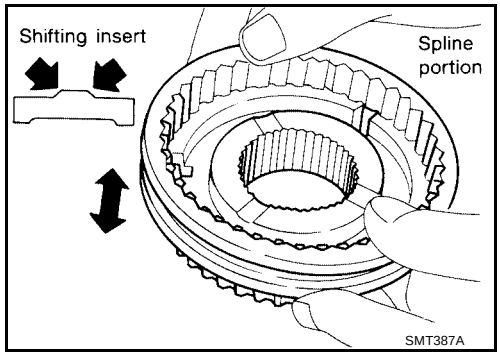
- Damage, peeling, dent, uneven wear, bending, and other non-standard conditions of the shaft.
- Excessive wear, damage, peeling, and other non-standard conditions of the gears.



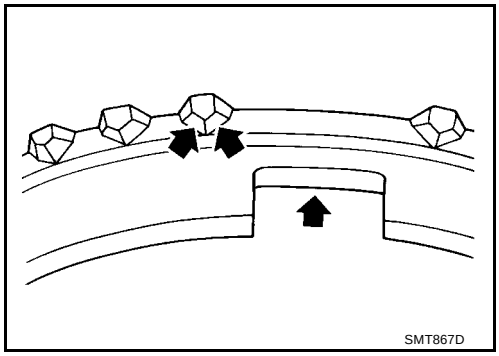
Synchronizer

Check parts listed. If necessary, replace them with new ones.

- Damage and unusual wear on contact surfaces of coupling sleeve, synchronizer hub, and shifting insert.
- Coupling sleeve and synchronizer hub must move smoothly.



- If any crack, damage, or excessive wear is found on cam face of baulk ring or working face of insert, replace it.



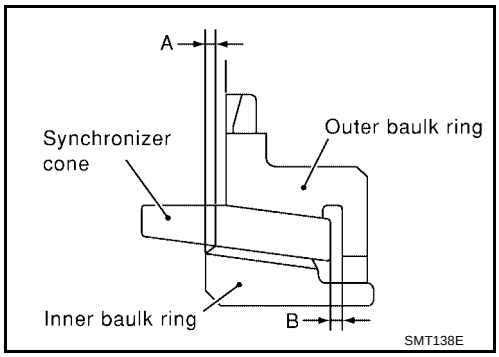
Baulk Ring Clearance

Checking the double cone synchronizer (1st and 2nd).

- Check the clearance of the outer baulk ring, synchronizer cone, and inner baulk ring of 1st and 2nd double cone synchronizers, following the procedure below.

NOTE:
The mean value is the middle value of a set of measurements between the highest and lowest values. It is calculated by adding the highest and lowest measured value and dividing their sum by two: [(high value) + (low value)] / 2 = mean value.

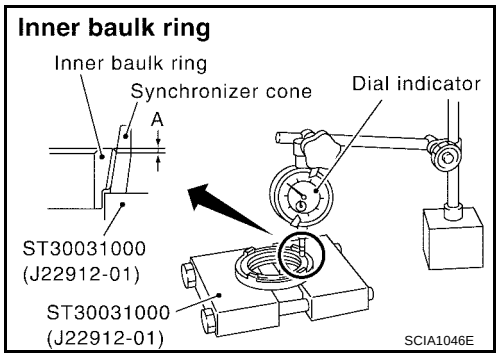
CAUTION:
Outer baulk ring, synchronizer cone, and inner baulk ring act as a set to control the clearances "A" and "B". If the measurement exceeds the service limit value, replace all of them as a set.



1. Using a dial gauge and Tool, measure clearance "A" at two or more points diagonally opposite, and calculate the mean value.

Clearance "A"

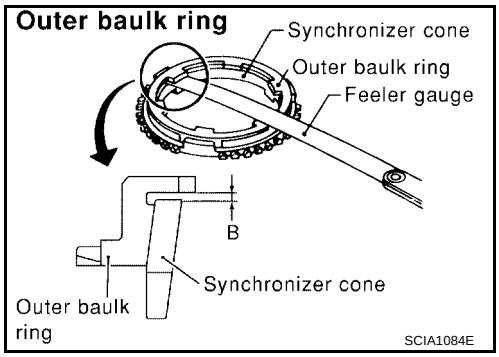
Standard	**: 0.6 - 0.8 mm (0.024 - 0.031 in)**
Limit value	**: 0.2 mm (0.008 in) or less**



2. Using a feeler gauge, measure clearance "B" at two or more points diagonally opposite, and calculate the mean value.

Clearance "B"

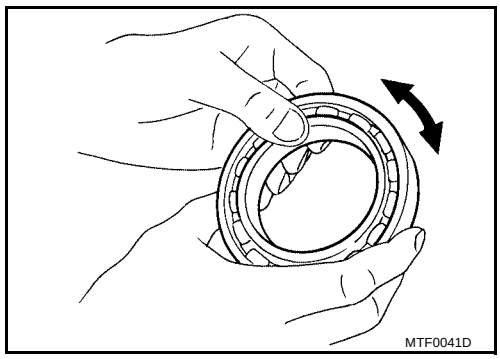
Standard	**: 0.6 - 1.1 mm (0.024 - 0.043 in)**
Limit value	**: 0.2 mm (0.008 in) or less**



Bearing

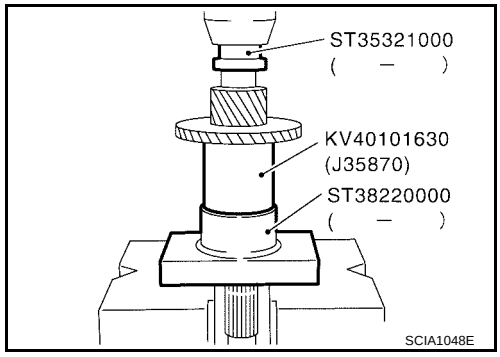
Check items below. If necessary, replace them with new ones.

- Damage and rough rotation of bearing



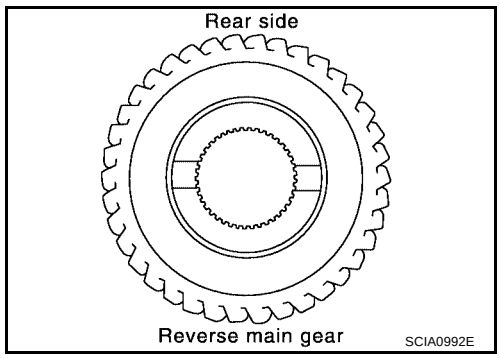
ASSEMBLY

1. Install reverse main gear using Tools as shown.

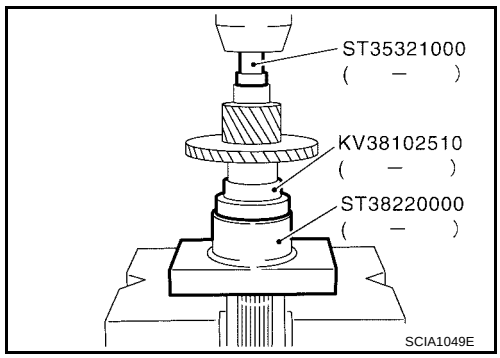


CAUTION:

Install the reverse main gear with the specified orientation as shown.



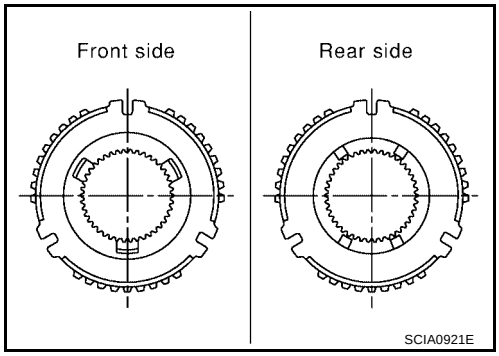
2. Install 1st bushing using Tools as shown.
3. Install needle bearing, and then 1st main gear.



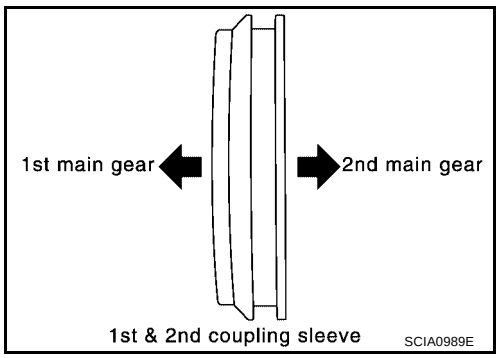
4. Install spread spring, shifting insert and new 1st-2nd synchronizer hub onto 1st-2nd coupling sleeve.

CAUTION:

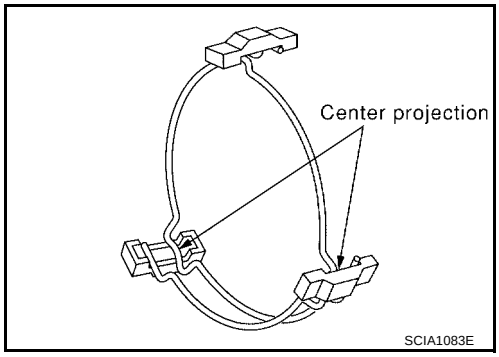
- **Install with orientation of synchronizer hub as shown.**
- **Do not reuse the 1st-2nd synchronizer hub.**



- **Install with orientation of coupling sleeve as shown.**



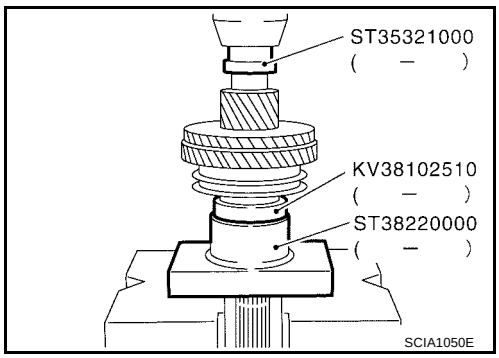
- **Do not to hook the ends of the two spread springs (front and back have two each) on same shifting insert as shown.**



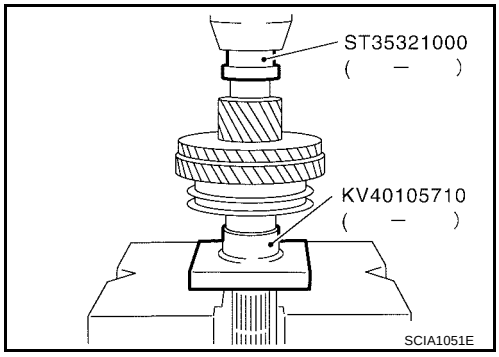
5. Install 1st gear synchronizer assembly onto mainshaft, and synchronizer hub assembly onto mainshaft using Tools as shown.

CAUTION:

- **Outer baulk ring, synchronizer cone, and inner baulk ring on 2nd gear-side must have been removed.**
- **Install with orientation of coupling sleeve.**



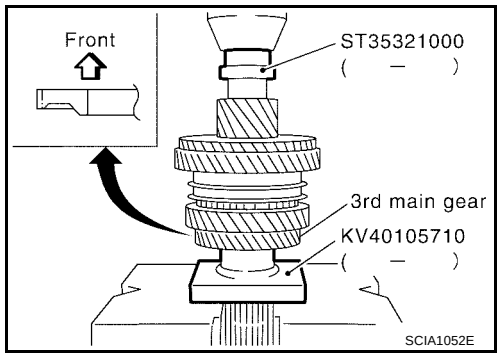
6. Install 2nd bushing using Tools as shown.
7. Install outer baulk ring, synchronizer cone, and inner baulk ring on 2nd gear-side.
8. Install 2nd needle bearing and 2nd gear.



9. Install 3rd main gear using Tools as shown.

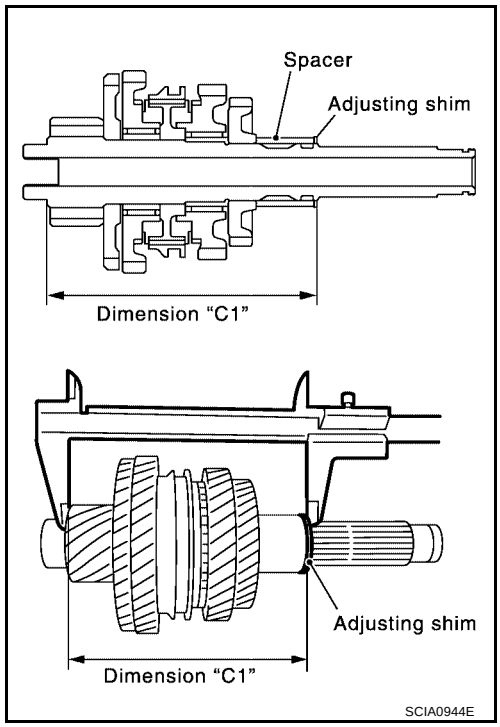
CAUTION:
Install with orientation of 3rd main gear as shown.

10. Install 3rd-4th mainshaft spacer.



11. Select a suitable adjusting shim so that the dimension "C_1" satisfies the standard value below, and install it onto the mainshaft as shown.

Standard for dimension "C_1" : 173.85 - 173.95 mm (6.844 - 6.848 in)



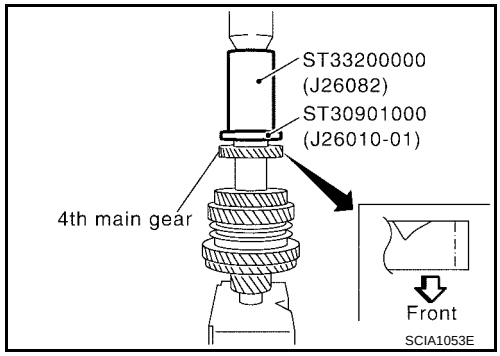
CAUTION:
Only 1 adjusting shim can be selected.

Adjusting Shims

Thickness	Part number	Thickness	Part number
0.52 mm (0.0205 in)	32238 8H500	0.84 mm (0.0331 in)	32238 8H504
0.60 mm (0.0236 in)	32238 8H501	0.92 mm (0.0362 in)	32238 8H505
0.68 mm (0.0268 in)	32238 8H502	1.00 mm (0.0394 in)	32238 8H506
0.76 mm (0.0299 in)	32238 8H503	1.08 mm (0.0425 in)	32238 8H507

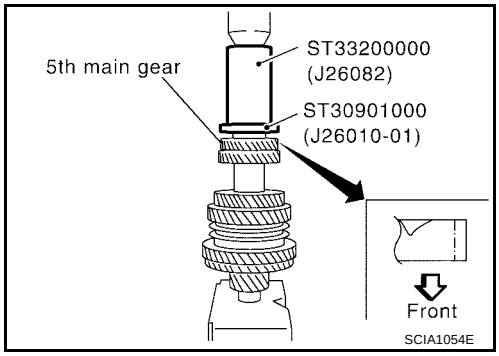
12. Install 4th main gear using Tools as shown.

CAUTION:
Install with orientation of 4th main gear as shown.



13. Install 5th main gear using Tools as shown.

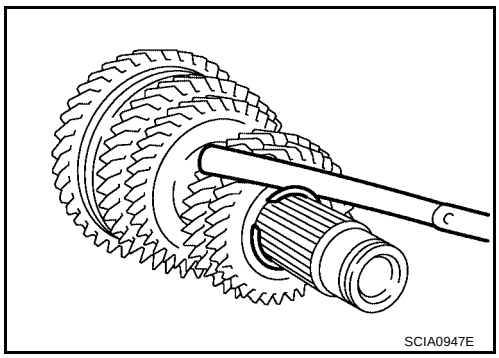
CAUTION:
Install with orientation of 5th main gear as shown.



14. Install snap ring onto mainshaft, and check that end play of 5th main gear satisfies standard value as shown.

End play standard value : 0 - 0.1 mm (0 - 0.004 in)

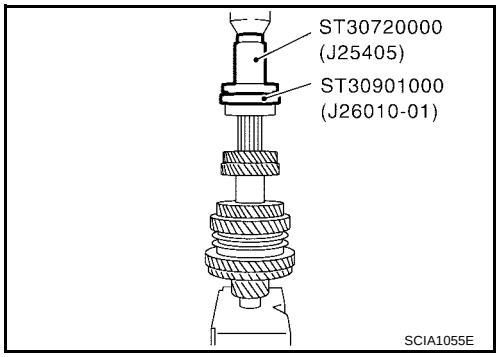
- If measurement is outside the standard value, reselect the required size snap ring.



Snap Rings

Thickness	Part number	Thickness	Part number
1.85 mm (0.0728 in)	32204 8H500	2.05 mm (0.0807 in)	32204 8H504
1.90 mm (0.0748 in)	32204 8H501	2.10 mm (0.0827 in)	32204 8H505
1.95 mm (0.0768 in)	32204 8H502	2.15 mm (0.0846 in)	32204 8H506
2.00 mm (0.0787 in)	32204 8H503	2.20 mm (0.0866 in)	32204 8H507

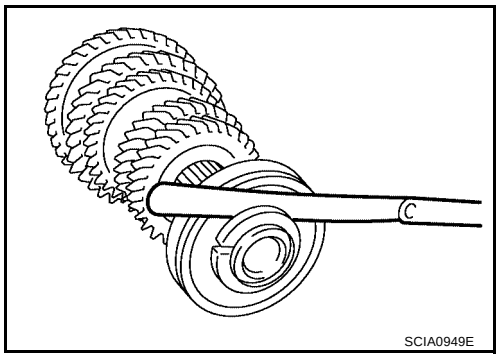
15. Install mainshaft rear bearing using Tools as shown.



16. Install C-ring onto mainshaft, and check that end play of mainshaft rear bearing meets specification as shown.

End play standard value : 0 - 0.06 mm (0 - 0.0024 in)

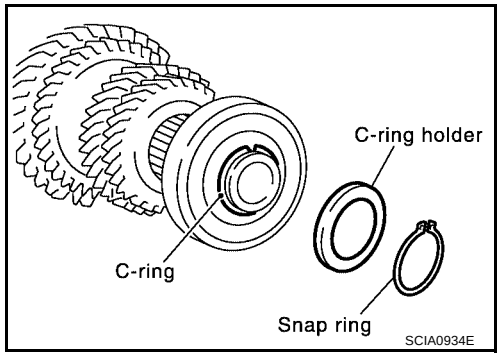
- If measurement is outside the standard value, reselect the required size C-ring.



C-rings

Thickness	Part number	Thickness	Part number
2.535 mm (0.0866 in)	32348 8H800	2.835 mm (0.1116 in)	32348 8H810
2.565 mm (0.1010 in)	32348 8H801	2.865 mm (0.1128 in)	32348 8H811
2.595 mm (0.1022 in)	32348 8H802	2.895 mm (0.1140 in)	32348 8H812
2.625 mm (0.1033 in)	32348 8H803	2.925 mm (0.1152 in)	32348 8H813
2.655 mm (0.1045 in)	32348 8H804	2.955 mm (0.1163 in)	32348 8H814
2.685 mm (0.1057 in)	32348 8H805	2.985 mm (0.1175 in)	32348 8H815
2.715 mm (0.1069 in)	32348 8H806	3.015 mm (0.1187 in)	32348 8H816
2.745 mm (0.1081 in)	32348 8H807	3.045 mm (0.1199 in)	32348 8H817
2.775 mm (0.1093 in)	32348 8H808	3.075 mm (0.1211 in)	32348 8H818
2.805 mm (0.1104 in)	32348 8H809		

17. Fit C-ring holder, and install snap ring as shown.



18. Check end play of 1st and 2nd main gears.

End play standard value

1st gear : 0.20 - 0.30 mm (0.0079 - 0.0118 in)

2nd gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)

REVERSE IDLER SHAFT AND GEARS

PFP:32281

Disassembly and Assembly

ECS005UR

DISASSEMBLY

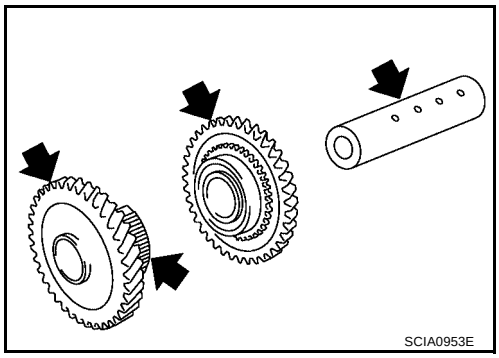
1. Remove reverse idler gear adjusting shim.
2. Remove reverse idler gear (rear), reverse coupling sleeve and insert spring simultaneously.
3. Remove reverse idler gear needle bearing.
4. Remove thrust needle bearing.
5. Remove reverse baulk ring.
6. Remove reverse idler gear (front).
7. Remove reverse idler gear needle bearing.
8. Remove thrust needle bearing.
9. Pull off locking pin from reverse idler shaft.

INSPECTION AFTER DISASSEMBLY

Reverse Idler Shaft and Gears

Check parts listed below. If necessary, replace them with new ones.

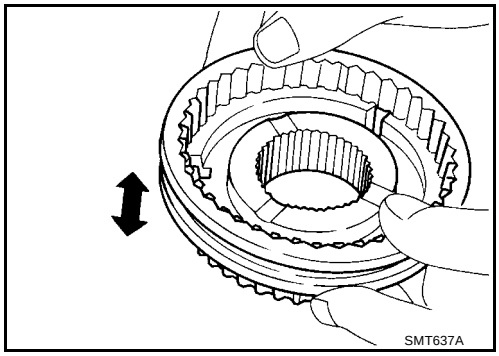
- Damage, peeling, dent, uneven wear, bending, and other non-standard conditions of the shaft.
- Excessive wear, damage, peeling, and other non-standard conditions of the gears.


SCIA0953E

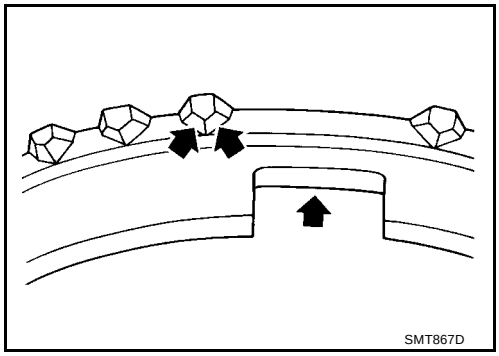
Synchronizer

Check parts listed below. If necessary, replace them with new ones.

- Damage and unusual wear on contact surfaces of coupling sleeve, synchronizer hub, and insert spring.
- Coupling sleeve and synchronizer hub must move smoothly.


SMT637A

- If any crack, damage, or excessive wear is found on cam face of baulk ring or working face of insert, replace it.


SMT867D

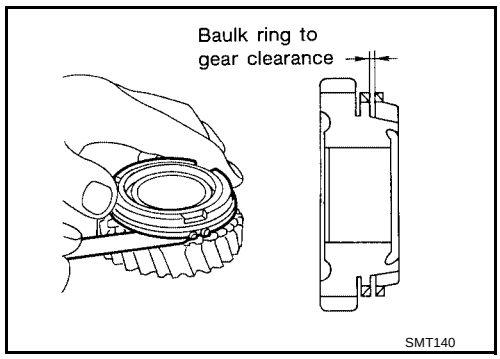
Baulk Ring Clearance

Press baulk ring against cone, and measure clearance between baulk ring and cone. If measurement is below limit value, replace it with a new one.

Clearance

Standard : 0.95 - 1.4 mm (0.0374 - 0.055 in)

Limit value : 0.7 mm (0.028 in)



Bearing

Check parts listed below. If necessary, replace them with new ones.

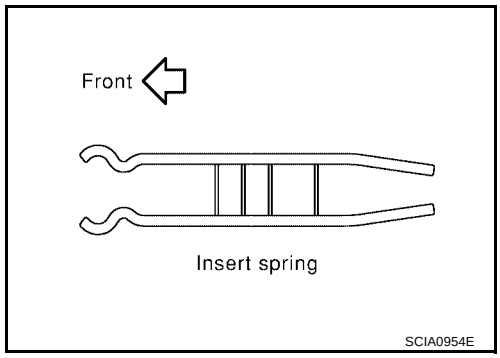
- Damage and rough rotation of bearing.

ASSEMBLY

Assembly is in the reverse order of disassembly.

CAUTION:

- **Install with orientation of insert spring as shown.**



FINAL DRIVE

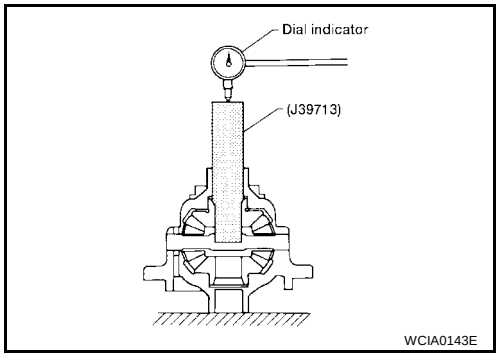
PFP:38411

Disassembly and Assembly

ECS005US

PRE-INSPECTION

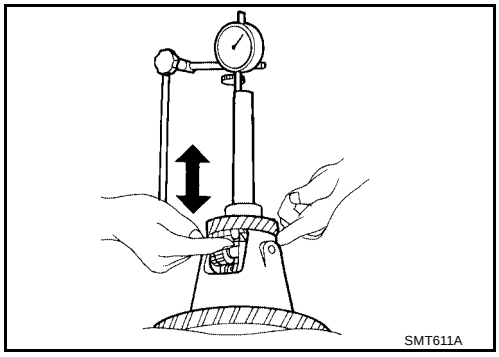
1. Clean final drive assembly sufficiently to prevent side gear thrust washer, differential case, side gear, and other parts from sticking by gear oil.
2. Upright the differential case so that the side gear to be measured faces upward.
3. Place final drive adapter and dial indicator onto side gear using Tool as shown.



4. Move side gear up and down, and measure the clearance as shown.

Clearance between side gear and differential case : 0.1 - 0.2 mm (0.004 - 0.008 in)

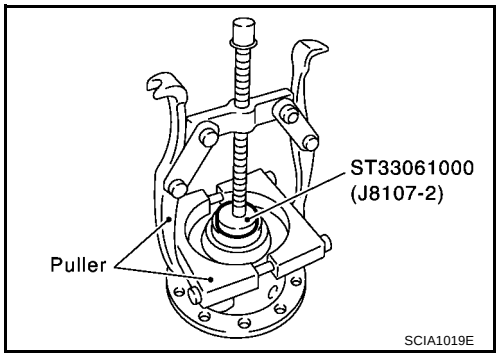
CAUTION:
There must be no resistance and the gears must rotate freely.



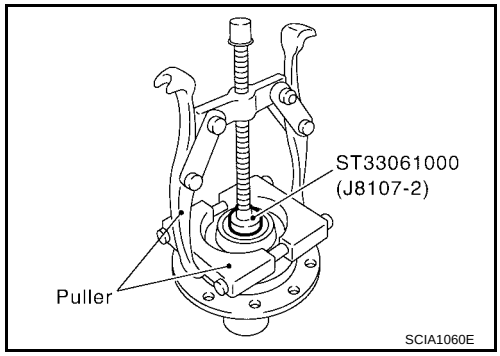
5. If the clearance measured is not within specification, adjust the clearance by changing the thrust washer thickness.
6. Turn the differential case upside down, and measure the clearance between the side gear and differential case on the other side to the same specifications, adjust using a thrust washer as necessary.

DISASSEMBLY

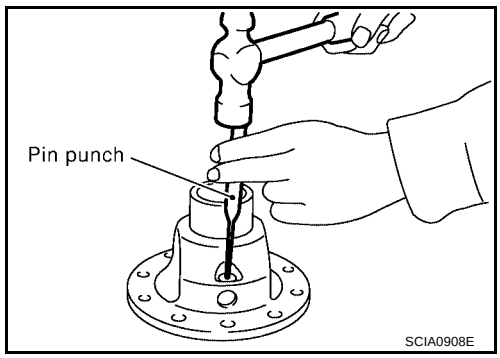
1. Remove the final gear bolts and then separate the final gear from the differential case.
2. Remove speedometer drive gear.
3. Using Tool and puller, remove differential side bearing (clutch housing side) as shown.



4. Using Tool and puller, remove differential side bearing (transaxle case side) as shown.



5. Using a pin punch, pull out lock pin and pinion mate shaft as shown.

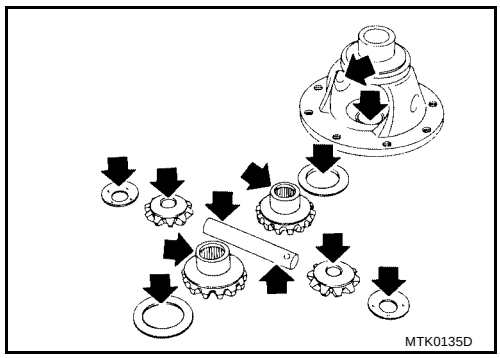


6. Rotate pinion mate gears, and remove pinion mate gears, pinion mate thrust washers, side gears, and side gear thrust washers from differential case.

INSPECTION AFTER DISASSEMBLY

Gear, Washer, Shaft and Case

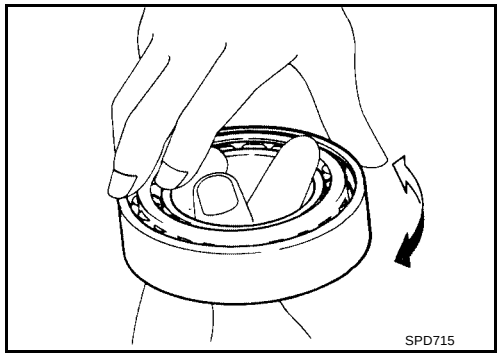
- Check side gears, side gear thrust washers, pinion mate shaft, pinion mate gears, pinion mate thrust washers and differential case as shown. If necessary, replace with new parts.



Bearing

- Check for bearing damage and rough rotation as shown. If necessary, replace with new parts.

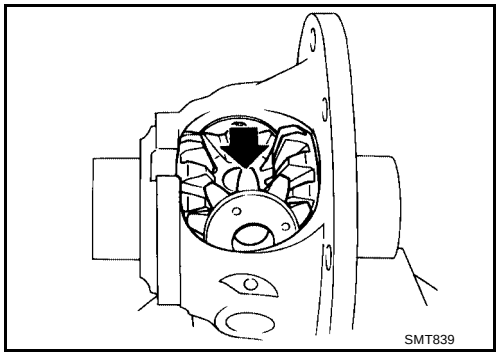
CAUTION:
When replacing tapered roller bearing, replace outer and inner races as a set.



ASSEMBLY

1. Apply gear oil to sliding area of differential case, each gear, and thrust washer.

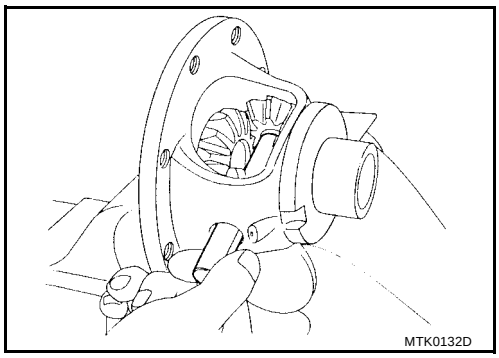
2. Install side gear thrust washers and side gears into differential case as shown.



3. While rotating pinion mate thrust washers and pinion mate gears, and aligning them diagonally, install them into differential case.

4. Insert pinion mate shaft into differential case as shown.

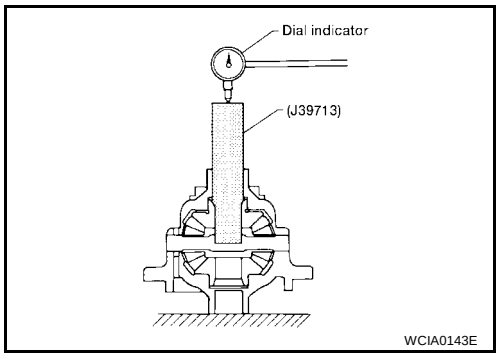
CAUTION:
Be sure not to damage pinion mate thrust washers.



5. Measure end play of side gears, using the procedure below. Then select side gear thrust washer.

a. Upright the differential case so that its side gear to be measured faces upward.

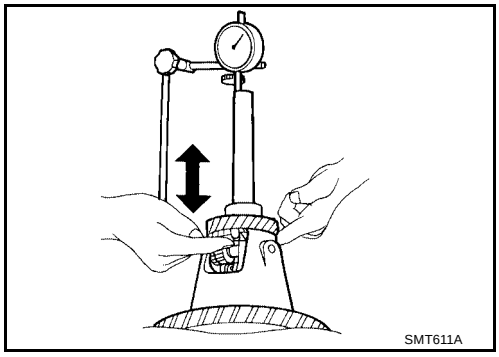
b. Place final drive adapter and dial indicator onto side gears as shown.



c. Move side gears up and down to measure end play, and select thrust washer so that it meets specification.

End play standard value : 0.1 - 0.2 mm (0.004 - 0.008 in)

CAUTION:
- **There must be no resistance and the gears must rotate freely.**
- **Place differential case upside down. Measure the end play for opposite side-gears using the same procedure.**
- **Only one thrust washer can be selected.**

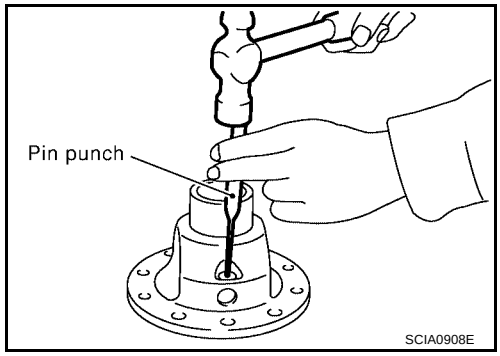


Thrust washers

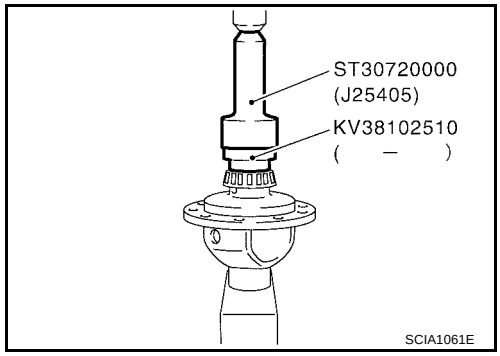
Thickness	Part number
0.75 mm (0.0295 in)	38424 81X00
0.80 mm (0.0315 in)	38424 81X01
0.85 mm (0.0335 in)	38424 81X02
0.90 mm (0.0354 in)	38424 81X03
0.95 mm (0.0374 in)	38424 81X04

6. Drive a new lock pin into the pinion mate shaft using a suitable tool as shown.

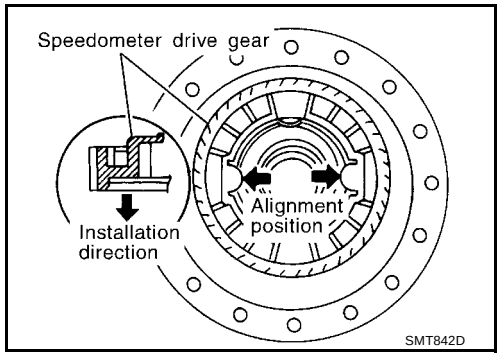
CAUTION:
Do not reuse the lock pin.



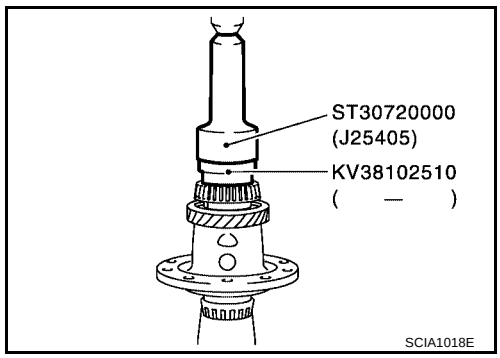
7. Install differential side bearing (transaxle case side) using Tool as shown.



8. Align and install speedometer drive gear onto differential case as shown.

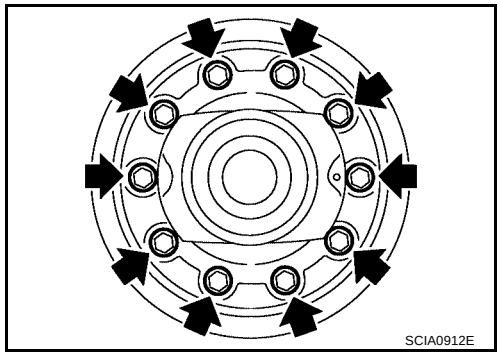


9. Install differential side bearing (clutch housing side) using Tools as shown.



10. Install the final gear into the differential case, and tighten the final gear bolts to specification.

Final gear bolts : Refer to MT-88, "FINAL DRIVE COMPONENTS" .



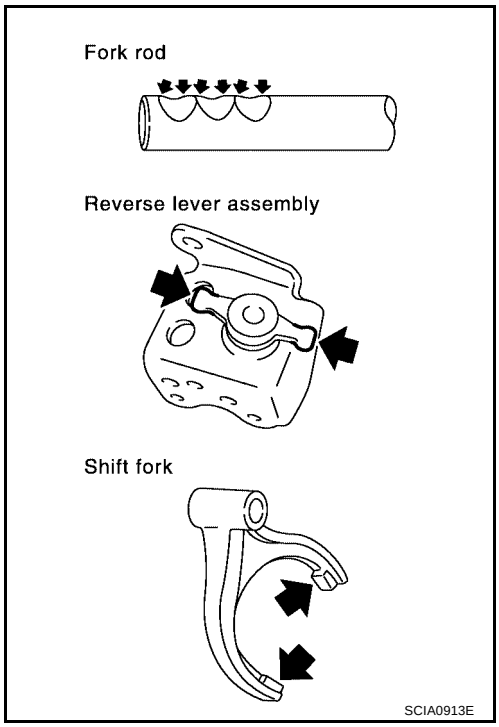
SHIFT CONTROL

PFP:32982

Inspection

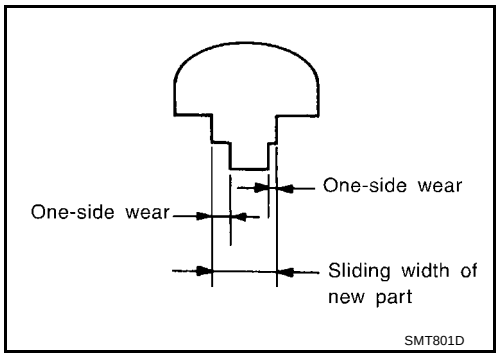
ECS005UT

- Check the contact surfaces and sliding areas for wear, damage, and bending as shown. Replace any parts as necessary.



SHIFT FORK

- Check that the width of the shift fork hooks (sliding area with coupling sleeve) as shown, are within specification.



Item	One-side wear specification	Sliding width of new part
1st & 2nd	0.2 mm (0.008 in)	7.80 - 7.93 mm (0.3071 - 0.3122 in)
3rd & 4th	0.2 mm (0.008 in)	7.80 - 7.93 mm (0.3071 - 0.3122 in)
5th	0.2 mm (0.008 in)	6.10 - 6.23 mm (0.2402 - 0.2453 in)
Reverse	0.2 mm (0.008 in)	12.80 - 12.93 mm (0.5039 - 0.5091 in)

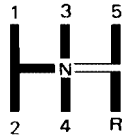
SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

ECS005UU

TRANSAXLE

Engine			QR25DE
Transaxle model			RS5F51A
Model code number			8U006
Number of speed			5
Synchromesh type			Warner
Shift pattern			 SCIA0821E
Gear ratio	1st		3.153
	2nd		1.842
	3rd		1.258
	4th		0.947
	5th		0.772
	Reverse		3.002
Number of teeth	Input gear	1st	13
		2nd	19
		3rd	31
		4th	38
		5th	44
		Reverse	13
	Main gear	1st	41
		2nd	35
		3rd	39
		4th	36
		5th	34
		Reverse	38
	Reverse idler gear	Front	37
		Rear	38
Oil capacity ℓ (qt)			2.3 (2 3/8)
Remarks	Reverse synchronizer		Installed
	Double baulk ring type synchronizer		1st & 2rd synchronizer

FINAL GEAR

Engine		QR25DE
Transaxle model		RS5F51A
Model code number		8U006
Final gear ratio		4.133
Number of teeth	Final gear/Pinion	62/15
	Side gear/Pinion mate gear	14/10

Gear End Play

ECS005UV

Unit: mm (in)

Gear	End play
1st main gear	0.20 - 0.30 (0.0079 - 0.0118)
2nd main gear	0.06 - 0.16 (0.0024 - 0.0063)
3rd input gear	0.18 - 0.31 (0.0071 - 0.0122)
4th input gear	0.20 - 0.30 (0.0079 - 0.0118)
5th input gear	0.06 - 0.16 (0.0024 - 0.0063)

Clearance Between Baulk Ring and Gear

ECS005UW

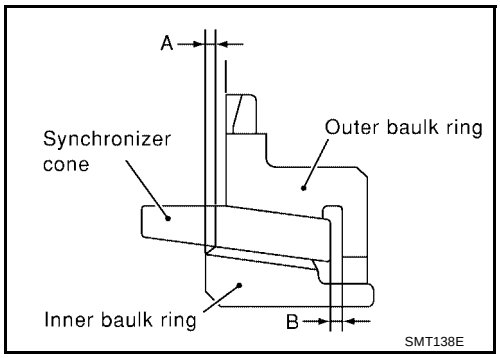
3RD, 4TH, 5TH & REVERSE BAULK RING

Unit: mm (in)

Standard		Wear limit
3rd	0.9 - 1.45 (0.035 - 0.0571)	0.7 (0.028)
4th	0.9 - 1.45 (0.035 - 0.0571)	0.7 (0.028)
5th	0.95 - 1.4 (0.0374 - 0.055)	0.7 (0.028)
Reverse	0.95 - 1.4 (0.0374 - 0.055)	0.7 (0.028)

1ST AND 2ND DOUBLE BAULK RING

Unit: mm (in)



Dimension	Standard	Wear limit
A	0.6 - 0.8 (0.024 - 0.031)	0.2 (0.008)
B	1.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)

Available Snap Rings

ECS005UX

INPUT SHAFT SPACER

End play		0 - 0.1 mm (0 - 0.004 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
1.71 (0.0673)	32204 8H510	2.01 (0.0791)	32204 8H516
1.76 (0.0693)	32204 8H511	2.06 (0.0811)	32204 8H517
1.81 (0.0713)	32204 8H512	2.11 (0.0831)	32204 8H518
1.86 (0.0732)	32204 8H513	2.16 (0.0850)	32204 8H519
1.91 (0.0752)	32204 8H514	2.21 (0.0871)	32204 8H520
1.96 (0.0772)	32204 8H515	2.26 (0.0890)	32204 8H521

*: Always check with the Parts Department for the latest parts information.

5TH MAIN GEAR

End play		0 - 0.1 mm (0 - 0.004 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
1.85 (0.0728)	32204 8H500	2.05 (0.0807)	32204 8H504
1.90 (0.0748)	32204 8H501	2.10 (0.0827)	32204 8H505
1.95 (0.0768)	32204 8H502	2.15 (0.0846)	32204 8H506
2.00 (0.0787)	32204 8H503	2.20 (0.0866)	32204 8H507

*: Always check with the Parts Department for the latest parts information.

Available C-rings

ECS005UY

MAINSHAFT C-RING

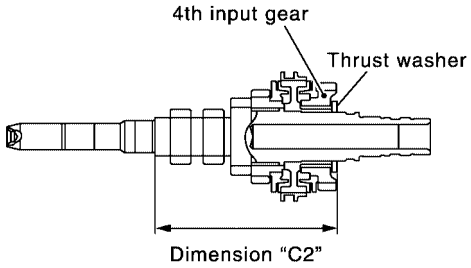
End play		0 - 0.06 mm (0 - 0.0024 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
2.535 (0.0866)	32348 8H800	2.835 (0.1116)	32348 8H810
2.565 (0.1010)	32348 8H801	2.865 (0.1128)	32348 8H811
2.595 (0.1022)	32348 8H802	2.895 (0.1140)	32348 8H812
2.625 (0.1033)	32348 8H803	2.925 (0.1152)	32348 8H813
2.655 (0.1045)	32348 8H804	2.955 (0.1163)	32348 8H814
2.685 (0.1057)	32348 8H805	2.985 (0.1175)	32348 8H815
2.715 (0.1069)	32348 8H806	3.015 (0.1187)	32348 8H816
2.745 (0.1081)	32348 8H807	3.045 (0.1199)	32348 8H817
2.775 (0.1093)	32348 8H808	3.075 (0.1211)	32348 8H818
2.805 (0.1104)	32348 8H809		

*: Always check with the Parts Department for the latest parts information.

Available Thrust Washers

ECS005UZ

INPUT SHAFT THRUST WASHER



SCIA1008E

Standard length “C2”		154.7 - 154.8 mm (6.091 - 6.094in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
3.84 (0.1512)	32347 8H500	4.02 (0.1583)	32347 8H503
3.90 (0.1535)	32347 8H501	4.08 (0.1606)	32347 8H504
3.96 (0.1559)	32347 8H502	4.14 (0.1630)	32347 8H505

*: Always check with the Parts Department for the latest parts information.

DIFFERENTIAL SIDE GEAR THRUST WASHER

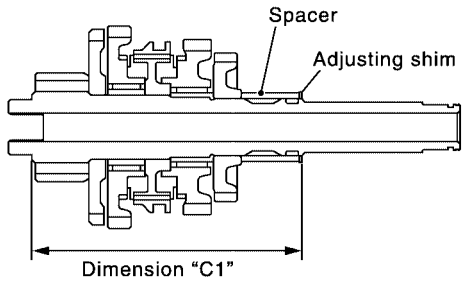
Allowable clearance between side gear and differential case with washer	0.1 - 0.2 mm (0.004 - 0.008 in)
Thickness mm (in)	Part number*
0.75 (0.0295)	38424 81X00
0.80 (0.0315)	38424 81X01
0.85 (0.0335)	38424 81X02
0.90 (0.0354)	38424 81X03
0.95 (0.0374)	38424 81X04

*: Always check with the Parts Department for the latest parts information.

Available Adjusting Shims

ECS005V0

MAINSHAFT ADJUSTING SHIM



SCIA1009E

Standard length "C1"		173.85 - 173.95 mm (6.844 - 6.848in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.52 (0.0205)	32238 8H500	0.84 (0.0331)	32238 8H504
0.60 (0.0236)	32238 8H501	0.92 (0.0362)	32238 8H505
0.68 (0.0268)	32238 8H502	1.00 (0.0394)	32238 8H506
0.76 (0.0299)	32238 8H503	1.08 (0.0425)	32238 8H507

*: Always check with the Parts Department for the latest parts information.

INPUT SHAFT REAR BEARING ADJUSTING SHIM

End play			0 - 0.06 mm (0 - 0.0024 in)		
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.40 (0.0157)	32225 8H500	0.88 (0.0346)	32225 8H512	1.36 (0.0520)	32225 8H524
0.44 (0.0173)	32225 8H501	0.92 (0.0362)	32225 8H513	1.40 (0.0551)	32225 8H560
0.48 (0.0189)	32225 8H502	0.96 (0.0378)	32225 8H514	1.44 (0.0567)	32225 8H561
0.52 (0.0205)	32225 8H503	1.00 (0.0396)	32225 8H515	1.48 (0.0583)	32225 8H562
0.56 (0.0220)	32225 8H504	1.04 (0.0409)	32225 8H516	1.52 (0.0598)	32225 8H563
0.60 (0.0236)	32225 8H505	1.08 (0.0425)	32225 8H517	1.56 (0.0614)	32225 8H564
0.64 (0.0252)	32225 8H506	1.12 (0.0441)	32225 8H518	1.60 (0.0630)	32225 8H565
6.68 (0.0268)	32225 8H507	1.16 (0.0457)	32225 8H519	1.64 (0.0646)	32225 8H566
0.72 (0.0283)	32225 8H508	1.20 (0.0472)	32225 8H520	1.68 (0.0661)	32225 8H567
0.76 (0.0299)	32225 8H509	1.24 (0.0488)	32225 8H521	1.72 (0.0677)	32225 8H568
0.80 (0.0315)	32225 8H510	1.28 (0.0504)	32225 8H522		
0.84 (0.0331)	32225 8H511	1.32 (0.0520)	32225 8H523		

*: Always check with the Parts Department for the latest parts information.

MAINSHAFT REAR BEARING ADJUSTING SHIM

End play		0 - 0.06 mm (0 - 0.0024 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.44 (0.0173)	32238 8H510	0.80 (0.0315)	32238 8H519
0.48 (0.0189)	32238 8H511	0.84 (0.0331)	32238 8H520
0.52 (0.0205)	32238 8H512	0.88 (0.0346)	32238 8H521
0.56 (0.0220)	32238 8H513	0.92 (0.0362)	32238 8H522
0.60 (0.0236)	32238 8H514	0.96 (0.0378)	32238 8H523
0.64 (0.0252)	32238 8H515	1.00 (0.0396)	32238 8H524
0.68 (0.0268)	32238 8H516	1.04 (0.0409)	32238 8H560
0.72 (0.0283)	32238 8H517	1.08 (0.0425)	32238 8H561
0.76 (0.0299)	32238 8H518		

*: Always check with the Parts Department for the latest parts information.

REVERASE IDLER GEAR ADJUSTING SHIM

End play		0.04 - 0.14 mm (0.0016 - 0.0055 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
1.76 (0.0693)	32237 8H500	2.24 (0.0882)	32237 8H506
1.84 (0.0724)	32237 8H501	2.32 (0.0913)	32237 8H507
1.92 (0.0756)	32237 8H502	2.40 (0.0945)	32237 8H508
2.00 (0.0787)	32237 8H503	2.48 (0.0976)	32237 8H509
2.08 (0.0819)	32237 8H504	2.56 (0.1008)	32237 8H510
2.16 (0.0850)	32237 8H505	2.64 (0.1039)	32237 8H511

*: Always check with the Parts Department for the latest parts information.

Available Shims

ECS005V1

— Differential Side Bearing Preload and Adjusting Shim —

BEARING PRELOAD

Differential side bearing preload: L*	0.15 - 0.21 mm (0.0059 - 0.0083)

*: Install shims which are “deflection of differential case” + “L” in thickness.

DIFFERENTIAL SIDE BEARING ADJUSTING SHIM(S)

Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.48 (0.0189)	31438 80X00	0.72 (0.0283)	31438 80X06
0.52 (0.0205)	31438 80X01	0.76 (0.0299)	31438 80X07
0.56 (0.0220)	31438 80X02	0.80 (0.0315)	31438 80X08
0.60 (0.0236)	31438 80X03	0.84 (0.0331)	31438 80X09
0.64 (0.0252)	31438 80X04	0.88 (0.0346)	31438 80X10
0.68 (0.0268)	31438 80X05	0.92 (0.0362)	31438 80X11

*: Always check with the Parts Department for the latest parts information.

PRECAUTIONS

PFP:00001

Caution

ECS005V2

- Do not reuse transaxle oil, once it has been drained.
- Check oil level, and drain and refill transaxle oil with the vehicle on level ground.
- During removal or installation, keep inside of transaxle clean of dust and dirt.
- Check for the correct installation orientation prior to removal or disassembly. If mating marks are required, be certain they do not interfere with the function of the parts they are applied to.
- In principle, tighten bolts or nuts gradually in several steps working diagonally and from inside to outside as applicable. If a tightening sequence is specified, follow it as specified.
- Be careful not to damage the sliding surfaces and mating surfaces of parts.

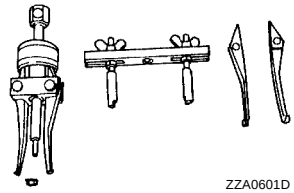
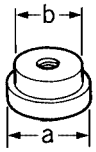
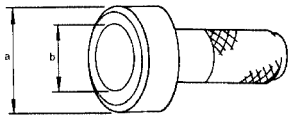
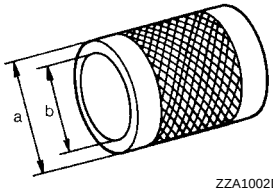
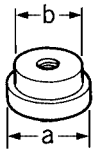
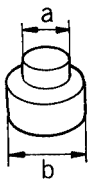
PREPARATION

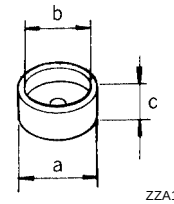
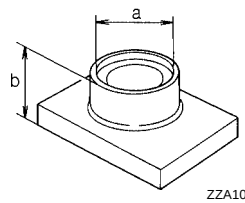
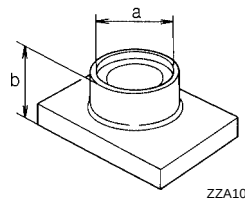
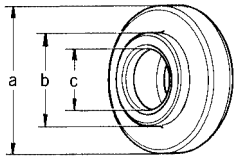
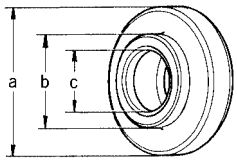
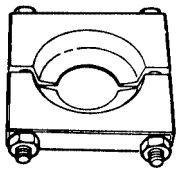
PFP:00002

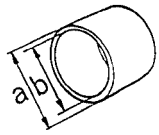
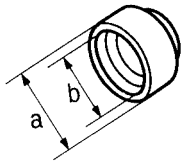
Special Service Tools

ECS005V3

The actual shapes of the Kent-Moore tools may differ from those of the special tools illustrated here.

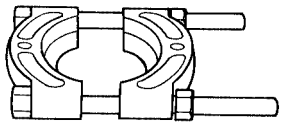
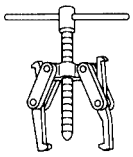
Tool number (Kent-Moore No.) Tool name		Description
KV381054S0 (J34286) Puller	 ZZA0601D	Side bearing outer race removal Mainshaft front bearing removal
ST35321000 (—) Drift	 ZZA1000D	Input shaft oil seal installation Reverse main gear installation 1st bushing installation 1st-2nd synchronizer hub installation 2nd bushing installation 3rd main gear installation **a: 49 mm (1.93 in) dia.** **b: 41 mm (1.61 in) dia.**
ST30720000 (J25405) Drift	 ZZA0811D	Differential oil seal installation Differential side bearing outer race installation Mainshaft rear bearing installation Differential side bearing installation **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**
ST33200000 (J26082) Drift	 ZZA1002D	Mainshaft front bearing installation 6th bushing installation 4th main gear installation 5th main gear installation 6th main gear installation **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**
ST33061000 (J8107-2) Drift	 ZZA1000D	Bore plug installation Differential side bearing removal **a: 38 mm (1.50 in) dia.** **b: 28.5 mm (1.122 in) dia.**
ST33052000 (—) Drift	 ZZA1023D	Welch plug installation Input shaft rear bearing removal 5th bushing, thrust washer, 4th input gear, 4th gear bushing, 3rd-4th synchronizer hub and 3rd input gear removal Input shaft front bearing installation 6th input gear and 6th bushing removal Mainshaft rear bearing removal 4th main gear and 5th main gear removal 6th main gear removal **a: 22 mm (0.87 in) dia.** **b: 28 mm (1.10 in) dia.**

Tool number (Kent-Moore No.) Tool name		Description
KV40105020 (—) Drift	 ZZA1133D	5th input gear and synchronizer hub removal 3rd main gear, 2nd main gear, 2nd bushing, 1st-2nd synchronizer hub, 1st main gear, reverse main gear and 1st bushing removal **a: 39.7 mm (1.563 in) dia.** **b: 35 mm (1.38 in) dia.** **c: 15 mm (0.59 in)**
KV40105710 (—) Press stand	 ZZA1058D	3rd-4th synchronizer hub installation 4th bushing installation 5th bushing installation 5th-6th synchronizer hub installation 2nd bushing installation 3rd main gear installation **a: 46 mm (1.81 in) dia.** **b: 41 mm (1.61 in)**
ST38220000 (—) Press stand	 ZZA1058D	Reverse main gear installation 1st bushing installation 1st-2nd synchronizer hub installation **a: 63 mm (2.48 in) dia.** **b: 65 mm (2.56 in)**
ST30032000 (J26010-01) Drift	 ZZA0978D	Input shaft front bearing installation **a: 80 mm (3.15 in) dia.** **b: 38 mm (1.50 in) dia.** **c: 31 mm (1.22 in) dia.**
ST30901000 (J26010-01) Drift	 ZZA0978D	Input shaft rear bearing installation 4th main gear installation 5th main gear installation 6th main gear installation Mainshaft rear bearing installation **a: 79 mm (3.11 in) dia.** **b: 45 mm (1.77 in) dia.** **c: 35.2 mm (1.386 in) dia.**
ST30031000 (J22912-01) Puller	 ZZA0537D	Measuring wear of 1st and 2nd baulk ring

Tool number (Kent-Moore No.) Tool name	Description
KV40101630 (J35870) Drift  ZZA1003D	Reverse main gear installation **a: 68 mm (2.68 in) dia.** **b: 60 mm (2.36 in) dia.**
KV38102510 (—) Drift  ZZA0838D	1st bushing installation 1st-2nd synchronizer hub installation Differential side bearing installation **a: 71 mm (2.80 in) dia.** **b: 65 mm (2.56 in) dia.**

Commercial Service Tools

ECS005V4

Tool name	Description
Puller  ZZB0823D	Each bearing gear and bushing removal
Puller  NT077	Each bearing gear and bushing removal
Pin punch ZZA0815D	Each retaining pin removal and installation **Tip: 4.5 mm (0.177 in) dia.**

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

ECS005V5

Use the chart below to help you find the cause of the symptom. The numbers indicate the order of the inspection. If necessary, repair or replace these parts.

Reference page		MT-76	MT-76	MT-76	MT-84			MT-140	MT-87		MT-85, MT-88			
Suspected parts (possible cause)		(oil level is low)	(wrong oil)	(oil level is high)	Gasket (damaged)	Oil seal (worn or damaged)	O-Ring (worn or damaged)	Control device and cable (worn)	Check plug return spring and check ball (worn or damaged)	Shift fork (worn)	Gear (worn or damaged)	Bearing (worn or damaged)	Baulk ring (worn or damaged)	Insert spring, shifting insert (damaged)
Symptom	Noise	1	2								3	3		
	Oil leakage		3	1	2	2	2							
	Hard to shift or will not shift		1	1				2					3	3
	Jumps out of gear							1	2	3	3			

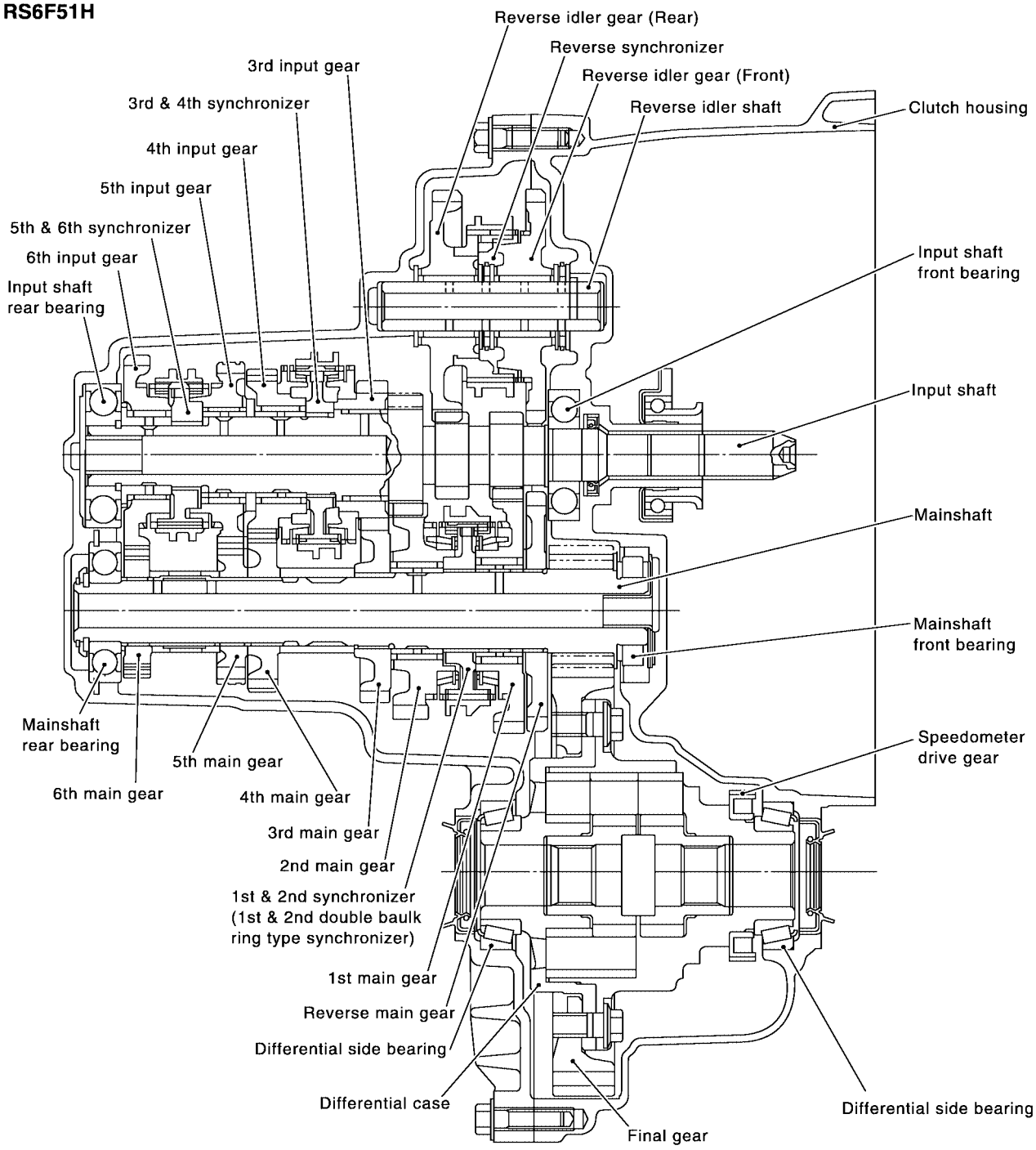
DESCRIPTION

PFP:00000

Cross-sectional View

ECS005V6

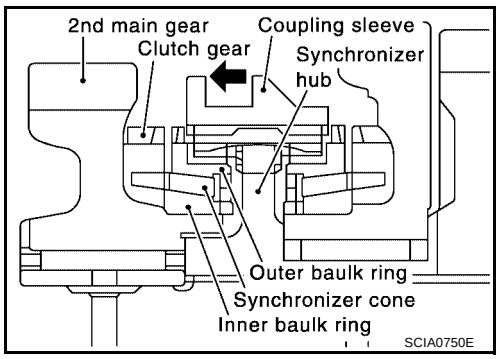
RS6F51H



SCIA0999E

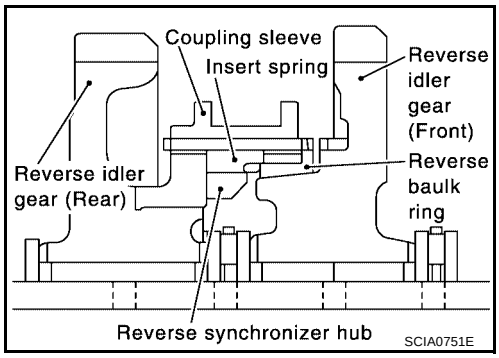
DOUBLE-CONE SYNCHRONIZER

Double-cone synchronizer is used for 1st and 2nd gears to reduce operating force of the shift lever as shown.



REVERSE GEAR

Description of reverse gear components is as shown.



M/T OIL

PFP:KLD20

Replacement

ECS005V7

DRAINING

1. Start the engine and let it run to warm up the transaxle oil.
2. Stop the engine. Remove drain plug and drain oil.
3. Set a new gasket on the drain plug and install it in transaxle body.

Drain plug : 30 - 39 N·m (3.1 - 4.0 kg-m, 23 - 28 ft-lb)

CAUTION:
Do not reuse gasket.

FILLING

1. Remove filler plug. Fill with new oil until oil level reaches the specified limit near filler plug mounting hole.

Oil grade : API GL-4
Capacity (reference) : Approximately 2.3 ℓ (2 3/8 qt)

2. After refilling oil, check oil level. Assemble a new gasket on to filler plug, then install it in transaxle body.

Filler plug : 30 - 39 N·m (3.1 - 4.0 kg-m, 23 - 28 ft-lb)

CAUTION:
Do not reuse gasket.

Checking

ECS005V8

OIL LEAKAGE AND OIL LEVEL

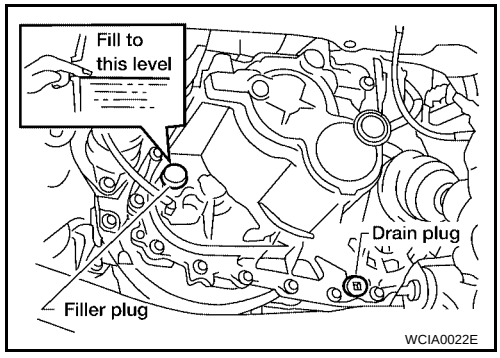
- Check that oil is not leaking from transaxle.
- Check oil level from filler plug mounting hole as shown.

CAUTION:
Never start engine while checking oil level.

- Set a new gasket on the filler plug and install it in transaxle body.

Filler plug : 30 - 39 N·m (3.1 - 4.0 kg-m, 23 - 28 ft-lb)

CAUTION:
Do not reuse gasket.



SIDE OIL SEAL

PFP:32113

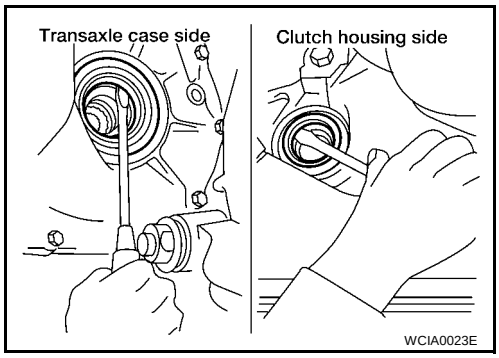
Removal and Installation

ECS005V9

REMOVAL

1. Remove the drive shaft from the transaxle body. Refer to FAX-14, "Removal" .
2. Remove oil seal with a slotted screwdriver.

CAUTION:
Be careful not to damage the case surface when removing the oil seal.

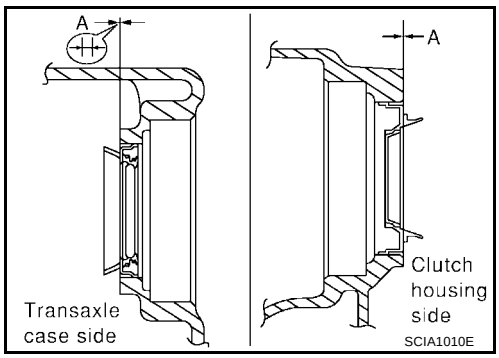


INSTALLATION

Installation is in the reverse order of removal.

- Using Tool (drift), drive the new oil seal straight until it protrudes from the case end equal to dimension "A" as shown.

Dimension "A" : Within 0.5 mm (0.02 in) or flush with the case.



CAUTION:
- **Before installing oil seal, apply multi-purpose grease to oil seal lips.**
- **Oil seal is not reusable.**

Drift to be used (special service tool)	ST30720000 (J25405)

- Check oil level after installation. Refer to MT-137, "Checking" .

POSITION SWITCH

PFP:32005

Checking

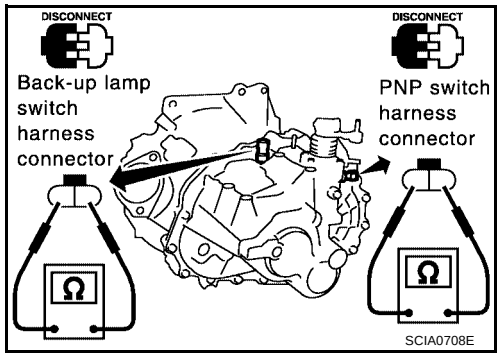
ECS005VA

NOTE:
For removal and installation of the switches. Refer to MT-145, "Component Parts" .

BACK-UP LAMP SWITCH

- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No



PARK/NEUTRAL POSITION SWITCH

- Check continuity.

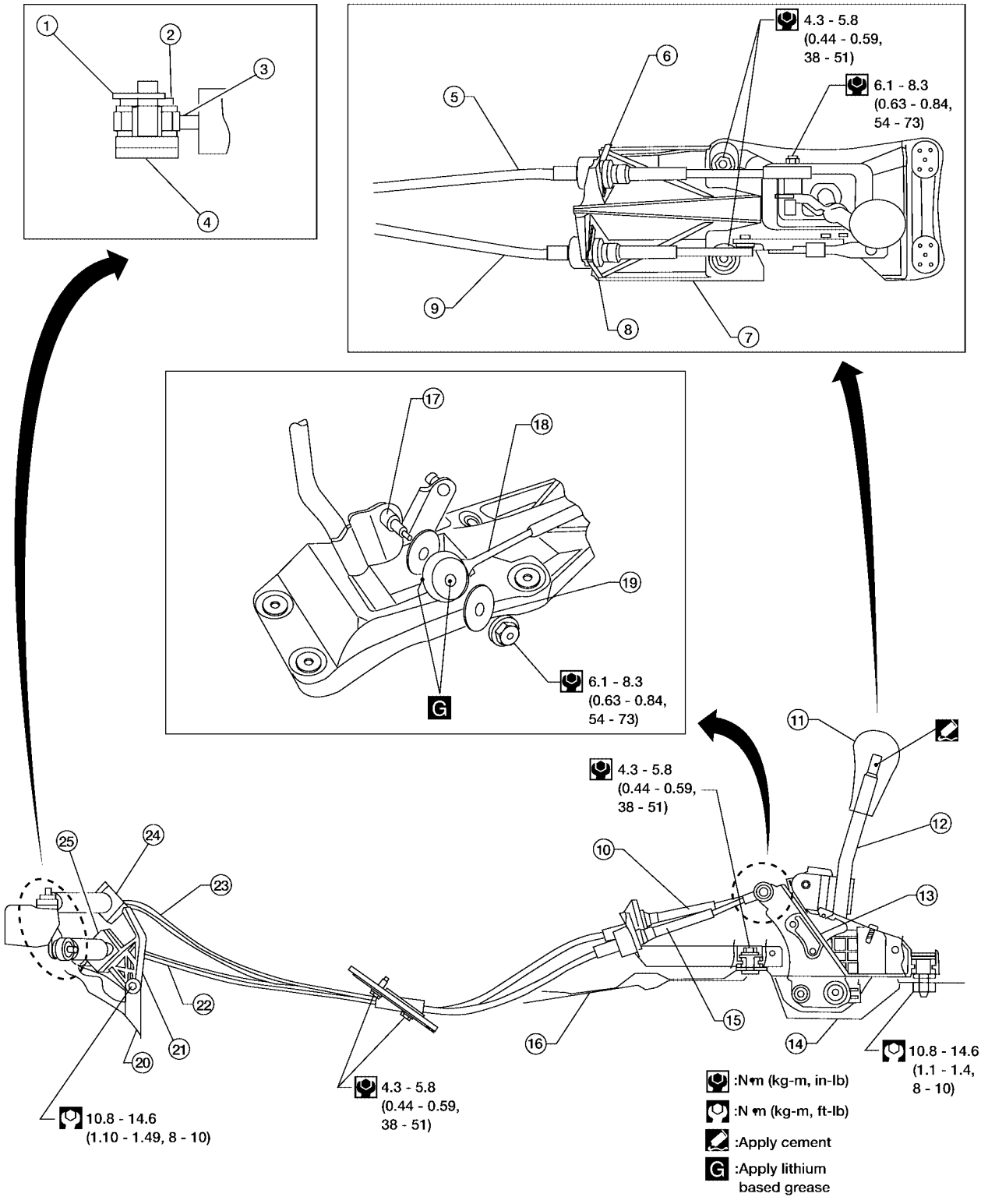
Gear position	Continuity
Neutral	Yes
Except neutral	No

CONTROL LINKAGE

PFP:34103

Removal and Installation of Control Device and Cable

ECS006H6



WCIA0136E

1. Snap pin
2. Washer
3. Cable
4. Manual lever
5. Shift cable
6. Lock plate
7. Control device assembly
8. Lock plate
9. Select cable
10. Shift cable
11. Control lever knob
12. Control lever

13. Control device assembly
14. Cover
15. Select cable
16. Floor
17. Pin
18. Shift cable
19. Washer
20. Clutch housing
21. Cable mounting bracket
22. Select cable
23. Shift cable
24. Lock plate
25. Lock plate

CAUTION:

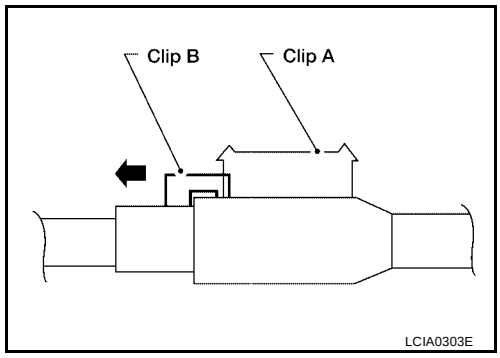
- **Note that the select side lock plate for securing the control cable is different from the one on the shift side.**
- **After assembly, make sure selector lever automatically returns to Neutral when it is moved to 1st, 2nd, or Reverse.**

Cable Adjustment

ECS0077W

NOTE:
After installation of the select cable, the cable must be adjusted for proper operation. This adjustment is performed before installing the interior console and shift boot.

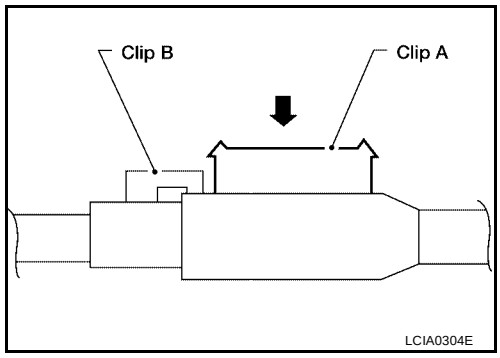
1. Slide clip “B” from under clip “A” as shown.



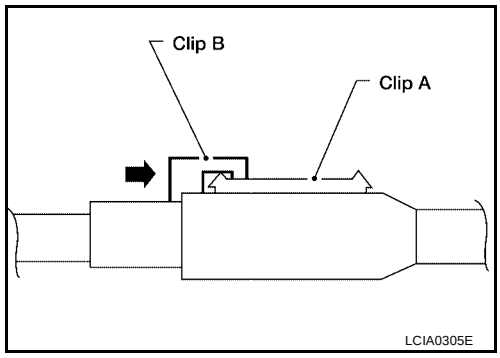
2. Shift the control lever to the neutral position.

   CAUTION:
   Do not move the control lever when adjusting the cables.

3. Push clip “A” into the cable end case until it snaps into place as shown.



4. Slide clip “B” back over clip “A” until it snaps into place and holds clip “A” in place as shown.

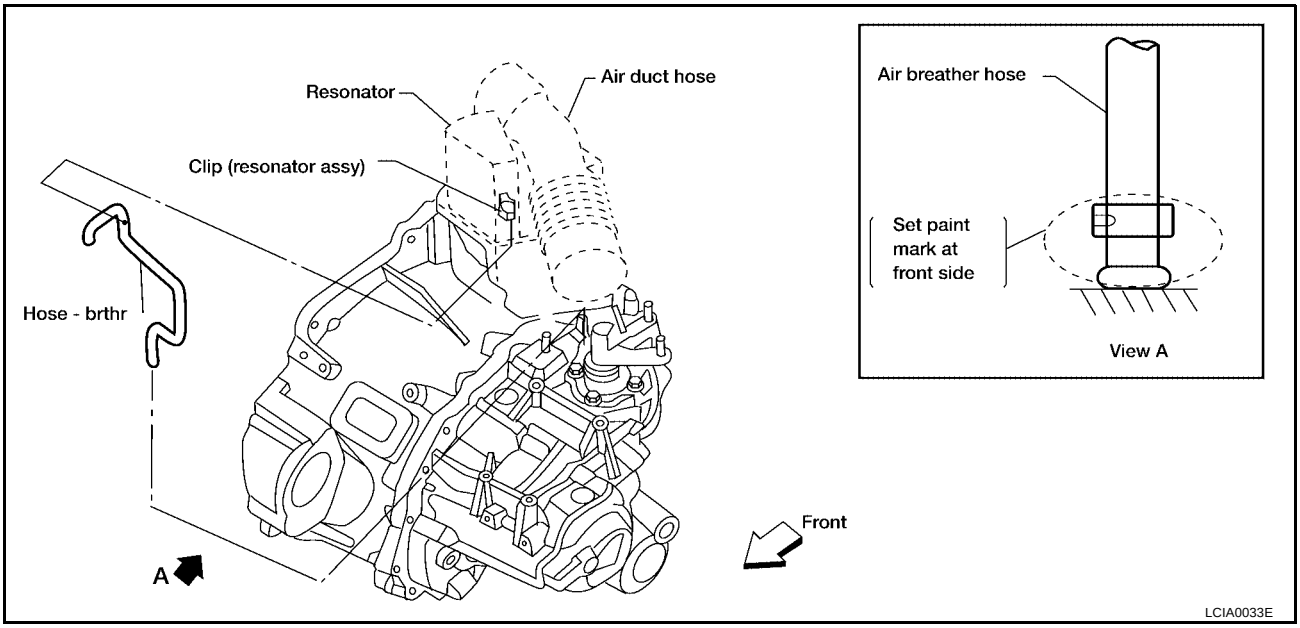


AIR BREATHER HOSE

PFP:31098

Removal and Installation

ECS005VC



CAUTION:

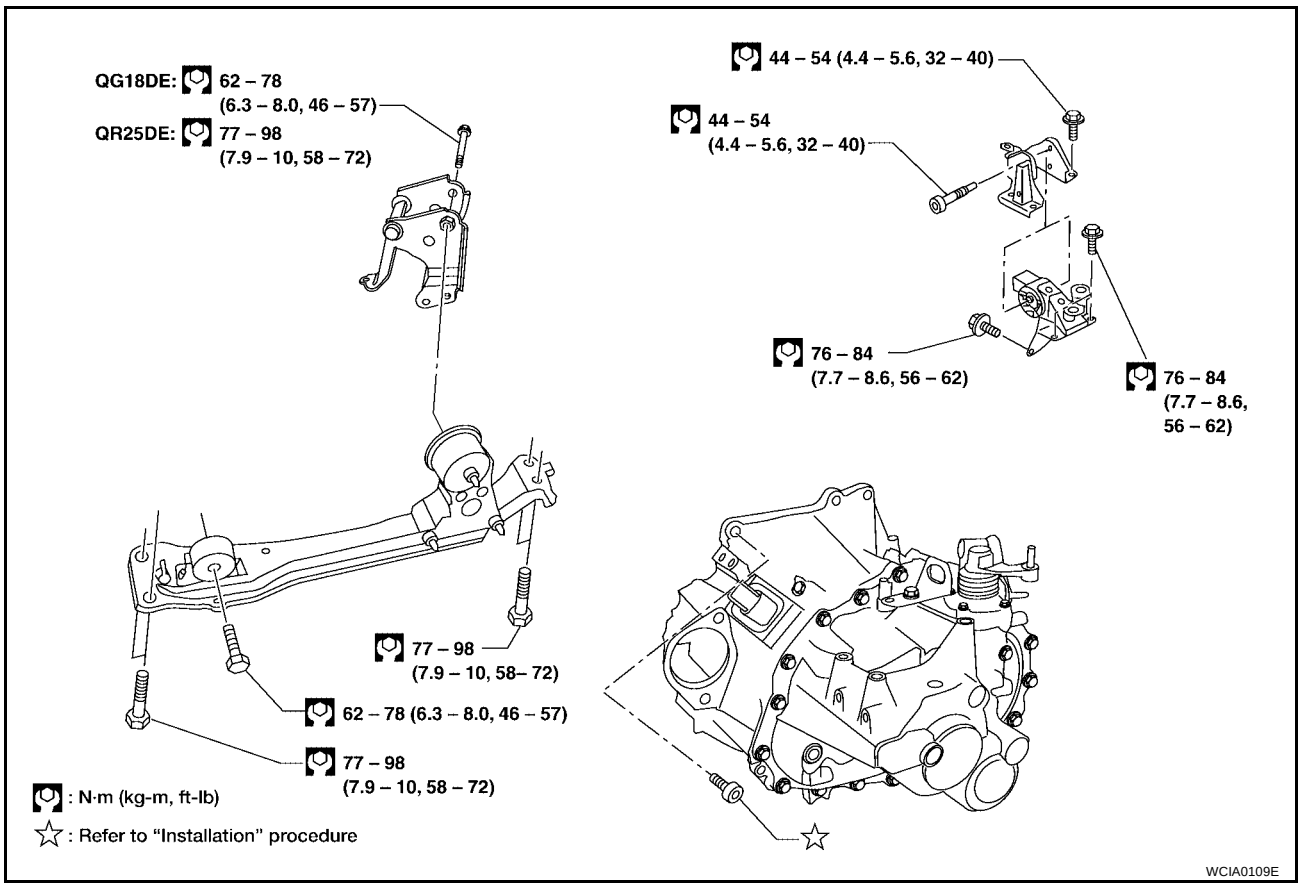
- **Make sure there are no pinched or restricted areas on the air breather hose caused by bending or winding when installing it.**
- **Insert the air breather hose into the transaxle tube until the overlap area reaches the spool.**

TRANSAXLE ASSEMBLY

PFP:32010

Removal and Installation

ECS005VD



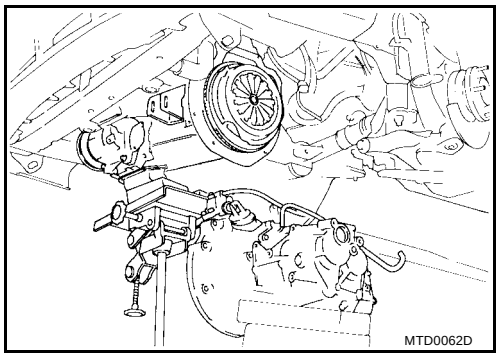
REMOVAL

1. Remove the air cleaner and air duct.
2. Remove the battery.
3. Remove the air breather hose. Refer to MT-81, "Removal and Installation" .
4. Remove the clutch operating cylinder.

   CAUTION:
   Do not depress the clutch pedal during the removal procedure.
5. Remove the engine under cover.
6. Disconnect the control cable from the transaxle. Refer to MT-140, "Removal and Installation of Control Device and Cable" .
7. Drain the gear oil from the transaxle. Refer to MT-76, "Replacement" .
8. Remove the connectors and harnesses for:
   - PNP switch
   - Speed sensor
   - Back-up lamp switch
   - Ground
9. Remove the exhaust front tube. Refer to EX-3, "Removal and Installation" .
10. Remove the drive shaft. Refer to FAX-14, "Removal" .
11. Remove the starter motor. Refer to SC-20, "Removal and Installation" .
12. Place a suitable jack under the transaxle.

    CAUTION:
    When setting the jack, be careful not to bring it into contact with the switches.
13. Remove the center member, engine insulator, and engine mount bracket.
14. Support the engine by placing a jack under the engine oil pan.

15. Remove the bolts that mount the engine to the transaxle.
16. Remove the transaxle from the vehicle as shown.



INSTALLATION

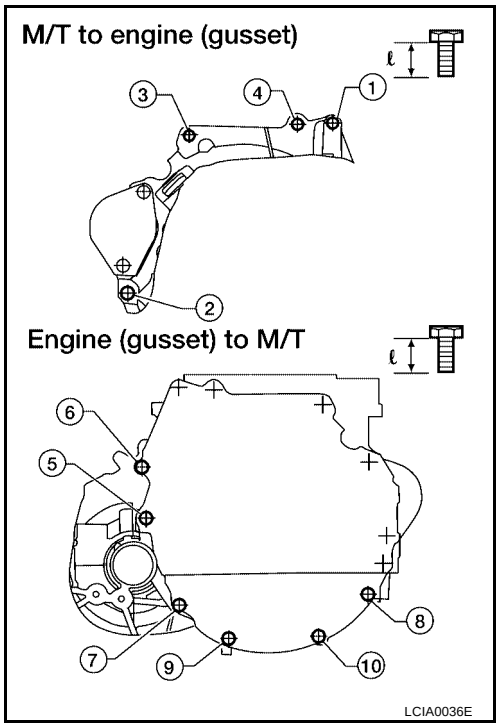
Installation is the reverse order of removal.

- When installing the transaxle to the engine, use them specified tightening torque in the numerical sequence as shown.

  CAUTION:
  When installing the transaxle, do not allow the transaxle input shaft to make contact with the clutch cover.

Bolt No.	1	2	3	4	5	6	7	8	9	10
" ℓ " mm (in)	40	82	47	47	52	40	40	40	30	30
Tightening torque N·m (kg-m, ft-lb)	30 - 40 (3.1 - 4.1, 22 - 29)	70 - 80 (7.1 - 8.1, 52 - 59)				30 - 40 (3.1 - 4.1, 22 - 29)				

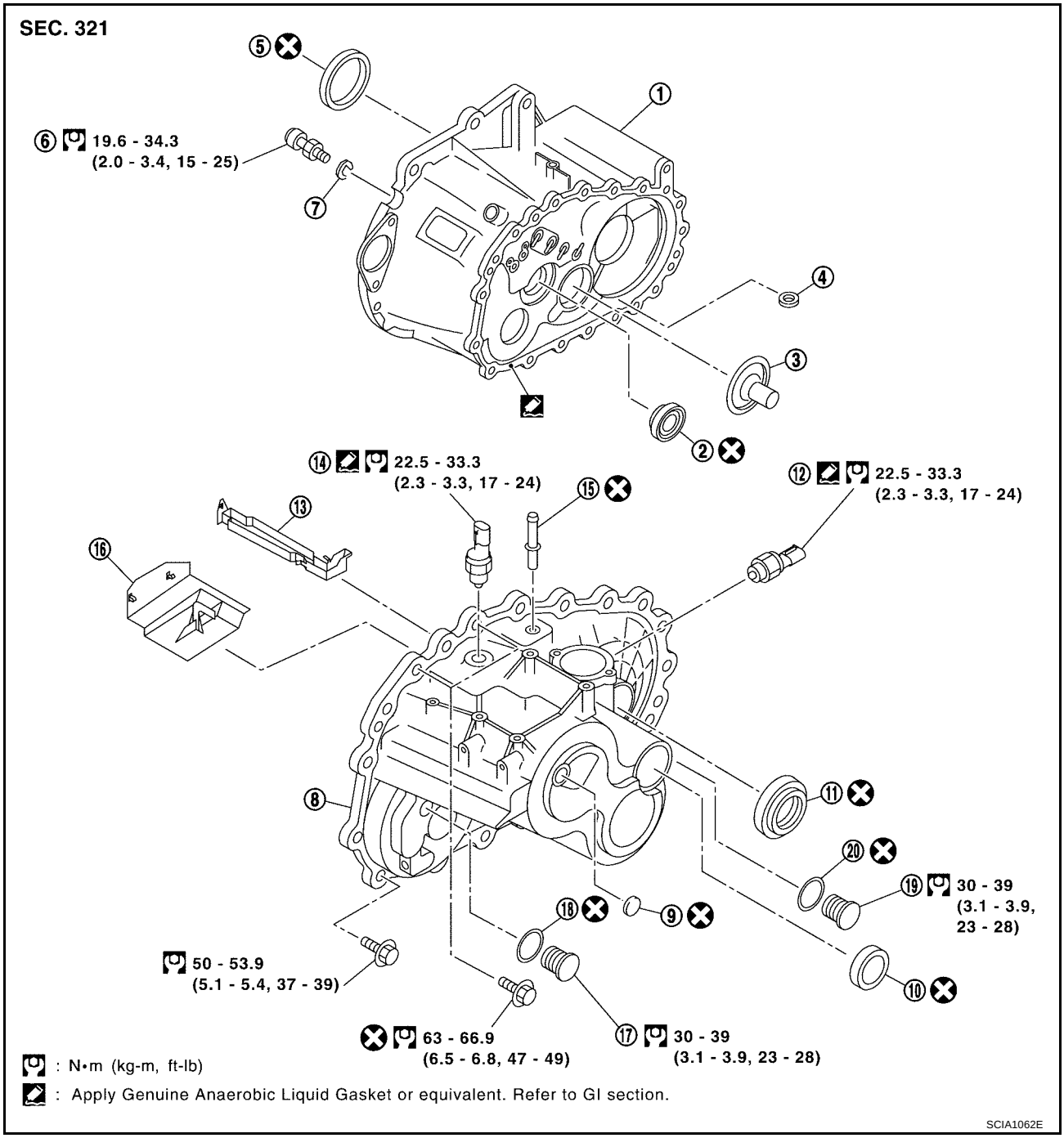
- After installation, check the transaxle oil level, and check for any leaks and any loose mechanisms.



Component Parts

ECS005VE

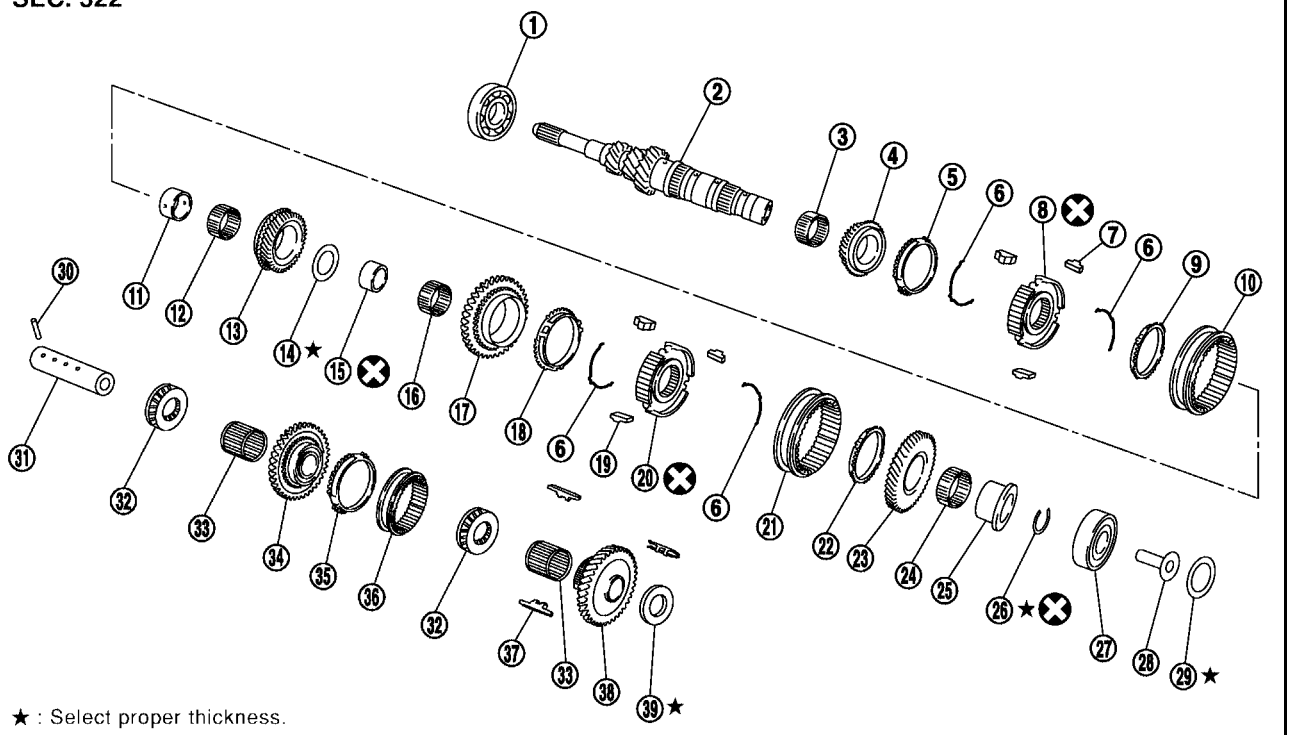
CASE AND HOUSING COMPONENTS



1. Clutch housing
2. Input shaft oil seal
3. Oil channel
4. Magnet
5. Differential oil seal
6. Ball pin
7. Washer
8. Transaxle case
9. Welch plug
10. Bore plug
11. Differential oil seal
12. Park/Neutral position switch
13. Oil gutter
14. Back-up lamp switch
15. Air breather tube
16. Baffle plate
17. Filler plug
18. Gasket
19. Drain plug
20. Gasket

GEAR COMPONENTS

SEC. 322



★ : Select proper thickness.

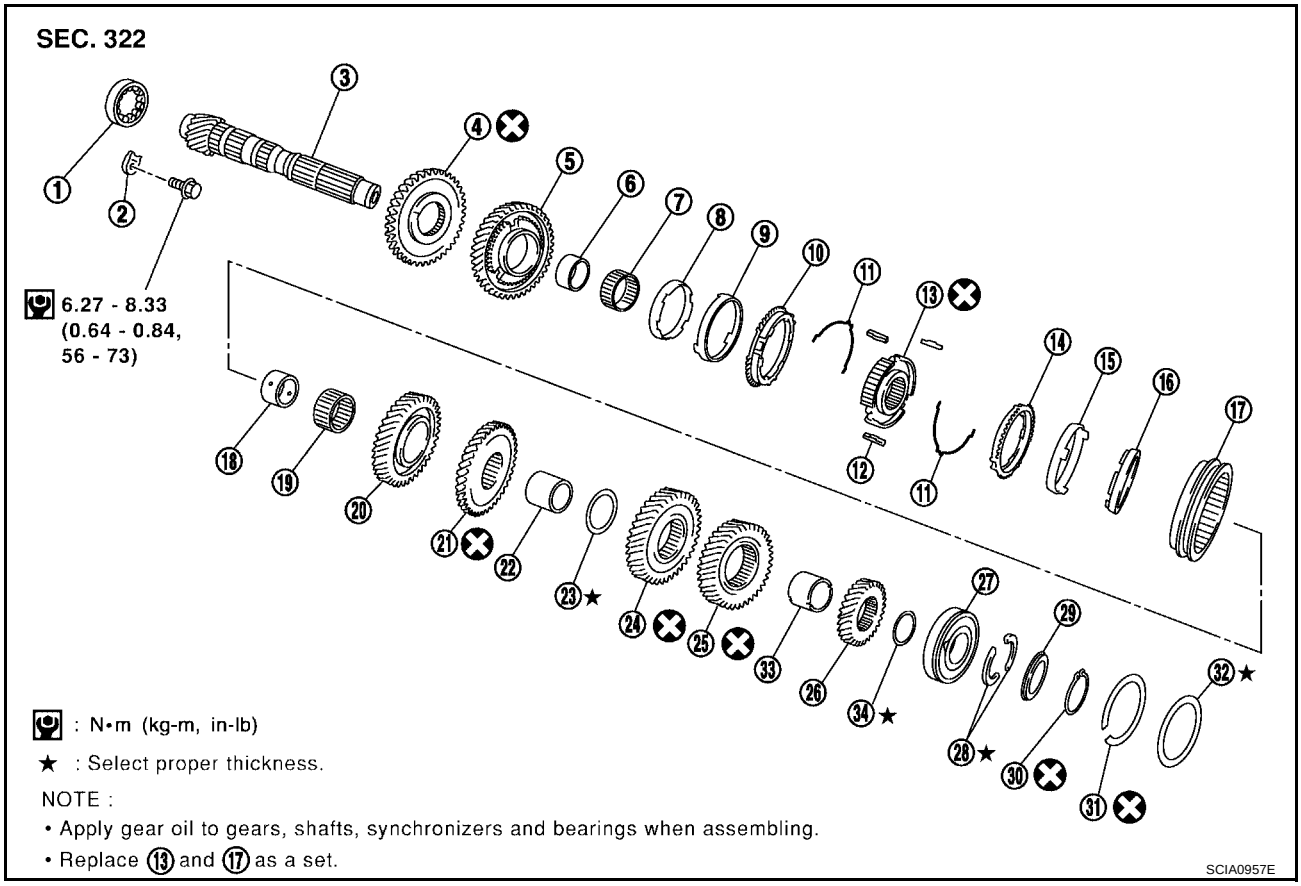
NOTE :

• Apply gear oil to gears, shafts, synchronizers and bearings when assembling.

• Replace (8) and (10), (20) and (21) as a set.

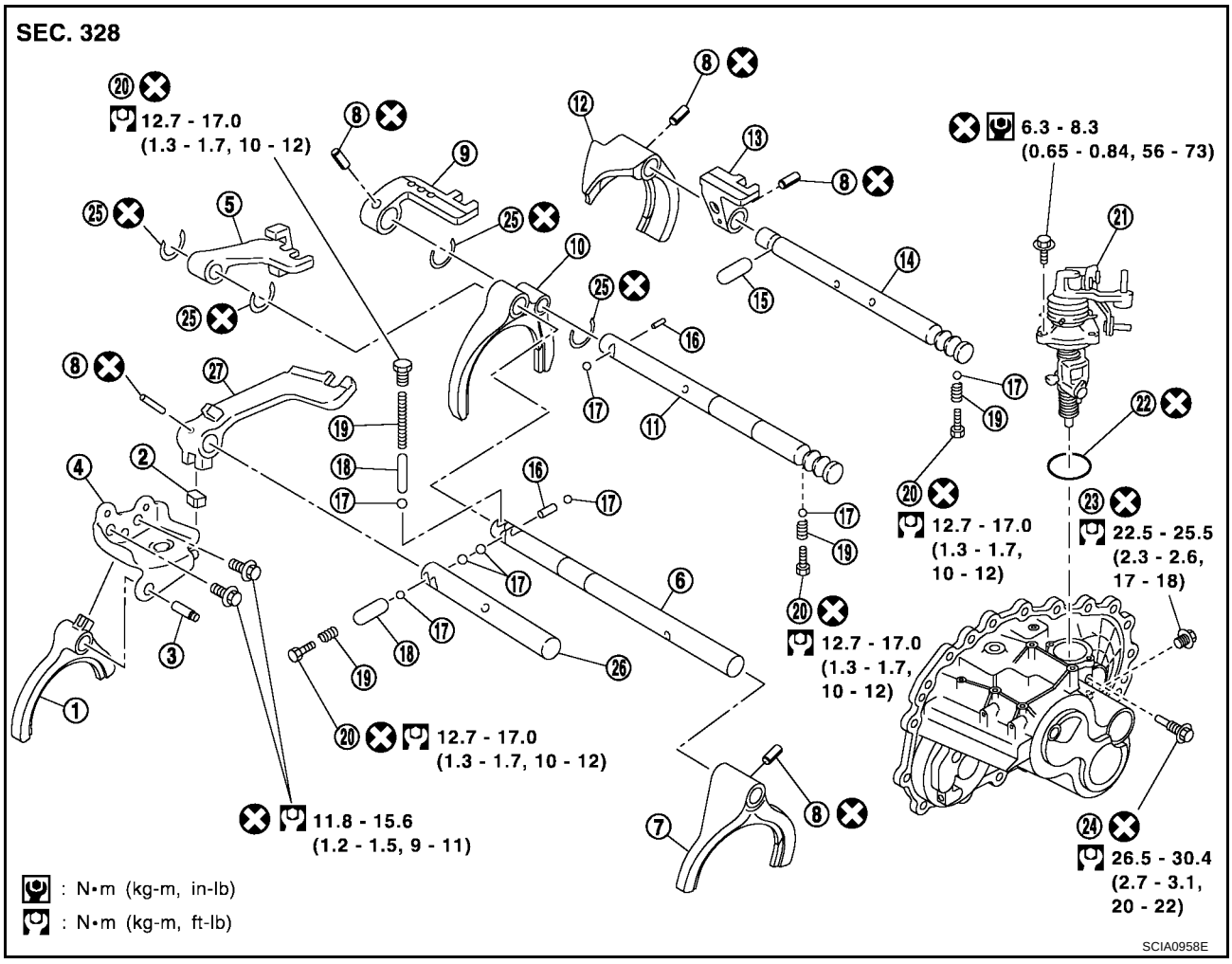
SCIA0956E

1. Input shaft front bearing	2. Input shaft	3. Needle bearing
4. 3rd input gear	5. 3rd baulk ring	6. Spread spring
7. 3rd & 4th shifting insert	8. 3rd & 4th synchronizer hub	9. 4th baulk ring
10. 3rd & 4th coupling sleeve	11. Bushing	12. Needle bearing
13. 4th input gear	14. Thrust washer	15. Bushing
16. Needle bearing	17. 5th input gear	18. 5th baulk ring
19. 5th & 6th shifting insert	20. 5th & 6th synchronizer hub	21. 5th & 6th coupling sleeve
22. Baulk ring	23. 6th input gear	24. Needle bearing
25. Bushing	26. Snap ring	27. Input shaft rear bearing
28. Oil channel	29. Input shaft rear bearing adjusting shim	30. Retaining pin
31. Reverse idler shaft	32. Thrust bearing	33. Needle bearing
34. Reverse idler gear (Front)	35. Reverse baulk ring	36. Reverse coupling sleeve
37. Insert spring	38. Reverse idler gear (Rear)	39. Reverse idler gear adjusting shim



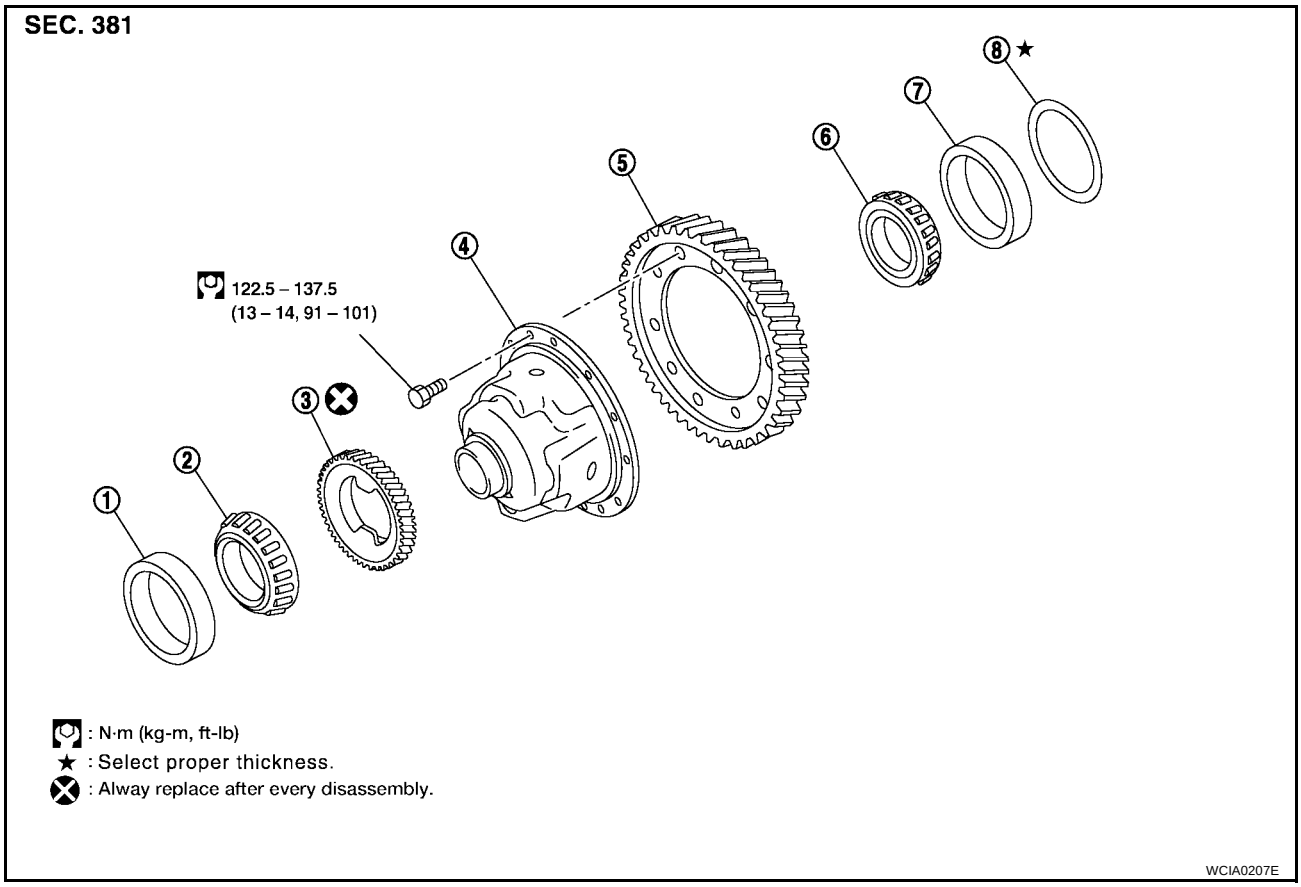
1. Mainshaft front bearing
2. Mainshaft bearing retainer
3. Mainshaft
4. Reverse main gear
5. 1st main gear
6. Bushing
7. Needle bearing
8. 1st inner baulk ring
9. 1st gear synchronizer cone
10. 1st outer baulk ring
11. Spread spring
12. 1st & 2nd shifting insert
13. 1st & 2nd synchronizer hub
14. 2nd outer baulk ring
15. 2nd gear synchronizer cone
16. 2nd inner baulk ring
17. 1st & 2nd coupling sleeve
18. Bushing
19. Needle bearing
20. 2nd main gear
21. 3rd main gear
22. 3rd & 4th mainshaft spacer
23. 4th main adjusting shim
24. 4th main gear
25. 5th main gear
26. 6th main gear
27. Mainshaft rear bearing
28. Mainshaft C-ring
29. C-ring holder
30. Snap ring
31. Snap ring
32. Mainshaft rear bearing adjusting shim
33. 5th & 6th mainshaft spacer
34. 6th main adjusting shim

SHIFT CONTROL COMPONENTS



1. Reverse shift fork
2. Shifter cap
3. Reverse fork rod
4. Reverse lever assembly
5. 5th & 6th bracket
6. 5th & 6th fork rod
7. 5th & 6th shift fork
8. Retaining pin
9. 3rd & 4th bracket
10. 3rd & 4th shift fork
11. 3rd & 4th fork rod
12. 1st & 2nd shift fork
13. 1st & 2nd bracket
14. 1st & 2nd fork rod
15. Shift check sleeve
16. Inter lock pin
17. Check ball
18. Shift check sleeve
19. Check spring
20. Check plug
21. Control assembly
22. O-ring
23. Shift check
24. Stopper bolt
25. Stopper ring
26. Reverse bracket fork rod
27. Reverse bracket

FINAL DRIVE COMPONENTS



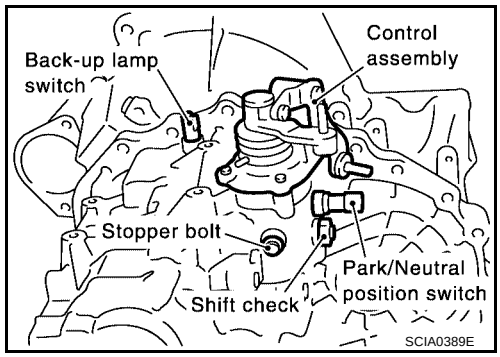
1. Differential side bearing outer race
2. Differential side bearing
3. Speedometer drive gear
4. Differential case
5. Final gear
6. Differential side bearing
7. Differential side bearing outer race
8. Differential side bearing adjusting shim

Disassembly and Assembly

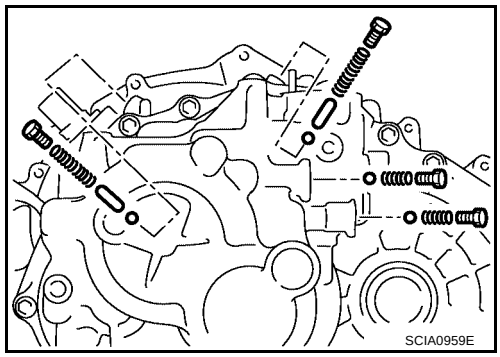
ECS005VF

DISASSEMBLY

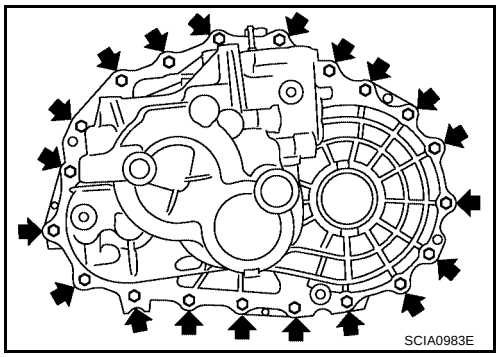
1. Remove the drain plug and filler plug.
2. Remove the park/neutral position switch and back-up lamp switch.
3. After removing the shift check and stopper bolt, remove the control assembly.



4. Remove the check plugs (4 pieces), check springs (4 pieces), check balls (4 pieces), and shift check sleeve (2 pieces) as shown.



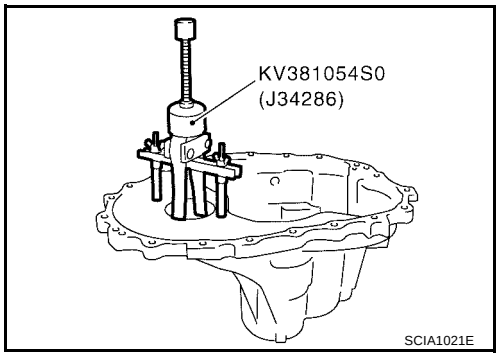
5. Remove the transaxle case fixing bolts as shown.


SCIA0983E

6. Remove the bore plug.

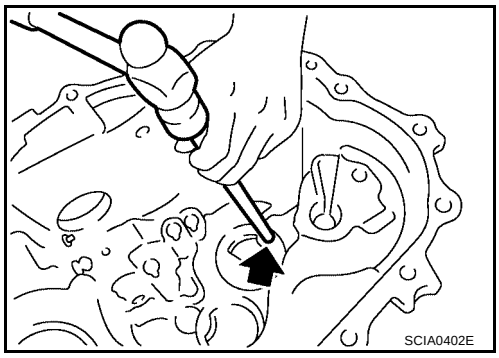
CAUTION:
Be careful not to damage transaxle case.

7. While spreading the snap ring of the mainshaft rear bearing located at bore plug hole, remove the transaxle case.
8. Remove the oil gutter and baffle plate.
9. Remove the snap ring, mainshaft rear bearing adjusting shim, and input shaft rear bearing adjusting shim from the transaxle case.
10. Remove the differential side bearing outer race (transaxle case side) using Tool as shown, and then remove the adjusting shim.

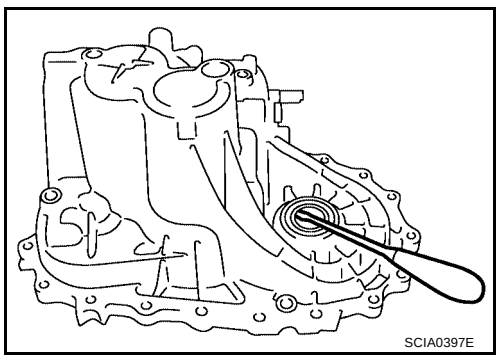


SCIA1021E

11. Remove the welch plug with a suitable punch and hammer as shown.


SCIA0402E

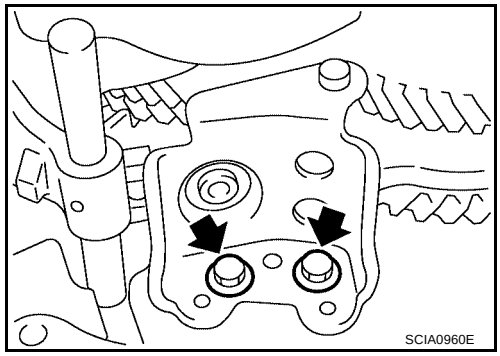
12. Remove the differential oil seal with a suitable tool as shown.


SCIA0397E

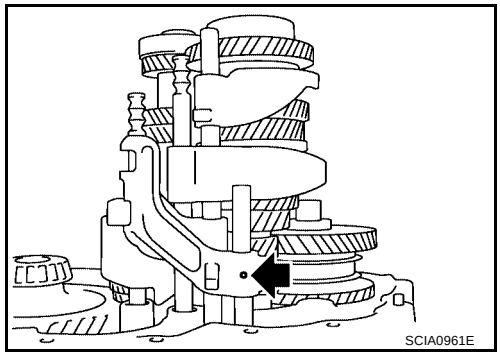
13. Remove the magnet from the clutch housing.

14. With the shift lever in 5th position, remove the bracket bolts from the reverse lever assembly as shown. Lift the reverse lever assembly to remove.

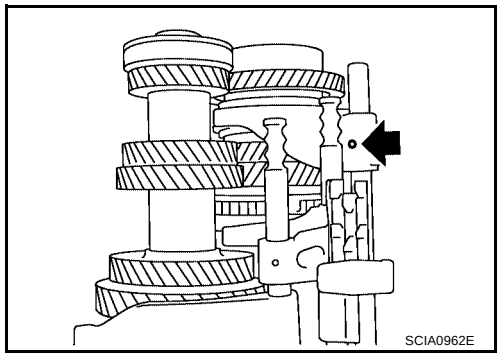
CAUTION:
Retain the shifter cap for installation.


SCIA0960E

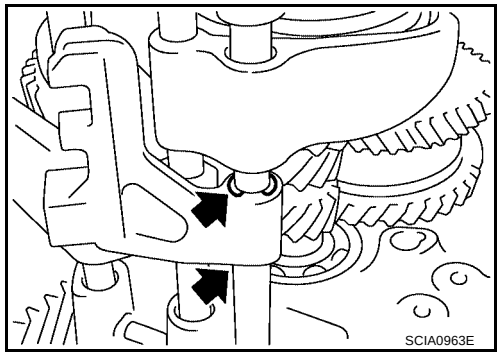
15. Pull out the reverse fork rod then remove the reverse shift fork.
16. Remove the retaining pin of the reverse bracket.


SCIA0961E

17. Pull out the reverse lever and the reverse bracket fork rod.
18. Remove the check ball (2 pieces) and the interlock pin.
19. Shift the 3rd-4th fork rod to the 3rd position. Remove the retaining pin of the 5th-6th shift fork using a pin punch.

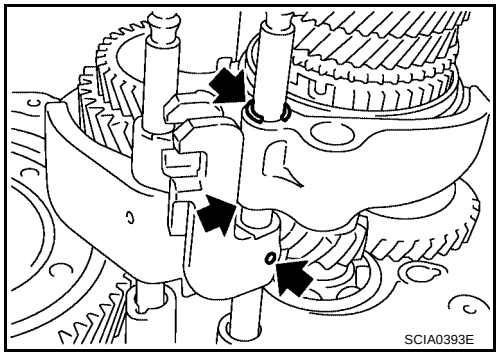

SCIA0962E

20. Remove the stopper rings for the 5th-6th bracket.

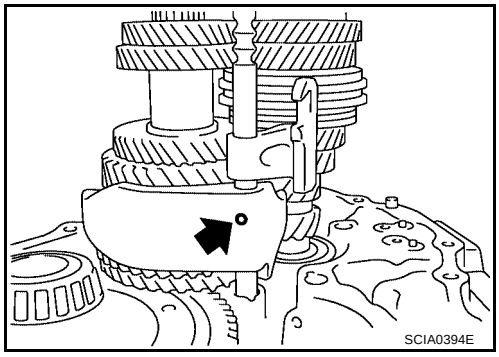

SCIA0963E

21. Pull out the 5th-6th fork rod and remove the 5th-6th shift fork and the 5th-6th bracket.
22. Remove the check balls (2 pieces) and interlock pin.

23. Remove the retaining pin of 3rd-4th bracket using pin punch.
24. Remove the stopper rings for 3rd-4th shift fork.



25. Pull out the 3rd-4th fork rod and remove 3rd-4th shift fork and bracket.
26. Remove the shift check sleeve from the clutch housing.
27. Remove the retaining pin of 1st-2nd shift fork using a suitable pin punch.

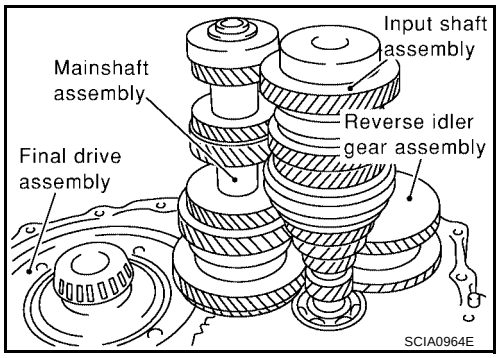


28. Pull out the 1st-2nd fork rod with bracket.
29. Remove the 1st-2nd shift fork.
30. Remove the retaining pin of 1st-2nd bracket using a suitable pin punch and separate the fork rod and bracket.
31. Remove the gear components from the clutch housing.

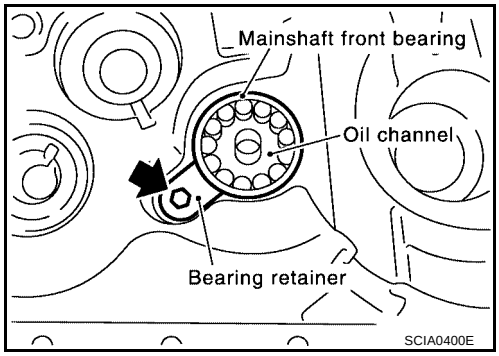
a. While tapping the input shaft with a plastic hammer, remove the input shaft assembly, mainshaft assembly, and reverse idler gear assembly as a set.

CAUTION:
Always withdraw the mainshaft straight out. Failure to do so can damage the resin oil channel on the clutch housing side.

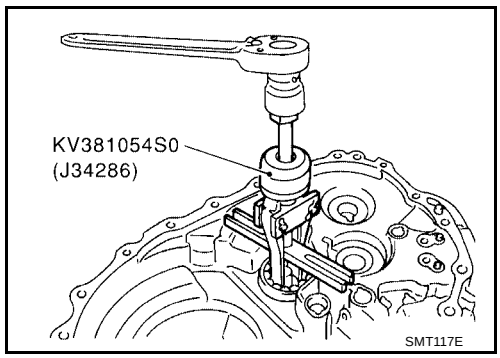
b. Remove the final drive assembly.



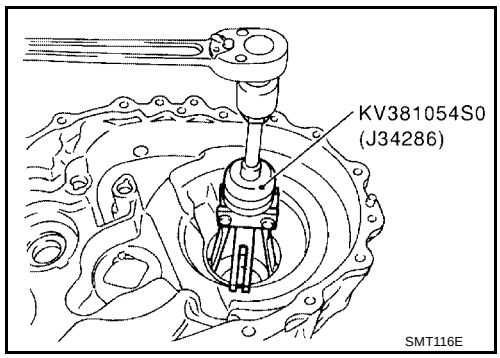
32. Remove the bearing retainer and then the mainshaft front bearing as shown.
33. Remove the oil channel on the mainshaft side.



34. Remove the differential oil seal (clutch housing side) using Tool as shown.

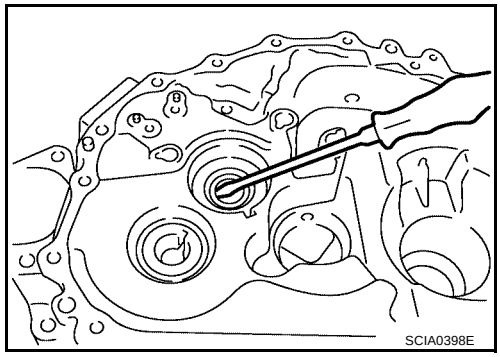


35. Remove the differential side bearing outer race (clutch housing side) using Tool as shown.



36. Remove the input shaft oil seal using a suitable tool as shown.

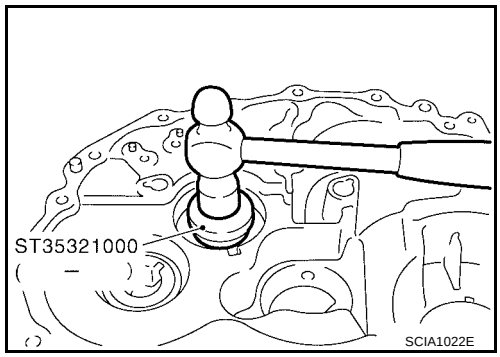
CAUTION:
Do not damage the clutch housing sealing surface.



ASSEMBLY

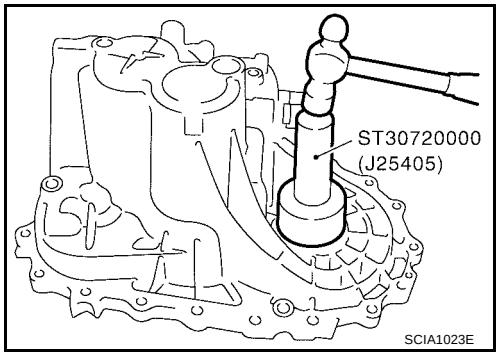
1. Install a new input shaft oil seal from the clutch housing end of the side, to the depth of 1.8 - 2.8 mm (0.071 - 0.110 in) using Tool (drift) as shown.

CAUTION:
Oil seals are not reusable.



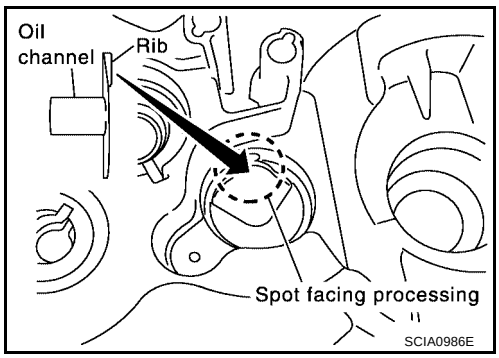
2. Install a new differential oil seal using Tool (drift) as shown.

CAUTION:
Oil seals are not reusable.



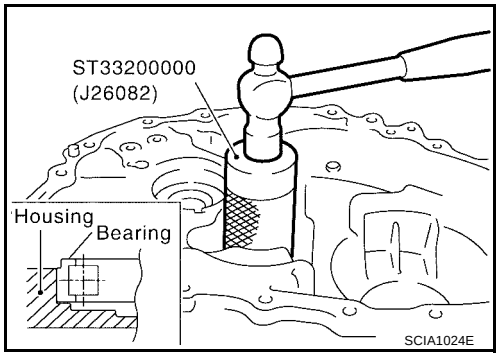
3. Install the oil channel on the mainshaft side as shown.

CAUTION:
Position the oil channel with the orientation as shown, for installation.



4. Install the mainshaft front bearing using Tool (drift) as shown.

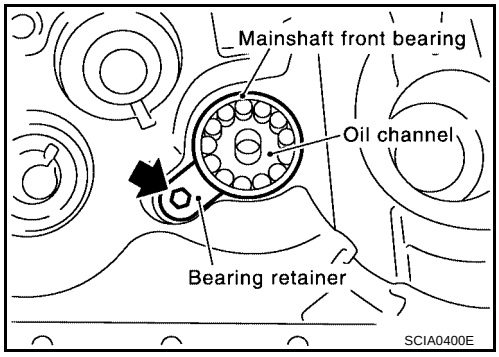
CAUTION:
Position the mainshaft front bearing with the orientation as shown, for installation



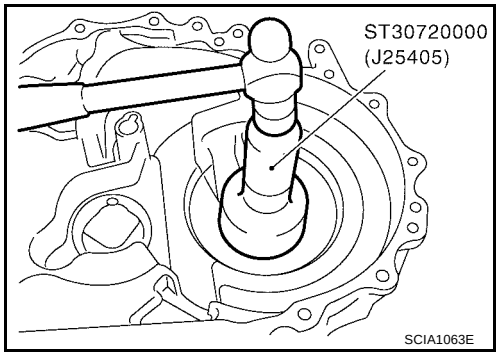
5. Install the mainshaft front bearing retainer.

CAUTION:
Install the bearing retainer with the punched surface facing up.

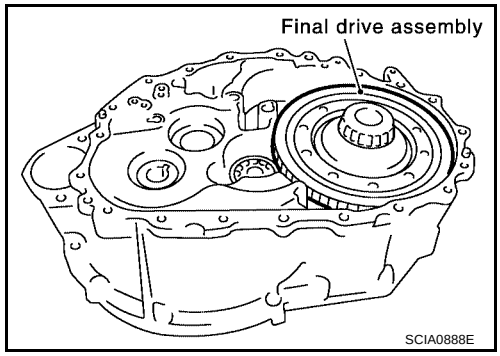
Bearing retainer bolt : 6.27 - 8.33 N·m (0.64 - 0.84 kg-m, 56 - 73 in-lb)



6. Install the differential side bearing outer race using Tool as shown.

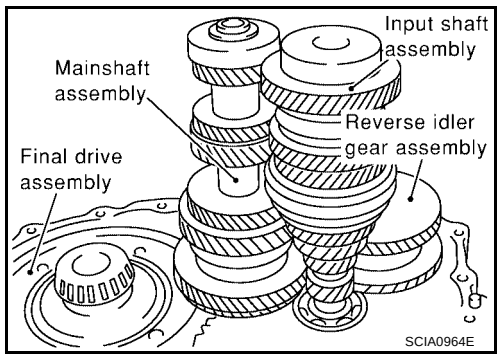


7. Install the final drive assembly into the clutch housing.



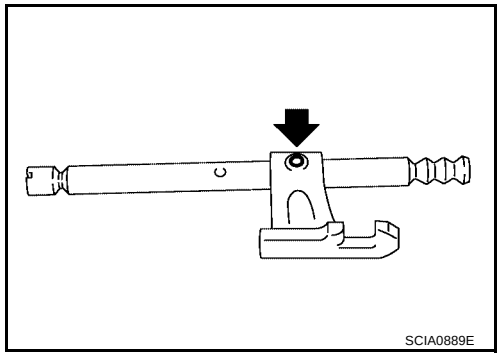
8. Install the input shaft assembly, mainshaft assembly, and reverse idler gear assembly into the clutch housing.

CAUTION:
Do not damage the input shaft oil seal.



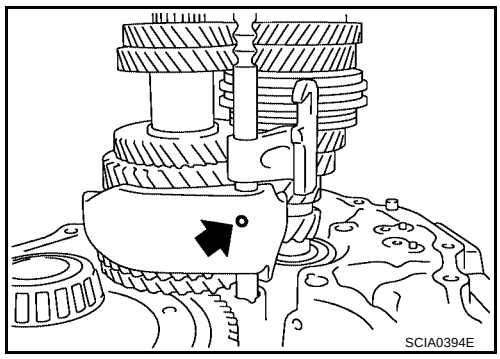
9. Install the 1st-2nd fork rod bracket onto the 1st-2nd fork rod, and then install a new retaining pin as shown.

CAUTION:
Retaining pins are not reusable.



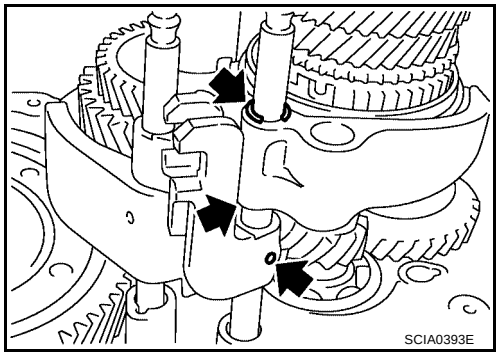
10. Install the 1st-2nd fork rod and the 1st-2nd shift fork, and then install a new retaining pin.

CAUTION:
Retaining pins are not reusable.

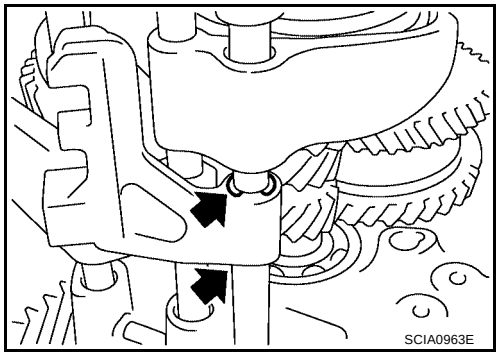


11. Install the shift check sleeve.
12. Install the 3rd-4th bracket, 3rd-4th shift fork, and 3rd-4th fork rod with the interlock pin.

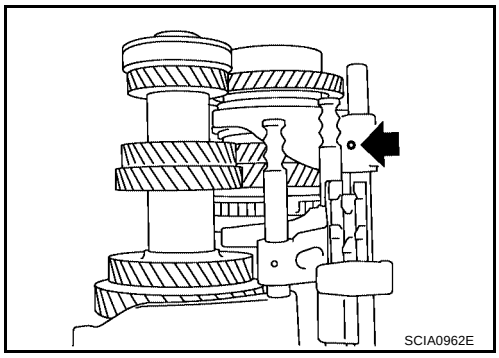
13. Install the new stopper rings onto the 3rd-4th shift fork.
    CAUTION:
    Stopper rings are not reusable.
14. Install a new retaining pin onto the 3rd-4th bracket.
    CAUTION:
    Retaining pins are not reusable.


SCIA0393E

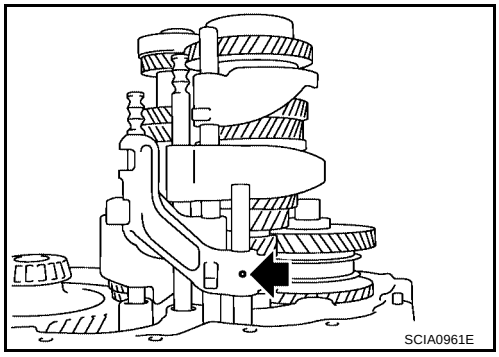
15. Install the 2 check balls.
16. Install the 5th-6th bracket, 5th-6th shift fork, and 5th-6th fork rod.
17. Install new stopper rings onto the 5th-6th bracket with interlock pin.
    CAUTION:
    Stopper rings are not reusable.


SCIA0963E

18. Install a new retaining pin onto the 5th-6th shift fork.
    CAUTION:
    Retaining pins are not reusable.


SCIA0962E

19. Install the two check balls.
20. Install the reverse bracket fork rod and reverse lever bracket.
21. Install a new retaining pin onto the reverse bracket.
    CAUTION:
    Retaining pins are not reusable.

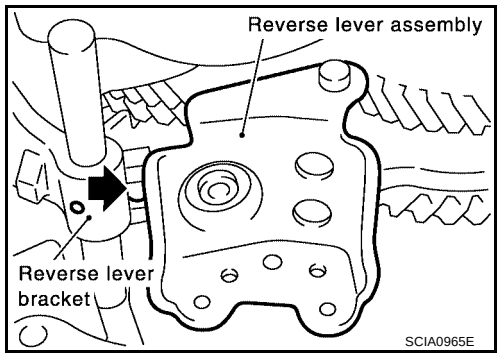

SCIA0961E

22. Install the reverse shift fork and reverse fork rod.
23. Install the reverse lever assembly using the following steps:

a. Install the shifter cap onto the reverse lever assembly cam, and then install them onto the reverse shift fork.

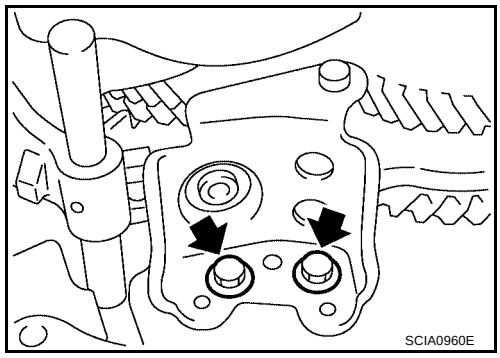
CAUTION:
Do not drop the shifter cap.

b. While lifting the reverse shift fork, align the cam with the reverse bracket.



c. Tighten the bracket bolts to specification, and install the reverse lever assembly.

Bracket bolts : 11.8 - 15.6 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)



24. Install the magnet onto the clutch housing.
25. Install the selected input shaft adjusting shim onto the input shaft.
    - For selection of adjusting shims, refer to MT-160, "INPUTSHAFT END PLAY" .
26. Install the baffle plate and oil gutter.
27. Install the transaxle case using the following steps:

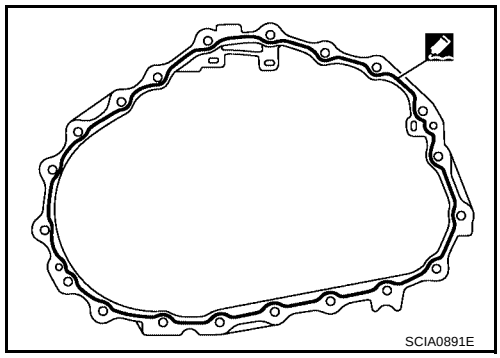
a. Install the selected mainshaft rear bearing adjusting shim into the transaxle case.
    - For selection of adjusting shims, refer to MT-162, "MAINSHAFT END PLAY" .

b. Temporarily install the snap ring of the mainshaft rear bearing into the transaxle case.

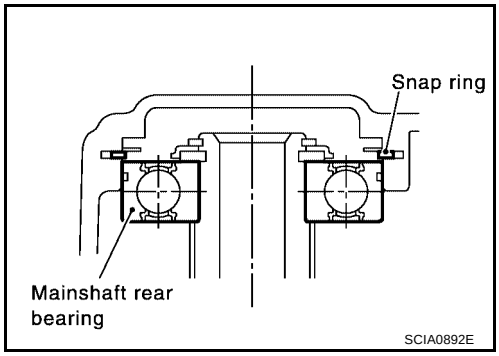
CAUTION:
Do not reuse the snap ring.

c. Apply sealant to the mating surfaces of the transaxle case and clutch housing as shown. Use Genuine Anaerobic Liquid Gasket or equivalent. Refer to GI-44, "Recommended Chemical Products and Sealants" .

CAUTION:
Remove any old sealant adhering to the mounting surfaces. Also remove any moisture, oil, or foreign material adhering to the sealant application and mounting surfaces.

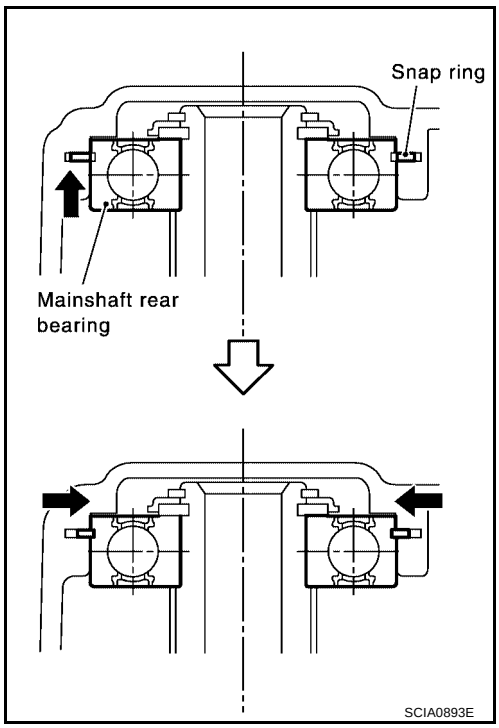


d. Using a snap ring of the mainshaft rear bearing temporarily, install the transaxle case over the clutch housing as shown.



e. Through the bore plug mounting hole, with the snap ring stretched, lift up the mainshaft assembly from the control assembly mounting hole.

f. Securely install the snap ring onto the mainshaft rear bearing as shown.



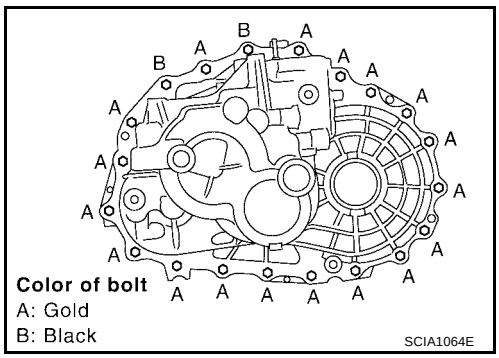
g. Tighten the "A" bolts (gold) and new "B" bolts (black) to specification.

"A" Bolt : 50.0 - 53.9 N-m (5.1 - 5.4 kg-m, 37 - 39 ft-lb)

"B" Bolt : 63.0 - 66.9 N-m (6.5 - 6.8 kg-m, 47 - 49 ft-lb)

CAUTION:

Always replace the "B" bolts as they are self-sealing bolts.



h. Install the control assembly using new O-rings.

CAUTION:

Do not reuse the O-ring.

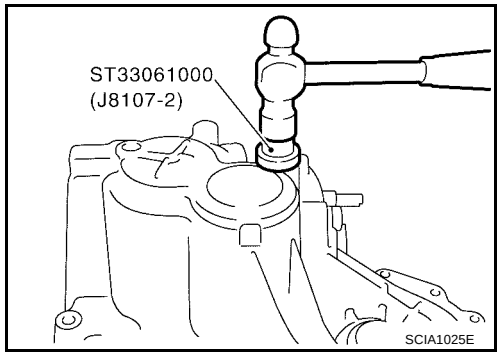
i. Install a new shift check and a new stopper bolt.

CAUTION:

Shift check and stopper bolt are not reusable.

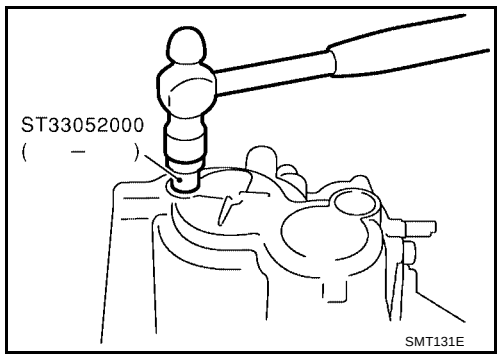
28. Install a new bore plug using Tool (drift) as shown.

CAUTION:
Bore plugs are not reusable.



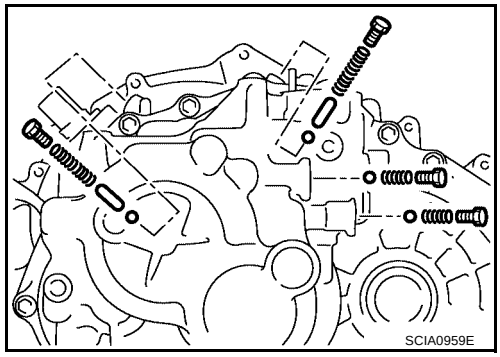
29. Install the new welch plug using Tool (drift).

CAUTION:
Do not reuse the welch plug

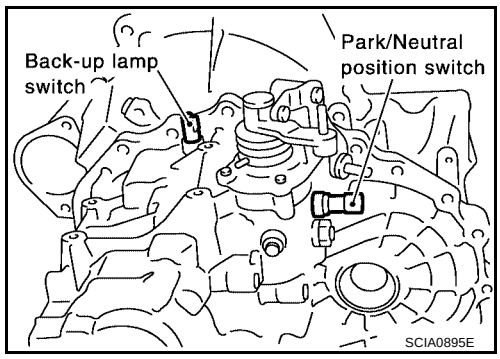


30. Install the 2 shift check sleeves, 4 check balls, 4 check springs, and 4 new check ball plugs.

CAUTION:
Check ball plugs are not reusable.



31. Apply sealant to the threads of the neutral switch and reverse lamp switch. Then install them into the transaxle case. Refer to MT-145, "CASE AND HOUSING COMPONENTS" . Use Genuine Anaerobic Liquid Gasket or equivalent. Refer to GI-44, "Recommended Chemical Products and Sealants" .



32. Install new gaskets onto the drain plug and filler plug, and then install them into the transaxle case.

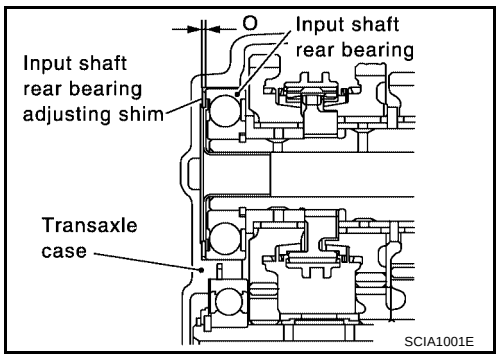
CAUTION:
- **Gaskets are not reusable.**
- **After oil is filled, tighten filler plug to specification. Refer to MT-145, "CASE AND HOUSING COMPONENTS" .**

Adjustment

ECS005VG

INPUTSHAFT END PLAY

- When adjusting the input shaft end play, select the adjusting shim for the input shaft bearing. To select the correct thickness for the adjusting shim, measure the clearance between the transaxle case and input shaft rear bearing.
- Calculate the dimension "O" (thickness of adjusting shim) using the following steps to adjust the input shaft rear bearing for the specified end play.



CAUTION:

Only 1 adjusting shim can be selected.

End play : 0 - 0.06 mm (0 - 0.0024 in)

Dimension "O" = (O_1 - O_2) + End play

"O" : Thickness of adjusting shim

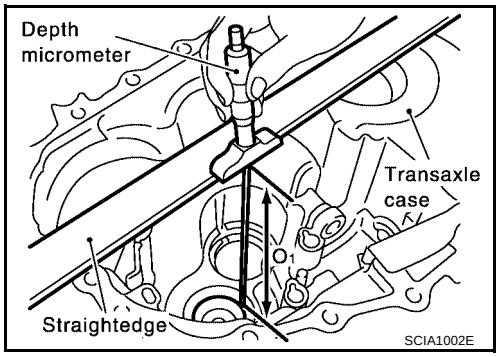
O_1 : Distance between transaxle case end face and mounting face of adjusting shim

O_2 : Distance between clutch housing case end face and end face of input shaft rear bearing

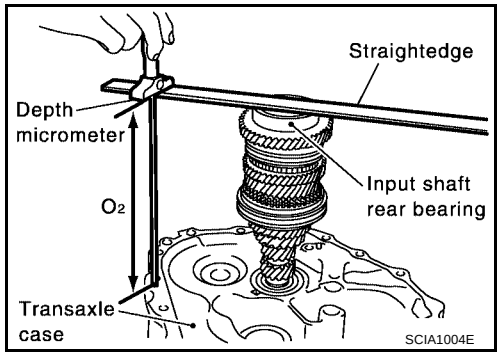
Adjusting Shims

Shim thickness	Part number	Shim thickness	Part number	Shim thickness	Part number
0.40 mm (0.0157 in)	32225 8H500	0.88 mm (0.0346 in)	32225 8H512	1.36 mm (0.0520 in)	32225 8H524
0.44 mm (0.0173 in)	32225 8H501	0.92 mm (0.0362 in)	32225 8H513	1.40 mm (0.0551 in)	32225 8H560
0.48 mm (0.0189 in)	32225 8H502	0.96 mm (0.0378 in)	32225 8H514	1.44 mm (0.0567 in)	32225 8H561
0.52 mm (0.0205 in)	32225 8H503	1.00 mm (0.0396 in)	32225 8H515	1.48 mm (0.0583 in)	32225 8H562
0.56 mm (0.0220 in)	32225 8H504	1.04 mm (0.0409 in)	32225 8H516	1.52 mm (0.0598 in)	32225 8H563
0.60 mm (0.0236 in)	32225 8H505	1.08 mm (0.0425 in)	32225 8H517	1.56 mm (0.0614 in)	32225 8H564
0.64 mm (0.0252 in)	32225 8H506	1.12 mm (0.0441 in)	32225 8H518	1.60 mm (0.0630 in)	32225 8H565
0.68 mm (0.0268 in)	32225 8H507	1.16 mm (0.0457 in)	32225 8H519	1.64 mm (0.0646 in)	32225 8H566
0.72 mm (0.0283 in)	32225 8H508	1.20 mm (0.0472 in)	32225 8H520		
0.76 mm (0.0299 in)	32225 8H509	1.24 mm (0.0488 in)	32225 8H521		
0.80 mm (0.0315 in)	32225 8H510	1.28 mm (0.0504 in)	32225 8H522		
0.84 mm (0.0331 in)	32225 8H511	1.32 mm (0.0520 in)	32225 8H523		

1. Using a depth micrometer and straight edge, measure the dimension "O_1 " between the transaxle case end face and mounting face of the adjusting shim as shown.



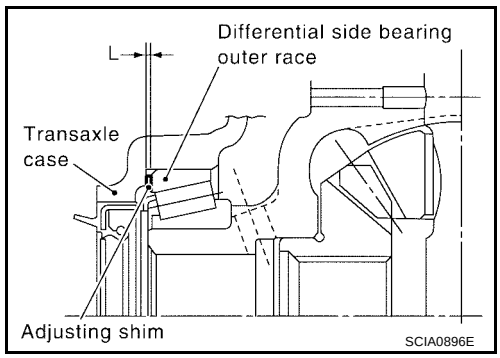
2. Using a depth micrometer and straight edge, measure the dimension "O_2 " between the clutch housing case end face and end face of the input shaft rear bearing as shown.



3. Install the selected input shaft rear bearing adjusting shim onto the input shaft.

DIFFERENTIAL SIDE BEARING PRELOAD

- When adjusting differential side bearing preload, select adjusting shim for differential side bearing. To select adjusting shim, measure clearance “L” between transaxle case and differential side bearing outer race.
- Calculate dimension “L” (thickness of adjusting shim) using the following procedure to meet specification of preload for differential side bearing.



Preload : 0.15 - 0.21 mm (0.0059 - 0.0083 in)

Dimension “L” = (L_1 - L_2) + Preload

"L" : Thickness of adjusting shim

L_1 : Distance between clutch housing case end face and mounting face of adjusting shim

L_2 : Distance between differential side bearing and transaxle case

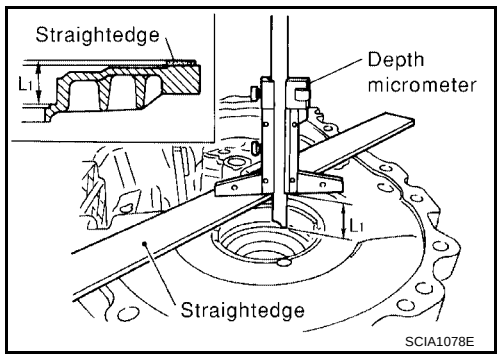
CAUTION:

Up to only 2 adjusting shims can be selected.

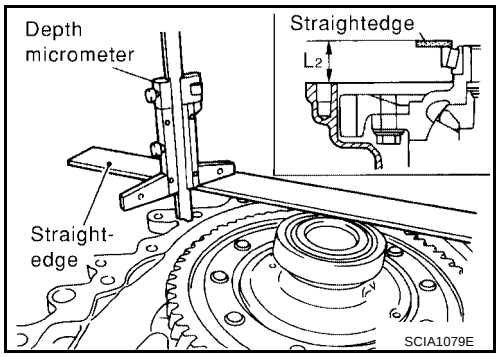
Adjusting Shim

Shim thickness	Part number
0.48 mm (0.0189 in)	31438 80X00
0.52 mm (0.0205 in)	31438 80X01
0.56 mm (0.0220 in)	31438 80X02
0.60 mm (0.0236 in)	31438 80X03
0.64 mm (0.0252 in)	31438 80X04
0.68 mm (0.0268 in)	31438 80X05
0.72 mm (0.0283 in)	31438 80X06
0.76 mm (0.0299 in)	31438 80X07
0.80 mm (0.0315 in)	31438 80X08
0.84 mm (0.0331 in)	31438 80X09
0.88 mm (0.0346 in)	31438 80X10
0.92 mm (0.0362 in)	31438 80X11

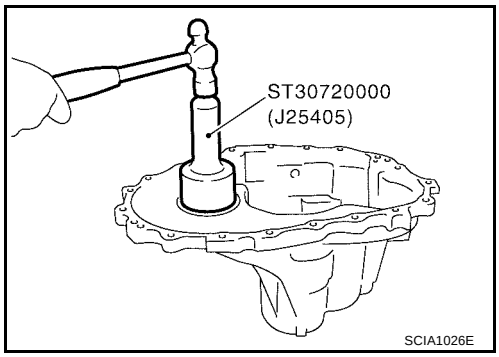
1. Using a depth micrometer and straight edge, measure the dimension "L_1 " between the clutch housing case end face and mounting face of the adjusting shim as shown.



2. Install the outer race onto the differential side bearing on the final gear side. Holding the outer race horizontally by hand, rotate the final gear five times or more (for smooth movement of the bearing roller).
3. Using a depth micrometer and straight edge, measure the dimension "L_2 " between the differential side bearing outer race and transaxle case end face as shown.

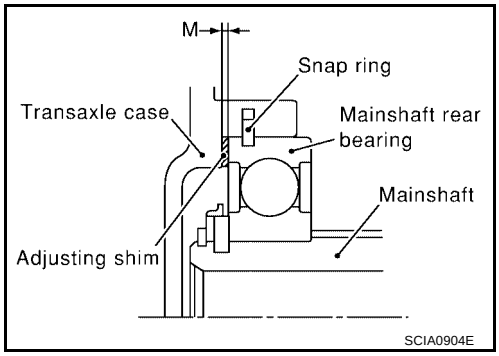


4. Install the selected adjusting shim and then the differential side bearing outer race using Tool as shown.



MAINSHAFT END PLAY

- When adjusting the mainshaft end play, select the adjusting shim for the mainshaft rear bearing. To select the adjusting shim, measure clearance “M” between the transaxle case and mainshaft rear bearing.
- Calculate the dimension "P" (thickness of adjusting shim) using the following procedure to meet specification of end play for mainshaft rear bearing.



End play : 0 - 0.06 mm (0 - 0.0024 in)

Dimension “P” = "M" + End play

"P" : Thickness of adjusting shim

"M" : Distance between mainshaft rear bearing and transaxle case

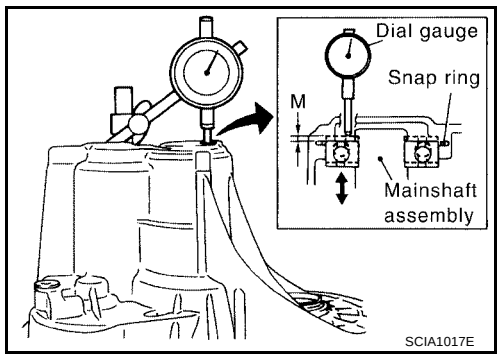
CAUTION:

Only 1 adjusting shim can be selected.

Adjusting Shim

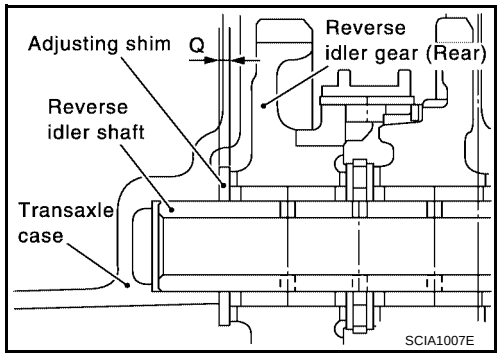
Shim thickness	Part number
0.44 mm (0.0173 in)	32238 8H510
0.48 mm (0.0189 in)	32238 8H511
0.52 mm (0.0205 in)	32238 8H512
0.56 mm (0.0220 in)	32238 8H513
0.60 mm (0.0236 in)	32238 8H514
0.64 mm (0.0252 in)	32238 8H515
0.68 mm (0.0268 in)	32238 8H516
0.72 mm (0.0283 in)	32238 8H517
0.76 mm (0.0299 in)	32238 8H518
0.80 mm (0.0315 in)	32238 8H519
0.84 mm (0.0331 in)	32238 8H520
0.88 mm (0.0346 in)	32238 8H521
0.92 mm (0.0362 in)	32238 8H522
0.96 mm (0.0378 in)	32238 8H523
1.00 mm (0.0396 in)	32238 8H524
1.04 mm (0.0409 in)	32238 8H560
1.08 mm (0.0425 in)	32238 8H561

1. Install the mainshaft assembly to the clutch housing.
2. Install the snap ring to the transaxle case.
3. Install the transaxle case to clutch housing, and temporarily assemble them with fixing bolts. Temporarily install the snap ring to the mainshaft rear bearing.
4. Install the dial gauge to the snap ring access hole, and expand the snap ring as shown. Lift the mainshaft assembly through the control assembly installation hole, and push it against the transaxle case. This state shall be defined as base. Moving the distance of the mainshaft assembly, with the snap ring installed on the main bearing, becomes “M”.



REVERSE IDLER GEAR END PLAY

- When adjusting the reverse idler gear end play, select the adjusting shim for the reverse idler gear. To select the correct thickness of adjusting shim, measure the clearance between the transaxle case and reverse idler gear.
- Calculate the dimension "Q" (thickness of adjusting shim) using the following steps to adjust the end play of the reverse idler gear to specification.



End play : 0.04 - 0.14 mm (0.0016 - 0.0055 in)

Dimension “Q” = (Q_1 - Q_2) + End play

"Q" : Thickness of adjusting shim

Q_1 : Distance between transaxle case end face and mounting face of adjusting shim

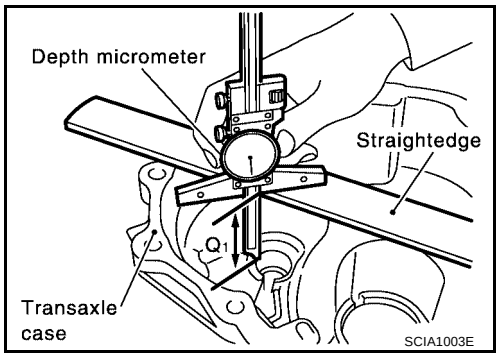
Q_2 : Distance between clutch housing case end face and end face of reverse idler gear

CAUTION:
Only 1 adjusting shim can be selected.

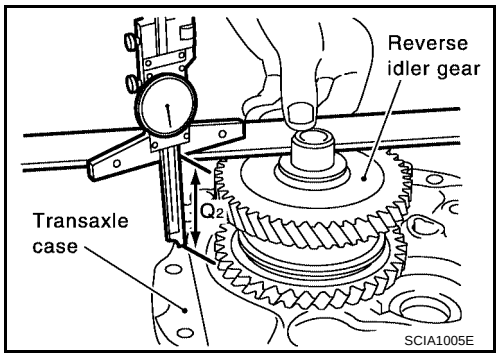
Adjusting Shim

Shim thickness	Part number
1.76 mm (0.0693 in)	32237 8H500
1.84 mm (0.0724 in)	32237 8H501
1.92 mm (0.0756 in)	32237 8H502
2.00 mm (0.0787 in)	32237 8H503
2.08 mm (0.0819 in)	32237 8H504
2.16 mm (0.0850 in)	32237 8H505
2.24 mm (0.0882 in)	32237 8H506
2.32 mm (0.0913 in)	32237 8H507
2.40 mm (0.0945 in)	32237 8H508
2.48 mm (0.0976 in)	32237 8H509
2.56 mm (0.1008 in)	32237 8H510
2.64 mm (0.1039 in)	32237 8H511

1. Using a depth micrometer and straight edge, measure the dimension "Q_1 " between the transaxle case end face and the mounting face of the adjusting shim as shown.



2. Using a depth micrometer and straight edge, measure the dimension "Q_2 " between the clutch housing case end face and the end face of reverse idler gear as shown.



3. Install the selected reverse idler gear adjusting shim onto the reverse idler gear.

INPUT SHAFT AND GEARS

PFP:32200

Disassembly and Assembly

ECS005VH

DISASSEMBLY

1. Before disassembling, measure the end play for 3rd, 4th, 5th, and 6th input gears.

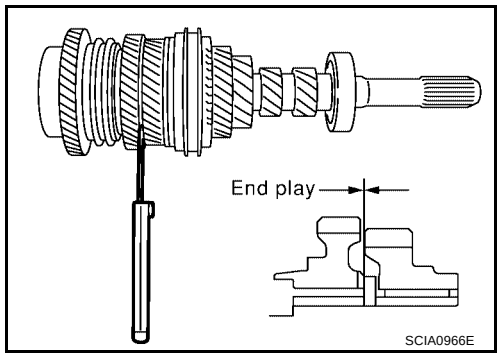
End play standard values

3rd gear : 0.18 - 0.31 mm (0.0071 - 0.0122 in)

4th gear : 0.20 - 0.30 mm (0.0079 - 0.0118 in)

5th gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)

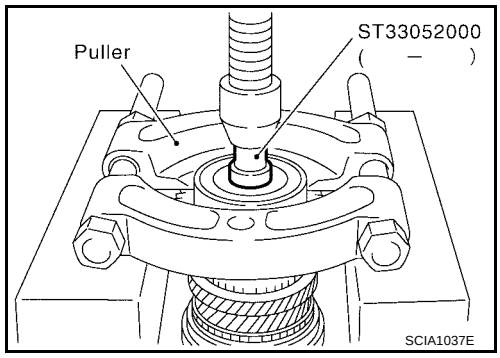
6th gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)



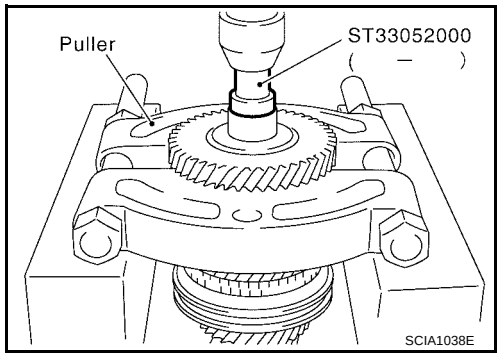
CAUTION:

If measurement is outside the standard value, disassemble to check the contact surfaces of the gear, shaft, and, hub. Adjust using the correct size snap ring for assembly.

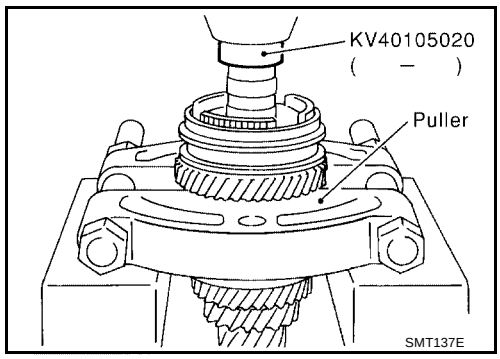
2. Remove the oil channel.
3. Remove the input shaft rear bearing using Tool as shown.
4. Remove the snap ring.



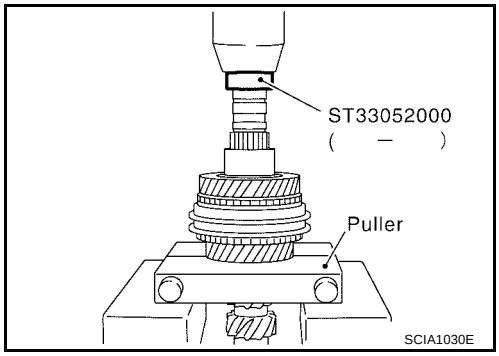
5. Remove the 6th input gear, 6th bushing, and 6th needle bearing using Tool as shown.
6. Remove the 6th baulk ring, 5th-6th coupling sleeve, and shifting insert.



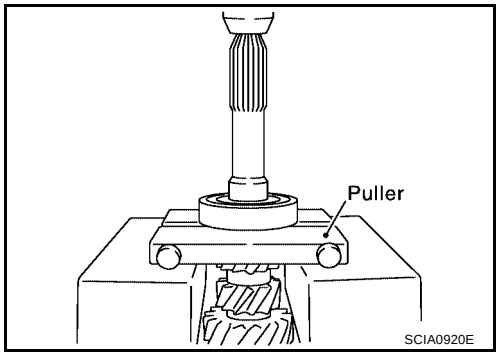
7. Remove the 5th input gear and synchronizer hub assembly simultaneously using Tool as shown.
8. Remove the 5th needle bearing.



9. Remove the 5th bushing, thrust washer, 4th input gear, 4th needle bearing, 4th bushing, 4th baulk ring, 3rd-4th synchronizer hub assembly, 3rd baulk ring, and 3rd input gear simultaneously using Tool as shown.
10. Remove the 3rd needle bearing.



11. Remove the input shaft front bearing using Tool as shown.

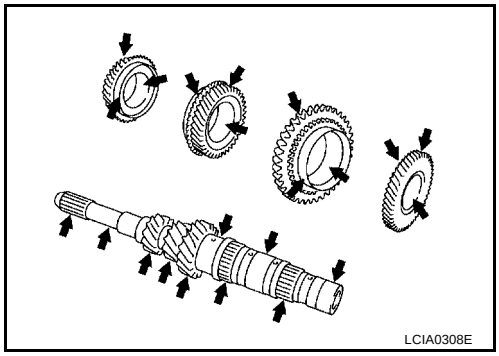


INSPECTION AFTER DISASSEMBLY

Input Shaft and Gears

Inspect the components for the following conditions as shown. If necessary, replace them with new ones.

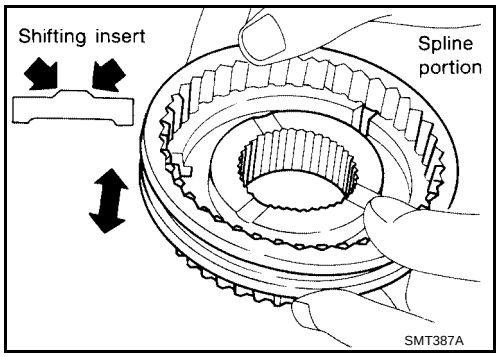
- Damage, peeling, dent, uneven wear, or bending of the input shaft.
- Excessive wear, damage, or peeling of the input gears.



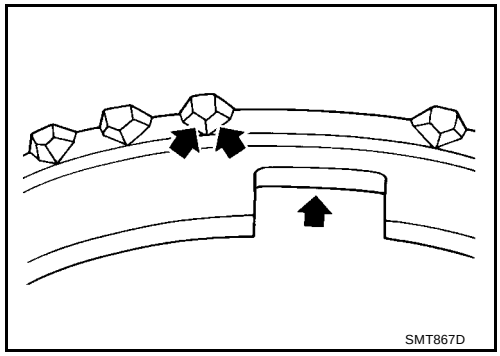
Synchronizer

Check the items below. If necessary, replace them with new ones.

- Damage and excessive wear of the contact surfaces of coupling sleeve, synchronizer hub, and shifting insert.
- Coupling sleeve and synchronizer hub must move smoothly as shown.



- If any cracks, damage, or excessive wear is found on the cam face of baulk ring or working face of the insert as shown, replace it.



Baulk Ring Clearance

Check the items below. If necessary, replace them with new ones.

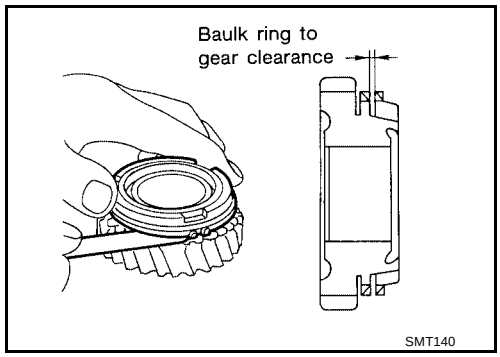
- Press the baulk ring against cone, and measure clearance between baulk ring and cone. If measurement is below limit, replace it with a new one.

Clearance - standard

3rd and 4th : 0.9 - 1.45 mm (0.035 - 0.0571 in)

5th and 6th : 0.95 - 1.4 mm (0.0374 - 0.055 in)

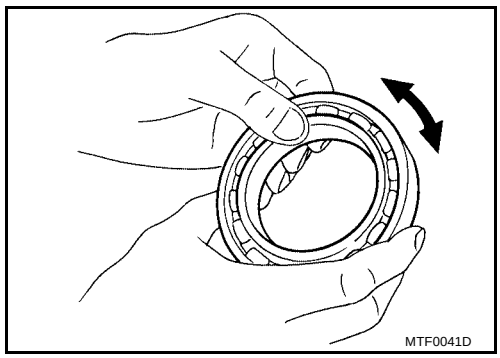
Limit : 0.7 mm (0.028 in)



Bearing

Check the items below. If necessary, replace them with new ones.

- Damage and rough rotation of the bearing as shown.

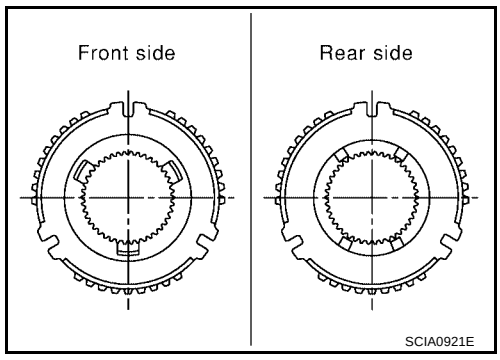


ASSEMBLY

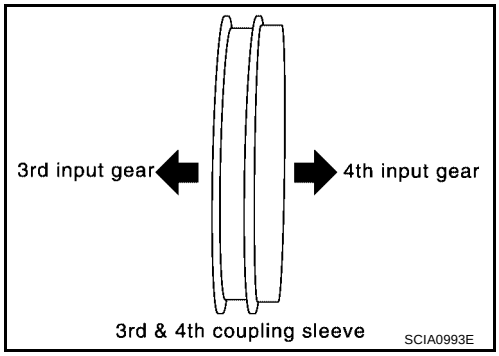
1. Install the 3rd needle bearing.
2. Install the 3rd input gear and 3rd baulk ring.
3. Install the spread spring, shifting insert, and a new 3rd-4th synchronizer hub onto the 3rd-4th coupling sleeve.

CAUTION:

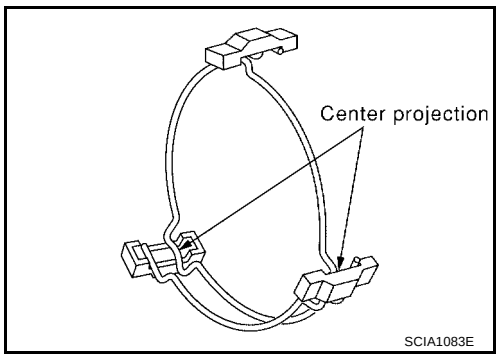
- **Install with orientation of the synchronizer hub as shown.**
- **Do not reuse the 3rd-4th synchronizer hub.**



- **Install with orientation of coupling sleeve as shown.**

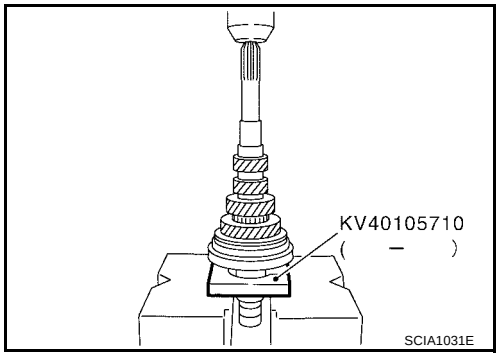


- **Be sure not to hook the ends of the 2 spread springs (front and back have two each) on the same shifting insert.**

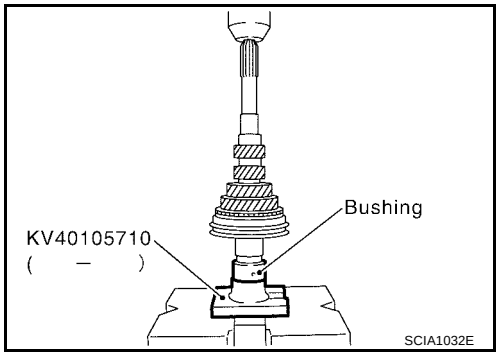


4. Install 3rd-4th synchronizer hub assembly using Tool as shown.

CAUTION:
Align grooves of shifting insert and 3rd baulk ring.



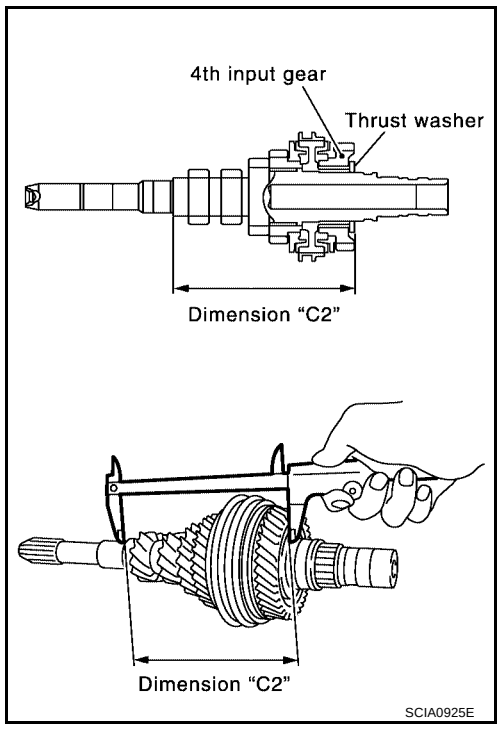
5. Install the 4th bushing using Tool as shown.
6. Install the 4th baulk ring.
7. Install the 4th input gear and 4th needle bearing.



8. Measure the dimension "C_2 " as shown. Select a thrust washer so that dimension "C_2 " satisfies standard dimension specification. Then install the thrust washer onto the input shaft.

Standard for dimension "C_2 " : 154.7 - 154.8 mm (6.091 - 6.094 in)

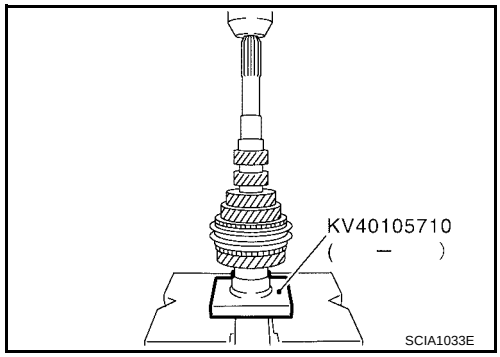
CAUTION:
Only 1 thrust washer can be selected.



Thrust Washer

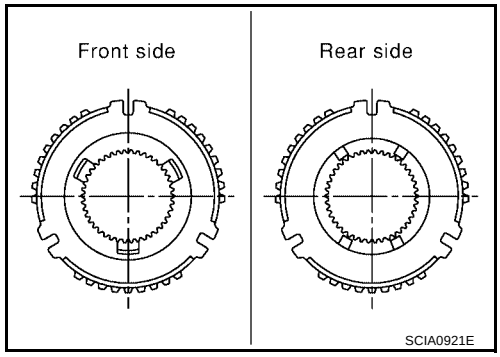
Thickness	Part number	Thickness	Part number
3.84 mm (0.1512 in)	32347 8H500	4.02 mm (0.1583 in)	32347 8H503
3.90 mm (0.1535 in)	32347 8H501	4.08 mm (0.1606 in)	32347 8H504
3.96 mm (0.1559 in)	32347 8H502	4.14 mm (0.1630 in)	32347 8H505

9. Install the 5th bushing using Tool as shown.
10. Install the 5th needle bearing and 5th input gear.
11. Install the 5th baulk ring.

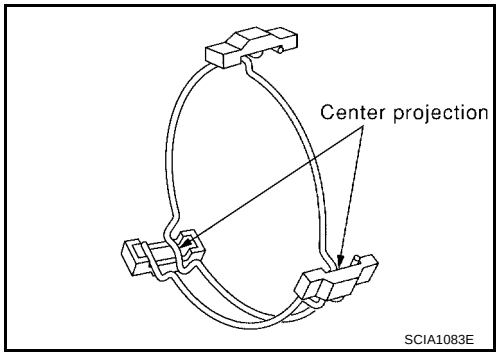


12. Install the synchronizer assembly onto a new 5th-6th synchronizer hub.

CAUTION:
- **Install with the orientation of the synchronizer hub as shown.**
- **Do not reuse the 5th-6th synchronizer hub.**

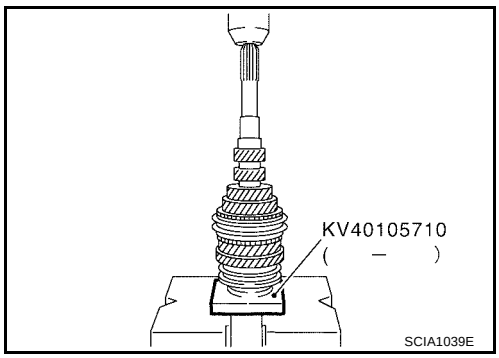


- **Be sure not to hook the ends of the 2 spread springs (front and back have two each) on the same shifting insert.**

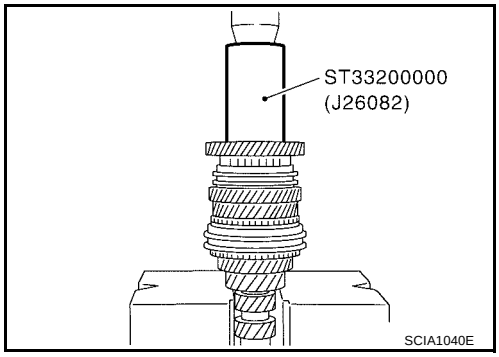


13. Install the 5th-6th synchronizer hub assembly using Tool as shown.

CAUTION:
Align the grooves of the 5th-6th shifting insert and 5th-6th baulk ring.



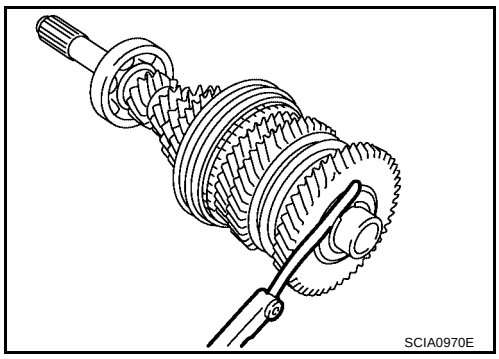
14. Install the needle bearing, 6th input gear and then 6th bushing using Tool as shown.



15. Install the snap ring onto the input shaft, and measure to check that end play (gap between snap ring and groove) of the 6th bushing is within specification.

End play standard value : 0 - 0.1 mm (0 - 0.004 in)

- If the measurement is outside the standard value, select the appropriate size snap ring.

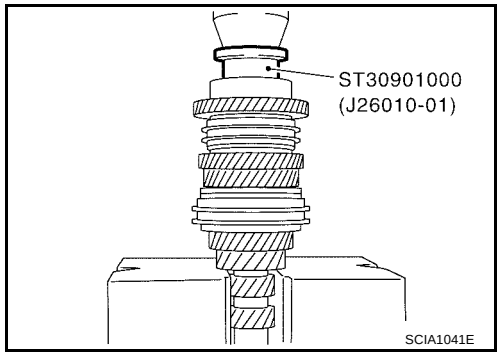


Snap Rings

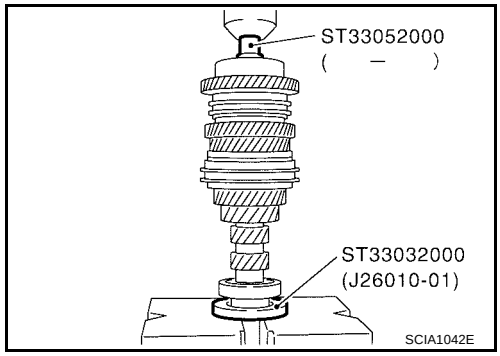
Thickness	Part number	Thickness	Part number
1.76 mm (0.0693 in)	32204 8H511	2.01 mm (0.0791 in)	32204 8H516
1.81 mm (0.0713 in)	32204 8H512	2.06 mm (0.0811 in)	32204 8H517
1.86 mm (0.0732 in)	32204 8H513	2.11 mm (0.0831 in)	32204 8H518
1.91 mm (0.0752 in)	32204 8H514	2.16 mm (0.0850 in)	32204 8H519
1.96 mm (0.0772 in)	32204 8H515	2.21 mm (0.0871 in)	32204 8H520

16. Install the input shaft rear bearing using Tool as shown.

CAUTION:
Install input shaft rear bearing with its brown surface facing the input gear side.



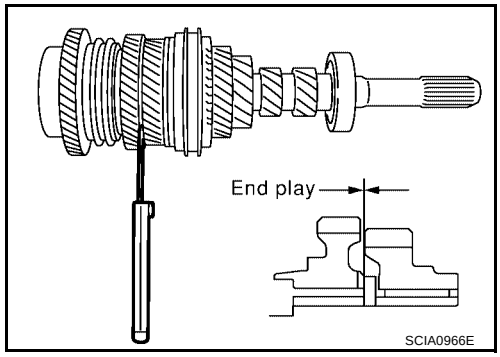
17. Install the input shaft front bearing using Tool as shown.
18. Install the oil channel onto the input shaft.



19. Check the end play of the 3rd, 4th, 5th and 6th input gears as shown.

End play standard value

3rd gear : 0.18 - 0.31 mm (0.0071 - 0.0122 in)
4th gear : 0.20 - 0.30 mm (0.0079 - 0.0118 in)
5th gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)
6th gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)



MAINSHAFT AND GEARS

PFP:32241

Disassembly and Assembly

ECS005VI

DISASSEMBLY

1. Before disassembling, measure the end play of 1st and 2nd main gears as shown.

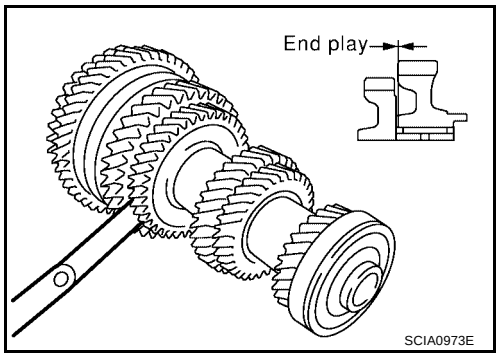
End play standard value

1st gear : 0.20 - 0.30 mm (0.0079 - 0.0118 in)

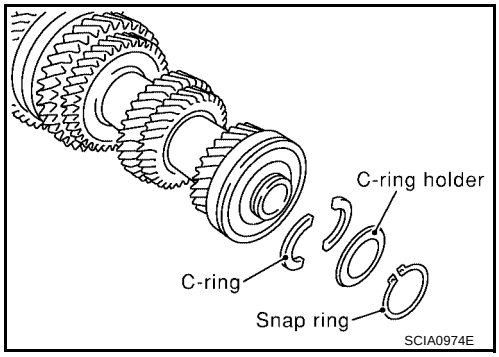
2nd gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)

CAUTION:

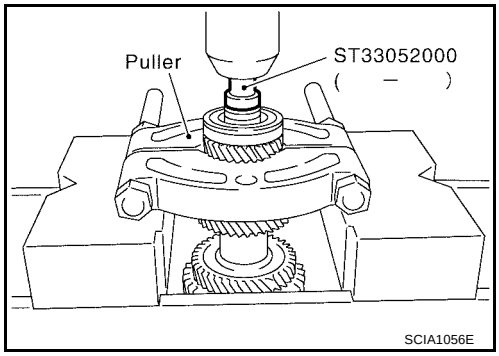
If the measurement is outside the standard value, disassemble to check the contact surfaces of gear, shaft, and hub. Adjust with the snap ring at assembly.



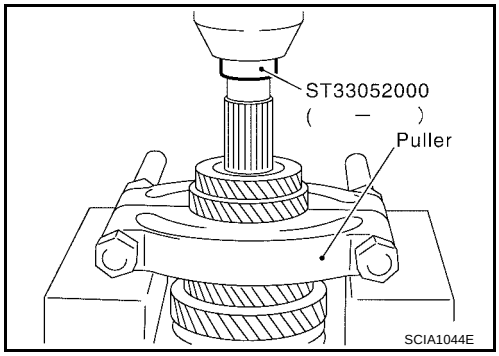
2. Remove the snap ring.
3. Remove the C-ring holder, and then mainshaft C-ring as shown.



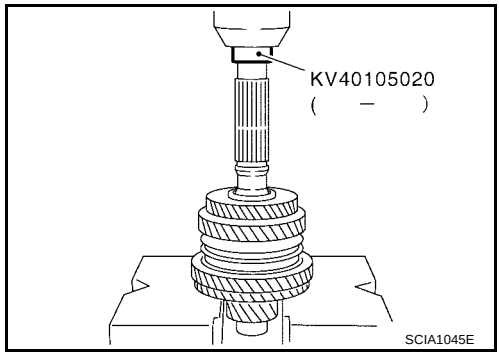
4. Remove the mainshaft rear bearing, adjust shim, and 6th main gear using Tool as shown.
5. Remove the 5th-6th mainshaft spacer.



6. Remove the 4th main gear and 5th main gear simultaneously using Tool as shown.
7. Remove the adjusting shim.
8. Remove the 3rd-4th mainshaft spacer.



9. Remove the 3rd main gear, 2nd main gear, 2nd gear needle bearing, 2nd bushing, 1st-2nd synchronizer assembly, 1st main gear, reverse main gear, 1st gear needle bearing, and 1st bushing simultaneously using Tool as shown.

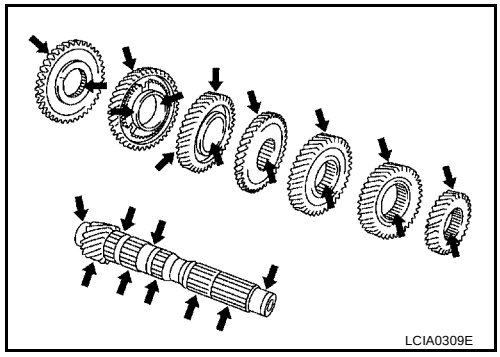


INSPECTION AFTER DISASSEMBLY

Mainshaft and Gears

Check the items listed as shown. If necessary, replace them with new ones.

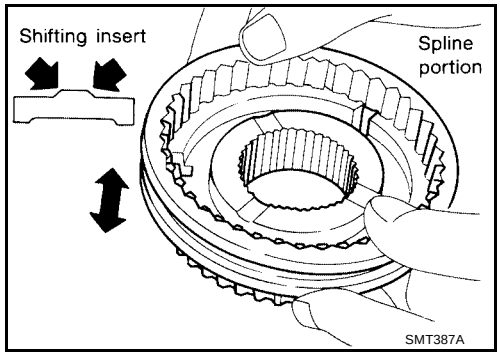
- Damage, peeling, dent, uneven wear, bending, and other non-standard conditions of the mainshaft.
- Excessive wear, damage, peeling, and other non-standard conditions of the mainshaft gears.



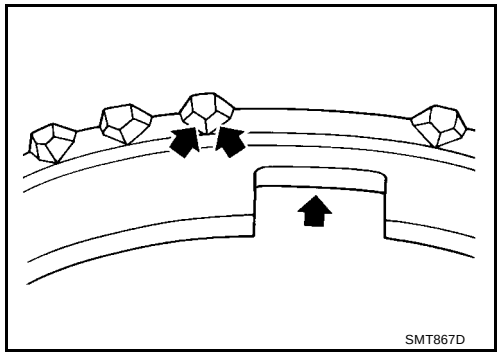
Synchronizer

Check the items listed as shown. If necessary, replace them with new ones.

- Damage, unusual wear on contact surfaces of coupling sleeve, synchronizer hub, and shifting insert.
- Coupling sleeve and synchronizer hub must move smoothly as shown.

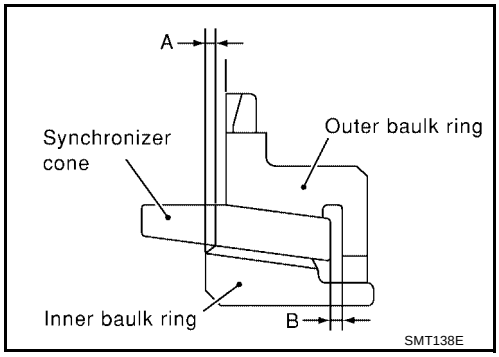


- If any cracks, damage, or excessive wear is found on the cam face of baulk ring or working face of the insert, replace it.



Baulk Ring Clearance

Checking the double cone synchronizer (1st-2nd)

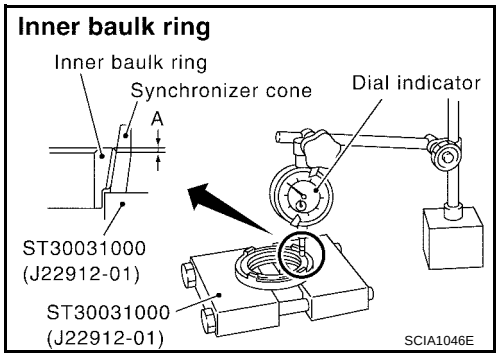


- Check the clearance of outer baulk ring, synchronizer cone, and inner baulk ring of 1st-2nd double cone synchronizer, using the following steps.

  NOTE:
  The mean value is the middle value of a set of measurements between the highest and lowest values. It is calculated by adding the highest and lowest measured value and dividing their sum by two: [(high value) + (low value)] / 2 = mean value.

  CAUTION:
  Outer baulk ring, synchronizer cone, and inner baulk ring act as a set to control the clearances "A" and "B". If the measurement exceeds the service limit value, replace all of them as a set.

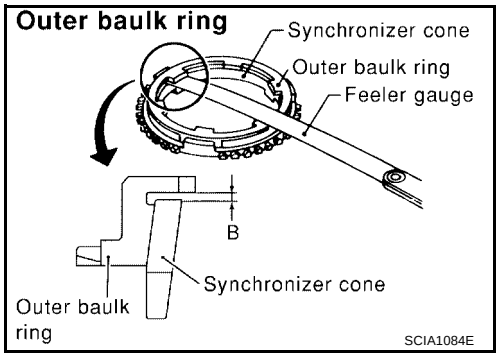
1. Using a dial gauge and Tool, measure clearance "A" at two or more points diagonally opposite, and calculate mean value.



   Clearance "A"

Standard	**: 0.6 - 0.8 mm (0.024 - 0.031 in)**
Limit value	**: 0.2 mm (0.008 in) or less**

2. Using a feeler gauge, measure clearance "B" at two or more points diagonally opposite, and calculate mean value as shown.



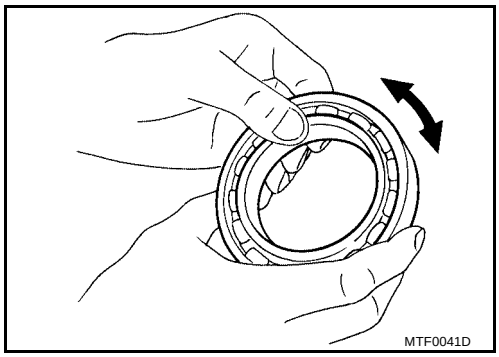
   Clearance "B"

Standard	**: 0.6 - 1.1 mm (0.024 - 0.043 in)**
Limit value	**: 0.2 mm (0.008 in) or less**

Bearing

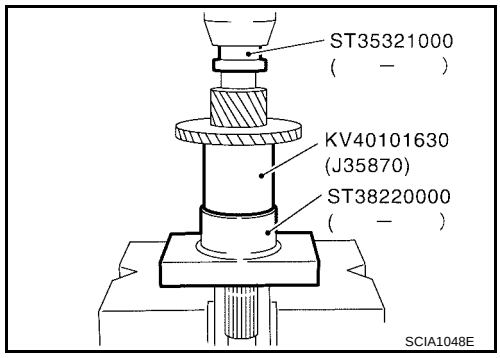
Check the items below. If necessary, replace them with new ones.

- Damage and rough rotation of the bearing as shown.

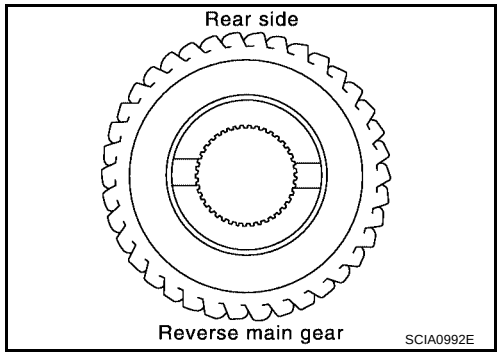


ASSEMBLY

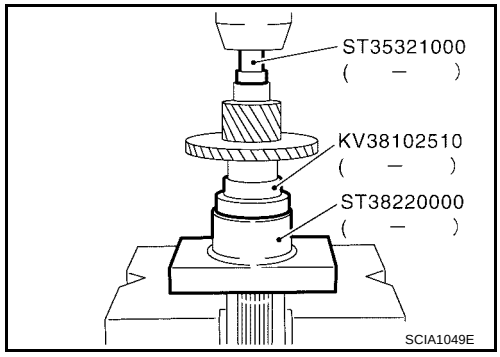
1. Install the reverse main gear using Tool as shown.



CAUTION:
Install with the orientation of reverse main gear as shown.

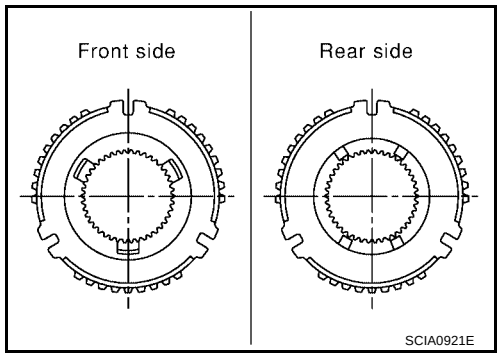


2. Install the 1st bushing using Tool as shown.
3. Install the needle bearing, and then the 1st main gear.

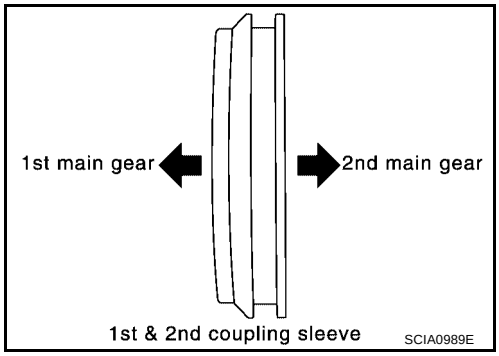


4. Install the spread spring, shifting insert, and a new 1st-2nd synchronizer hub onto the 1st-2nd coupling sleeve.

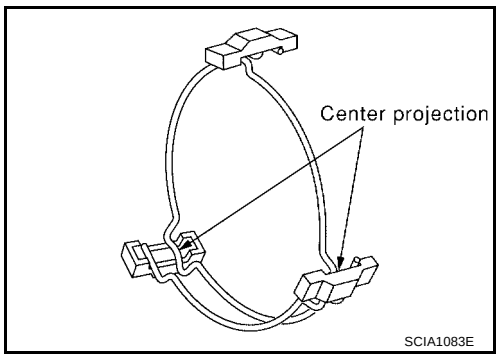
CAUTION:
- **Install with the orientation of the new synchronizer hub as shown.**
- **Do not reuse 1st-2nd synchronizer hub**



- **Install with the orientation of coupling sleeve as shown.**

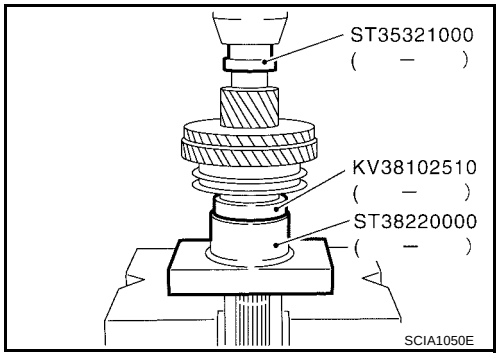


- **Do not hook the ends of the two spread springs (front and back have two each) on the same shifting insert.**

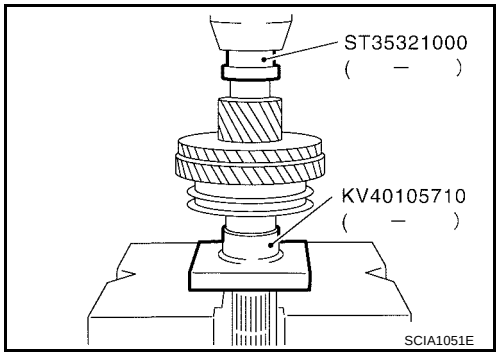


5. Install the 1st gear synchronizer assembly onto the mainshaft, and the synchronizer hub assembly onto the mainshaft using Tool as shown.

   CAUTION:
   - **Outer baulk ring, synchronizer cone, and inner baulk ring on the 2nd gear-side must have been removed.**
   - **Install the coupling sleeve with the proper orientation.**

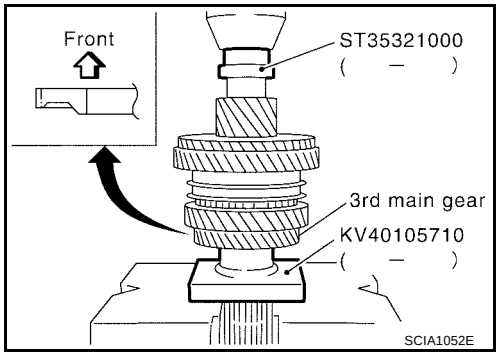


6. Install the 2nd bushing using Tool as shown.
7. Install the outer baulk ring, synchronizer cone, and inner baulk ring on 2nd gear-side.
8. Install the 2nd needle bearing and 2nd gear.



9. Install the 3rd main gear.

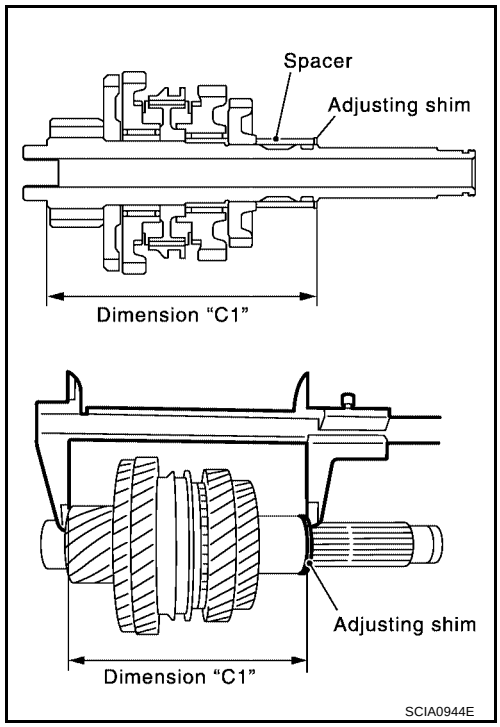
   CAUTION:
   Install the 3rd main gear with the orientation as shown.
10. Install the 3rd-4th mainshaft spacer.



11. Measure the dimension “C_1 ”. Select a suitable adjusting shim so that the dimension “C_1 ” satisfies the specified standard value, and install it onto the mainshaft.

Standard for dimension “C_1 ” : 173.85 - 173.95 mm (6.844 - 6.848 in)

CAUTION:
Only 1 adjusting shim can be selected.

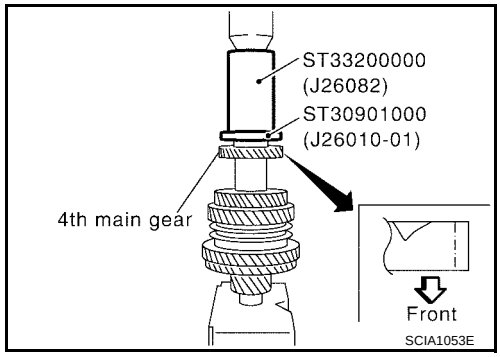


Adjusting Shim

Thickness	Part number	Thickness	Part number
0.52 mm (0.0205 in)	32238 8H500	0.84 mm (0.0331 in)	32238 8H504
0.60 mm (0.0236 in)	32238 8H501	0.92 mm (0.0362 in)	32238 8H505
0.68 mm (0.0268 in)	32238 8H502	1.00 mm (0.0394 in)	32238 8H506
0.76 mm (0.0299 in)	32238 8H503	1.08 mm (0.0425 in)	32238 8H507

12. Install the 4th main gear with the specified orientation as shown, using Tool as shown.

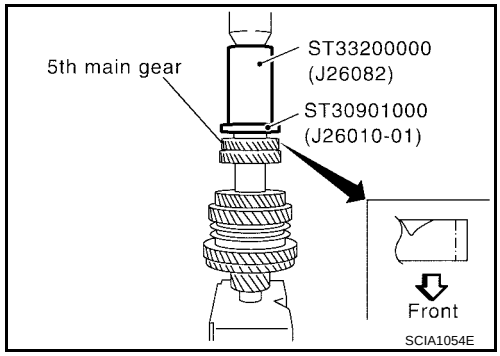
CAUTION:
Install the 4th main gear with the orientation as shown.



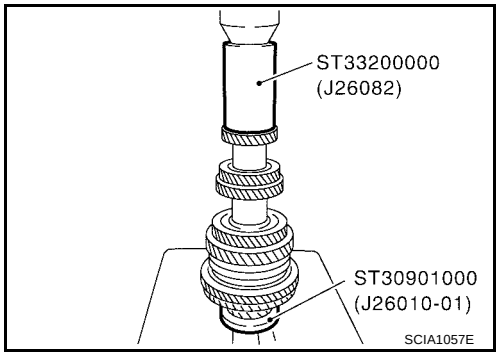
13. Install the 5th main gear with the specified orientation as shown, using Tool as shown.

CAUTION:
Install the 5th main gear with the orientation as shown.

14. Install the 5th-6th mainshaft spacer.



15. Install the 6th main gear using Tool as shown.



16. Select the 6th main adjusting shim and then install it onto the mainshaft.
    - Calculate thickness “S” of 6th main adjusting shim by procedure below so that end play dimension between 6th main gear and mainshaft rear bearing becomes the dimension specified.

      End play : 0 - 0.1 mm (0 - 0.004 in)

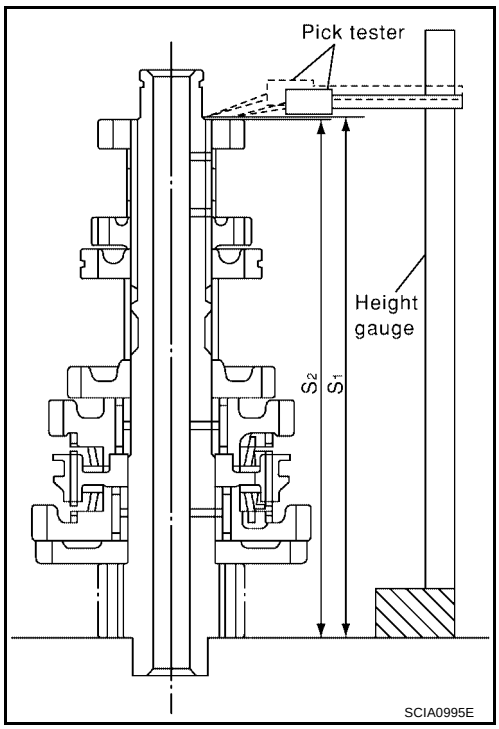
      Dimension “S” = (“S_1 ” - “S_2 ”) + end play

      “S” : Thickness of adjusting shim

      “S_1 ” : Dimension from mainshaft standard face to mainshaft rear bearing press-fit end face

      “S_2 ” : Dimension from mainshaft standard face to 6th main gear end face

      CAUTION:
      Only 1 adjusting shim can be selected.

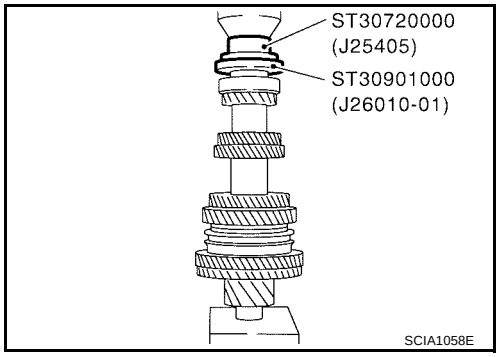


Adjusting Shim

Thickness	Part number	Thickness	Part number
0.88 mm (0.0346 in)	32237 8H560	1.20 mm (0.0472 in)	32237 8H564
0.96 mm (0.0378 in)	32237 8H561	1.28 mm (0.0504 in)	32237 8H565
1.04 mm (0.0409 in)	32237 8H562	1.36 mm (0.0535 in)	32237 8H566
1.12 mm (0.0441 in)	32237 8H563		

a. Using a height gauge, measure the dimension “S_1 ” and “S_2 ” as shown.
b. Install the selected 6th main adjusting shim to the mainshaft.

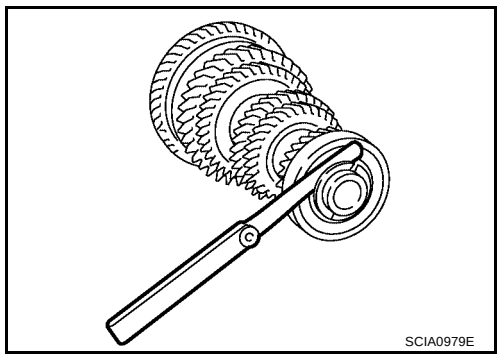
17. Install the mainshaft rear bearing using Tool as shown.



18. Install the C-ring onto the mainshaft, and check that the end play of mainshaft rear bearing meets specifications.

End play standard value : 0 - 0.06 mm (0 - 0.0024 in)

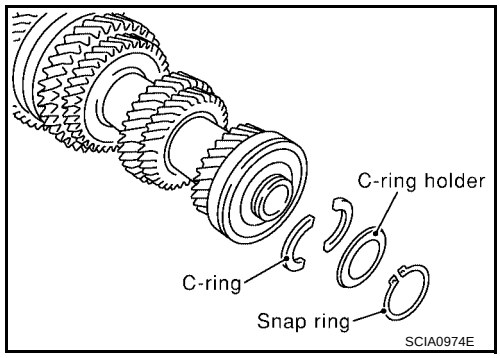
- If the measurement is outside the specified standard value, reselect a new C-ring.



C-Ring

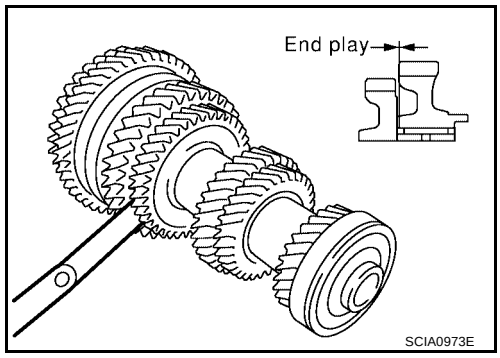
Thickness	Part number	Thickness	Part number
2.535 mm (0.0866 in)	32348 8H800	2.835 mm (0.1116 in)	32348 8H810
2.565 mm (0.1010 in)	32348 8H801	2.865 mm (0.1128 in)	32348 8H811
2.595 mm (0.1022 in)	32348 8H802	2.895 mm (0.1140 in)	32348 8H812
2.625 mm (0.1033 in)	32348 8H803	2.925 mm (0.1152 in)	32348 8H813
2.655 mm (0.1045 in)	32348 8H804	2.955 mm (0.1163 in)	32348 8H814
2.685 mm (0.1057 in)	32348 8H805	2.985 mm (0.1175 in)	32348 8H815
2.715 mm (0.1069 in)	32348 8H806	3.015 mm (0.1187 in)	32348 8H816
2.745 mm (0.1081 in)	32348 8H807	3.045 mm (0.1199 in)	32348 8H817
2.775 mm (0.1093 in)	32348 8H808	3.075 mm (0.1211 in)	32348 8H818
2.805 mm (0.1104 in)	32348 8H809		

19. Fit the C-ring holder, and install the snap ring as shown.



20. Check the end play of 1st and 2nd main gears as shown.

End play standard value
1st gear : 0.20 - 0.30 mm (0.0079 - 0.0118 in)
2nd gear : 0.06 - 0.16 mm (0.0024 - 0.0063 in)



REVERSE IDLER SHAFT AND GEARS

PFP:32281

Disassembly and Assembly

ECS005VJ

DISASSEMBLY

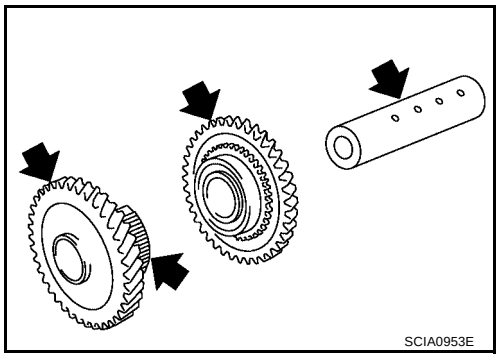
1. Remove the reverse idler gear adjusting shim.
2. Remove the reverse idler gear (rear), reverse coupling sleeve and insert spring simultaneously.
3. Remove the reverse idler gear needle bearing.
4. Remove the thrust needle bearing.
5. Remove the reverse baulk ring.
6. Remove the reverse idler gear (front).
7. Remove the reverse idler gear needle bearing.
8. Remove the thrust needle bearing.
9. Pull off the locking pin from the reverse idler shaft.

INSPECTION AFTER DISASSEMBLY

Reverse Idler Shaft and Gears

Check the parts listed. If necessary, replace them with new ones.

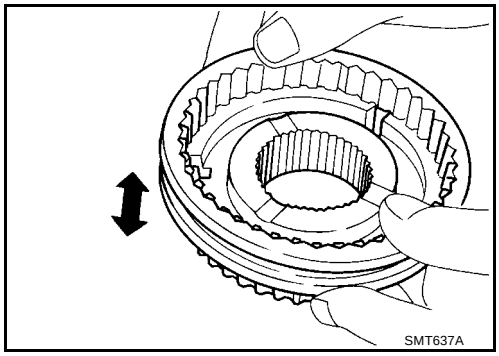
- Damage, peeling, dent, uneven wear, bending, and other non-standard conditions of the reverse idler shaft.
- Excessive wear, damage, peeling, and other non-standard conditions of the reverse idler gears.


SCIA0953E

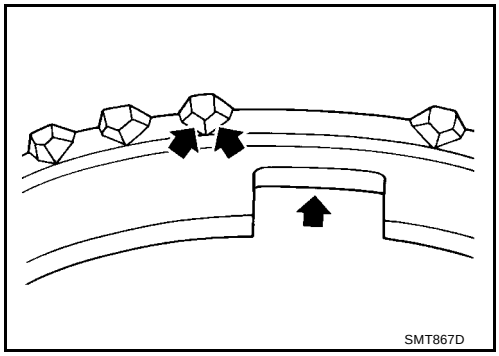
Synchronizer

Check parts listed. If necessary, replace them with new ones.

- Damage and unusual wear on contact surfaces of coupling sleeve, synchronizer hub, and insert spring.
- Coupling sleeve and synchronizer hub must move smoothly as shown.


SMT637A

- If any crack, damage, or excessive wear is found on cam face of baulk ring or working face of insert, replace it.


SMT867D

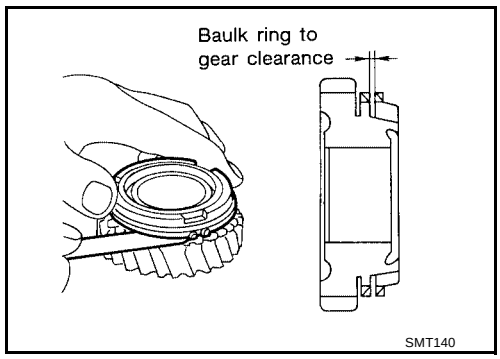
Baulk ring clearance

- Press the baulk ring against the cone, and measure the clearance between the baulk ring and cone as shown. If the measurement is below the specified limit, replace it with a new one.

Baulk ring to gear clearance

Standard : 0.95 - 1.4 mm (0.0374 - 0.055 in)

Limit value : 0.7 mm (0.028 in)



Bearing

Check the parts listed. If necessary, replace them with new ones.

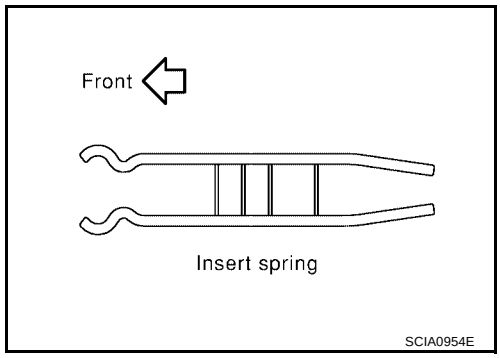
- Damage and rough rotation of the bearing.

ASSEMBLY

Assembly is in the reverse order of disassembly.

CAUTION:

- **Install the insert spring with the orientation as shown.**



FINAL DRIVE

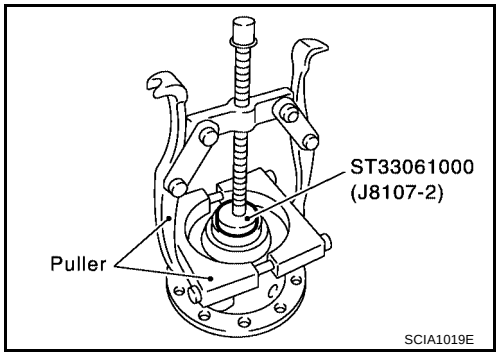
PFP:38411

Disassembly and Assembly

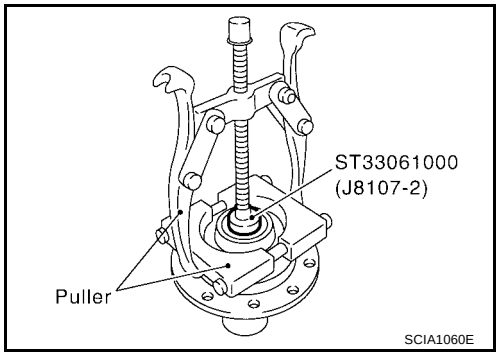
ECS005VK

DISASSEMBLY

1. Remove the final gear bolts. Then, separate the final gear from the differential case.
2. Remove the speedometer drive gear.
3. Using a puller and Tool (drift), remove the differential side bearing (clutch housing side) as shown.



4. Using a puller and Tool (drift), remove the differential side bearing (transaxle case side) as shown.

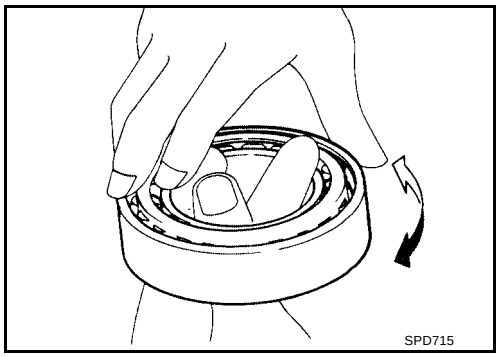


INSPECTION AFTER DISASSEMBLY

Bearing

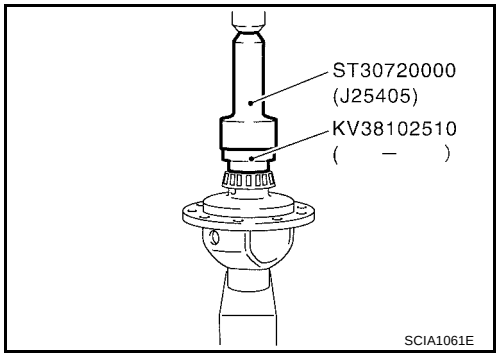
- Check for bearing damage and rough rotation as shown. If necessary, replace with a new one.

CAUTION:
When replacing the tapered roller bearing, replace the outer and inner races as a set.

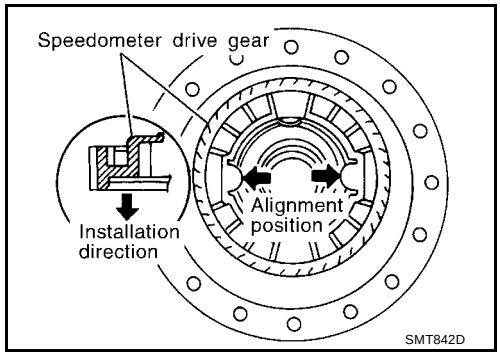


ASSEMBLY

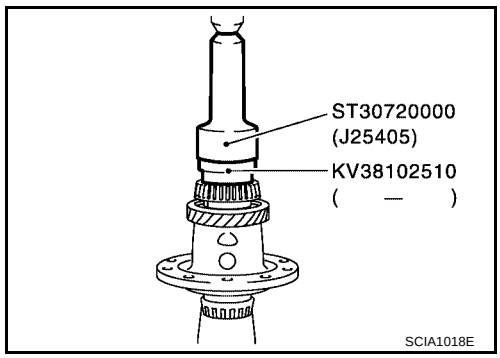
1. Using Tool (drift), install the differential side bearing (transaxle case side) as shown.



2. Align and install the speedometer drive gear onto the differential case as shown.

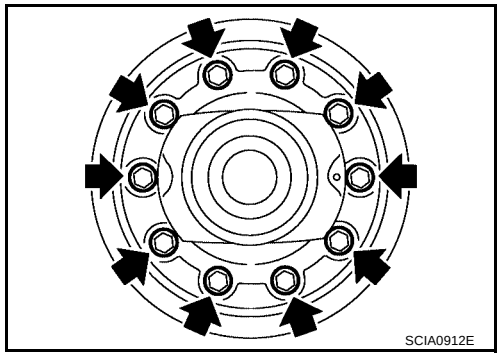


3. Using Tool (drift), install the differential side bearing (clutch housing side) as shown.



4. Install the final gear into the differential case, and tighten the final gear bolts to specification.

Final gear bolts **: Refer to MT-149, "FINAL DRIVE COMPONENTS" .**



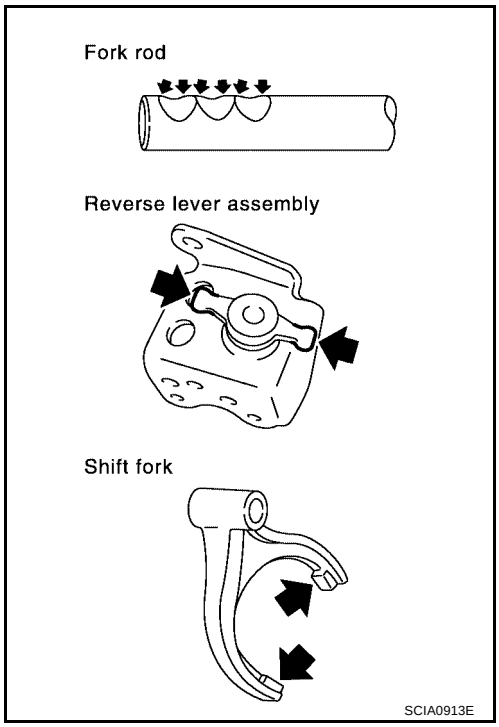
SHIFT CONTROL

PFP:32982

Inspection

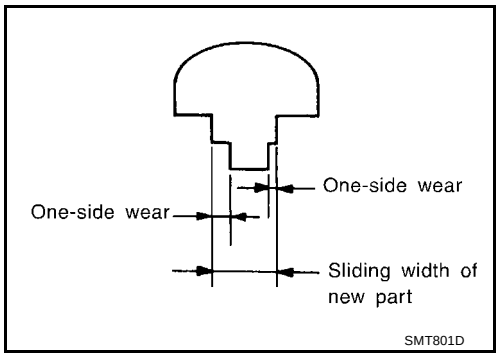
ECS005VL

- Check the contact surfaces and sliding area for wear, damage, or bending as shown. If necessary, replace the parts.



SHIFT FORK

- Check if the width of the shift fork hook (sliding area with coupling sleeve) is within specification, as shown.



Shift Fork

Item	One-side wear specification	Sliding width of new part
1st & 2nd	0.2 mm (0.008 in)	7.80 - 7.93 mm (0.3071 - 0.3122 in)
3rd & 4th	0.2 mm (0.008 in)	7.80 - 7.93 mm (0.3071 - 0.3122 in)
5th & 6th	0.2 mm (0.008 in)	6.10 - 6.23 mm (0.2402 - 0.2453 in)
Reverse	0.2 mm (0.008 in)	12.80 - 12.93 mm (0.5039 - 0.5091 in)

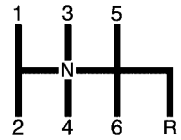
SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

ECS005VM

TRANSAXLE

Engine			QR25DE
Transaxle model			RS6F51H
Model code number			8U376
Number of speed			6
Synchromesh type			Warner
Shift pattern			 SCIA0955E
Gear ratio	1st		3.153
	2nd		1.944
	3rd		1.392
	4th		1.055
	5th		0.809
	6th		0.673
	Reverse		3.002
Number of teeth	Input gear	1st	13
		2nd	18
		3rd	28
		4th	36
		5th	42
		6th	46
		Reverse	13
	Main gear	1st	41
		2nd	35
		3rd	39
		4th	38
		5th	34
		6th	29
		Reverse	38
	Reverse idler gear	Front	37
		Rear	38
Oil capacity ℓ (qt)			2.3 (2 3/8)
Remarks	Reverse synchronizer		Installed
	Double baulk ring type synchronizer		1st & 2rd synchronizer

FINAL GEAR

Engine		QR25DE
Transaxle model		RS6F51H
Model code number		8U376
Final gear ratio		4.133
Number of teeth	Final gear/Pinion	62/15
	Side gear/Pinion mate gear	—

Gear End Play

ECS005VN

Unit: mm (in)

Gear	End play
1st main gear	0.20 - 0.30 (0.0079 - 0.0118)
2nd main gear	0.06 - 0.16 (0.0024 - 0.0063)
3rd input gear	0.18 - 0.31 (0.0071 - 0.0122)
4th input gear	0.20 - 0.30 (0.0079 - 0.0118)
5th input gear	0.06 - 0.16 (0.0024 - 0.0063)
6th input gear	0.06 - 0.16 (0.0024 - 0.0063)

Clearance Between Baulk Ring and Gear

ECS005VO

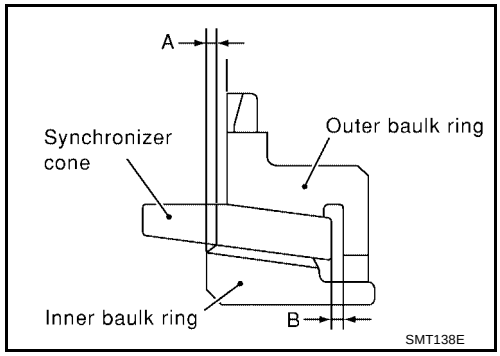
3RD, 4TH, 5TH, 6TH & REVERSE BAULK RING

Unit: mm (in)

Standard		Wear limit
3rd	0.9 - 1.45 (0.035 - 0.0571)	0.7 (0.028)
4th	0.9 - 1.45 (0.035 - 0.0571)	0.7 (0.028)
5th	0.95 - 1.4 (0.0374 - 0.055)	0.7 (0.028)
6th	0.95 - 1.4 (0.0374 - 0.055)	0.7 (0.028)
Reverse	0.95 - 1.4 (0.0374 - 0.055)	0.7 (0.028)

1ST AND 2ND DOUBLE BAULK RING

Unit: mm (in)



Dimension	Standard	Wear limit
A	0.6 - 0.8 (0.024 - 0.031)	0.2 (0.008)
B	0.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)

Available Snap Rings

ECS005VP

6TH BUSHING

End play		0 - 0.1 mm (0 - 0.004 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
1.76 (0.0693)	32204 8H511	2.01 (0.0791)	32204 8H516
1.81 (0.0713)	32204 8H512	2.06 (0.0811)	32204 8H517
1.86 (0.0732)	32204 8H513	2.11 (0.0831)	32204 8H518
1.91 (0.0752)	32204 8H514	2.16 (0.0850)	32204 8H519
1.96 (0.0772)	32204 8H515	2.21 (0.0871)	32204 8H520

*: Always check with the Parts Department for the latest parts information.

Available C-rings

ECS005VQ

MAINSHAFT C-RING

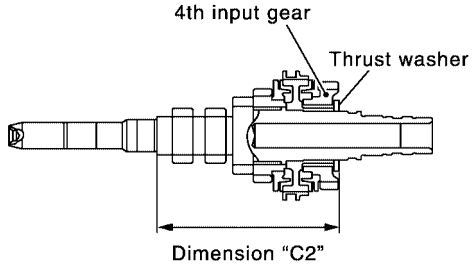
End play		0 - 0.06 mm (0 - 0.0024 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
2.535 (0.0866)	32348 8H800	2.835 (0.1116)	32348 8H810
2.565 (0.1010)	32348 8H801	2.865 (0.1128)	32348 8H811
2.595 (0.1022)	32348 8H802	2.895 (0.1140)	32348 8H812
2.625 (0.1033)	32348 8H803	2.925 (0.1152)	32348 8H813
2.655 (0.1045)	32348 8H804	2.955 (0.1163)	32348 8H814
2.685 (0.1057)	32348 8H805	2.985 (0.1175)	32348 8H815
2.715 (0.1069)	32348 8H806	3.015 (0.1187)	32348 8H816
2.745 (0.1081)	32348 8H807	3.045 (0.1199)	32348 8H817
2.775 (0.1093)	32348 8H808	3.075 (0.1211)	32348 8H818
2.805 (0.1104)	32348 8H809		

*: Always check with the Parts Department for the latest parts information.

Available Thrust Washers

ECS005VR

INPUT SHAFT THRUST WASHER



SCIA1008E

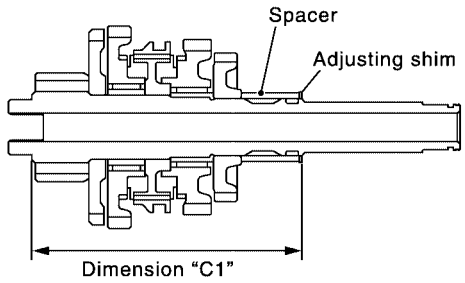
Standard length “C2”		154.7 - 154.8 mm (6.091 - 6.094in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
3.84 (0.1512)	32347 8H500	4.02 (0.1583)	32347 8H503
3.90 (0.1535)	32347 8H501	4.08 (0.1606)	32347 8H504
3.96 (0.1559)	32347 8H502	4.14 (0.1630)	32347 8H505

*: Always check with the Parts Department for the latest parts information.

Available Adjusting Shims

ECS005VS

MAINSHAFT ADJUSTING SHIM



SCIA1009E

Standard length “C1”		173.85 - 173.95 mm (6.844 - 6.848in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.52 (0.0205)	32238 8H500	0.84 (0.0331)	32238 8H504
0.60 (0.0236)	32238 8H501	0.92 (0.0362)	32238 8H505
0.68 (0.0268)	32238 8H502	1.00 (0.0394)	32238 8H506
0.76 (0.0299)	32238 8H503	1.08 (0.0425)	32238 8H507

*: Always check with the Parts Department for the latest parts information.

INPUT SHAFT REAR BEARING ADJUSTING SHIM

End play			0 - 0.06 mm (0 - 0.0024 in)		
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.40 (0.0157)	32225 8H500	0.88 (0.0346)	32225 8H512	1.36 (0.0520)	32225 8H524
0.44 (0.0173)	32225 8H501	0.92 (0.0362)	32225 8H513	1.40 (0.0551)	32225 8H560
0.48 (0.0189)	32225 8H502	0.96 (0.0378)	32225 8H514	1.44 (0.0567)	32225 8H561
0.52 (0.0205)	32225 8H503	1.00 (0.0396)	32225 8H515	1.48 (0.0583)	32225 8H562
0.56 (0.0220)	32225 8H504	1.04 (0.0409)	32225 8H516	1.52 (0.0598)	32225 8H563
0.60 (0.0236)	32225 8H505	1.08 (0.0425)	32225 8H517	1.56 (0.0614)	32225 8H564
0.64 (0.0252)	32225 8H506	1.12 (0.0441)	32225 8H518	1.60 (0.0630)	32225 8H565
6.68 (0.0268)	32225 8H507	1.16 (0.0457)	32225 8H519	1.64 (0.0646)	32225 8H566
0.72 (0.0283)	32225 8H508	1.20 (0.0472)	32225 8H520		
0.76 (0.0299)	32225 8H509	1.24 (0.0488)	32225 8H521		
0.80 (0.0315)	32225 8H510	1.28 (0.0504)	32225 8H522		
0.84 (0.0331)	32225 8H511	1.32 (0.0520)	32225 8H523		

*: Always check with the Parts Department for the latest parts information.

MAINSHAFT REAR BEARING ADJUSTING SHIM

End play		0 - 0.06 mm (0 - 0.0024 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.44 (0.0173)	32238 8H510	0.80 (0.0315)	32238 8H519
0.48 (0.0189)	32238 8H511	0.84 (0.0331)	32238 8H520
0.52 (0.0205)	32238 8H512	0.88 (0.0346)	32238 8H521
0.56 (0.0220)	32238 8H513	0.92 (0.0362)	32238 8H522
0.60 (0.0236)	32238 8H514	0.96 (0.0378)	32238 8H523
0.64 (0.0252)	32238 8H515	1.00 (0.0396)	32238 8H524
0.68 (0.0268)	32238 8H516	1.04 (0.0409)	32238 8H560
0.72 (0.0283)	32238 8H517	1.08 (0.0425)	32238 8H561
0.76 (0.0299)	32238 8H518		

*: Always check with the Parts Department for the latest parts information.

REVERASE IDLER GEAR ADJUSTING SHIM

End play		0.04 - 0.14 mm (0.0016 - 0.0055 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
1.76 (0.0693)	32237 8H500	2.24 (0.0882)	32237 8H506
1.84 (0.0724)	32237 8H501	2.32 (0.0913)	32237 8H507
1.92 (0.0756)	32237 8H502	2.40 (0.0945)	32237 8H508
2.00 (0.0787)	32237 8H503	2.48 (0.0976)	32237 8H509
2.08 (0.0819)	32237 8H504	2.56 (0.1008)	32237 8H510
2.16 (0.0850)	32237 8H505	2.64 (0.1039)	32237 8H511

*: Always check with the Parts Department for the latest parts information.

6TH MAIN GEAR ADJUSTING SHIM

End play		0 - 0.1 mm (0 - 0.004 in)	
Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.88 (0.0346)	32237 8H560	1.20 (0.0472)	32237 8H564
0.96 (0.0378)	32237 8H561	1.28 (0.0504)	32237 8H565
1.04 (0.0409)	32237 8H562	1.36 (0.0520)	32237 8H566
1.12 (0.0441)	32237 8H563		

*: Always check with the Parts Department for the latest parts information.

Available Shims

ECS005VT

— Differential Side Bearing Preload and Adjusting Shim —

BEARING PRELOAD

Differential side bearing preload: L*	0.15 - 0.21 mm (0.0059 - 0.0083)

*: Install shims which are “deflection of differential case” + “L” in thickness.

DIFFERENTIAL SIDE BEARING ADJUSTING SHIM(S)

Thickness mm (in)	Part number*	Thickness mm (in)	Part number*
0.48 (0.0189)	31438 80X00	0.72 (0.0283)	31438 80X06
0.52 (0.0205)	31438 80X01	0.76 (0.0299)	31438 80X07
0.56 (0.0220)	31438 80X02	0.80 (0.0315)	31438 80X08
0.60 (0.0236)	31438 80X03	0.84 (0.0331)	31438 80X09
0.64 (0.0252)	31438 80X04	0.88 (0.0346)	31438 80X10
0.68 (0.0268)	31438 80X05	0.92 (0.0362)	31438 80X11

*: Always check with the Parts Department for the latest parts information.

SECTION MTC

MANUAL AIR CONDITIONER

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EJS001QX

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Precautions for Working with HFC-134a (R-134a)

EJS001A7

WARNING:

- **CFC-12 (R-12) refrigerant and HFC-134a (R-134a) refrigerant are not compatible. If the refrigerants are mixed and compressor failure is likely to occur. Refer to MTC-3, "Contaminated Refrigerant" . To determine the purity of HFC-134a (R-134a) in the vehicle and recovery tank, use Refrigerant Recovery/Recycling equipment and Refrigerant Identifier.**
- **Use only specified lubricant for the HFC-134a (R-134a) A/C system and HFC-134a (R-134a) components. If lubricant other than that specified is used, compressor failure is likely to occur.**
- **The specified HFC-134a (R-134a) lubricant rapidly absorbs moisture from the atmosphere. The following handling precautions must be observed:**
  - **When removing refrigerant components from a vehicle, immediately cap (seal) the component to minimize the entry of moisture from the atmosphere.**
  - **When installing refrigerant components to a vehicle, do not remove the caps (unseal) until just before connecting the components. Connect all refrigerant loop components as quickly as possible to minimize the entry of moisture into system.**
  - **Only use the specified lubricant from a sealed container. Immediately reseal containers of lubricant. Without proper sealing, lubricant will become moisture saturated and should not be used.**
  - **Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Remove R-134a from the A/C system, using certified service equipment meeting requirements of SAE J2210 (R-134a recycling equipment), or J2209 (R-134a recovery equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.**
  - **Do not allow A/C lubricant (Genuine Nissan A/C System Lubricant Type R or equivalent) to come in contact with styrofoam parts. Damage may result.**

Contaminated Refrigerant

EJS001A8

If a refrigerant other than pure R-134a is identified in a vehicle, your options are:

- Explain to the customer that environmental regulations prohibit the release of contaminated refrigerant into the atmosphere.
- Explain that recovery of the contaminated refrigerant could damage your service equipment and refrigerant supply.
- Suggest the customer return the vehicle to the location of previous service where the contamination may have occurred.
- If you choose to perform the repair, recover the refrigerant using only **dedicated equipment and containers. Do not recover contaminated refrigerant into your existing service equipment.** If your facility does not have dedicated recovery equipment, you may contact a local refrigerant product retailer for available service. This refrigerant must be disposed of in accordance with all federal and local regulations. In addition, replacement of all refrigerant system components on the vehicle is recommended.

- If the vehicle is within the warranty period, the air conditioner warranty is void. Please contact Nissan Customer Affairs for further assistance.

General Refrigerant Precautions

EJS001A9

WARNING:

- **Do not release refrigerant into the air. Use approved recovery/recycling equipment to capture the refrigerant every time an air conditioning system is discharged.**
- **Always wear eye and hand protection (goggles and gloves) when working with any refrigerant or air conditioning system.**
- **Do not store or heat refrigerant containers above 52°C (125°F).**
- **Do not heat a refrigerant container with an open flame; if container warming is required, place the bottom of the container in a warm pail of water.**
- **Do not intentionally drop, puncture, or incinerate refrigerant containers.**
- **Keep refrigerant away from open flames: poisonous gas will be produced if refrigerant burns.**
- **Refrigerant will displace oxygen, therefore be certain to work in well ventilated areas to prevent suffocation.**
- **Do not pressure test or leak test HFC-134a (R-134a) service equipment and/or vehicle air conditioning systems with compressed air during repair. Some mixtures of air and R-134a have been shown to be combustible at elevated pressures. These mixtures, if ignited, may cause injury or property damage. Additional health and safety information may be obtained from refrigerant manufacturers.**

Precautions for Leak Detection Dye

EJS001AA

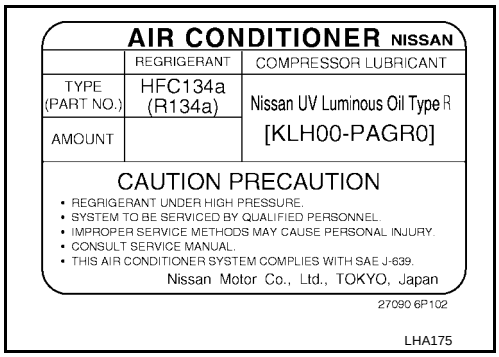
- The A/C system contains a fluorescent leak detection dye used for locating refrigerant leaks. An ultraviolet (UV) lamp is required to illuminate the dye when inspecting for leaks.
- Always wear fluorescence enhancing UV safety glasses to protect your eyes and enhance the visibility of the fluorescent dye.
- A compressor shaft seal should not be repaired because of dye seepage. The compressor shaft seal should only be repaired after confirming the leak with an electronic refrigerant leak detector (J-41995).
- Always remove any dye from the leak area after repairs are complete to avoid a misdiagnosis during a future service.
- Do not allow dye to come into contact with painted body panels or interior components. If dye is spilled, clean immediately with the approved dye cleaner. Fluorescent dye left on a surface for an extended period of time **cannot be removed** .
- Do not spray the fluorescent dye cleaning agent on hot surfaces (engine exhaust manifold, etc.).
- Do not use more than one refrigerant dye bottle (1/4 ounce / 7.4 cc) per A/C system.
- Leak detection dyes for R-134a and R-12 A/C systems are different. Do not use R-134a leak detection dye in R-12 A/C systems or R-12 leak detection dye in R-134a A/C systems or A/C system damage may result.
- The fluorescent properties of the dye will remain for over three (3) years unless a compressor failure occurs.

A/C Identification Label

EJS001AB

Vehicles are equipped factory installed fluorescent dye and have this identification label on the under side of hood.

NOTE:
Vehicles equipped with factory installed fluorescent dye have a green label.

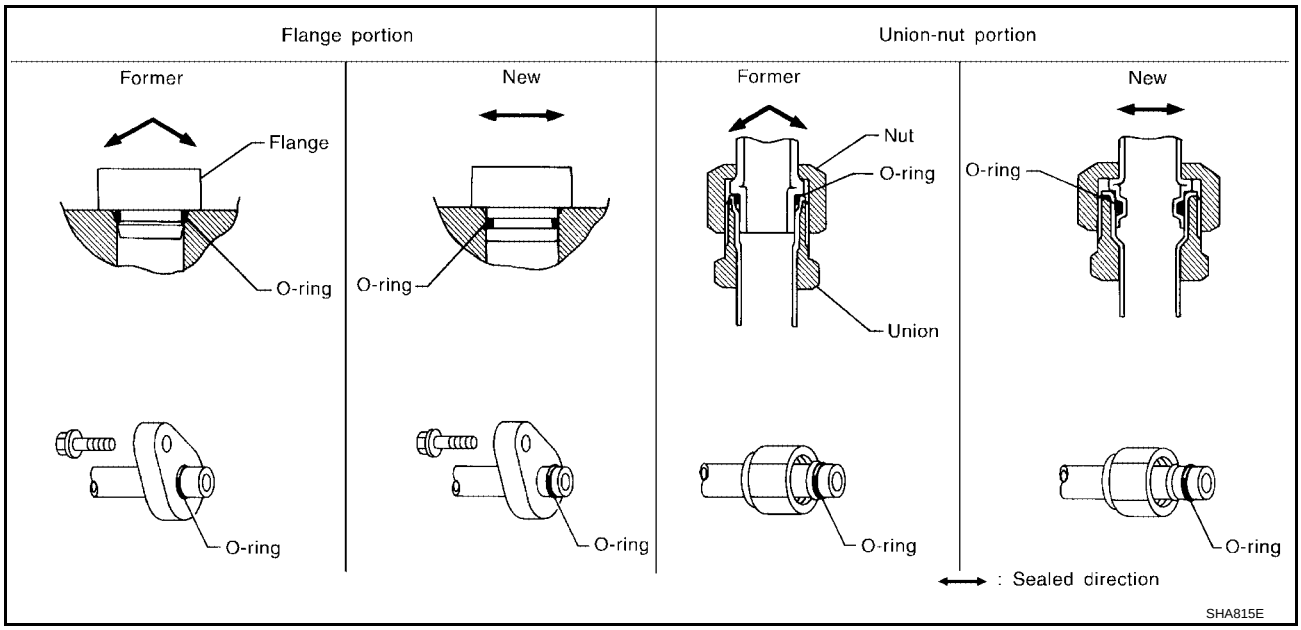


Precautions for Refrigerant Connection

EJS001AC

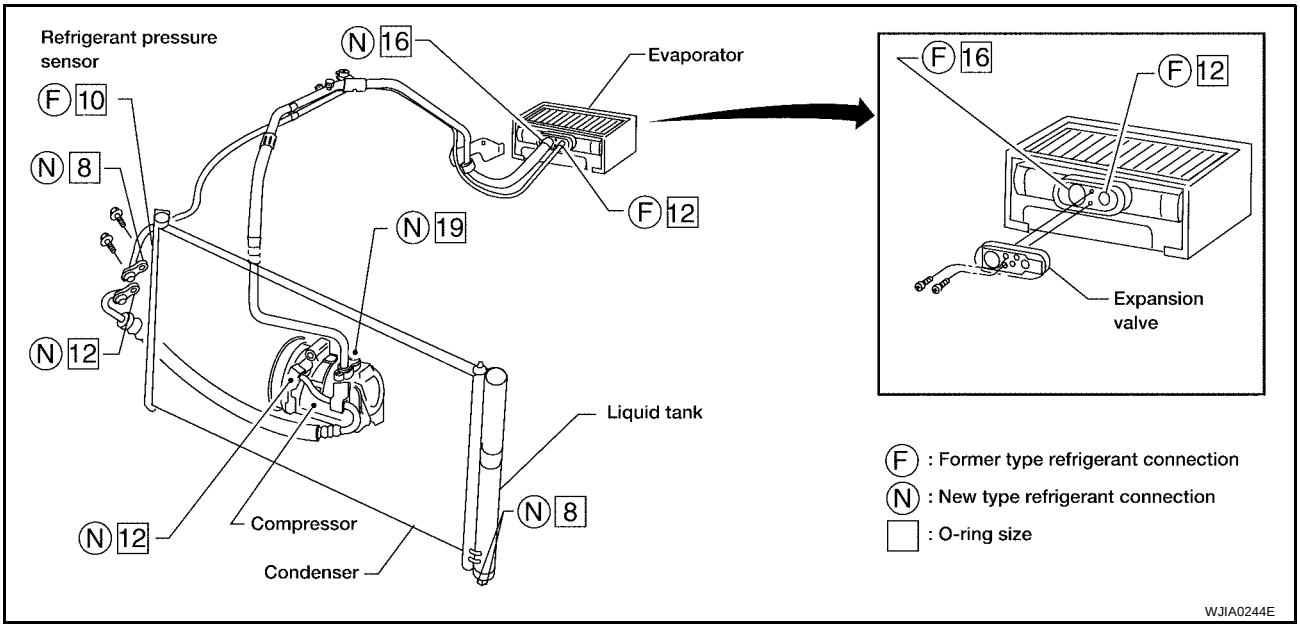
FEATURES OF NEW TYPE REFRIGERANT CONNECTION

- The O-ring has been relocated. It has also been provided with a groove for proper installation. This eliminates the chance of the O-ring being caught in, or damaged by, the mating part. The sealing direction of the O-ring is now set vertically in relation to the contacting surface of the mating part to improve sealing characteristics.
- The reaction force of the O-ring will not occur in the direction that causes the joint to pull out, thereby facilitating piping connections.

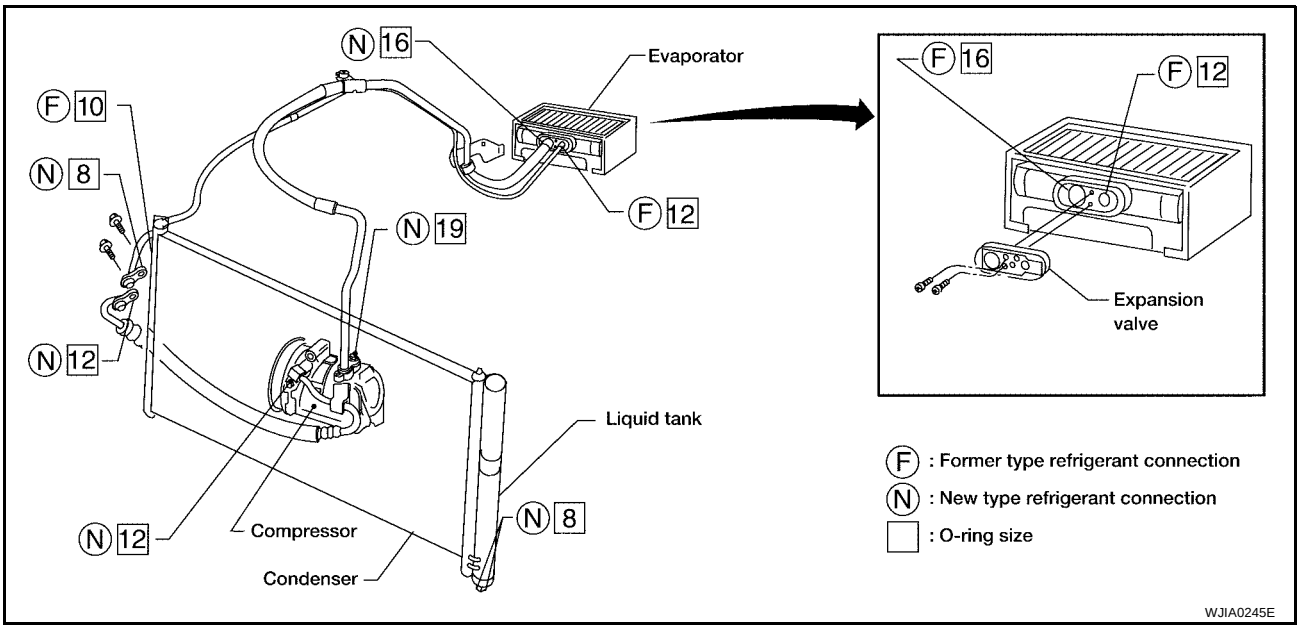


O-RING AND REFRIGERANT CONNECTION

QG18DE



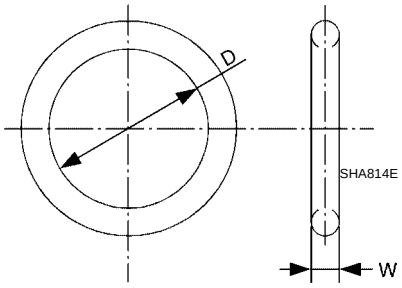
QR25DE



CAUTION:

The new and former refrigerant connections in some systems use different O-ring configurations. Do not confuse O-rings since they are not interchangeable. If a wrong O-ring is installed, refrigerant will leak at, or around, the connection.

O-Ring Part Numbers and Specifications



Connection type	O-ring size	Part number*	D mm (in)	W mm (in)
New	8	92471 N8210	6.8 (0.268)	1.85 (0.0728)
Former	10	J2476 N8200	9.25 (0.3642)	1.78 (0.0701)
Former	12	92471 N8200	10.8 (0.425)	1.78 (0.0701)
New	12	92472 N8210	10.9 (0.429)	3.65 (0.1437)
Former	16	92473 N8200	13.9 (0.547)	1.78 (0.0701)
New	16	92473 N8210	13.6 (0.535)	2.43 (0.0957)
New	19	92474 N8210	16.5 (0.650)	2.43 (0.0957)

*: Always check with the Parts Department for the latest parts information.

WARNING:

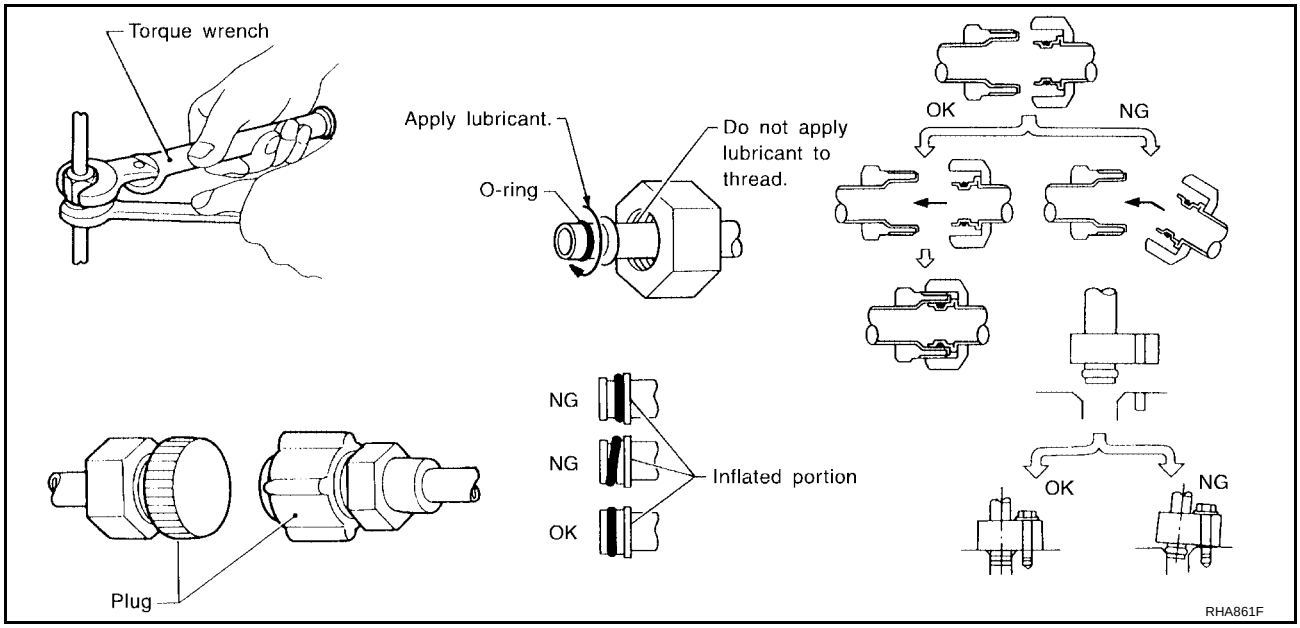
Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric pressure. Then gradually loosen the discharge side hose fitting and remove it.

CAUTION:

When replacing or cleaning refrigerant cycle components, observe the following.

- **When the compressor is removed, store it in the same position as it is when mounted on the car. Failure to do so will cause lubricant to enter the low pressure chamber.**
- **When connecting tubes, always use a torque wrench and a back-up wrench.**
- **After disconnecting tubes, immediately plug all openings to prevent entry of dirt and moisture.**
- **When installing an air conditioner in the vehicle, connect the pipes as the final stage of the operation. Do not remove the seal caps of pipes and other components until just before required for connection.**
- **Allow components stored in cool areas to warm to working area temperature before removing seal caps. This prevents condensation from forming inside A/C components.**
- **Thoroughly remove moisture from the refrigeration system before charging the refrigerant.**
- **Always replace used O-rings.**
- **When connecting tube, apply lubricant to circle of the O-rings shown in illustration. Be careful not to apply lubricant to threaded portion.**
  Lubricant name: Genuine Nissan A/C System Lubricant Type R or equivalent
  Part number: KLH00-PAGR0
- **O-ring must be closely attached to dented portion of tube.**
- **When replacing the O-ring, be careful not to damage O-ring and tube.**
- **Connect tube until you hear it click, then tighten the nut or bolt by hand until snug. Make sure that the O-ring is installed to tube correctly.**

- **After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.**



Precautions for Servicing Compressor

EJS001AD

- **Plug all openings to prevent moisture and foreign matter from entering.**
- **When the compressor is removed, store it in the same position as it is when mounted on the car.**
- **When replacing or repairing compressor, follow “Maintenance of Lubricant Quantity in Compressor” exactly. Refer to MTC-16, "Maintenance of Lubricant Quantity in Compressor" .**
- **Keep friction surfaces between clutch and pulley clean. If the surface is contaminated, with lubricant, wipe it off by using a clean waste cloth moistened with thinner.**
- **After compressor service operation, turn the compressor shaft by hand more than five turns in both directions. This will equally distribute lubricant inside the compressor. After the compressor is installed, let the engine idle and operate the compressor for one hour.**
- **After replacing the compressor magnet clutch, apply voltage to the new one and check for normal operation. [Gap between clutch disc and pulley is 0.3 - 0.6 mm (0.012 - 0.024 in)]**

Precautions for Service Equipment

EJS001AE

RECOVERY/RECYCLING EQUIPMENT

Follow the manufacturer's instructions for machine operation and machine maintenance. Never introduce any refrigerant other than that specified into the machine.

ELECTRONIC LEAK DETECTOR

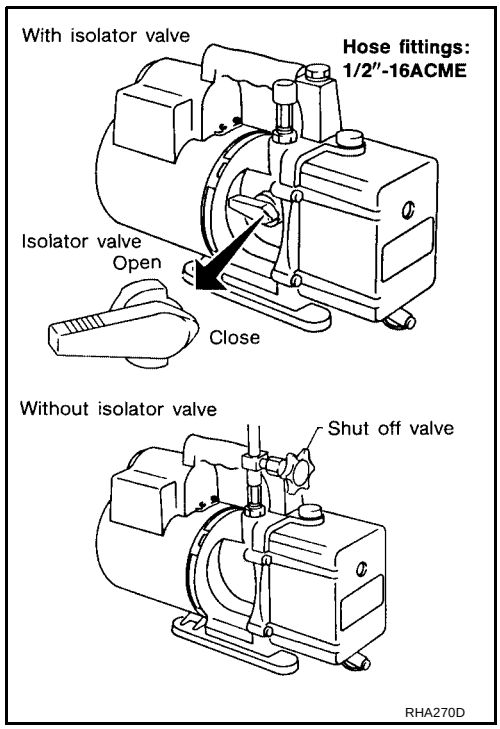
Follow the manufacturer's instructions for tester operation and tester maintenance.

VACUUM PUMP

The lubricant contained inside the vacuum pump is not compatible with the specified lubricant for HFC-134a (R-134a) A/C systems. The vent side of the vacuum pump is exposed to atmospheric pressure so the vacuum pump lubricant may migrate out of the pump into the service hose. This is possible when the pump is switched off after evacuation (vacuuming) and hose is connected to it.
To prevent this migration, use a manual valve situated near the hose-to-pump connection, as follows.

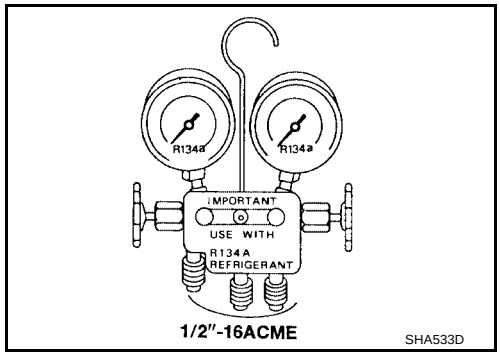
- Usually vacuum pumps have a manual isolator valve as part of the pump. Close this valve to isolate the service hose from the pump.
- For pumps without an isolator, use a hose equipped with a manual shut-off valve near the pump end. Close the valve to isolate the hose from the pump.
- If the hose has an automatic shut off valve, disconnect the hose from the pump: as long as the hose is connected, the valve is open and lubricating oil may migrate.

Some one-way valves open when vacuum is applied and close under a no vacuum condition. Such valves may restrict the pump's ability to pull a deep vacuum and are not recommended.



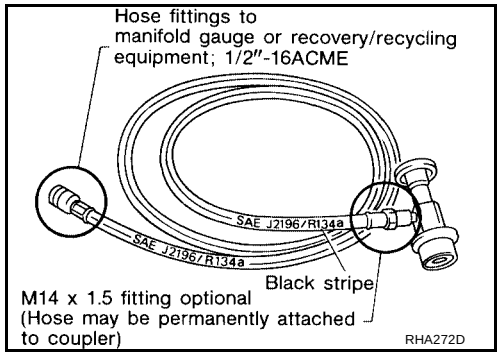
MANIFOLD GAUGE SET

Be certain that the gauge face indicates R-134a or 134a. Make sure the gauge set has 1/2″-16 ACME threaded connections for service hoses. Confirm the set has been used only with refrigerant HFC-134a (R-134a) along with specified lubricant.



SERVICE HOSES

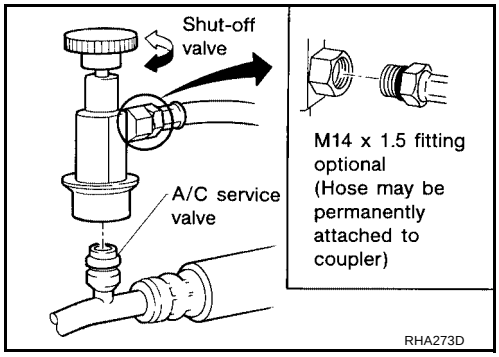
Be certain that the service hoses display the markings described (colored hose with black stripe). All hoses must include positive shut off devices (either manual or automatic) near the end of the hoses opposite the manifold gauge.



SERVICE COUPLERS

Never attempt to connect HFC-134a (R-134a) service couplers to an CFC-12 (R-12) A/C system. The HFC-134a (R-134a) couplers will not properly connect to the CFC-12 (R-12) system. However, if an improper connection is attempted, discharging and contamination may occur.

Shut-off valve rotation	A/C service valve
Clockwise	Open
Counterclockwise	Close



CHARGING CYLINDER

Using a charging cylinder is not recommended. Refrigerant may be vented into air from cylinder's top valve when filling the cylinder with refrigerant. Also, the accuracy of the cylinder is generally less than that of an electronic scale or of quality recycle/recharge equipment.

Wiring Diagrams and Trouble Diagnosis

EJS001AF

When you read wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams"
- PG-4, "Wiring Diagram — POWER —"

When you perform trouble diagnosis, refer to the following:

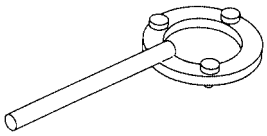
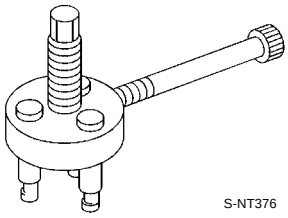
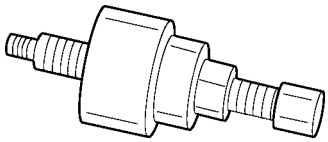
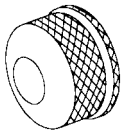
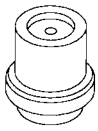
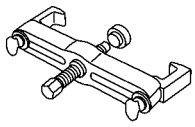
- GI-9, "How to Follow Trouble Diagnoses"
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"

PREPARATION

PFP:00002

Special Service Tools

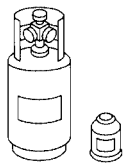
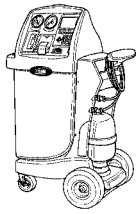
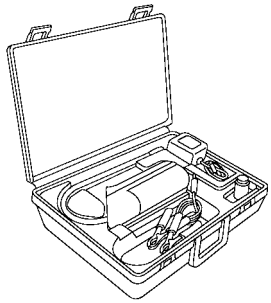
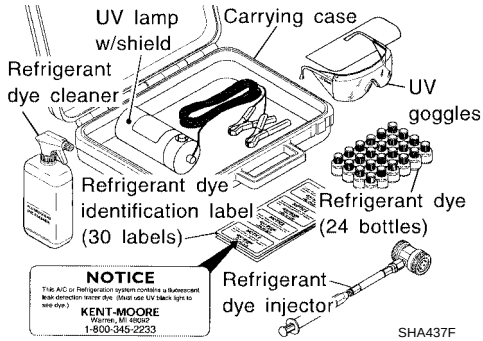
EJS001AG

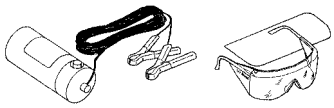
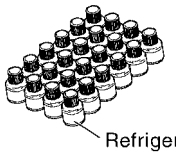
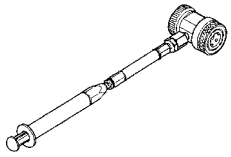
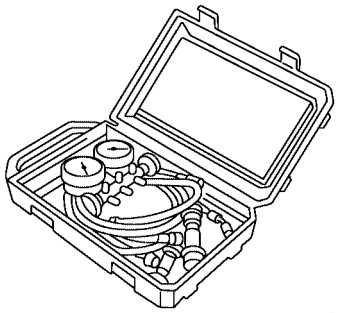
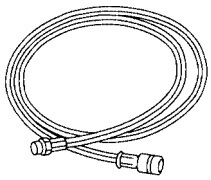
Tool number (Kent-Moore No.) Tool name		Description
KV99231260 (J-38874) Clutch disc wrench	 NT204	Removing shaft nut and clutch disc
KV99232340 (J-38874) Clutch disc puller	 S-NT376	Removing clutch disc
(J-38873-A) Drive plate installer	 WJIA0367E	Installing pulley and drive plate
KV99234330 (J-39024) Pulley installer	 NT207	Installing pulley
KV99233130 (J-39023) Pulley puller	 NT208	Removing pulley
KV99233130 (J-29884) (with small adaptor) Pulley puller	 LHA172	Removing pulley

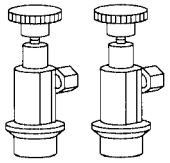
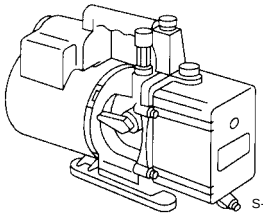
HFC-134a (R-134a) Service Tools and Equipment

EJS001AH

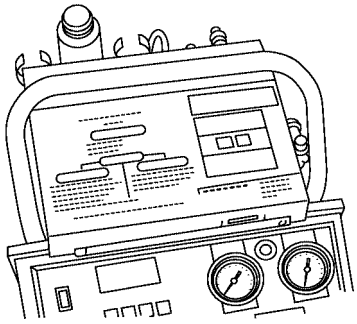
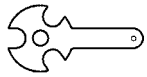
Never mix HFC-134a refrigerant and/or its specified lubricant with CFC-12 (R-12) refrigerant and/or its lubricant.
Separate and non-interchangeable service equipment must be used for handling each type of refrigerant/lubricant.
Refrigerant container fittings, service hose fittings and service equipment fittings (equipment which handles refrigerant and/or lubricant) are different between CFC-12 (R-12) and HFC-134a (R-134a). This is to avoid mixed use of the refrigerants/lubricant.
Adapters that convert one size fitting to another must never be used: refrigerant/lubricant contamination will occur and compressor failure will result.

Tool number (Kent-Moore No.) Tool name		Description
HFC-134a (R-134a) refrigerant	 S-NT196	Container color: Light blue Container marking: HFC-134a (R-134a) Fitting size: Thread size ● large container 1/2^2 -16 ACME
KLH00-PAGR0 (—) Genuine NISSAN A/C System Lubricant Type R	 S-NT197	Type: Poly alkaline glycol oil (PAG), type R Application: HFC-134a (R-134a) vane rotary compressors (NISSAN only) Lubricity:40 m ℓ (1.4 US fl oz, 1.4 Imp fl oz)
(J-43600) Recovery/Recycling equipment (ACR2000)	 WJIA0293E	Function: Refrigerant Recovery and Recycling and Recharging
(J-41995) Electrical leak detector	 AHA281A	Power supply: ● DC 12V (Cigarette lighter)
(J-43926) Refrigerant dye leak detection kit Kit includes: (J-42220) UV lamp and UV safety glasses (J-41459) Refrigerant dye injector (J-41447) qty. 24 HFC-134a (R-134a) refrigerant dye (J-43872) Refrigerant dye cleaner	 SHA437F	Power supply: DC 12V (Battery terminal)

Tool number (Kent-Moore No.) Tool name		Description
(J-42220) Fluorescent dye leak detector	 SHA438F	Power supply: DC 12V (Battery terminal) For checking refrigerant leak when fluorescent dye is installed in A/C system. Includes: UV lamp and UV safety glasses
(J-41447) HFC-134a (R-134a) Fluorescent leak detection dye (Box of 24, 1/4 ounce bottles)	 Refrigerant dye (24 bottles) SHA439F	Application: For HFC-134a (R-134a) PAG oil Container: 1/4 ounce (7.4cc) bottle (Includes self-adhesive dye identification labels for affixing to vehicle after charging system with dye.)
(J-41459) HFC-134a (R-134a) Dye injector Use with J-41447, 1/4 ounce bottle	 SHA440F	For injecting 1/4 ounce of fluorescent leak detection dye into A/C system.
(J-43872) Dye cleaner	 SHA441F	For cleaning dye spills.
(J-39183) Manifold gauge set (with hoses and couplers)	 RJIA0196E	Identification: ● The gauge face indicates R-134a. Fitting size: Thread size ● 1/2^2 -16 ACME
Service hoses ● High side hose (J-39501-72) ● Low side hose (J-39502-72) ● Utility hose (J-39476-72)	 S-NT201	Hose color: ● Low hose: Blue with black stripe ● High hose: Red with black stripe ● Utility hose: Yellow with black stripe or green with black stripe Hose fitting to gauge: ● 1/2^2 -16 ACME

Tool number (Kent-Moore No.) Tool name	Description
Service couplers ● High side coupler (J-39500-20) ● Low side coupler (J-39500-24)  S-NT202	Hose fitting to service hose: ● M14 x 1.5 fitting is optional or permanently attached.
(J-39649) Vacuum pump (Including the isolator valve)  S-NT203	Capacity: ● Air displacement: 4 CFM ● Micron rating: 20 microns ● Oil capacity: 482 g (17 oz) Fitting size: Thread size ● $1/2^2$ -16 ACME

COMMERCIAL SERVICE TOOL

(Kent-Moore No.) Tool name	Description
(J-41810-NI) Refrigerant identifier equipment (R-134a)  RJIA0197E	For checking refrigerant purity and for system contamination
(J-44614) Clutch disc holding tool 	For holding clutch disc

REFRIGERATION SYSTEM

PFP:KA990

Refrigeration Cycle

EJS001AI

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the liquid tank, through the evaporator, and back to the compressor. The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION

The compressor cycles go on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the intake sensor interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

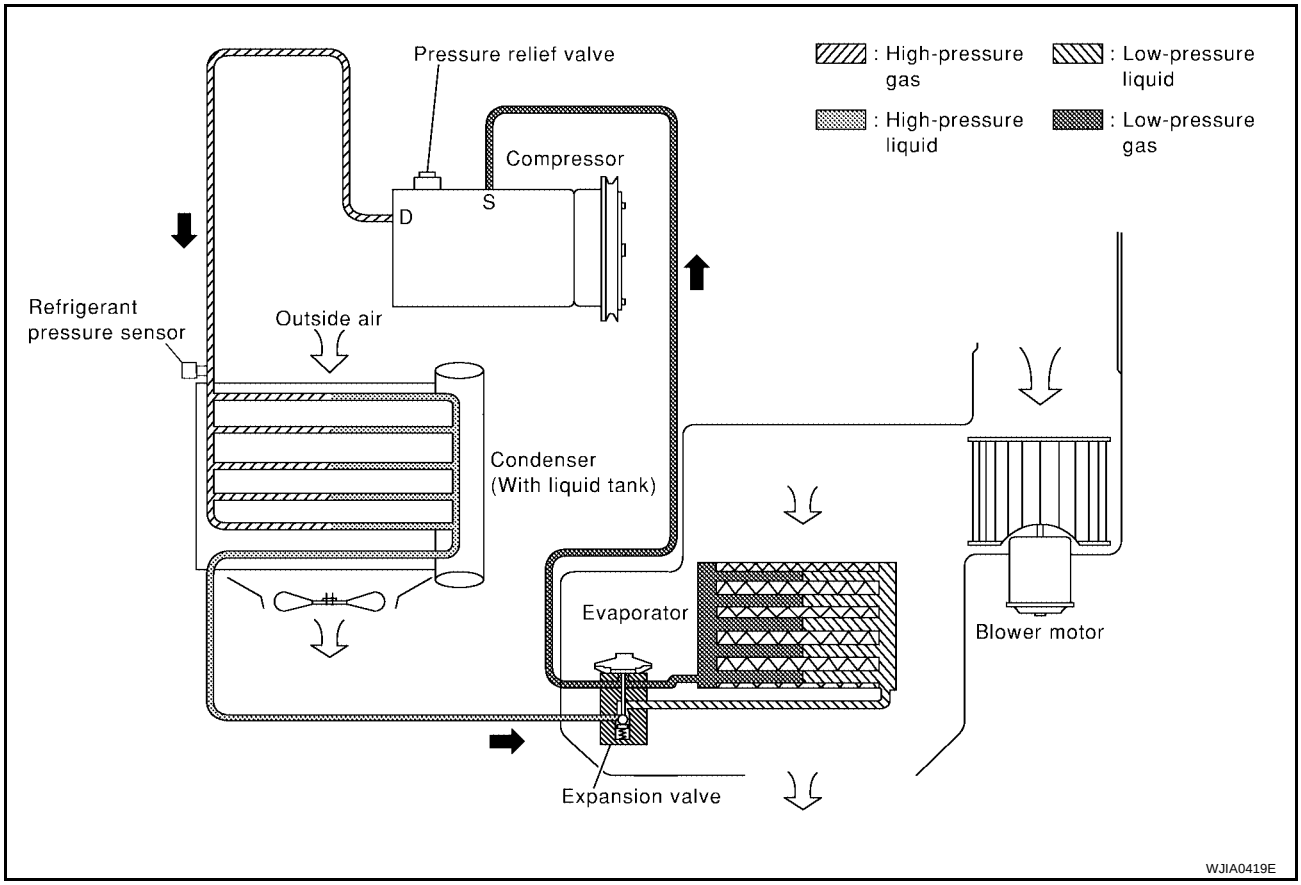
REFRIGERANT SYSTEM PROTECTION

Refrigerant Pressure Sensor

The refrigerant system is protected against excessively high or low pressures by the refrigerant pressure sensor, located on the refrigerant lines where they attach to the condenser. If the system pressure rises above or falls below the specifications, the refrigerant pressure sensor detects the pressure inside the refrigerant line and sends the voltage signal to the ECM. The ECM turns the A/C relay OFF and stops the compressor when pressure on the high pressure side detected by refrigerant pressure sensor is over about 2,746 kPa (28 kg/cm^2 , 398 psi) or below about 177 kPa (1.8 kg/cm^2 , 26 psi).

Pressure Relief Valve

The refrigerant system is also protected by a pressure relief valve, located in the rear head of the compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm^2 , 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



LUBRICANT

PFP:KLG00

Maintenance of Lubricant Quantity in Compressor

EJS001AJ

The lubricant in the compressor circulates through the system with the refrigerant. Add lubricant to compressor when replacing any component or after a large refrigerant leakage has occurred. It is important to maintain the specified amount.
If lubricant quantity is not maintained properly, the following malfunctions may result:

- Lack of lubricant: May lead to a seized compressor
- Excessive lubricant: Inadequate cooling (thermal exchange interference)

LUBRICANT

Name: Genuine Nissan A/C System Lubricant Type R or equivalent
Part number: KLH00-PAGR0

CHECKING AND ADJUSTING

Adjust the lubricant quantity according to the test group shown below.

1. LUBRICANT RETURN OPERATION

Can lubricant return operation be performed?

- A/C system works properly.
- There is no evidence of a large amount of lubricant leakage.

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. PERFORM LUBRICANT RETURN OPERATION

1. Start engine, and set the following conditions:

- **Test condition**
  Engine speed: Idling to 1,200 rpm
  A/C switch: ON
  Blower speed: Max. position

2. Perform lubricant return operation for about 10 minutes.
3. Stop engine.

CAUTION:
If excessive lubricant leakage is noted, do not perform the lubricant return operation.

>> GO TO 3.

3. CHECK COMPRESSOR

Should the compressor be replaced?

Yes or No

Yes >> GO TO MTC-68, "Removal and Installation" .
No >> GO TO 4.

4. CHECK ANY PART

Is there any part to be replaced? (Evaporator, condenser, liquid tank or in case there is evidence of a large amount of lubricant leakage.)

Yes or No

Yes >> GO TO MTC-17, "Lubricant Adjusting Procedure for Components Replacement Except Compressor" .
No >> Carry out the A/C performance test.

Lubricant Adjusting Procedure for Components Replacement Except Compressor

After replacing any of the following major components, add the correct amount of lubricant to the system.

Amount of lubricant to be added

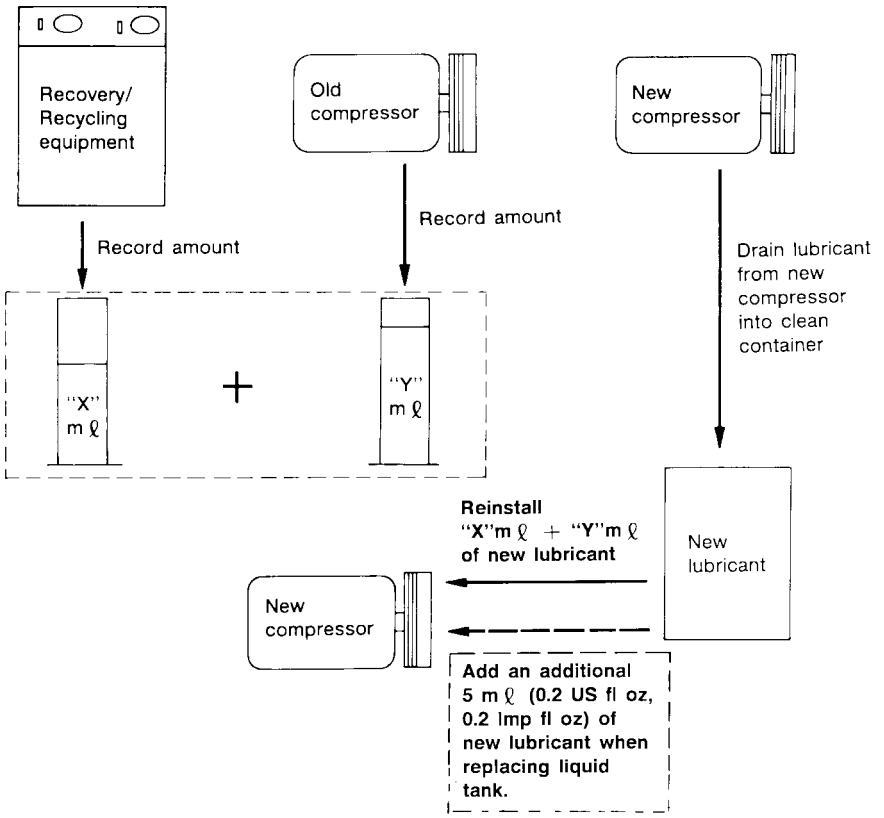
Part replaced	Lubricant to be added to system Amount of lubricant ml (US fl oz, Imp fl oz)	Remarks
Evaporator	75 (2.5, 2.6)	—
Condenser	75 (2.5, 2.6)	—
Liquid tank	5 (0.2, 0.2)	Add if compressor is not replaced.
In case of refrigerant leak	30 (1.0, 1.1)	Large leak
	—	Small leak *1

- *1: If refrigerant leak is small, no addition of lubricant is needed.

Lubricant Adjustment Procedure for Compressor Replacement

1. Before connecting recovery/recycling equipment to vehicle, check recovery/recycling equipment gauges. No refrigerant pressure should be displayed. If OK, recover refrigerant from equipment lines.
2. Confirm refrigerant purity in supply tank using recovery/recycling equipment and refrigerant identifier. If NG, refer to MTC-3, "Contaminated Refrigerant" .
3. Connect ZCR4 to vehicle. Confirm refrigerant purity in vehicle A/C system using recovery/recycling equipment and refrigerant identifier. If NG, refer to MTC-3, "Contaminated Refrigerant" .
4. Discharge refrigerant into the refrigerant recovery/recycling equipment. Measure lubricant discharged into the recovery/recycling equipment.
5. Drain the lubricant from the “old” (removed) compressor into a graduated container and recover the amount of lubricant drained.
6. Drain the lubricant from the “new” compressor into a separate, clean container.
7. Measure an amount of new lubricant installed equal to amount drained from “old” compressor. Add this lubricant to “new” compressor through the suction port opening.
8. Measure an amount of new lubricant equal to the amount recovered during discharging. Add this lubricant to “new” compressor through the suction port opening.
9. If the liquid tank also needs to be replaced, add an additional 5 ml (0.2 US fl oz, 0.2 Imp fl oz) of lubricant at this time.
   Do not add this 5 ml (0.2 US fl oz, 0.2 Imp fl oz) of lubricant if only replacing the compressor.

Lubricant adjusting procedure for compressor replacement



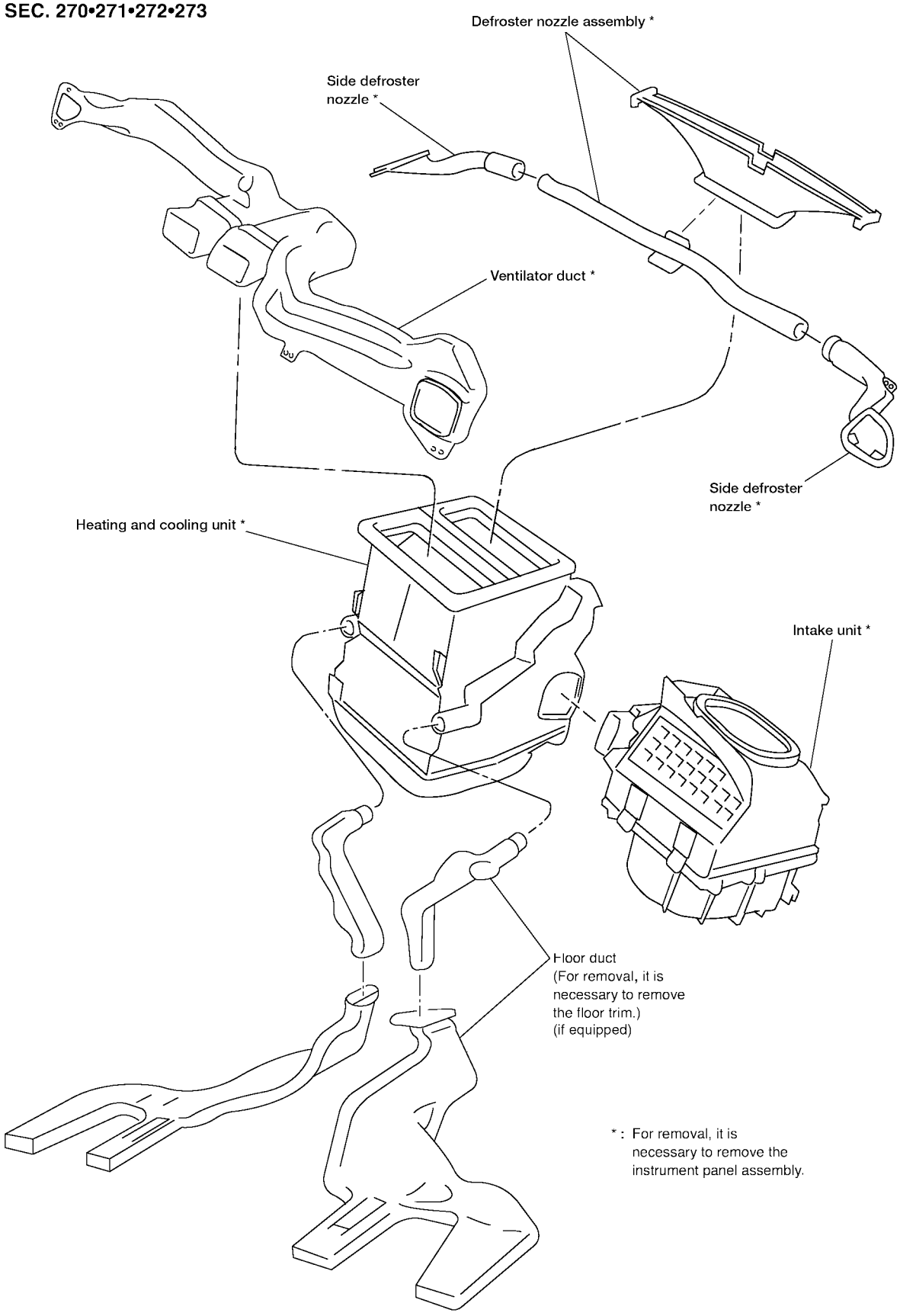
TROUBLE DIAGNOSIS

PFP:00004

Component Layout

EJS001AK

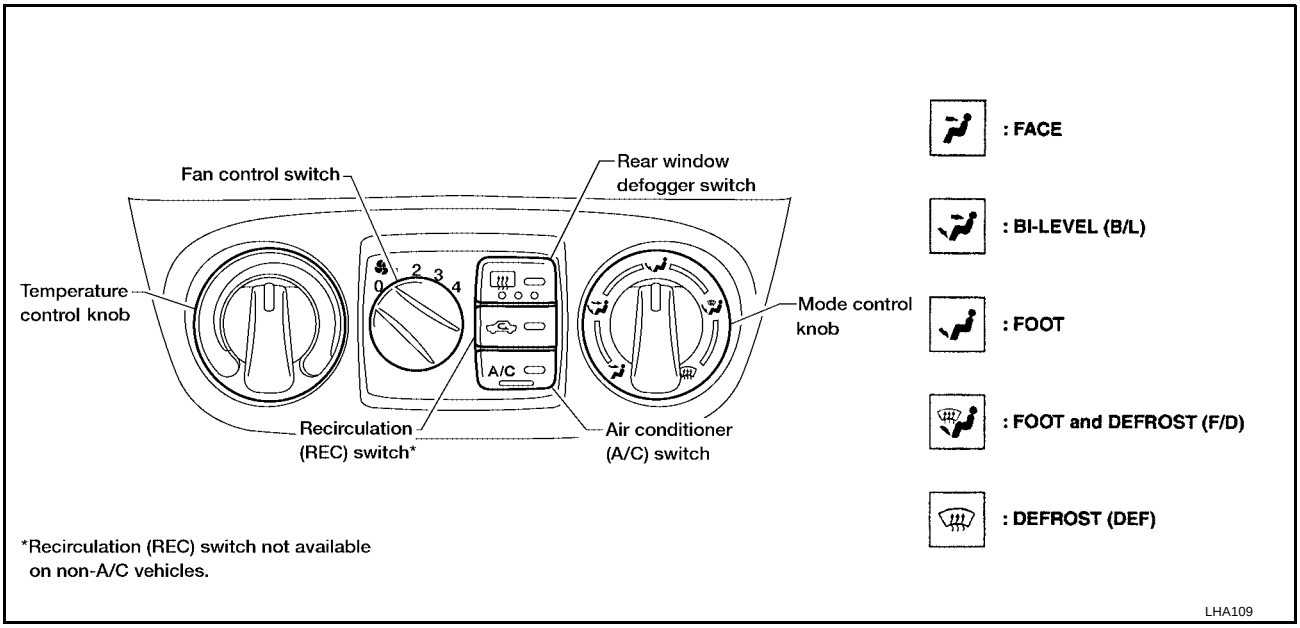
SEC. 270•271•272•273



WJIA0257E

Control Operation

EJS001AL



FAN CONTROL SWITCH

This switch turns the fan ON and OFF, and controls fan speed.

REAR WINDOW DEFOGGER SWITCH

This switch turns the rear window defogger ON and OFF.

MODE CONTROL KNOB

This control knob controls the outlet air flow.

When DEF or F/D mode is selected, the push control unit sets the intake door to FRESH.

The compressor turns on when DEF mode is selected and remains on until the key is turned off.

TEMPERATURE CONTROL KNOB

This knob adjusts the temperature of the discharge air.

RECIRCULATION (REC) SWITCH

OFF position: Outside air is drawn into the passenger compartment.
ON position: Interior air is recirculated inside the vehicle.
The indicator lamp will also light.

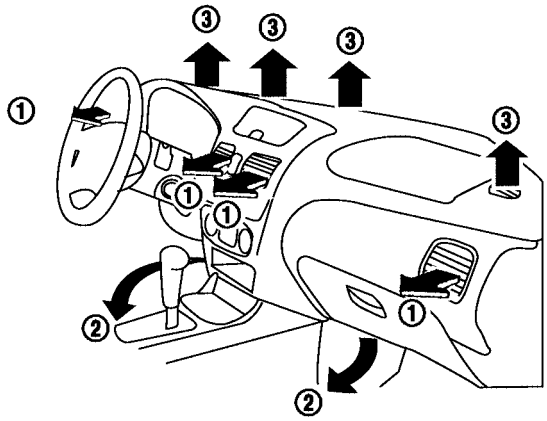
Recirculation is canceled when DEF or F/D mode is selected, and resumes when another mode is chosen.

AIR CONDITIONER (A/C) SWITCH

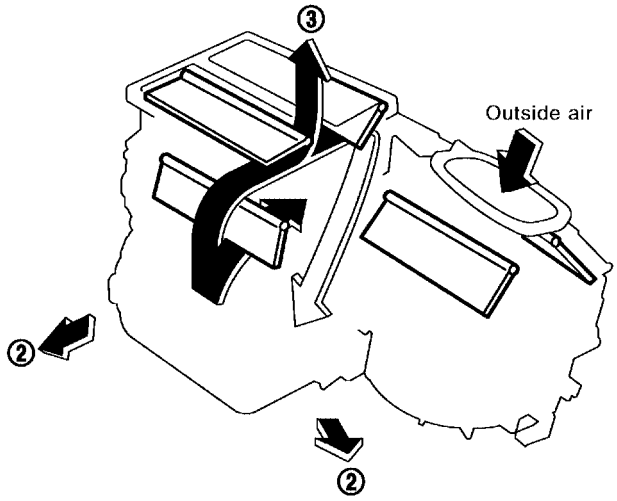
The air conditioner switch controls the A/C system. When the switch is depressed with the fan ON, the compressor will turn ON. The indicator lamp will also light.
The air conditioner cooling function operates only when the engine is running.

Discharge Air Flow

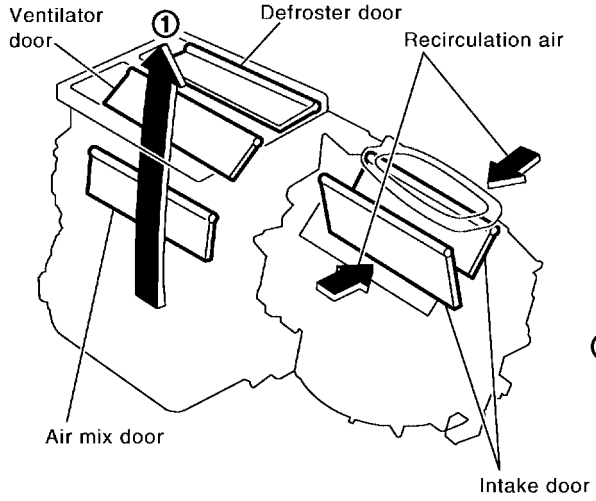
EJS001AM



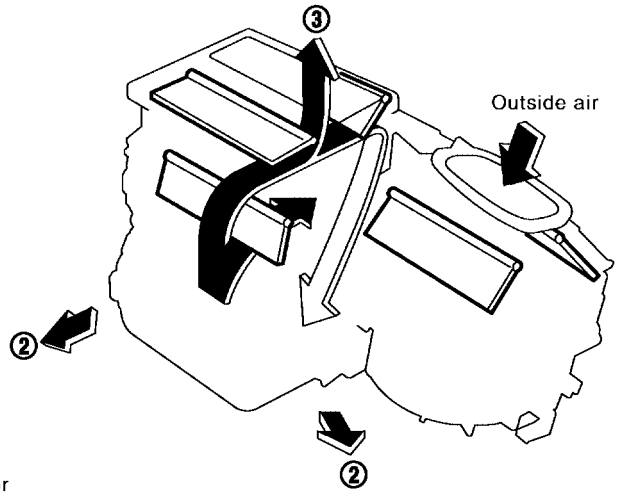
Foot



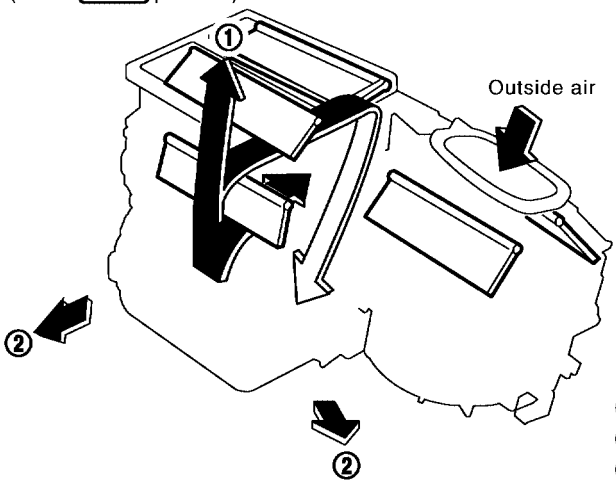
Ventilation
(Recirculation position)



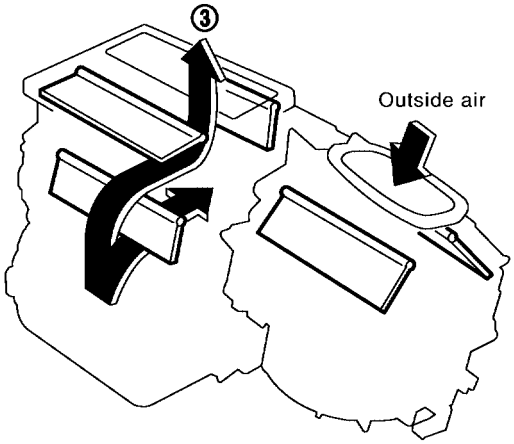
F/D



Bi-level
(Fresh position)



Defroster



①: To face
②: To foot
③: To defroster

For air flow %, refer to "Operational Check", "TROUBLE DIAGNOSES".

LHA127

System Description

EJS001AN

SWITCHES AND THEIR CONTROL FUNCTIONS

Knob/Switch		Knob/Switch position							Air outlet	Intake air	Compressor
		A/C									
A/C		○							—	—	ON*1
Mode			○						FACE	—	—
				○					B/L	—	—
					○				FOOT	—	—
						○			F/D	FRE	—
							○		DEF	FRE	ON*1
								○	—	REC*2	—

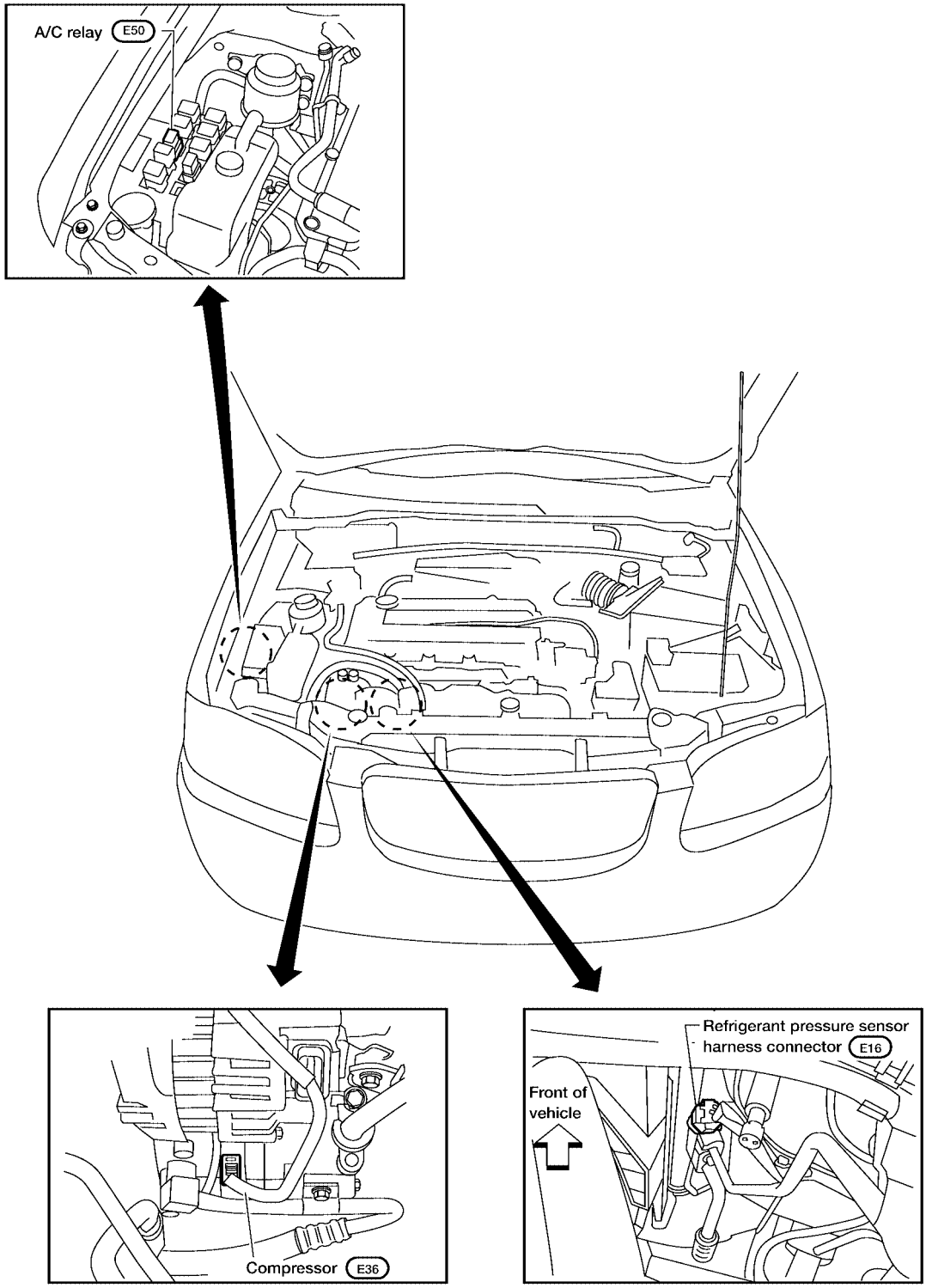
*1: Compressor operation is controlled by the ECM (when the compressor is activated in DEF mode, it remains on until the key is turned off).

*2: In DEF and F/D modes, REC switch is canceled.

Component Location

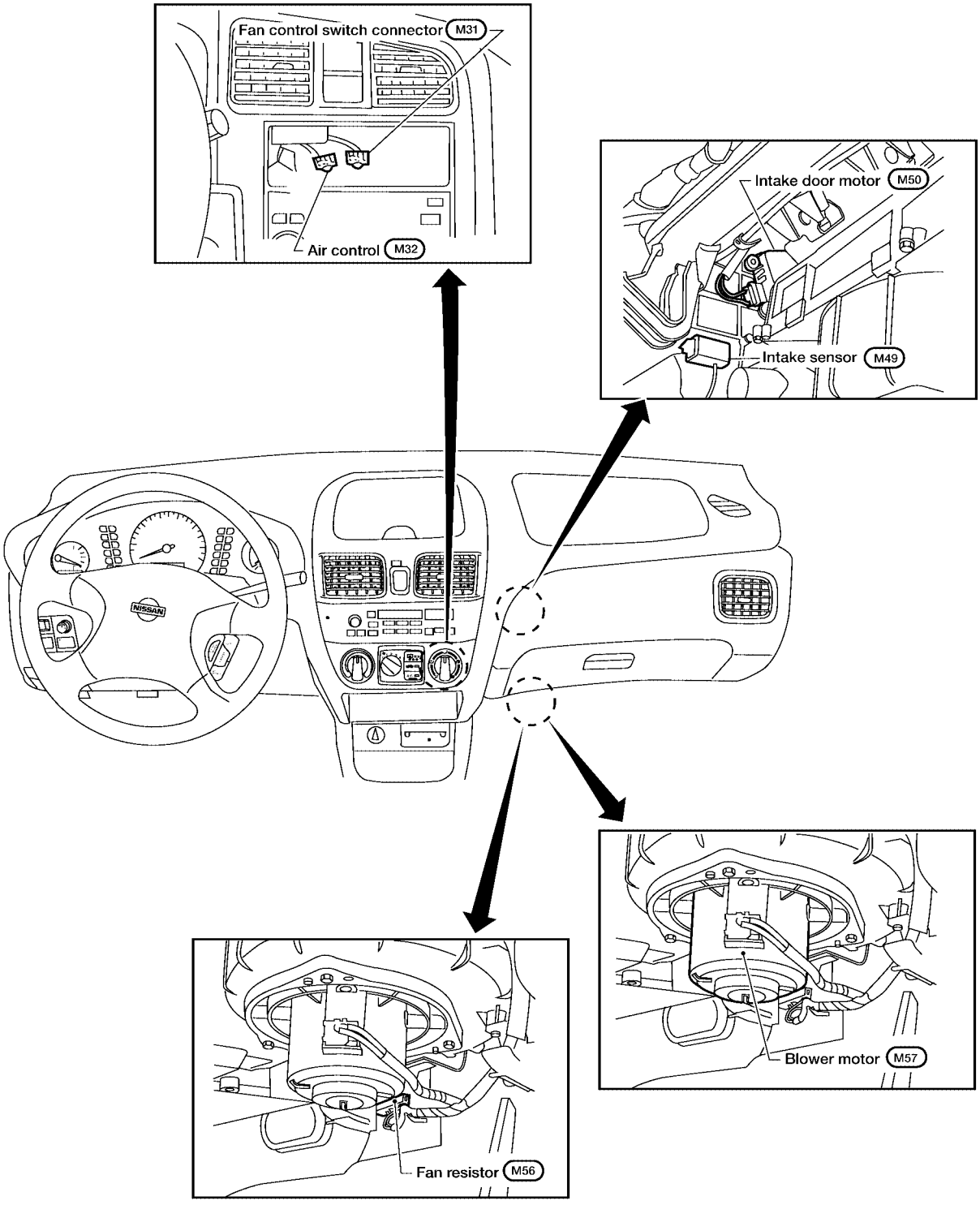
EJS001AO

ENGINE COMPARTMENT



WJIA0248E

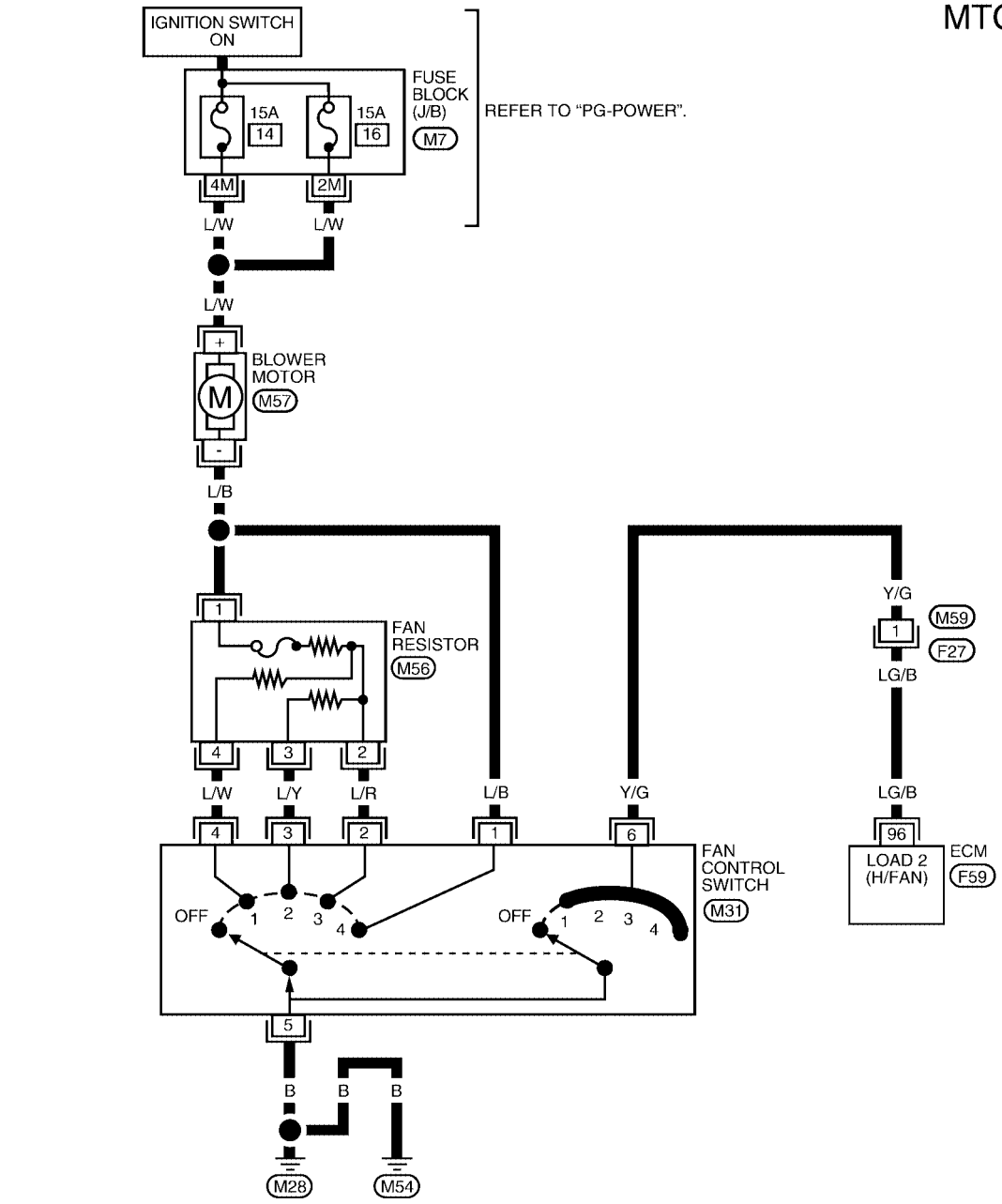
PASSENGER COMPARTMENT

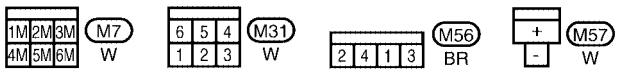


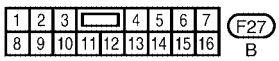
Wiring Diagram — Heater —

EJS001AP

QG18DE MODELS







REFER TO THE FOLLOWING.
F59 - ELECTRICAL UNITS

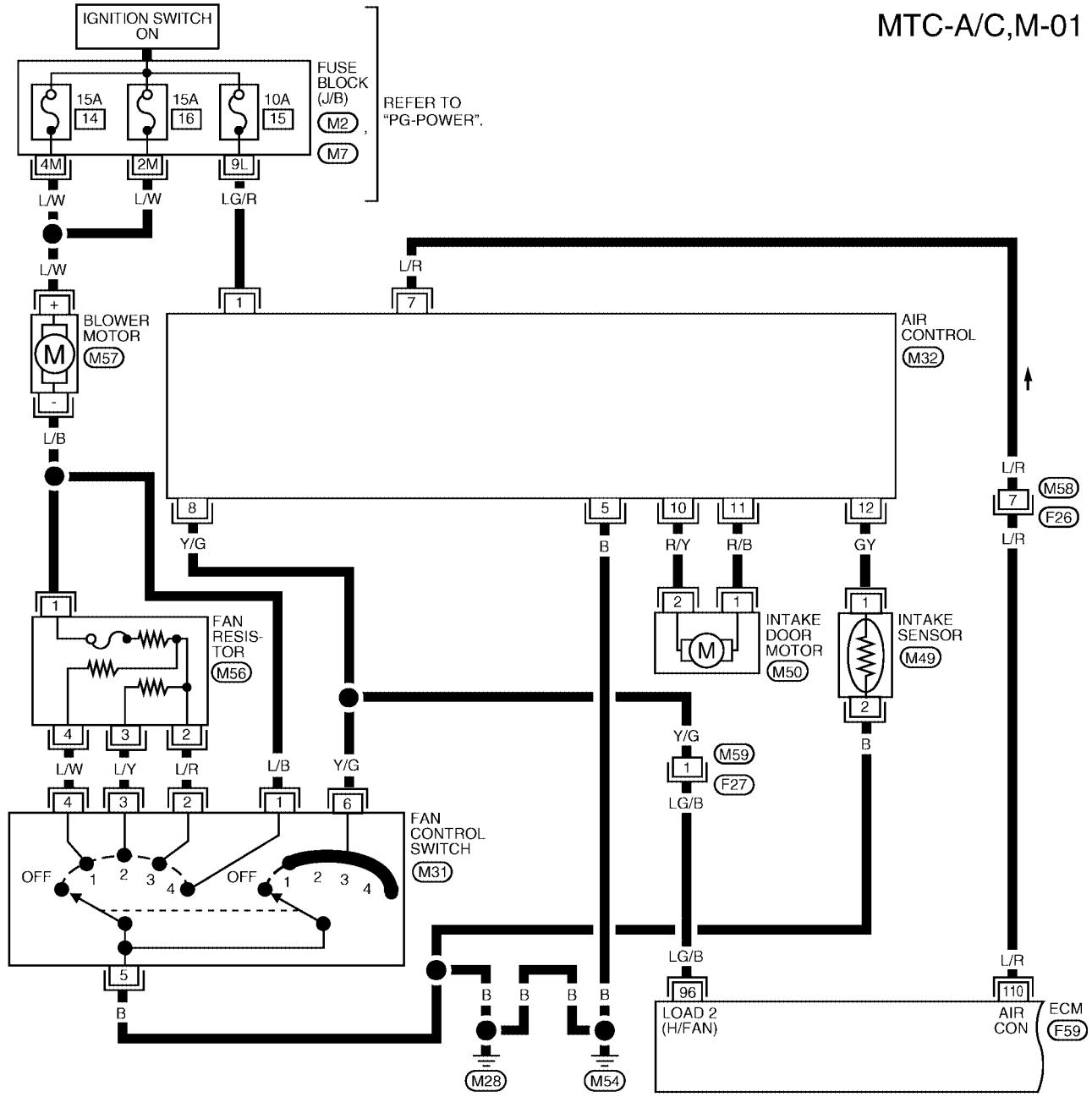
WJWA0032E

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
96	LG/B	FAN CONTROL SWITCH	FAN CONTROL SWITCH "ON" (ENGINE RUNNING)	APPROX. 0V
			FAN CONTROL SWITCH "OFF" (ENGINE RUNNING)	APPROX. 5V

Wiring Diagram — A/C, M —

EJS001AQ

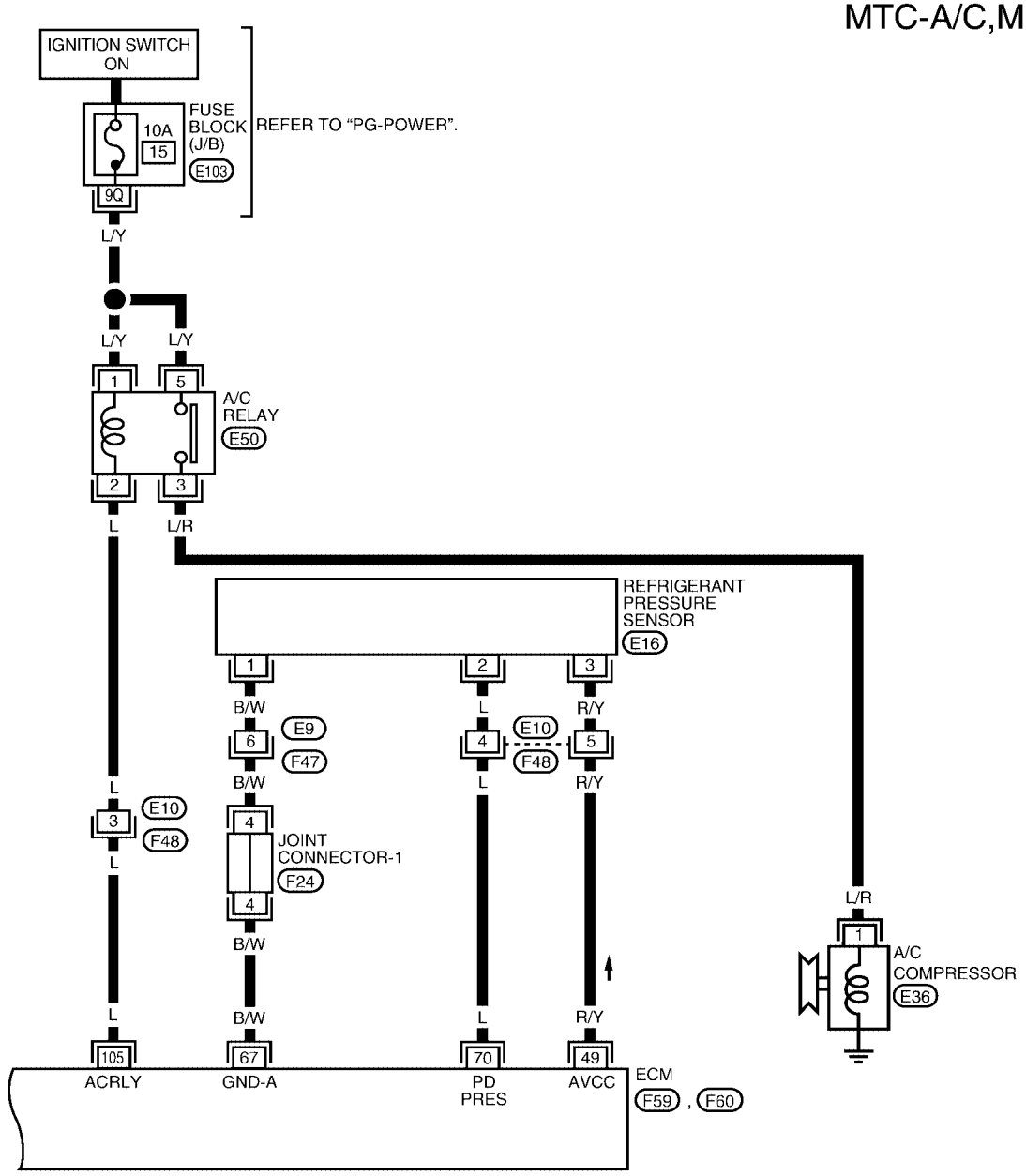
QG18DE MODELS

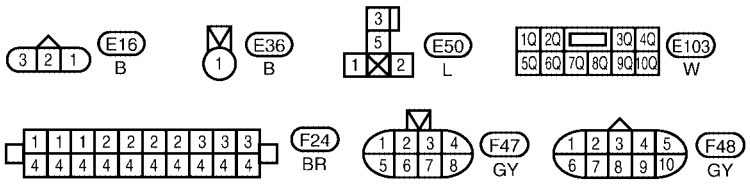


WJWA0033E

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
96	LG/B	FAN CONTROL SWITCH	FAN CONTROL SWITCH "ON" (ENGINE RUNNING)	APPROX. 0V
			FAN CONTROL SWITCH "OFF" (ENGINE RUNNING)	APPROX. 5V
110	L/R	AIR CONDITIONER SWITCH SIGNAL	BOTH A/C SWITCH AND BLOWER SWITCH "ON" (ENGINE RUNNING)	APPROX. 0V
			A/C SWITCH "OFF" (ENGINE RUNNING)	BATTERY VOLTAGE

MTC-A/C,M-02





REFER TO THE FOLLOWING.
F59 , F60 - ELECTRICAL UNITS

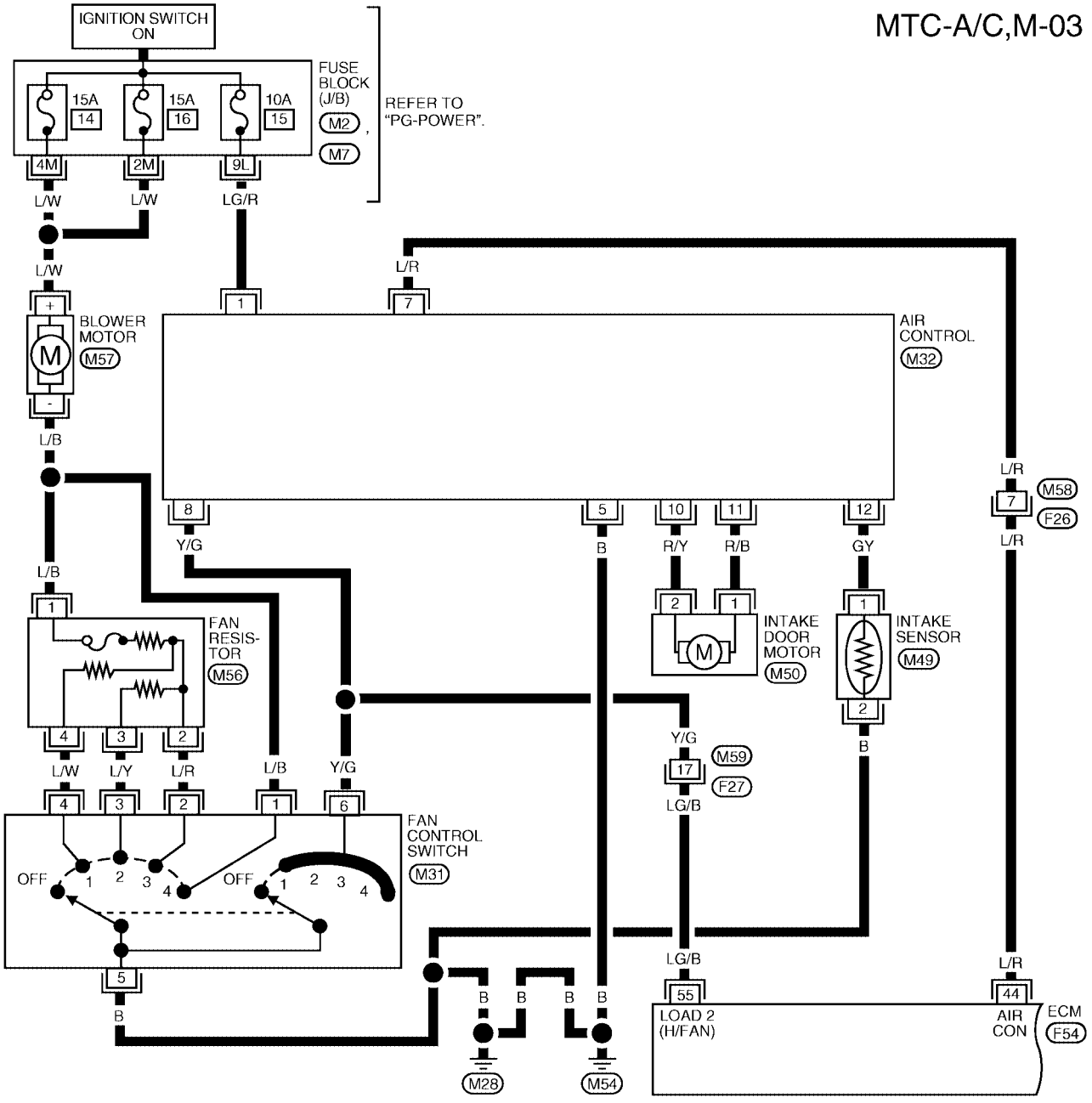
WJWA0034E

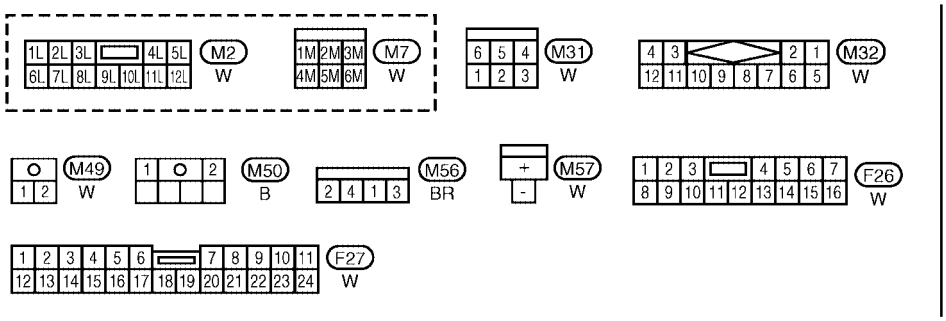
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
49	R/Y	SENSOR POWER SUPPLY	IGNITION SWITCH "ON"	APPROX. 5.0V
67	B/W	ECM GROUND	IDLE SPEED (ENGINE RUNNING)	1V OR LESS
70	L	REFRIGERANT PRESSURE SENSOR	BOTH A/C SWITCH AND BLOWER SWITCH "ON" (ENGINE RUNNING, WARM-UP CONDITION, COMPRESSOR OPERATING)	0.36 - 3.88V
105	L	AIR CONDITIONER RELAY	BOTH A/C SWITCH AND BLOWER SWITCH "ON" (ENGINE RUNNING) (COMPRESSOR OPERATING)	0 - 1.0V
			A/C SWITCH "OFF" (ENGINE RUNNING)	BATTERY VOLTAGE

QR25DE MODELS

MTC-A/C,M-03



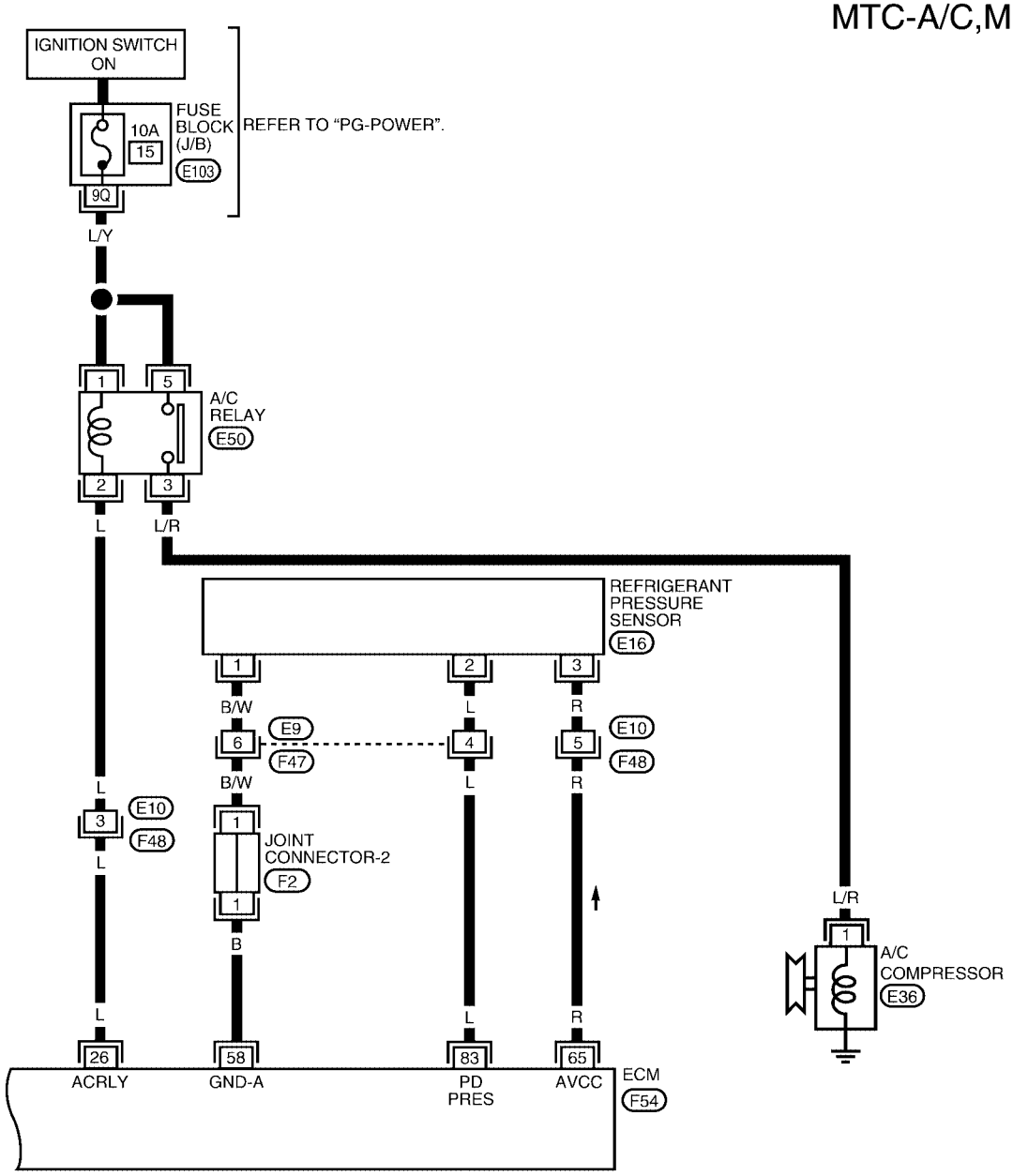


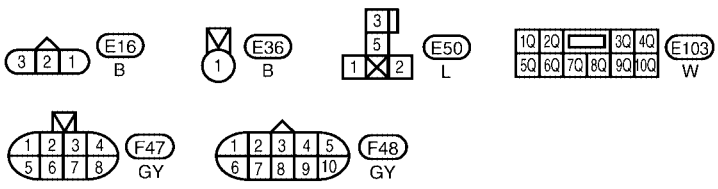
REFER TO THE FOLLOWING.
F54 - ELECTRICAL UNITS

WJWA0035E

ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND				
TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
44	L/R	AIR CONDITIONER SWITCH SIGNAL	BOTH A/C SWITCH AND BLOWER SWITCH "ON" (ENGINE RUNNING)	APPROX. 0V
			A/C SWITCH "OFF" (ENGINE RUNNING)	BATTERY VOLTAGE
55	LG/B	FAN CONTROL SWITCH	FAN CONTROL SWITCH "ON" (ENGINE RUNNING)	APPROX. 0V
			FAN CONTROL SWITCH "OFF" (ENGINE RUNNING)	APPROX. 5V

MTC-A/C,M-04





REFER TO THE FOLLOWING.
F54 - ELECTRICAL UNITS

WJWA0036E

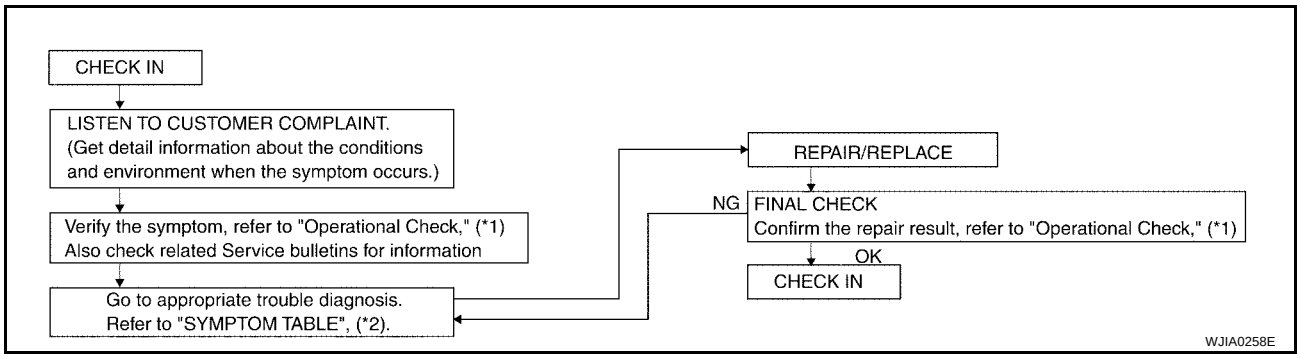
ECM TERMINALS AND REFERENCE VALUE MEASURED BETWEEN EACH TERMINAL AND GROUND

TERMINAL	WIRE COLOR	ITEM	CONDITION	DATA (DC)
26	L	AIR CONDITIONER RELAY	BOTH A/C SWITCH AND BLOWER SWITCH "ON" (ENGINE RUNNING) (COMPRESSOR OPERATING)	0 - 1.0V
			A/C SWITCH "OFF" (ENGINE RUNNING)	BATTERY VOLTAGE
58	B	ECM GROUND	IDLE SPEED (ENGINE RUNNING)	1V OR LESS
65	R	SENSOR POWER SUPPLY	IGNITION SWITCH "ON"	APPROX. 5.0V
83	L	REFRIGERANT PRESSURE SENSOR	BOTH A/C SWITCH AND BLOWER SWITCH "ON" (ENGINE RUNNING, WARM-UP CONDITION, COMPRESSOR OPERATING)	0.36 - 3.88V

How to Perform Trouble Diagnoses for Quick and Accurate Repair

EJS001AR

WORK FLOW



*1: MTC-35 *2 MTC-34

SYMPTOM TABLE

Symptom	Reference page	
● Intake door does not change in VENT, B/L or FOOT mode.	● Go to “TROUBLE DIAGNOSIS PROCEDURE FOR INTAKE DOOR”.	MTC-38
● Air outlet does not change.	● Go to “TROUBLE DIAGNOSIS PROCEDURE FOR MODE DOOR”.	MTC-42
● Air mix door does not change.	● Go to “TROUBLE DIAGNOSIS PROCEDURE FOR AIR MIX DOOR”.	MTC-44
● Blower motor does not rotate at all.	● Go to “TROUBLE DIAGNOSIS PROCEDURE FOR BLOWER MOTOR”.	MTC-46
● Magnet clutch does not engage when A/C switch and fan switch are ON.	● Go to “TROUBLE DIAGNOSIS PROCEDURE FOR MAGNET CLUTCH”.	MTC-51
● Insufficient cooling.	● Go to “TROUBLE DIAGNOSIS PROCEDURE FOR INSUFFICIENT COOLING”.	MTC-57
● Insufficient heating.	● Go to “TROUBLE DIAGNOSIS PROCEDURE FOR INSUFFICIENT HEATING”.	MTC-64
● Noise	● Go to “TROUBLE DIAGNOSIS PROCEDURE FOR NOISE”.	MTC-65

Operational Check

EJS001AS

The purpose of the operational check is to confirm that the system operates properly.

CONDITIONS:

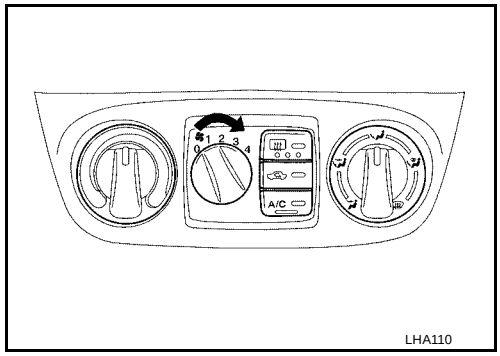
- **Engine running and at normal operating temperature.**

PROCEDURE:

1. Check Blower

1. Turn fan control switch to 1-speed.
   Blower should operate on 1-speed.
2. Then turn fan control switch to 2-speed, and continue checking blower speed until all speeds are checked.
3. Leave fan control switch on 4-speed.

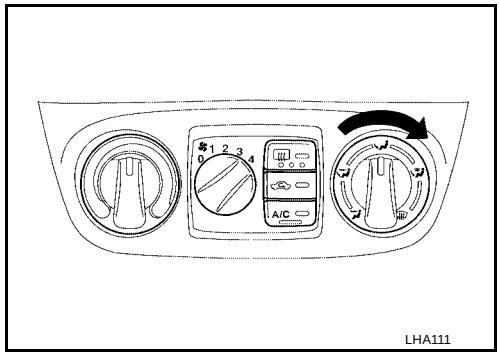
If NG, go to MTC-46, "Trouble Diagnosis Procedure for Blower Motor" .
If OK, continue with next check.



LHA110

2. Check Discharge Air

1. Turn knob to each mode.



LHA111

2. Confirm that discharge air comes out according to the air distribution table.

Refer to MTC-21, "Discharge Air Flow" .
If NG, go to MTC-42, "TROUBLE DIAGNOSIS PROCEDURE FOR MODE DOOR" .
If OK, continue with next check.

NOTE:
Confirm that the compressor clutch is engaged (visual inspection) and intake door position is at FRESH when the DEF mode is selected.
Confirm that the intake door position is at FRESH when the F/D mode is selected.
Intake door position is checked in the next step.

Discharge air flow

Mode control knob	Air outlet/distribution		
	Face	Foot	Defroster
	100%	–	–
	60%	40%	–
	–	80%	20%
	–	60%	40%
	–	–	100%

RHA654F

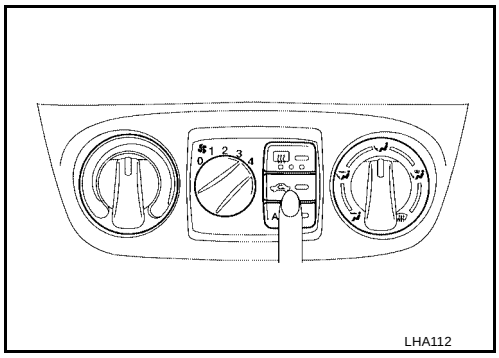
3. Check Recirculation

1. Press REC switch.
   Recirculation indicator should illuminate.
2. Listen for intake door position change (you should hear blower sound change slightly).

If NG, go to MTC-38, "Trouble Diagnosis Procedure for Intake Door" .
If OK, continue with next check.

NOTE:

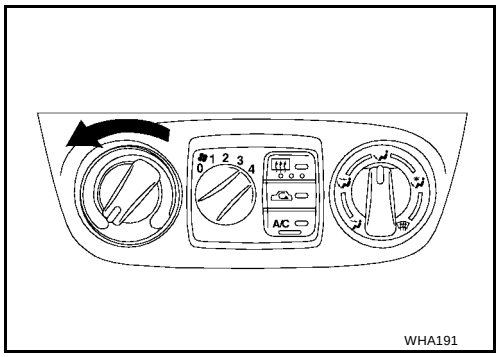
- **Recirculation does not operate in DEF and F/D modes.**



4. Check Temperature Decrease

1. Turn temperature control knob to full cold.
2. Check for cold air at discharge air outlets.

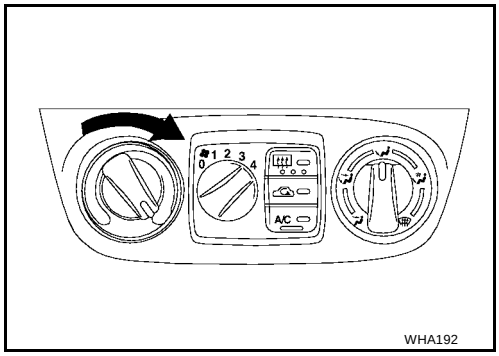
If NG, go to MTC-57, "Trouble Diagnosis Procedure for Insufficient Cooling" .
If OK, continue with next check.



5. Check Temperature Increase

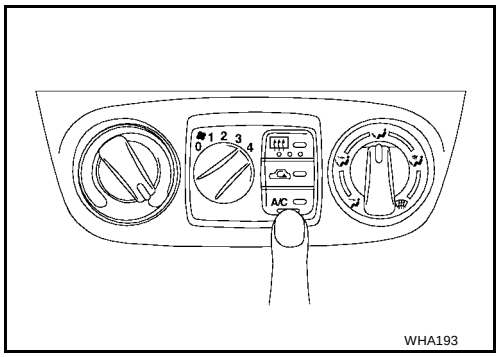
1. Turn temperature control knob to full hot.
2. Check for hot air at discharge air outlets.

If NG, go to MTC-64, "Trouble Diagnosis Procedure for Insufficient Heating" .



6. Check Air Conditioner Switch

Turn the fan control switch to the desired (1- to 4-speed) position and push the A/C switch to turn ON the air conditioner.
The indicator lamp should come on when air conditioner is ON.
If NG, go to MTC-51, "Trouble Diagnosis Procedure for Magnet Clutch" .



Main Power Supply and Ground Circuit Check

EJS001AT

POWER SUPPLY CIRCUIT CHECK

Check power supply circuit for air conditioner system.
Refer to PG-4, "Wiring Diagram — POWER —" .

INTAKE DOOR

PFP:27245

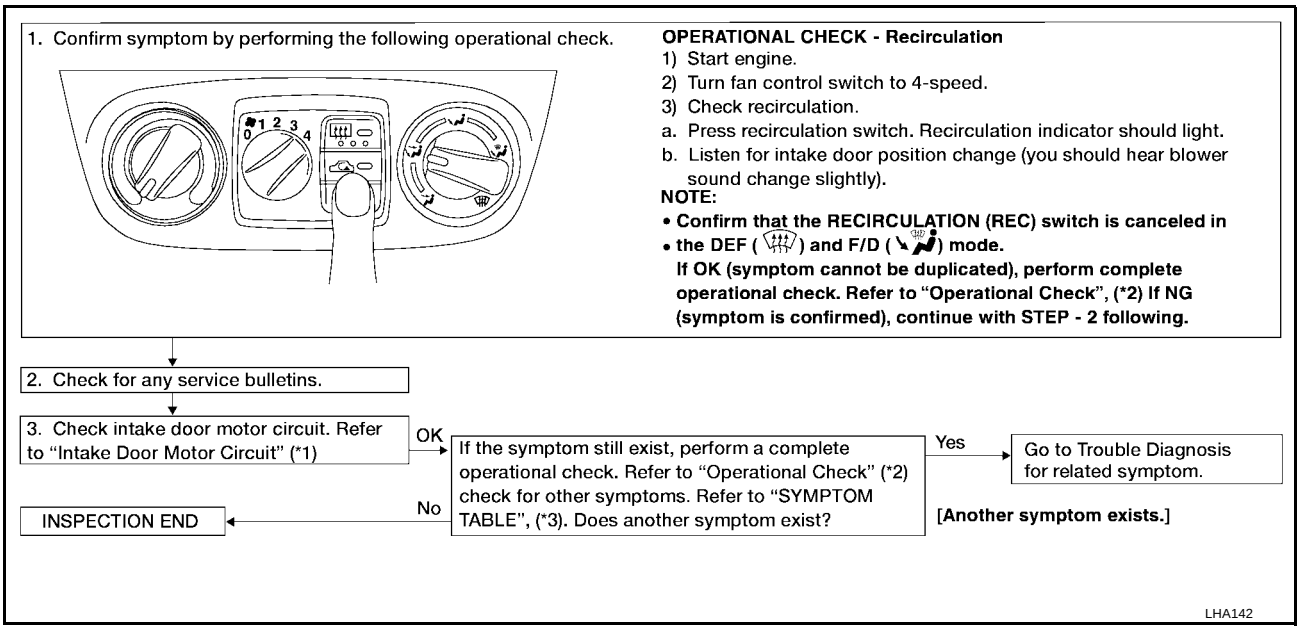
Trouble Diagnosis Procedure for Intake Door

EJS001AU

SYMPTOM:

- **Intake door does not change.**

INSPECTION FLOW



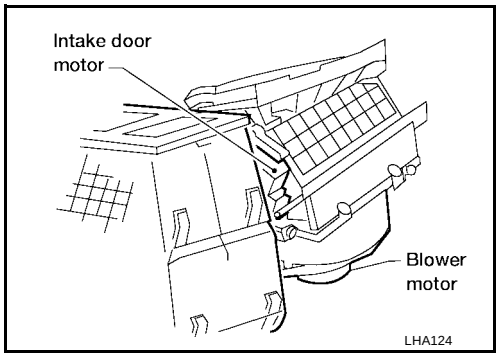
*1 MTC-39 *2 MTC-35 *3 MTC-34

Component Description

EJS001AV

INTAKE DOOR MOTOR

The intake door motor is installed on the intake unit. Using a link, it opens and closes the intake door.
When REC switch is ON, the ground line of the motor is switched from terminal 2 to 1. This starts the motor because the position switch contacts built into it make current flow. When REC switch is OFF, the ground line is switched from terminal 1 to 2. The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop.



Intake Door Motor Circuit

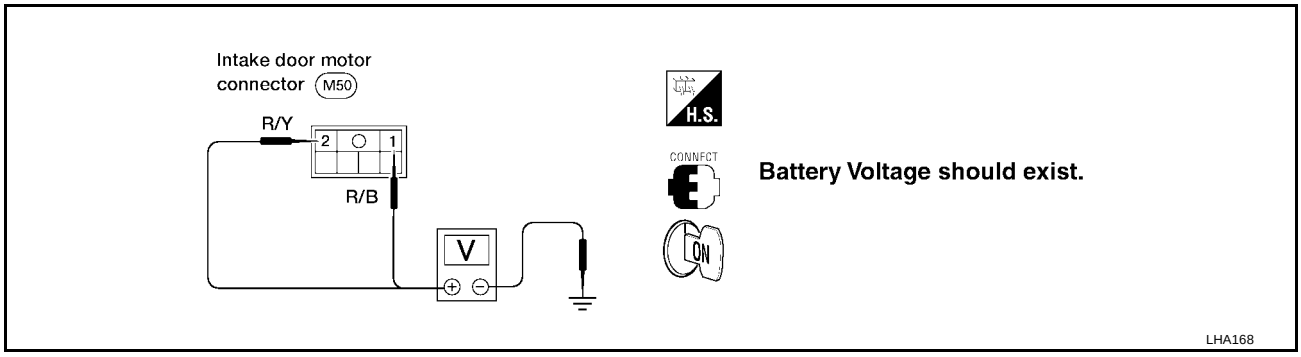
EJS001AW

SYMPTOM:

- **Intake door does not change.**

1. CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR

Disconnect intake door motor harness connector.
Do approx. 12 volts exist between intake door motor harness terminal Nos. 1, 2 and body ground?

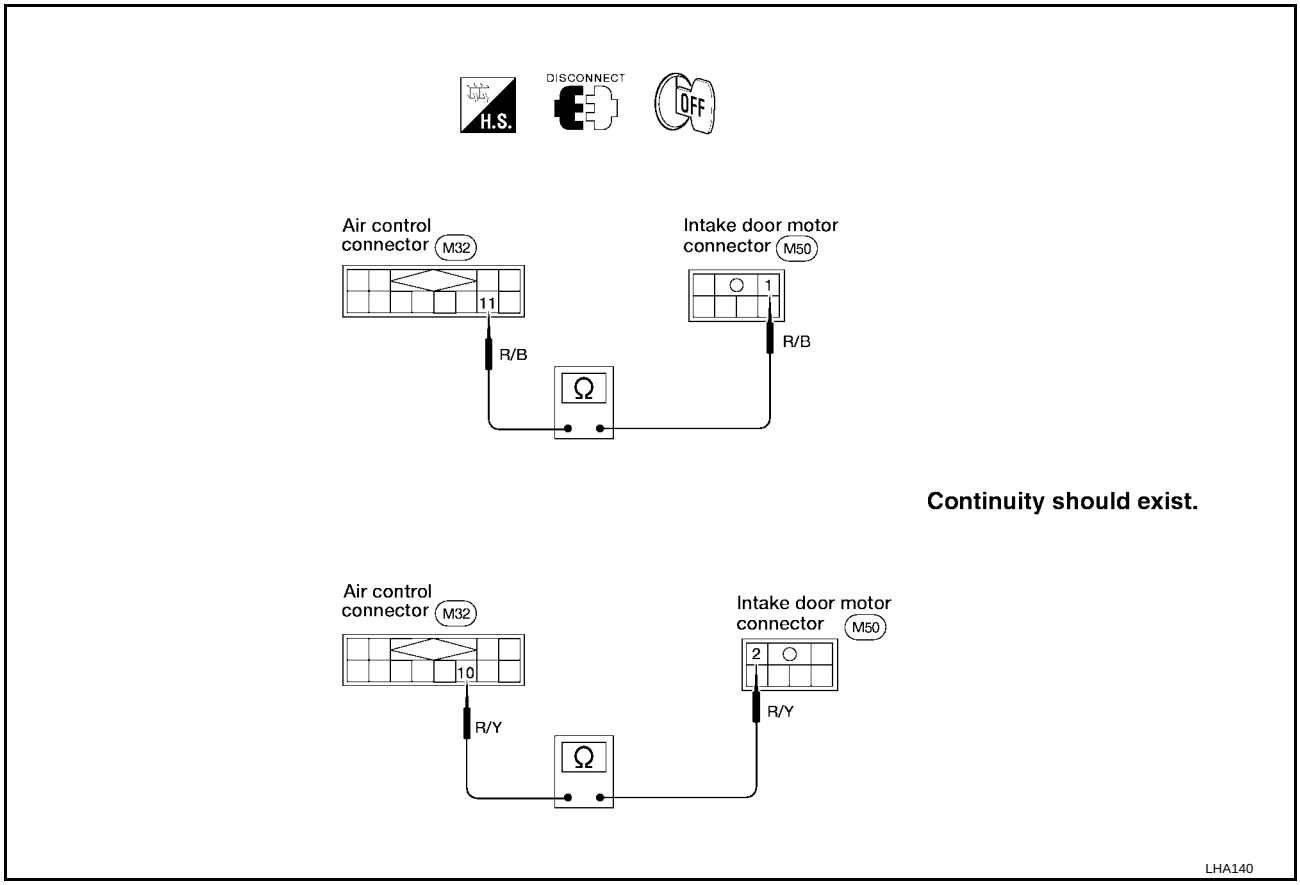


Yes or No

Yes >> GO TO 3.
No >> GO TO 2.

2. CHECK CIRCUIT CONTINUITY BETWEEN INTAKE DOOR MOTOR AND AIR CONTROL UNIT

Check circuit continuity between A/C control unit harness terminal Nos. 10 (11) and intake door motor harness terminal Nos. 2 (1).



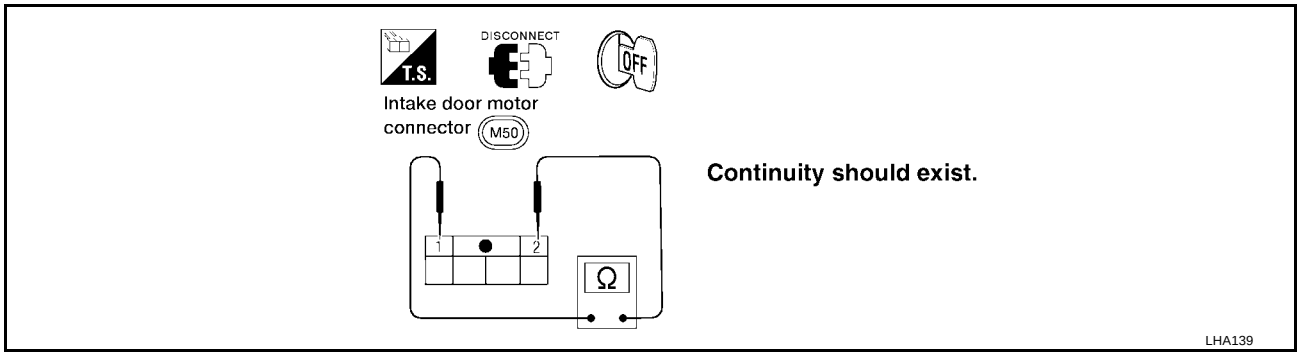
If OK, check harness for short.

Yes or No

Yes >> Replace A/C control unit.
No >> Repair harness or connector.

3. CHECK CIRCUIT CONTINUITY OF INTAKE DOOR MOTOR

Check circuit continuity between intake door motor harness terminal No. 1 and No. 2.



OK or NG

OK >> GO TO 4.
NG >> Replace intake door motor.

4. CHECK INTAKE DOOR LINKAGE

Refer to MTC-43, "CONTROL LINKAGE ADJUSTMENT" .

OK or NG

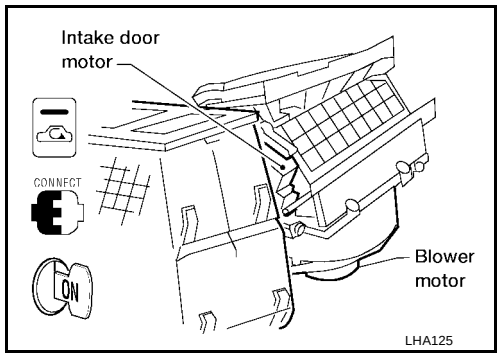
OK >> **INSPECTION END**.
NG >> Repair or adjust.

Control Linkage Adjustment

EJS001AX

INTAKE DOOR MOTOR

1. Install intake door motor on intake unit.
   Ensure that the intake door motor lever is fitted into the slit portion of intake door link.
2. Connect the intake door motor harness connector.
3. Turn ignition switch to “ON” position.
4. Check that intake door operates properly when REC switch is turned ON and OFF.



Mode Door

EJS001AY

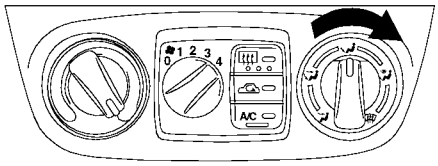
TROUBLE DIAGNOSIS PROCEDURE FOR MODE DOOR

SYMPTOM:

- **Mode door does not change.**

INSPECTION FLOW

1. Confirm symptom by performing the following operational check.



OPERATIONAL CHECK - Discharge air.

1) Turn mode control knob.

2) Confirm that discharge air comes out according to the air distribution table at left.
Refer to "Discharge Air Flow" in "DESCRIPTION" (*1).

Discharge air flow

Mode control knob	Air outlet/distribution		
	Face	Foot	Defroster
	100%	–	–
	60%	40%	–
	–	80%	20%
	–	60%	40%
	–	–	100%

NOTE:
Confirm that the compressor clutch is engaged (visual inspection) and intake door position is at FRESH when the DEF ( ) or D/F ( ) button is pressed.
If OK (symptom cannot be duplicated), perform complete operational check (*3).
If NG (symptom is confirmed), continue with STEP-2 following.

2. Check for any service bulletins.

3. Check mode door control linkage adjustment, refer to “CONTROL LINKAGE ADJUSTMENT” (*2)

OK

If the symptom still exists, perform a complete operational check, refer to “Operational Check”, (*3) and check for other symptoms.
Refer to “SYMPTOM TABLE”, (*4)
Does another symptom exist?

No → INSPECTION END

Yes → Go to Trouble Diagnosis for related symptom

[Another symptom exists.]

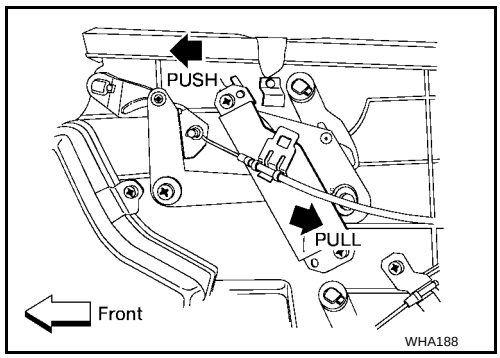
LHA146

*1 MTC-21 *2 MTC-41 *3 MTC-35
*4 MTC-34

CONTROL LINKAGE ADJUSTMENT

Mode Door Control Linkage

- Turn mode door control knob to position.
- Set side link in DEF mode.
- Pull on outer cable in direction of arrow and then clamp it.
- **After positioning mode door control cable, check that it operates properly.**



Air Mix Door

EJS001AZ

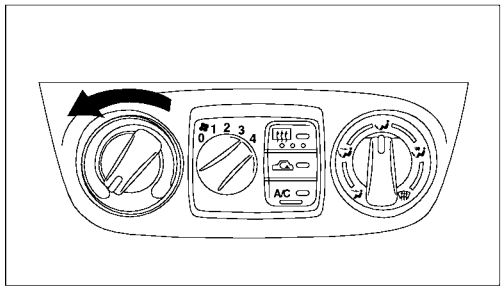
TROUBLE DIAGNOSIS PROCEDURE FOR AIR MIX DOOR

SYMPTOM:

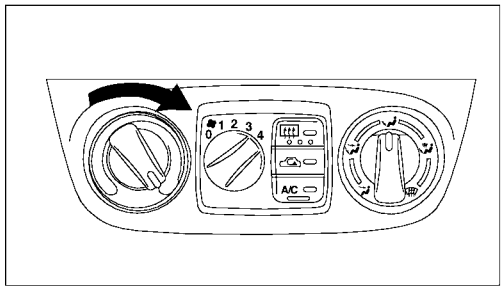
- **Air mix door does not change.**

INSPECTION FLOW

1. Confirm symptom by performing the following operational check.



OPERATIONAL CHECK - Recirculation
1. Check Temperature Decrease
1) Turn temperature control knob to full cold.
2) Check for cold air at discharge air outlets.



2. Check Temperature Increase
1) Turn temperature control knob to full hot.
2) Check for hot air at discharge air outlets.

If OK (symptom cannot be duplicated). Perform complete operational check. (*1)
If NG (symptom is confirmed), continue with STEP-2 following.

2. Check for any service bulletins.

3. Visually check air mix door linkage operation.

4. Visually check air mix door.

OK

If the symptom still exist, perform a complete operational check and check for other symptoms. Refer to "SYMPTOM TABLE", (*2). Does another symptom exist?

Yes → Go to Trouble Diagnosis for related symptom.

[Another symptom exists.]

No → INSPECTION END

WHA190

*1 MTC-35 *2 MTC-34

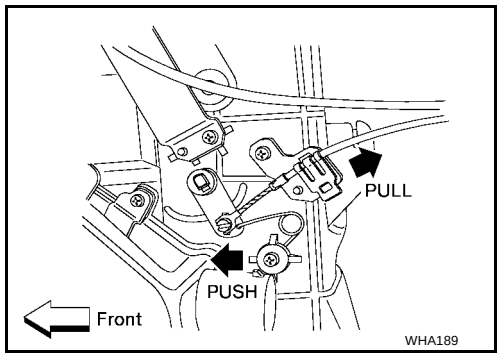
Temperature Control Linkage Adjustment

EJS001B0

Temperature Control Cable

- Turn temperature control knob to the full cold position.
- Set the air mix door lever in the full cold position by hand.
- Pull on cable cover in the direction of the arrow and then clamp cable cover.

After positioning air mix door control cable, check for proper operation.



BLOWER MOTOR

PFP:27226

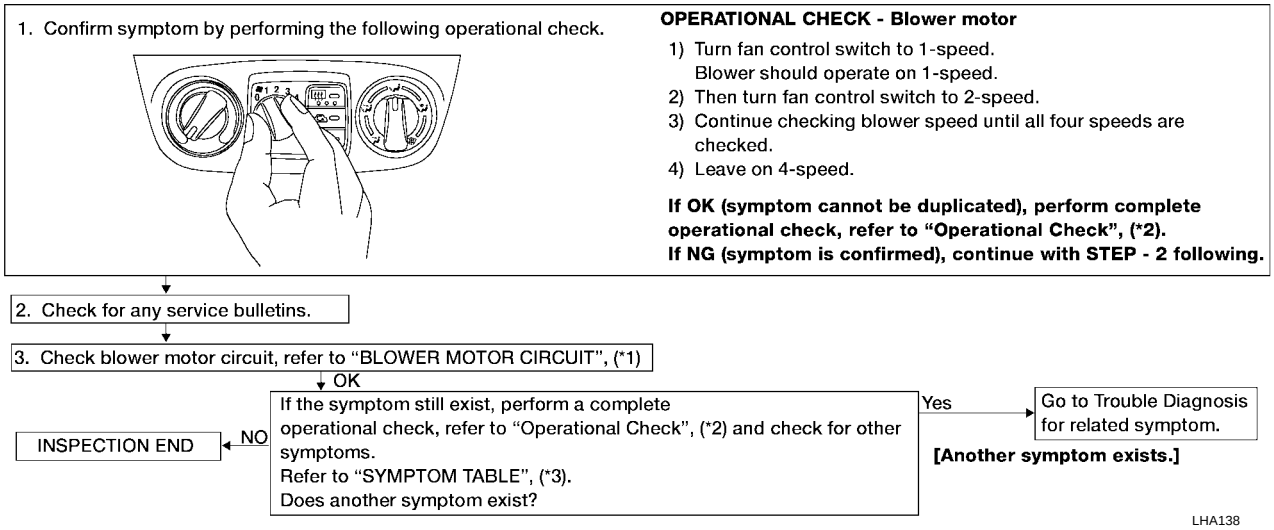
Trouble Diagnosis Procedure for Blower Motor

EJS001B1

SYMPTOM:

- **Blower motor does not rotate at all.**

INSPECTION FLOW



*1 MTC-46 *2 MTC-35 *3 MTC-34

Blower Motor Circuit

EJS001B2

SYMPTOM:

- **Blower motor does not rotate.**

Symp-tom table No.	INCIDENT
1	Fan fails to rotate.
2	Fan does not rotate at 1-speed.
3	Fan does not rotate at 2-speed.
4	Fan does not rotate at 3-speed.
5	Fan does not rotate at 4-speed.

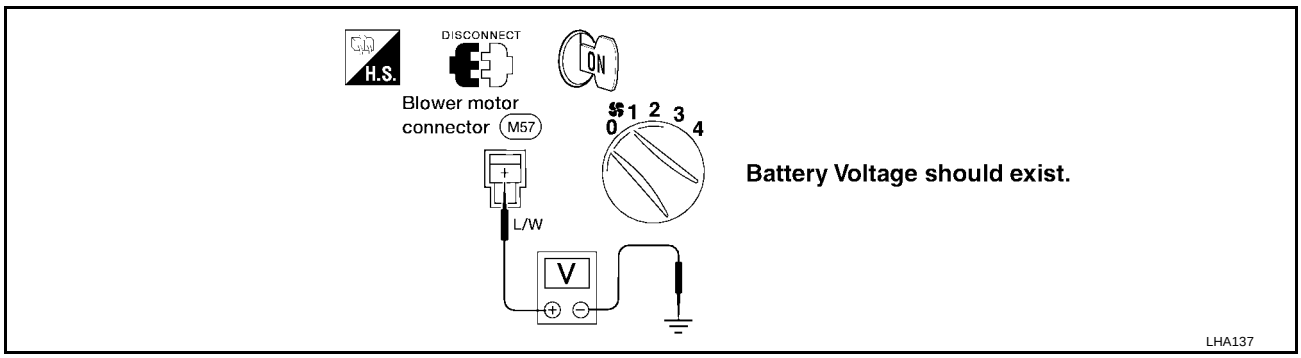
1. DIAGNOSTIC PROCEDURE

Check if blower motor rotates properly at each fan speed.
Conduct checks as per symptom table above.

1 >> GO TO 2.
2, 3, 4 >> GO TO 8.
5 >> GO TO 10.

2. CHECK POWER SUPPLY FOR BLOWER MOTOR

1. Disconnect blower motor harness connector.
2. Do approx. 12 volts exist between blower motor harness terminal + and body ground?



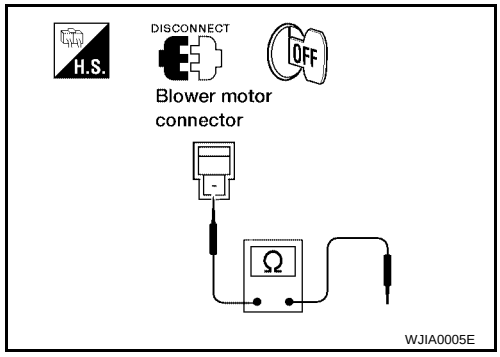
Yes or No

Yes >> GO TO 3.
No >> Check 15A (Nos. 14 and 16) fuses at fuse block. Refer to PG-8, "IGNITION POWER SUPPLY — IGNITION SW. IN "ON"" .

3. CHECK CIRCUIT CONTINUITY FOR BLOWER MOTOR

1. Turn fan control switch to any position except OFF.
2. Check circuit continuity between blower motor connector M57 terminal – (L/B) and body ground.

Continuity should exist.



OK or NG

OK >> GO TO 4.
NG >> Reconnect blower motor harness connector. GO TO 5.

4. CHECK BLOWER MOTOR

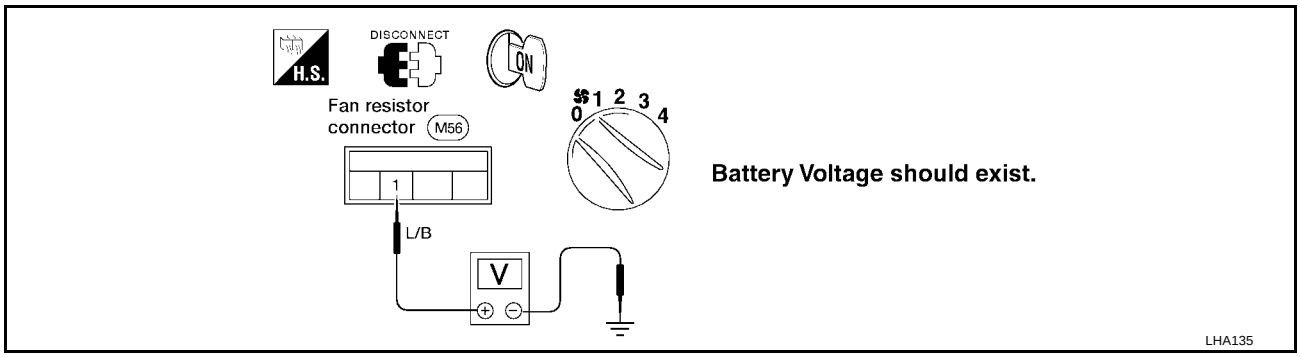
Refer to MTC-50, "BLOWER MOTOR" .

OK or NG

OK >> **INSPECTION END**.
NG >> Replace blower motor.

5. CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND FAN RESISTOR

Do approx. 12 volts exist between fan resistor harness terminal No. 1 and body ground?

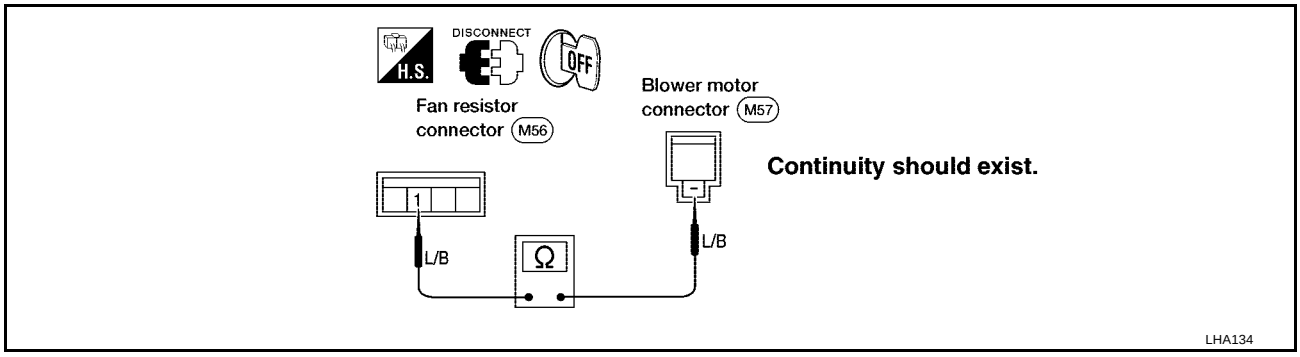


Yes or No

Yes >> Disconnect fan control switch harness connector. GO TO 7.
No >> Disconnect blower motor and fan resistor harness connectors. GO TO 6.

6. CHECK CIRCUIT CONTINUITY BETWEEN BLOWER MOTOR AND FAN RESISTOR

Check circuit continuity between blower motor harness terminal – and fan resistor harness terminal No. 1.

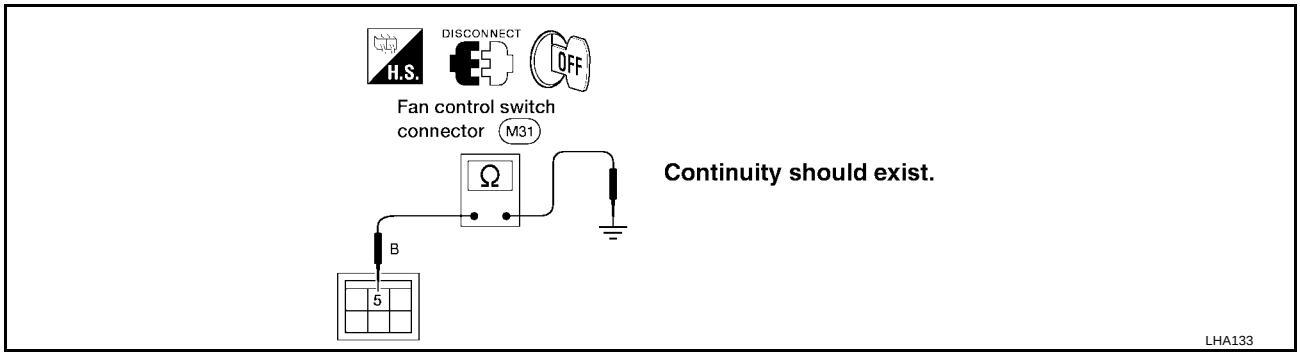


OK or NG

OK >> Check harness for short and repair as necessary.
NG >> Check harness for open and check connectors. Repair as necessary.

7. CHECK GROUND CIRCUIT FOR FAN CONTROL SWITCH

Check circuit continuity between fan control switch harness terminal No. 5 and body ground.



OK or NG

OK >> GO TO 8.
NG >> Repair harness or connector.

8. CHECK RESISTOR AFTER DISCONNECTING IT

Refer to MTC-50, "FAN RESISTOR" .

OK or NG

OK >> GO TO 9.
NG >> Replace fan resistor.

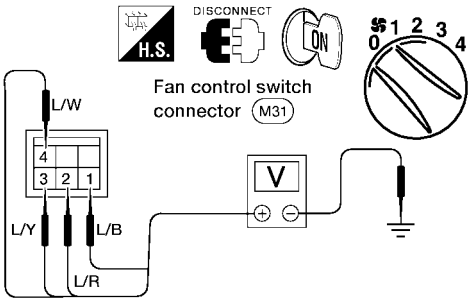
9. CHECK FAN RESISTOR HARNESS CONNECTOR

Reconnect fan resistor harness connector.

1 >> GO TO 12.
2, 3, 4 >> GO TO 10.

10. CHECK FAN CONTROL SWITCH CIRCUIT

Do approx. 12 volts exist between each fan control switch harness terminal and body ground?



Symptom table No.	Terminal No. (+)	Terminal No. (−)	Voltage
2	4	Body ground	Approx. 12V
3	3		
4	2		
5	1		

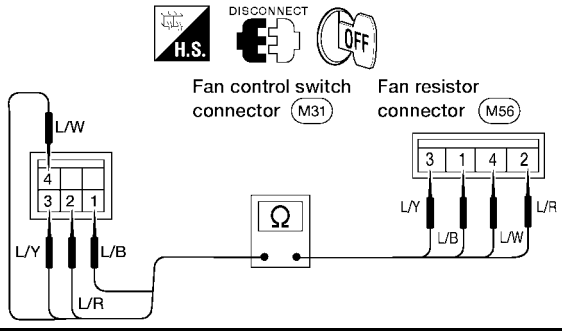
LHA131

Yes or No

Yes >> GO TO 12.
No >> GO TO 11.

11. CHECK CIRCUIT CONTINUITY BETWEEN FAN CONTROL SWITCH AND FAN RESISTOR

Check circuit continuity between fan control switch harness terminal and fan resistor harness terminal.



Terminal No. Fan control switch	Terminal No. Fan resistor	Continuity
1	1	Yes
2	2	
3	3	
4	4	

LHA132

OK or NG

OK >> Check harness for short and repair as necessary.
NG >> Check harness for open and check connectors. Repair as necessary.

12. CHECK FAN CONTROL SWITCH AFTER DISCONNECTING IT

Refer to MTC-50, "FAN CONTROL SWITCH" .

OK or NG

OK >> **INSPECTION END**.
NG >> Replace fan control switch.

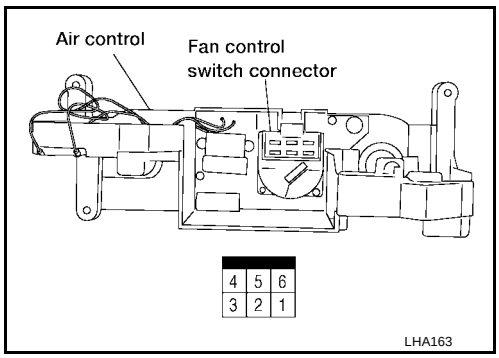
Electrical Components Inspection

EJS001B3

FAN CONTROL SWITCH

Check continuity between terminals at each switch position.

Fan control switch position	Continuity between terminals
OFF	
1	4 — 5 — 6
2	3 — 5 — 6
3	2 — 5 — 6
4	1 — 5 — 6



BLOWER MOTOR

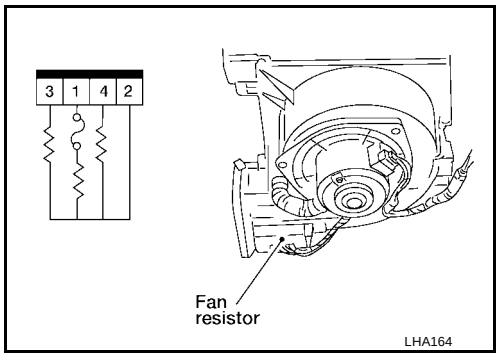
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.

FAN RESISTOR

Check resistance between terminals.

Terminal No.		Resistance (Approx.)
(+)	(–)	
3	1	1.305 - 1.595Ω
4		2.457 - 3.003Ω
2		0.225 - 0.275Ω



MAGNET CLUTCH

PFP:92660

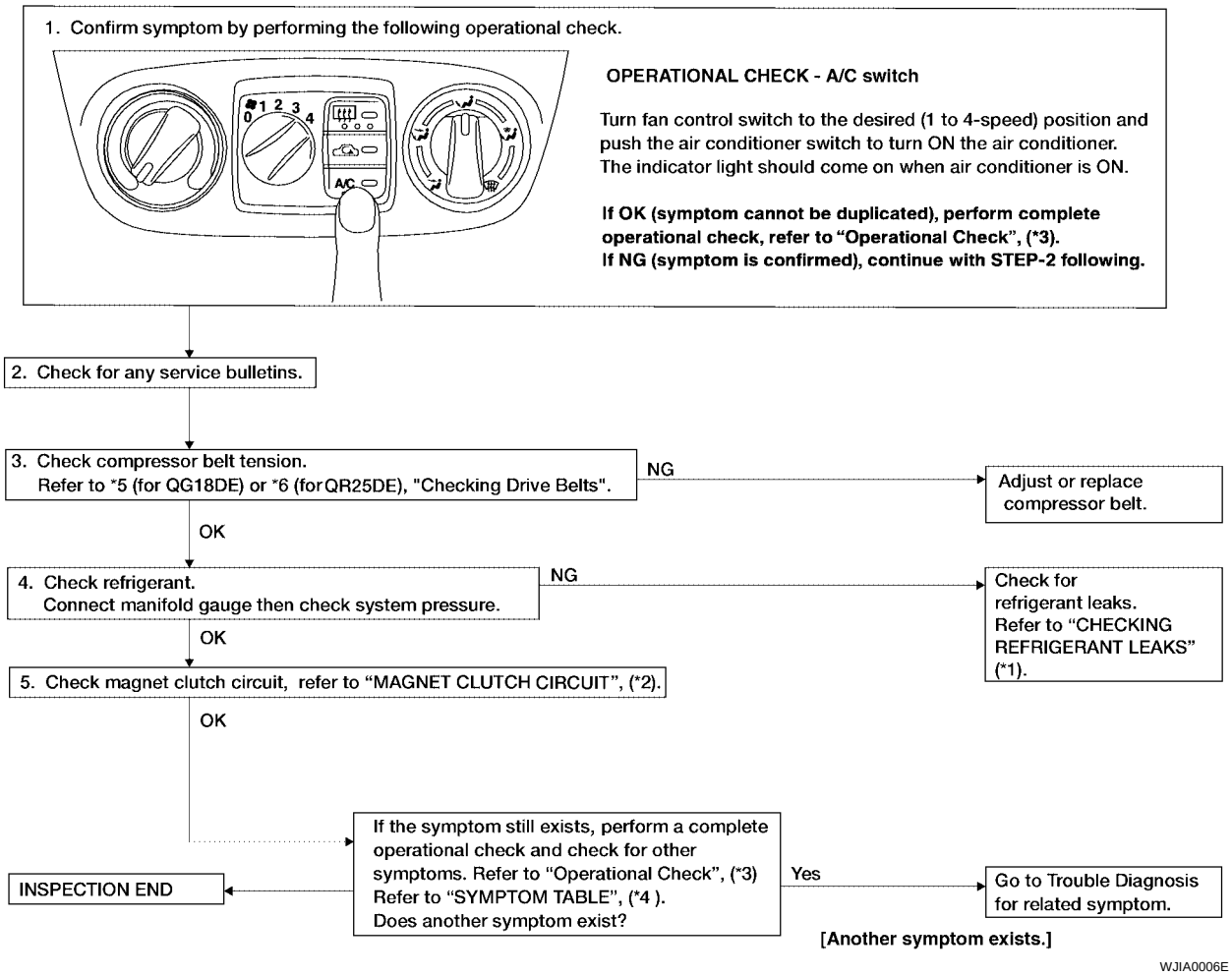
Trouble Diagnosis Procedure for Magnet Clutch

EJS001B4

SYMPTOM:

- **Magnet clutch does not operate when A/C switch and fan control switch are ON.**

INSPECTION FLOW



*1 MTC-86 *2 MTC-52 *3 MTC-35
*4 MTC-34 *5 MA-16 *6 MA-23

Magnet Clutch Circuit

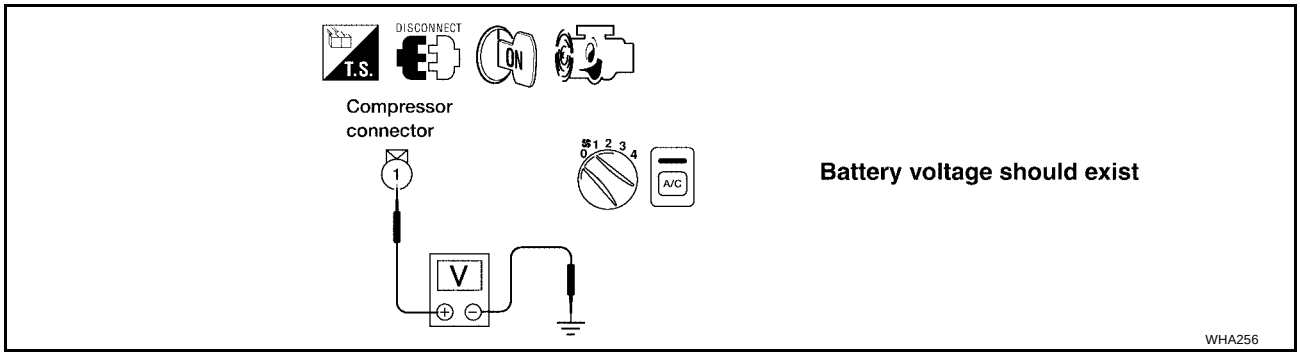
EJS001B5

SYMPTOM:

- **Magnet clutch does not engage when A/C switch and fan control switch are ON.**

1. CHECK POWER SUPPLY FOR COMPRESSOR

Disconnect compressor harness connector.
Do approx. 12 volts exist between compressor harness connector E36 terminal No. 1, (L/R) and body ground?

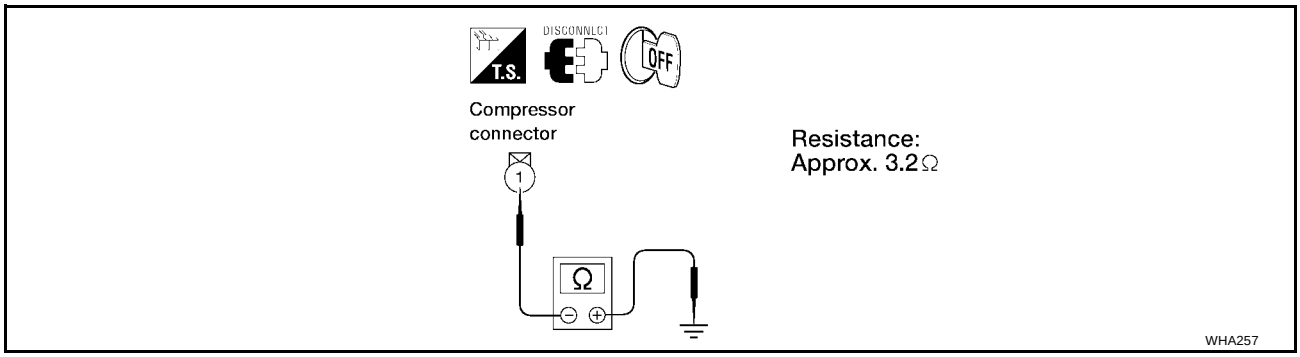


Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK MAGNET CLUTCH COIL

Disconnect magnet clutch connector.
Do approx. 3.2Ω exist between A/C compressor harness connector E36 terminal No. 1, (L/R) and body ground?

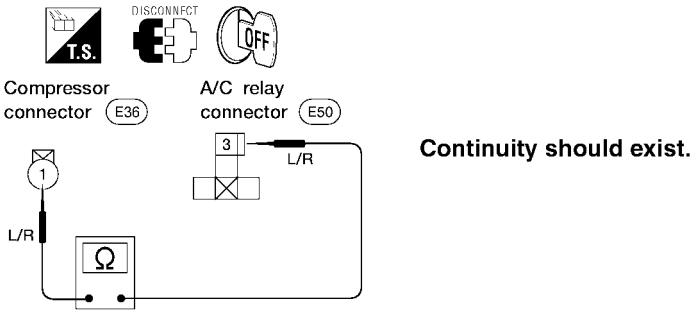


Yes or No

Yes >> **INSPECTION END**.
No >> Replace magnet clutch. Refer to MTC-69, "COMPRESSOR CLUTCH" .

3. CHECK CIRCUIT CONTINUITY BETWEEN A/C RELAY AND COMPRESSOR HARNESS

Disconnect A/C relay.
Check circuit continuity between A/C relay harness terminal No. 3 and compressor harness terminal No. 1.



If OK, check harness for short.

OK or NG

OK >> GO TO 4.
NG >> Repair harness or connector.

4. CHECK INTAKE SENSOR CIRCUIT

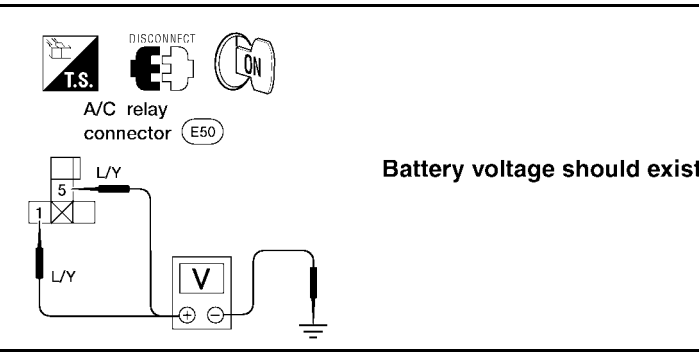
Refer to MTC-66, "Intake Sensor Circuit" .

OK or NG

OK >> GO TO 5.
NG >> Repair as necessary.

5. CHECK POWER SUPPLY FOR A/C RELAY

Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminal Nos. 1, 5 and body ground?



Yes or No

Yes >> GO TO 6.
No >> Check power supply circuit and 10A (No. 15) fuse at fuse block. Refer to PG-8, "IGNITION POWER SUPPLY — IGNITION SW. IN “ON”" .

6. CHECK A/C RELAY AFTER DISCONNECTING IT

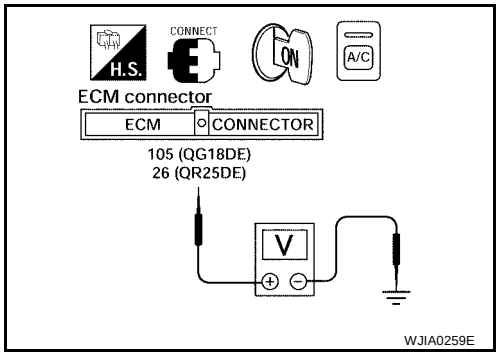
Refer to MTC-55, "A/C RELAY" .

OK or NG

OK >> Reconnect A/C relay. GO TO 7.
NG >> Replace A/C relay.

7. CHECK COIL SIDE CIRCUIT OF A/C RELAY

Reconnect A/C relay.
Do approx. 12 volts exist between ECM harness connector F59 terminal No. 105 (L) (QG18DE) or F54 terminal No. 26 (L) (QR25DE) and body ground?



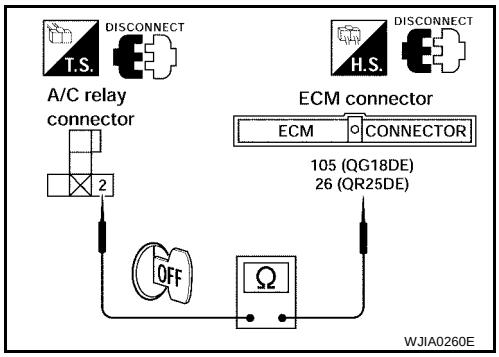
Battery voltage should exist.

Yes or No

Yes >> GO TO 9.
No >> Disconnect A/C relay. Disconnect ECM harness connector. GO TO 8.

8. CHECK CIRCUIT CONTINUITY BETWEEN A/C RELAY AND ECM HARNESS

Check circuit continuity between A/C relay harness connector E50 terminal No. 2 (L) and ECM harness connector F59 terminal No. 105 (L) (QG18DE) or F54 terminal No. 26 (L) (QR25DE) .



Continuity should exist.

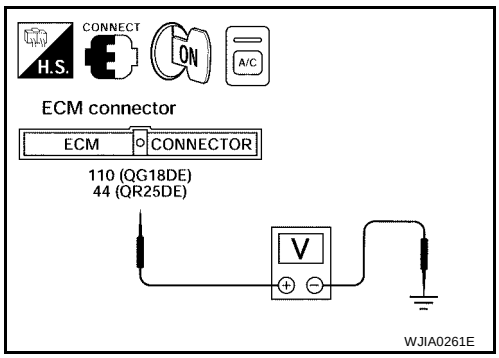
If OK, check harness for short.

OK or NG

OK >> Check ECM. Refer to EC-105, "ECM Terminals and Reference Value" [QG18DE (ULEV Models)], EC-686, "ECM Terminals and Reference Value" [QG18DE (SULEV Models)] or EC-1307, "ECM Terminals and Reference Value" (QR25DE).
NG >> Repair harness or connector.

9. CHECK VOLTAGE FOR ECM

Do approx. 12 volts exist between ECM harness connector F59 (QG18DE) terminal No. 110 (L/R) (QG18DE) or F54 (QR25DE) terminal No. 44 (L/R) and body ground?



Battery voltage should exist.

Yes or No

Yes >> GO TO 10.
No >> Check ECM. Refer to EC-105, "ECM Terminals and Reference Value" [QG18DE (ULEV Models)], EC-686, "ECM Terminals and Reference Value" [QG18DE (SULEV Models)] or EC-1307, "ECM Terminals and Reference Value" (QR25DE).

10. CHECK REFRIGERANT PRESSURE SENSOR

Refer to MTC-56, "REFRIGERANT PRESSURE SENSOR" .

OK or NG

OK >> GO TO 11.
NG >> Replace refrigerant pressure sensor.

11. CHECK CIRCUIT CONTINUITY BETWEEN FAN CONTROL SWITCH AND A/C CONTROL UNIT

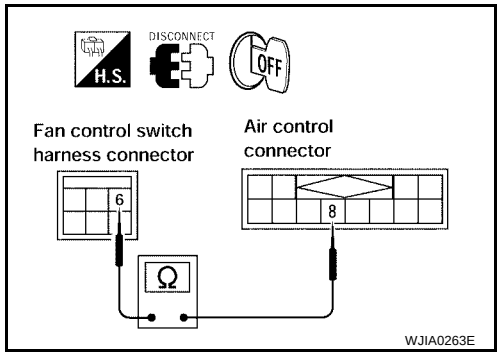
Disconnect A/C control unit and fan control switch.
Check circuit continuity between fan control switch harness connector M31 terminal No. 6 (Y/G) and A/C control unit harness connector M32 terminal No. 8 (Y/G).

Continuity should exist.

If OK, check harness for short.

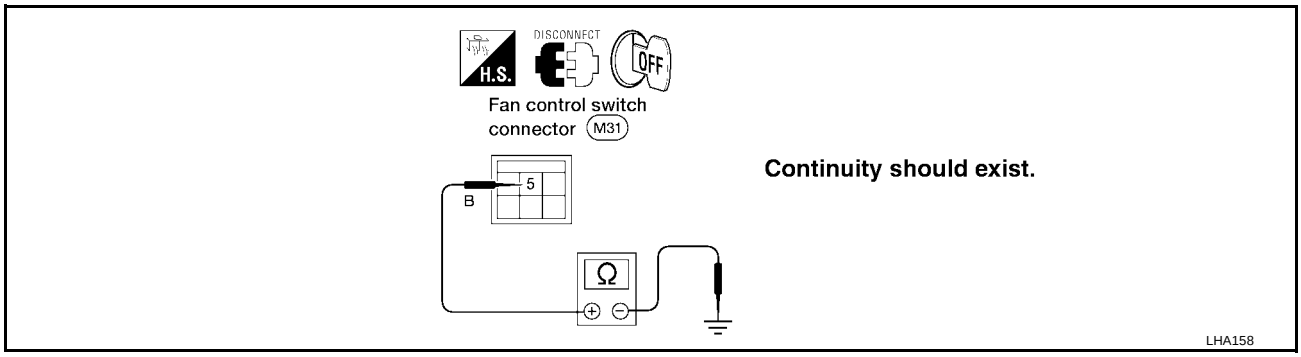
OK or NG

OK >> GO TO 12.
NG >> Repair harness or connector.



12. CHECK FAN CONTROL SWITCH GROUND

Disconnect fan control switch harness connector.
Does continuity exist between fan control switch harness terminal No. 5 and body ground?



Yes or No

Yes >> Replace A/C control unit.
No >> Repair harness or connector.

Electrical Component Inspection

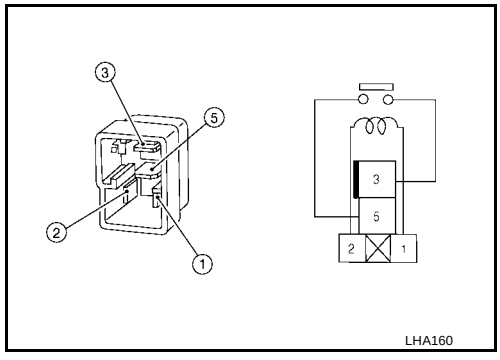
EJS001B6

A/C RELAY

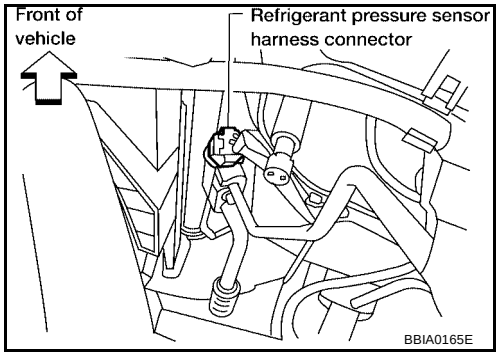
Check continuity between terminal Nos. 3 and 5.

Conditions	Continuity
12V direct current supply between terminal Nos. 1 and 2	Yes
No current supply	No

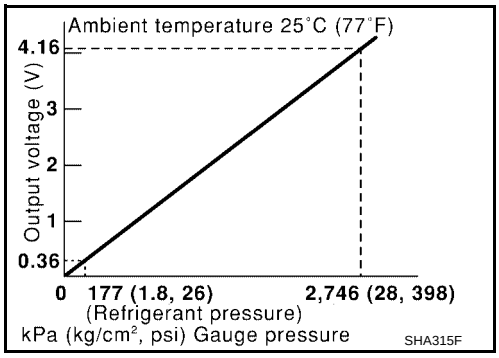
If NG, replace relay.



REFRIGERANT PRESSURE SENSOR



Make sure that higher A/C refrigerant pressure results in higher refrigerant pressure sensor output voltage.



INSUFFICIENT COOLING

PFP:00000

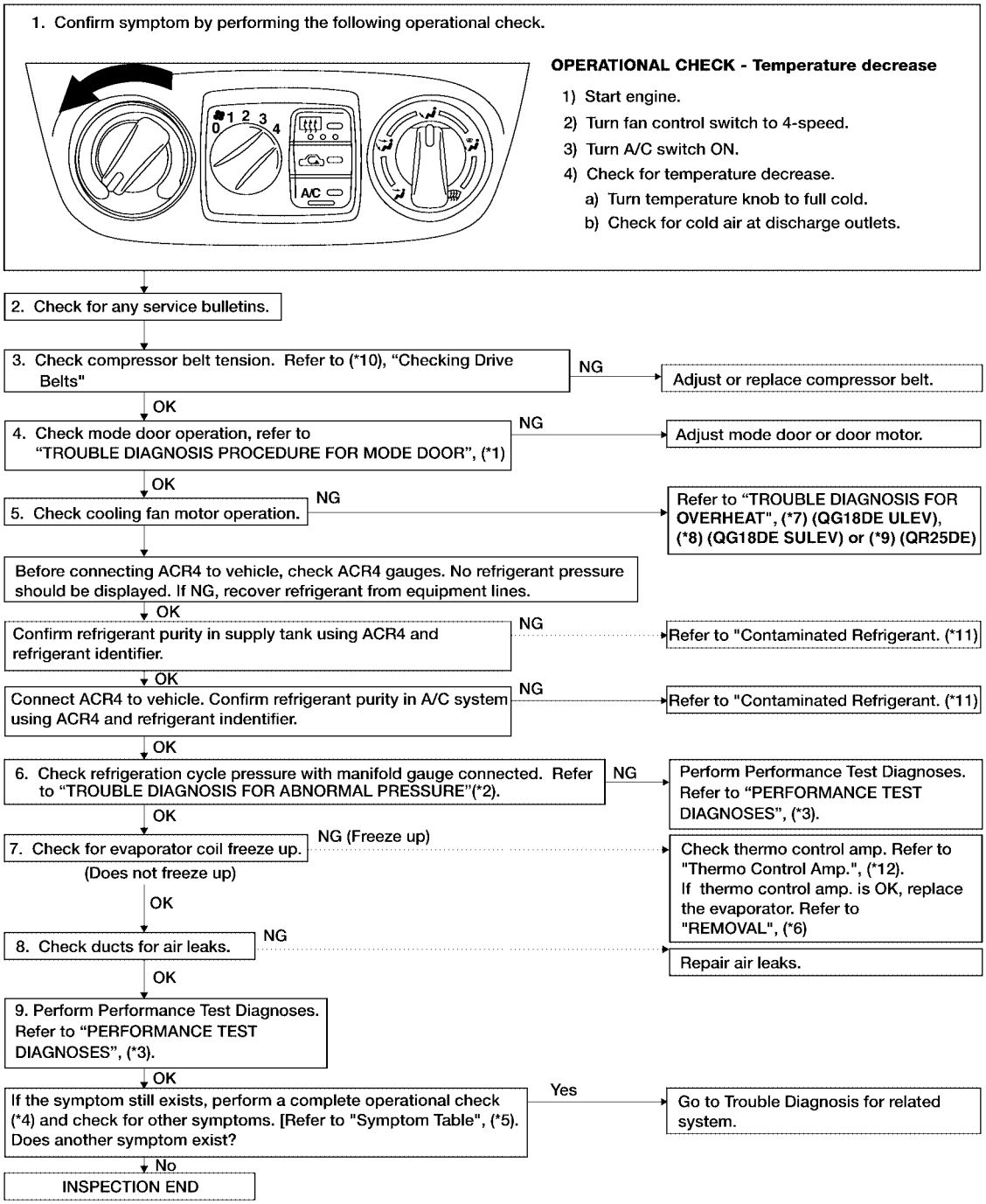
Trouble Diagnosis Procedure for Insufficient Cooling

EJS001B7

SYMPTOM:

- **Insufficient cooling**

INSPECTION FLOW

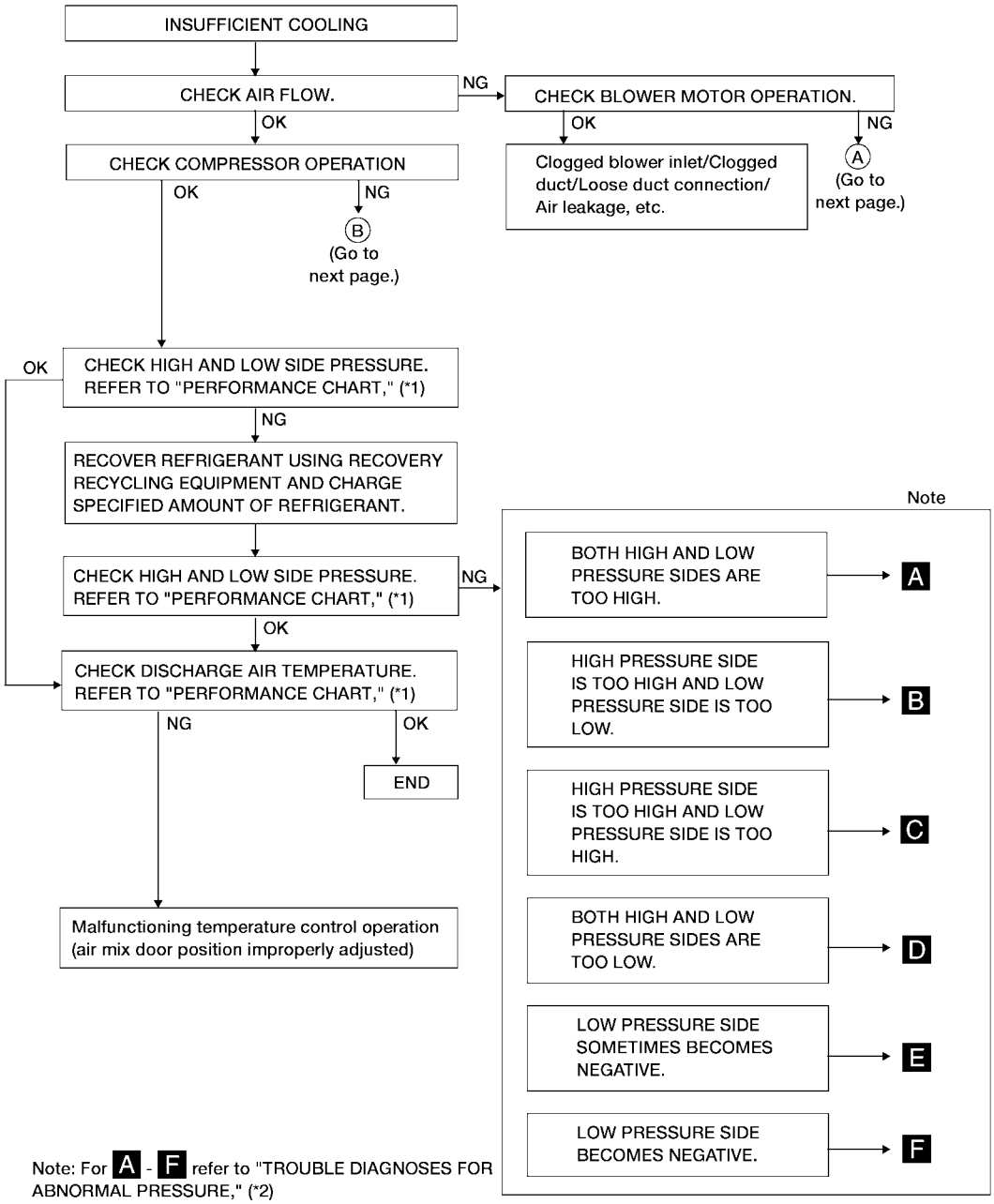


WJIA0262E

*1	MTC-42	*2	MTC-61	*3	MTC-58
*4	MTC-35	*5	MTC-34	*6	MTC-80
*7	EC-438	*8	EC-1009	*9	EC-1651
*10	MA-17 (QG18DE) or MA-24 (QR25DE)	*11	MTC-3	*12	MTC-66

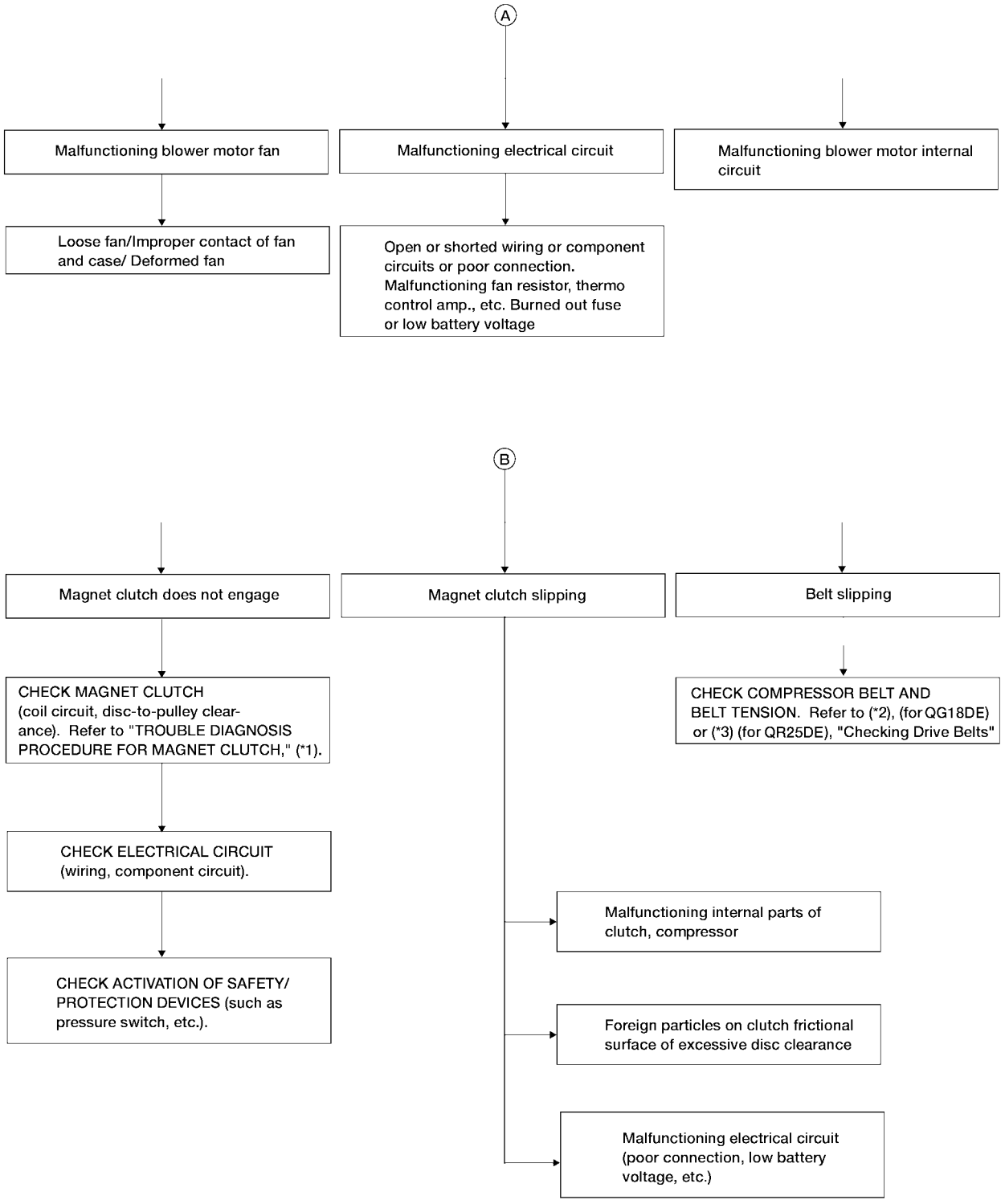
Performance Test Diagnoses

EJS001B8



LHA196

*1 MTC-60 *2 MTC-61



WJIA0008E

*1 MTC-51 *2 MA-16 *3 MA-23

Performance Chart

EJS001B9

The Nissan A/C system uses a thermal expansion valve to provide a restriction which causes a pressure change and also controls refrigerant flow through the evaporator.
The best way to diagnose a condition in the refrigerant system is to note the system pressures (shown by the manifold gauges) and the clutch cycle rate and times. Then, compare the findings to the charts.

- The system pressures are low (compressor suction) and high (compressor discharge).
- A clutch cycle is the time the clutch is engaged plus the time it is disengaged (time on plus time off).
- Clutch cycle times are the lengths of time (in seconds) that the clutch is ON and OFF.

TEST CONDITION

Testing must be performed as follows:

Vehicle location	Indoors or in the shade (in a well-ventilated place)
Doors	Closed
Door windows	Open
Hood	Open
TEMP. switch	Max. COLD
Mode switch	(Ventilation) set
REC switch	(Recirculation) set
(blower) speed	4-speed
Engine speed	1,500 rpm
Operate the air conditioning system for 10 minutes before taking measurements.	

TEST READING

Recirculating-to-Discharge Air Temperature Table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	6.6 - 8.3 (44 - 47)
	25 (77)	10.4 - 12.4 (51 - 54)
	30 (86)	14.2 - 16.7 (58 - 62)
	35 (95)	18.2 - 21 (65 - 70)
	40 (104)	22.0 - 25.2 (72 - 77)
60 - 70	20 (68)	8.3 - 9.8 (47 - 50)
	25 (77)	12.4 - 14.4 (54 - 58)
	30 (86)	16.7 - 18.9 (62 - 66)
	35 (95)	21.0 - 23.6 (70 - 74)
	40 (104)	25.2 - 28.1 (77 - 83)

Ambient Air Temperature-to-Operating Pressure Table

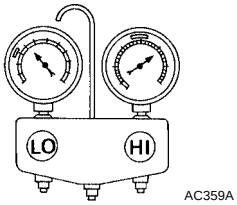
Ambient air		High-pressure (Discharge side) kPa (kg/cm^2 , psi)	Low-pressure (Suction side) kPa (kg/cm^2 , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	961 - 1,187 (9.8 - 12.1, 139 - 172)	108 - 157 (1.1 - 1.6, 16 - 23)
	25 (77)	1,295 - 1,599 (13.2 - 16.3, 186 - 228)	161.8 - 215.8 (1.65 - 2.2, 23.5 - 31.3)
	30 (86)	1,285 - 1,599 (13.1 - 16.0, 186 - 228)	167 - 216 (1.7 - 2.2, 24 - 31)
	35 (95)	1,520 - 1,863 (15.5 - 19.0, 220 - 279)	235 - 284 (2.4 - 2.9, 34 - 41)
	40 (104)	1,765 - 2,158 (18 - 22, 256 - 313)	289.3 - 353.1 (2.95 - 3.6, 41.9 - 51.2)

Trouble Diagnoses for Abnormal Pressure

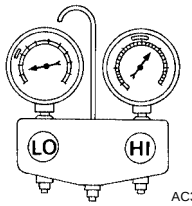
EJS001BA

Whenever system's high and/or low side pressure is abnormal, diagnose using a manifold gauge. The marker above the gauge scale in the following tables indicates the standard (normal) pressure range. However, since the standard (normal) pressure differs from vehicle to vehicle, refer to MTC-60, "Ambient Air Temperature-to-Operating Pressure Table" .

BOTH HIGH AND LOW-PRESSURE SIDES ARE TOO HIGH.

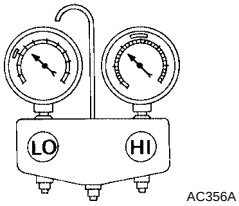
Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high and low-pressure sides are too high. A  AC359A	● Pressure is reduced soon after water is splashed on condenser.	Excessive refrigerant charge in refrigeration cycle	Reduce refrigerant until specified pressure is obtained.
	Air suction by cooling fan is insufficient.	Insufficient condenser cooling performance ↓ 1. Condenser fins are clogged. 2. Improper fan rotation of cooling fan	● Clean condenser. ● Check and repair cooling fan as necessary.
	● Low-pressure pipe is not cold. ● When compressor is stopped high-pressure value quickly drops by approximately 196 kPa (2 kg/cm^2 , 28 psi). It then decreases gradually thereafter.	Poor heat exchange in condenser (After compressor operation stops, high pressure decreases too slowly.) ↓ Air in refrigeration cycle	Evacuate repeatedly and recharge system.
	Engine tends to overheat.	Engine cooling systems malfunction.	Check and repair each engine cooling system.
	● An area of the low-pressure pipe is colder than areas near the evaporator outlet. ● Plates are sometimes covered with frost.	● Excessive liquid refrigerant on low-pressure side ● Excessive refrigerant discharge flow ● Expansion valve is open a little compared with the specification. ↓ 1. Improper thermal valve installation 2. Improper expansion valve adjustment	Replace expansion valve.

HIGH-PRESSURE SIDE IS TOO HIGH AND LOW-PRESSURE SIDE IS TOO LOW.

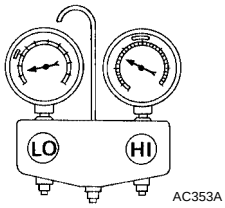
Gauge indication	Refrigerant cycle	Probable cause	Corrective action
High-pressure side is too high and low-pressure side is too low. B  AC360A	Upper side of condenser and high-pressure side are hot, however, liquid tank is not so hot.	High-pressure tube or parts located between compressor and condenser are clogged or crushed.	● Check and repair or replace malfunctioning parts. ● Check lubricant for contamination.

INSUFFICIENT COOLING

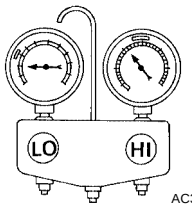
HIGH-PRESSURE SIDE IS TOO LOW AND LOW-PRESSURE SIDE IS TOO HIGH.

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
High-pressure side is too low and low-pressure side is too high. C  AC356A	High and low-pressure sides become equal soon after compressor operation stops.	Compressor pressure operation is improper. ↓ Damaged inside compressor packings	Replace compressor.
	No temperature difference between high and low-pressure sides	Compressor pressure operation is improper. ↓ Damaged inside compressor packings.	Replace compressor.

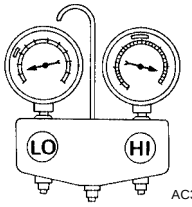
BOTH HIGH- AND LOW-PRESSURE SIDES ARE TOO LOW.

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high- and low-pressure sides are too low. D  AC353A	● There is a big temperature difference between receiver drier outlet and inlet. Outlet temperature is extremely low. ● Liquid tank inlet and expansion valve are frosted.	Compressor discharge capacity does not change. (Compressor stroke is set at maximum.)	● Replace liquid tank. ● Check lubricant for contamination.
	● Temperature of expansion valve inlet is extremely low as compared with areas near liquid tank. ● Expansion valve inlet may be frosted. ● Temperature difference occurs somewhere in high-pressure side	High-pressure pipe located between receiver drier and expansion valve is clogged.	● Check and repair malfunctioning parts. ● Check lubricant for contamination.
	● Expansion valve and liquid tank are warm or only cool when touched.	Low refrigerant charge ↓ Leaking fittings or components	Check refrigerant for leaks. Refer to MTC-86, "Checking Refrigerant Leaks" .
	There is a big temperature difference between expansion valve inlet and outlet while the valve itself is frosted.	Expansion valve closes a little compared with the specification. ↓ 1. Improper expansion valve adjustment 2. Malfunctioning thermal valve 3. Outlet and inlet may be clogged.	● Remove foreign particles by using compressed air. ● Check lubricant for contamination.
	An area of the low-pressure pipe is colder than areas near the evaporator outlet.	Low-pressure pipe is clogged or crushed.	● Check and repair malfunctioning parts. ● Check lubricant for contamination.
	Air flow volume is not enough or is too low.	Evaporator is frozen.	● Check intake sensor operation. Refer to MTC-66, "INTAKE SENSOR" . ● Replace expansion valve.

LOW-PRESSURE SIDE SOMETIMES BECOMES NEGATIVE.

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side sometimes becomes negative. E  AC354A	● Air conditioning system does not function and does not cyclically cool the compartment air. ● The system constantly functions for a certain period of time after compressor is stopped and restarted.	Refrigerant does not discharge cyclically. ↓ Moisture is frozen at expansion valve outlet and inlet. ↓ Water is mixed with refrigerant.	● Drain water from refrigerant or replace refrigerant. ● Replace liquid tank.

LOW-PRESSURE SIDE BECOMES NEGATIVE.

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side becomes negative. F  AC362A	Liquid tank or front/rear side of expansion valve's pipe is frosted or dewed.	High-pressure side is closed and refrigerant does not flow. ↓ Expansion valve or liquid tank is frosted.	Leave the system at rest until no frost is present. Start it again to check whether or not the problem is caused by water or foreign particles. ● If water is the cause, initially cooling is okay. Then the water freezes causing a blockage. Drain water from refrigerant or replace refrigerant. ● If due to foreign particles, remove expansion valve and remove particles with dry and compressed air (not shop air). ● If either of the above methods cannot correct the problem, replace expansion valve. ● Replace liquid tank. ● Check lubricant for contamination.

INSUFFICIENT HEATING

PFP:00000

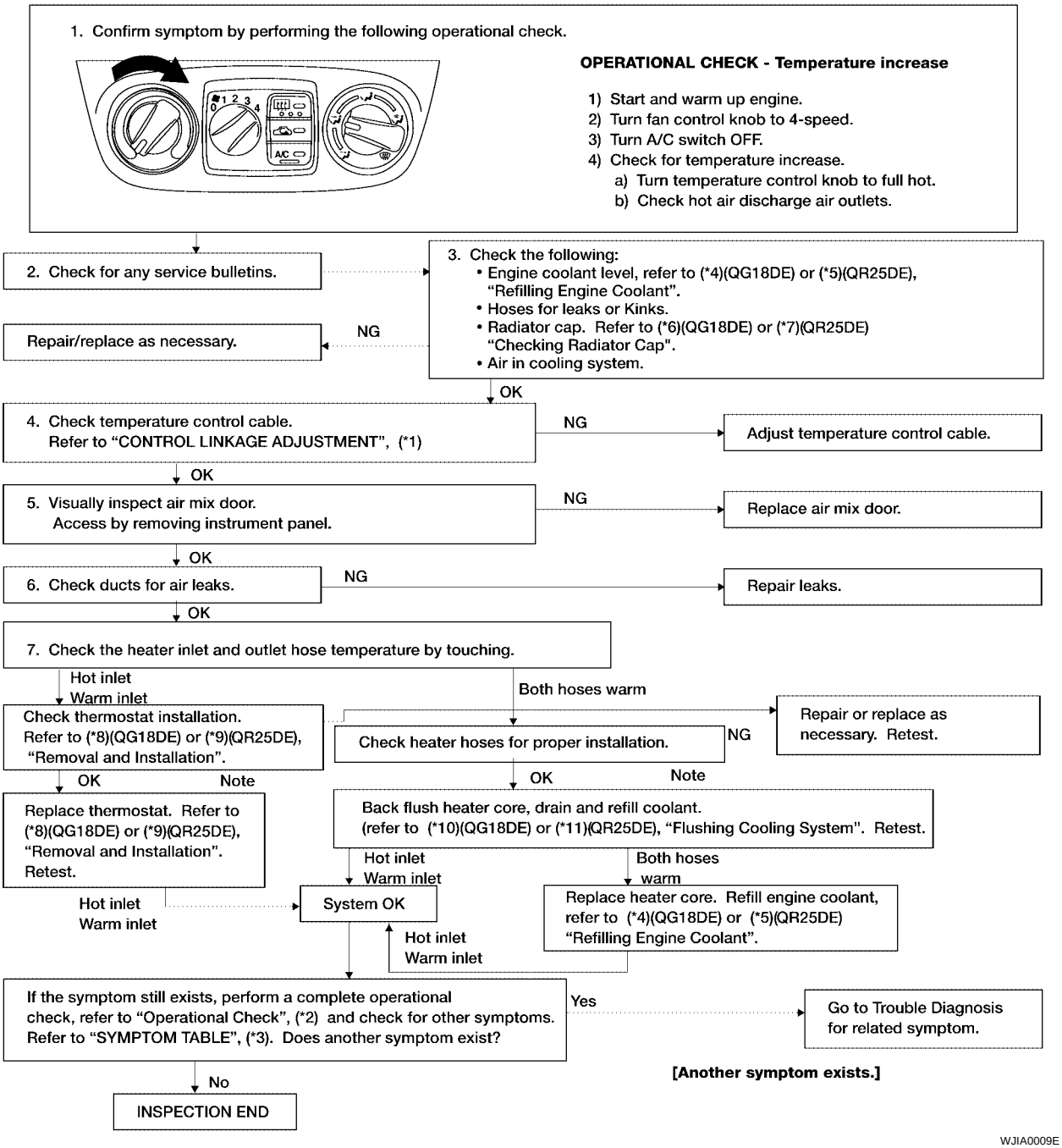
Trouble Diagnosis Procedure for Insufficient Heating

EJS001BB

Symptom:

- **Insufficient heating**

Inspection Flow



*1	MTC-41	*2	MTC-35	*3	MTC-34
*4	MA-17	*5	MA-24	*6	CO-8
*7	CO-34	*8	CO-11	*9	CO-28
*10	MA-18	*11	MA-25		

NOISE

PFP:00004

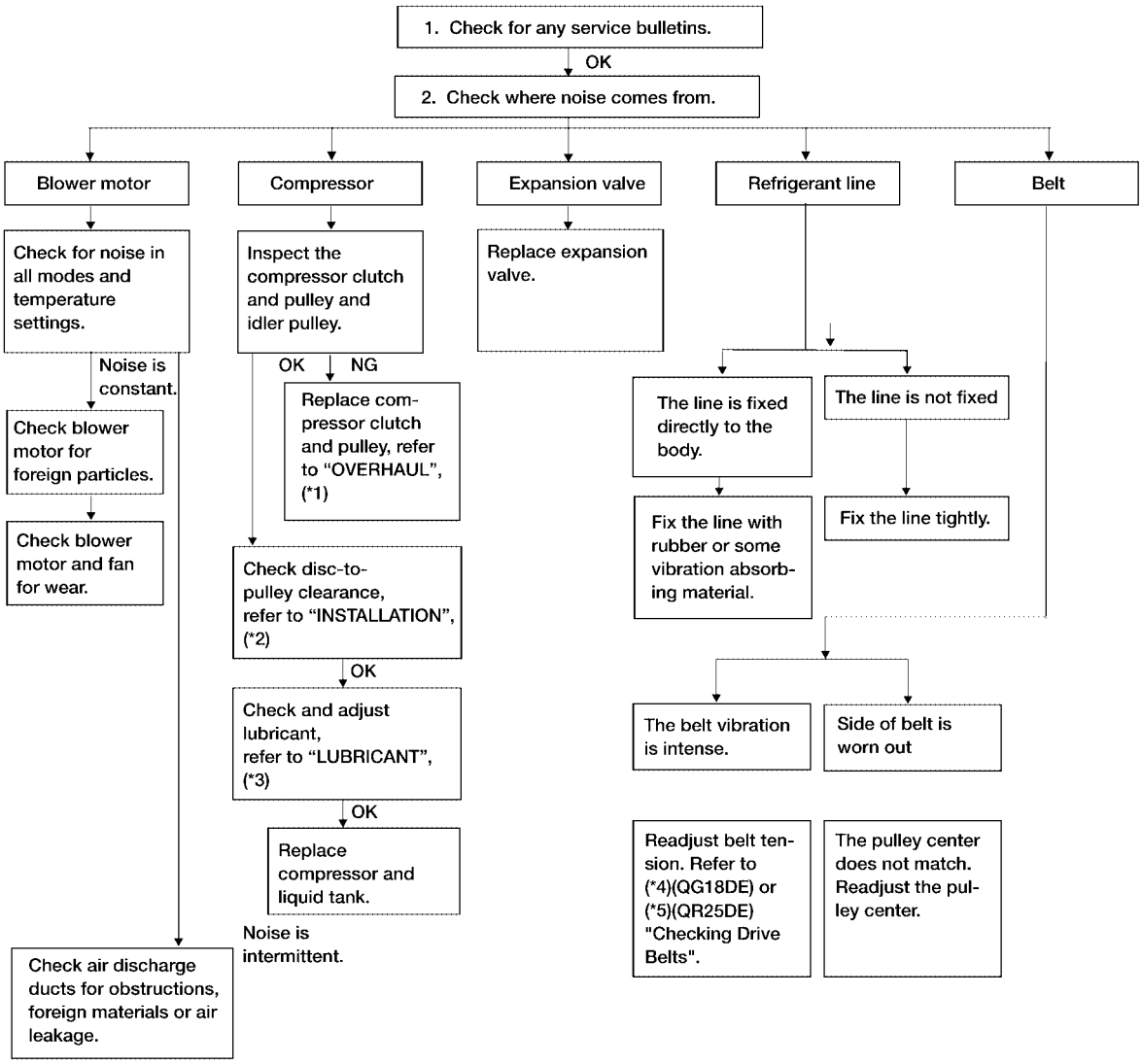
Trouble Diagnosis Procedure for Noise

EJS001BC

SYMPTOM:

- **Noise**

INSPECTION FLOW



WJIA0214E

*1 MTC-69 *2 MTC-72 *3 MTC-16

*4 MA-16 *5 MA-23

INTAKE SENSOR

PFP:27723

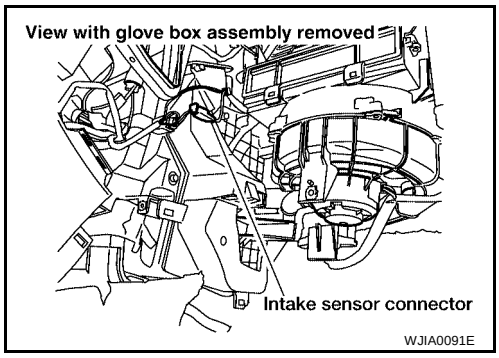
Intake Sensor Circuit

EJS001GW

COMPONENT DESCRIPTION

Intake Sensor

The intake sensor is located on the heater and cooling unit. It converts temperature of air after it passes through the evaporator into a resistance value which is then input to the A/C control unit.
After disconnecting intake sensor harness connector, measure resistance between terminals 1 and 2 at sensor harness side, using the table below.

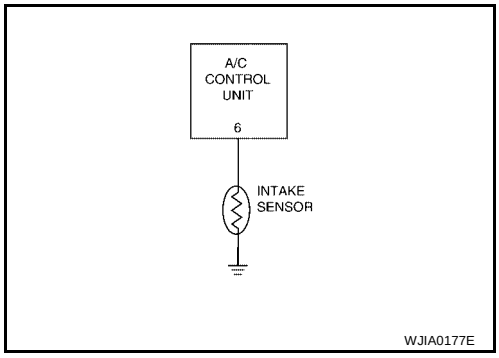


Temperature °C (°F)	Resistance kΩ
-15 (5)	12.34
-10 (14)	9.62
-5 (23)	7.56
0 (32)	6.00
5 (41)	4.80
10 (50)	3.87
15 (59)	3.15
20 (68)	2.57
25 (77)	2.12
30 (86)	1.76
35 (95)	1.47
40 (104)	1.23
45 (113)	1.04

If NG, replace intake sensor.

DIAGNOSTIC PROCEDURE

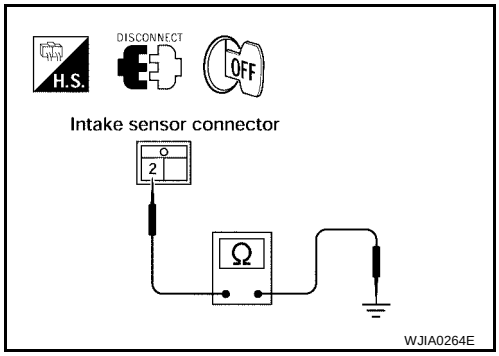
SYMPTOM: Intake sensor circuit is open or shorted.



1. CHECK INTAKE SENSOR CIRCUIT BETWEEN INTAKE SENSOR AND BODY GROUND

Disconnect intake sensor harness connector.

Terminals			Continuity
(+)		(–)	
Connector	Terminal No. (Wire color)	Body ground	Yes
M49	2 (B)		



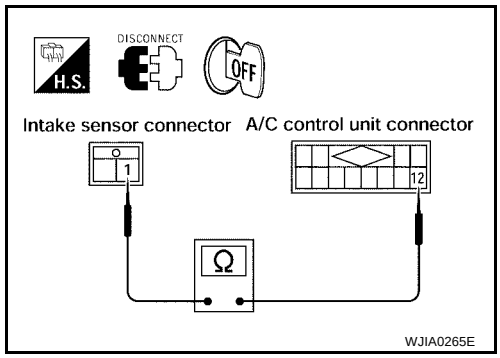
OK or NG

OK >> GO TO 2.
NG >> Repair harness or connector.

2. CHECK INTAKE SENSOR CIRCUIT BETWEEN INTAKE SENSOR AND A/C CONTROL UNIT

Disconnect A/C control unit harness connector.

Terminals				Continuity
(+)		(–)		
Connector	Terminal No. (Wire color)	Connector	Terminal No. (Wire color)	Yes
M49	1 (GY)	M32	12 (GY)	



OK or NG

OK >> GO TO 3.
NG >> Repair harness or connector.

3. CHECK INTAKE SENSOR

Refer to MTC-66, "Intake Sensor Circuit" .

OK or NG

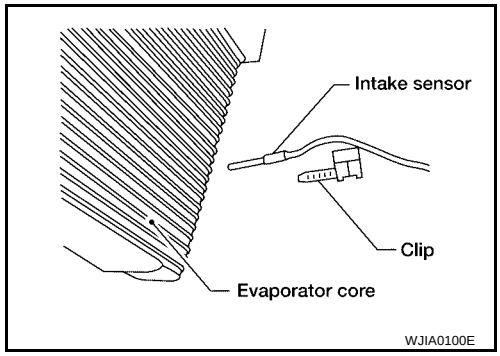
OK >> Replace A/C control unit.
NG >> Replace intake sensor.

Removal and Installation

EJS001GV

1. Remove the evaporator. Refer to MTC-80, "Removal" .
2. Remove the intake sensor clip and then the sensor.

CAUTION:
Be careful not to damage the core surface.

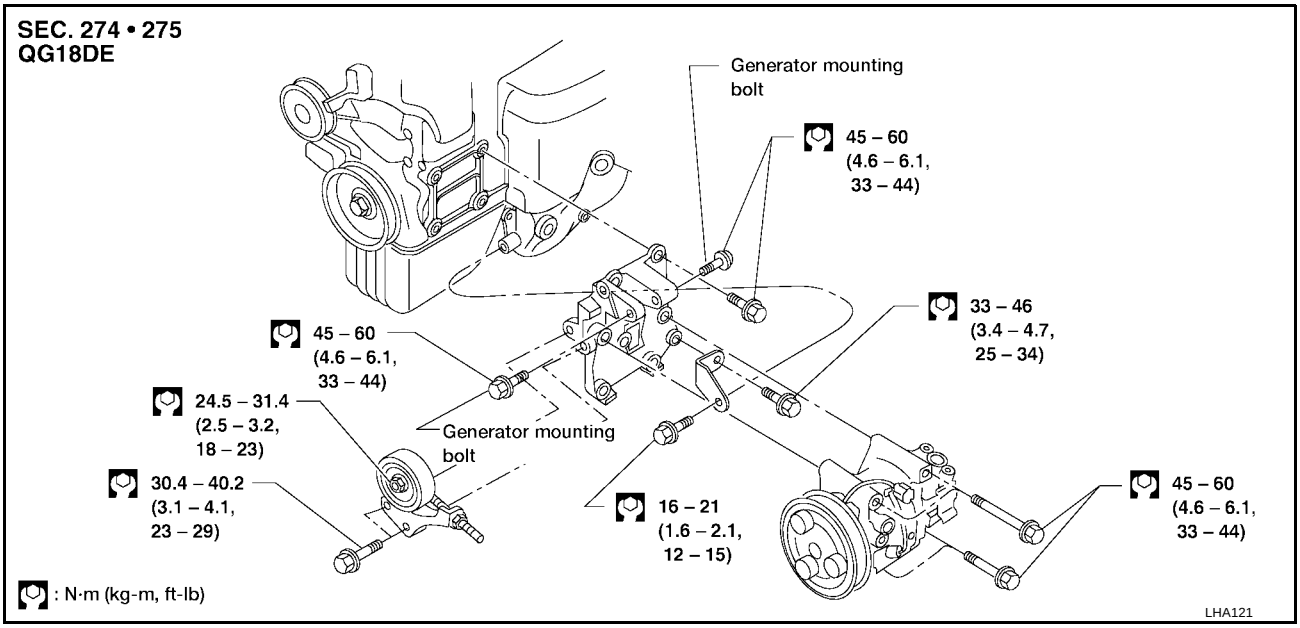


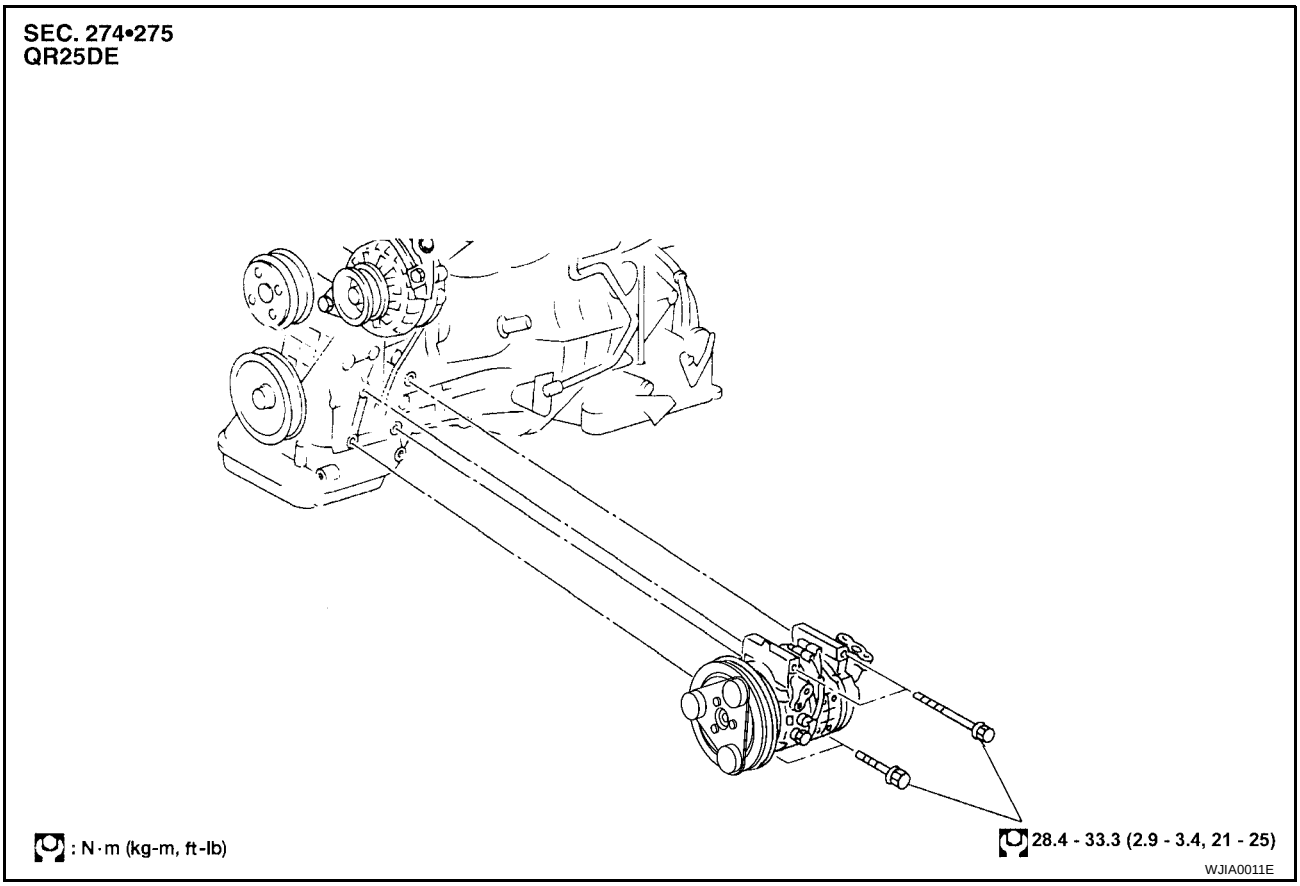
COMPRESSOR

PFP:92600

Removal and Installation

EJS001BD





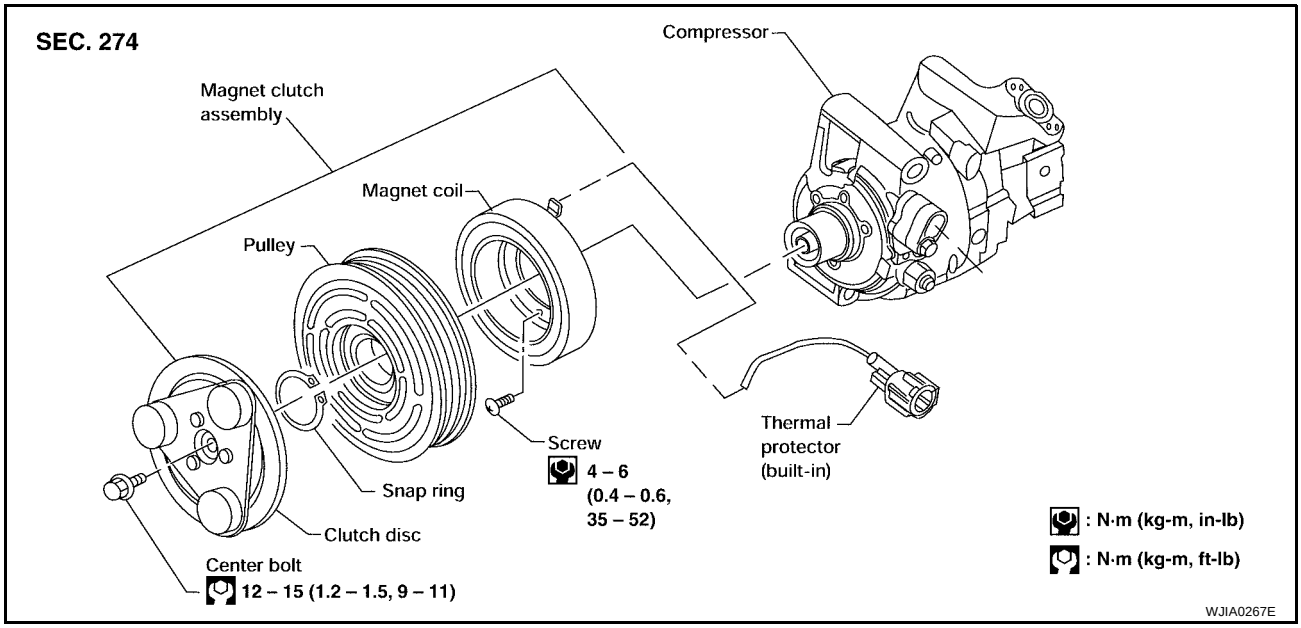
COMPRESSOR CLUTCH

PFP:92600

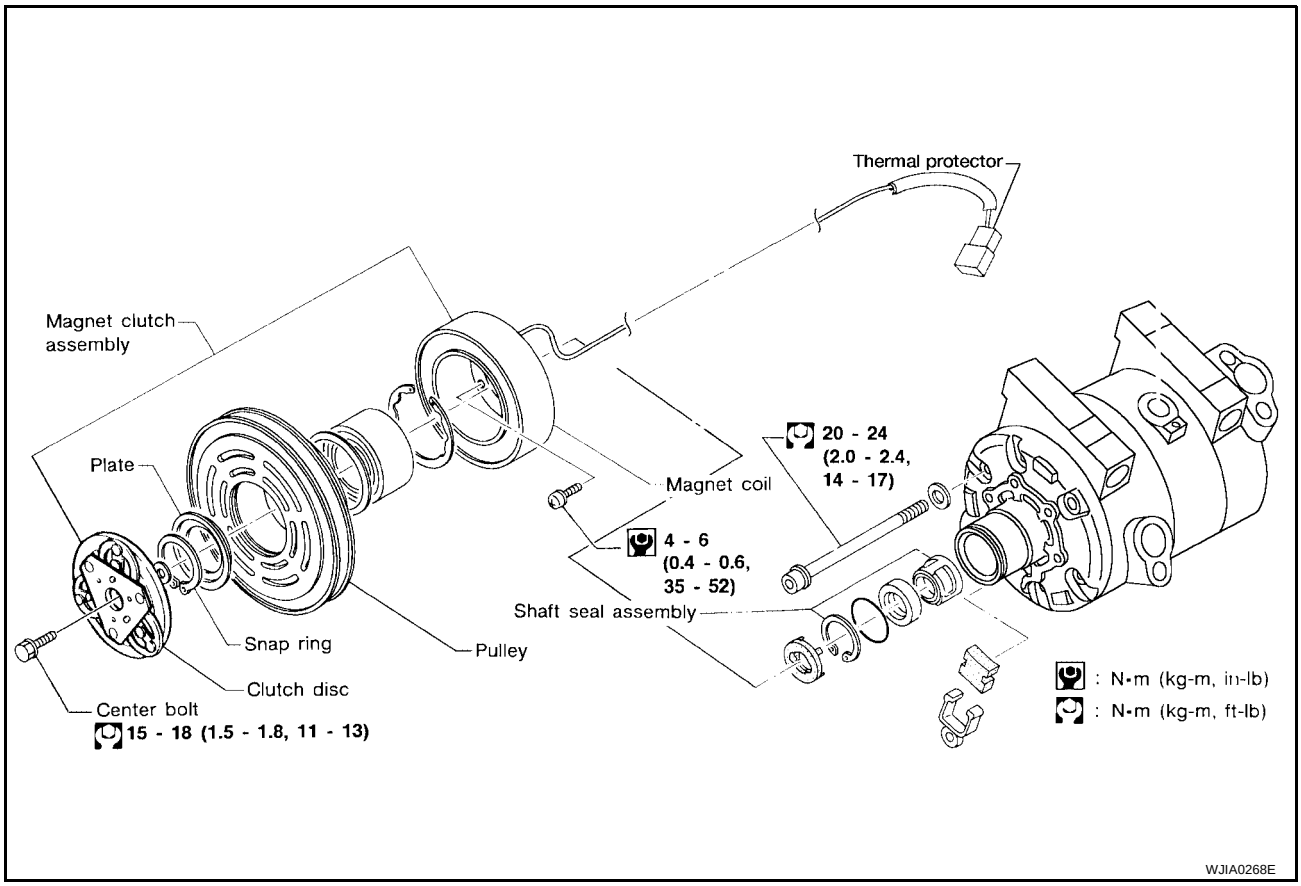
Overhaul

EJS001BE

QG18DE



QR25DE

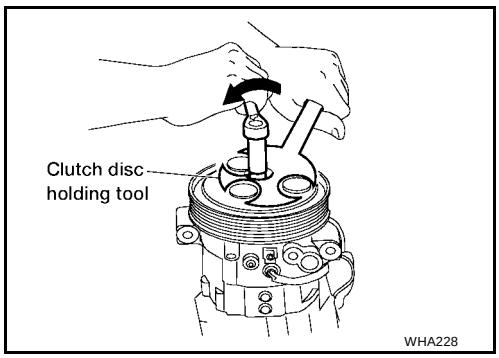


Removal

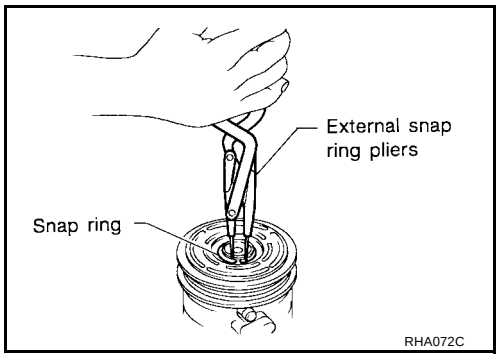
EJS001BF

QG18DE

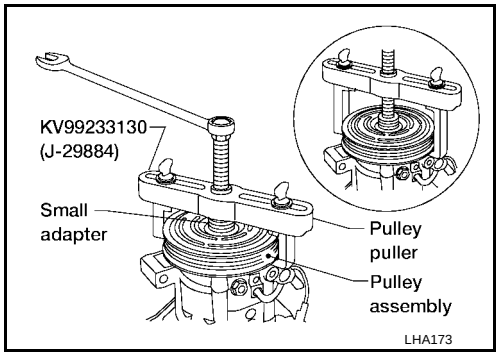
- When removing center bolt, hold clutch disc with clutch disc tool.
- Remove the clutch disc.
  Clutch disc holding tool:
  (J-44614) Commercial service tool

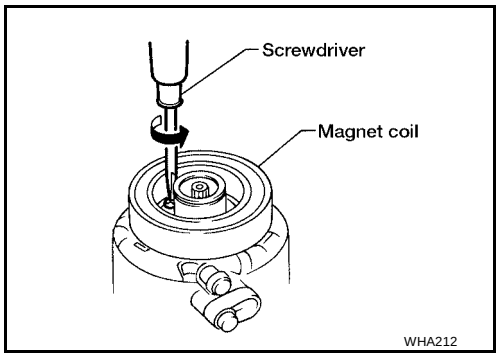


- Remove the snap ring using external snap ring pliers.



- Pulley removal:

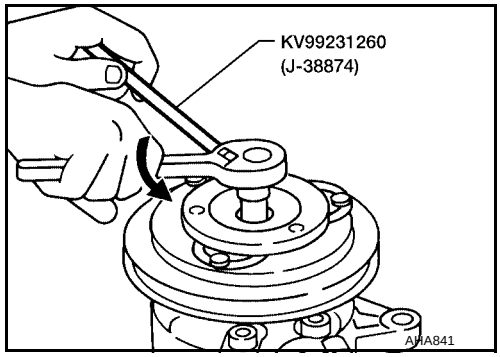


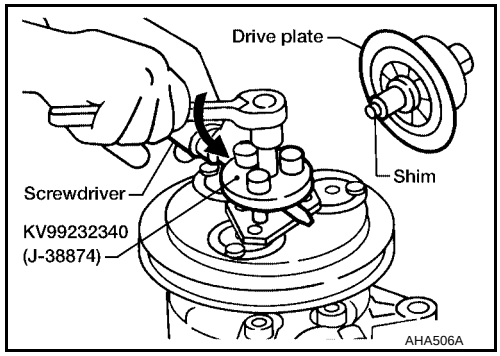


  Use a pulley puller with small adapter. Position the small adapter on the end of the drive shaft and the center of the puller on the small adapter. Remove the pulley assembly with the puller.
  To prevent deformation of the pulley groove, the puller claws should be hooked under (not into) the pulley groove.
- Remove the snap ring using external snap ring pliers.
- Remove the magnet coil harness clip using a screwdriver, the three magnet coil fixing screws and remove the magnet coil.

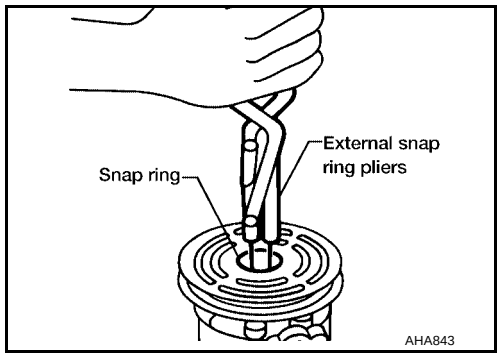
QR25DE

- When removing center bolt, hold clutch disc with clutch disc tool.
- Remove the drive plate using the clutch disc puller.
  Insert the holder's three pins into the drive plate. Rotate the holder clockwise to hook it onto the plate. Then tighten the center bolt to remove the drive plate.
  While tightening the center bolt, insert a round bar (screwdriver, etc.) between two of the pins (as shown in the figure) to prevent drive plate rotation. After removing the drive plate, remove the shims from either the drive shaft or the drive plate.

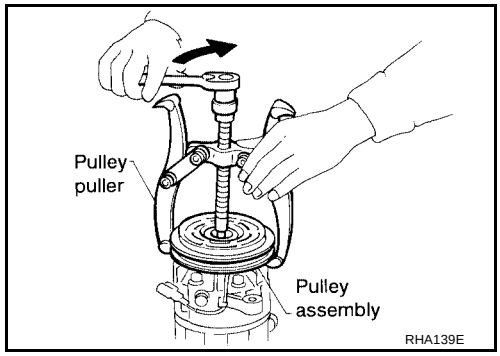




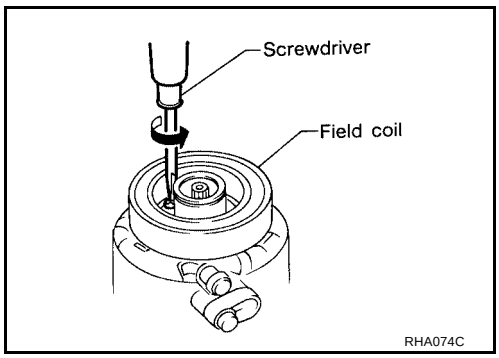
- Remove the snap ring using external snap ring pliers.



- For pulley removal, use pulley puller.
  Use a commercially available pulley puller. Position the center of the puller on the end of the drive shaft. Remove the pulley assembly with the puller.
  To prevent deformation of the pulley groove, the puller claws should be hooked under (not into) the pulley groove.
- Remove the field coil harness clip using a screwdriver.



- Remove the three field coil fixing screws and remove the field coil.

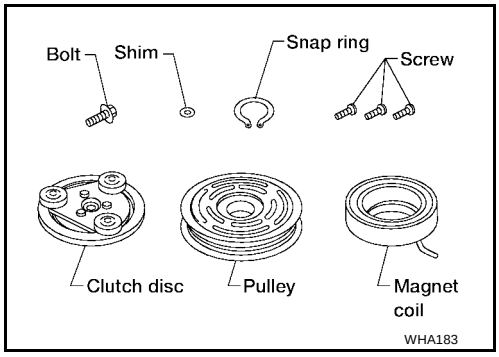


Inspection

EJS001BG

CLUTCH DISC

If the contact surface shows signs of damage due to excessive heat, replace clutch disc and pulley.



PULLEY

Check the appearance of the pulley assembly. If contact surface of pulley shows signs of excessive grooving, replace clutch disc and pulley. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

COIL

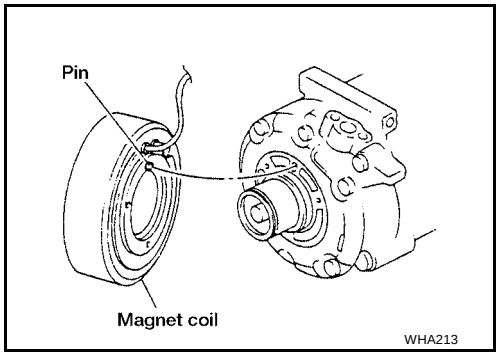
Check magnet coil for loose connection or cracked insulation.

Installation

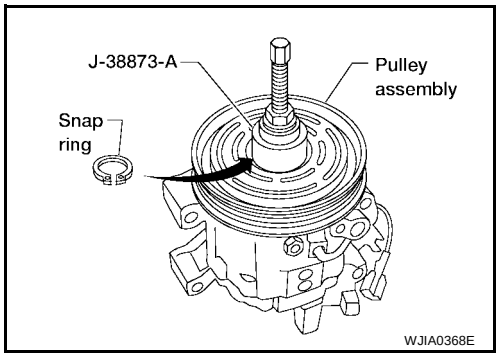
EJS001BH

QG18DE

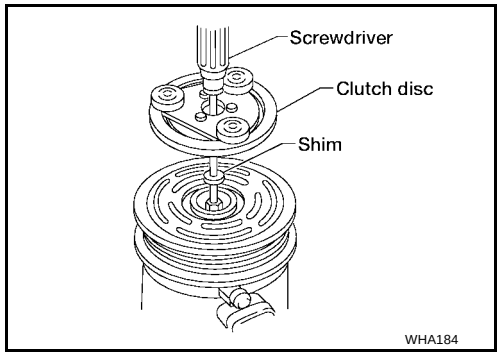
- Install the magnet coil.
  Be sure to align the magnet coil pin with the hole in the compressor front head.
- Install the magnet coil harness clip using a screwdriver.



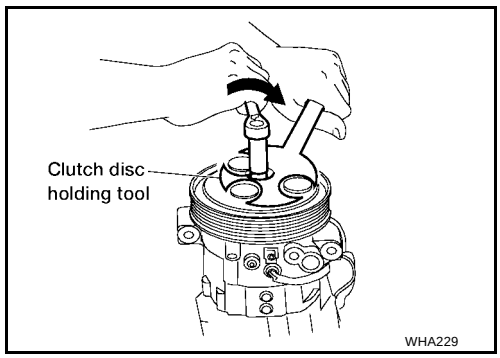
- Install the pulley assembly using the installer and a wrench, and then install the snap ring using snap ring pliers.



- Install the clutch disc on the drive shaft, together with the original shim(s). Press the clutch disc down using the drive plate installer.



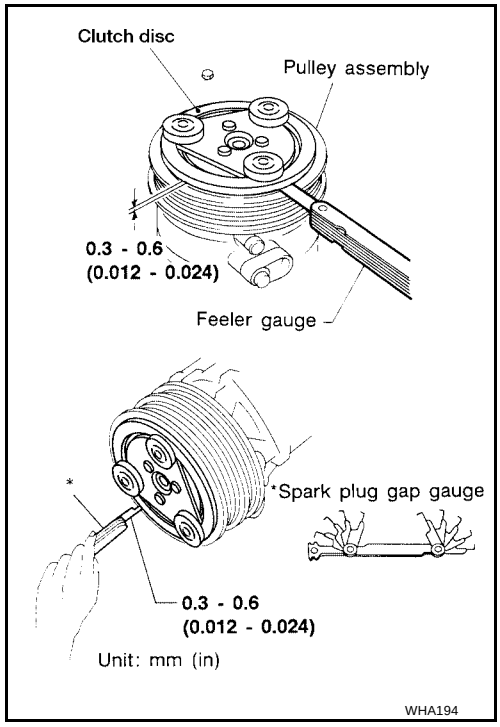
- Using the clutch disc tool to prevent clutch disc rotation, tighten the bolt to 12 to 15 N·m (1.2 to 1.5 kg-m, 9 to 11 ft-lb) torque.
- **After tightening the bolt, check that the pulley rotates smoothly.**



- Check clearance all the way around the clutch disc.

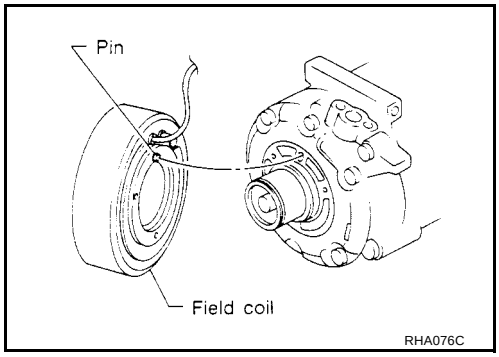
  Clutch disc-to-pulley clearance : 0.3 - 0.6 mm (0.012 - 0.024 in)

  If the specified clearance is not obtained, replace adjusting spacer and readjust.

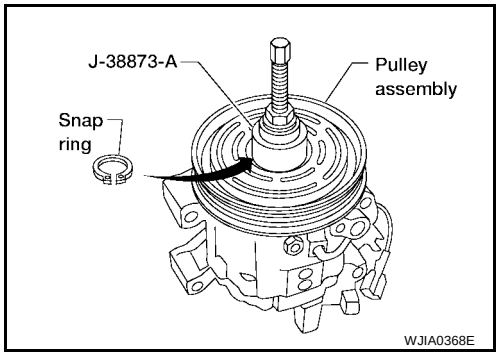


QR25DE

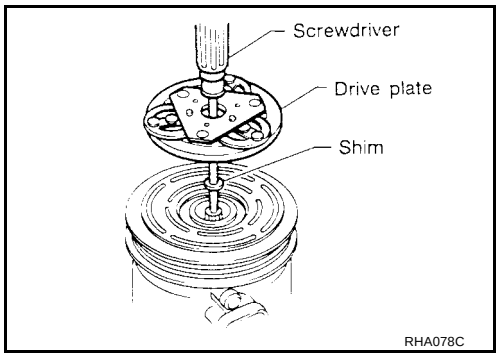
- Install the field coil.
  Be sure to align the magnet coil pin with the hole in the compressor front head.
- Install the magnet coil harness clip using a screwdriver.



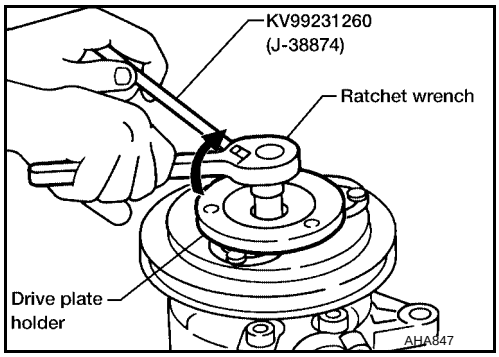
- Install the pulley assembly using the installer, and then install the snap ring using snap ring pliers.



- Install the drive plate on the drive shaft, together with the original shim(s). Press the drive plate down with the installer.



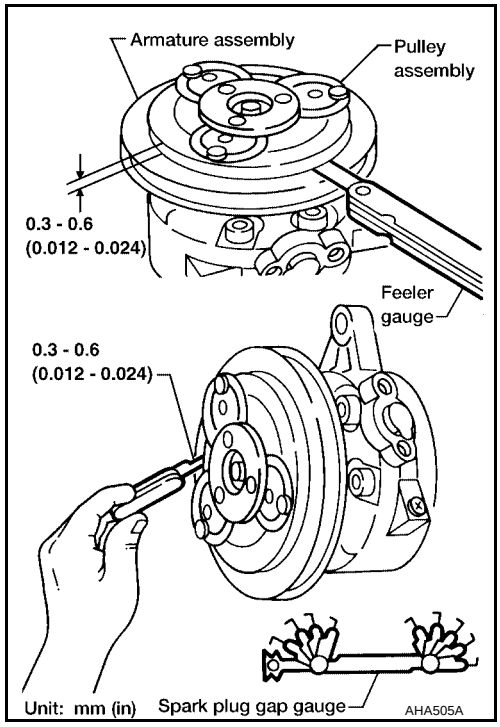
- Using the holder to prevent clutch disc rotation, tighten the bolt to 12 to 15 N-m (1.2 to 1.5 kg-m, 9 to 11 ft-lb) torque.
- **After tightening the bolt, check that the pulley rotates smoothly.**



- Check clearance all the way around the clutch disc.

  Clutch disc-to-pulley clearance : 0.3 - 0.6 mm (0.012 - 0.024 in)

  If the specified clearance is not obtained, replace adjusting spacer and readjust.



Break-In Operation

EJS001BI

When replacing compressor clutch assembly, always conduct the break-in operation. This is done by engaging and disengaging the clutch about 30 times. Break-in operation raises the level of transmitted torque.

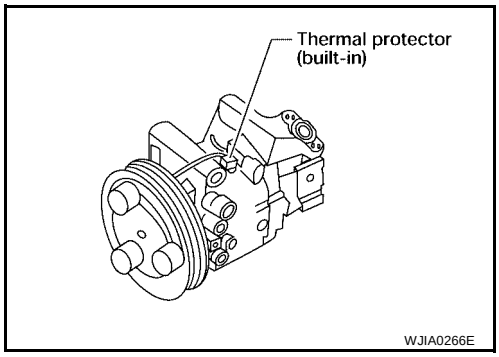
THERMAL PROTECTOR

PFP:27631

Inspection

EJS001BJ

- Check continuity between terminal and ground.



IN-CABIN MICROFILTER

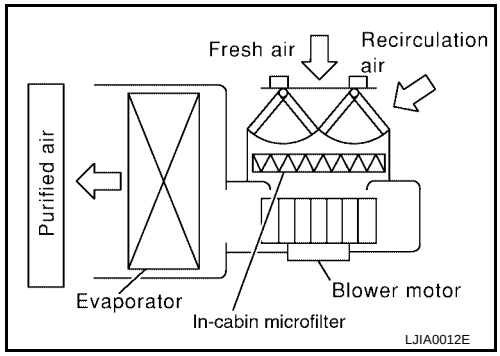
PFP:27277

Removal and Installation

EJS001GX

FUNCTION

Air inside passenger compartment is kept clean at either recirculation or fresh mode by installing in-cabin microfilter into blower unit.

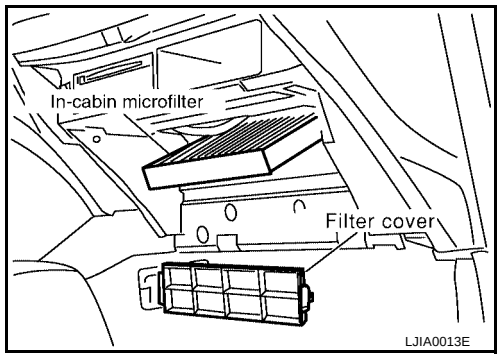


REPLACEMENT TIMING

Refer to MA-7, "Schedule 1" or MA-11, "Schedule 2" .
Caution label is affixed inside the glove box.

REPLACEMENT PROCEDURES

1. Remove glove box assembly. Refer to IP-10, "Removal and Installation" .
2. Remove in-cabin microfilter cover.
3. Remove the in-cabin microfilter from blower unit.
4. Replace with new in-cabin microfilter and reinstall cover on blower unit.
5. Reinstall glove box assembly.

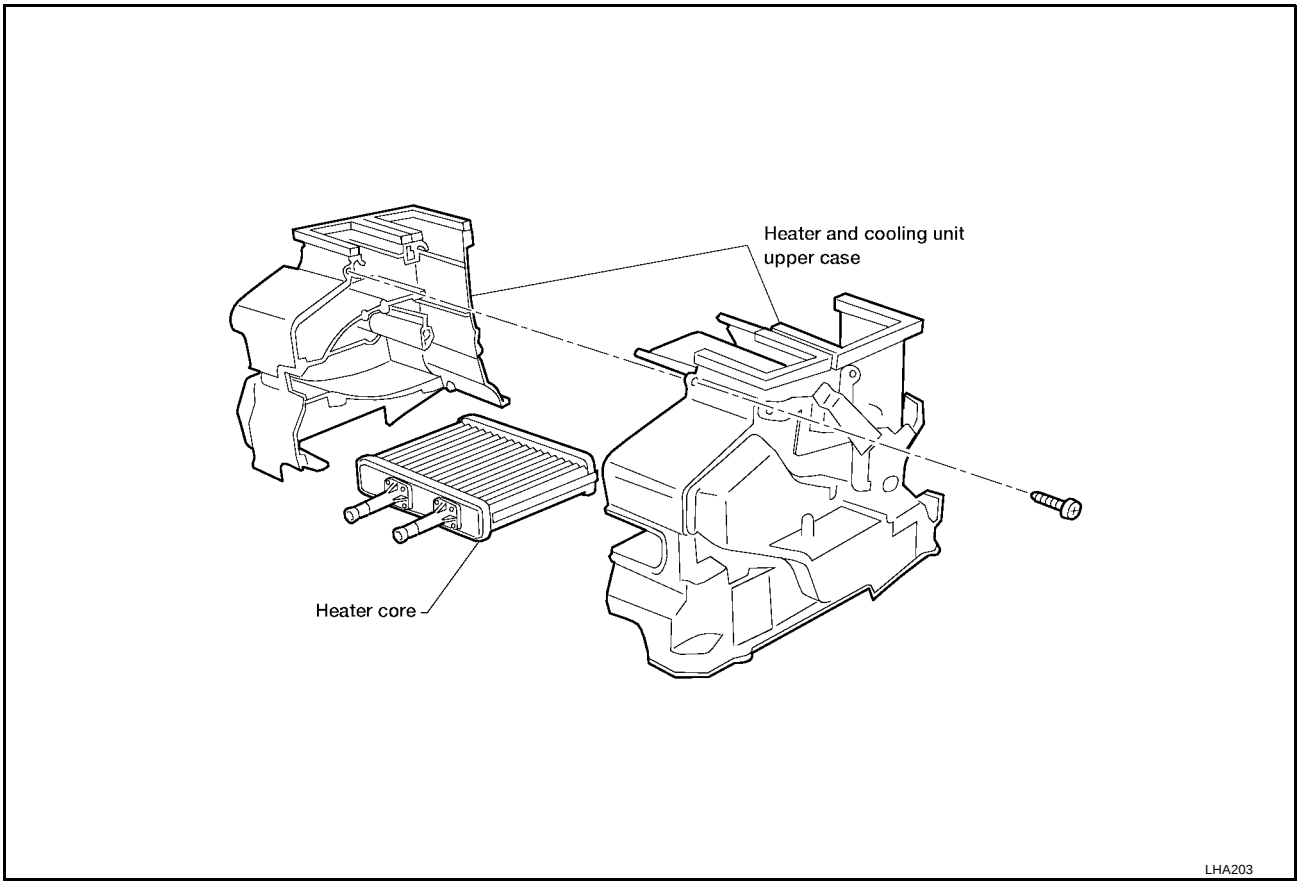


HEATER & COOLING UNIT (HEATER CORE)

PFP:27110

Removal

EJS001BK



1. Drain the cooling system. Refer to MA-16, "DRAINING ENGINE COOLANT" (QG18DE), or MA-23, "DRAINING ENGINE COOLANT" (QR25DE).
2. Discharge the A/C system. Refer to MTC-82, "Discharging Refrigerant" .
3. Disconnect the two heater hoses from inside the engine compartment.
4. Remove the instrument panel assembly and steering member assembly. Refer to IP-10, "INSTRUMENT PANEL ASSEMBLY" .
5. Remove the heater unit.
6. Remove the heater core.

Installation

EJS001BL

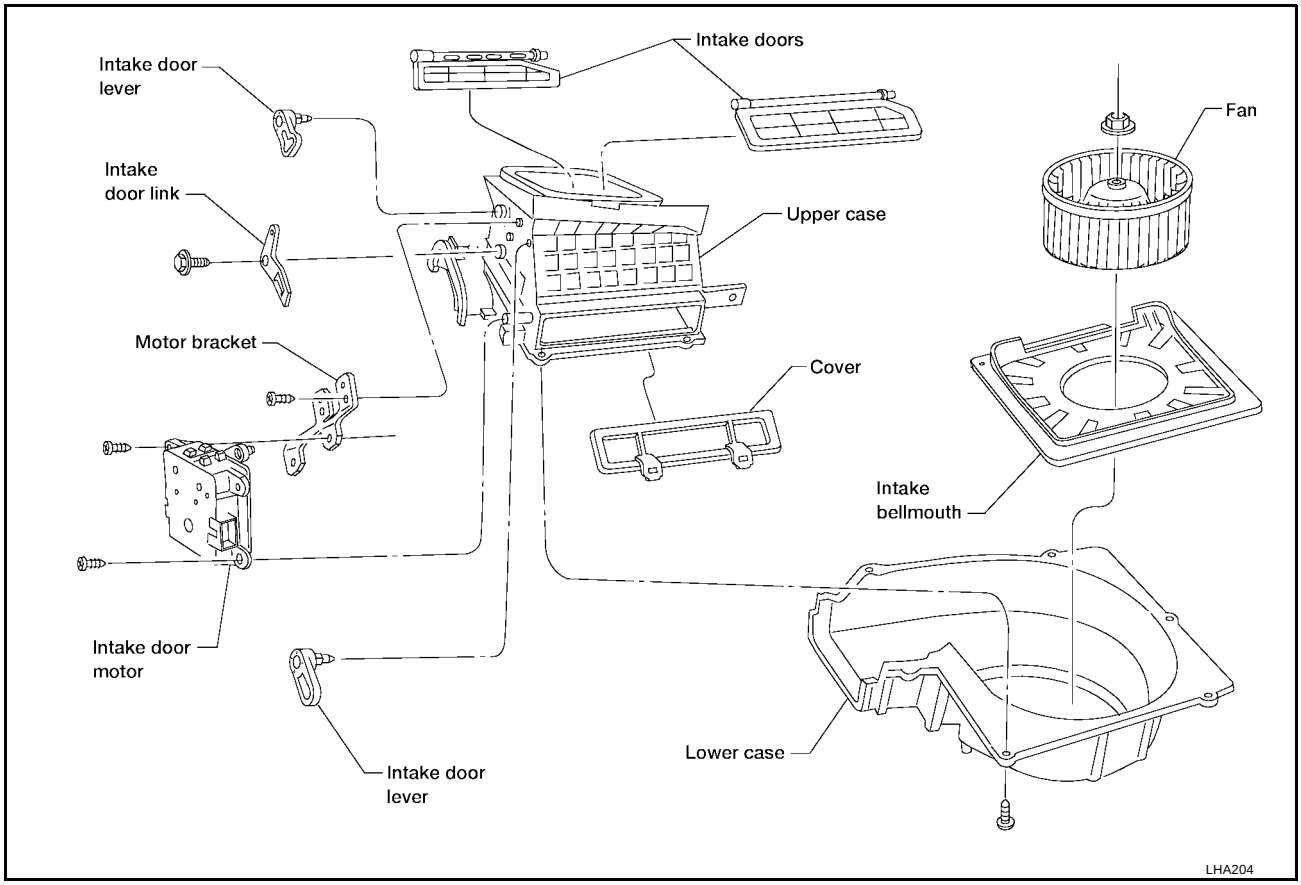
Install in the reverse order of removal.
When filling radiator with coolant, refer to MA-16, "DRAINING ENGINE COOLANT" (QG18DE), or MA-23, "DRAINING ENGINE COOLANT" (QR25DE).
Recharge the A/C system. Refer to MTC-82, "Evacuating System and Charging Refrigerant" .

BLOWER UNIT

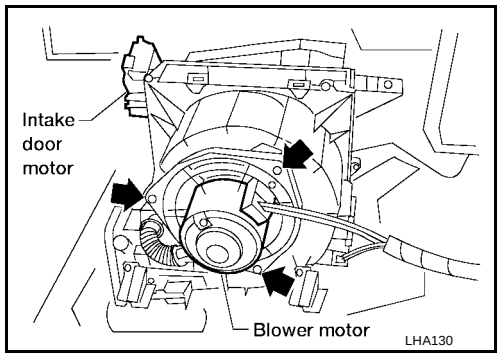
PFP:27200

Removal

EJS001BM



1. Discharge the A/C system. Refer to MTC-82, "Discharging Refrigerant" .
2. Disconnect the two refrigerant lines from the engine compartment.
   Cap the A/C lines to prevent moisture from entering the system.
3. Remove the glove box and mating trim. Refer to IP-10, "Removal and Installation" .
4. Remove cooling unit. Refer to MTC-80, "Removal" .
5. Disconnect the resistor and blower motor connector.
6. Remove blower unit.
7. Remove the three bolts and then remove the motor from the blower case.



Installation

EJS001BN

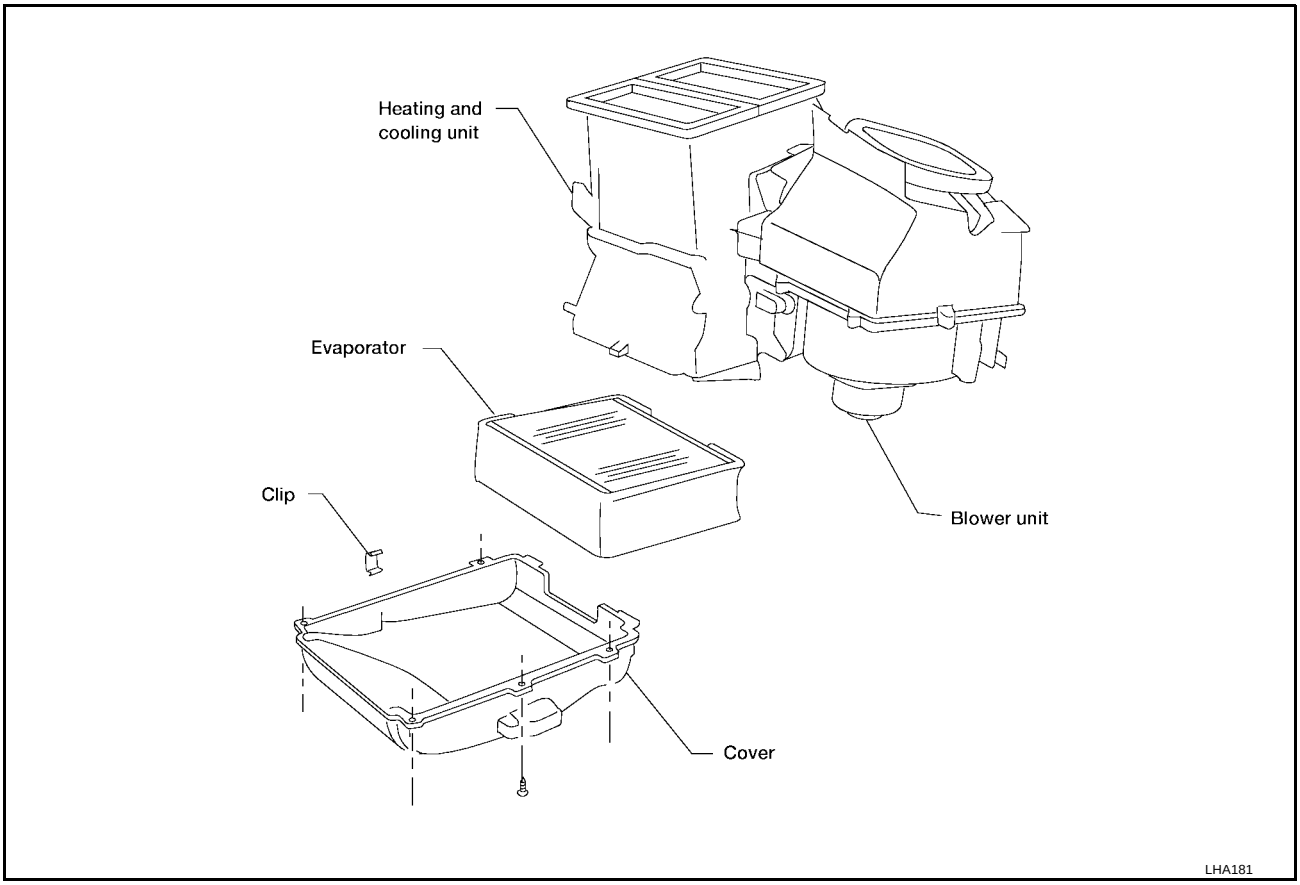
Install in the reverse order of removal.
Recharge the A/C system. Refer to MTC-82, "Evacuating System and Charging Refrigerant" .

A/C EVAPORATOR

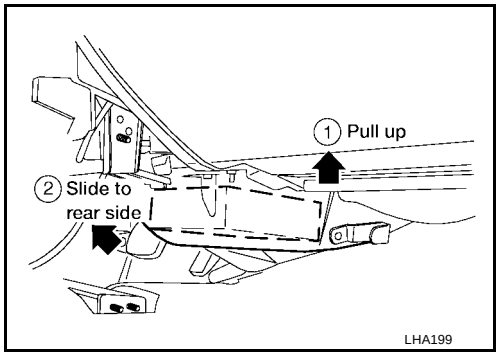
PFP:27280

Removal

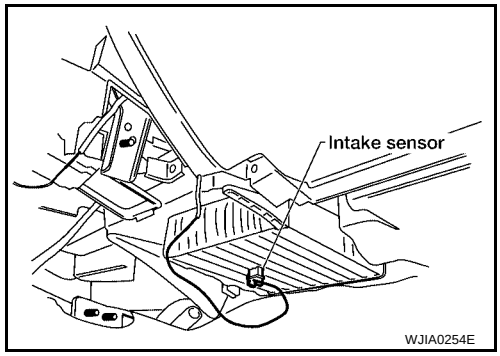
EJS001BO



1. Discharge the A/C system. Refer to MTC-82, "Discharging Refrigerant" .
2. Remove clamp bolt and remove low-pressure and high-pressure lines from cooling unit (expansion valve). Remove lines from retaining clip on dash panel and move lines away from dash panel for clearance.
3. Install caps over cooling unit (expansion valve) ports and lines.
4. Remove both side front console side covers.
5. Remove passenger side instrument panel lower cover and left lower instrument cover clip (from blower case).
6. Remove center console.
7. Remove instrument stay assemblies LH and RH.
8. Remove floor air duct risers on the right and left sides of the console front brackets (if equipped).
9. Disconnect cooling unit drain hose from lower cooling unit cover.
10. Remove five screws and clip from heating and cooling unit lower cover.
11. Drop lower cover as far as possible, reach inside of case and slide evaporator core rearward away from dash panel as far as possible so that rear of evaporator core slides up on case retaining tabs. Evaporator core may be pushed from engine compartment to ease movement. (This provides clearance at the front of the unit so that the cover can be removed).
12. Remove lower cover.



13. Mark installation point of intake sensor and remove intake sensor from evaporator core.
14. Remove evaporator core from case by sliding forward off of case retaining tabs.
15. Remove expansion valve from evaporator core (if necessary).



Installation

EJS001BP

Installation is the reverse of removal*.
Recharge the A/C system. Refer to MTC-82, "Evacuating System and Charging Refrigerant" .
*: When installing lower cover to cooling unit case, ensure that the thermo probe is in the same location as originally installed, and that the intake sensor wire is properly positioned in case slot.

NOTE:
Be sure that the evaporator core is fully seated against the dash panel before securing lower cover.

REFRIGERANT LINES

PFP:92600

HFC-134a (R-134a) Service Procedure

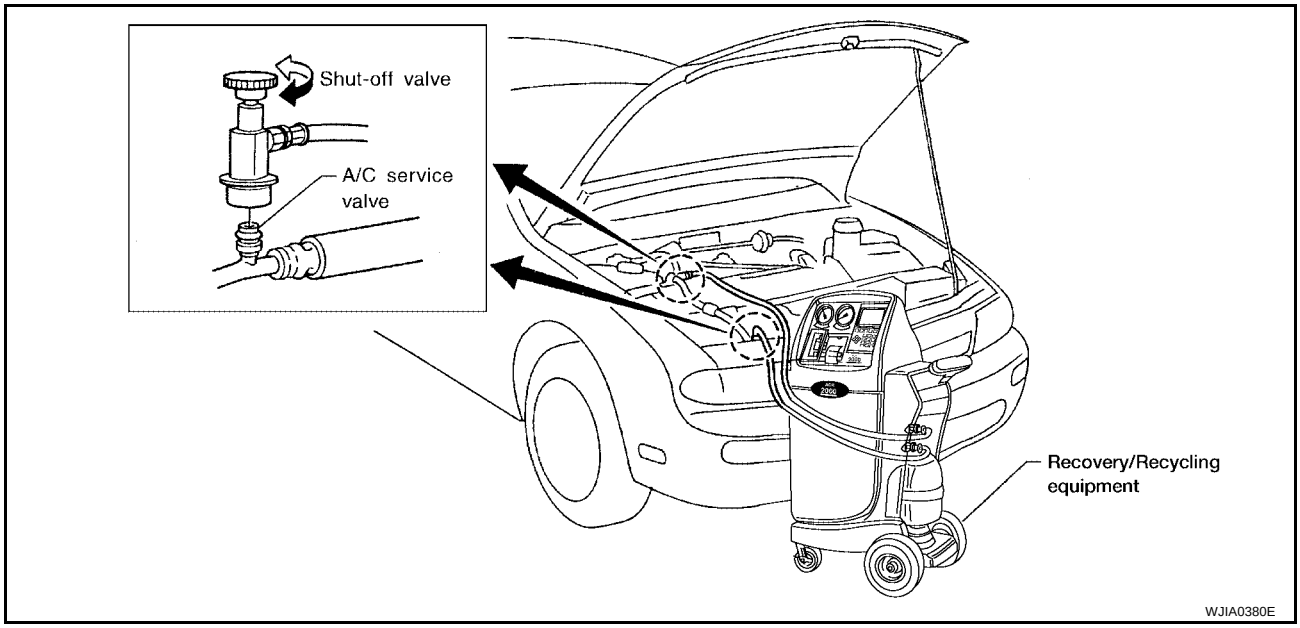
EJS001BQ

SETTING OF SERVICE TOOLS AND EQUIPMENT

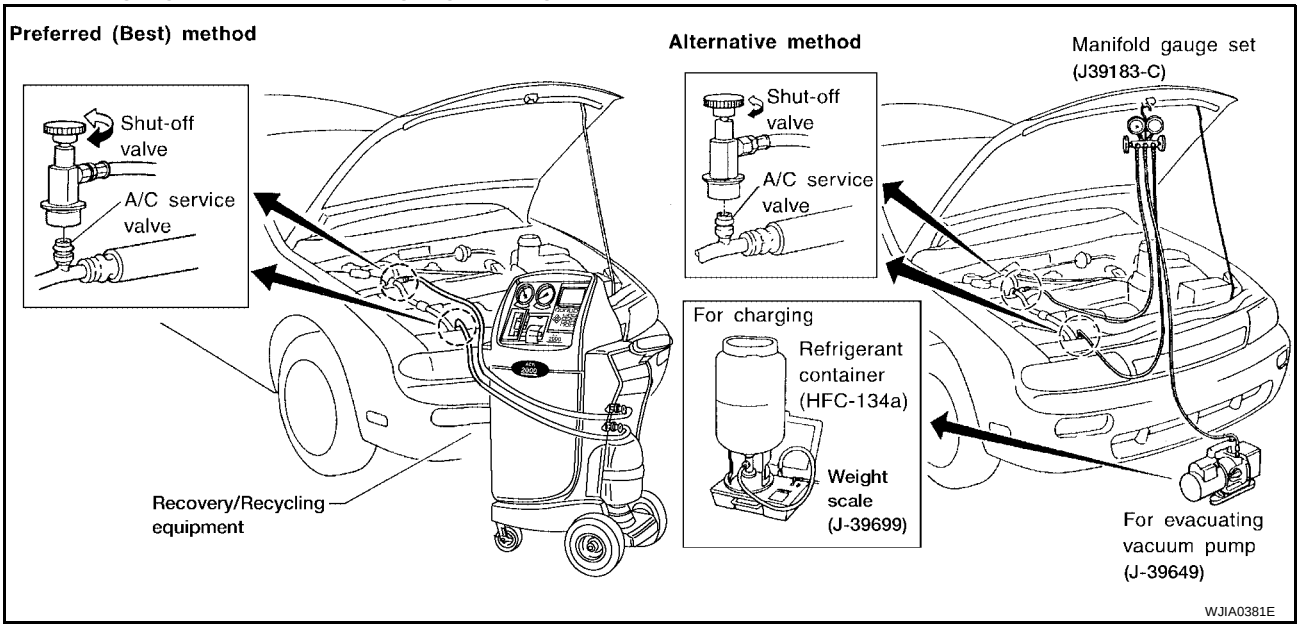
Discharging Refrigerant

WARNING:

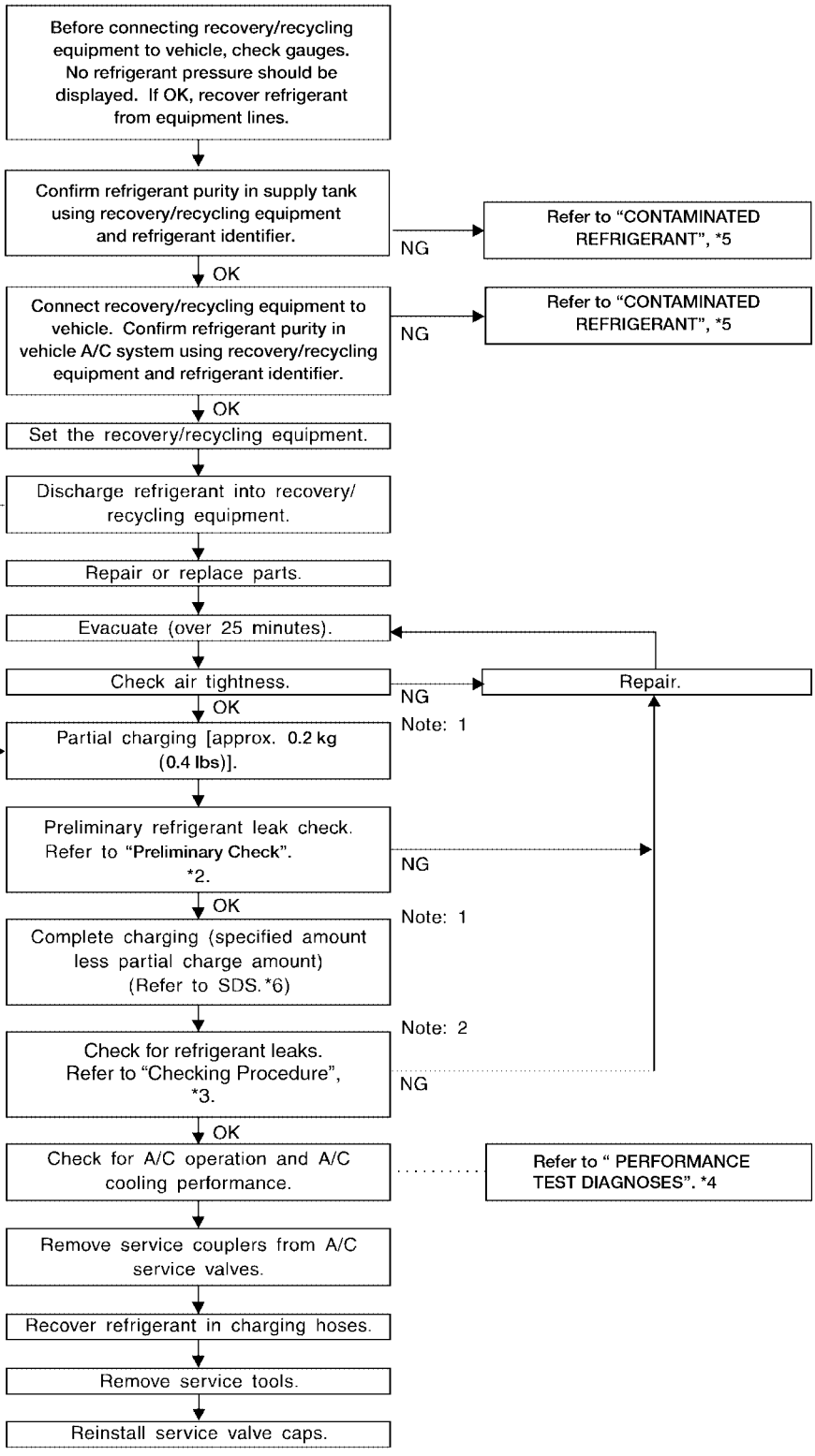
Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Remove HFC-134a (R-134a) from A/C system using certified service equipment meeting requirements of SAE J2210 (R-134a recycling equipment) or J2209 (R-134a recovery equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.



Evacuating System and Charging Refrigerant



Recovered lubricant. Refer to "CHECKING AND ADJUSTING", *1.



Note: 1 Before charging refrigerant, ensure engine is off.
Note: 2 Befofe checking for leaks, start engine to activate air conditioning system then turn engine off. Service valve caps must be installed to prevent leakage.

WJIA0382E

*1 MTC-16 *2 MTC-86 *3 MTC-87
*4 MTC-58 *5 MTC-3 *6 MTC-91

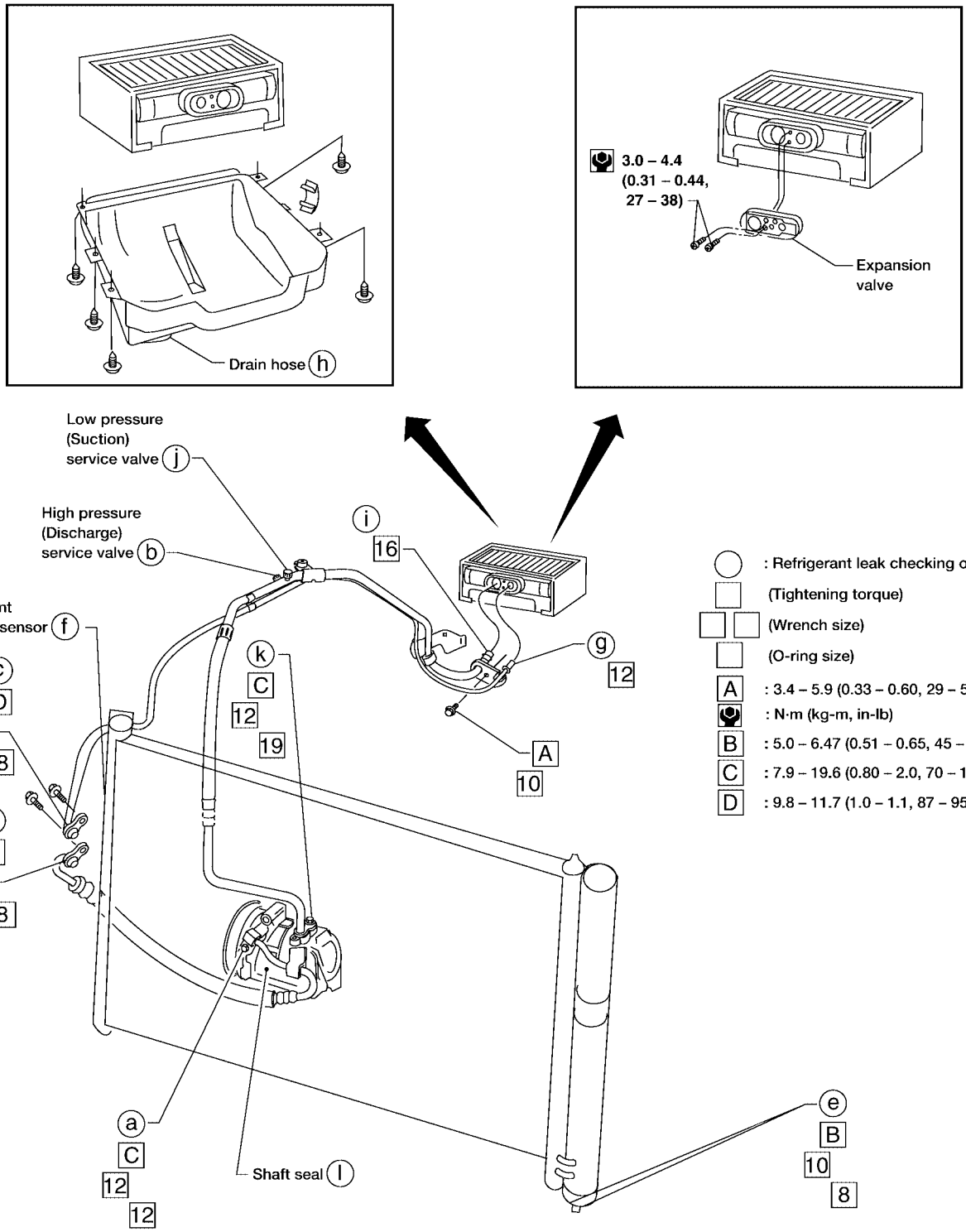
Removal and Installation

EJS001BR

- Refer to MTC-5, "Precautions for Refrigerant Connection" .

QG18DE

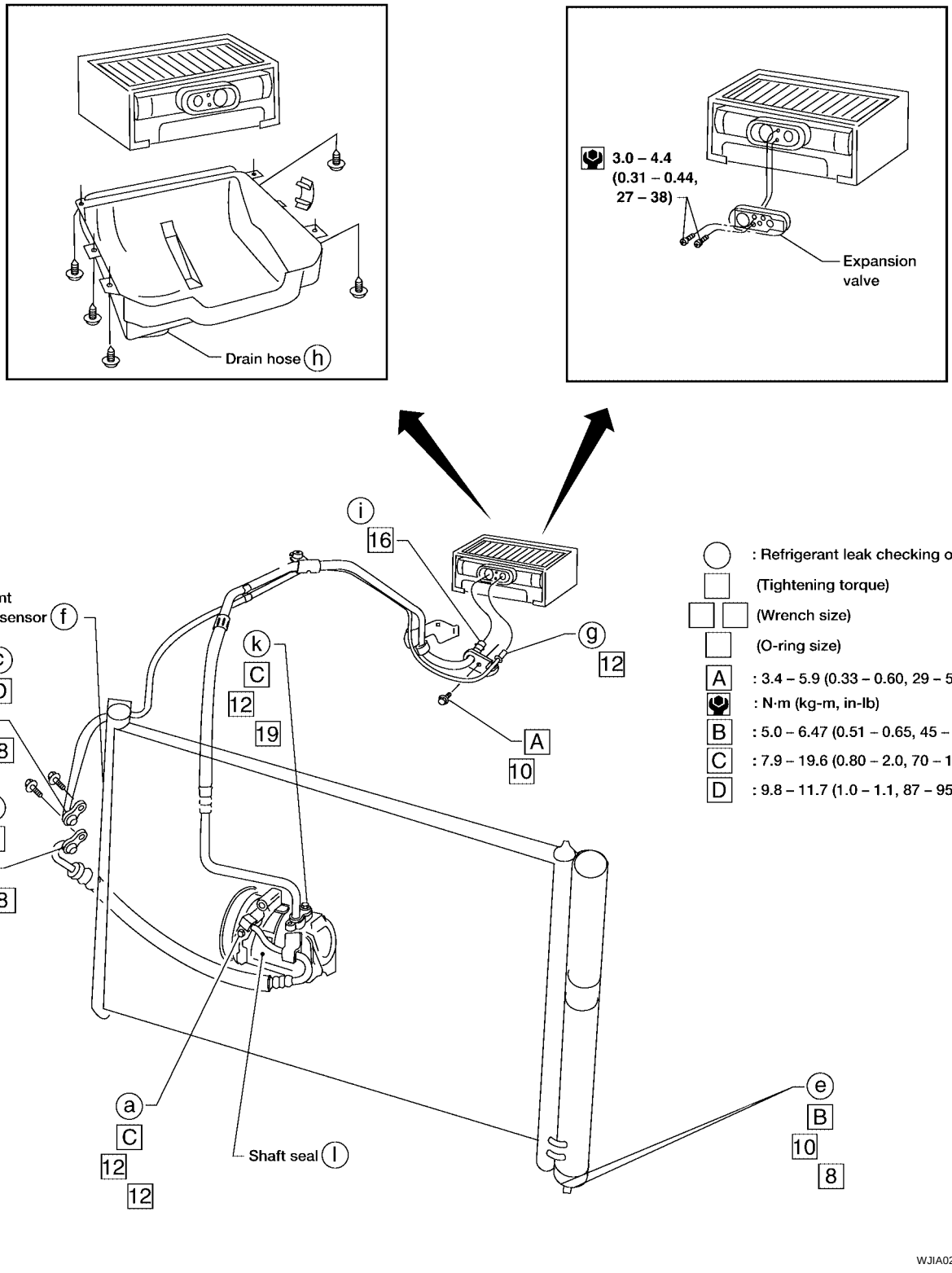
SEC. 271 • 274 • 276



WJIA0246E

QR25DE

SEC. 271 • 274 • 276



WJIA0247E

Checking Refrigerant Leaks

EJS001BS

PRELIMINARY CHECK

- Perform a visual inspection of all refrigeration parts, fittings, hoses and components for signs of A/C lubricant leakage, damage and corrosion. A/C lubricant leakage may indicate an area of refrigerant leakage. Allow extra inspection time in these areas when using either an electronic refrigerant leak detector or fluorescent dye leak detector.
- If dye is observed, confirm the leak with an approved electronic refrigerant leak detector. It is possible a prior leak was repaired and not properly cleaned.
- When searching for leaks, do not stop when one leak is found but continue to check for additional leaks at all system components and connections.
- When searching for refrigerant leaks using an electronic leak detector, move the probe along the suspected leak area at 25 - 50 mm (1 - 2 in) per second and no further than 1/4 inch from the component.

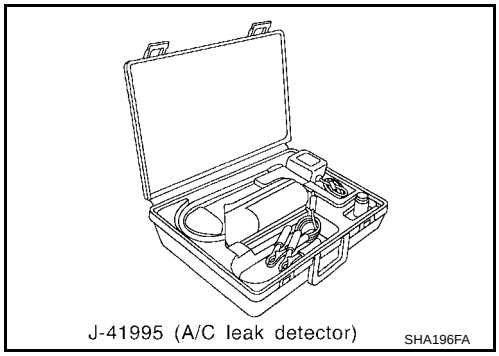
NOTE:
Moving the electronic leak detector probe slower and closer to the suspected leak area will improve the chances of finding a leak.

Electronic Refrigerant Leak Detector

EJS001BT

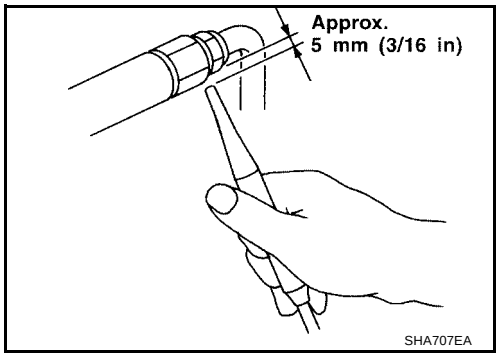
PRECAUTIONS FOR HANDLING LEAK DETECTOR

When performing a refrigerant leak check, use a J-41995 electronic refrigerant leak detector or equivalent. Ensure that the instrument is calibrated and set properly per the operating instructions.
The leak detector is a delicate device. In order to use the leak detector properly, read the operating instructions and perform any specified maintenance.


J-41995 (A/C leak detector) SHA196FA

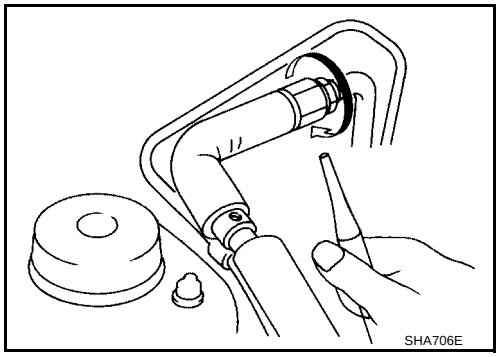
- **Other gases in the work area or substances on the A/C components, for example, anti-freeze, windshield washer fluid, solvents and lubricants, may falsely trigger the leak detector. Make sure the surfaces to be checked are clean. Clean with a dry cloth or blow off with shop air.**
- **Do not allow the sensor tip of the detector to contact with any substance. This can also cause false readings and may damage the detector.**

1. Position probe approximately 5 mm (3/16 in) away from point to be checked.

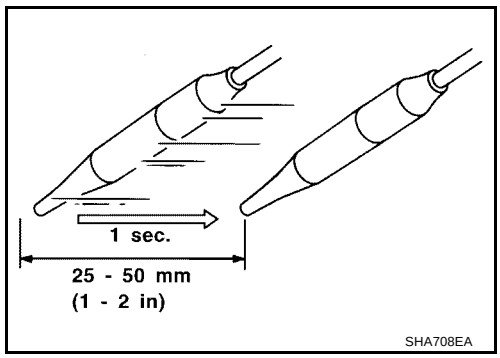


SHA707EA

2. When testing, circle each fitting completely with probe.


SHA706E

3. Move probe along component approximately 25 to 50 mm (1 to 2 in)/sec.



CHECKING PROCEDURE

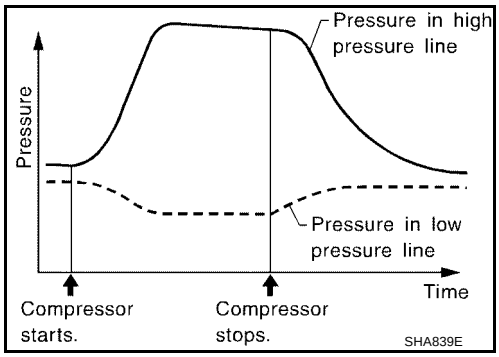
To prevent inaccurate or false readings, make sure there is no refrigerant vapor, shop chemicals, or cigarette smoke in the vicinity of the vehicle. Perform the leak test in calm area (low air/wind movement) so that the leaking refrigerant is not dispersed.

1. Turn engine off.
2. Connect a suitable A/C manifold gauge set to the A/C service ports.
3. Check if the A/C refrigerant pressure is at least 345 kPa (3.52 kg/cm^2 , 50 psi) above 16°C (61°F). If less than specification, recover/evacuate and recharge the system with the specified amount of refrigerant. Refer to MTC-82, "HFC-134a (R-134a) Service Procedure" .

   NOTE:
   At temperatures below 16°C (61°F), leaks may not be detected since the system may not reach 345 kPa (3.52 kg/cm^2 , 50 psi).
4. Conduct the leak test from the high side (compressor discharge **a** to evaporator inlet **g**) to the low side (evaporator drain hose **g** to shaft seal **l**). Refer to MTC-86, "Checking Refrigerant Leaks" . Perform a leak check for the following areas carefully. Clean the component to be checked and move the leak detector probe completely around the connection/component.
   - **Compressor**
     Check the fitting of high and low pressure hoses, relief valve and shaft seal.
   - **Liquid tank**
     Check the pressure switch, tube fitting, weld seams and the fusible plug mount.
   - **Service valves**
     Check all around the service valves. Ensure service valve caps are secured on the service valves (to prevent leaks).

     NOTE:
     After removing A/C manifold gauge set from service valves, wipe any residue from valves to prevent any false readings by leak detector.
   - **Cooling unit (Evaporator)**
     With engine OFF, turn blower fan on “High” for at least 15 seconds to dissipate any refrigerant trace in the cooling unit. Wait a minimum of 10 minutes accumulation time (refer to the manufacturer's recommended procedure for actual wait time) before inserting the leak detector probe into the drain hose. Keep the probe inserted for at least ten seconds. Use caution not to contaminate the probe tip with water or dirt that may be in the drain hose.
5. If a leak detector detects a leak, verify at least once by blowing compressed air into area of suspected leak, then repeat check as outlined above.
6. Do not stop when one leak is found. Continue to check for additional leaks at all system components.
   If no leaks are found, perform steps 7 - 10.
7. Start engine.
8. Set the heater A/C control as follows:
   1. A/C switch ON.
   2. Face mode
   3. Recirculation switch ON
   4. Max cold temperature
   5. Fan speed high

9. Run engine at 1,500 rpm for at least 2 minutes.
10. Turn engine off and perform leak check again following steps 4 through 6 above.
    Refrigerant leaks should be checked immediately after stopping the engine. Begin with the leak detector at the compressor. The pressure on the high pressure side will gradually drop after refrigerant circulation stops and pressure on the low pressure side will gradually rise, as shown in the graph. Some leaks are more easily detected when pressure is high.



11. Before connecting the recovery/recycling equipment to the vehicle, check the recovery/recycling equipment gauges. No refrigerant pressure should be displayed. If pressure is displayed, recover refrigerant from equipment lines and then check refrigerant purity.
12. Confirm refrigerant purity in supply tank using recovery/recycling equipment and refrigerant identifier. Refer to MTC-3, "Contaminated Refrigerant" .
13. Confirm refrigerant purity in vehicle A/C system using the recovery/recycling equipment and refrigerant identifier. Refer to MTC-3, "Contaminated Refrigerant" .
14. Discharge A/C system using approved recovery/recycling equipment. Refer to MTC-82, "Discharging Refrigerant" . Repair the leaking fitting or component as necessary.
15. Evacuate and recharge the A/C system. Refer to MTC-82, "Evacuating System and Charging Refrigerant" . Perform the leak test to confirm no refrigerant leaks.
16. Conduct A/C performance test to make sure the A/C system works properly.

Fluorescent Dye Leak Detector

EJS001BU

PRECAUTIONS FOR FLUORESCENT DYE LEAK DETECTION

- The fluorescent dye leak detector is not a replacement for an electronic refrigerant leak detector. The fluorescent dye leak detector should be used in conjunction with an electronic refrigerant leak detector (J-41995) to pinpoint refrigerant leaks.
- For your safety and your customer's satisfaction, read and follow all manufacturer's operating instructions and precautions prior to performing the work.
- Refer to MTC-4, "Precautions for Leak Detection Dye" .

CHECKING SYSTEM FOR LEAKS USING THE FLUORESCENT LEAK DETECTOR

1. Check A/C system for leaks using the UV lamp and safety glasses (J-42220) in a low sunlight area (area without windows preferable). Illuminate all components, fittings and lines. The dye will appear as a bright green/yellow area at the point of leakage. Fluorescent dye observed at the evaporator drain opening indicates an evaporator core assembly (tubes, core or TXV) leak.
2. If the suspected area is difficult to see, use an adjustable mirror or wipe the area with a clean shop rag or cloth, then check the cloth with the UV lamp for dye residue.
3. Confirm any suspected leaks with an approved electronic refrigerant leak detector.
4. After the leak is repaired, remove any residual dye using dye cleaner (J-43872) to prevent future misdiagnosis.
5. Perform a system performance check and verify the leak repair with an approved electronic refrigerant leak detector.

DYE INJECTION

(This procedure is only necessary when re-charging the system or when the compressor has seized and was replaced.)
Refer to MTC-4, "Precautions for Leak Detection Dye" .

1. Check A/C system static (at rest) pressure. Pressure must be at least 345 kPa (3.52 kg/cm^2 , 50 psi).
2. Pour one bottle (1/4 ounce / 7.4 cc) of the A/C refrigerant dye into the injector tool (J-41459).
3. Connect the injector tool to the A/C LOW PRESSURE side service fitting.
4. Start engine and switch A/C ON.

5. With the A/C operating (compressor running), inject one bottle (1/4 ounce / 7.4 cc) of fluorescent dye through the low-pressure service valve using dye injector tool J-41459 (refer to the manufacturer's operating instructions).
6. With the engine still running, disconnect the injector tool from the service fitting.

CAUTION:
Be careful not to allow dye to spray or drip when disconnecting the injector from the system.

NOTE:
If repairing the A/C system or replacing a component, pour the dye directly into the open system connection and proceed with the service procedures.

7. Operate the A/C system for a minimum of 20 minutes to mix the dye with the system oil. Depending on the leak size, operating conditions and location of the leak, it may take from minutes to days for the dye to penetrate a leak and become visible.

BELT

PFP:92600

Tension Adjustment

EJS001BV

- **Refer to MA-16, "Checking Drive Belts" (QG18DE) or MA-23, "Checking Drive Belts" (QR25DE).**

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

EJS001BX

COMPRESSOR

Engine	QG18DE	QR25DE
Model	ZEXEL make DKV-11G	ZEXEL make DKV-14G
Type	Vane rotary	
Displacement cm^3 (cu in)/rev.	110 (6.71)	140 (8.54)
Direction of rotation	Clockwise (viewed from drive end)	
Drive belt	Poly V	

LUBRICANT

Name		Genuine Nissan A/C Lubricant Type R or equivalent
Part number		KLH00-PAGR0
Capacity ml (US fl oz, Imp fl oz)	Total in system	180 (6.1, 6.3)

REFRIGERANT

Type	HFC-134a (R-134a)
Capacity kg (lb)	0.45 - 0.55 (0.99 - 1.21)

Inspection and Adjustment

EJS001BY

ENGINE IDLING SPEED (WHEN A/C IS ON)

- **Refer to EC-42, "IDLE SPEED" [QG18DE (ULEV Model)], EC-623, "IDLE SPEED" [QG18DE (SULEV Model)] or EC-1244, "IDLE SPEED" (QR25DE).**

BELT TENSION

- **Refer to MA-16, "Checking Drive Belts" (QG18DE) or MA-23, "Checking Drive Belts" (QR25DE).**

SECTION PG

POWER SUPPLY, GROUND & CIRCUIT ELEMENTS

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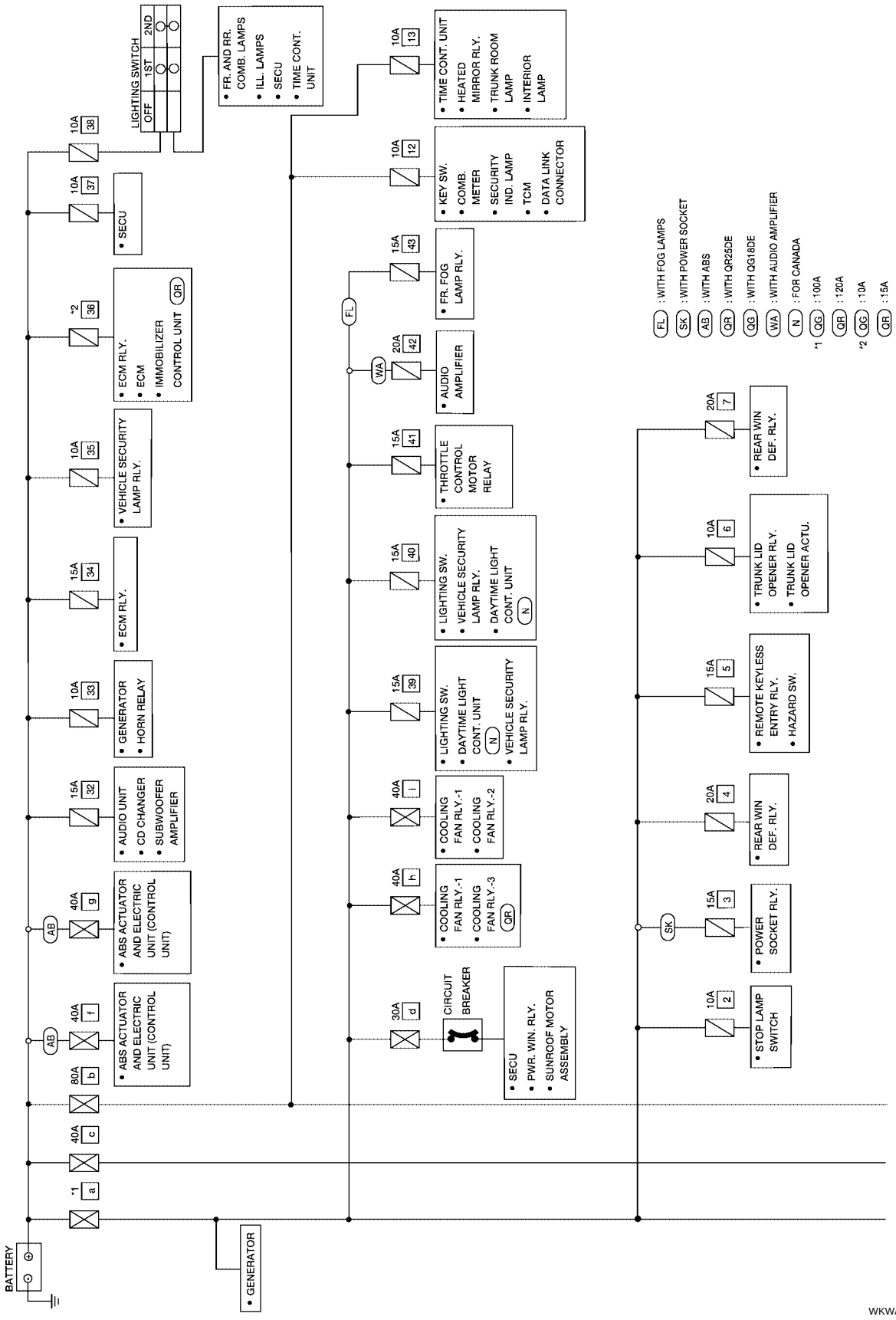
POWER SUPPLY ROUTING

PFP:24110

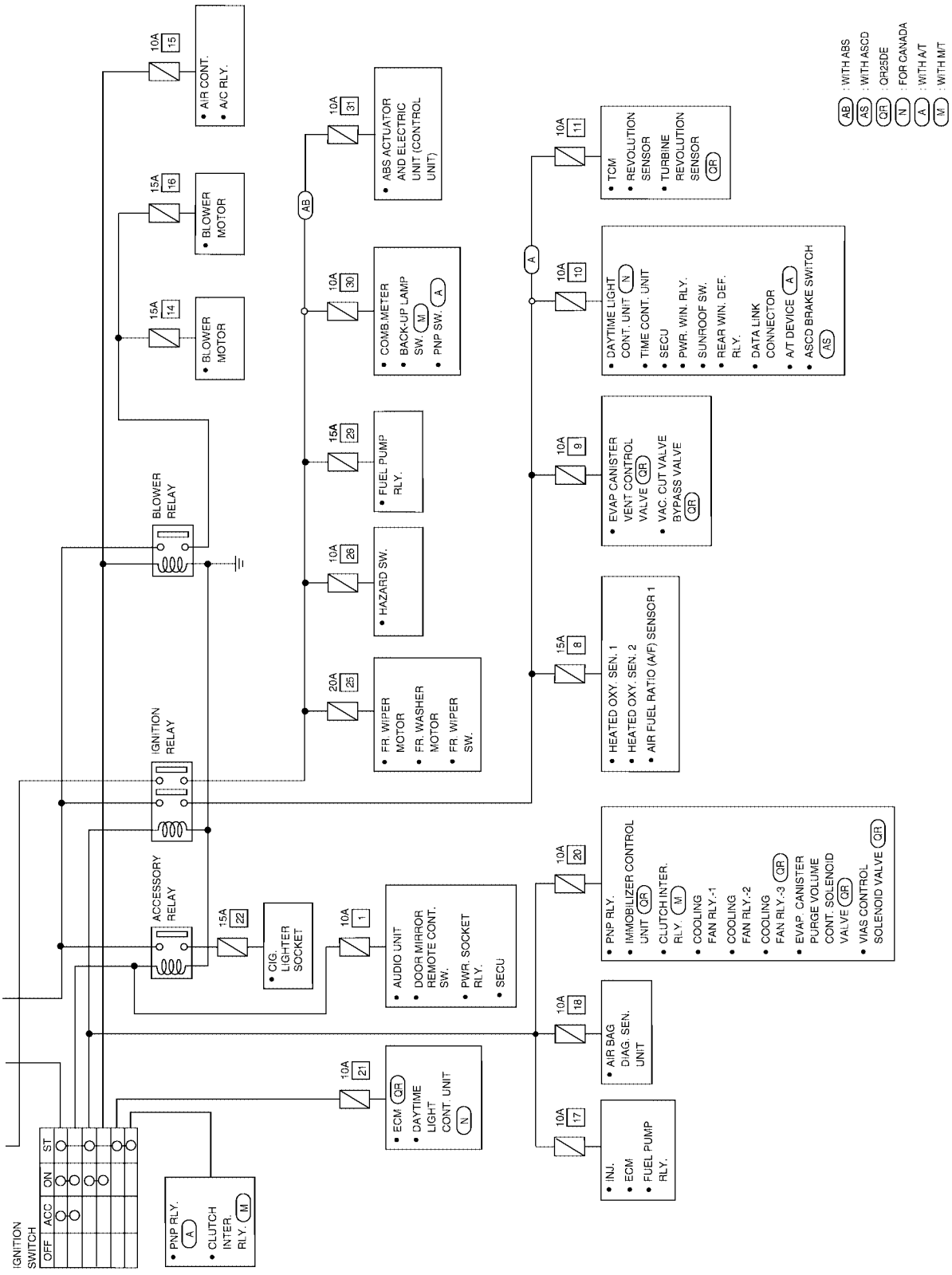
Schematic

EKS003AZ

For detailed ground distribution information, refer to PG-12, "Ground Distribution" .



WKWA0501E

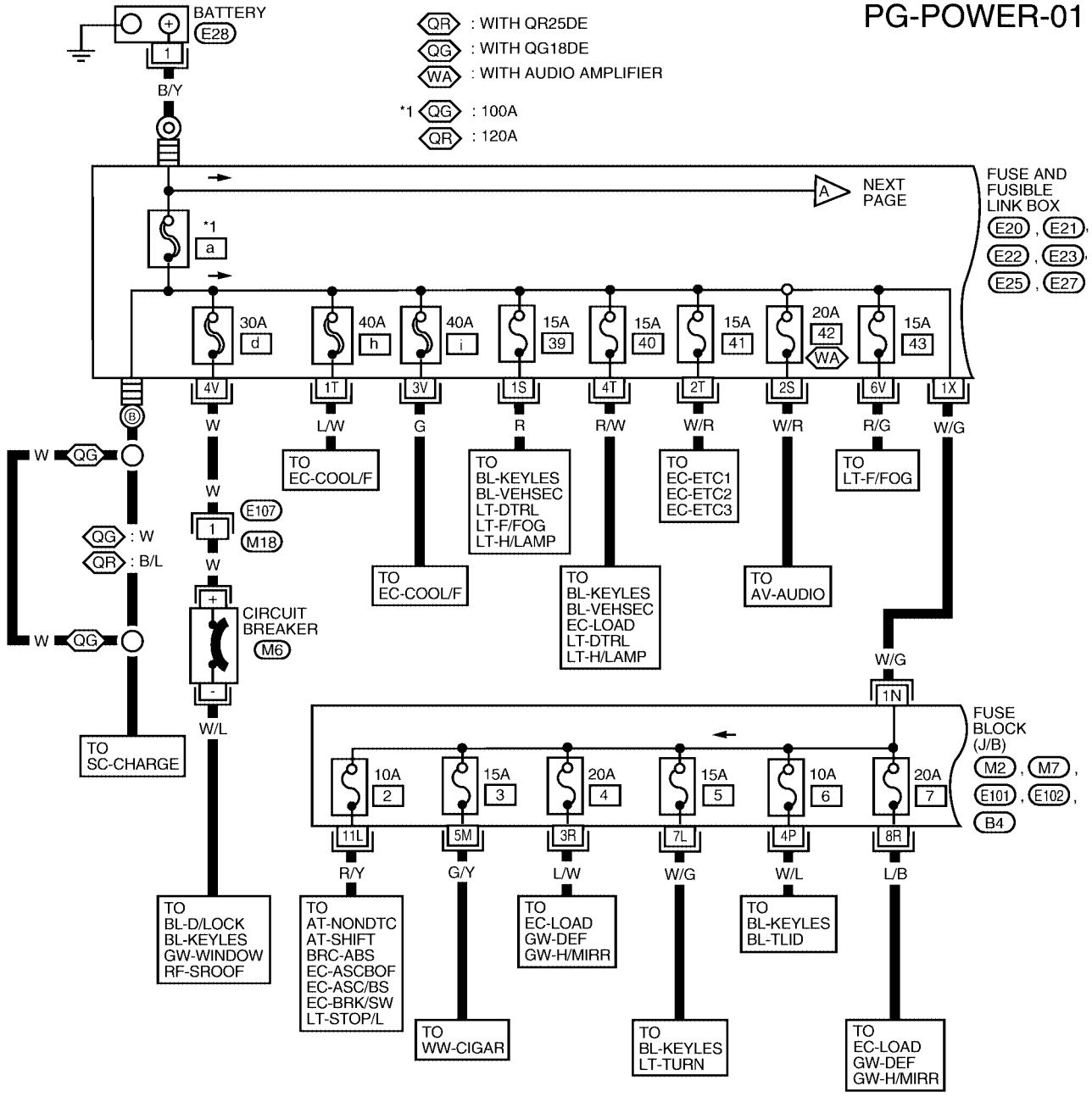

IGNITION SWITCH
OFF
ACC
ON
ST
BLOWER RELAY
IGNITION RELAY
ACCESSORY RELAY
10A 15 • AIR CONT. • A/C RLY.
15A 16 • BLOWER MOTOR
15A 14 • BLOWER MOTOR
10A 31 • ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)
10A 30 • COMB.METER • BACK-UP LAMP SW. (M) • PNP SW. (A)
15A 29 • FUEL PUMP RLY.
10A 26 • HAZARD SW.
20A 25 • FR. WIPER MOTOR • FR. WASHER MOTOR • FR. WIPER SW.
15A 22 • CIG. LIGHTER SOCKET
10A 1 • AUDIO UNIT • DOOR MIRROR REMOTE CONT. SW. • PWR. SOCKET RLY. • SECU
10A 21 • ECM (QR) • DAYTIME LIGHT CONT UNIT (N)
10A 20 • PNP RLY. • IMMOBILIZER CONTROL UNIT (QR) • CLUTCH INTER. RLY. (M) • COOLING FAN RLY.-1 • COOLING FAN RLY.-2 • COOLING FAN RLY.-3 (QR) • EVAP. CANISTER PURGE VOLUME CONT. SOLENOID VALVE (QR) • VIAS CONTROL SOLENOID VALVE (QR)
10A 18 • AIR BAG DIAG. SEN. UNIT
10A 17 • INJ. • ECM • FUEL PUMP RLY.
• PNP RLY. (A) • CLUTCH INTER. RLY. (M)
AB
A
10A 11 • TCM • REVOLUTION SENSOR • TURBINE REVOLUTION SENSOR (QR)
10A 10 • DAYTIME LIGHT CONT. UNIT (N) • TIME CONT. UNIT • SECU • PWR. WIN. RLY. • SUNROOF SW. • REAR WIN. DEF. RLY. • DATA LINK CONNECTOR (A) • A/T DEVICE (A) • ASCD BRAKE SWITCH (AS)
10A 9 • EVAP CANISTER VENT CONTROL VALVE (QR) • VAC. CUT VALVE BYPASS VALVE (QR)
15A 8 • HEATED OXY. SEN. 1 • HEATED OXY. SEN. 2 • AIR FUEL RATIO (A/F) SENSOR 1
(AB) : WITH ABS
(AS) : WITH ASCD
(QR) : QR25DE
(N) : FOR CANADA
(A) : WITH A/T
(M) : WITH M/T

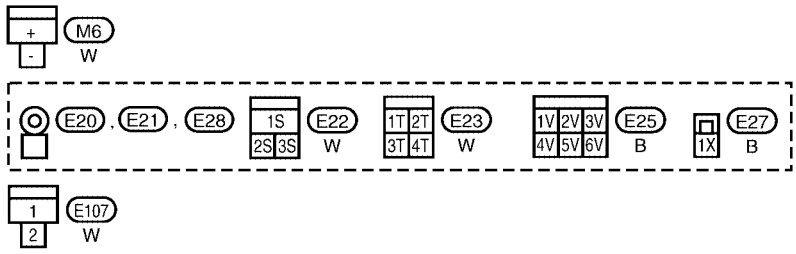
WKWA0502E

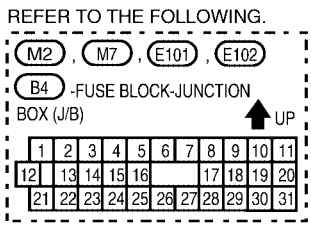
Wiring Diagram — POWER —

EKS003B0

BATTERY POWER SUPPLY — IGNITION SW. IN ANY POSITION



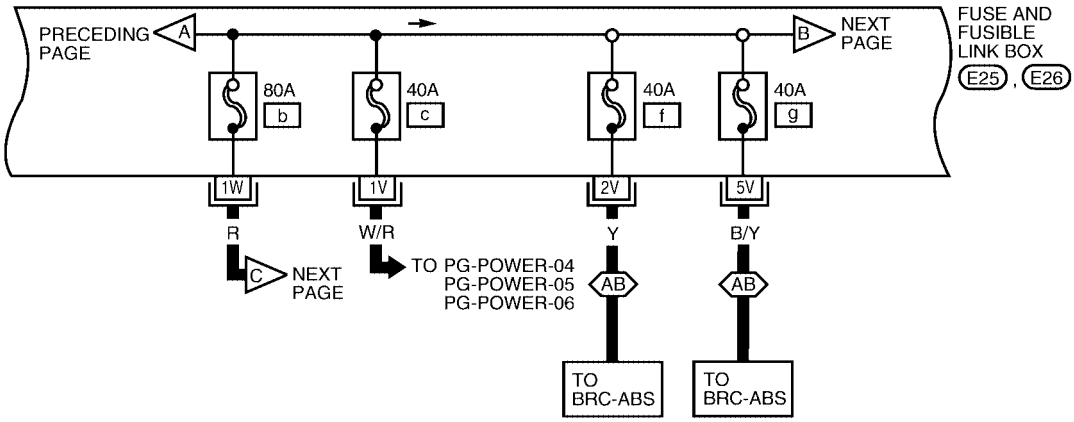


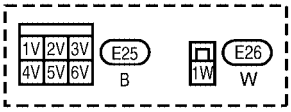


WKWA0503E

PG-POWER-02

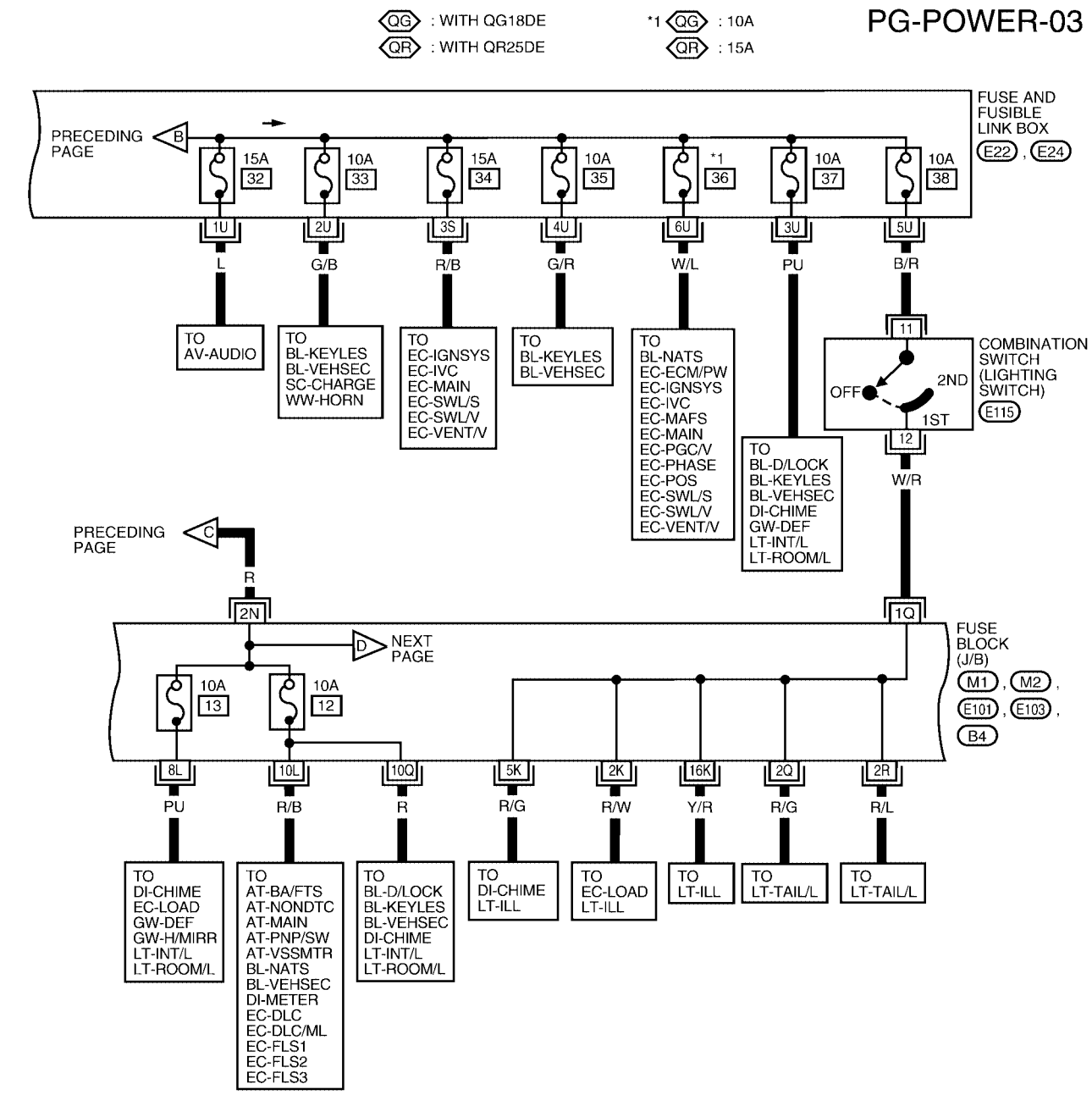
AB : WITH ABS





WKWA0057E

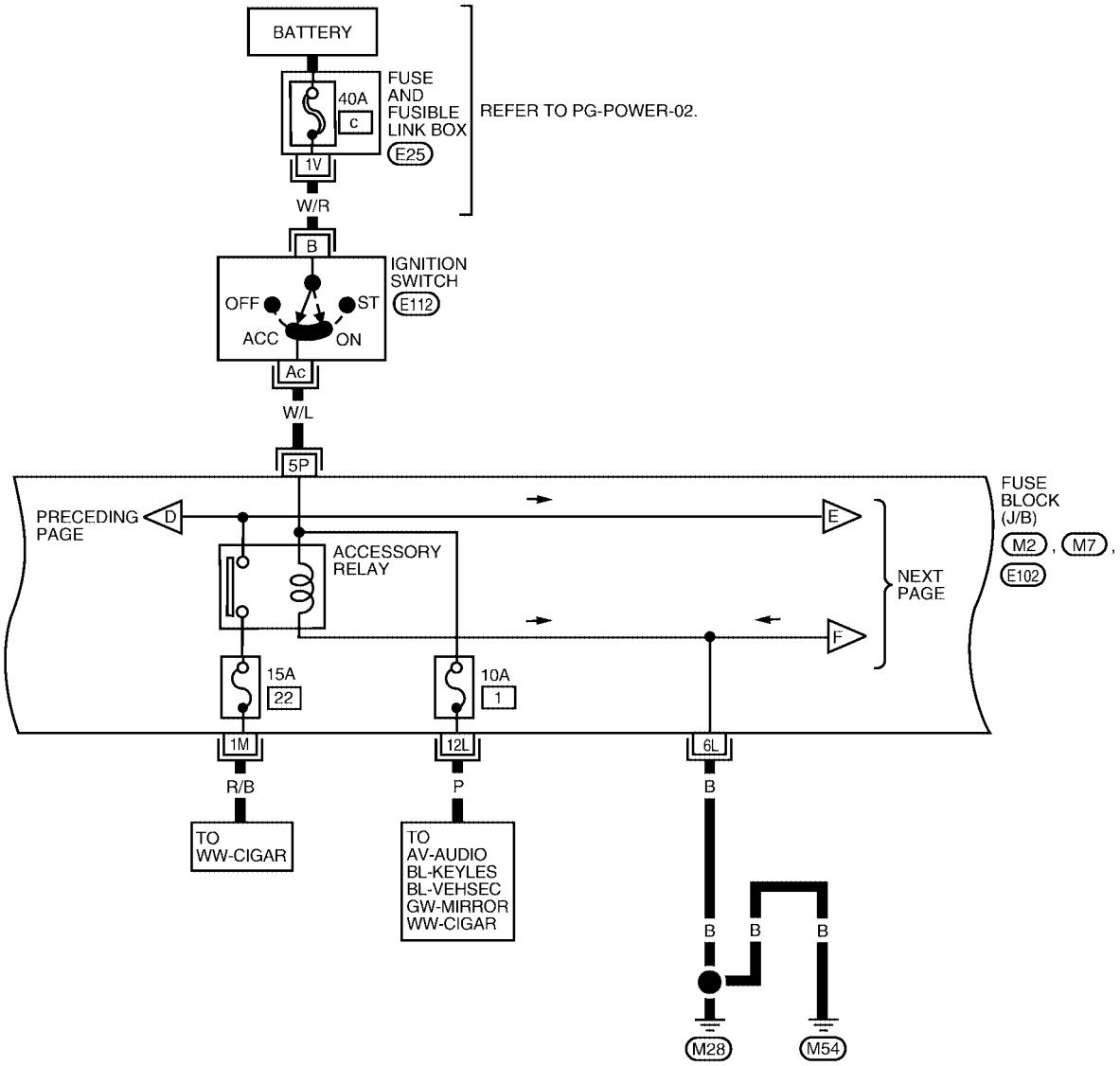
PG-POWER-03

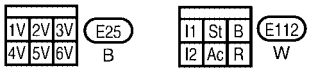


WKWA0504E

ACCESSORY POWER SUPPLY — IGNITION SW. IN “ACC” OR “ON”

PG-POWER-04

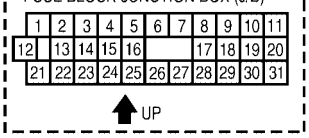




REFER TO THE FOLLOWING.

M2 , M7 , E102

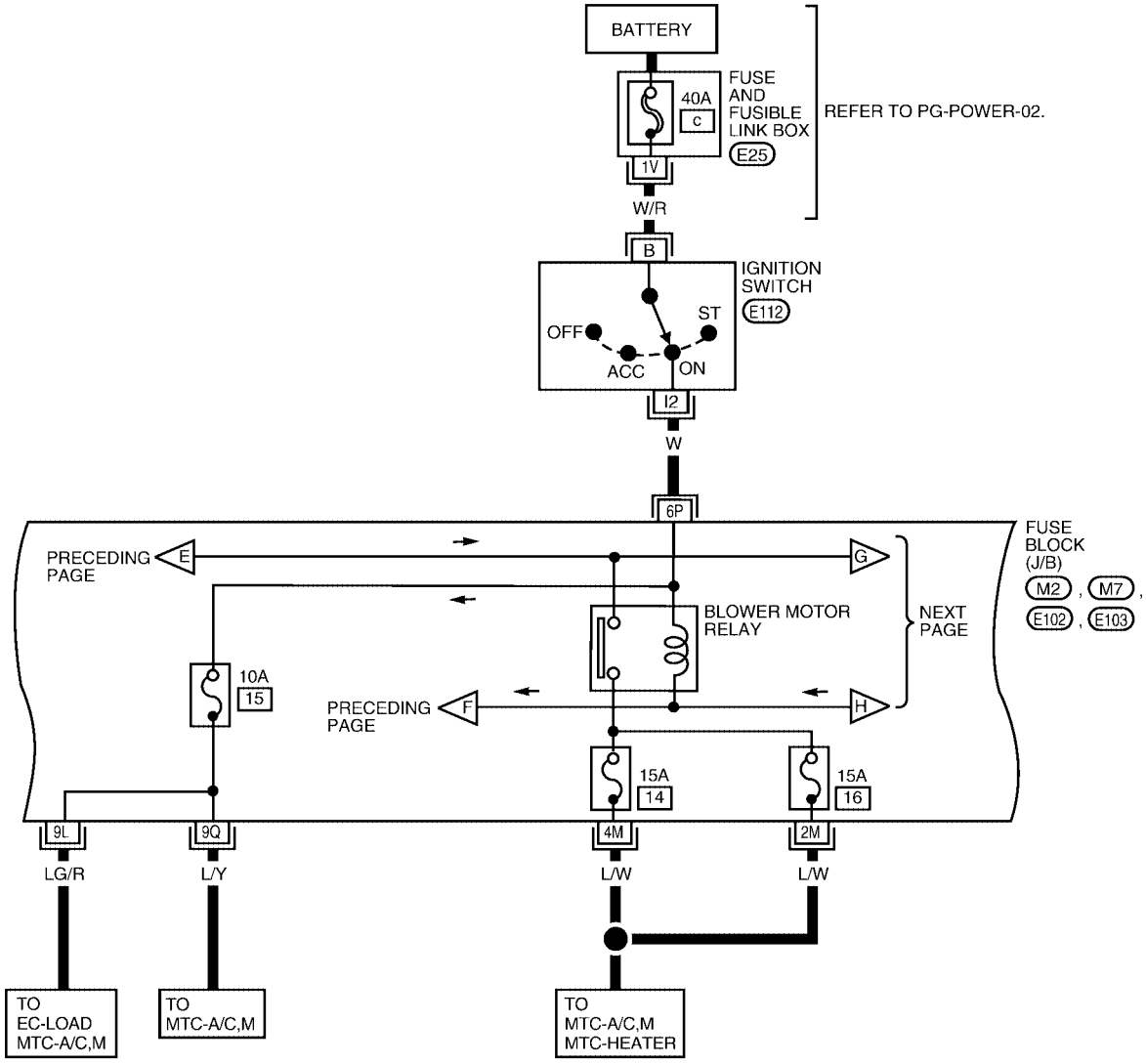
-FUSE BLOCK-JUNCTION BOX (J/B)

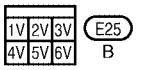


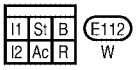
WKWA0250E

IGNITION POWER SUPPLY — IGNITION SW. IN “ON”

PG-POWER-05







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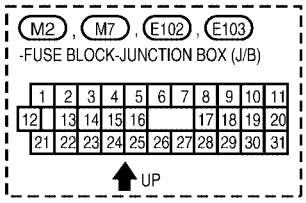
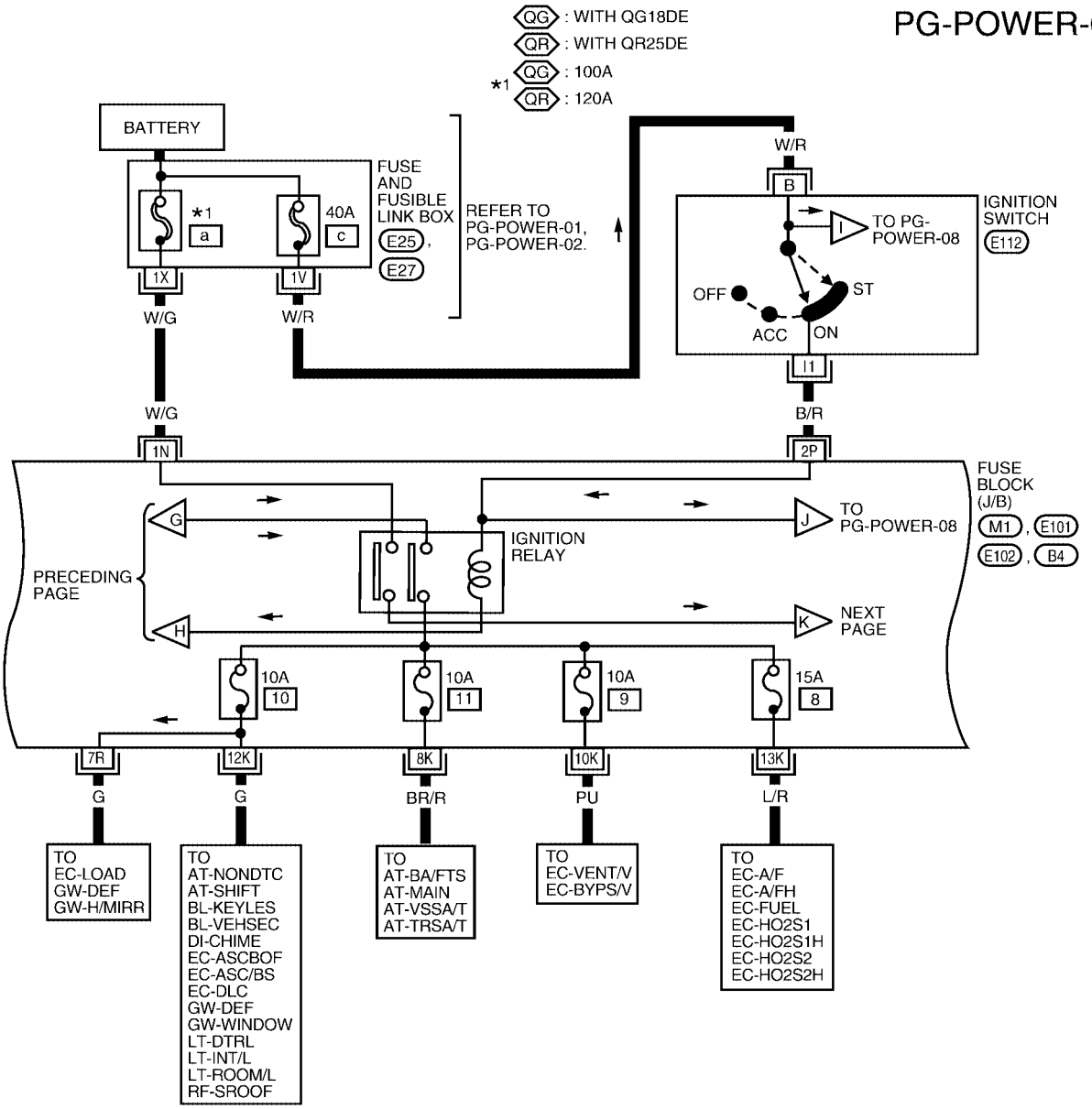
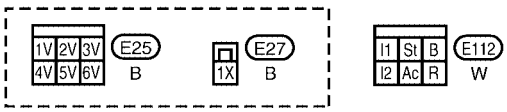


WKWA0493E

IGNITION POWER SUPPLY — IGNITION SW. IN “ON” AND/OR “START”

PG-POWER-06





REFER TO THE FOLLOWING.

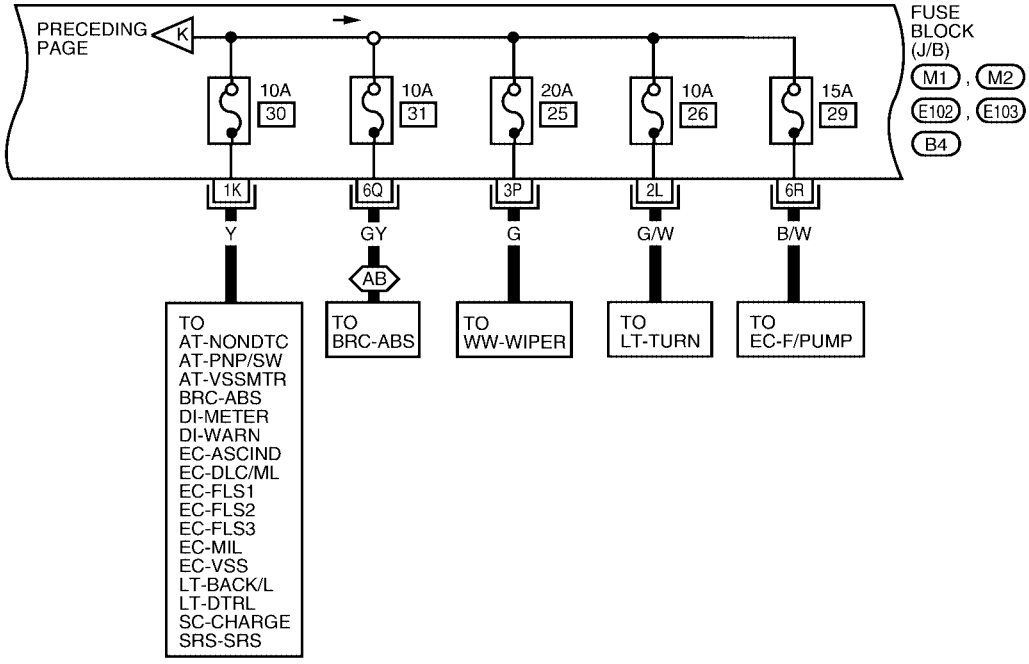
M1, E101, E102, B4
-FUSE BLOCK-
JUNCTION BOX (J/B)

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16			17	18	19	20
21	22	23	24	25	26	27	28	29	30	31

UP

WKWA0252E

AB : With ABS



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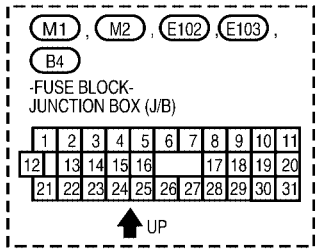
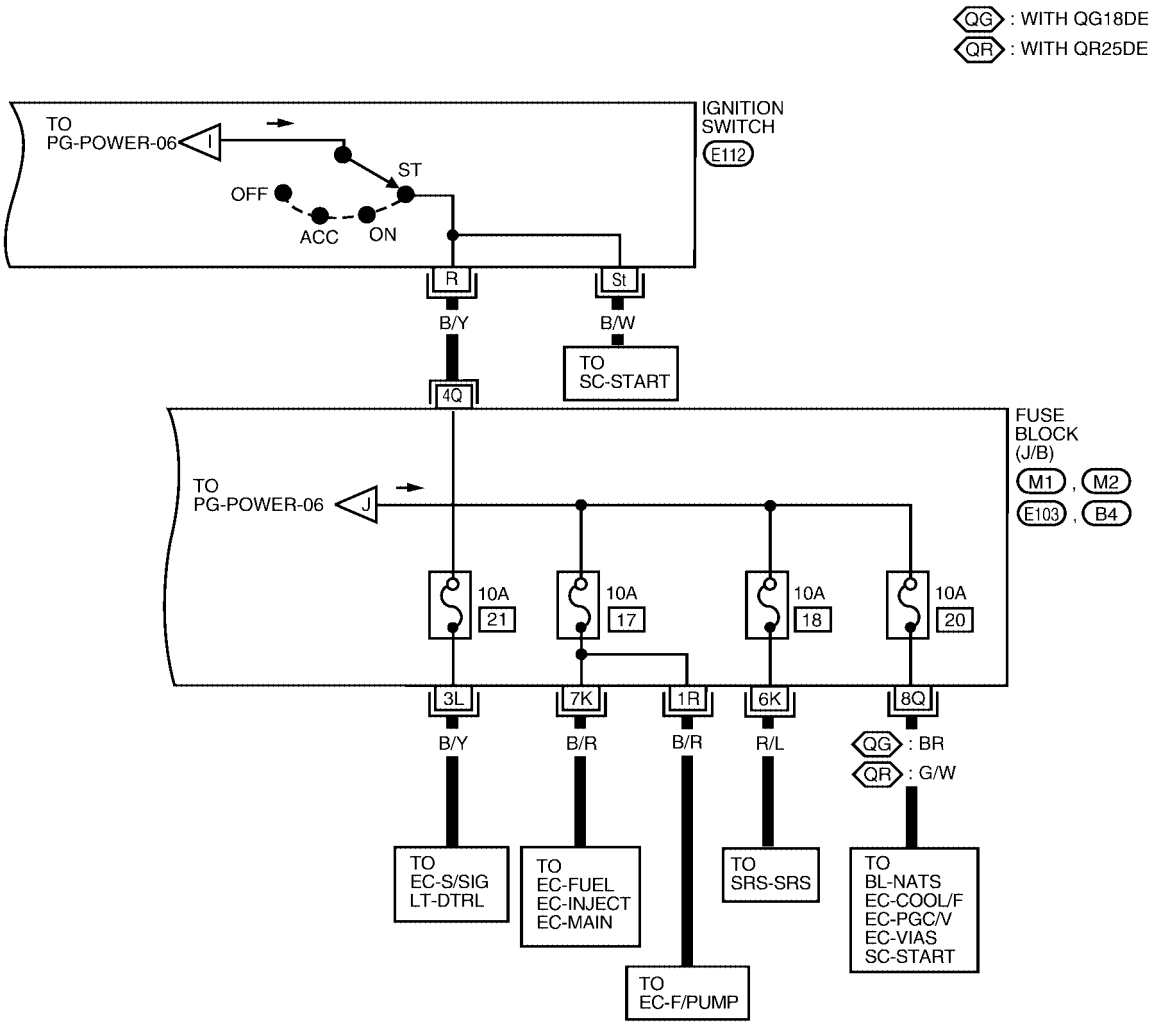
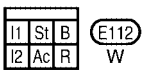


WKWA0253E

PG-POWER-08





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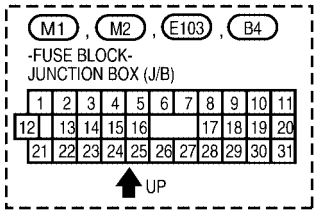

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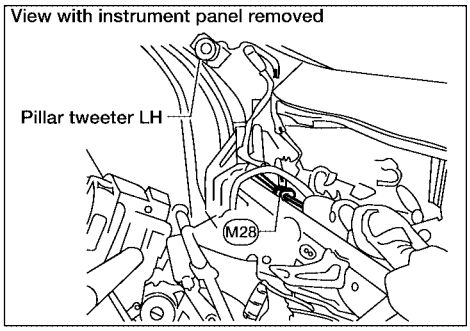
GROUND

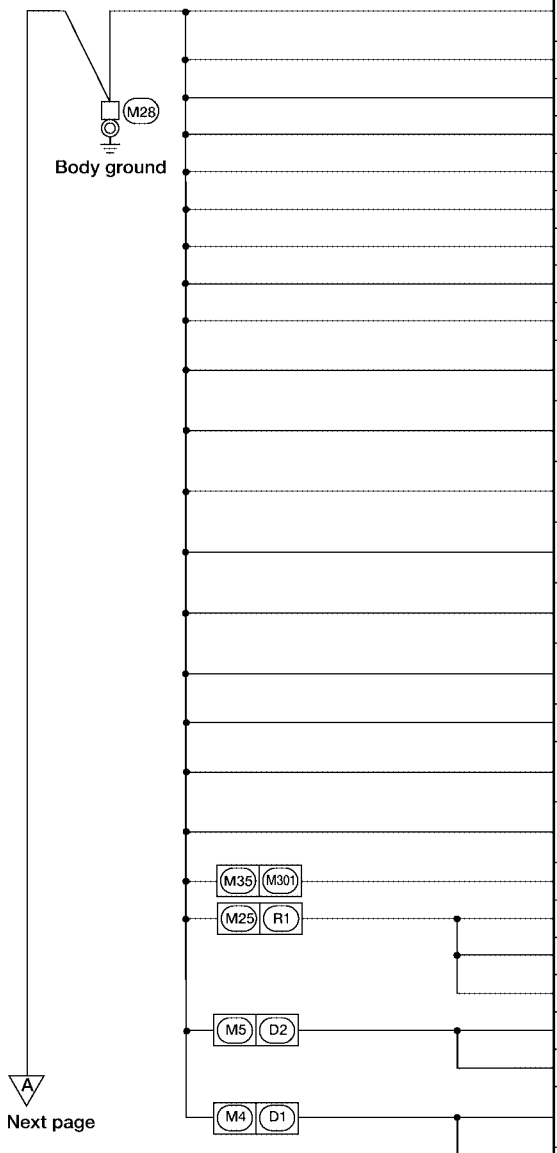
PFP:24080

Ground Distribution

EKS003B1

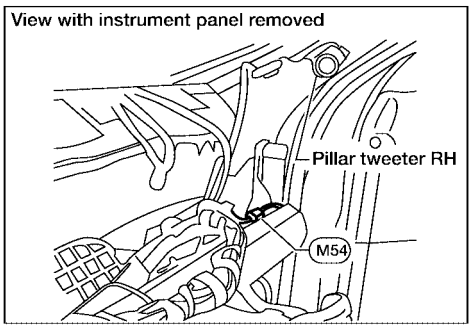
MAIN HARNESS

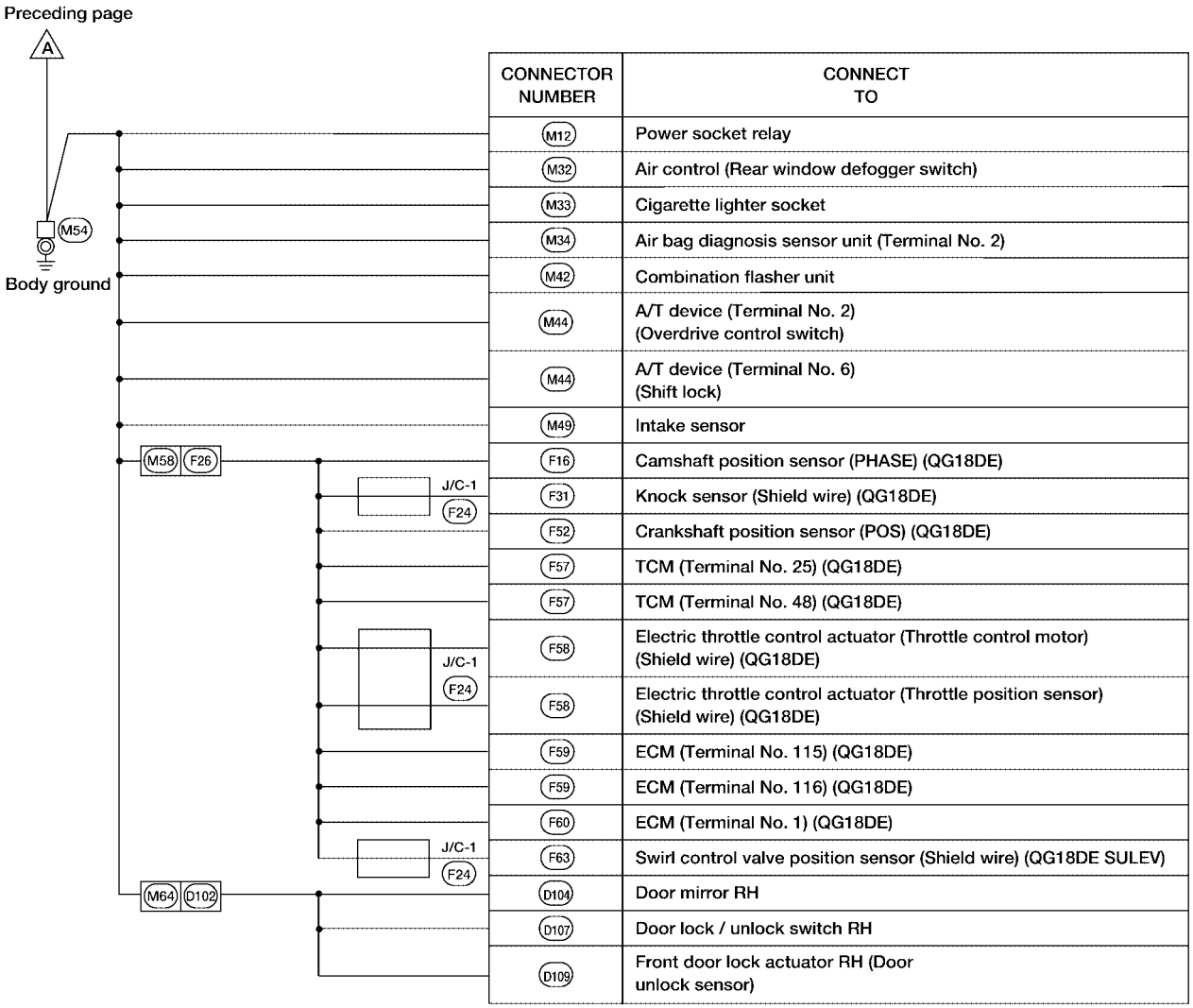




CONNECTOR NUMBER	CONNECT TO
M2	Fuse block (J/B) (Blower motor relay, ignition relay, accessory relay)
M3	Heated mirror relay
M8	Data link connector (Terminal No. 4)
M8	Data link connector (Terminal No. 5)
M9	Power window relay
M10	Trunk lid opener relay
M21	Trunk lid opener switch
M22	Illumination control switch
M23	Door mirror remote control switch
M29	Combination meter (Terminal No.3) (High beam indicator) (With tachometer)
M29	Combination meter (Terminal No.12) (Turn signal indicator lamps and ABS warning) (With tachometer)
M29	Combination meter (Terminal No.14) (High beam indicator) (Without tachometer)
M30	Combination meter (Terminal No. 27) (Speedometer) (Without tachometer)
M30	Combination meter (Terminal No. 39) (Turn signal indicator lamps) (Without tachometer)
M30	Combination meter (Terminal No. 48) (Speedometer) (With tachometer)
M31	Fan control switch
M38	Smart entrance control unit (with power door locks) (Terminal No. 16)
M40	Time control unit (Without power door locks) (Terminal No. 8)
M302	Power socket
R2	Vanity lamp LH
R3	Map lamp
R7	Vanity lamp RH
D4	Door mirror LH
D8	Front door key cylinder switch LH
D6	Main power window and door lock / unlock switch
D7	Front door lock actuator (door unlock sensor) LH

WKIA0213E

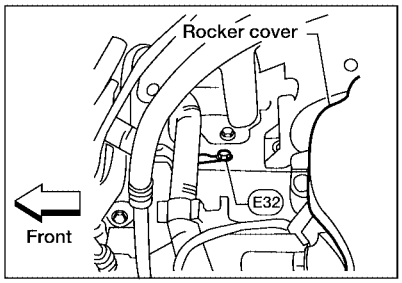


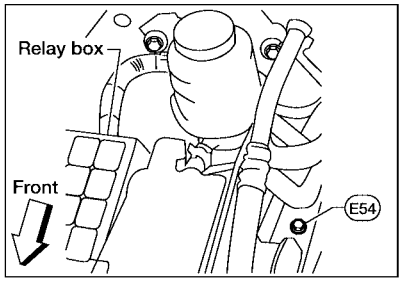


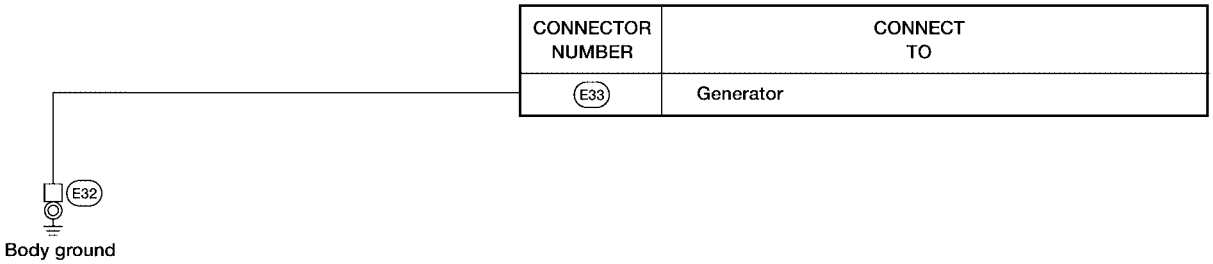
CONNECTOR NUMBER	CONNECT TO
M12	Power socket relay
M32	Air control (Rear window defogger switch)
M33	Cigarette lighter socket
M34	Air bag diagnosis sensor unit (Terminal No. 2)
M42	Combination flasher unit
M44	A/T device (Terminal No. 2) (Overdrive control switch)
M44	A/T device (Terminal No. 6) (Shift lock)
M49	Intake sensor
F16	Camshaft position sensor (PHASE) (QG18DE)
F31	Knock sensor (Shield wire) (QG18DE)
F52	Crankshaft position sensor (POS) (QG18DE)
F57	TCM (Terminal No. 25) (QG18DE)
F57	TCM (Terminal No. 48) (QG18DE)
F58	Electric throttle control actuator (Throttle control motor) (Shield wire) (QG18DE)
F58	Electric throttle control actuator (Throttle position sensor) (Shield wire) (QG18DE)
F59	ECM (Terminal No. 115) (QG18DE)
F59	ECM (Terminal No. 116) (QG18DE)
F60	ECM (Terminal No. 1) (QG18DE)
F63	Swirl control valve position sensor (Shield wire) (QG18DE SULEV)
D104	Door mirror RH
D107	Door lock / unlock switch RH
D109	Front door lock actuator RH (Door unlock sensor)

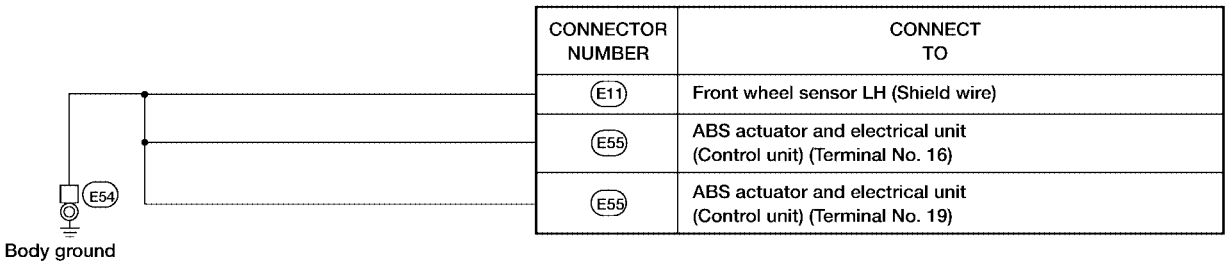
WKIA0989E

ENGINE ROOM HARNESS

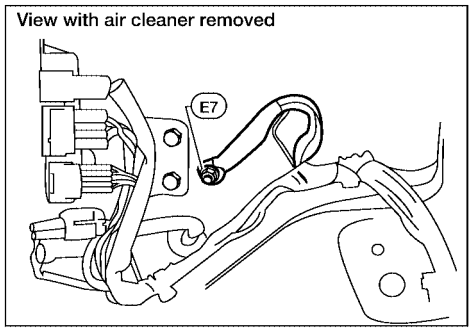


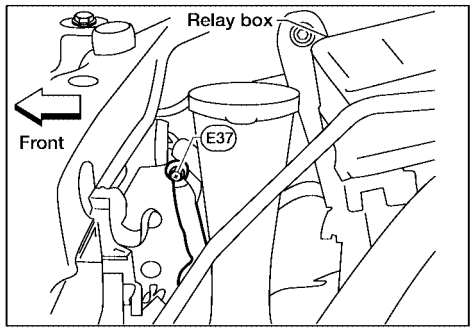


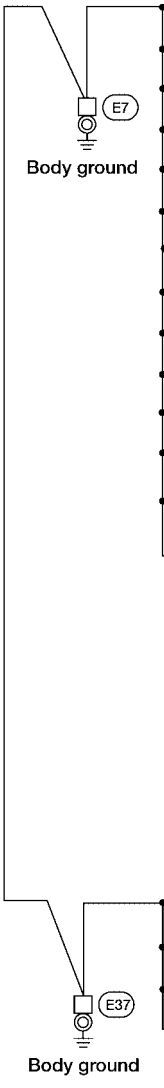




WKIA0215E





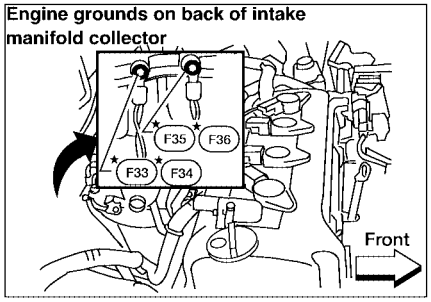


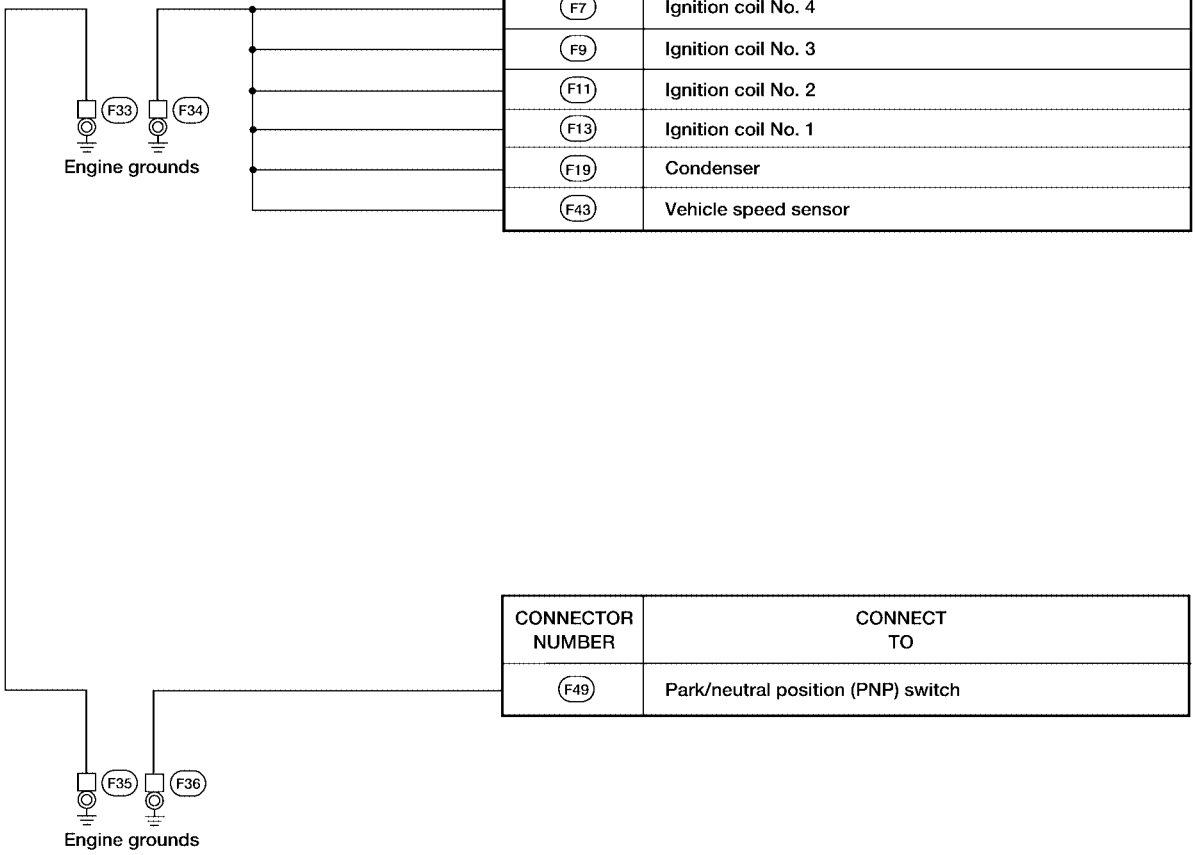
CONNECTOR NUMBER	CONNECT TO
E1	Brake fluid level switch
E3	Front wiper motor
E4	Front combination lamp (Parking) LH
E14	Hood switch (If equipped)
E18	Cooling fan motor-2
E30	Front fog lamp RH
E31	Headlamp RH
E38	Front combination lamp (Parking) RH
E40	Washer fluid level switch
E44	Cooling fan relay-3 (HI-relay) (QR25DE)
E105	Daytime light control unit (For Canada)
E110	Clutch interlock switch (With M/T)
E116	Combination switch (Front wiper switch)
E117	Combination switch (Front fog lamp switch)

CONNECTOR NUMBER	CONNECT TO
E13	Headlamp LH (For USA)
E15	Front fog lamp LH
E17	Cooling fan motor-1
E52	Cooling fan relay-2

WKIA0990E

ENGINE CONTROL HARNESS
QG18DE



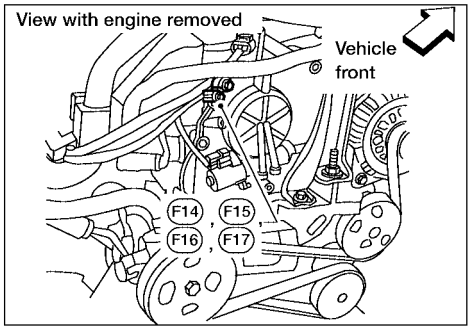


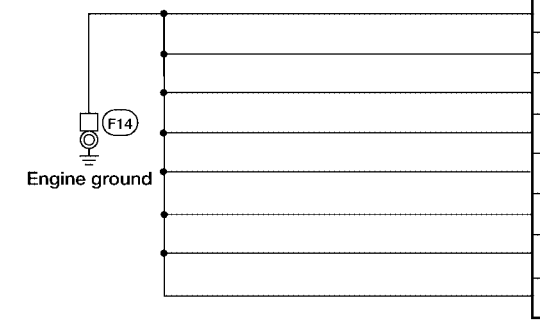
CONNECTOR NUMBER	CONNECT TO
F7	Ignition coil No. 4
F9	Ignition coil No. 3
F11	Ignition coil No. 2
F13	Ignition coil No. 1
F19	Condenser
F43	Vehicle speed sensor

CONNECTOR NUMBER	CONNECT TO
F49	Park/neutral position (PNP) switch

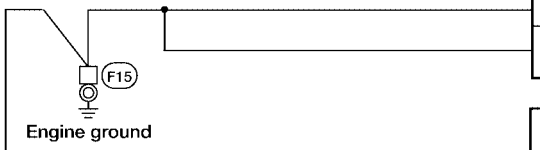
WKIA0217E

QR25DE

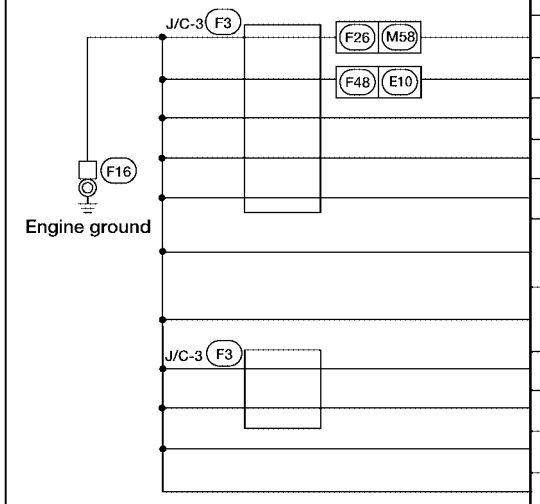




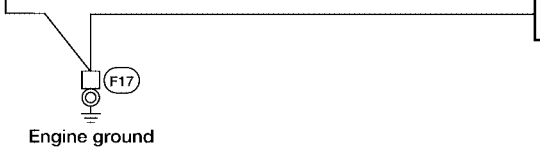
CONNECTOR NUMBER	CONNECT TO
F5	Ignition coil No.1 (With power transistor)
F6	Ignition coil No. 2 (With power transistor)
F7	Ignition coil No. 4 (With power transistor)
F8	Ignition coil No. 3 (With power transistor)
F21	Condenser
F29	Park/neutral position (PNP) switch (Terminal No.2) (With A/T)
F54	ECM (Terminal No. 106)
F54	ECM (Terminal No. 108)



CONNECTOR NUMBER	CONNECT TO
F42	Park/neutral position (PNP) switch (Terminal No. 2) (With M/T)
F54	ECM (Terminal No. 115)



CONNECTOR NUMBER	CONNECT TO
M8	Data link connector (Terminal No. 5)
E111	Immobilizer control unit
F9	Camshaft position sensor (PHASE)
F11	Crankshaft position sensor (POS)
F23	Heated oxygen sensor 2
F50	Electric throttle control actuator (Throttle position sensor) (Shield wire)
F50	Electric throttle control actuator (Throttle control motor) (Shield wire)
F54	ECM (Terminal No. 59)
F54	ECM (Terminal No. 60)
F57	TCM (Terminal No. 25)
F57	TCM (Terminal No. 48)



CONNECTOR NUMBER	CONNECT TO
F22	Heated oxygen sensor 1

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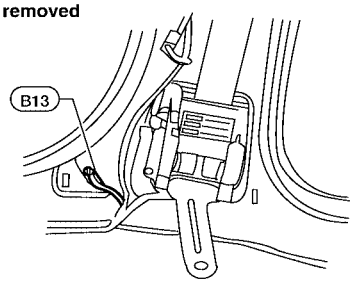
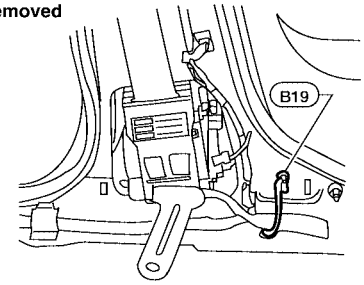
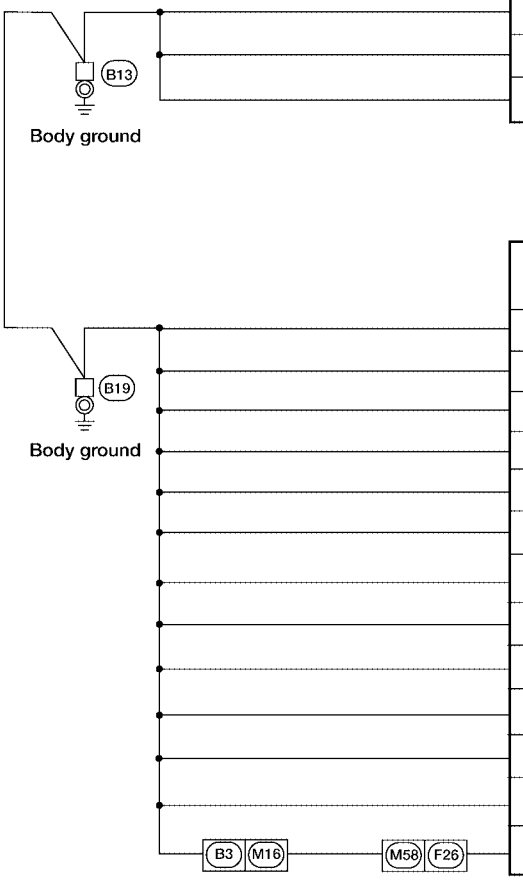
BODY HARNESS

View with center pillar lower garnish RH removed



View with center pillar lower garnish LH removed



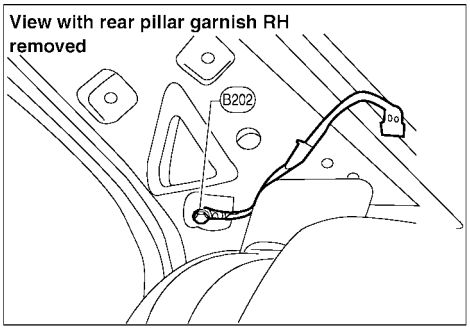


CONNECTOR NUMBER	CONNECT TO
B8	Seat belt buckle switch LH
B29	High-mounted stop lamp (Without rear air spoiler)
B53	Audio amplifier (With premium audio)

CONNECTOR NUMBER	CONNECT TO
B23	Front door switch LH
B25	Fuel level sensor unit and fuel pump
B28	Subwoofer amplifier (With mid level audio)
B38	Back-up lamp LH
B39	High-mounted stop lamp (With rear air spoiler)
B40	License plate lamp LH
B41	License plate lamp RH
B42	Back-up lamp RH
B43	Trunk lid key cylinder switch
B44	Rear combination lamp LH
B48	Trunk room lamp switch
B49	Rear combination lamp RH
F54	ECM (Terminal No. 77) (QR25DE)

WKIA0991E

REAR WINDOW DEFOGGER GROUND HARNESS

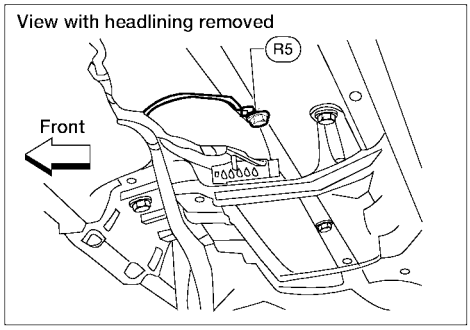


CONNECTOR NUMBER	CONNECT TO
B201	Rear window defogger

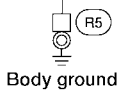
B202
Body ground

LEL434

ROOM HARNESS



CONNECTOR NUMBER	CONNECT TO
R4	Sunroof motor assembly



LEL433

HARNESS

PFP:24010

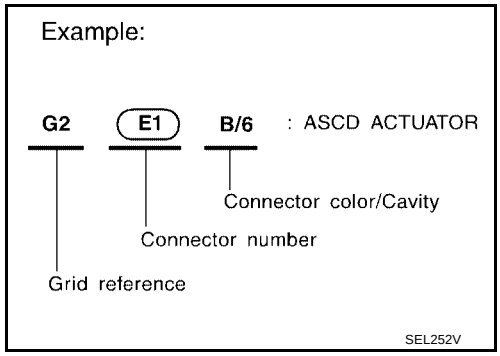
Harness Layout

EKS003B2

HOW TO READ HARNESS LAYOUT

The following Harness Layouts use a map style grid to help locate connectors on the drawings:

- Main Harness
- Engine Room Harness
- Engine Control Harness
- Body Harness



TO USE THE GRID REFERENCE

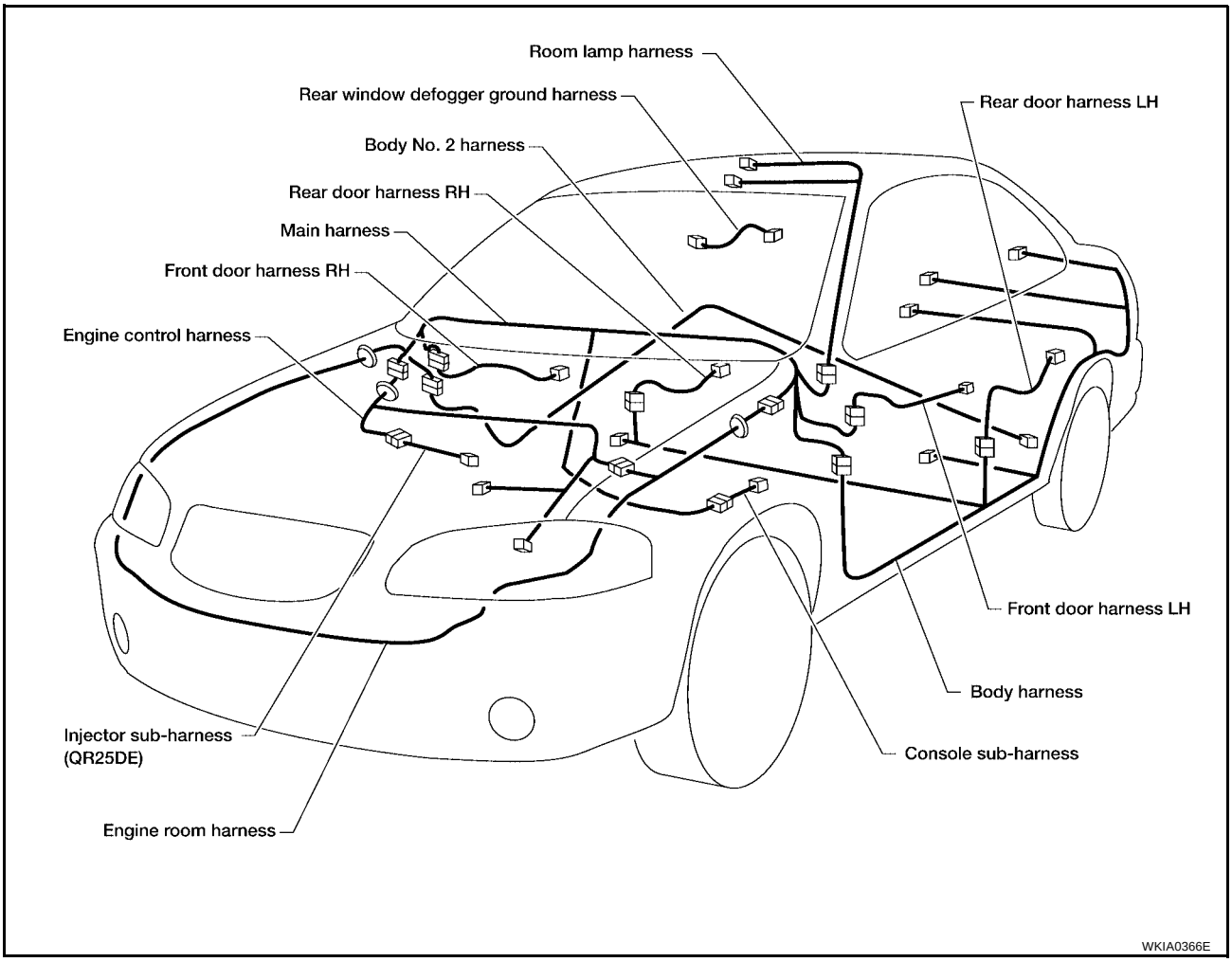
1. Find the desired connector number on the connector list.
2. Find the grid reference.
3. On the drawing, find the crossing of the grid reference letter column and number row.
4. Find the connector number in the crossing zone.
5. Follow the line (if used) to the connector.

CONNECTOR SYMBOL

Main symbols of connector (in Harness Layout) are indicated in the below.

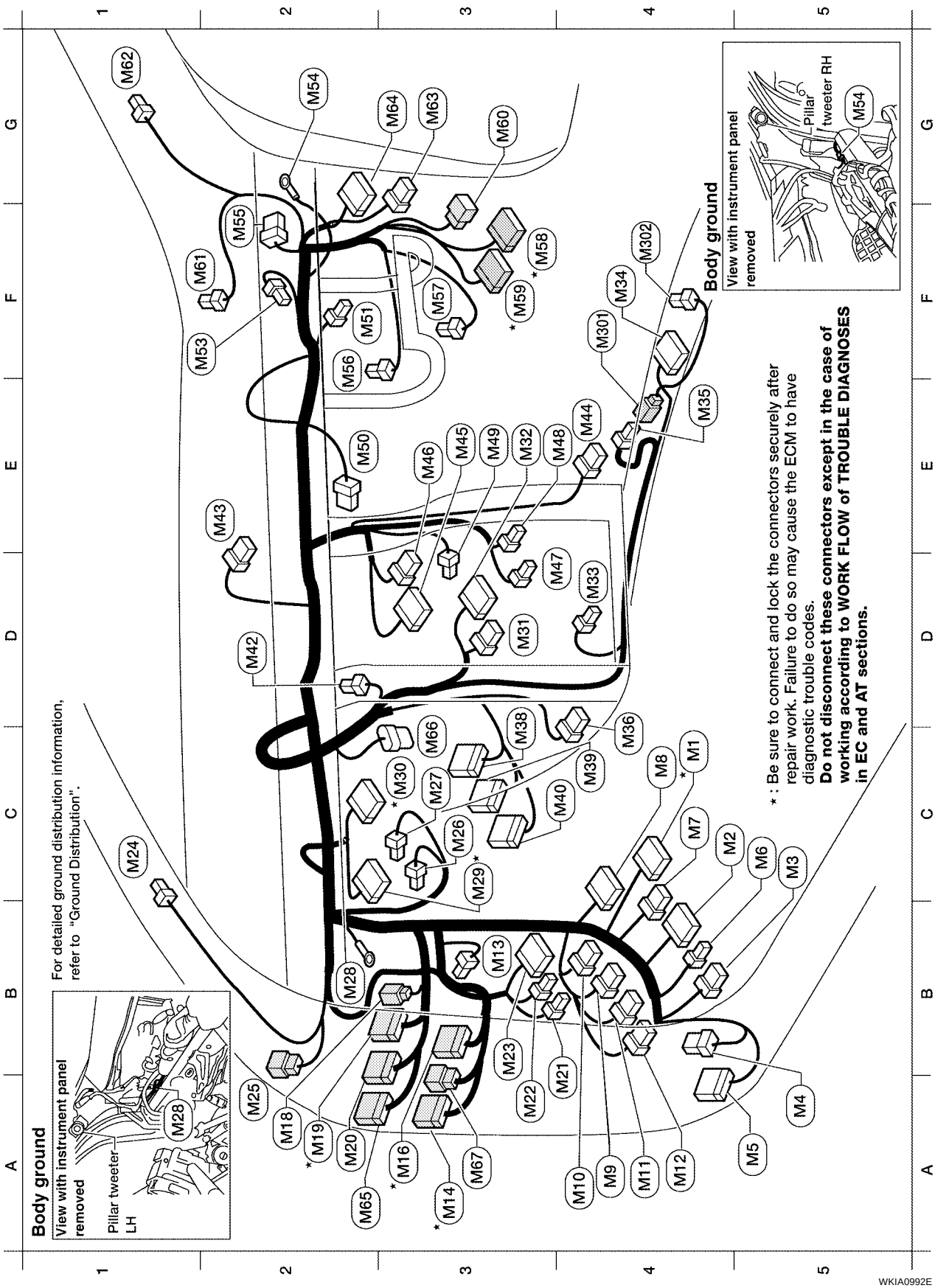
Connector type	Water proof type		Standard type	
	Male	Female	Male	Female
● Cavity: Less than 4 ● Relay connector				
● Cavity: From 5 to 8				
● Cavity: More than 9				
● Ground terminal etc.	—			

OUTLINE



NOTE:
For detailed ground distribution information, refer to PG-12, "Ground Distribution" .

MAIN HARNESS



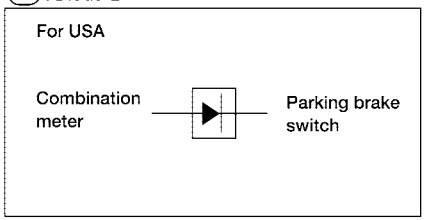
Main harness

C4 *(M1) W/16 : Fuse block (J/B)
C4 (M2) W/12 : Fuse block (J/B)
C5 (M3) L/4 : Heated mirror relay
A5 (M4) W/8 : To (D1)
A5 (M5) W/16 : To (D2)
C5 (M6) W/2 : Circuit breaker
C4 (M7) W/6 : Fuse block (J/B)
C4 (M8) W/16 : Data link connector
A4 (M9) L/4 : Power window relay
A4 (M10) L/4 : Trunk lid opener relay
A4 (M11) BR/6 : Remote keyless entry relay
A4 (M12) L/4 : Power socket relay
B3 (M13) L/2 : ASCD clutch switch (M/T with ASCD)
A3 *(M14) BR/16 : To (B1)
A3 *(M16) W/20 : To (B3)
A2 (M18) W/2 : To (E107)
A2 *(M19) W/16 : To (E108)
A2 (M20) W/10 : To (E109) (QG18DE)
A2 (M20) W/16 : To (E109) (QR25DE)
A4 (M21) B/2 : Trunk lid opener switch
A3 (M22) W/3 : Illumination control switch
B3 (M23) W/10 : Door mirror remote control switch
C1 (M24) BR/2 : Pillar tweeter LH
A2 (M25) W/6 : To (R1)
C3 (M26) B/2 : Stop lamp switch (With M/T)
C3 (M26) W/4 : Stop lamp switch (With A/T)
C3 (M27) BR/2 : ASCD brake switch
B2 *(M28) - : Body ground
C3 (M29) W/24 : Combination meter (Without tachometer)
C3 *(M29) BR/24 : Combination meter (With tachometer)
C3 *(M30) BR/20 : Combination meter (Without tachometer)
C3 *(M30) W/24 : Combination meter (With tachometer)
D3 (M31) W/6 : Fan control switch
E3 (M32) W/12 : Air control
D4 (M33) W/3 : Cigarette lighter socket
F4 (M34) Y/20 : Air bag diagnosis sensor unit
E4 (M35) W/2 : To (M301)
C4 (M36) Y/7 : Spiral cable
C3 (M38) W/18 : Smart entrance control unit (With power door locks)
C4 (M39) B/24 : Smart entrance control unit (With power door locks)
C4 (M40) W/10 : Time control unit (Without power door locks)
D2 (M42) B/3 : Combination flasher unit
E2 (M43) W/8 : Hazard switch
E4 (M44) W/8 : A/T device
E3 (M45) W/10 : Audio unit
E3 (M46) W/6 : Audio unit
D3 (M47) W/4 : CD changer
E3 (M48) B/2 : CD changer
E3 (M49) W/2 : Intake sensor
E3 (M50) B/6 : Intake door motor
F3 (M51) Y/2 : Front passenger air bag module
F2 (M53) GY/2 : Diode-2
G2 (M54) - : Body ground
F2 (M55) L/3 : Diode-3
F2 (M56) BR/4 : Fan resistor
F3 (M57) W/2 : Blower motor
F3 *(M58) W/16 : To (F26)
F3 *(M59) BR/16 : To (F27) (With QG18DE)
F3 *(M59) W/24 : To (F27) (With QR25DE)
G3 (M60) W/6 : To (F28)
F2 (M61) BR/2 : Security indicator lamp
G1 (M62) BR/2 : Pillar tweeter RH
G3 (M63) W/8 : To (D101)
G3 (M64) W/16 : To (D102)
A2 (M65) W/12 : To (B50)
C3 (M66) B/6 : Accelerator pedal position sensor
A3 (M67) W/2 : To (B51)

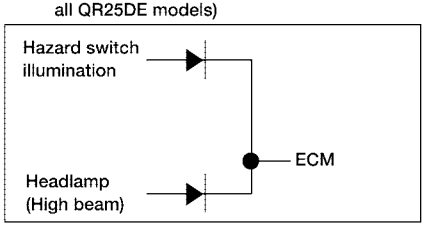
Console Sub-harness

F4 (M301) W/2 : To (M35)
F4 (M302) B/3 : Power socket

(M53) : Diode-2



(M55) : Diode-3 (For Canada QG18DE models and all QR25DE models)



*: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

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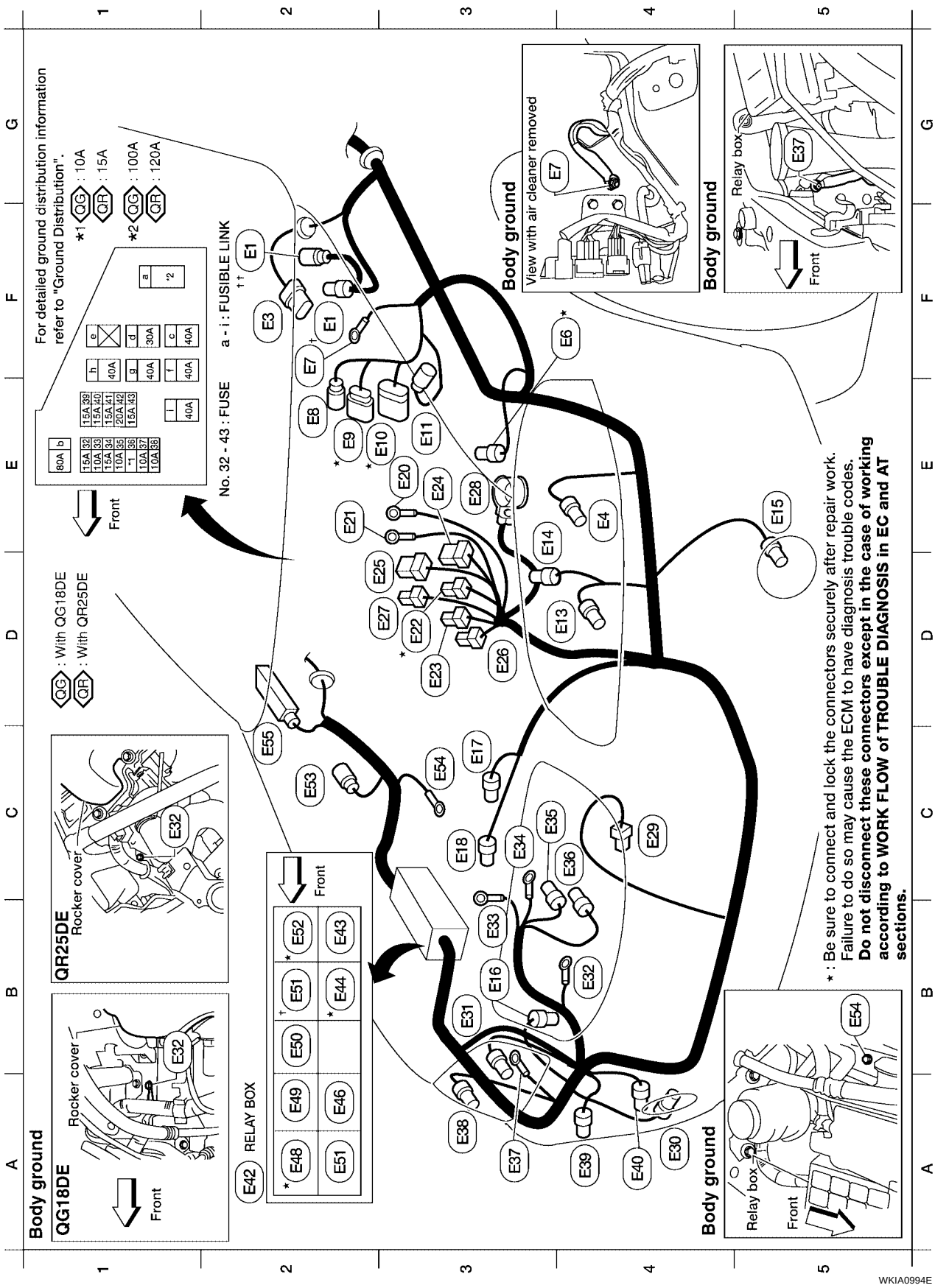
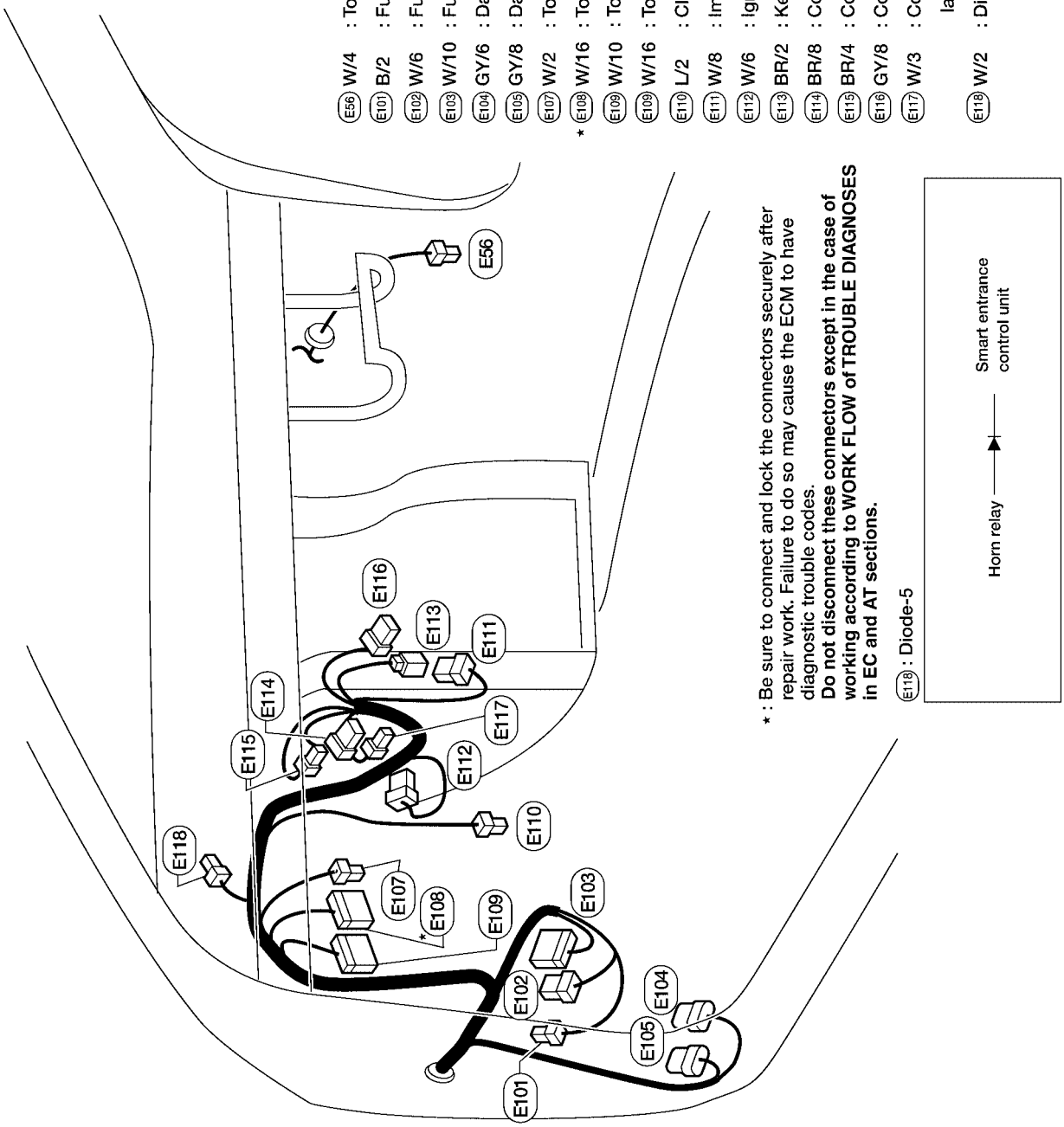
ENGINE ROOM HARNESS



F2	†(E1)	GY/2	: Brake fluid level switch (with QG18DE)
F2	††(E1)	GY/2	: Brake fluid level switch (with QR25DE)
F2	(E3)	GY/6	: Front wiper motor
E4	(E4)	GY/3	: Front combination lamp LH
F4	★(E6)	GY/2	: Dropping resistor
F3	(E7)	-	: Body ground
E3	(E8)	GY/1	: To (F46)
E3	★(E9)	GY/8	: To (F47)
E4	★(E10)	GY/10	: To (F48)
E4	(E11)	BR/2	: Front wheel sensor LH
D4	(E13)	B/3	: Headlamp LH
E3	(E14)	GY/2	: Hood switch (if equipped)
D5	(E15)	GY/2	: Front fog lamp LH
B4	(E16)	B/3	: Refrigerant pressure sensor
C3	(E17)	GY/4	: Cooling fan motor 1
C3	(E18)	GY/2	: Cooling fan motor 2 (with QG18DE)
C3	(E18)	GY/4	: Cooling fan motor 2 (with QR25DE)
E3	(E20)	-	: Fuse and fusible link box
E3	(E21)	-	: Fuse and fusible link box
D3	★(E22)	W/3	: Fuse and fusible link box
D3	(E23)	W/4	: Fuse and fusible link box
E3	(E24)	W/6	: Fuse and fusible link box
D3	(E25)	B/6	: Fuse and fusible link box
D3	(E26)	W/1	: Fuse and fusible link box
D3	(E27)	B/1	: Fuse and fusible link box
E3	(E28)	-	: Battery (positive)
C4	(E29)	B/1	: Horn
A4	(E30)	GY/2	: Front fog lamp RH
B3	(E31)	B/3	: Headlamp RH
B4	(E32)	-	: Body ground
B3	(E33)	-	: Generator
C3	(E34)	-	: Generator
C3	(E35)	GY/2	: Generator
C4	(E36)	B/1	: A/C compressor
A3	(E37)	-	: Body ground
A3	(E38)	GY/3	: Front combination lamp RH
A4	(E39)	GY/2	: Front washer motor
A4	(E40)	BR/2	: Washer fluid level switch
A2	(E42)	-	: Relay box
B2	(E43)	BR/6	: Vehicle security lamp relay
B2	(E44)	BR/6	: Cooling fan relay-3 (with QR25DE)
A2	(E46)	L/4	: Front fog lamp relay
A2	(E48)	BR/6	: Cooling fan relay-1
A2	(E49)	W/3	: Horn relay
A2	(E50)	L/4	: A/C relay
A2	(E51)	L/4	: Clutch interlock relay (M/T)
B2	†(E51)	L/4	: Park/neutral position (PNP) relay (A/T)
B2	(E52)	BR/6	: Cooling fan relay-2
C2	(E53)	GY/2	: Front wheel sensor RH
C3	(E54)	-	: Body ground
C2	(E55)	B/31	: ABS actuator and electric unit (control unit)

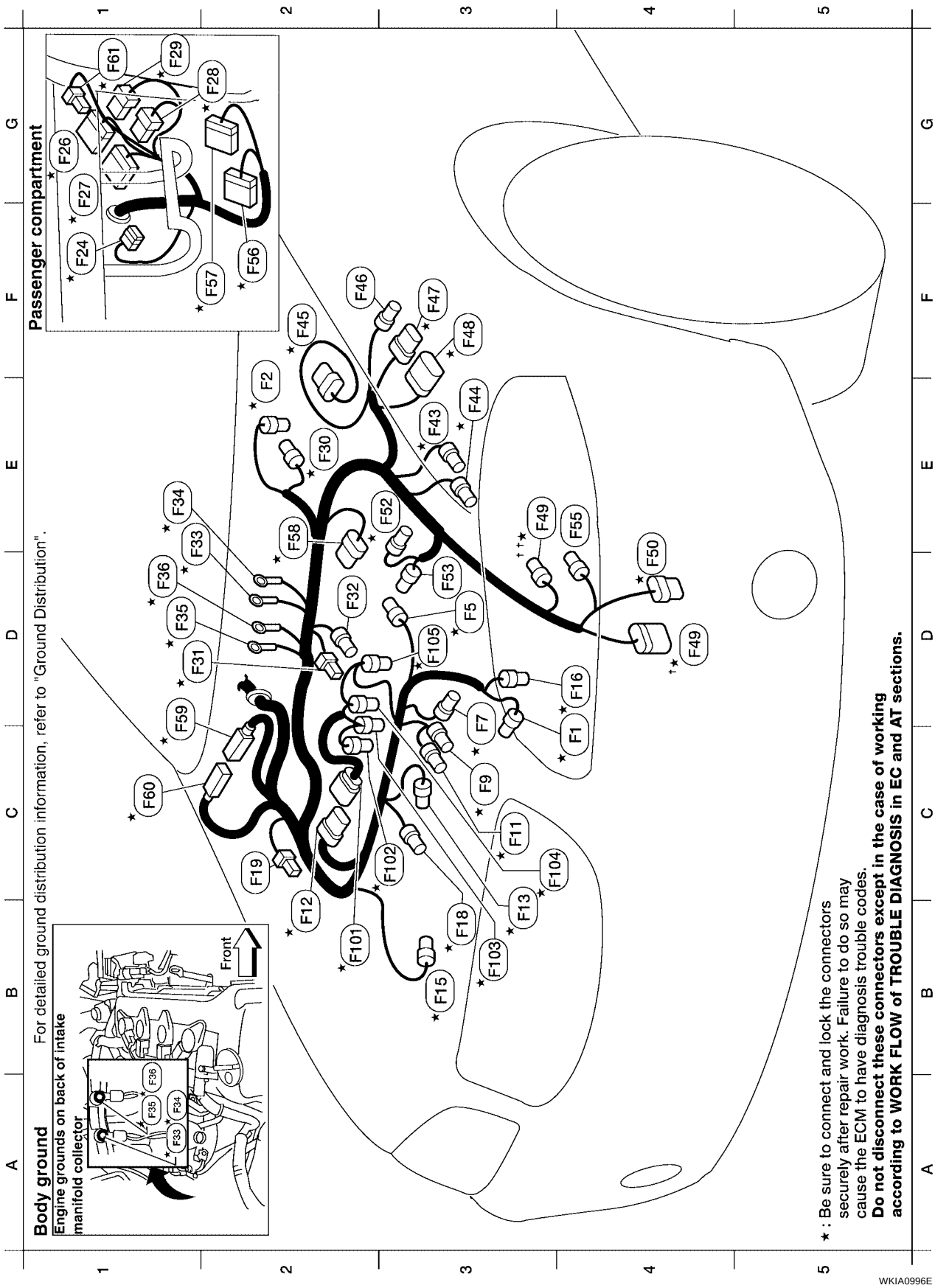
★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

WKIA0995E


E56 W/4 : To B101
E101 B/2 : Fuse block (J/B)
E102 W/6 : Fuse block (J/B)
E103 W/10 : Fuse block (J/B)
E104 GY/6 : Daytime light control unit
E105 GY/8 : Daytime light control unit
E107 W/2 : To M18
* E108 W/16 : To M19
E109 W/10 : To M20 (QG18DE)
E109 W/16 : To M20 (QR25DE)
E110 L/2 : Clutch interlock switch (M/T)
E111 W/8 : Immobilizer control unit
E112 W/6 : Ignition switch
E113 BR/2 : Key switch
E114 BR/8 : Combination switch (Lighting switch)
E115 BR/4 : Combination switch (Lighting switch)
E116 GY/8 : Combination switch (Front wiper switch)
E117 W/3 : Combination switch (Front fog lamp switch)
E118 W/2 : Diode-5
★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.
E118 : Diode-5
Horn relay
Smart entrance control unit
E56
E116
E113
E111
E114
E117
E115
E112
E110
E118
E107
E108
E109
E103
E102
E104
E105
E101

WKIA0242E

ENGINE CONTROL HARNESS
QG18DE (ULEV)



Engine control harness

D3	* (F1)	G/4	: Heated oxygen sensor 1
E2	* (F2)	G/4	: Heated oxygen sensor 2
D3	* (F5)	L/2	: EVAP canister purge volume control solenoid valve
D3	* (F7)	GY/3	: Ignition coil No. 4
C3	* (F9)	GY/3	: Ignition coil No. 3
C3	* (F11)	GY/3	: Ignition coil No. 2
B2	* (F12)	GY/6	: To (F101)
B3	* (F13)	GY/3	: Ignition coil No. 1
B3	* (F15)	GY/2	: Engine coolant temperature sensor
D4	* (F16)	B/3	: Camshaft position sensor (PHASE)
B3	* (F18)	G/2	: Intake valve timing control solenoid valve
C2	(F19)	GY/2	: Condenser
D1	* (F24)	BR/20	: Joint connector-1
G1	* (F26)	W/16	: To (M58)
F1	* (F27)	BR/16	: To (M59)
G2	* (F28)	W/6	: To (M60)
G1	* (F29)	BR/6	: ECM Relay
E2	* (F30)	B/3	: Power steering pressure sensor
D1	* (F31)	B/2	: Knock sensor
D2	(F32)	GY/1	: Oil pressure switch
E1	* (F33)	-	: Engine ground
E1	* (F34)	-	: Engine ground
D1	* (F35)	-	: Engine ground
D1	* (F36)	-	: Engine ground
E3	* (F43)	GY/2	: Vehicle speed sensor
E3	* (F44)	BR/3	: Revolution sensor (A/T)
F2	* (F45)	GY/5	: Mass air flow sensor
F2	(F46)	GY/1	: To (E8)
F3	* (F47)	GY/8	: To (E9)
F3	* (F48)	GY/10	: To (E10)
E3	†† * (F49)	B/2	: Park/neutral position (PNP) switch (M/T)
D4	† * (F49)	B/10	: Park/neutral position (PNP) switch (A/T)
D4	* (F50)	B/8	: Terminal cord assembly (A/T)
E3	* (F52)	B/3	: Crankshaft position sensor (POS)
D3	(F53)	GY/1	: Starter motor
E4	(F55)	B/2	: Back-up lamp switch (M/T)
F2	* (F56)	W/24	: TCM (Transmission control module) (A/T)
F2	* (F57)	GY/24	: TCM (Transmission control module) (A/T)
E2	* (F58)	G/6	: Electric throttle control actuator
D1	* (F59)	SMJ	: ECM
C1	* (F60)	SMJ	: ECM
G1	* (F61)	L/4	: Throttle control motor relay

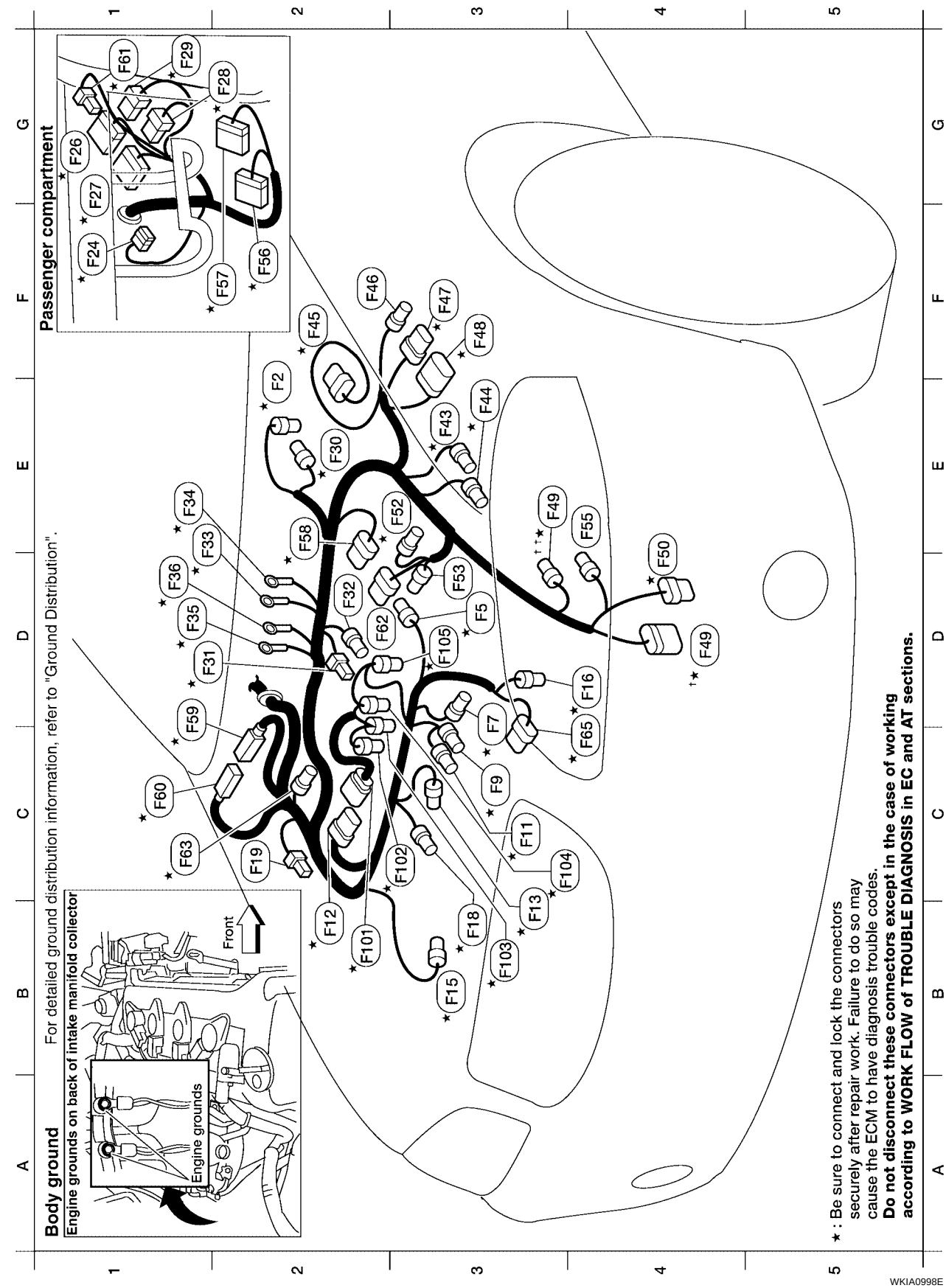
Engine control sub-harness

B2	* (F101)	GY/6	: To (F12)
C2	* (F102)	GY/2	: Injector No. 1
B3	* (F103)	GY/2	: Injector No. 2
C4	* (F104)	GY/2	: Injector No. 3
D3	* (F105)	GY/2	: Injector No. 4

⋆ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

WKIA0997E

QG18DE (SULEV)



E2	* (F2)	G/4	: Heated oxygen sensor 2
D3	* (F5)	L/2	: EVAP canister purge volume control solenoid valve
D3	* (F7)	GY/3	: Ignition coil No. 4
C3	* (F9)	GY/3	: Ignition coil No. 3
C3	* (F11)	GY/3	: Ignition coil No. 2
B2	* (F12)	GY/6	: To (F101)
B3	* (F13)	GY/3	: Ignition coil No. 1
B3	* (F15)	GY/2	: Engine coolant temperature sensor
D4	* (F16)	B/3	: Camshaft position sensor (PHASE)
B3	* (F18)	G/2	: Intake valve timing control solenoid valve
C2	(F19)	GY/2	: Condenser
D1	* (F24)	BR/20	: Joint connector-1
G1	* (F26)	W/16	: To (M58)
F1	* (F27)	BR/16	: To (M59)
G2	* (F28)	W/6	: To (M60)
G1	* (F29)	BR/6	: ECM Relay
E2	* (F30)	B/3	: Power steering pressure sensor
D1	* (F31)	B/2	: Knock sensor
D2	(F32)	GY/1	: Oil pressure switch
E1	* (F33)	-	: Engine ground
E1	* (F34)	-	: Engine ground
D1	* (F35)	-	: Engine ground
D1	* (F36)	-	: Engine ground
E3	* (F43)	GY/2	: Vehicle speed sensor
E3	* (F44)	BR/3	: Revolution sensor (A/T)
F2	* (F45)	GY/5	: Mass air flow sensor
F2	(F46)	GY/1	: To (E8)
F3	* (F47)	GY/8	: To (E9)
F3	* (F48)	GY/10	: To (E10)
E3	†† * (F49)	B/2	: Park/neutral position (PNP) switch (M/T)
D4	† * (F49)	B/10	: Park/neutral position (PNP) switch (A/T)
D4	* (F50)	B/8	: Terminal cord assembly (A/T)
E3	* (F52)	B/3	: Crankshaft position sensor (POS)
D3	(F53)	GY/1	: Starter motor
E4	(F55)	B/2	: Back-up lamp switch (M/T)
F2	* (F56)	W/24	: TCM (Transmission control module) (A/T)
F2	* (F57)	GY/24	: TCM (Transmission control module) (A/T)
E2	* (F58)	G/6	: Electric throttle control actuator
D1	* (F59)	SMJ	: ECM
C1	* (F60)	SMJ	: ECM
G1	* (F61)	L/4	: Throttle control motor relay
D2	* (F62)	GY/6	: Swirl control valve
C2	* (F63)	BR/3	: Swirl control valve position sensor
D4	* (F65)	B/6	: Air fuel ratio (A/F) sensor 1

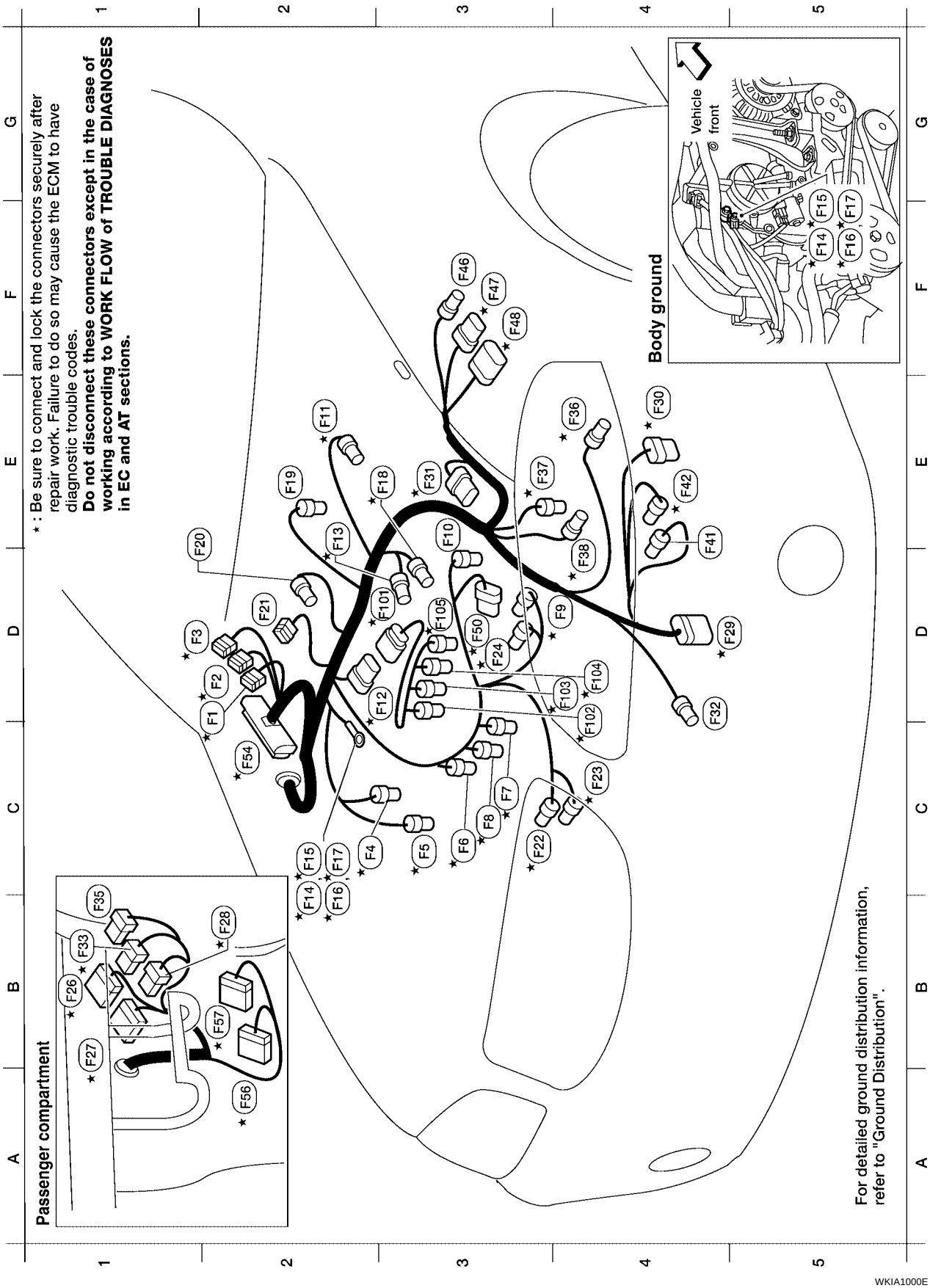
Engine control sub-harness

B2	* (F101)	GY/6	: To (F12)
C2	* (F102)	GY/2	: Injector No. 1
B3	* (F103)	GY/2	: Injector No. 2
C4	* (F104)	GY/2	: Injector No. 3
D3	* (F105)	GY/2	: Injector No. 4

★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

WKIA0999E

QR25DE


★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.
Passenger compartment
Body ground
Vehicle front
For detailed ground distribution information, refer to "Ground Distribution".
WKIA1000E

C2	* (F1)	GY/6	: Joint connector-1
D2	* (F2)	L/12	: Joint connector-2
D2	* (F3)	GY/6	: Joint connector-3
C2	* (F4)	G/2	: Intake valve timing control solenoid valve
C3	* (F5)	GY/3	: Ignition coil No. 1
C3	* (F6)	GY/3	: Ignition coil No. 2
C3	* (F7)	GY/3	: Ignition coil No. 4
C3	* (F8)	GY/3	: Ignition coil No. 3
D4	* (F9)	B/3	: Camshaft position sensor (PHASE)
E3	* (F10)	L/2	: EVAP canister purge volume control solenoid valve
E2	* (F11)	B/3	: Crankshaft position sensor
D3	* (F12)	B/6	: To (F101)
E2	* (F13)	BR/2	: VIAS control solenoid valve
B2	* (F14)	-	: Engine ground
C2	* (F15)	-	: Engine ground
B2	* (F16)	-	: Engine ground
B2	* (F17)	-	: Engine ground
C2	* (F18)	GY/2	: Knock sensor
E2	(F19)	GY/1	: Oil presure switch
E2	(F20)	B/1	: Power steering oil pressure switch
D2	(F21)	GY/2	: Condenser
C3	* (F22)	G/4	: Heated oxygen sensor 1
C4	* (F23)	L/4	: Heated oxygen sensor 2
D3	* (F24)	GY/2	: Engine coolant temperature sensor
B1	* (F26)	W/16	: To (M58)
B1	* (F27)	W/24	: To (M59)
B2	* (F28)	W/6	: To (M60)
D4	* (F29)	B/10	: Park/neutral position (PNP) switch (with A/T)
E4	* (F30)	B/8	: Terminal cord assembly (with A/T)
E3	* (F31)	GY/5	: Mass air flow sensor
D4	(F32)	GY/1	: Starter motor
B1	* (F33)	L/5	: Throttle control motor relay
B1	* (F35)	BR/6	: ECM relay
E4	* (F36)	GY/2	: Vehicle speed sensor
E4	* (F37)	B/3	: Turbine revolution sensor (with A/T)
D4	* (F38)	B/3	: Revolution sensor (with A/T)
E4	(F41)	B/2	: Back-up lamp switch (with M/T)
E4	* (F42)	B/2	: Park/neutral position (PNP) switch (with M/T)
F3	(F46)	GY/1	: To (E8)
F3	* (F47)	GY/8	: To (E9)
F3	* (F48)	GY/10	: To (E10)
D3	* (F50)	G/6	: Electric throttle control actuator
C2	* (F54)	SMJ	: ECM
A2	* (F56)	W/24	: TCM (transmission control module) (with A/T)
B2	* (F57)	GY/24	: TCM (transmission control module) (with A/T)

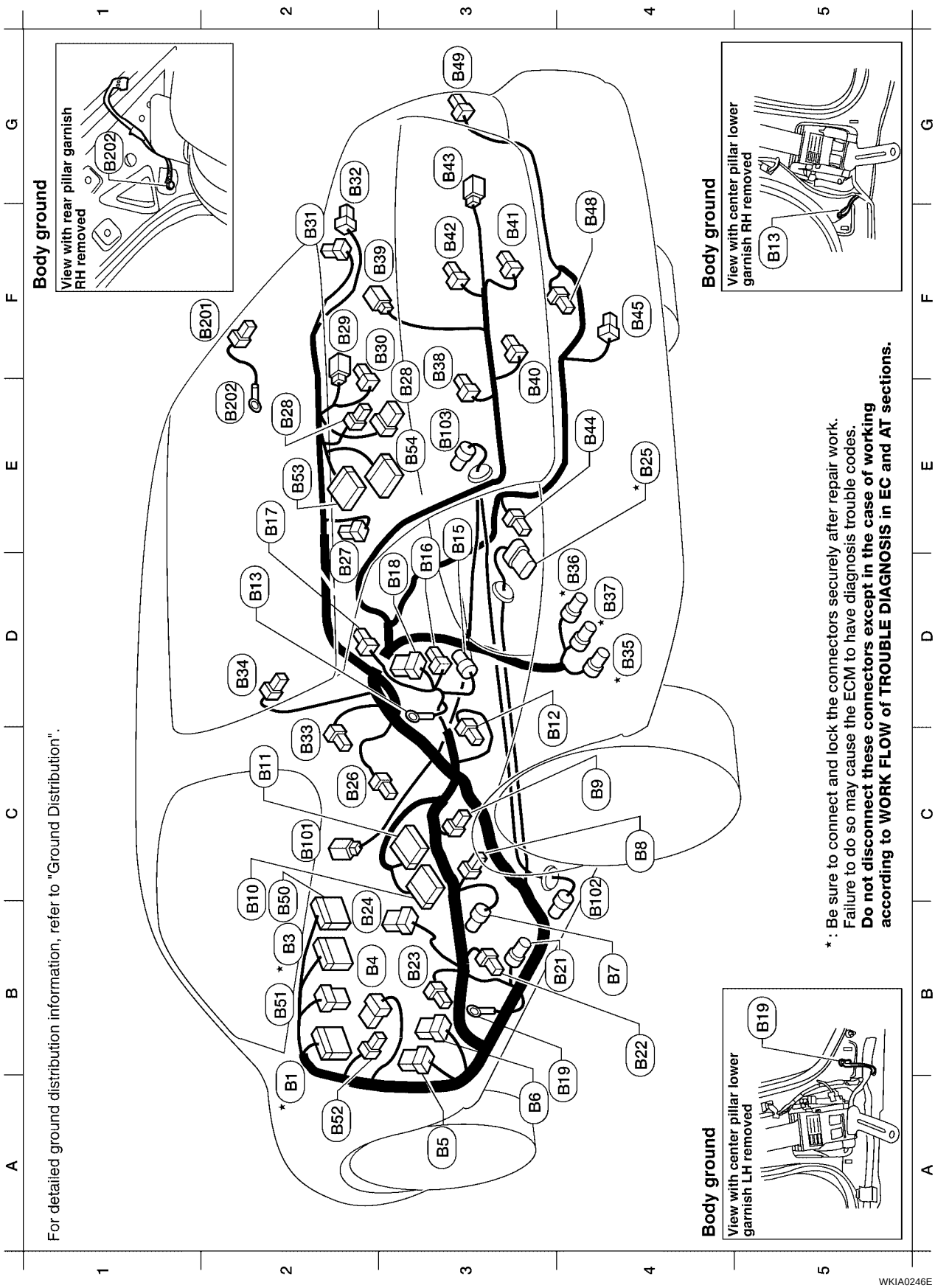
Engine Control Sub-harness

D3	* (F101)	B/6	: To (F12)
D4	* (F102)	GY/2	: Injector No. 1
D4	* (F103)	GY/2	: Injector No. 2
D4	* (F104)	GY/2	: Injector No. 3
D3	* (F105)	GY/2	: Injector No. 4

*: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

WKIA1001E

BODY HARNESS



A2 *	B1	BR/16	: To M14
B2 *	B3	W/20	: To M16
B2	B4	W/8	: Fuse block (J/B)
A3	B5	L/5	: Fuel pump relay
A3	B6	BR/6	: Rear window defogger relay
B4	B7	Y/2	: Front LH side air bag module
C4	B8	W/3	: Seat belt buckle switch LH
C4	B9	B/1	: Parking brake switch
C2	B10	Y/12	: Air bag diagnosis sensor unit
C2	B11	Y/12	: Air bag diagnosis sensor unit
D4	B12	Y/2	: Front RH side air bag module
D2	B13	–	: Body ground
E3	B15	Y/2	: RH side air bag (Satellite) sensor
E3	B16	Y/2	: Front RH seat belt pre-tensioner
E2	B17	W/3	: Front door switch RH
D3	B18	W/8	: To D301
A4	B19	–	: Body ground
B3	B21	Y/2	: LH side air bag (Satellite) sensor
B4	B22	Y/2	: Front LH seat belt pre-tensioner
B3	B23	W/3	: Front door switch LH
B2	B24	W/8	: To D201
E4 *	B25	GY/5	: Fuel level sensor unit and fuel pump
C2	B26	W/1	: Rear door switch LH
E2	B27	BR/2	: Rear speaker LH
E3	B28	W/8	: Subwoofer (With mid level audio system)
E2	B28	W/4	: Subwoofer (With premium audio system)
F2	B29	W/2	: High-mounted stop lamp (Without rear air spoiler)
F3	B30	W/2	: Trunk room lamp
F2	B31	BR/2	: Rear speaker RH
F2	B32	W/1	: Rear door switch RH
C2	B33	W/2	: Diode-4
D2	B34	B/1	: Rear window defogger
D4 *	B35	B/2	: EVAP canister vent control valve
D4 *	B36	GY/3	: EVAP control system pressure sensor
D4 *	B37	G/2	: Vacuum cut valve bypass valve (QR25DE)
F3	B38	W/2	: Back-up lamp LH
F2	B39	BR/2	: High-mounted stop lamp (With rear air spoiler)
E3	B40	W/2	: License plate lamp LH
F3	B41	W/2	: License plate lamp RH
F3	B42	W/2	: Back-up lamp RH
G3	B43	W/2	: Trunk lid key cylinder switch (Unlock switch) (With vehicle security system)
E4	B44	W/4	: Rear combination lamp LH
F4	B45	W/4	: Trunk lid opener actuator
F3	B48	W/2	: Trunk room lamp switch
G3	B49	W/4	: Rear combination lamp RH
B2	B50	W/12	: To M65
B2	B51	W/2	: To M67
A2	B52	W/4	: To D9
E2	B53	W/12	: Audio amplifier (With premium audio system)
E3	B54	W/12	: Audio amplifier (With premium audio system)

Body No. 2 harness

C2	B101	W/4	: To E56
C4	B102	BR/2	: Rear wheel sensor LH
E3	B103	GY/2	: Rear wheel sensor RH

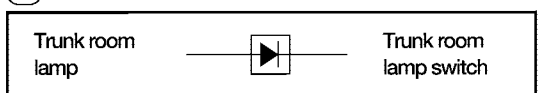
Rear window defogger ground sub-harness

F2	B201	B/1	: Rear window defogger
F2	B202	–	: Body ground

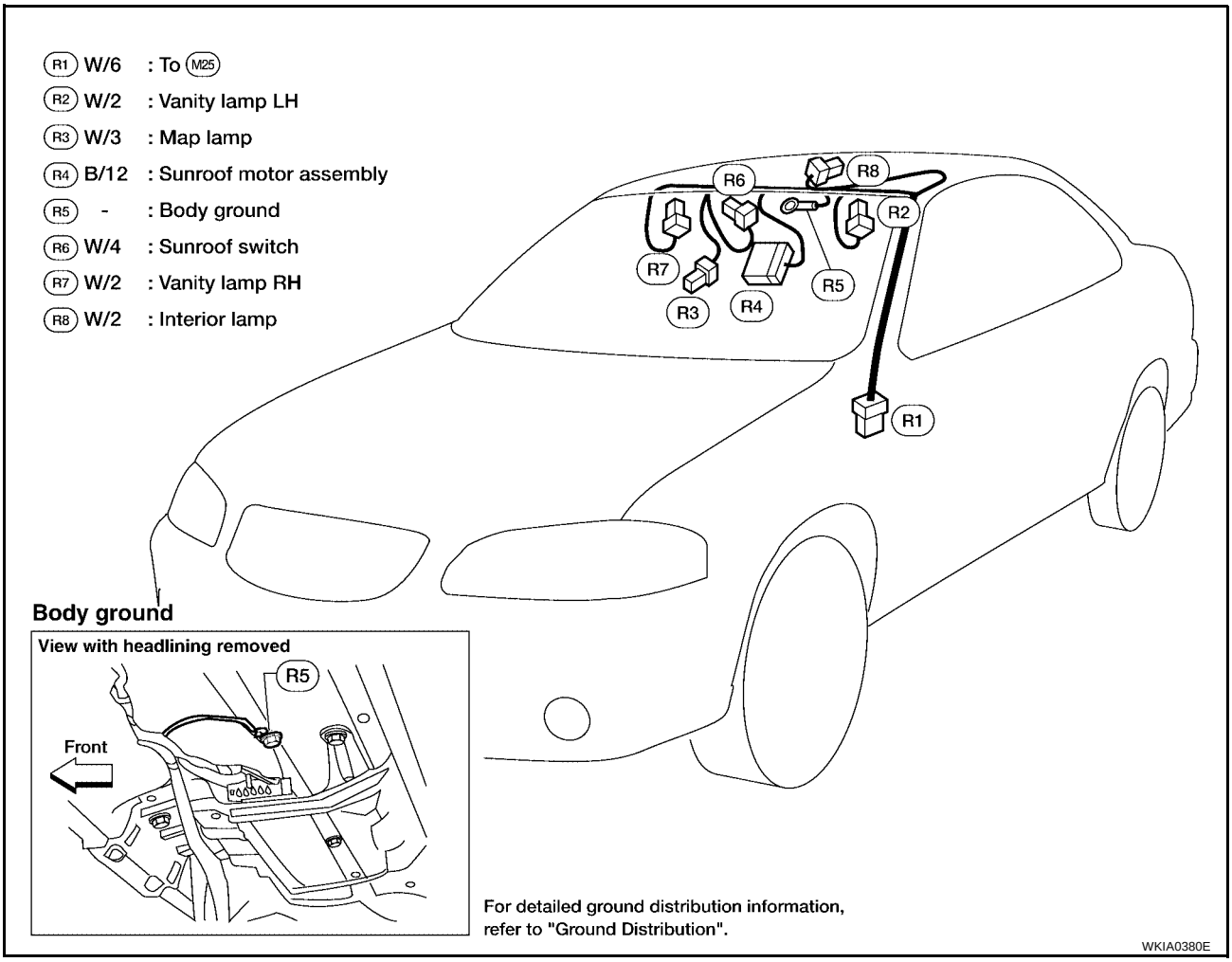
* : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

WKIA1002E

B33 : Diode-4



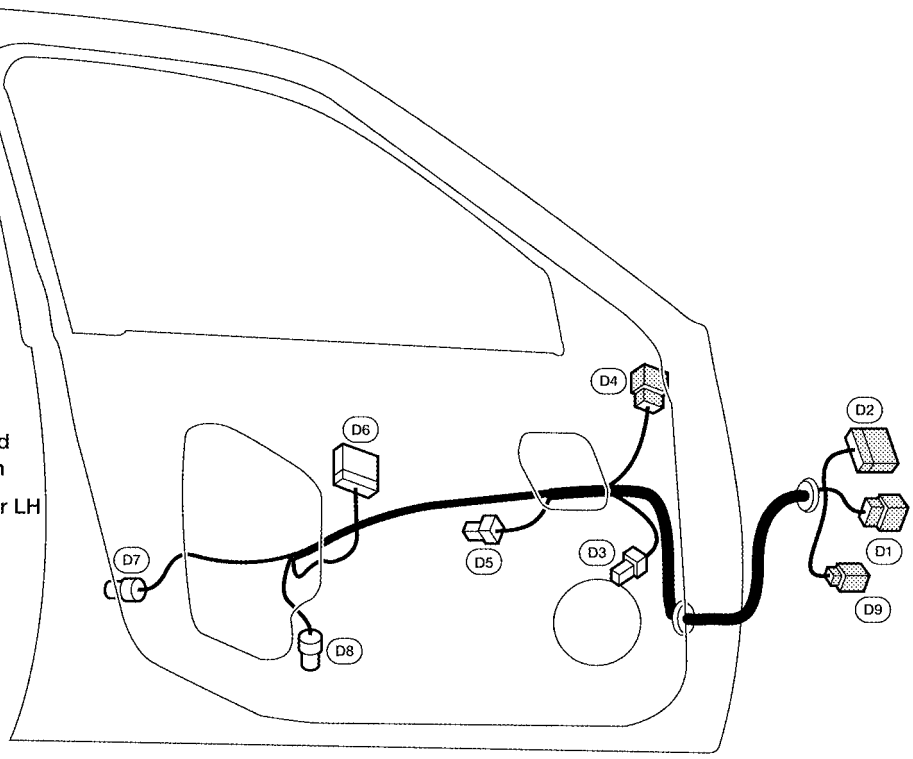
ROOM LAMP HARNESS



FRONT DOOR HARNESS

LH SIDE

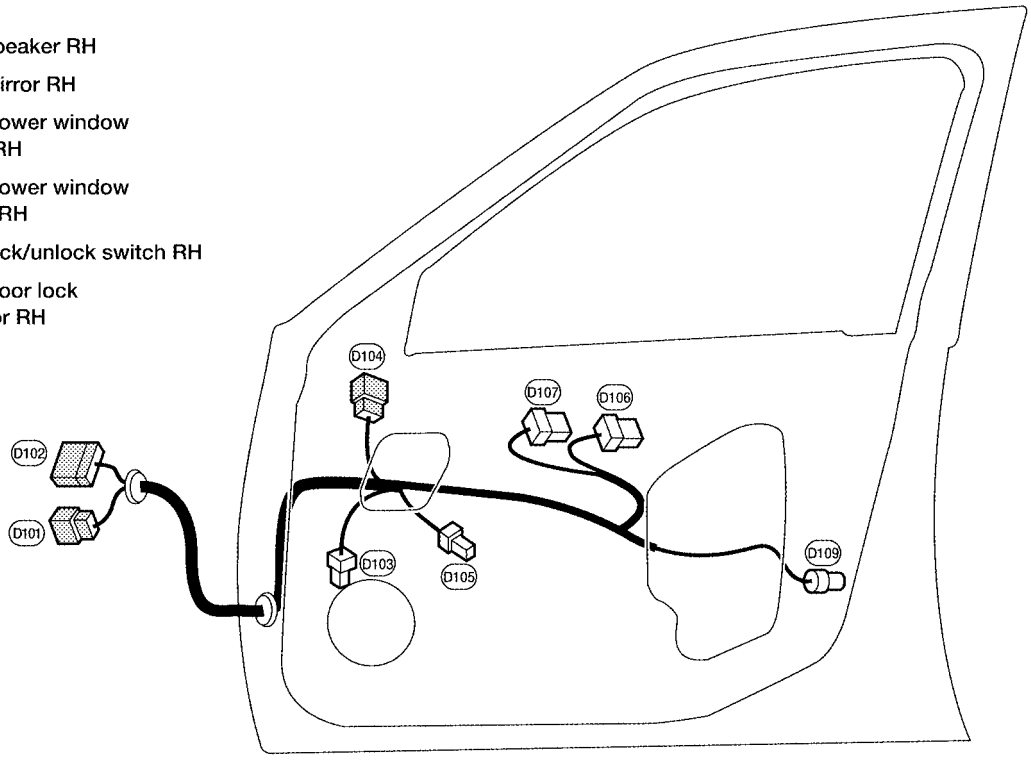
(D1) W/8 : To (M4)
(D2) W/16 : To (M5)
(D3) W/2 : Door speaker LH
(D4) GY/6 : Door mirror LH
(D5) B/2 : Front power window motor LH
(D6) W/16 : Main power window and door lock/unlock switch
(D7) SB/4 : Front door lock actuator LH
(D8) BR/3 : Front door key cylinder switch LH
(D9) W/4 : To (B52)



WKIA0381E

RH SIDE

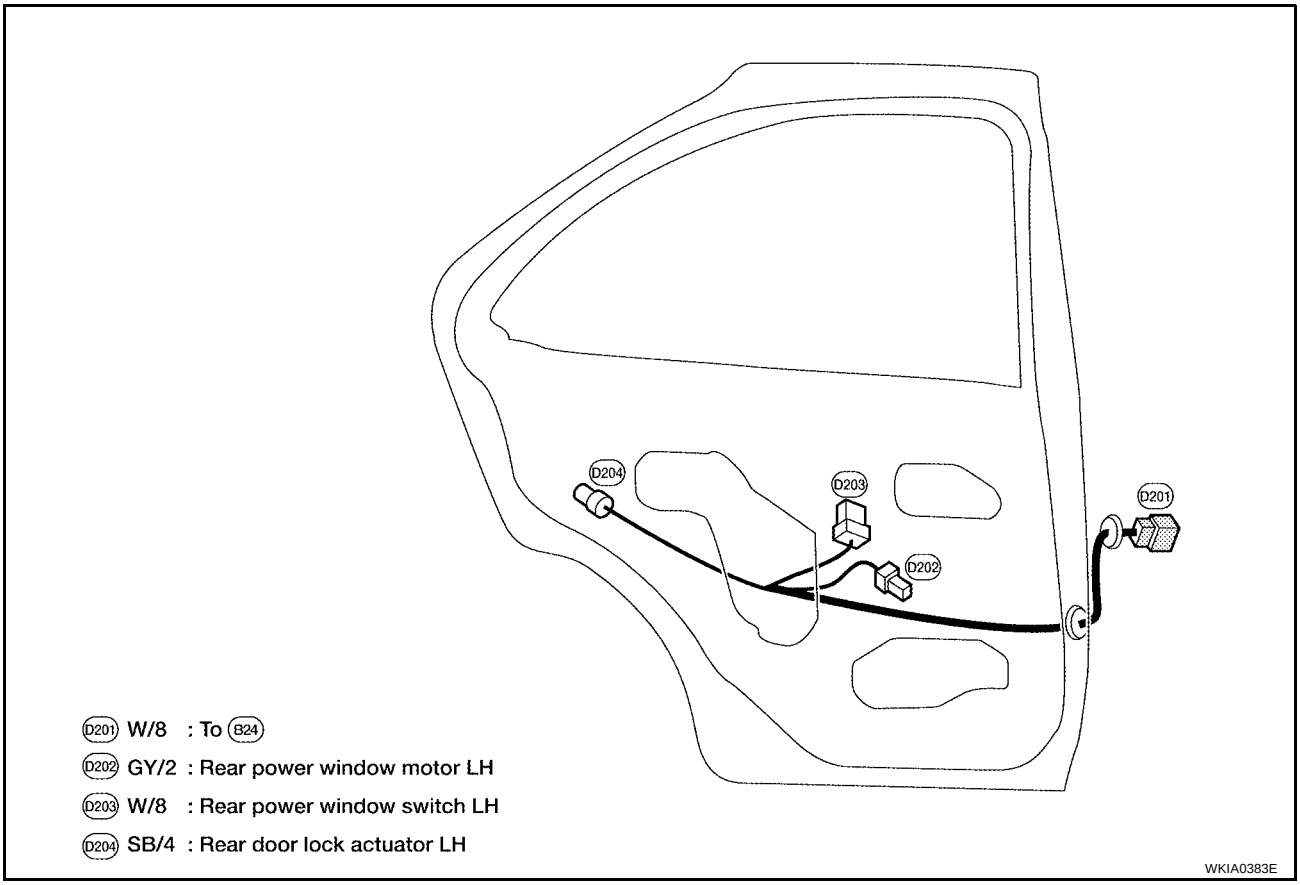
(D101) W/8 : To (M63)
(D102) W/16 : To (M64)
(D103) W/2 : Door speaker RH
(D104) GY/6 : Door mirror RH
(D105) B/2 : Front power window motor RH
(D106) W/8 : Front power window switch RH
(D107) GY/8 : Door lock/unlock switch RH
(D109) SB/4 : Front door lock acutator RH



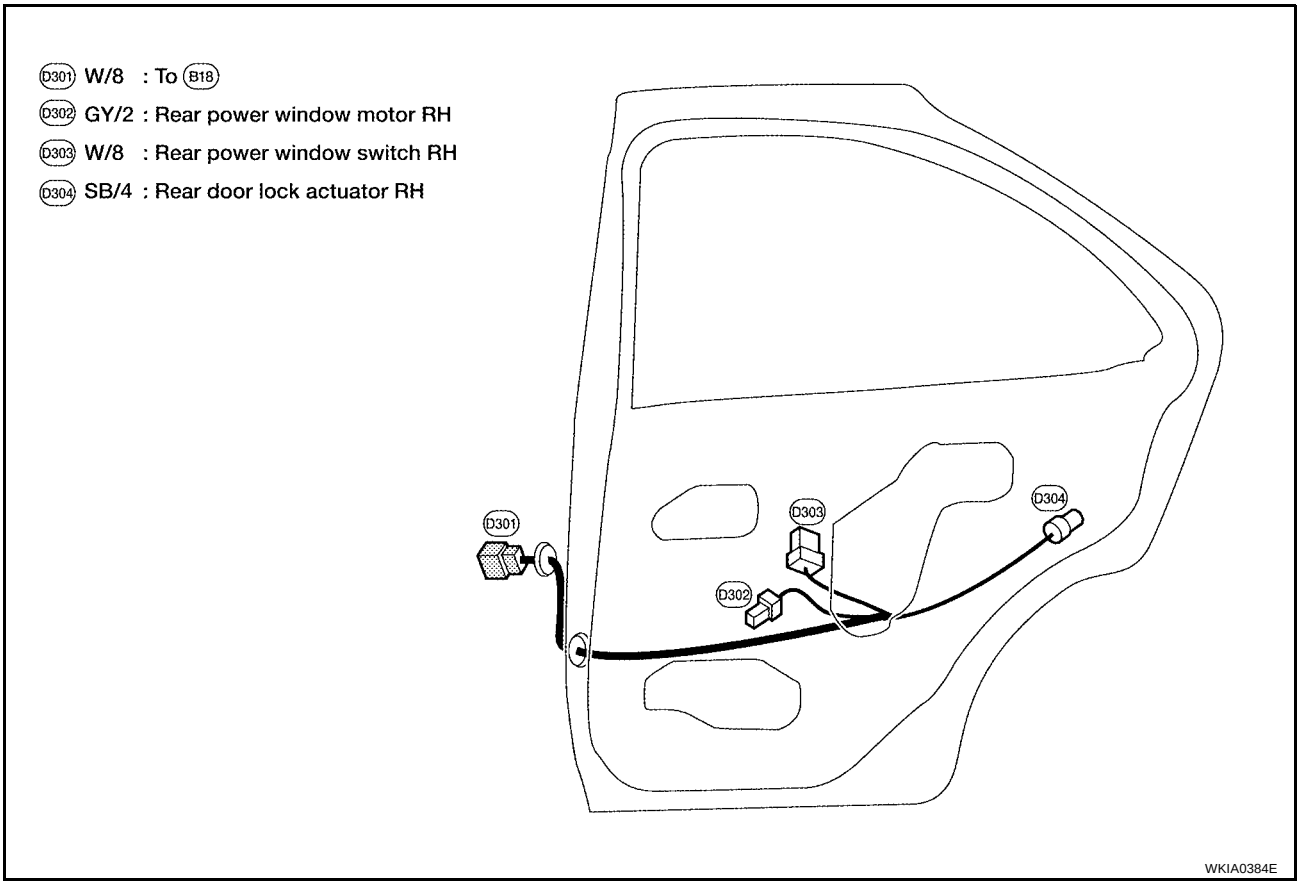
WKIA0382E

REAR DOOR HARNESS

LH SIDE



RH SIDE



Wiring Diagram Codes (Cell Codes)

EKS003B3

Use the chart below to find out what each wiring diagram code stands for.
Refer to the wiring diagram code in the alphabetical index to find the location (page number) of each wiring diagram.

Code	Section	Wiring Diagram Name
1STSIG	AT	A/T 1ST Signal
2NDSIG	AT	A/T 2ND Signal
3RDSIG	AT	A/T 3RD Signal
4THSIG	AT	A/T 4TH Signal
ABS	BRC	Anti-lock Brake System
A/C,M	MTC	Air Conditioner
A/F	EC	Air Fuel Ratio (A/F) Sensor 1 [QG18DE (SULEV)]
A/FH	EC	Air Fuel Ratio (A/F) Sensor 1 Heater [QG18DE (SULEV)]
APPS1	EC	Accelerator Pedal Position Sensor
APPS2	EC	Accelerator Pedal Position Sensor
APPS3	EC	Accelerator Pedal Position Sensor
ASC/BS	EC	ASCD Brake Switch
ASCBOF	EC	ASCD Brake Switch
ASCIND	EC	ASCD Indicator
ASC/SW	EC	ASCD Steering Switch
AUDIO	AV	Audio
BACK/L	LT	Back-up Lamp
BA/FTS	AT	A/T Fluid Temperature Sensor and TCM Power Supply
BRK/SW	EC	Brake Switch
BYPS/V	EC	Vacuum Cut Valve Bypass Valve (QR25DE Models)
CAN	AT	CAN Communication Line
CAN	EC	CAN Communication Line
CAN	LAN	CAN Communication Line
CHARGE	SC	Charging System
CHIME	DI	Warning Chime
CIGAR	WW	Cigarette Lighter
COOL/F	EC	Cooling Fan Control
DEF	GW	Rear Window Defogger
DLC	EC	Data Link Connector
D/LOCK	BL	Power Door Lock
DTRL	LT	Headlamp - With Daytime Light System (For Canada)
ECM/PW	EC	ECM Power Supply
ECTS	EC	Engine Coolant Temperature Sensor
ENGSS	AT	Engine Speed Signal
ETC1	EC	Electric Throttle Control Function
ETC2	EC	Throttle Control Motor Relay
ETC3	EC	Throttle Control Motor
F/FOG	LT	Front Fog Lamp
FLS1	EC	Fuel Level Sensor Circuit (Slosh)
FLS2	EC	Fuel Level Sensor Circuit
FLS3	EC	Fuel Level Sensor Circuit (Ground Signal)

Code	Section	Wiring Diagram Name
F/PUMP	EC	Fuel Pump Control
FTS	AT	A/T Fluid Temperature Sensor
FTTS	EC	Fuel Tank Temperature Sensor
FUEL	EC	Fuel Injection System Function
HEATER	MTC	Heater System
H/LAMP	LT	Headlamp
H/MIRR	GW	Heated Mirror
HO2S1	EC	Heated Oxygen Sensor 1
HO2S1H	EC	Heated Oxygen Sensor 1 Heater
HO2S2	EC	Heated Oxygen Sensor 2
HO2S2H	EC	Heated Oxygen Sensor 2 Heater
HORN	WW	Horn
IATS	EC	Intake Air Temperature Sensor
IGNSYS	EC	Ignition Signal
ILL	LT	Illumination
INJECT	EC	Injector
INT/L	LT	Interior, Step, Spot, Vanity Mirror and Trunk Room Lamps
IVC	EC	Intake Valve Timing Control Solenoid Valve
IVCS	EC	Intake Valve Timing Control Position Sensor
KEYLES	BL	Remote Keyless Entry System
KS	EC	Knock Sensor
LOAD	EC	Load Signal
LPSV	AT	Line Pressure Solenoid Valve
MAFS	EC	Mass Air Flow Sensor
MAIN	AT	Main Power Supply and Ground Circuit
MAIN	EC	Main Power Supply and Ground Circuit
METER	DI	Speedometer, Tachometer, Temp., Oil, and Fuel Gauges
MIL	EC	Malfunction Indicator Lamp
MIRROR	GW	Power Door Mirror
NATS	BL	NVIS (Nissan Vehicle Immobilizer System — NATS)
NONDTC	AT	Non-detectable Items
OVRCSV	AT	Overrun Clutch Solenoid Valve
PGC/V	EC	EVAP Canister Purge Volume Control Solenoid Valve
PHASE	EC	Camshaft Position Sensor (PHASE)
PNP/SW	AT	Park/Neutral Position Switch
PNP/SW	EC	Park/Neutral Position Switch
POS	EC	Crankshaft Position Sensor (POS)
POWER	PG	Power Supply Routing
PRE/SE	EC	EVAP Control System Pressure Sensor
PS/SEN	EC	Power Steering Pressure Sensor (QG18DE Model)
PST/SW	EC	Power Steering Oil Pressure Switch (QR25DE Model)
ROOM/L	LT	Room Lamp
RP/SEN	EC	Refrigerant Pressure Sensor
SEN/PW	EC	Sensor Power Supply

Code	Section	Wiring Diagram Name
SHIFT	AT	A/T Shift Lock System
SROOF	RF	Sunroof
SRS	SRS	Supplemental Restraint System
S/SIG	EC	Start Signal (QR25DE Model)
SSV/A	AT	Shift Solenoid Valve A
SSV/B	AT	Shift Solenoid Valve B
START	SC	Starting System
STOP/L	LT	Stop Lamp
SWL/S	EC	Swirl Control Valve Position Sensor [QG18DE (SULEV)]
SWL/V	EC	Swirl Control Valve [QG18DE (SULEV)]
TAIL/L	LT	Parking, License and Tail Lamps
TCCSIG	AT	A/T TCC Signal (Lock Up)
TCV	AT	Torque Converter Clutch Solenoid Valve
TLID	BL	Trunk Lid Opener
TPS	AT	Throttle Position Sensor
TPS1	EC	Throttle Position Sensor
TPS2	EC	Throttle Position Sensor
TPS3	EC	Throttle Position Sensor
TRSA/T	AT	Turbine Revolution Sensor (QR25DE Model)
TURN	LT	Turn Signal and Hazard Warning Lamps
VIAS	EC	Variable Air Induction Control System (QR25DE Model)
VEHSEC	BL	Vehicle Security System
VENT/V	EC	EVAP Canister Vent Control Valve
VIAS	EC	Variable Air Induction Control System
VSS	EC	Vehicle Speed Sensor
VSSA/T	AT	Vehicle Speed Sensor A/T (Revolution Sensor)
VSSMTR	AT	Vehicle Speed Sensor MTR
WARN	DI	Warning Lamps
WINDOW	GW	Power Window
WIPER	WW	Front Wiper and Washer

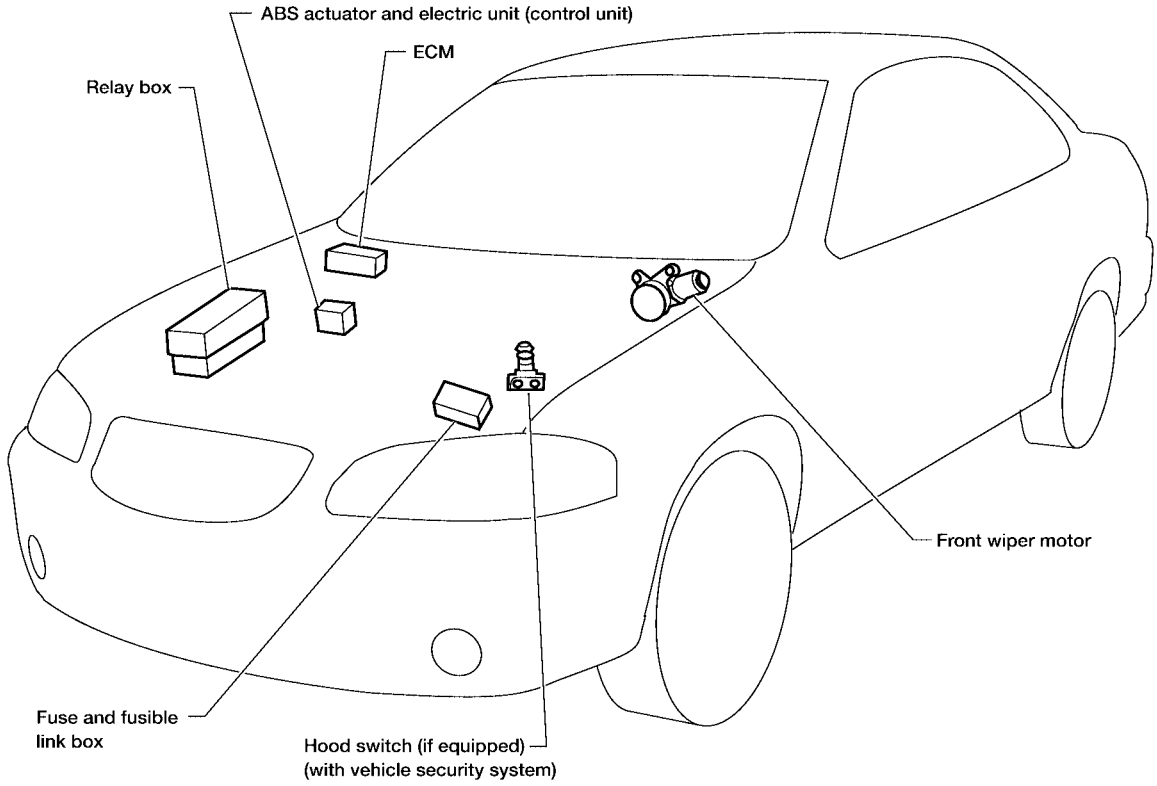
ELECTRICAL UNITS LOCATION

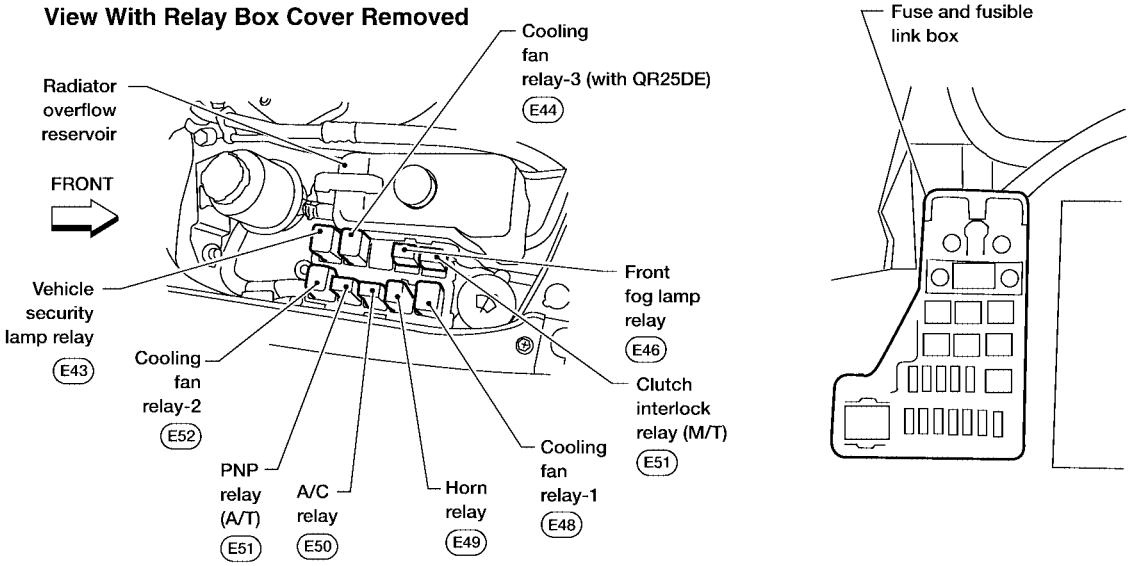
PFP:25230

Electrical Units Location

EKS003B4

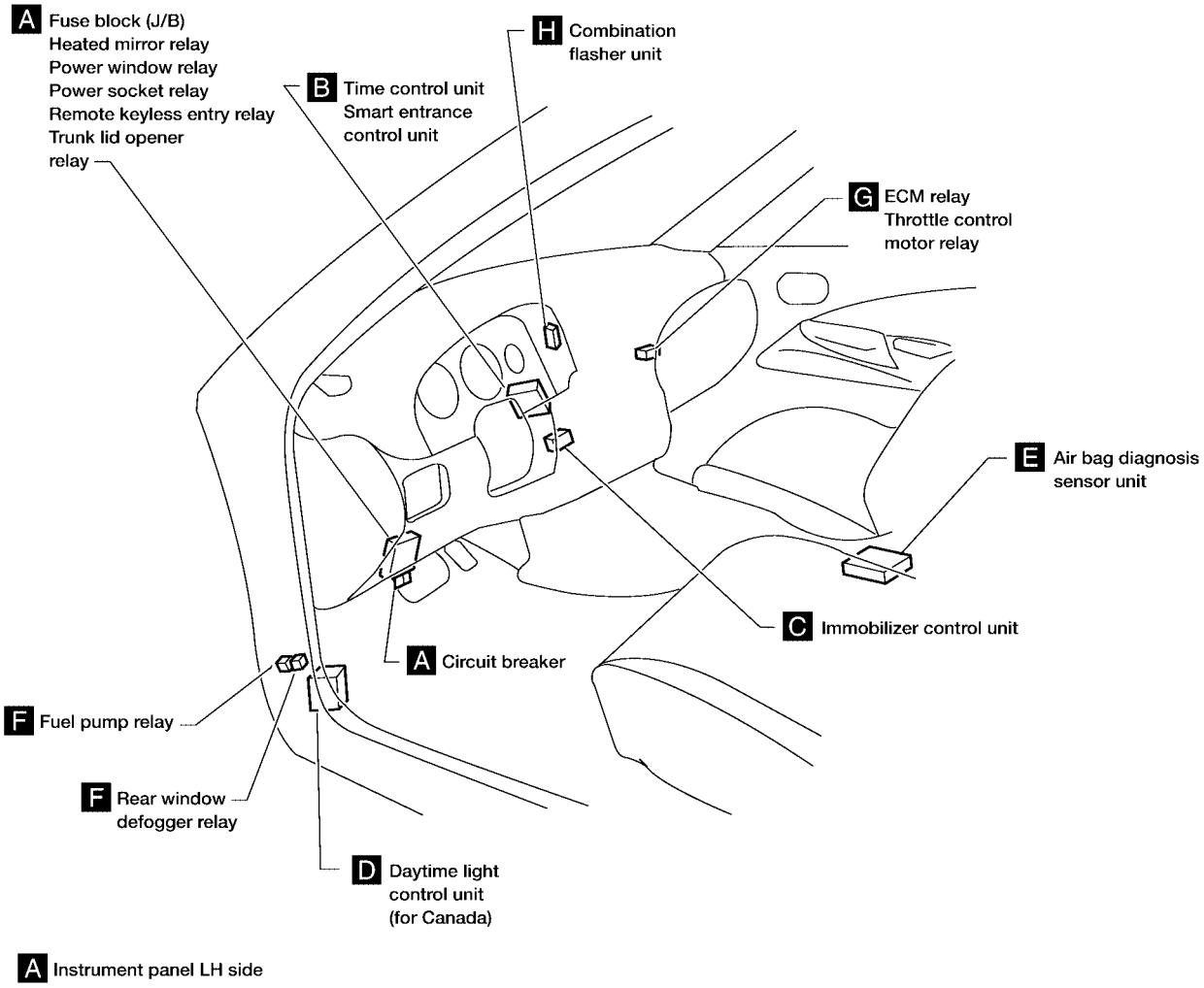
ENGINE COMPARTMENT



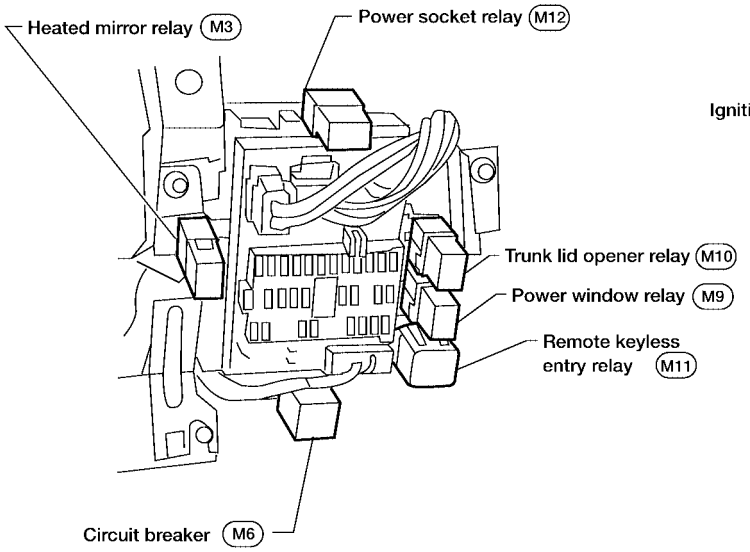


WKIA1003E

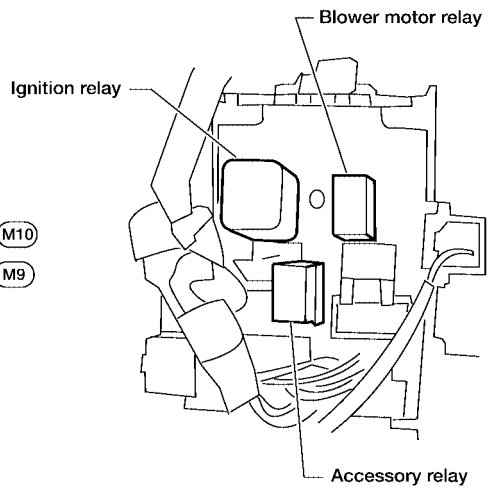
PASSENGER COMPARTMENT



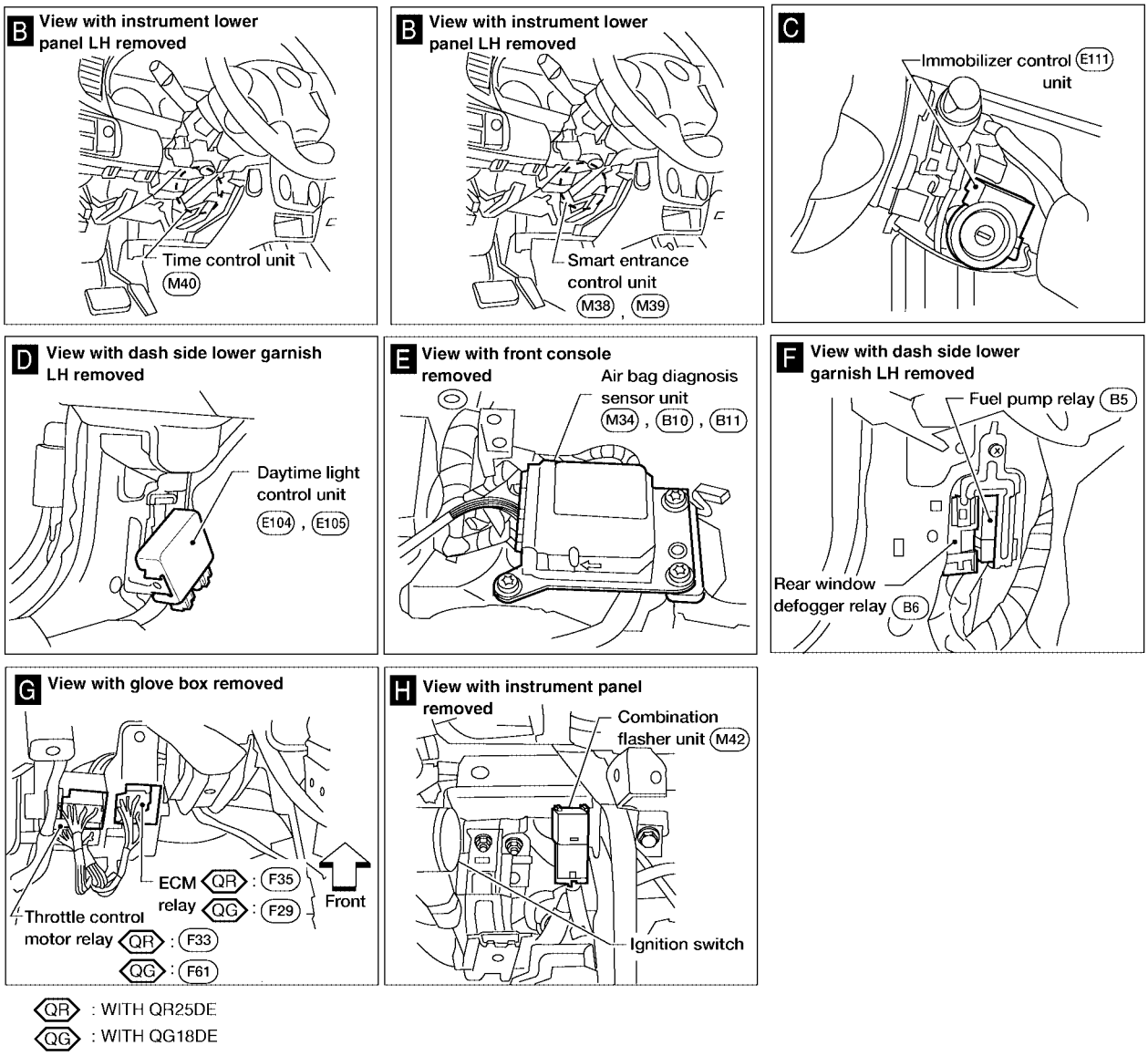
View with instrument panel removed



View of rear of fuse block (J/B)



WKIA0249E

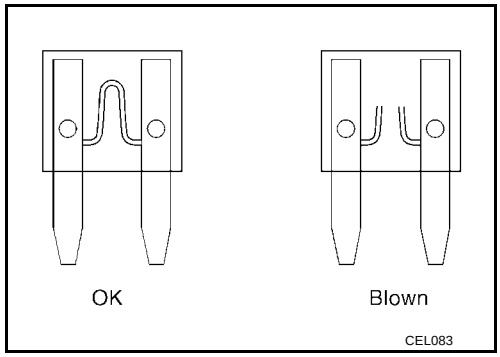

B View with instrument lower panel LH removed
Time control unit
M40
B View with instrument lower panel LH removed
Smart entrance control unit
M38 , M39
C
Immobilizer control unit E111
D View with dash side lower garnish LH removed
Daytime light control unit
E104 , E105
E View with front console removed
Air bag diagnosis sensor unit
M34 , B10 , B11
F View with dash side lower garnish LH removed
Fuel pump relay B5
Rear window defogger relay B6
G View with glove box removed
ECM relay QR : F35
QG : F29
Front
Throttle control motor relay QR : F33
QG : F61
H View with instrument panel removed
Combination flasher unit M42
Ignition switch
QR : WITH QR25DE
QG : WITH QG18DE

WKIA0981E

Fuse

EKS003B5

- If fuse is blown, be sure to eliminate cause of incident before installing new fuse.
- Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not partially install fuse; always insert it into fuse holder properly.
- Remove fuse for “ELECTRICAL PARTS (BAT)” if vehicle is not used for a long period of time.



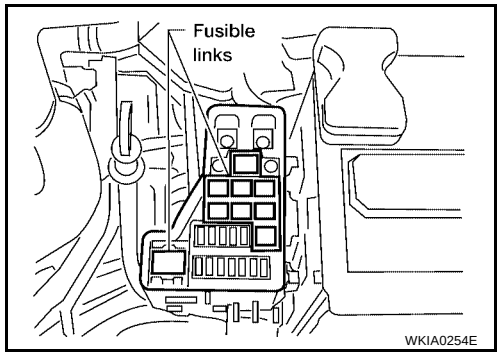
Fusible Link

EKS003B6

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

CAUTION:

- **If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of incident.**
- **Never wrap outside of fusible link with vinyl tape. Important: Never let fusible link touch any other wiring harness, vinyl or rubber parts.**

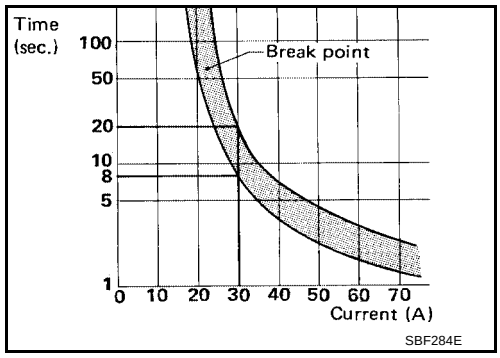


Circuit Breaker

EKS003B7

For example, when current is 30A, the circuit is broken within 8 to 20 seconds.
A circuit breaker is used for the following systems:

- Power door locks
- Power sunroof
- Power windows
- Remote keyless entry system



HARNESS CONNECTOR

PFP:24010

Description

EKS003B8

HARNESS CONNECTOR (TAB-LOCKING TYPE)

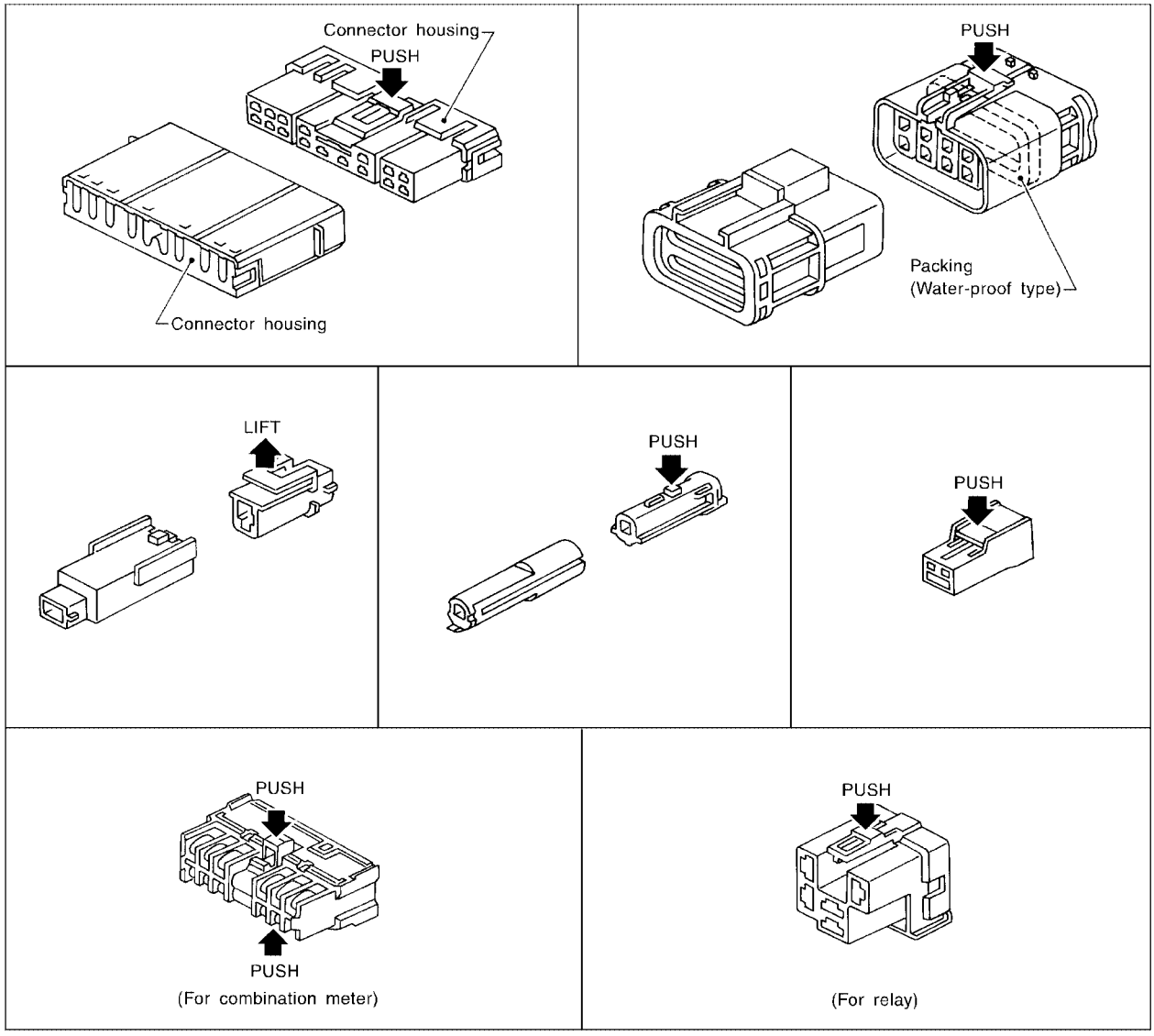
- The tab-locking type connectors help prevent accidental looseness or disconnection.
- The tab-locking type connectors are disconnected by pushing or lifting the locking tab(s). Refer to the illustration below.

Refer to the next page for description of the slide-locking type connector.

CAUTION:

Do not pull the harness or wires when disconnecting the connector.

[Example]



SEL769DA

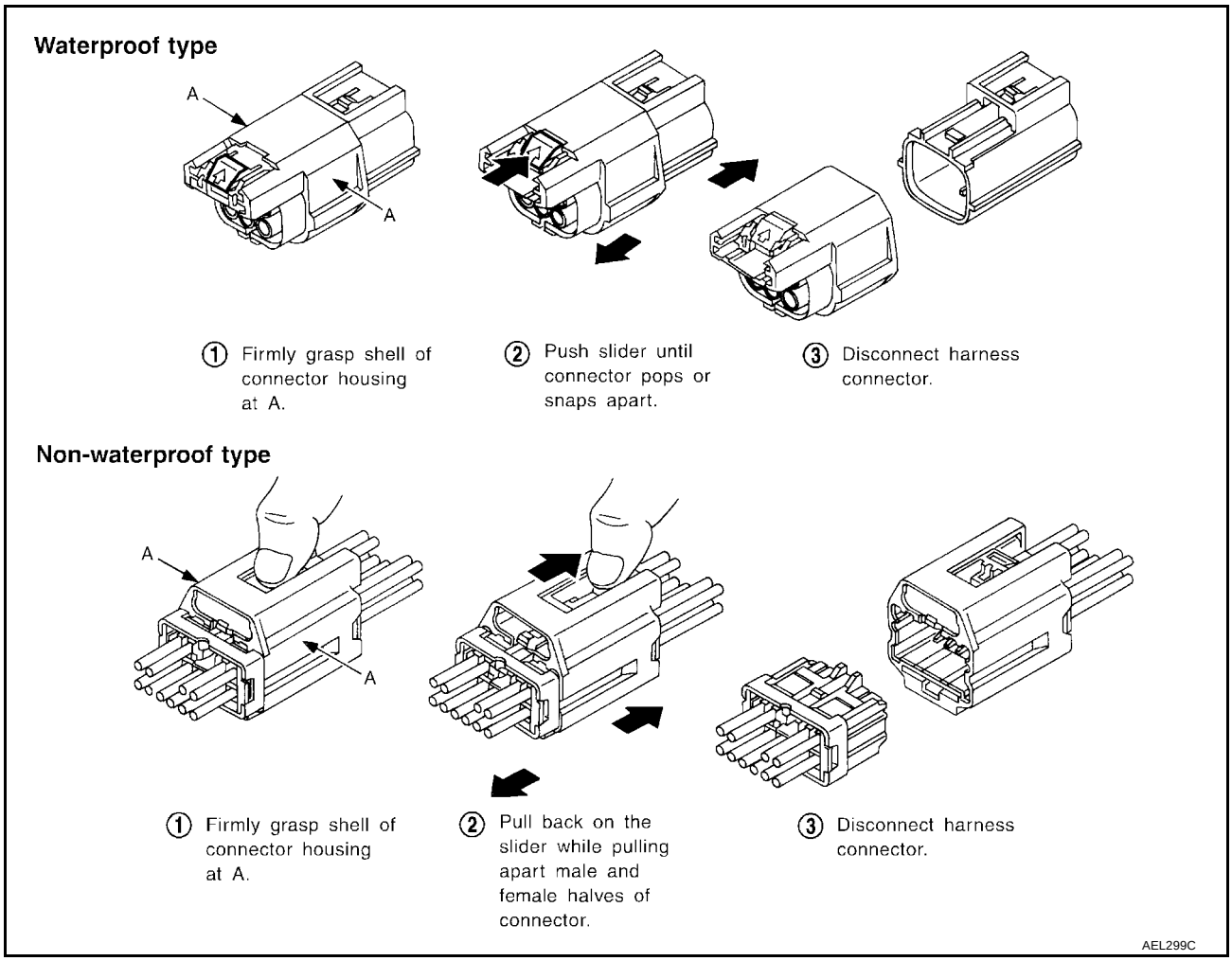
HARNESS CONNECTOR (SLIDE-LOCKING TYPE)

- A new style slide-locking type connector is used on certain systems and components, especially those related to OBD.
- The slide-locking type connectors help prevent incomplete locking and accidental looseness or disconnection.
- The slide-locking type connectors are disconnected by pushing or pulling the slider. Refer to the illustration below.

CAUTION:

- **Do not pull the harness or wires when disconnecting the connector.**
- **Be careful not to damage the connector support bracket when disconnecting the connector.**

[Example]

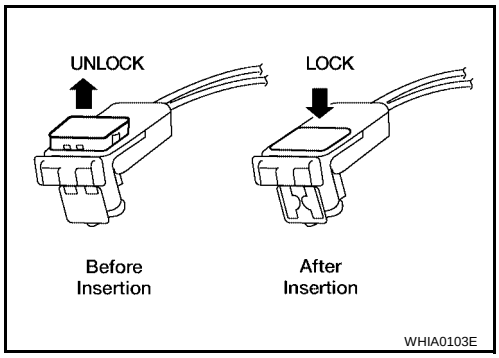


HARNESS CONNECTOR (DIRECT-CONNECT SRS COMPONENT TYPE)

- SRS direct-connect type harness connectors are used on certain SRS components such as air bag modules and seat belt pre-tensioners.
- Always pull up to release black locking tab prior to removing connector from SRS component.
- Always push down to lock black locking tab after installing connector to SRS component. When locked, the black locking tab is level with the connector housing.

CAUTION:

- **Do not pull the harness or wires when removing connectors from SRS components.**



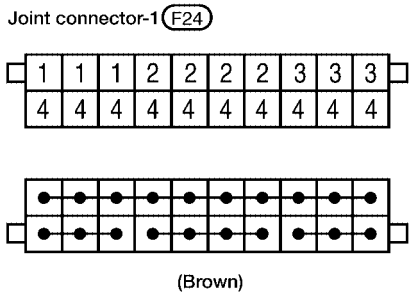
JOINT CONNECTOR

PFP:B4341

Terminal Arrangement

EKS003B9

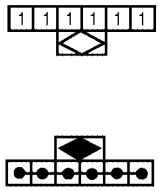
QG18DE



WKIA0251E

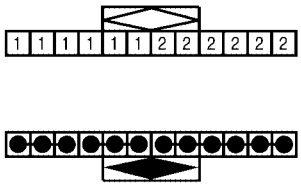
QR25DE

JOINT CONNECTOR - 1 (F1)



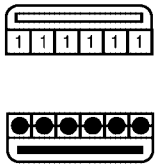
(GRAY)

JOINT CONNECTOR - 2 (F2)



(BLUE)

JOINT CONNECTOR - 3 (F3)



(GRAY)

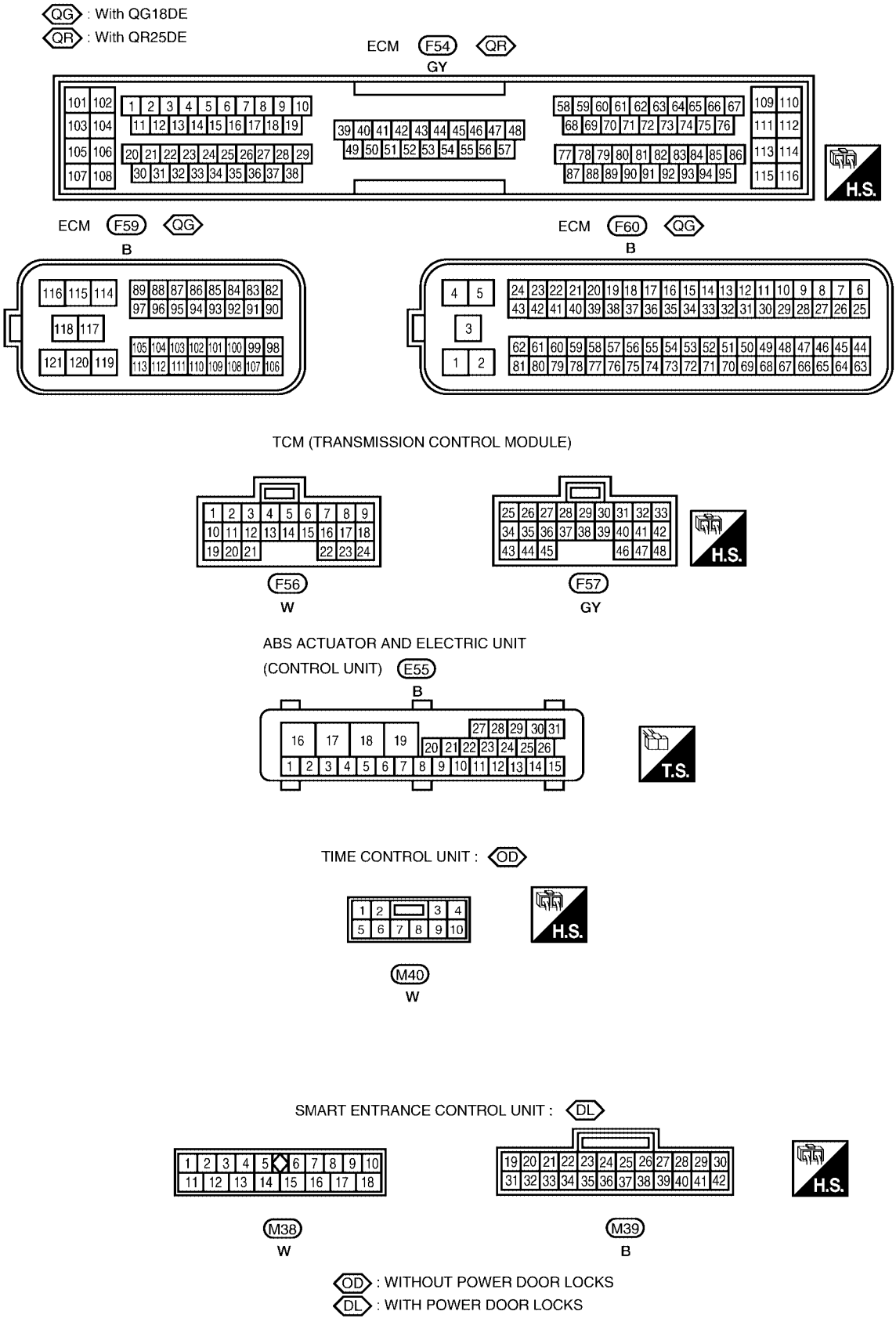
WKIA0029E

ELECTRICAL UNITS

PFP:23710

Terminal Arrangement

EKS003BA



WKIA1004E

STANDARDIZED RELAY

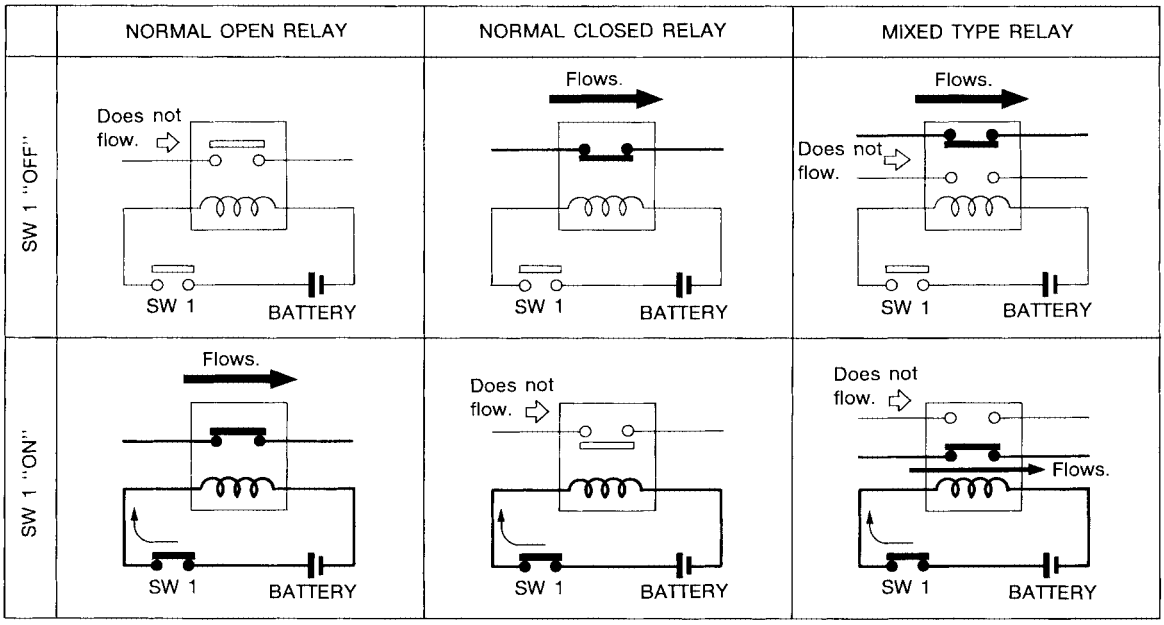
PFP:25230

Description

EKS003BB

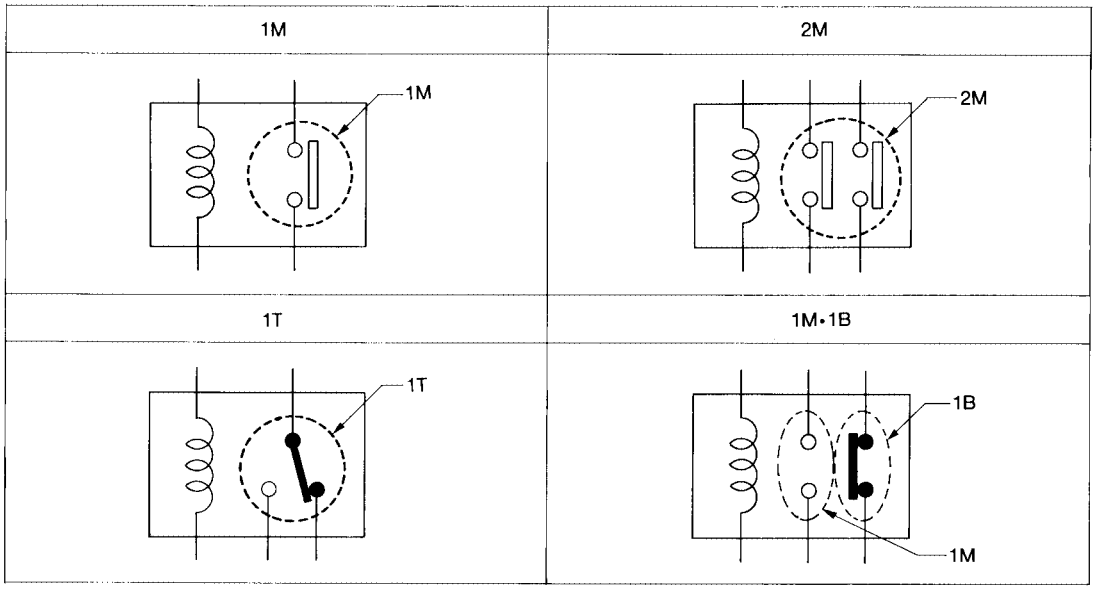
NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



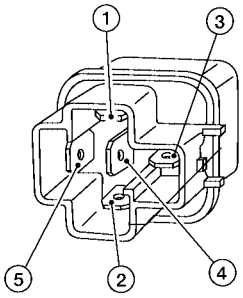
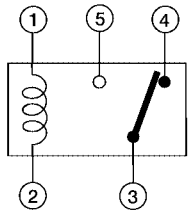
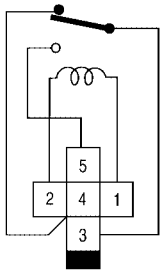
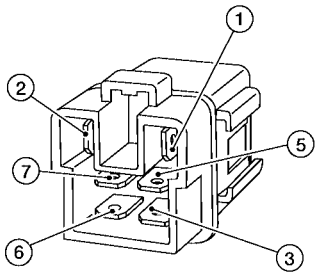
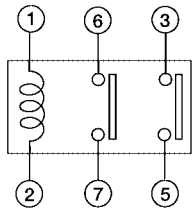
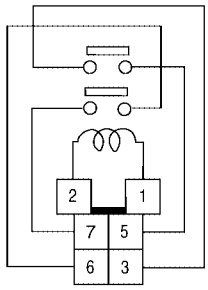
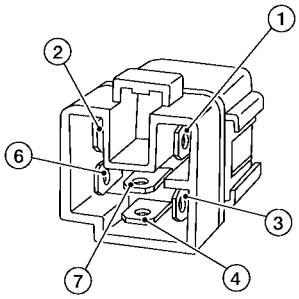
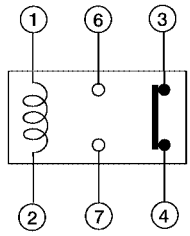
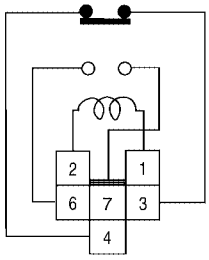
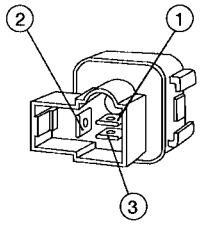
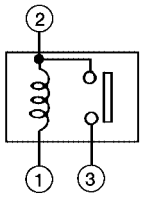
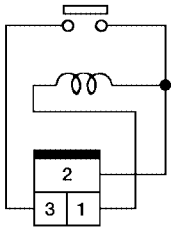
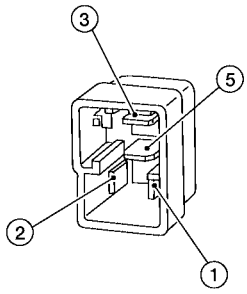
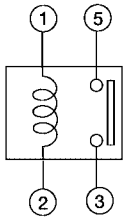
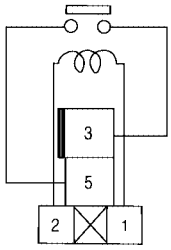
SEL881H

TYPE OF STANDARDIZED RELAYS



SEL882H

1M	1 Make	2M	2 Make
1T	1 Transfer	1M·1B	1 Make 1 Break

Type	Outer view	Circuit	Connector Symbol and connection	Case color
1T				BLACK
2M				BROWN
1M -1B				GRAY
1M				BLACK
				BLUE

The arrangement of terminal numbers on the actual relays may differ from those shown above.

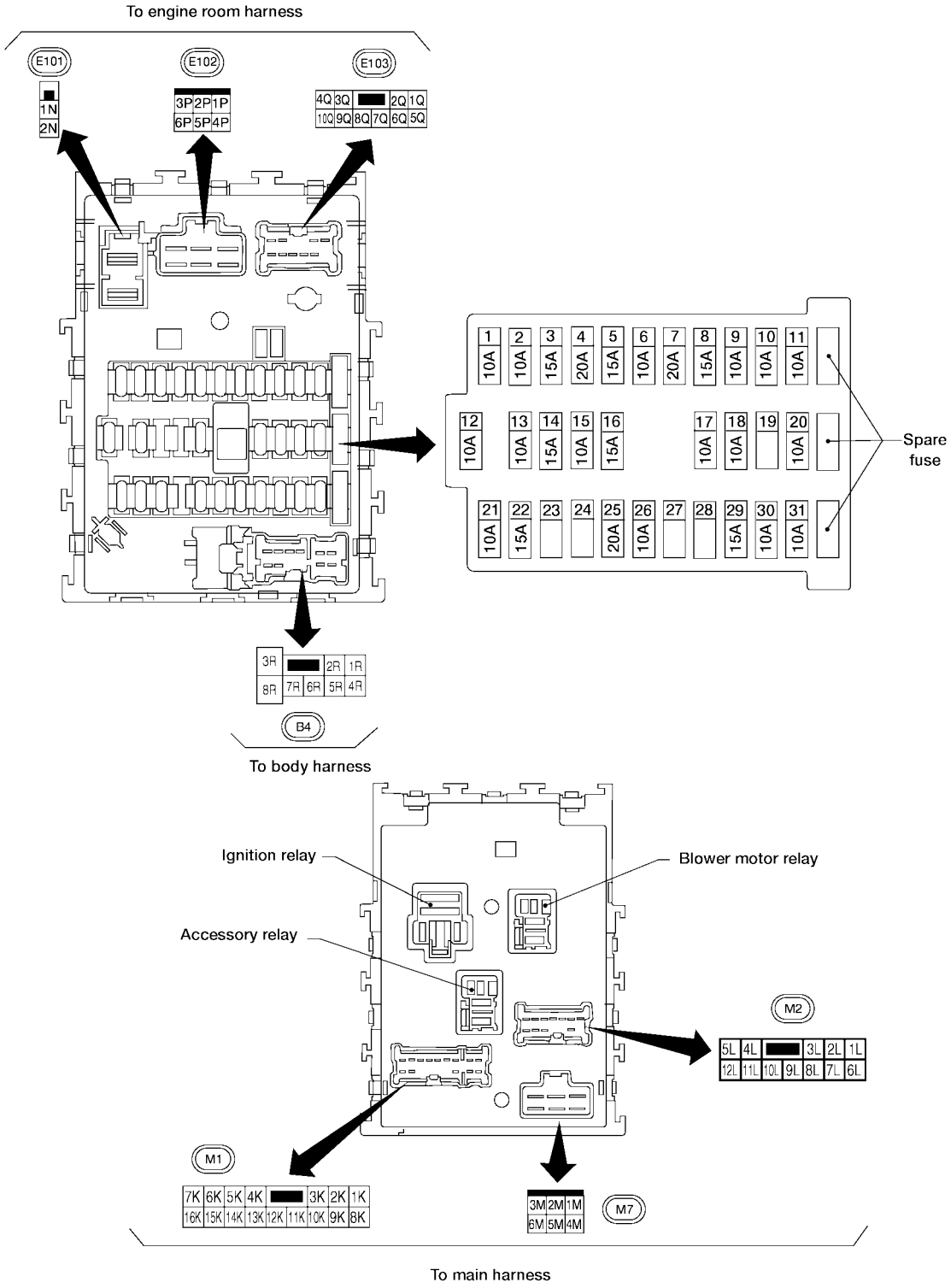
WKIA0253E

FUSE BLOCK — JUNCTION BOX (J/B)

PFP:24350

Terminal Arrangement

EKS003BC



WEL473

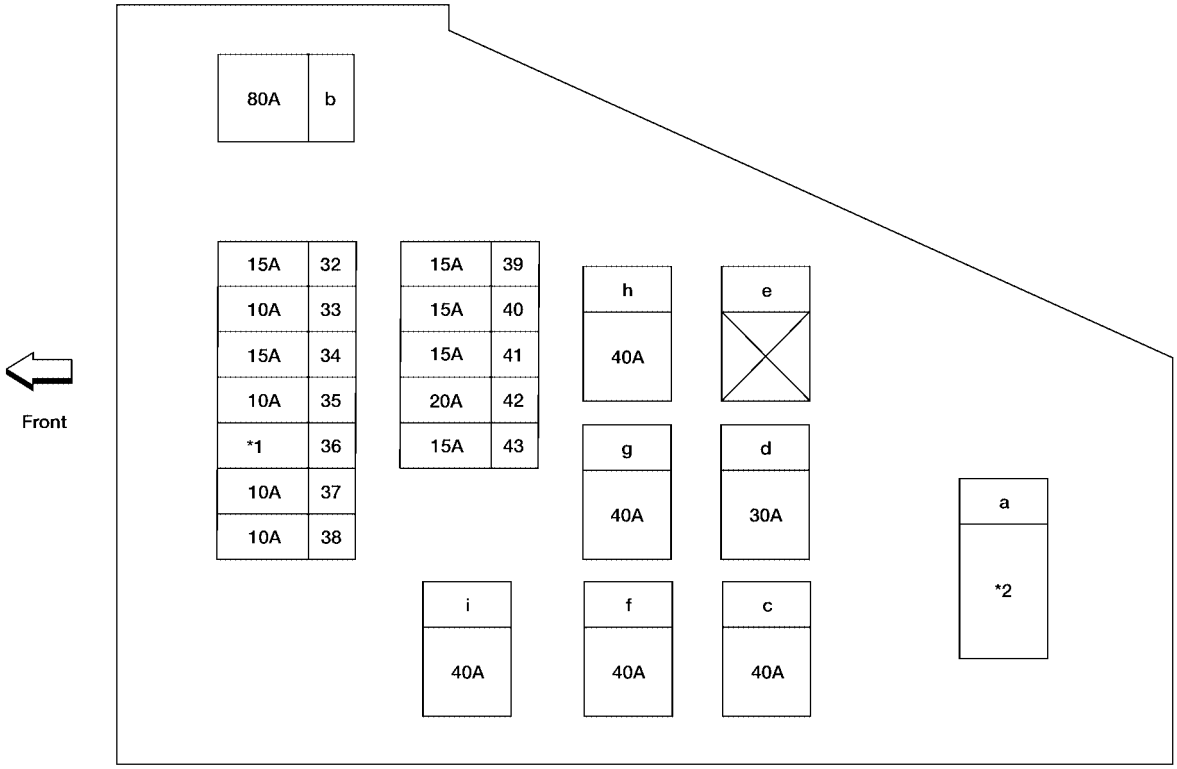
FUSE AND FUSIBLE LINK BOX

PFP:24381

Terminal Arrangement

EKS003BD

QG : With QG18DE
QR : With QR25DE



No. 32 - 43 : FUSE a - i : FUSIBLE LINK

*1 QG : 10A
QR : 15A

*2 QG : 100A
QR : 120A

WKIA0030E

SECTION PS
POWER STEERING SYSTEM

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Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER” 2
Precautions for Steering System 2
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Special Service Tools 3
Commercial Service Tool 5
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STEERING COLUMN 12
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Inspection 14
TILT MECHANISM 14
POWER STEERING GEAR AND LINKAGE 15
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Inspection 18
BOOT 18
TIE-ROD OUTER AND INNER SOCKETS 19
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POWER STEERING OIL PUMP 21
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COMPONENTS 21
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DISASSEMBLY 22
INSPECTION 22
ASSEMBLY 22
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Removal and Installation 24
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Steering Wheel 26
Steering Column 26
Steering Gear and Linkage 26
Power Steering 27

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EGS000FE

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Precautions for Steering System

EGS000FF

- **Before disassembly, thoroughly clean the outside of the unit.**
- **Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.**
- **For easier and proper assembly, place disassembled parts in order on a parts rack.**
- **Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.**
- **Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.**
- **Before assembly, apply a coat of recommended Genuine NISSAN PSF II or equivalent to hydraulic parts. Petroleum jelly may be applied to O-rings and seals. Do not use any grease.**
- **Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.**

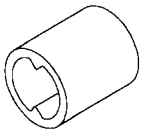
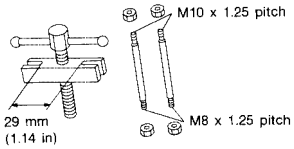
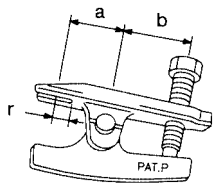
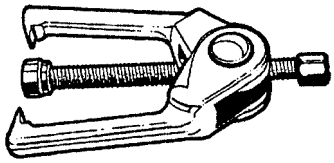
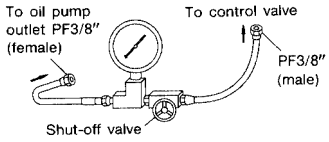
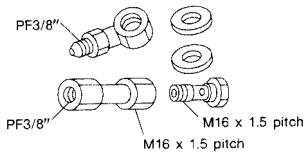
PREPARATION

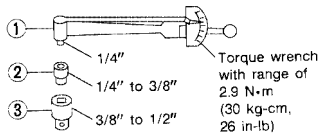
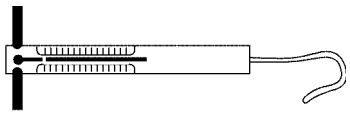
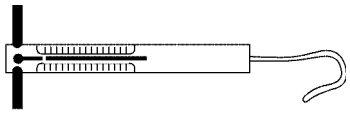
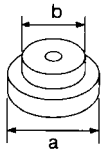
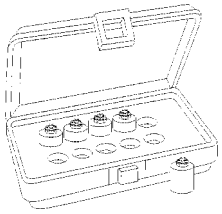
PFP:00002

Special Service Tools

EGS000FG

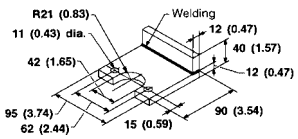
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name		Description
KV48101100 (J26364) Torque adapter	 NT169	Measuring pinion rotating torque
ST27180001 (J25726-B) Steering wheel puller	 S-NT544	Removing steering wheel
HT72520000 (J25730-B) Ball joint remover	 NT546	Removing tie-rod and lower ball joint **a: 33 mm (1.30 in)** **b: 50 mm (1.97 in)** **r: R11.5 mm (0.453 in)**
(J-24319-B) Tie rod puller	 LGIA0007E	Remove outer tie rod
KV48103500 (J26357 and J26357-10) Pressure gauge	 S-NT547	Measuring oil pressure
KV48102500 (J33914) Pressure gauge adapter	 S-NT542	Measuring oil pressure

Tool number (Kent-Moore No.) Tool name		Description
ST3127S000 1 GG91030000 (See J25765-A) Torque wrench 2 HT62940000 (—) Socket adapter 3 HT62900000 (—) Socket adapter	 S-NT541	Measuring turning torque
(J44372) 5-60 Pound pull gauge	 WST052	Measuring steering wheel turning force
(J44183-A) 20-100 Pound pull gauge	 WST052	Measuring rack sliding force
ST35300000 (—) Drift	 NT073	Installing power steering pump oil seal **a: 49 mm (1.93 in) dia.** **b: 41 mm (1.61 in) dia.**
(J-44615) Air Bag Master Key Set	 LRS194	Removing and installing accessory air bag bolts.

Commercial Service Tool

EGS000FH

Tool number	Description
Power steering pump attachment  S-NT179	Disassembling and assembling power steering pump Unit: mm (in)
10 mm Drift LST027	Installing power steering pump snap ring

NOISE, VIBRATION, AND HARSHNESS(NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

EGS000FI

Use the chart below to help you find the cause of the symptom. If necessary, repair or replace these parts.

Possible cause and SUSPECTED PARTS			Fluid level	Air in hydraulic system	Tie-rod ball joint swinging force	Tie-rod ball joint rotating torque	Tie-rod ball joint end play	Steering gear fluid leakage	Steering wheel play	Steering gear rack sliding force	Drive belt looseness	Improper steering wheel	Improper installation or looseness or tilt lock lever	Mounting rubber deterioration	Steering column deformation or damage	Improper installation or looseness of steering column	Steering linkage looseness	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES
Reference page			Refer to PS-8	Refer to PS-8	Refer to PS-19	Refer to PS-19	Refer to PS-19	Refer to PS-8	Refer to PS-7	Refer to PS-9	MA-16, "Checking Drive Belts", MA-23, "Checking Drive Belts"	Refer to PS-11	Refer to PS-14	Refer to PS-8	Refer to PS-14	Refer to PS-12	Refer to PS-12	FAX-4, "NVH Troubleshooting Chart"	FAX-4, "NVH Troubleshooting Chart"	FSU-4, "NVH Troubleshooting Chart"	WT-2, "NVH Troubleshooting Chart"	WT-2, "NVH Troubleshooting Chart"	BR-5, "NVH Troubleshooting Chart"
Symptom	STEERING	Noise	×	×	×	×	×	×	×	×	×							×	×	×	×	×	×
		Shake										×	×	×				×	×	×	×	×	×
		Vibration										×	×	×	×	×		×	×	×	×		
		Shimmy										×	×	×			×		×	×	×	×	×
		Judder												×			×		×	×	×	×	×

×: Applicable

ON-VEHICLE SERVICE

PFP:00000

Checking Steering Wheel Play

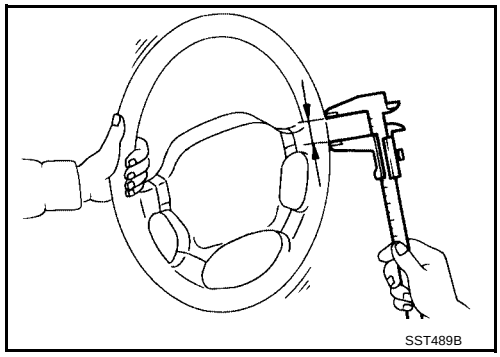
EGS000FJ

- With wheels in a straight-ahead position, check steering wheel play.

Steering wheel play **: 35 mm (1.38 in) or less**

- If it is not within specification, check the following for loose or worn components:

– Steering gear assembly
– Steering column
– Front suspension and axle



Checking Neutral Position on Steering Wheel

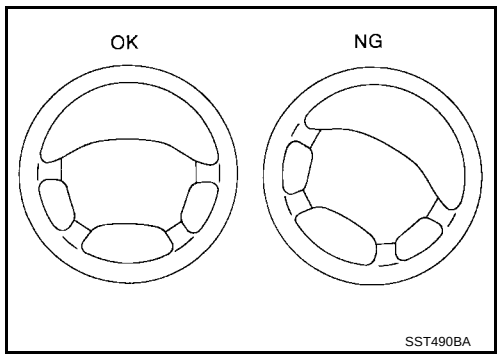
EGS000FK

PRE-CHECKING

- Make sure that wheel alignment is correct.

Wheel alignment **: Refer to FSU-6, "Front Wheel Alignment"**

- Verify that the steering gear is centered before removing the steering wheel.



CHECKING

1. Check that the steering wheel is in the neutral position when driving straight ahead.
2. If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
3. If the neutral position is between two teeth, loosen tie-rod lock nuts. Turn the tie-rods by the same amount in opposite directions on both left and right sides.

Front Wheel Turning Angle

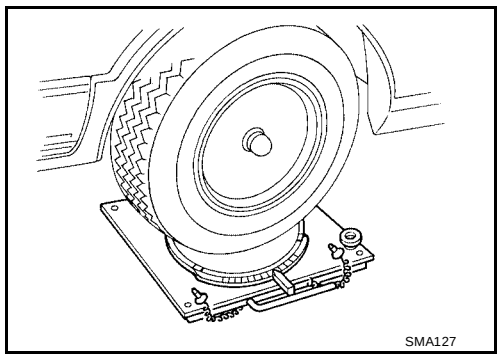
EGS000FL

1. Rotate steering wheel all the way right and left; measure turning angle.

Turning angle of full turns **: Refer to FSU-6, "Front Wheel Alignment"**

2. If it is not within specification, check rack stroke.

Rack stroke “S” **: Refer to PS-26, "Steering Gear and Linkage"**



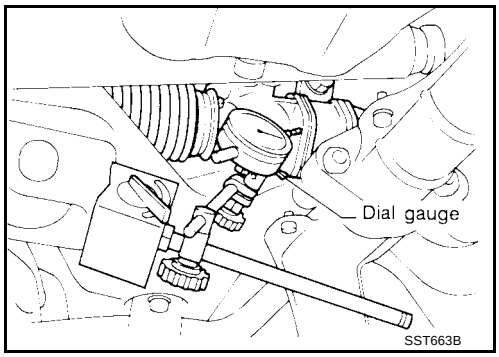
Checking Gear Housing Movement

EGS000FM

1. Check the movement of steering gear housing during stationary steering on a dry paved surface.
   - Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.
     Turn off ignition key while checking.

   Movement of gear housing : ±2 mm (±0.08 in) or less

2. If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.



Checking and Adjusting Drive Belts

EGS000FN

Refer to MA-16, "Checking Drive Belts" (QG18DE), MA-23, "Checking Drive Belts" (QR25DE).

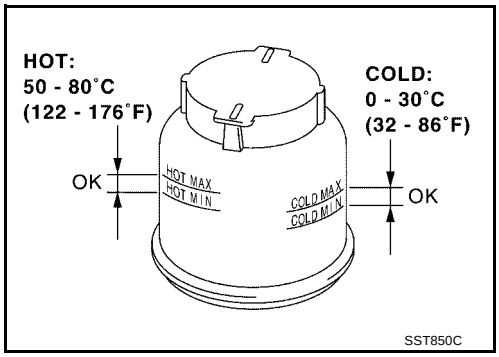
Checking Fluid Level

EGS000FO

Check fluid level, referring to the scale on reservoir tank.
Use “HOT” range for fluid temperatures of 50 to 80°C (122 to 176°F).
Use “COLD” range for fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

- **Do not overfill.**
- **Recommended fluid is Genuine NISSAN PSF or equivalent. Refer to MA-13, "Fluids and Lubricants" .**



Checking Fluid Leakage

EGS000FP

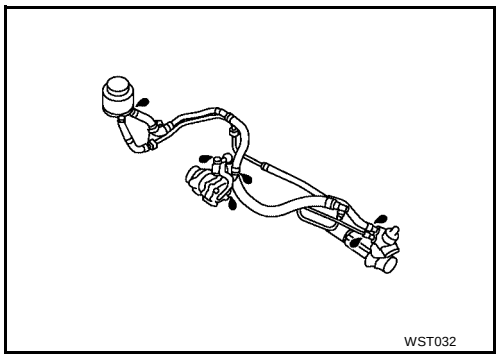
Check the lines for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

1. Run engine between idle speed and 1,000 rpm.

Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each “lock” position for five seconds and carefully check for fluid leakage.

CAUTION:
Do not hold the steering wheel in a locked position for more than 15 seconds.



4. If fluid leakage at connectors is noticed, shut off engine, then loosen and retighten flare nut.

Do not overtighten connector as this can damage O-ring, washer and connector.

5. If fluid leakage from power steering pump is noticed, check power steering pump. Refer to PS-21, "PRE-DISASSEMBLY INSPECTION" .
6. Check rack boots for accumulation of power steering fluid.

Bleeding Hydraulic System

EGS000FQ

1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Then quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   Repeat step 2 above.

- If any of the following occurs, bleed air again:

– Air bubbles in reservoir tank

- Clicking noise in oil pump
- Excessive buzzing in oil pump

Fluid noise may occur in the valve or oil pump. This is common when the vehicle is stationary or while turning the steering wheel slowly. This does not affect the performance or durability of the system.

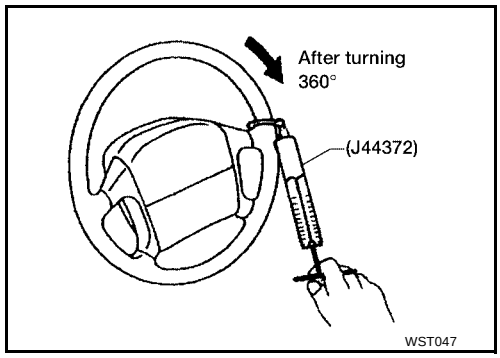
Checking Steering Wheel Turning Force

EGS000FR

1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from the neutral position.



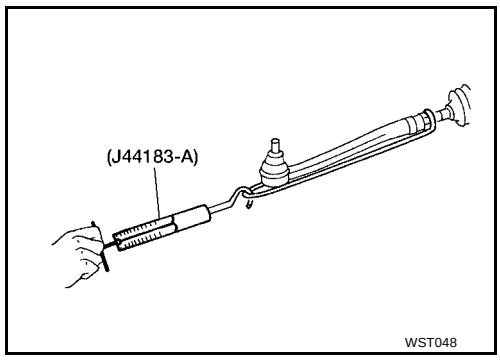
Steering wheel turning force : 39 N (4 kg, 9 lb) or less

5. If steering wheel turning force is out of specification, check rack sliding force.

a. Disconnect steering column lower joint and knuckle arms from the gear.

b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.

c. Pull tie-rod slowly to move it from neutral position to ±11.5 mm (±0.453 in) at speed of 3.5 mm (0.138 in)/s. Check that rack sliding force is within specification.



Average rack sliding force (QG18DE)	**: 140 - 330 N (14.3 - 33.6 kg, 31.5 - 74.1 lb)**
Average rack sliding force (QR25DE)	**: 160 - 350 N (16.3 - 35.7 kg, 36.0 - 78.7 lb)**
Maximum force deviation	**: 98 N (10 kg, 22 lb)**

d. Check sliding force outside the above range at rack speed of 40 mm (1.75 in)/s.

Maximum rack sliding force	**: Not more than 294 N (30 kg, 66 lb)**
Maximum force deviation	**: 147 N (15 kg, 33 lb)**

6. If rack sliding force is not within specification, overhaul steering gear assembly.
7. If rack sliding force is OK, inspect steering column. Refer PS-14, "Inspection" .

Checking Hydraulic System

EGS000FS

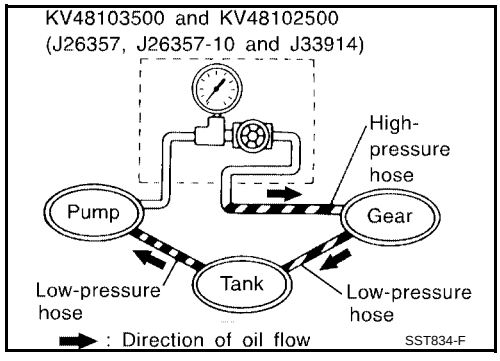
Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. Refer to PS-8, "Bleeding Hydraulic System" .
2. Run engine at idle speed or 1,000 rpm.

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).

WARNING:

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, fluid pressure in oil pump increases to maximum. This will raise oil temperature abnormally.



3. Check pressure with steering wheel fully turned to left and right positions with engine idling at 1,000 rpm.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

Oil pump maximum standard pressure

(QG18DE) : 7,649 - 8,238 kPa (78 - 84 kg/cm^2 , 1,109 - 1,194 psi)

(QR25DE) : 8,000 - 8,800 kPa (82 - 90 kg/cm^2 , 1,160 - 1,276 psi)

- If pressure reaches maximum operating pressure, system is OK.
- If pressure increases above maximum operating pressure, check power steering pump flow control valve. Refer to PS-21, "COMPONENTS" .

4. If power steering pressure is below the maximum operating pressure, slowly close shut-off valve and check pressure again.

   CAUTION:
   Do not close shut-off valve for more than 15 seconds.

   - If pressure increases to maximum operating pressure, gear is damaged. Refer to PS-16, "Removal and Installation" .
   - If pressure remains below maximum operating pressure, pump is damaged. Refer to PS-22, "DISASSEMBLY" .

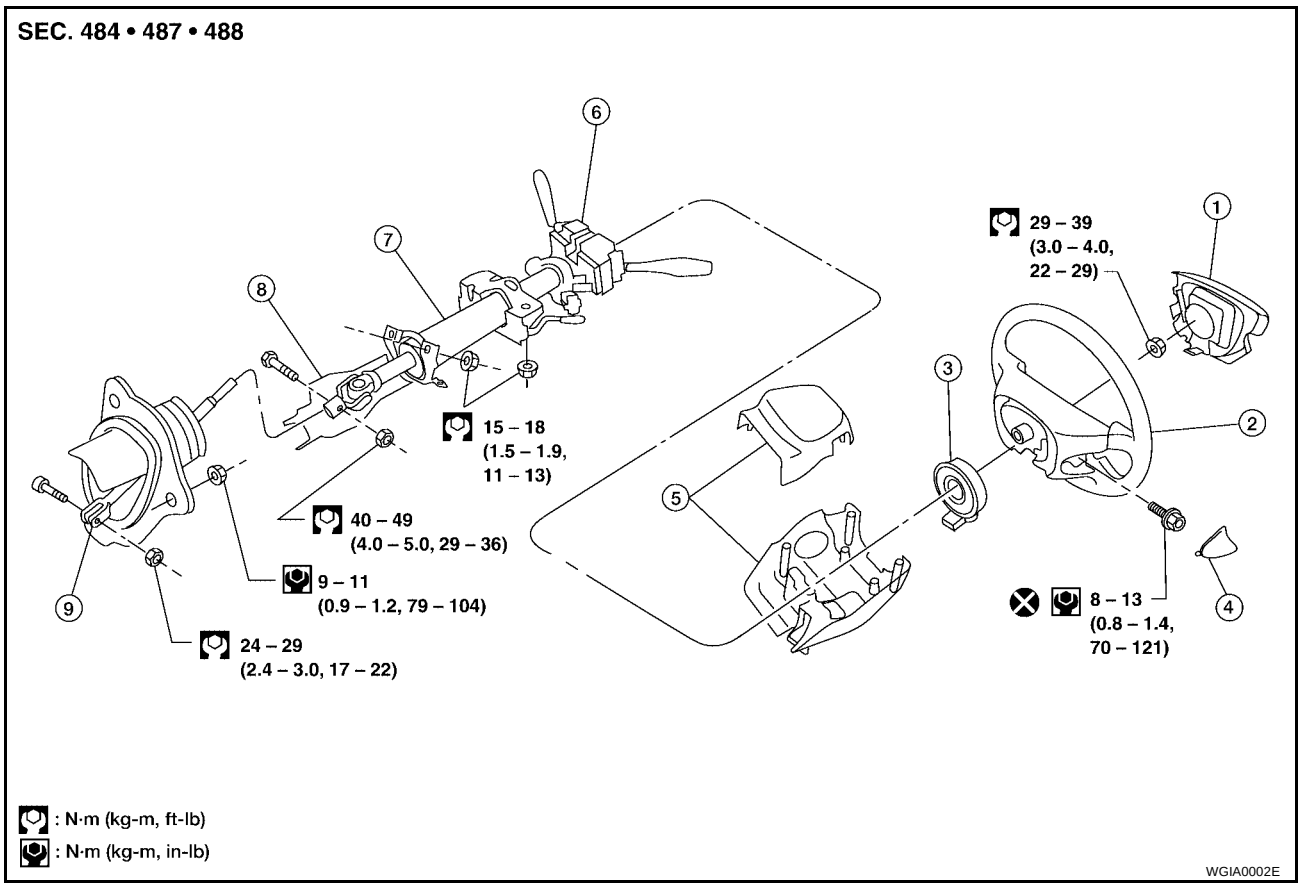
5. After checking hydraulic system, remove Tool and add fluid as necessary. Then completely bleed air out of system. Refer to PS-8, "Bleeding Hydraulic System" .

STEERING WHEEL AND STEERING COLUMN

PFP:48430

Components

EGS000FT



1. Air bag module
2. Steering wheel
3. Spiral cable
4. Side lid LH
5. Column cover
6. Combination switch
7. Steering column assembly
8. Steering column lower cover
9. Lower joint

CAUTION:

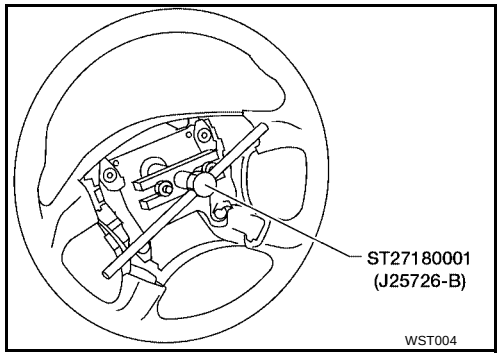
- **The rotation of the spiral cable (SRS "Air bag" component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.**
- **Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.**

Removal and Installation

EGS000FU

STEERING WHEEL

1. Remove air bag module.
   Refer to SRS-40, "Removal and Installation" .
2. Remove steering wheel mounting nut.
3. Remove steering wheel with Tool.
4. Installation is in the reverse order of removal.



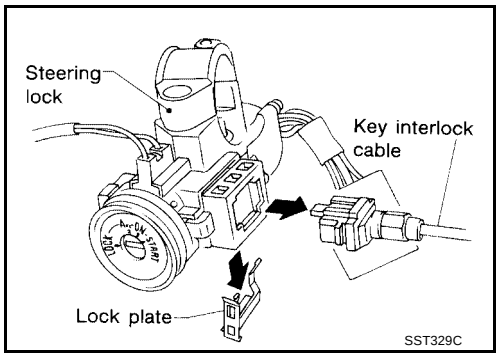
STEERING COLUMN

Removal

CAUTION:

- **The rotation of the spiral cable (SRS “Air Bag” component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.**
- **Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.**

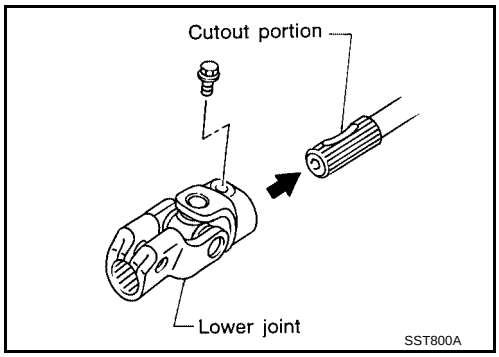
1. Remove the steering wheel, refer to PS-11, "STEERING WHEEL" .
2. Removal spiral cable, refer to SRS-42, "Removal and Installation" .
3. Remove instrument lower panel and dash lower reinforcement panel.
4. Remove the column covers.
5. Disconnect electrical connectors from the ignition switch and combination switch.
6. Remove three screws securing combination switch and remove combination switch.
7. Remove key interlock cable (A/T models).
8. Remove the hole cover, then remove bolt from lower joint.
9. Remove the steering column lower cover.
10. Remove four nuts securing steering column and remove steering column.



Installation

1. Installation is the reverse order of removal.

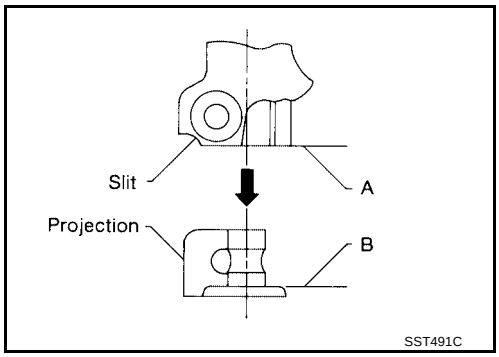
- When installing steering column, finger tighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching coupling joint, be sure tightening bolt faces cutout portion.



- Align slit of lower joint with projection on dust cover. Insert joint until surface A contacts surface B.

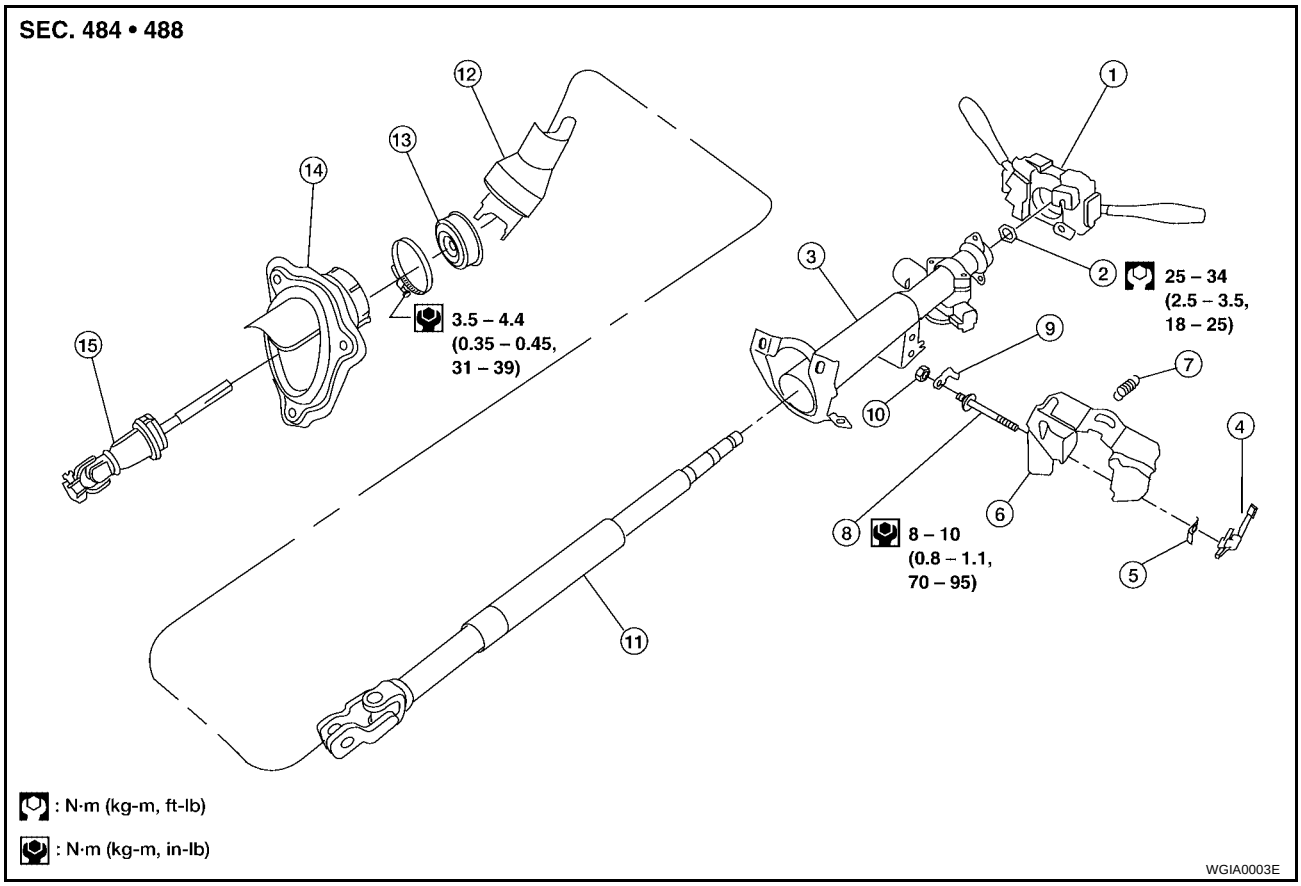
CAUTION:

After installation, turn steering wheel to make sure it moves smoothly. Ensure the number of turns are the same from the straight forward position to left and right locks. Be sure that the steering wheel is in a neutral position when driving straight ahead.



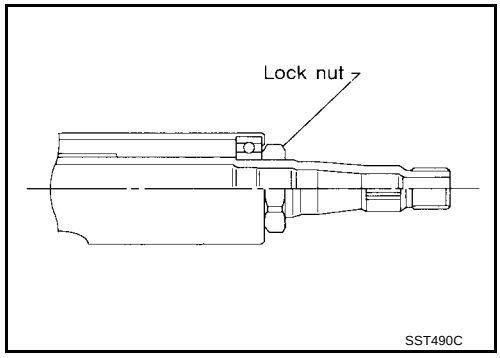
Disassembly and Assembly

EGS000FV



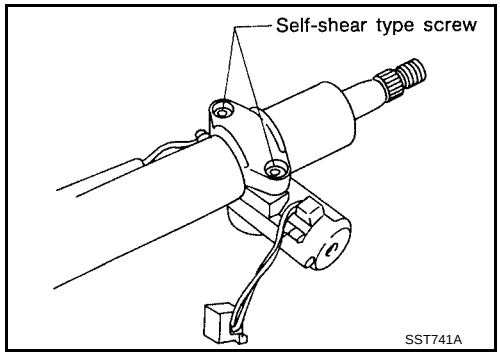
1. Combination switch
2. Lock nut
3. Jacket tube assembly
4. Tilt lever
5. Tilt lever stopper
6. Steering column mounting bracket
7. Spring
8. Adjust bolt
9. Adjust bolt stopper
10. Nut
11. Column shaft assembly
12. Steering column lower cover
13. Hole cover seal
14. Hole cover
15. Lower joint

- When disassembling and assembling, unlock steering lock with key.
- Install lock nut on steering column shaft and tighten the nut.

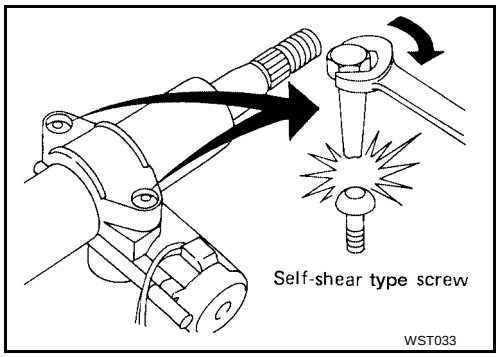


- Steering lock:

– Break self-shear type screws using a drill or other appropriate tool.



– Install new self-shear type screws, then tighten until screw heads break off.



Inspection

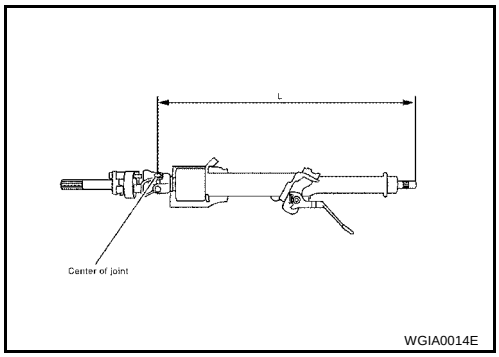
EGS000FW

- When steering wheel does not turn smoothly, check the steering column as follows and replace damaged parts.

– Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

– Check jacket tube for deformation or breakage. Replace if necessary.

- When the vehicle comes into a light collision, check length “L”.

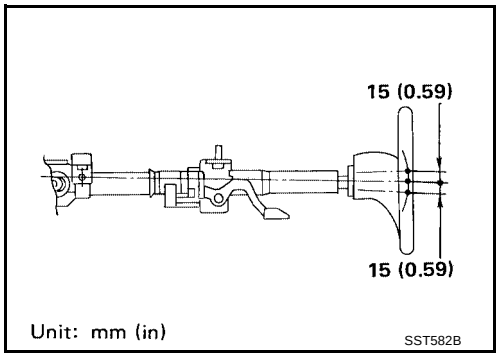


Steering column length “L” : 542 - 544 mm (21.34 - 21.42 in)

If out of specification, replace steering column as an assembly.

TILT MECHANISM

- After installing steering column, check tilt mechanism operation.



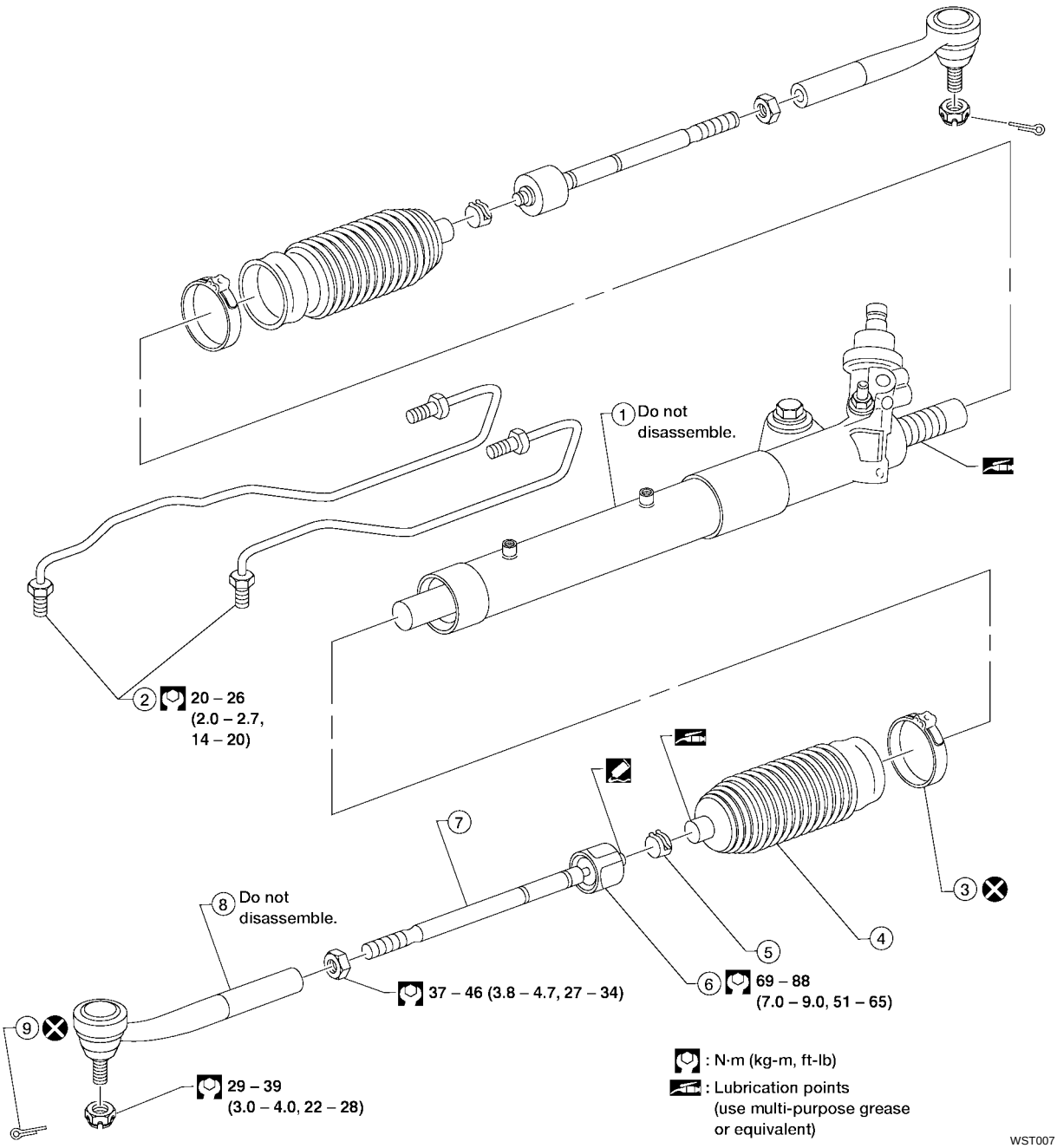
POWER STEERING GEAR AND LINKAGE

PFP:49001

Components

EGS000FX

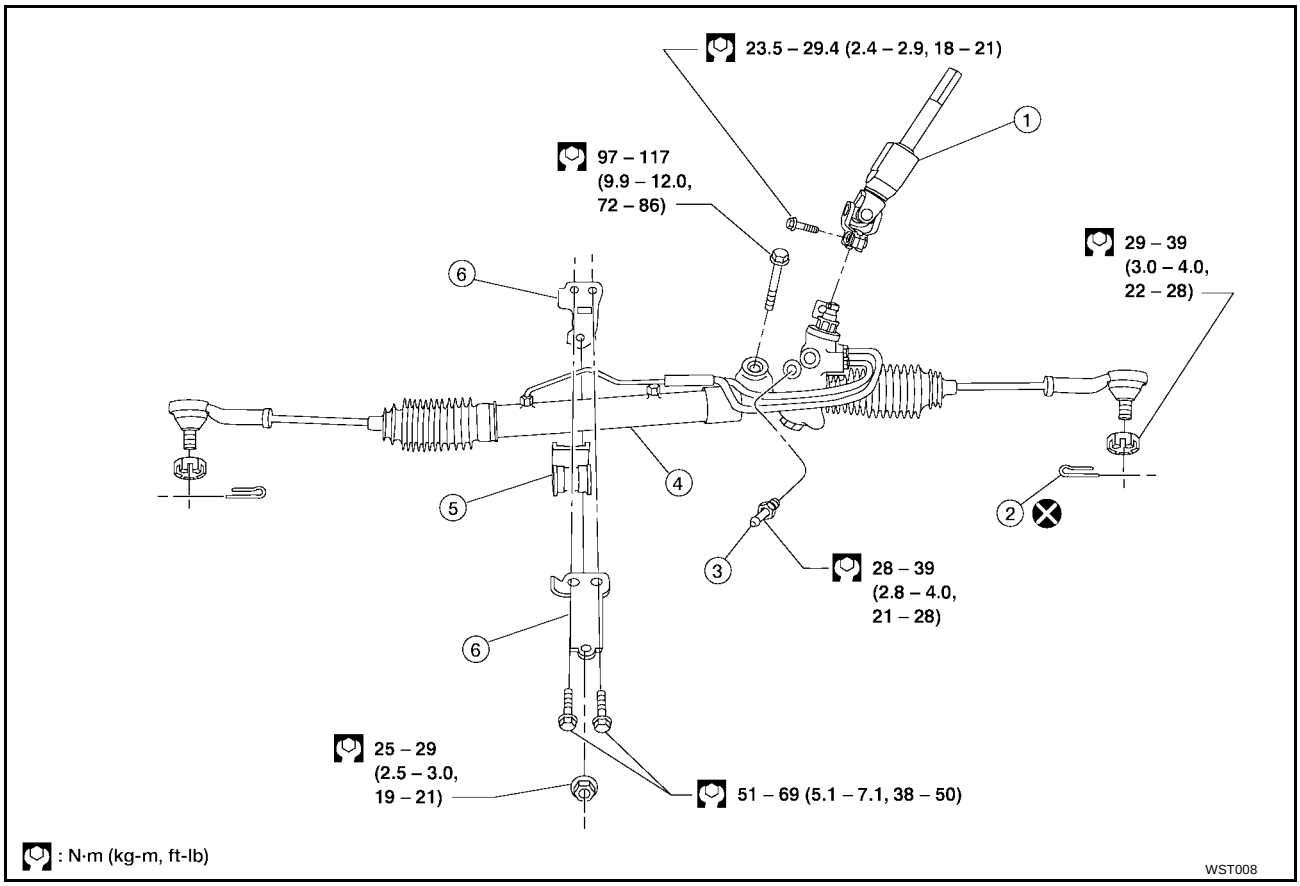
SEC. 492



1. Steering gear
2. Gear housing tube
3. Boot clamp
4. Dust boot
5. Boot band
6. Tie-rod inner socket
7. Tie-rod
8. Tie-rod outer socket
9. Cotter pin

Removal and Installation

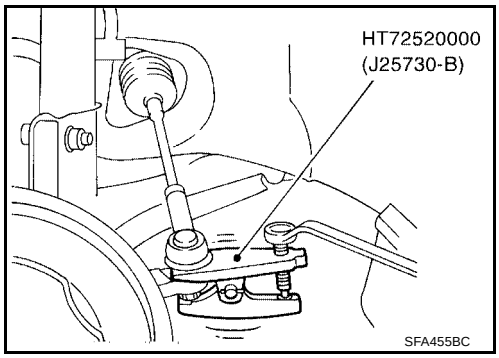
EGS000FY



1. Lower joint
2. Cotter pin
3. Low pressure line fitting
4. Gear and linkage assembly
5. Rack mounting insulator
6. Gear housing mounting bracket

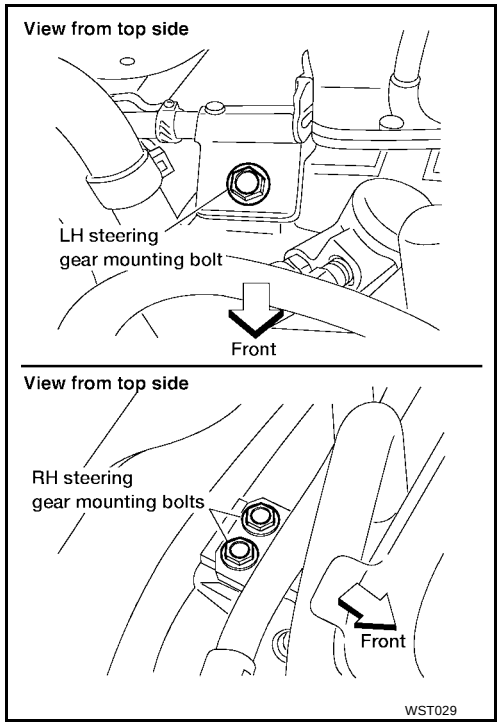
CAUTION:

- **The rotation of the spiral cable (SRS "Air bag" component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.**
- **Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.**



1. Detach tie-rod outer sockets.
2. Disconnect the power steering lines.
3. Disconnect the steering gear lower joint.
4. Position the bracket for the hoses and harness aside.
5. Remove the return line fitting.

6. Remove the steering gear mounting bolts.
7. Remove the steering gear through the passenger side.



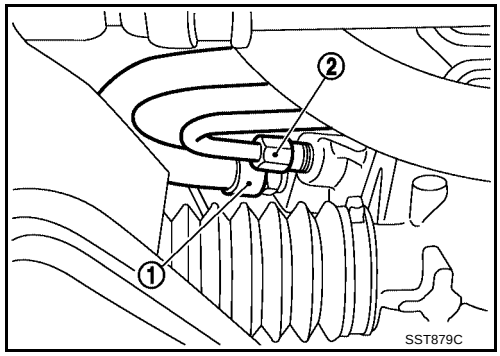
8. Installation is the reverse order of removal.

- Install power steering line connector.
- Observe specified tightening torque when tightening high-pressure and low-pressure line connectors. Excessive tightening will damage threads of connector or O-ring.

Connector tightening torque

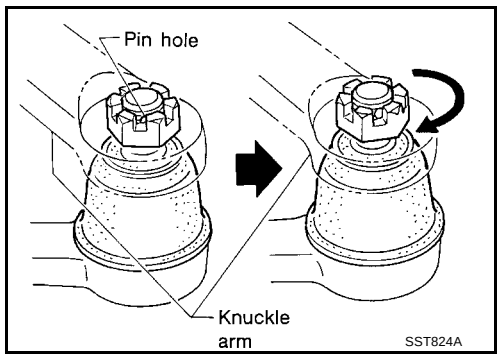
1 Low-pressure side : 28 - 39 N·m (2.8 - 4.0 kg-m, 21 - 28 ft-lb)

2 High-pressure side : 15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)

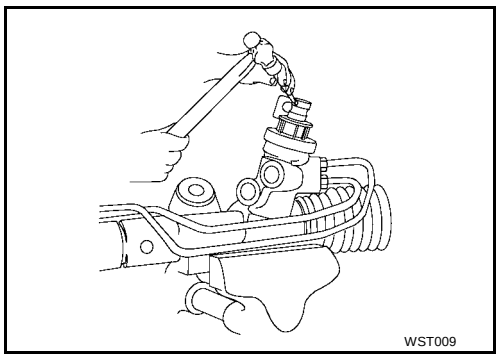


- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.
- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 28 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

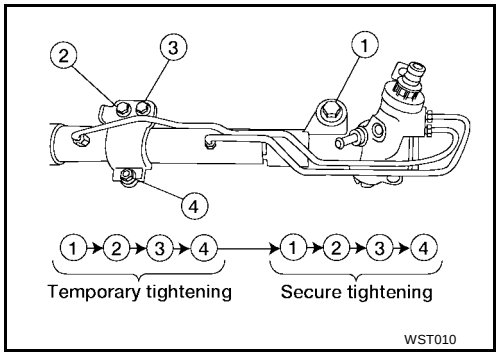
CAUTION:
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position.
- To install, set left and right dust boots to equal deflection. Attach lower joint by aligning matching marks of pinion shaft and pinion housing.



- Tighten gear housing mounting bracket bolts and nut in the order shown.



Disassembly

EGS000FZ

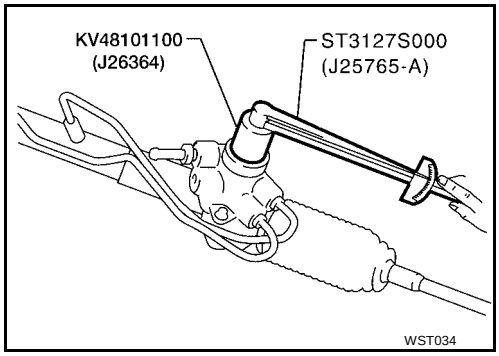
1. Prior to disassembling, measure pinion rotating torque.

Within ±100° from the neutral position

Average rotating torque	**: 0.6 - 2.0 N·m (7 - 20 kg-cm, 6 - 17 in-lb)**
Maximum torque deviation	**: 0.6 N·m (7 kg-cm, 5.8 in-lb)**

Except for above measuring range

Maximum rotating torque	**: 1.9 N·m (19 kg-cm, 17 in-lb)**
Maximum torque deviation	**: 0.65 N·m (7 kg-cm, 6 in-lb)**



- **If pinion rotating torque is not within the specifications, replace steering gear assembly.**
- **Before measuring, disconnect gear housing tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.**

2. Remove tie-rod outer sockets and boots.
3. Remove tie-rod inner sockets.

Inspection

EGS000G0

Thoroughly clean all parts in cleaning solvent or Genuine NISSAN PSF or equivalent. Blow dry with compressed air, if available.

BOOT

- Check condition of boot. If cracked excessively, replace it.
- Check boots for accumulation of power steering fluid.

TIE-ROD OUTER AND INNER SOCKETS

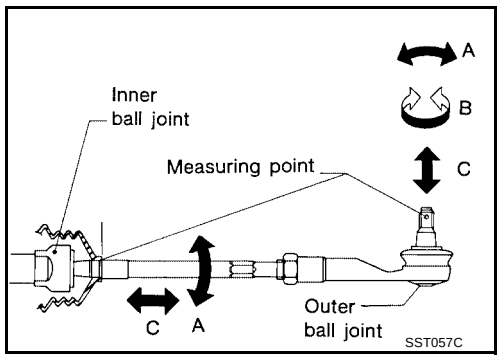
- Check outer and inner ball joints for swinging force “A” and axial end play “C”.

  Refer to PS-26, "Steering Gear and Linkage" .

- Check outer ball joint for rotating torque “B”.

  Refer to PS-26, "Steering Gear and Linkage" .

- Check condition of dust cover. If excessively cracked, replace outer tie-rod.

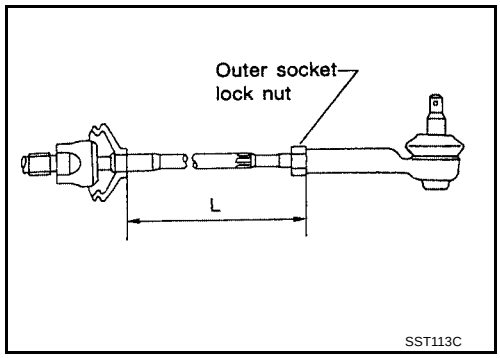


EGS000G1

Assembly

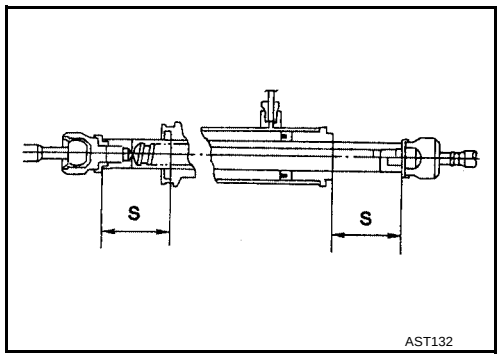
1. Install tie-rod inner sockets, dust boots and outer sockets.
2. Tighten outer socket lock nut.

   Tie-rod length “L” : Refer to PS-26, "Steering Gear and Linkage" .

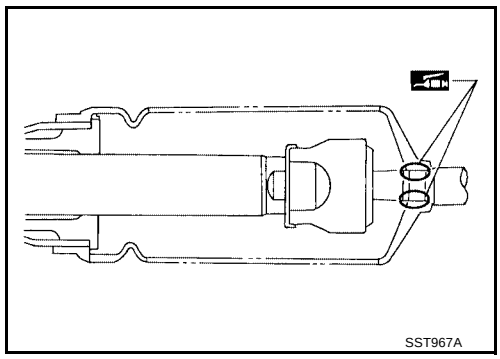


3. Measure rack stroke.

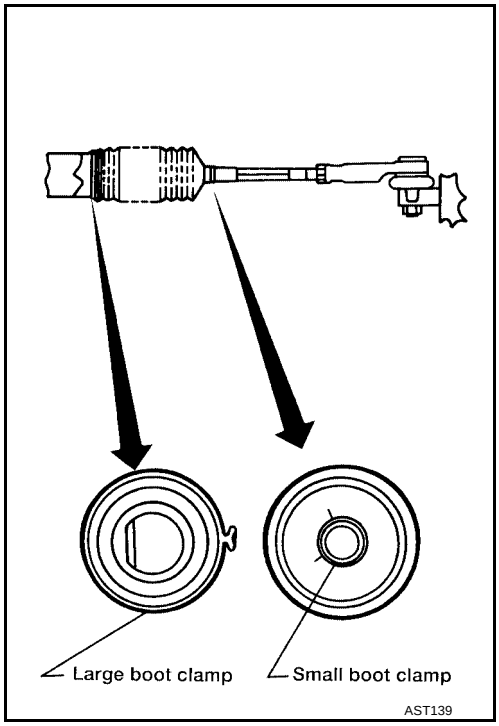
   Rack stroke “S” : Refer to PS-26, "Steering Gear and Linkage" .



4. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



5. Install boot clamps.
   - Install large boot clamp using suitable tool and crimp securely.
   - Install small boot clamp as shown.



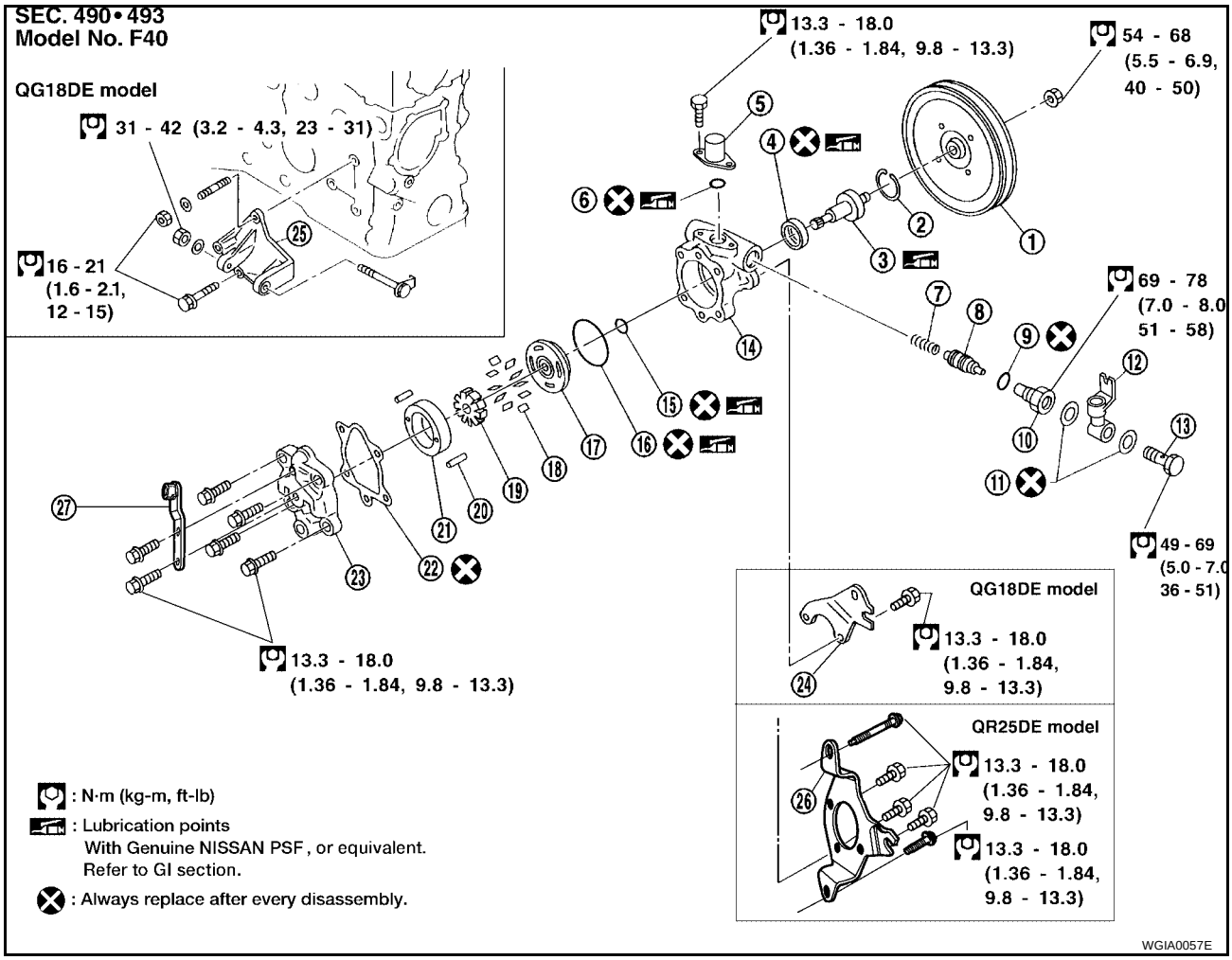
POWER STEERING OIL PUMP

PFP:49110

QG18DE and QR25DE

EGS000G2

COMPONENTS

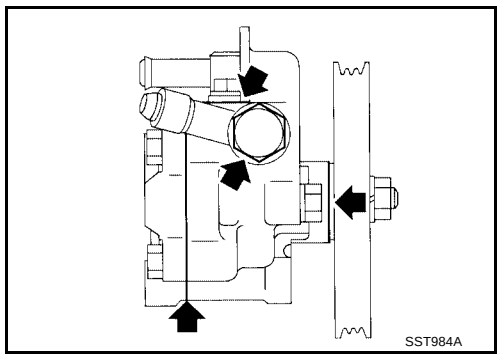


1. Pulley	2. Snap ring	3. Drive shaft
4. Oil seal	5. Suction pipe	6. O-ring
7. Spring	8 Flow control valve	9. O-ring
10. Connector	11. Washer	12. Joint
13. Connector bolt	14. Pump case	15. O-ring
16. O-ring	17. Front side plate	18. Vane
19. Rotor	20. Pin	21. Cam ring
22. Gasket	23. Rear cover	24. Mounting bracket
25. Power steering pump bracket	26. Mounting bracket	27. Mounting bracket

PRE-DISASSEMBLY INSPECTION

Disassemble the power steering oil pump only if the following items are found.

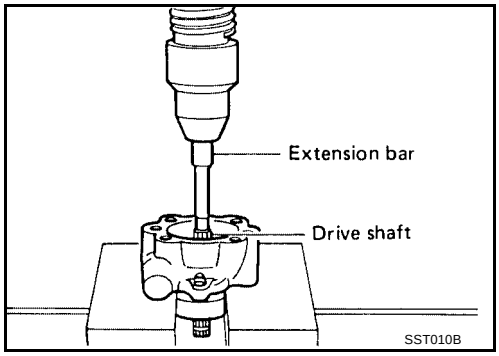
- Fluid leak from any point shown in the figure.
- Deformed or damaged pulley
- Poor performance



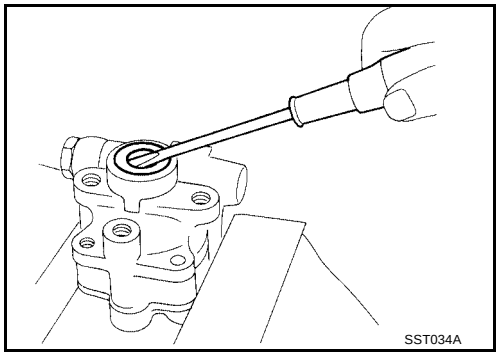
DISASSEMBLY

CAUTION:

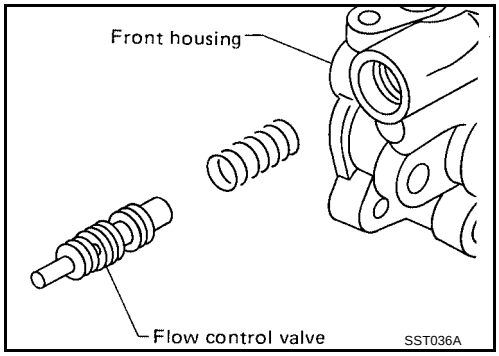
- **Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.**
- **Disassemble in as clean a place as possible.**
- **Clean your hands before disassembly.**
- **Do not use rags; use nylon cloths or paper towels.**
- **Refer to PS-2, "Precautions for Steering System" .**
- **When disassembling and reassembling, do not let foreign matter enter or contact the parts.**
- Remove snap ring, then draw drive shaft out.
  Be careful not to drop drive shaft.



- Remove oil seal.
  Be careful not to damage front housing.



- Remove connector and flow control valve with spring.
  Be careful not to drop flow control valve.
  Do not disassemble flow control valve.



INSPECTION

- If pulley is cracked or deformed, replace it.
- If an oil leak is found around pulley shaft oil seal, replace the seal.
- If serration on pulley or pulley shaft is deformed or worn, replace it.

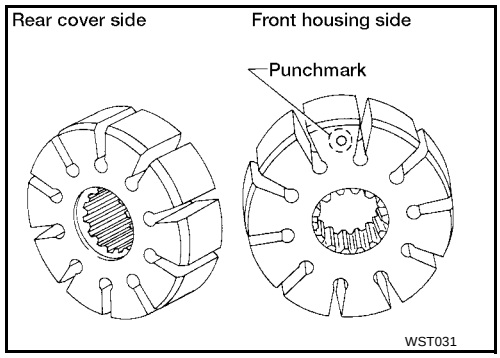
ASSEMBLY

Assemble oil pump, noting the following instructions.

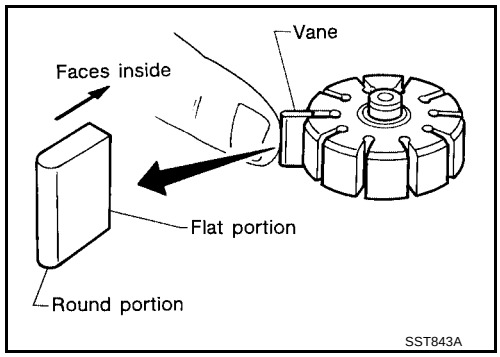
- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.

- Coat each part with Genuine NISSAN PSF or equivalent when assembling.

- Pay attention to the direction of rotor.

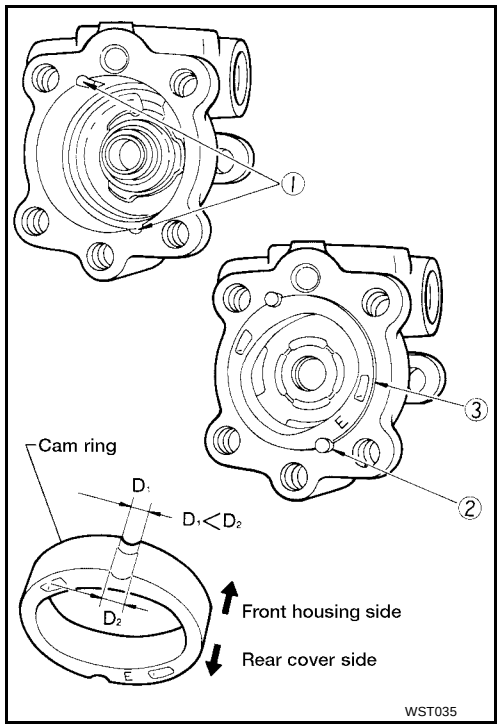


- When assembling vanes to rotor, flat surfaces of vanes must face inside of rotor (rounded surfaces of vanes face cam ring side).



- Insert pin 2 into pin groove 1 of front housing and front side plate. Then install cam ring 3 as shown.

  Cam ring : D_1 is less than D_2 .



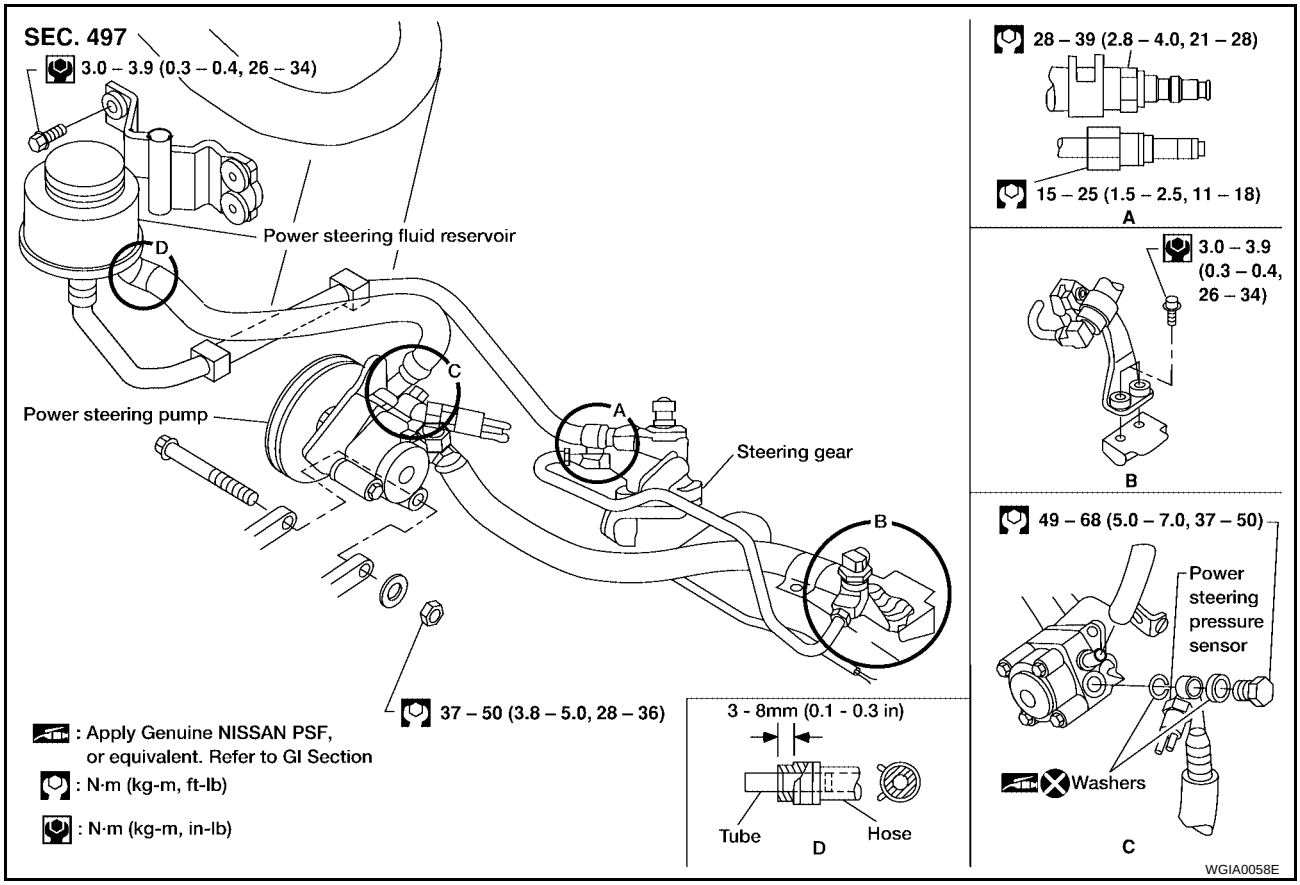
HYDRAULIC LINE

PFP:49721

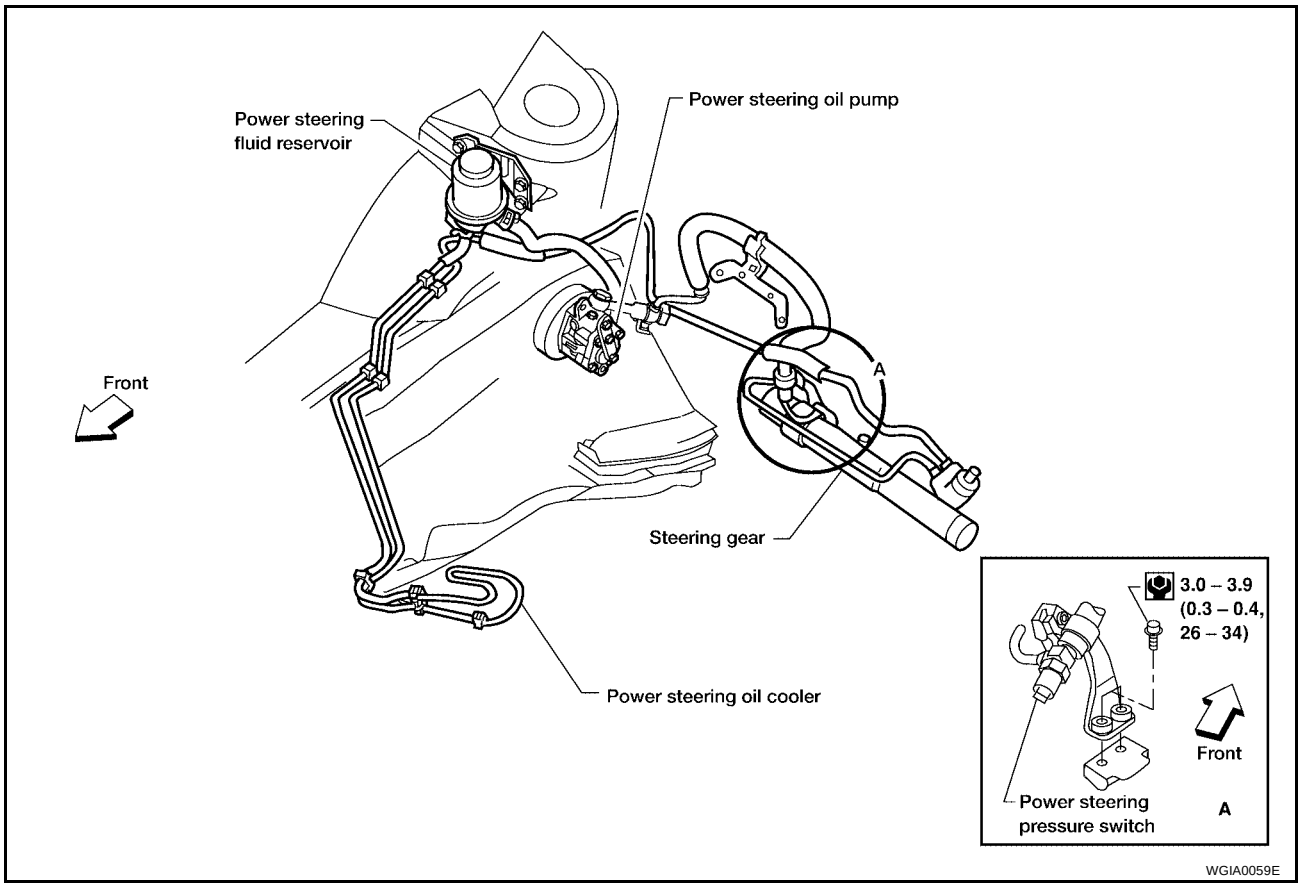
Removal and Installation

EGS000JO

QG18DE Engine



QR25DE Engine



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

EGS000G3

Applied model	QG18DE	QR25DE
Steering model	Power steering	
Steering gear type	Rack and Pinion (PR25T)	
Steering overall gear ratio	17.48	15.80
Turns of steering wheel (Lock to lock)	3.01	2.4
Steering column type	Collapsible, tilt	

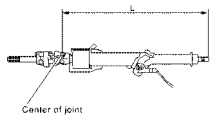
Steering Wheel

EGS000G4

Applied model	All
Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Movement of gear housing mm (in)	±2 (±0.08) or less

Steering Column

EGS000G5

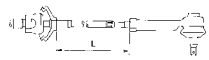


SST855C

Applied model	All
Steering column length “L” mm (in)	542 - 544 (21.34 - 21.42)

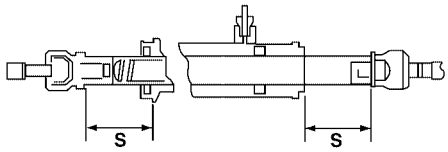
Steering Gear and Linkage

EGS000G6



SST867C

Applied model		QG18DE	QR25DE
Steering gear type		Rack and Pinion (PR25T)	
Tie-rod outer socket	Swinging force at cotter pin hole: “A” N (kg, lb)	6.9 - 65.7 (0.66 - 6.59, 1.5 - 14.8)	
	Rotating torque: “B” N·m (kg-cm, in-lb)	0.29 - 2.94 (3.0 - 30.0, 2.6 - 26.0)	
	Axial end play: “C” mm (in)	0.4 (0.016) or less	
	Initial tightening torque N·m (kg-cm, ft-lb)	29 - 39 (3 - 4, 22 - 28)	
	Maximum tightening torque N·m (kg-cm, ft-lb)	49 (5, 36)	
Tie-rod inner socket	Swinging force*: “A” N (kg, lb)	5.9 - 46.1 (0.58 - 4.65, 1.3 - 10.4)	
	Axial end play: “C” mm (in)	0.2 (0.004) or less	
	Initial tightening torque N·m (kg-cm, ft-lb)	29 - 39 (3 - 4, 22 - 28)	
	Maximum tightening torque N·m (kg-cm, ft-lb)	49 (5, 36)	
Tie-rod standard length “L” mm (in)		133.04 (5.238)	136.09 (5.358)



SST086BA

Retainer adjustment Adjusting screw	Initial tightening torque N·m (kg-cm, in-lb)	4.9 - 5.9 (50 - 60, 43 - 52)
	Retightening torque after loosening N·m (kg-cm, in-lb)	0.2 (2, 1.7)
	Tightening torque after gear has settled N·m (kg-cm, in-lb)	4.9 - 5.9 (50 - 60, 43 - 52)
	Returning angle degree	60° - 80°
Steering gear type		PR25T
Rack stroke “S” mm (in)		65 (2.56)
Pinion gear preload without gear fluid Within ±100° from the neutral position	Average rotating torque N·m (kg-cm, in-lb)	0.6 - 2.0 (7 - 20, 6 - 17)
	Maximum torque deviation N·m (kg-cm, in-lb)	0.6 (7, 5.8)
Except above range	Maximum rotating torque N·m (kg-cm, in-lb)	1.9 (19, 17)
	Maximum torque deviation N·m (kg-cm, in-lb)	0.65 (7, 6)

*: Measuring point [l: 172 mm (6.77 in)]

Power Steering

EGS000G7

Applied model			QG18DE	QR25DE
Steering gear type			Rack and Pinion (PR25T)	
Pump type			F40	
Rack sliding force N (kg, lb) Under normal operating oil pressure	Range within ±11.5 mm (±0.453 in) from the neutral position at rack speed of 3.5 mm (0.138 in)/s	Average rack sliding force	140 - 330 (14.3 - 33.6, 31.5 - 74.1)	160 - 350 (16.3 - 35.7, 36.0 - 78.7)
		Maximum force deviation	98 (10, 22)	
	Except for the above range	Maximum rack sliding force	294 (30, 66)	
		Maximum force deviation	147 (15, 33)	
Steering wheel turning force (Measured at one full turn from the neutral position) N (kg, lb)			39 (4, 9) or less	
Fluid capacity (Approximate) ℓ (US qt, Imp qt)			1.0 (1-1/8, 7/8)	
Oil pump maximum pressure kPa (kg/cm^2 , psi)			7,649 - 8,238 (78 - 84, 1,109 - 1,194)	8,000 - 8,800 (82 - 90, 1,160 - 1,276)

SECTION RSU
REAR SUSPENSION

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Wheel Arch Height (Unladen*) 13

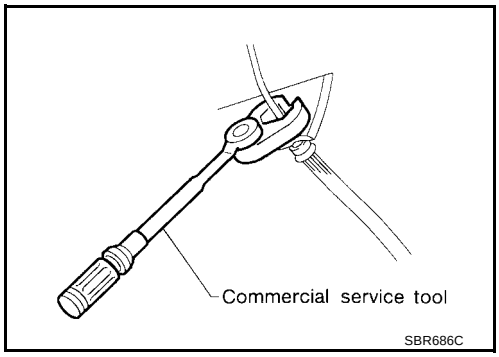
PRECAUTIONS

PFP:00001

Precautions

EES000IT

- **When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.**
  Oil will shorten the life of rubber bushings. Be sure to wipe off any spilled oil.
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **Use flare nut wrench when removing or installing brake tubes.**
- **After installing removed suspension parts, check wheel alignment.**
- **Do not jack up at the trailing arm and lateral link.**
- **Always torque brake lines when installing.**
- **Lock nuts are unreusable parts; always use new ones.**
  When replacing, do not wipe the oil off of the new lock nut before tightening.

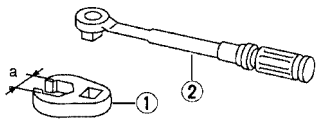
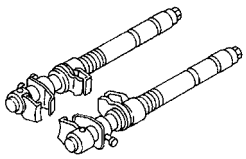


PREPARATION

PFP:00002

Commercial Service Tools

EES000IU

Tool name		Description
Equivalent to GG94310000 1 Flare nut crowfoot 2 Torque wrench	 S-NT360	Removing and installing brake piping **a: 10 mm (0.39 in)**
Spring compressor	 NT717	Removing and installing coil spring

NOISE, VIBRATION, AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

EES000IV

Use the following chart to help you find the cause of the symptom. If necessary, repair or replace these parts.

		Possible Cause and SUSPECTED PARTS	Improper installation, looseness	Shock absorber deformation, damage or deflection	Bushing or mounting deterioration	Parts interference	Spring fatigue	Suspension looseness	Incorrect wheel alignment	Out-of-round	Imbalance	Incorrect air pressure	Uneven tire wear	Deformation or damage	Non-uniformity	Incorrect tire size	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES
		Reference page	Refer to RSU-5	Refer to RSU-5	Refer to RSU-10 , RSU-11	—	Refer to RSU-13	Refer to RSU-5 , RSU-6	Refer to RSU-6	Refer to RSU-6	Refer to WT-4	Refer to WT-6	—	—	—	Refer to RSU-13	Refer to RAX-4	Refer to SUSPENSION in this chart.	Refer to TIRES in this chart.	Refer to ROAD WHEEL in this chart.	Refer to BR-5
Symptom	SUSPENSION	Noise	×	×	×	×	×	×									×		×	×	×
		Shake	×	×	×	×		×									×		×	×	×
		Vibration	×	×	×	×	×										×		×		
		Shimmy	×	×	×	×			×								×		×	×	×
		Judder	×	×	×												×		×	×	×
		Poor quality ride or handling	×	×	×	×	×		×								×		×	×	
	TIRES	Noise	×							×	×	×	×	×	×		×	×		×	×
		Shake	×							×	×	×	×	×		×	×	×		×	×
		Vibration										×				×	×	×			
		Shimmy	×							×	×	×	×	×	×	×	×	×		×	×
		Judder	×							×	×	×	×	×		×	×	×		×	×
		Poor quality ride or handling	×							×	×	×	×	×		×	×	×		×	
	ROAD WHEEL	Noise	×							×	×			×			×	×	×		×
		Shake	×							×	×			×			×	×	×		×
		Shimmy, Judder	×							×	×			×			×	×	×		×
		Poor quality ride or handling	×							×	×			×			×	×	×		

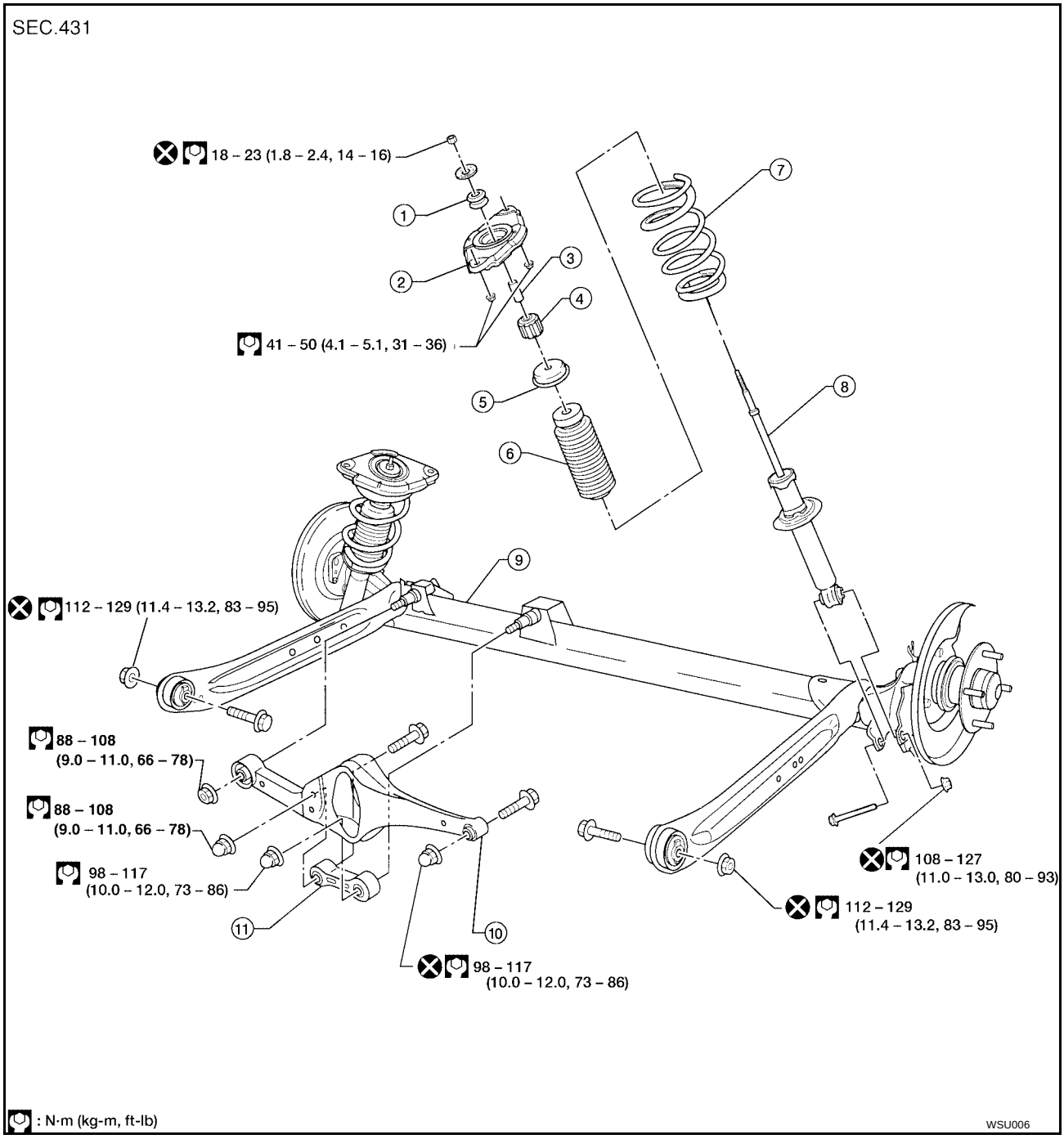
×: Applicable

REAR SUSPENSION ASSEMBLY

PFP:55020

Components

EES000IW



1. Bushing
2. Shock absorber mounting bracket
3. Distance tube
4. Distance tube bushing
5. Bound bumper cover
6. Bound bumper
7. Coil spring
8. Shock absorber
9. Torsion beam
10. Lateral link
11. Control rod

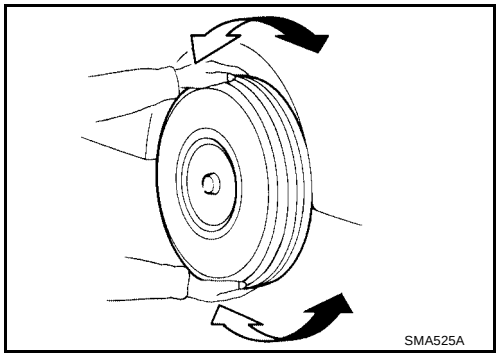
On-Vehicle Service

EES000IX

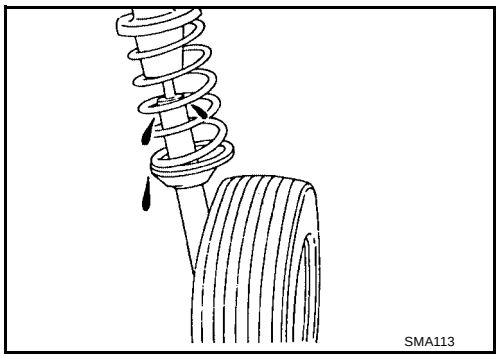
Check axle and suspension parts for excessive play, wear or damage.

- Shake each rear wheel to check for excessive play.
- Retighten all nuts and bolts to the specified torque.

Tightening torque : Refer to RSU-5, "Components" .



- Check shock absorber for oil leakage or other damage.
- Check wheelarch height. Refer to RSU-13, "Wheel Arch Height (Unladen*)" .



Rear Wheel Alignment

EES000IY

Before checking rear wheel alignment, be sure to make a preliminary inspection (Unladen*).
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

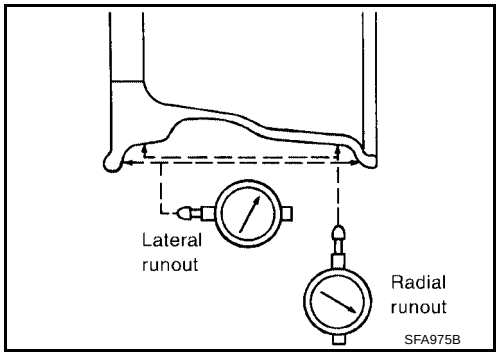
PRELIMINARY INSPECTION

1. Check tires for wear and improper inflation.
2. Check wheels for deformation, cracks and other damage. If deformed, remove wheel and check wheel runout.

a. Remove tire from wheel and mount wheel on a tire balance machine.

b. Set dial indicator as shown in the illustration.

Wheel runout (Dial indicator value) : Refer to WT-6, "Road Wheel" .

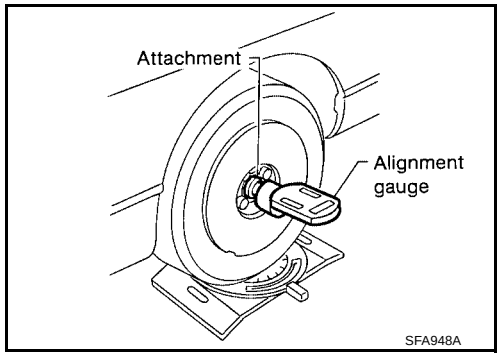


3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work properly.
7. Check vehicle wheelarch height (unladen*). Refer to RSU-13, "Wheel Arch Height (Unladen*)" .
   - *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

CAMBER

Camber is preset at factory and cannot be adjusted.

Camber	**: Refer to RSU-13, "Rear Wheel Alignment (Unladen*)" .**



1. Measure camber of both right-hand and left-hand wheels with a suitable alignment gauge.
2. If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.

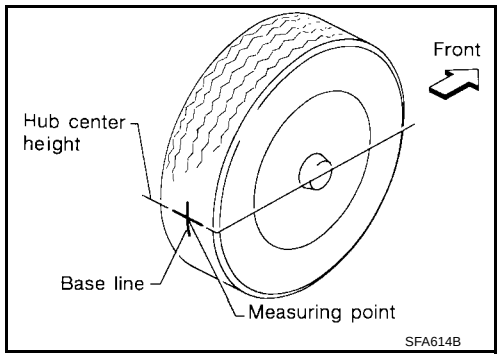
TOE-IN

Toe-in is preset at factory and cannot be adjusted.
Measure toe-in using following procedure. If out of specification, inspect and replace any damaged or worn rear suspension parts.

WARNING:

- **Always perform the following procedure on a flat surface.**
- **Make sure that no person is in front of the vehicle before pushing it.**

1. Bounce rear of vehicle up and down to stabilize the posture.
2. Push the vehicle straight ahead about 5 m (16 ft).

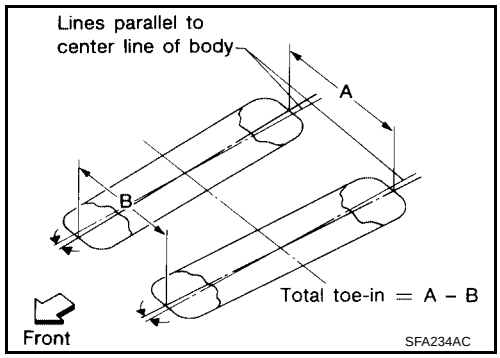


3. Put a mark on base line of the tread (rear side) of both tires at the same height of hub center. This mark is a measuring point.
4. Measure distance “A” (rear side).
5. Push the vehicle slowly ahead to rotate the wheels 180 degrees (1/2 turn).

If the wheels have rotated more than 180 degrees (1/2 turn), try the above procedure again from the beginning. Never push vehicle backward.

6. Measure distance “B” (front side).

Total toe-in	**: A – B** **Refer to RSU-13, "Rear Wheel Alignment (Unladen*)" .**



REMOVAL AND INSTALLATION

PFP:00000

Removal and Installation

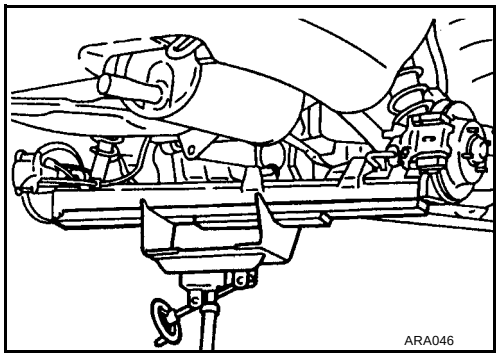
EES000IZ

REMOVAL

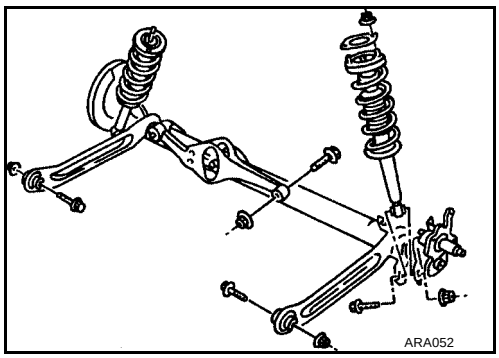
CAUTION:

- **Before removing the rear suspension assembly, disconnect the ABS wheel sensor from the assembly. Failure to do so may result in damaged sensor wires and sensor becoming inoperative.**
- **Drain brake fluid before disconnecting brake lines.**

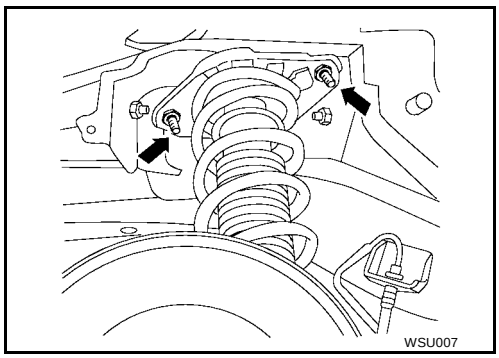
1. Disconnect brake hydraulic lines and parking brake cables at toggle levers. (Models with drum brakes.)
2. Disconnect brake hydraulic lines and parking brake cables from calipers and remove brake calipers and rotors. (Models with disc brakes.)



3. Disconnect ABS wheel sensor, if equipped.
4. Using a transmission jack, raise torsion beam a little, and remove nuts and bolts from the trailing arms, shock absorber assemblies (lower side) and lateral link.
5. Lower transmission jack and remove suspension.
6. Remove luggage compartment trim. Refer to EI-33, "Removal and Installation" .



7. Remove shock absorber fixing nuts (upper side). Then pull out shock absorber assemblies.

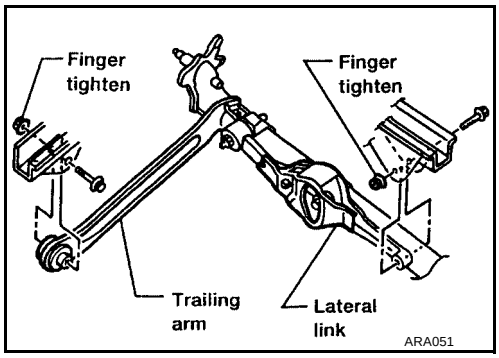


INSTALLATION

CAUTION:

- **Refill with new brake fluid DOT 3.**
- **Never reuse drained brake fluid.**

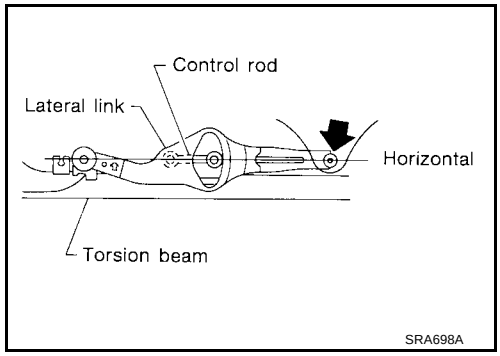
1. Attach torsion beam at trailing arm and lateral link to vehicle. Do not tighten bolts at this time.



2. Using a transmission jack, place lateral link and control rod horizontally against torsion beam. Tighten lateral link on vehicle.
3. Attach shock absorber assembly to vehicle. Then tighten the lower side of shock absorber assembly.
4. Lower torsion beam to fully extended position. Remove transmission jack and tighten torsion beam, at trailing arm, to specified torque. Refer to RSU-5, "Components" .
5. Install brake hydraulic lines and tighten flare nuts.

Flare nut tightening torque	**: 15 - 18 N·m (1.5 - 1.8 kg-m, 11 – 13 ft-lb)**

6. Connect ABS wheel sensor, if equipped.
7. Bleed air. Refer to BR-7, "Bleeding Brake System" .
8. Install ABS wheel sensor.



COIL SPRING AND SHOCK ABSORBER

PFP:56210

Removal and Installation

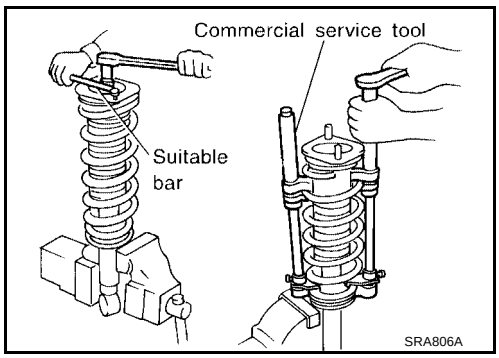
EES000J0

Remove shock absorber upper and lower fixing nuts.
Do not remove piston rod lock nut on vehicle.

Disassembly

EES000J1

1. Set shock absorber in vise, then **loosen** piston rod lock nut.
   Do not remove piston rod lock nut at this time.
2. Compress spring with Tool so that the shock absorber upper spring seat can be turned by hand.
   WARNING:
   Make sure that the pawls of the two spring compressors are firmly hooked on the spring. The spring compressors must be tightened alternately so as not to tilt the spring.
3. Remove piston rod lock nut.



Inspection

EES000J2

SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage.
  Replace if necessary.

UPPER RUBBER SEAT AND BUSHING

Check rubber parts for deterioration or cracks.
Replace if necessary.

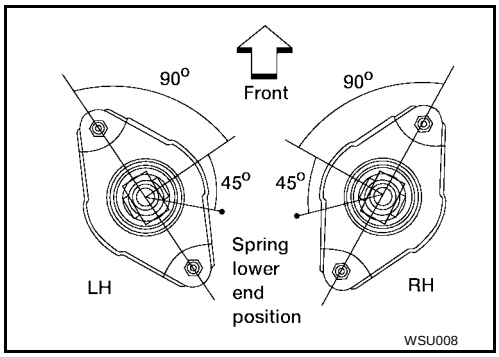
COIL SPRING

Check for cracks, deformation or other damage. Replace if necessary.

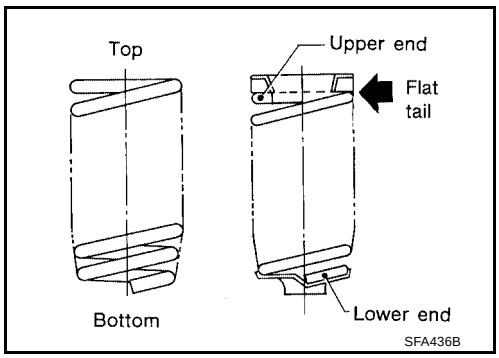
Assembly

EES000J3

- Locate upper spring seat as shown.



- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)
- When installing coil spring on shock absorber, it must be positioned as shown.
  CAUTION:
  Do not reuse piston rod lock nut.



TORSION BEAM, LATERAL LINK AND CONTROL ROD

PFP:55130

Disassembly

EES000J4

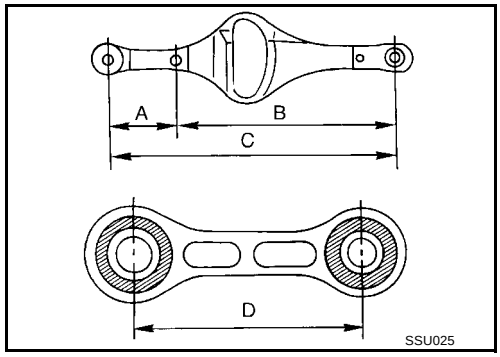
- Remove torsion beam assembly. Refer to RSU-8, "REMOVAL" .
- Remove lateral link and control rod from torsion beam.

Inspection

EES000J5

- Check for cracks, distortion or other damage. Replace if necessary.

Standard length : "A" 207 - 208 mm (8.15 - 8.19 in)
"B" 394 - 395 mm (15.51 - 15.55 in)
"C" 601 - 603 mm (23.66 - 23.74 in)
"D" 106 - 108 mm (4.17 - 4.25 in)



- Check all rubber parts for wear, cracks or deformation. Replace if necessary.

Rubber Bushing Replacement

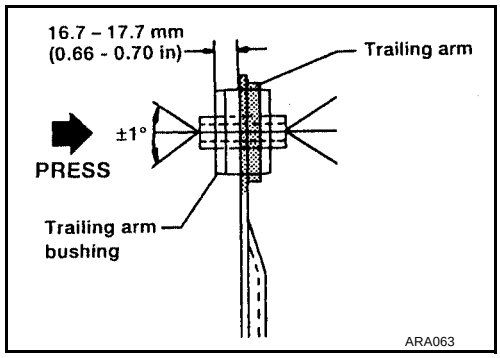
EES000J6

TRAILING ARM

Trailing arm bushings are press fit and must be centered properly in trailing arm collars.

1. Press out old bushing from trailing arm collar.
2. Press in new bushing until inside edge of bushing is 16.7 to 17.7 mm (0.66 to 0.70 in) from inside edge of trailing arm.

- Do not allow bushing to incline more than 1 degree.
- During installation, do not allow trailing arm to bend or twist.

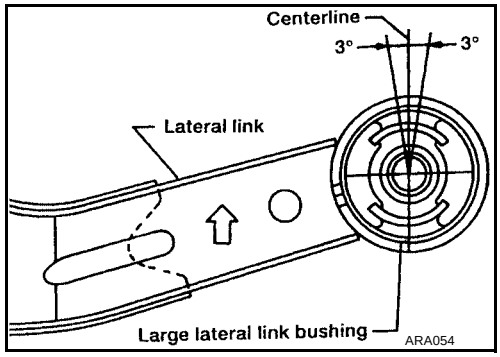


LATERAL LINK

Lateral link bushings are press fit. The large lateral link bushing is directional and must be installed in a specific position.

1. Remove lateral link.
2. Press out bushings. Note installation position of large bushing before removing.
3. Press in small bushing until bushing is centered in lateral link collar.
4. Press in large bushing until bushing is centered in lateral link collar.

a. Position bushing on lateral link collar.
b. Angle between bushing centerline and collar centerline must be within 3 degrees as shown in illustration.



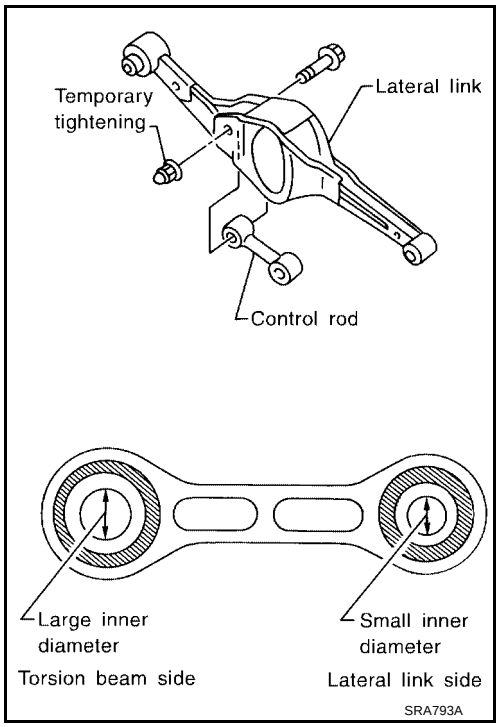
CONTROL ROD

Control rod bushings are not replaceable. If bushings are worn or damaged, replace control rod.

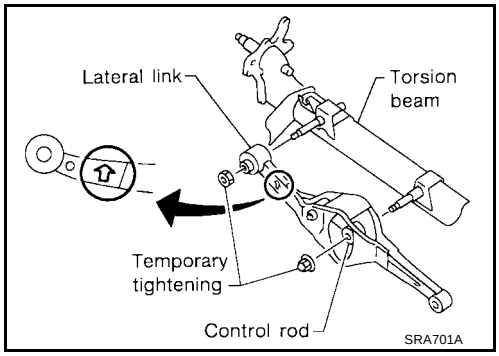
Assembly

EES000J7

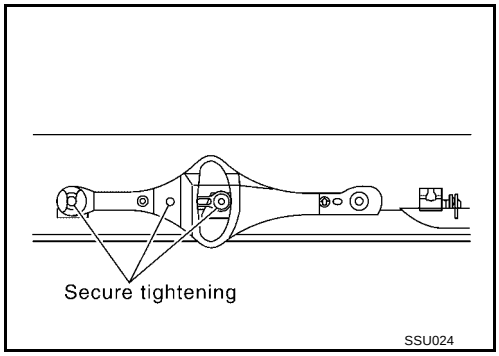
1. Temporarily assemble lateral link and control rod.
   - When installing the control rod, connect the bushing with the smaller inner diameter to the lateral link.



2. Temporarily install lateral link and control rod on torsion beam.
   - When installing, place lateral link with the arrow topside.



3. Place lateral link and control rod horizontally against torsion beam, and tighten to the specified torque.
4. Install torsion beam assembly. Refer to RSU-8, "INSTALLATION" .



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

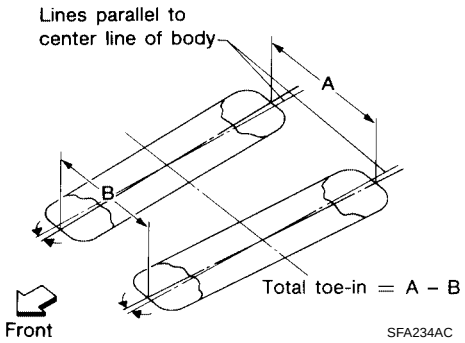
General Specifications (Rear)

EES000J8

Suspension type	Multi-link beam suspension
Shock absorber type	Double-acting hydraulic

Rear Wheel Alignment (Unladen*)

EES000J9

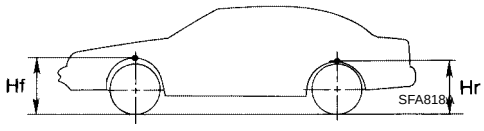


Camber Degree minute (Decimal degree)		Minimum	–1°45′ (–1.75°)
		Nominal	–1°00′ (–1.00°)
		Maximum	–0°15′ (–0.25°)
Total toe-in	Distance (A – B) mm (in)	Minimum	–3 (–0.12)
		Nominal	1 (0.04)
		Maximum	5 (0.20)
	Angle (left plus right) Degree minute (Decimal degree)	Minimum	–16′ (–0.27°)
		Nominal	5′30″ (0.09°)
		Maximum	26′ (0.43°)

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

Wheel Arch Height (Unladen*)

EES000JA



Engine	QG18DE	QR25DE		
Grade	XE, GXE	LE	SE-R	SPEC-V
Tire Size	P195/60HR15	P195/60HR15	P195/55HR16	P215/45ZR17
Front (Hf) mm (in)	659 (25.94)	659 (25.94)	660 (25.98)	664 (26.14)
Rear (Hr) mm (in)	653 (25.71)	653 (25.71)	652 (25.67)	655 (25.79)

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

SECTION SC

STARTING & CHARGING SYSTEM

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PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EKS0037L

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

Wiring Diagrams and Trouble Diagnosis

EKS0037M

When you read wiring diagrams, refer to the following:

- GI-13, "How to Read Wiring Diagrams"
- PG-2, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnosis, refer to the following:

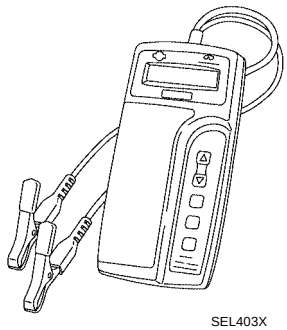
- GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES".
- GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"

PREPARATION

PFP:00002

Special Service Tool

EKS0037N

Tool number Tool name		Description
J-44373 Model 620 Battery/Starting/Charging system tester	 SEL403X	

BATTERY

PFP:AYBGL

How to Handle Battery

EKS0037O

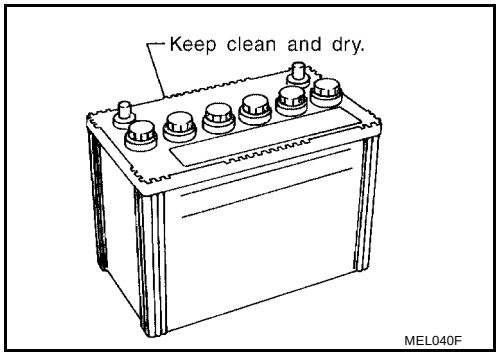
CAUTION:

- **If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.**
- **After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.**
- **Never add distilled water through the hole used to check specific gravity.**

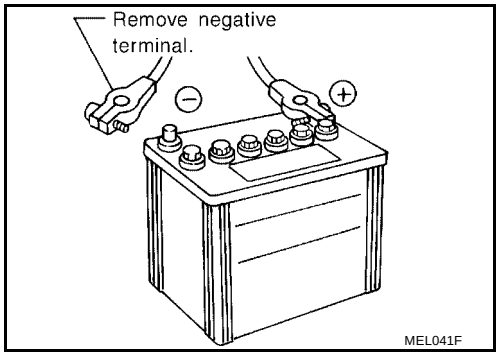
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

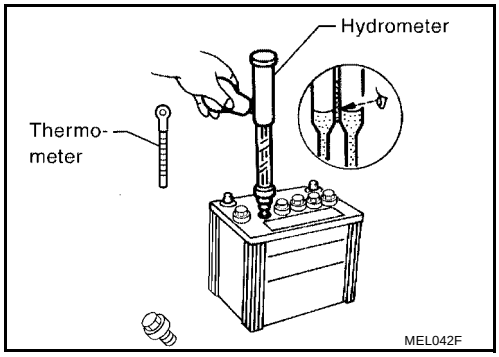
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level.
  This also applies to batteries designated as “low maintenance” and “maintenance-free”.



- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal.



- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

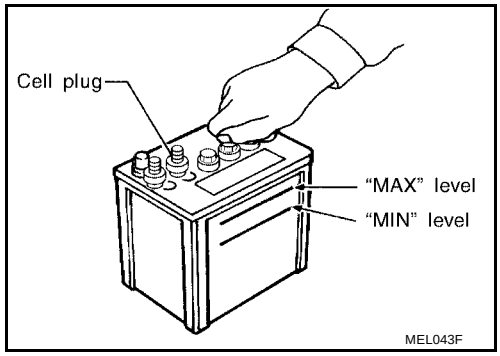


CHECKING ELECTROLYTE LEVEL

WARNING:

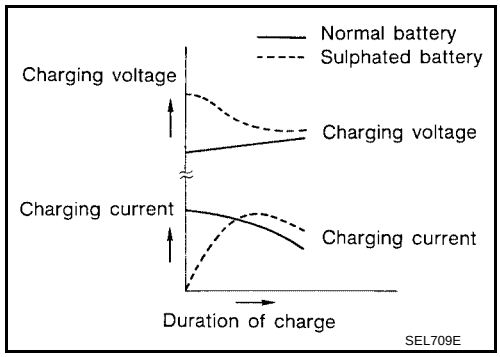
Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If acid contacts eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



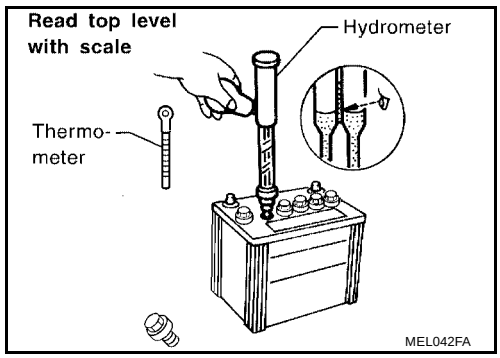
Sulphation

A battery will be completely discharged if it is left unattended for a long time and the specific gravity will become less than 1.100. This may result in sulphation on the cell plates.
To determine if a battery has been "sulphated", note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulphated batteries.
A sulphated battery may sometimes be brought back into service by means of a long, slow charge, 12 hours or more, followed by a battery capacity test.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.
2. Use the following chart to correct your hydrometer reading according to electrolyte temperature.



Hydrometer Temperature Correction

Battery electrolyte temperature °C (°F)	Add to specific gravity reading
71 (160)	0.032
66 (150)	0.028
60 (140)	0.024
54 (130)	0.020
49 (120)	0.016
43 (110)	0.012
38 (100)	0.008
32 (90)	0.004
27 (80)	0
21 (70)	–0.004
16 (60)	–0.008
10 (50)	–0.012
4 (40)	–0.016
–1 (30)	–0.020
–7 (20)	–0.024

Battery electrolyte temperature °C (°F)	Add to specific gravity reading
–12 (10)	–0.028
–18 (0)	–0.032

Corrected specific gravity	Approximate charge condition
1.260 - 1.280	Fully charged
1.230 - 1.250	3/4 charged
1.200 - 1.220	1/2 charged
1.170 - 1.190	1/4 charged
1.140 - 1.160	Almost discharged
1.110 - 1.130	Completely discharged

CHARGING THE BATTERY

CAUTION:

- **Do not “quick charge” a fully discharged battery.**
- **Keep the battery away from open flame while it is being charged.**
- **When connecting the charger, connect the leads first, then turn on the charger. Do not turn on the charger first, as this may cause a spark.**
- **If battery electrolyte temperature rises above 60°C (140°F), stop charging. Always charge battery at a temperature below 60°C (140°F).**

Charging Rates

Amps	Time
50	1 hour
25	2 hours
10	5 hours
5	10 hours

Do not charge at more than 50 ampere rate.

NOTE:

The ammeter reading on your battery charger will automatically decrease as the battery charges. This indicates that the voltage of the battery is increasing normally as the state of charge improves. The charging amps indicated above refer to initial charge rate.

- If, after charging, the specific gravity of any two cells varies more than .050, the battery should be replaced.

Trouble Diagnoses with Battery/Starting/Charging System Tester

EKS0037P

CAUTION:

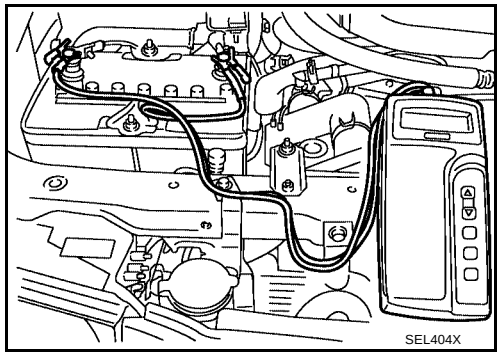
When working with batteries, always wear appropriate eye protection.

NOTE:

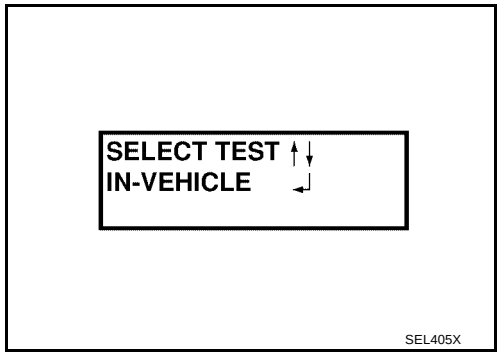
- To ensure a complete and thorough diagnosis, the battery, starter and generator test segments must be done as a set from start to finish.
- If battery surface charge is detected while testing, the tester will prompt you to turn on the headlights to remove the surface charge.
- If necessary, the tester will prompt you to determine if the battery temperature is above or below 0°C (32°F). Choose the appropriate selection by pressing the up or down arrow button, then press “ENTER” to make the selection.

1. Turn off all loads on the vehicle electrical system. Clean or repair as necessary.
2. Visually inspect the battery, battery terminals and cable ends with ignition switch in “OFF” position.

   NOTE:
   The contact surface between the battery terminals, cable ends and tester leads must be clean for a valid test. A poor connection will prevent testing and a “CHECK CONNECTION” message will appear during the test procedures. If this occurs, clean the battery post and terminals, reconnect them and restart the test.


SEL404X

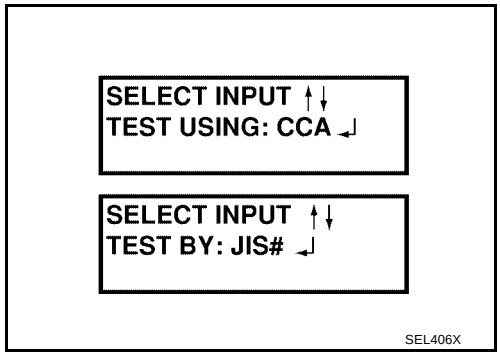
3. Connect the red tester lead clamp to the positive battery terminal, and the black to the negative terminal.
4. The tester will turn on automatically. Using the arrow keys, select “IN-VEHICLE” on the tester and then press the “ENTER” key.



SEL405X

5. Locate the battery type and rating stamped or written on the top case of the battery to be tested.

   NOTE:
   The battery type and rating will have either of the following.
   CCA: Cold Cranking Amps (490 CCA, 550 CCA, etc.)
   JIS: Japanese Industrial Standard.
   Battery is stamped with a number such as:
   80D26L: 80 (rank of output), D (physical size-depth), 26 (width in cm). The last character L (post configuration) is not input into the tester.
   The tester requires the rating for the battery be entered exactly as it is written or stamped on the battery. Do not attempt a CCA conversion for JIS stamped batteries. JIS must be input directly.

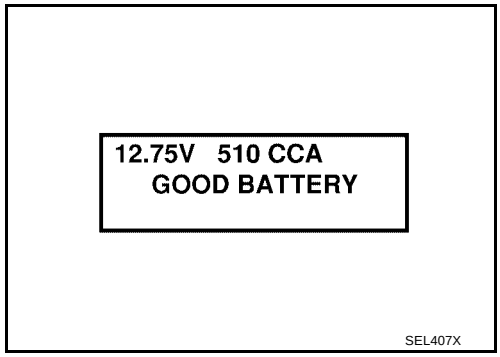


SEL406X

6. Using the arrow and “ENTER” keys alternately, select the battery type and rating.

   NOTE:
   The tester lists five choices; CCA, JIS, IEC, DIN, and EN. Only use CCA or JIS.

7. Press “ENTER” to begin the test. Diagnosis results are displayed on the tester. Refer to SC-8, "DIAGNOSTIC RESULT ITEM CHART" .

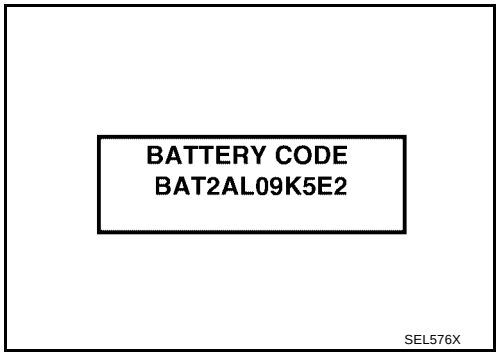


SEL407X

8. Press “ENTER”, then test output code is displayed. Record the test output code on the repair order.
9. Toggle back to the “DIAGNOSTIC SCREEN” for test results.

NOTE:

- If necessary, the tester will ask the user to determine if the battery has just been charged. Choose the appropriate selection by pressing the up or down arrow button and then press the “ENTER” button to make the selection.
- When testing a battery installed in a vehicle that has recently been driven, select “BEFORE CHARGE”.
- If the battery has just been slow charged due to a “CHARGE & RETEST” decision by the tester, and the tester asks the user “BEFORE CHARGE/AFTER CHARGE”, select “AFTER CHARGE”.



DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
GOOD BATTERY	Battery is OK. Refer to SC-6, "Trouble Diagnoses with Battery/Starting/Charging System Tester" .
REPLACE BATTERY	Replace battery. Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again with Battery/Starting/Charging system tester. If second test result is “Replace Battery”, then do so. Perform battery test again to confirm repair.
BAD CELL-REPLACE	Replace the battery. Perform battery test again with Battery/Starting/Charging system tester to confirm repair.
GOOD-RECHARGE	Perform the slow battery charging procedure. (Initial rate of charge is 10A for 12 hours.) Perform battery test again with Battery/Starting/Charging system tester.
CHARGE & RETEST	Perform the slow battery charging. (Initial rate of charge is 10A for 12 hours.) Perform battery test again with Battery/Starting/Charging system tester to confirm repair. **NOTE:** **If the tester asks the user “BEFORE CHARGE/AFTER CHARGE”, select “AFTER CHARGE”.**

STARTING SYSTEM

PFP:23300

System Description

EKS0037Q

M/T MODEL

Power is supplied at all times:

- through 40A fusible link (letter **c** , located in the fuse and fusible link box)
- to ignition switch terminal B.

With the ignition switch in the START position, power is supplied:

- from ignition switch terminal St
- to clutch interlock relay terminal 5.

With the ignition switch in the ON or START position, power is supplied:

- through 10A fuse [No. 20, located in the fuse block (J/B)]
- to clutch interlock relay terminal 1.

When the clutch pedal is depressed, ground is supplied to clutch interlock relay terminal 2 through the clutch interlock switch and body grounds E7 and E37.
The clutch interlock relay is energized and power is supplied:

- from terminal 3 of the clutch interlock relay
- to terminal S of the starter motor windings.

The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates.

A/T MODEL

Power is supplied at all times:

- through 40A fusible link (letter **c** , located in the fuse and fusible link box)
- to ignition switch terminal B.

With the ignition switch in the START position, power is supplied:

- from ignition switch terminal St
- to park/neutral position relay terminal 5

With the ignition switch in the ON or START position, power is supplied:

- through 10A fuse [No. 20, located in the fuse block (J/B)]
- to park/neutral position relay terminal 1.

With the selector lever in the P or N position, ground is supplied:

- to park/neutral position relay terminal 2
- through park/neutral position switch.

The park/neutral position relay is energized and power is supplied:

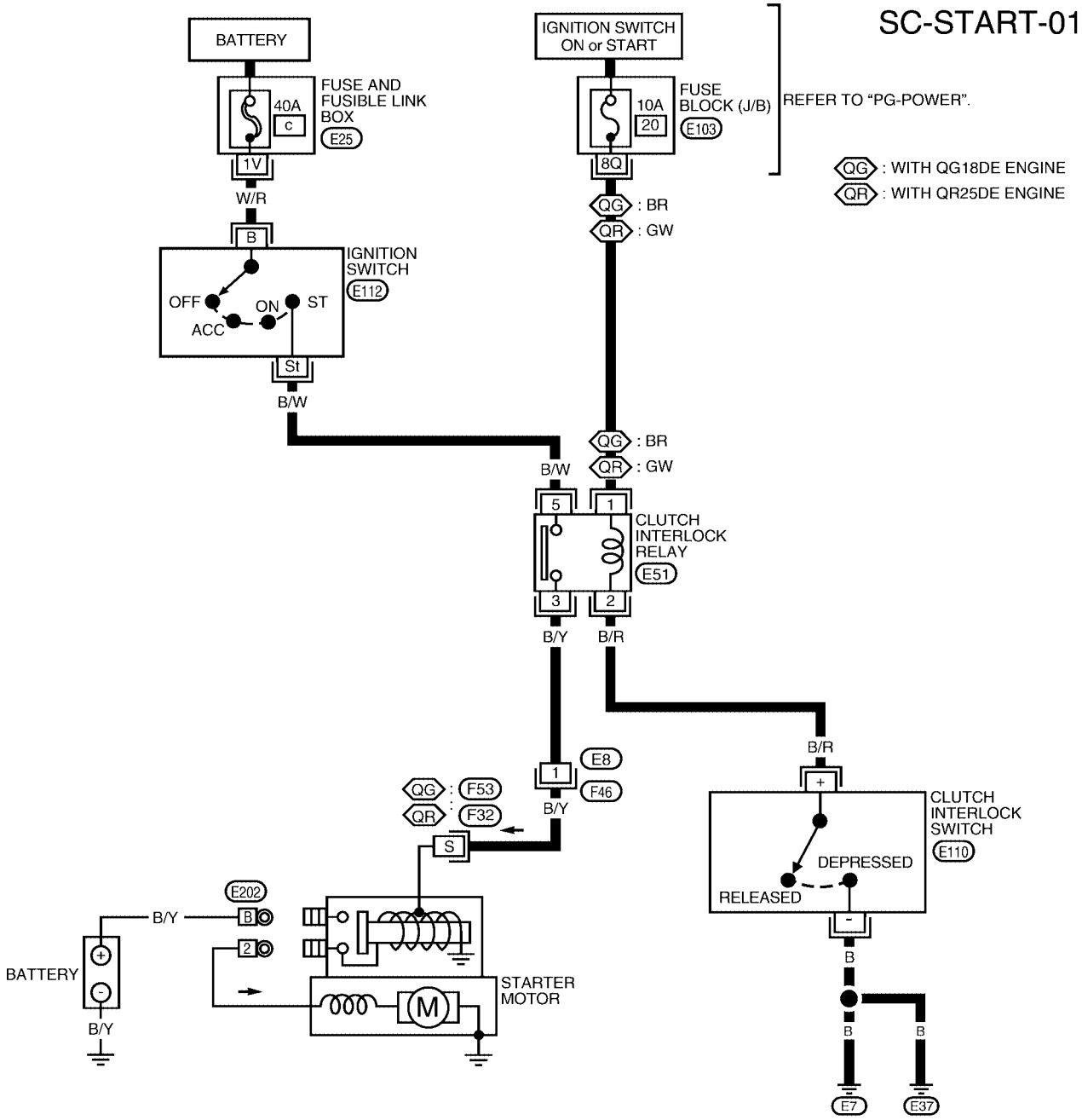
- from ignition switch terminal St
- through park/neutral position relay terminals 5 and 3
- to terminal S of the starter motor windings.

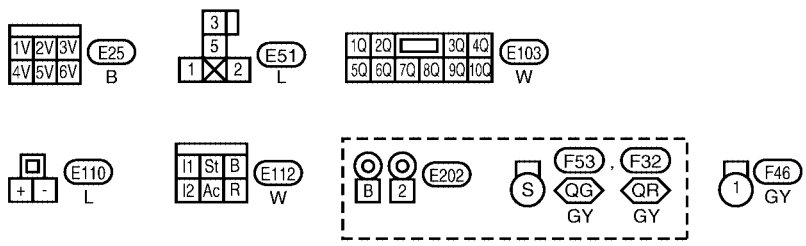
The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates.

Wiring Diagram — START —

EKS0037R

M/T MODEL

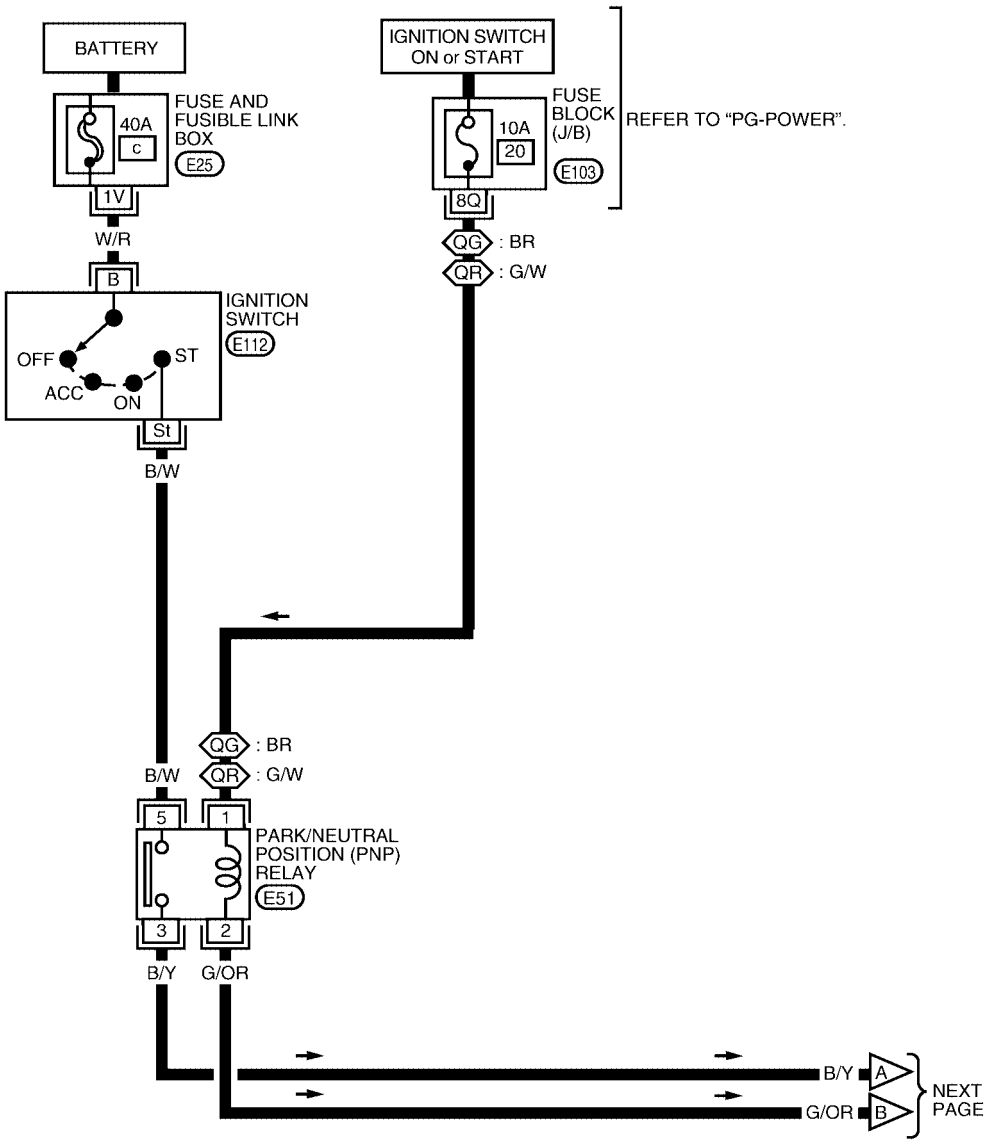


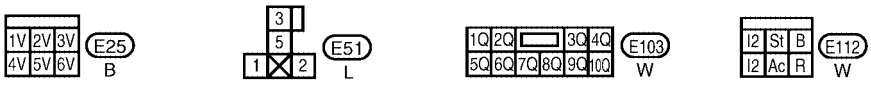


WKWA0159E

A/T MODEL

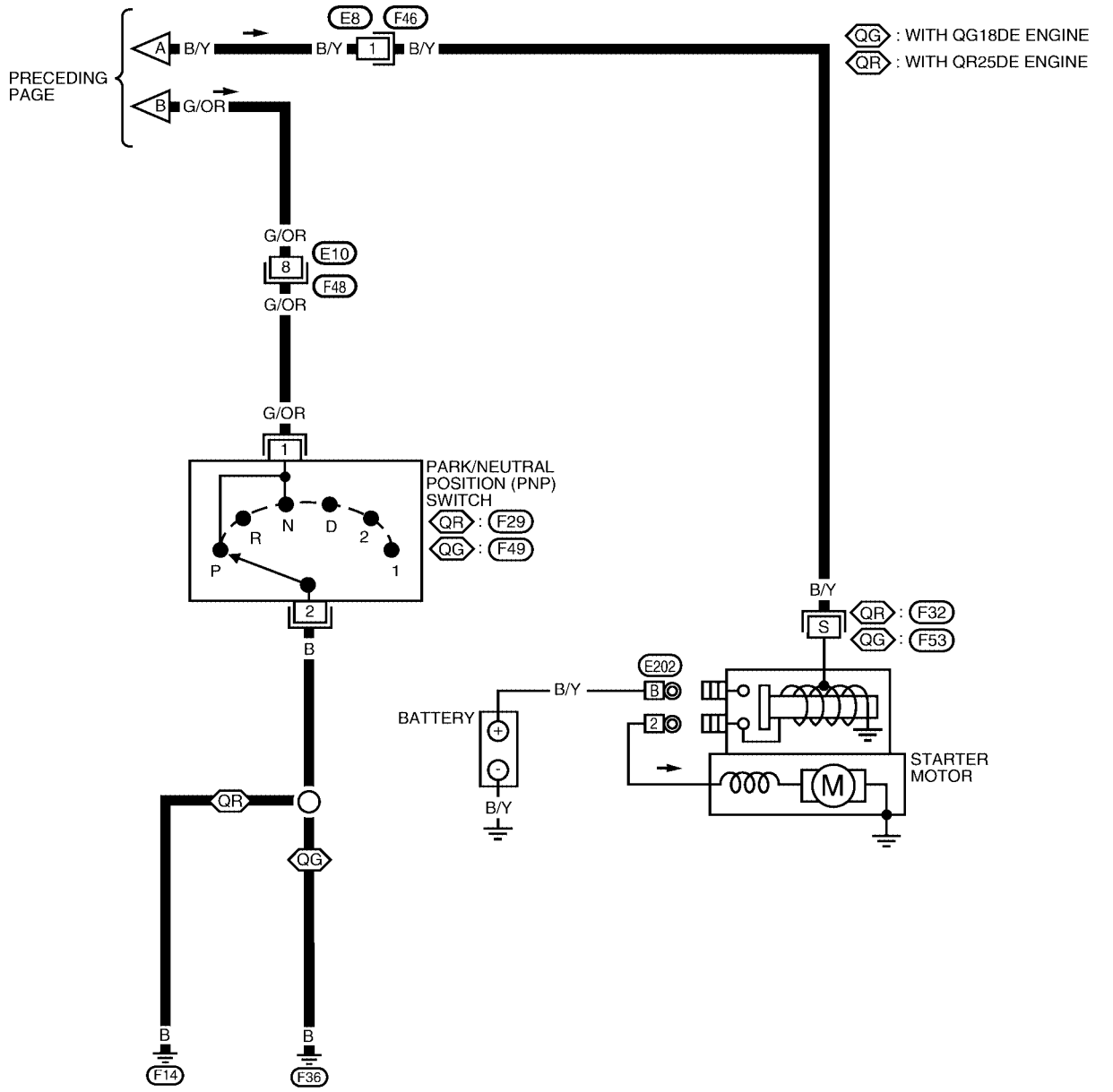
SC-START-02

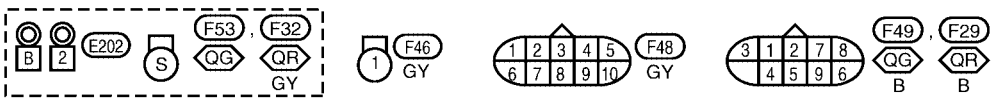




WKWA0160E

SC-START-03





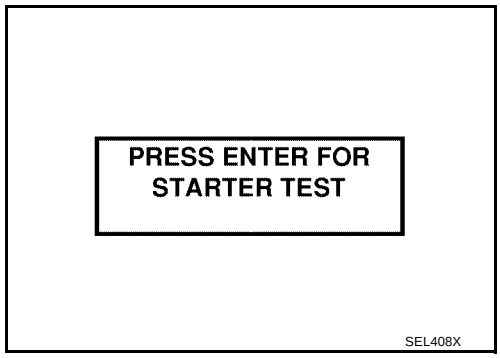
WKWA0161E

Trouble Diagnoses with Battery/Starting/Charging System Tester

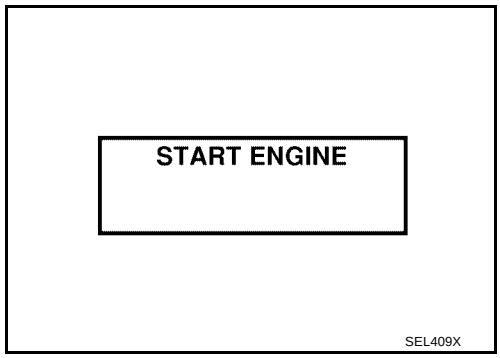
EKS0037S

NOTE:
To ensure a complete and thorough diagnosis, the battery, starter and generator test segments must be done as a set from start to finish.

1. Turn off all loads on the vehicle electrical system.
2. Perform battery test with Battery/Starting/Charging system tester. Refer to SC-13, "Trouble Diagnoses with Battery/Starting/Charging System Tester" .
3. Press “ENTER” to begin the starting system test.

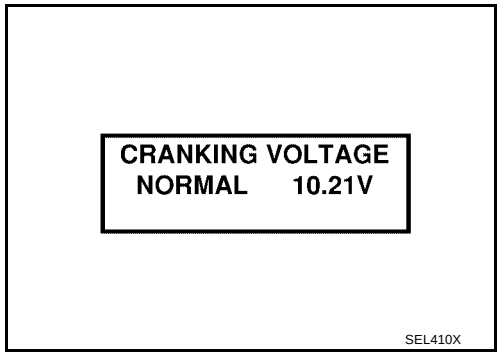


4. Start the engine.



5. Diagnosis result is displayed on the tester. Refer to SC-13, "DIAGNOSTIC RESULT ITEM CHART" .

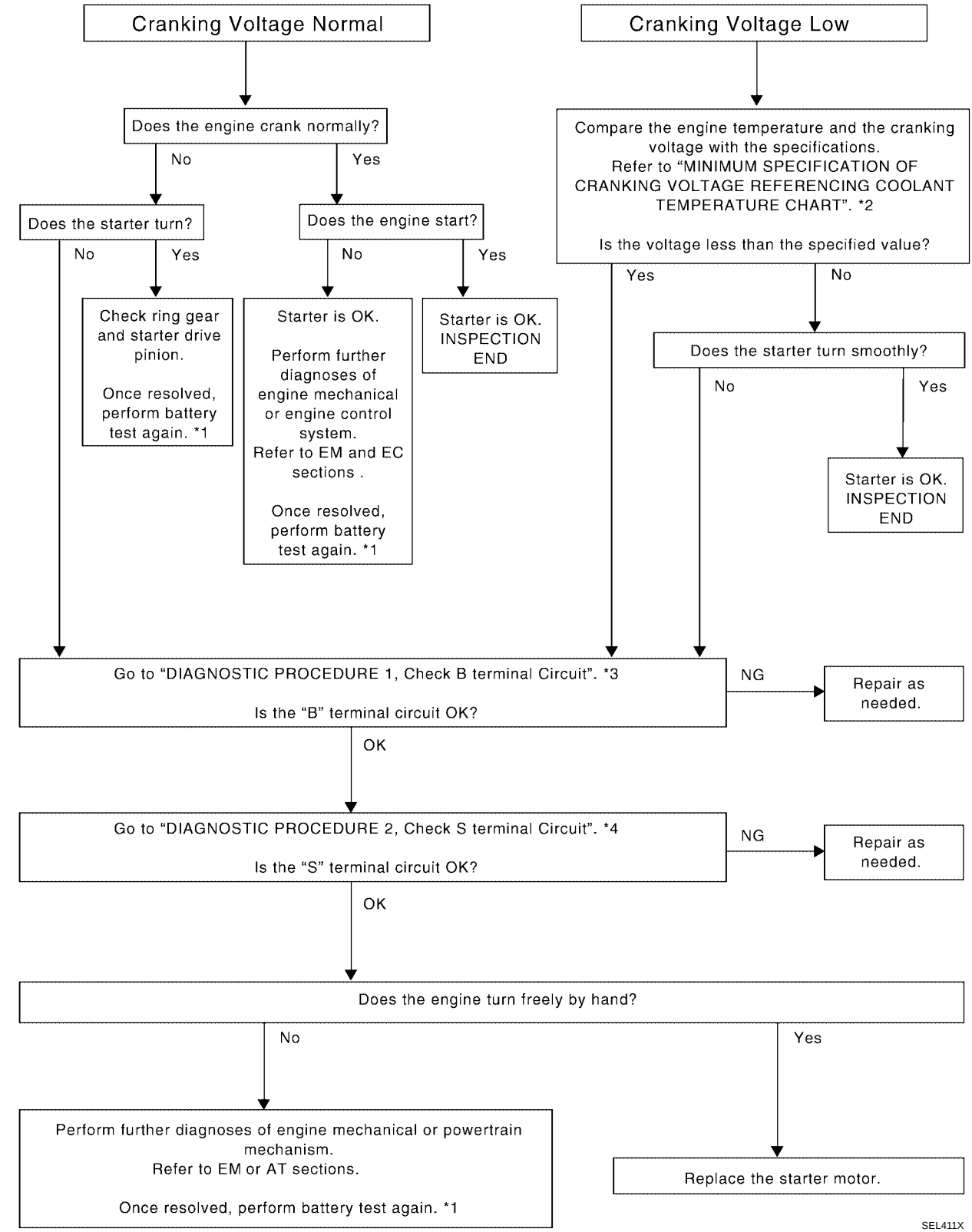
   NOTE:
   - If the starter performs normally but the engine does not start, perform engine diagnosis.
   - For intermittent “NO CRANK” or “NO STARTER OPERATION” incidents, refer to SC-17, "DIAGNOSTIC PROCEDURE 2" .



DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
CRANKING VOLTAGE NORMAL	Go to “WORK FLOW”, SC-14, "WORK FLOW" .
CRANKING VOLTAGE LOW	Go to “WORK FLOW”, SC-14, "WORK FLOW" .
CHARGE BATTERY	Perform the slow battery charging procedure. (Initial rate of charge is 10A for 12 hours.) Perform battery test again with Battery/Starting/Charging system tester. Refer to SC-13, "Trouble Diagnoses with Battery/Starting/Charging System Tester" .
REPLACE BATTERY	Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again with Battery/Starting/Charging system tester. Refer to SC-13, "Trouble Diagnoses with Battery/Starting/Charging System Tester" . If second test result is “REPLACE BATTERY”, then do so. Perform battery test again to confirm repair.

WORK FLOW



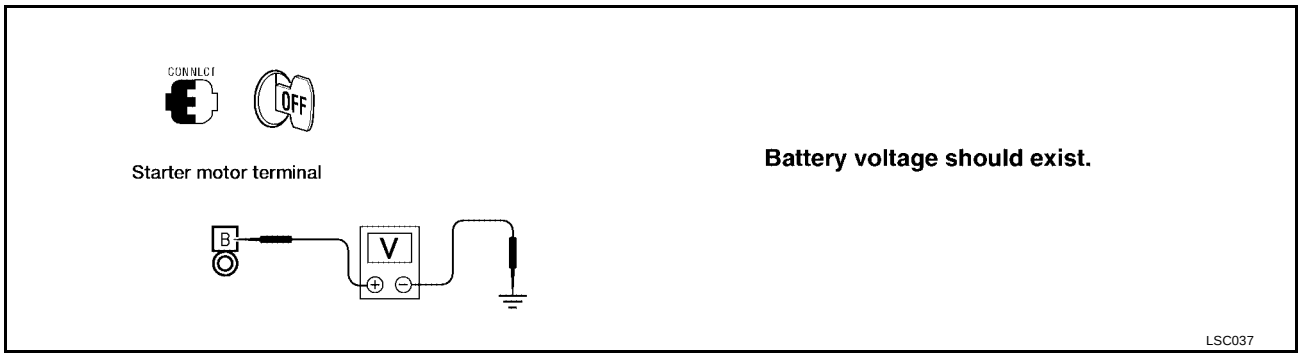
*1 SC-6 *2 SC-18 *3 SC-15

*4 SC-17

DIAGNOSTIC PROCEDURE 1
Check “B” Terminal Circuit

1. CHECK POWER SUPPLY FOR STARTER MOTOR “B” TERMINAL

1. Remove the fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn the ignition switch OFF.
4. Check that the starter motor connector E202 terminal B (B/Y) connection is clean and tight.
5. Check voltage between starter motor connector E202 terminal B (B/Y) and ground using a digital circuit tester.

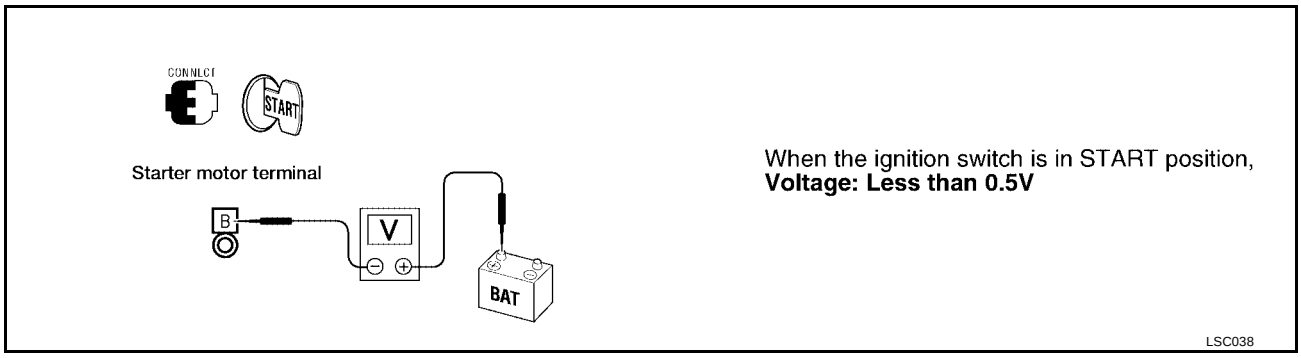


OK or NG

OK >> GO TO 2.
NG >> Check harness between the battery and the starter motor for open circuit.

2. CHECK BATTERY CABLE CONNECTION QUALITY (VOLTAGE DROP TEST)

1. Check voltage between starter motor connector E202 terminal B (B/Y) and battery positive terminal using a digital circuit tester.

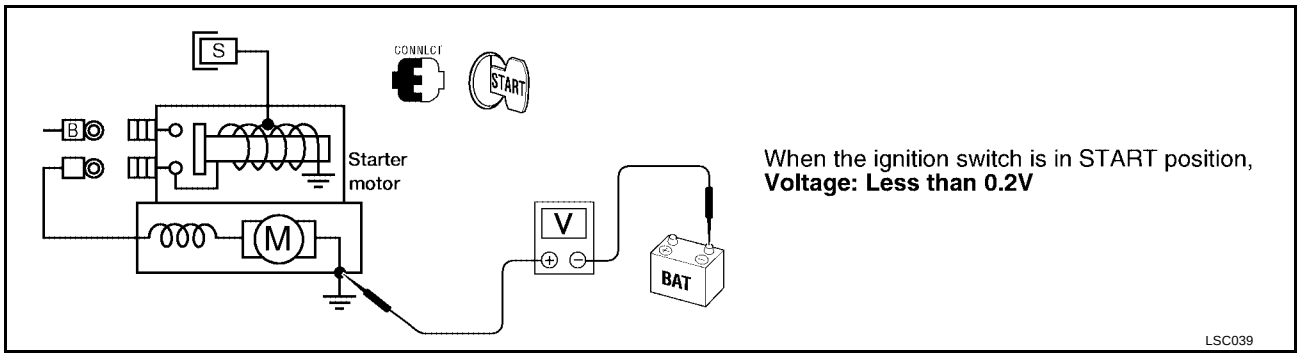


OK or NG

OK >> GO TO 3.
NG >> Check harness between the battery and the starter motor for poor continuity.

3. CHECK STARTER MOTOR GROUND CIRCUIT (VOLTAGE DROP TEST)

1. Check voltage between starter motor case and battery negative terminal using a digital circuit tester.



OK or NG

OK >> Starter motor “B” terminal circuit is OK. Further inspection is necessary. Refer to SC-14, "WORK FLOW" .

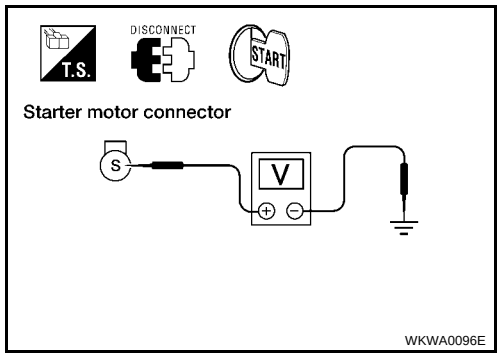
NG >> Check the starter motor case and ground for poor continuity.

DIAGNOSTIC PROCEDURE 2
Check “S” Terminal Circuit

1. CHECK POWER SUPPLY FOR STARTER MOTOR “S” TERMINAL

1. Remove the fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn the ignition switch OFF.
4. Disconnect starter motor connector F53 (QG18DE), F32 (QR25DE) terminal S (B/Y) connector.
5. Check voltage between starter motor connector F53 (QG18DE), F32 (QR25DE) terminal S (B/Y) and ground using a digital circuit tester.

With the ignition switch ON : **Battery voltage should exist**



OK or NG

OK >> GO TO 2.

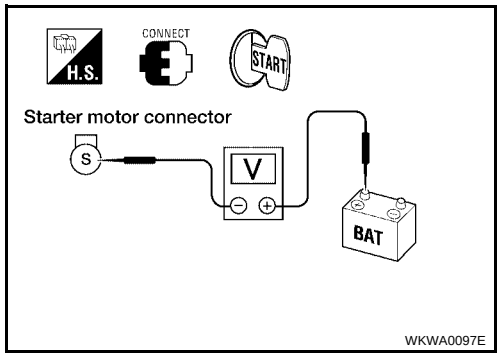
NG >> Check the following.

- 40A fusible link (letter **c** , located in fuse and fusible link box)
- Clutch interlock relay
- Park/neutral position relay
- Harness for open or short

2. CHECK “S” TERMINAL CONNECTION QUALITY (VOLTAGE DROP TEST)

1. Connect starter motor connector F53 (QG18DE), F32 (QR25DE) terminal S (B/Y) connector.
2. Check voltage between starter motor connector F53 (QG18DE), F32 (QR25DE) terminal S (B/Y) and battery positive terminal using a digital tester.

With the ignition switch in START : **Voltage less than 1V**



OK or NG

OK >> Starter motor “S” terminal circuit is OK. Further inspection is necessary. Refer to SC-14, "WORK FLOW" .

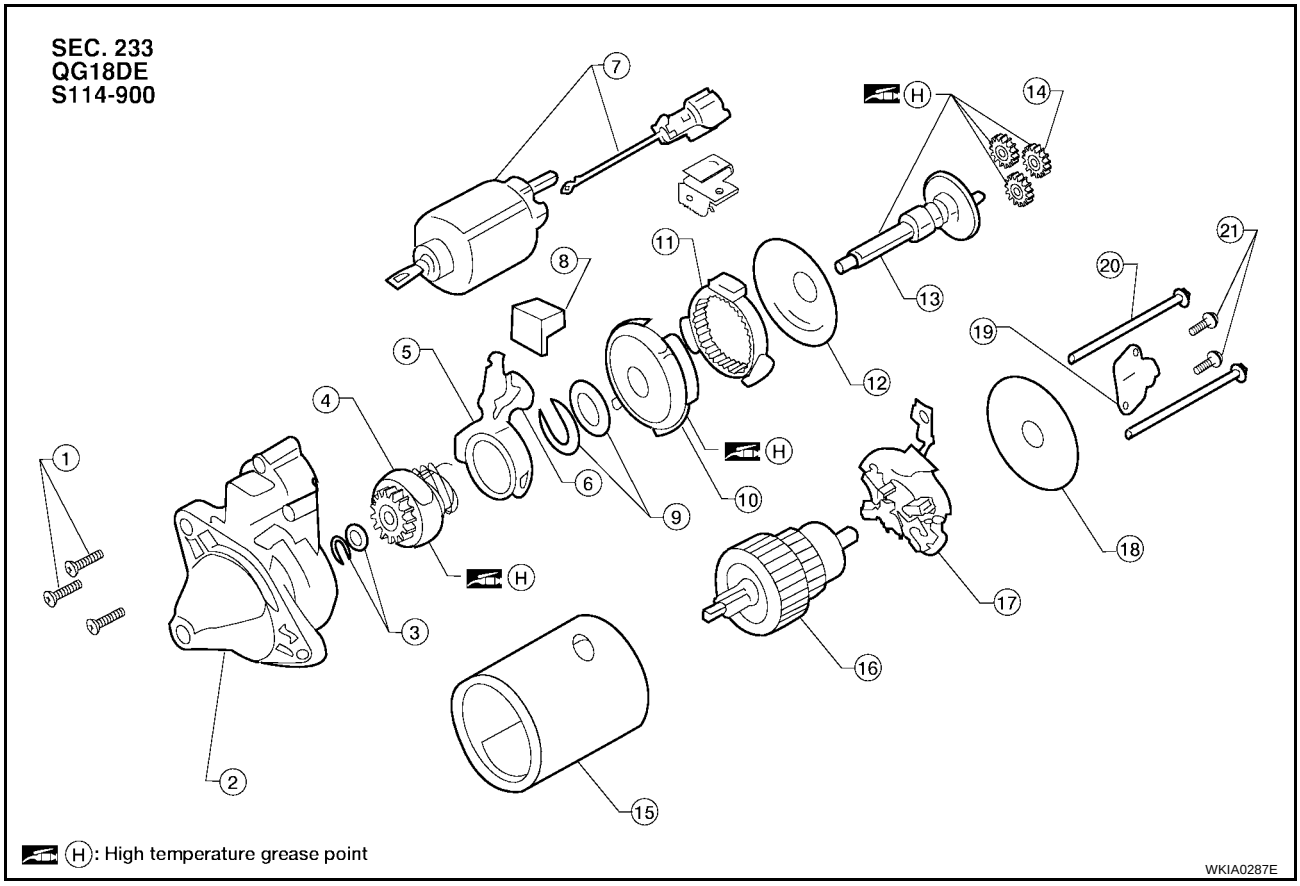
NG >> Check harness between the battery and the starter motor “S” terminal for poor continuity.

MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE

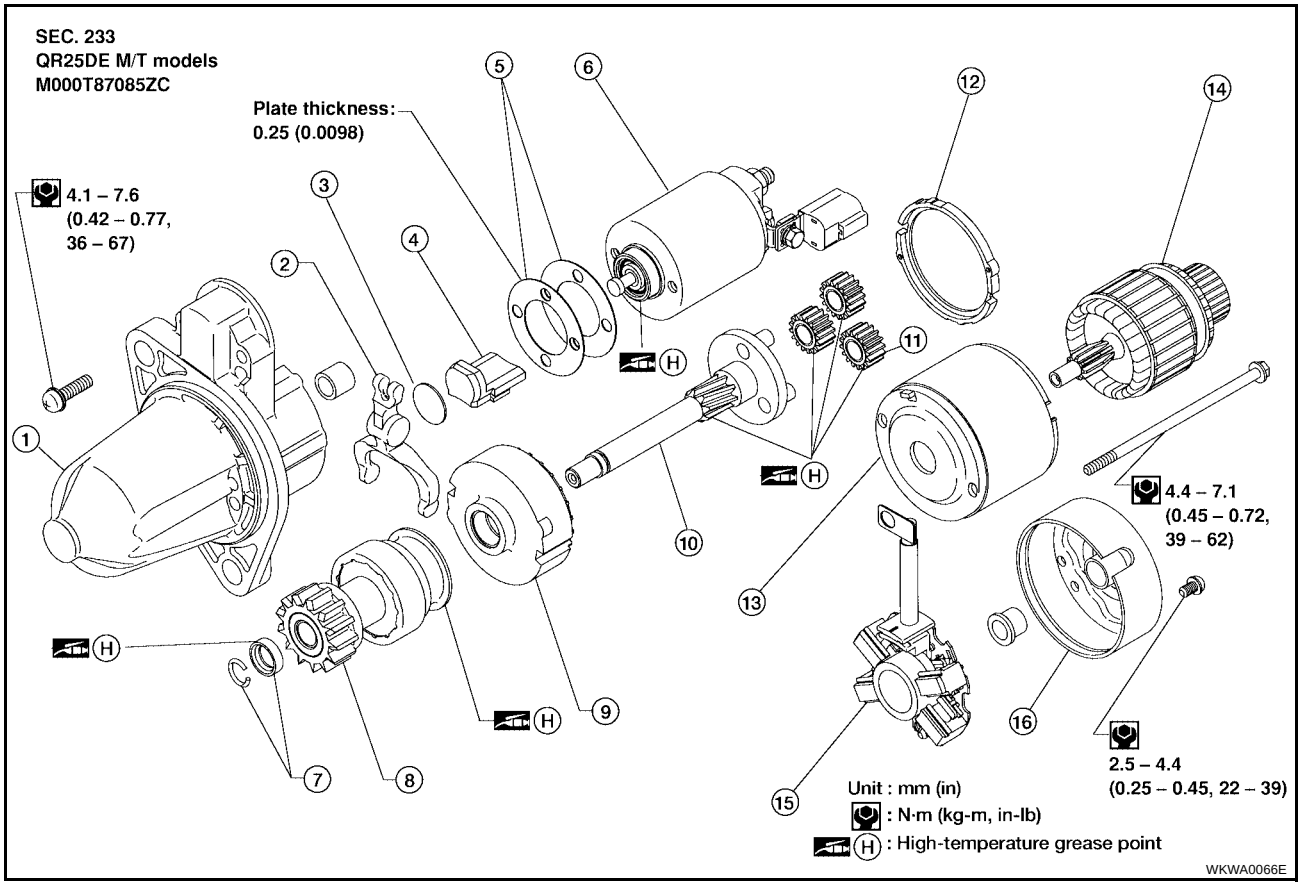
Engine coolant temperature	Voltage V	
	QG18DE	QR25DE
–30°C to –20°C (–22°F to –4°F)	7.4	8.7
–19°C to –10°C (–2°F to 14°F)	8.2	9.2
–9°C to 0°C (16°F to 32°F)	9.3	9.6
More than 1°C (More than 34°F)	9.5	10.0

Construction

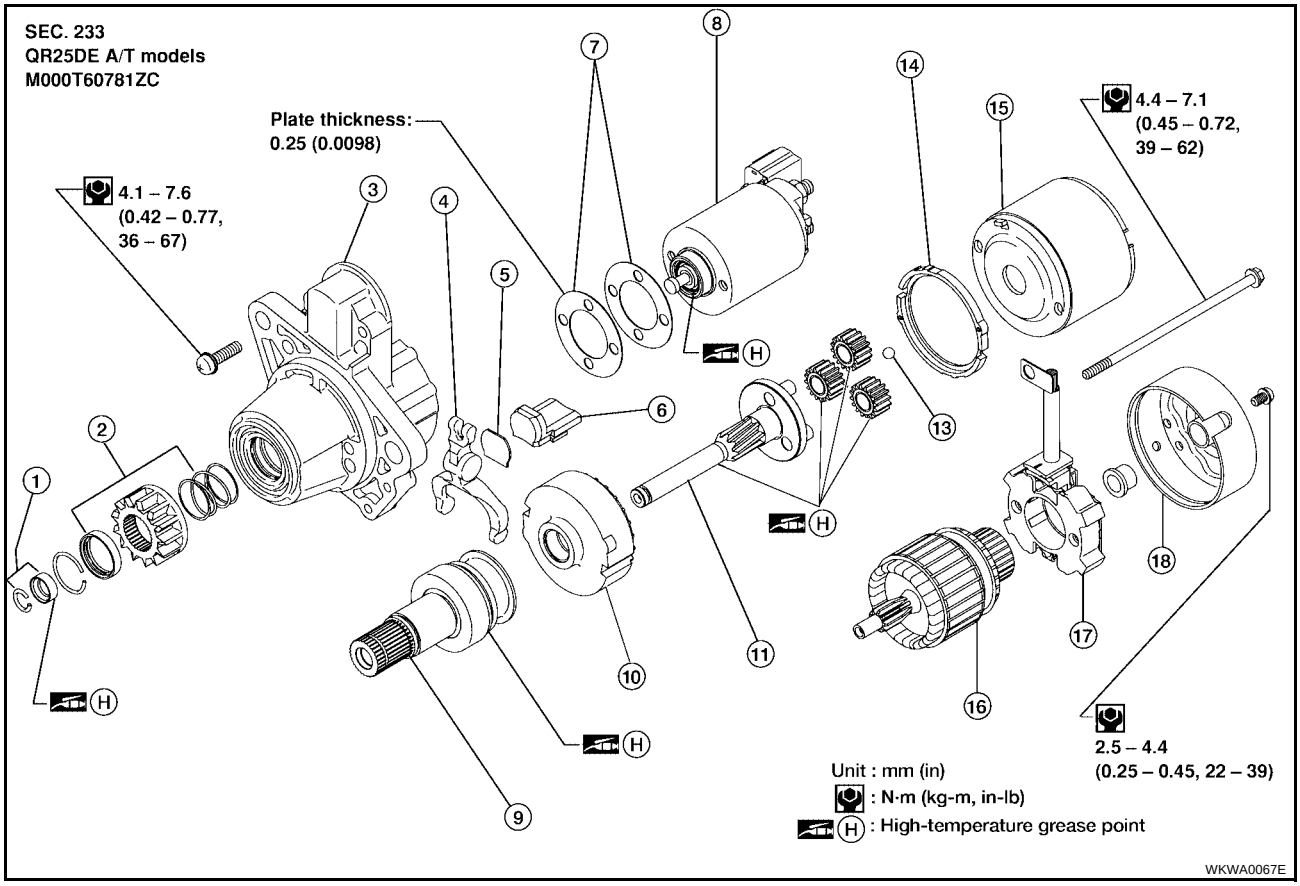
EKS0037T



1. Solenoid through bolts
2. Drive end shield
3. Retainers
4. Pinion assembly
5. Fork lever
6. Bearing pedestal
7. Solenoid switch assembly
8. Seal
9. Locking washers
10. Intermediate bearing
11. Internal gear
12. Cover disc
13. Drive shaft
14. Planetary gears
15. Yoke assembly
16. Armature assembly
17. Brush holder
18. Commutator end shield
19. Closure cap
20. Starter through bolts
21. Closure cap screws



1. Gear case
2. Shift lever
3. Plate
4. Packing
5. Adjusting plate
6. Magnetic switch assembly
7. Pinion stopper set
8. Pinion assembly
9. Internal gear
10. Pinion shaft
11. Planetary gear
12. Packing
13. Yoke
14. Armature
15. Brush holder assembly
16. Rear cover



1. Pinion stopper set
2. Pinion assembly
3. Front bracket
4. Shift lever
5. Plate
6. Packing
7. Adjusting plate
8. Magnetic switch assembly
9. Clutch gear
10. Internal gear
11. Gear shaft
12. Planetary gears
13. Ball
14. Center bracket
15. Yoke assembly
16. Armature
17. Brush assembly
18. Rear bracket

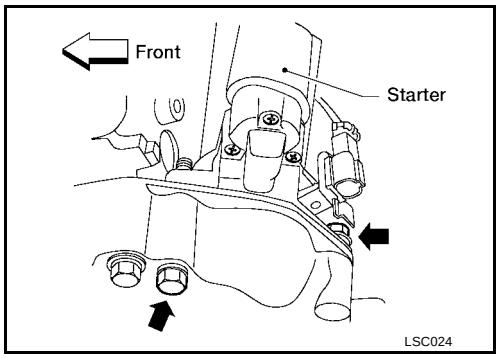
Removal and Installation

EKS0037U

QG18DE

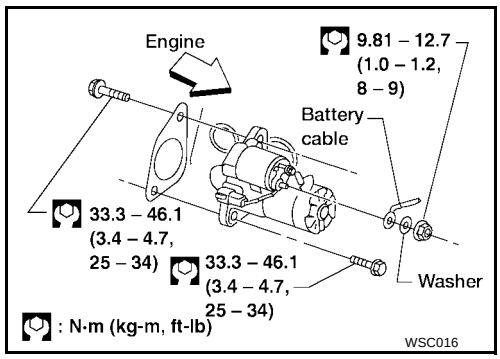
Removal

1. Disconnect the negative battery terminal.
2. Remove the upper starter mounting bolt.
3. Remove the harness protector from the starter engine room harness.
4. Disconnect the starter harness connectors.
5. Remove the lower starter mounting bolt.
6. Remove the starter.



Installation

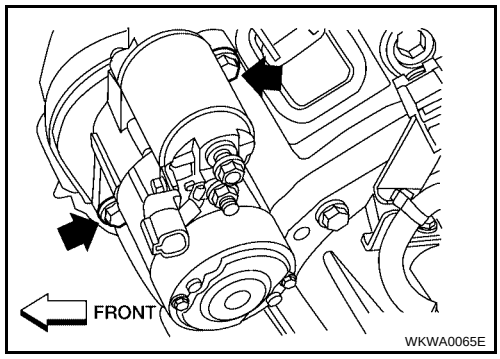
To install, reverse the removal procedure.



QR25DE

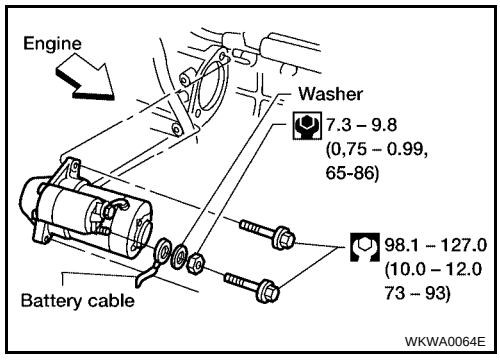
Removal

1. Disconnect the negative and positive battery cables.
2. Remove the engine undercover (M/T) or the air duct, fresh air intake hose, and air cleaner lid (A/T).
3. Disconnect the starter harness connectors.
4. Remove the two starter mounting bolts.
5. Remove the starter.



Installation

To install, reverse the removal procedure.



Pinion/Clutch Check

EKS0037V

1. Inspect pinion assembly teeth.
   - Replace pinion assembly if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect planetary gears/planetary gear teeth.
   - Replace planetary gears if teeth are worn or damaged. (Also check condition of pinion shaft/drive shaft gear teeth.)
3. Check to see if pinion assembly locks in one direction and rotates smoothly in the opposite direction.
   - If it locks or rotates in both directions, or unusual resistance is evident, replace.

CHARGING SYSTEM

PFP:23100

System Description

EKS0037W

NOTE:
For vehicles with QR25DE engine, a low tone whistling noise coming from the generator for less than 10 seconds after engine shut down is normal. This is caused by the rotor "slow-down" function. Do not replace the generator exclusively for this symptom.

The generator provides DC voltage to operate the vehicle's electrical system and to keep the battery charged. The voltage output is controlled by the IC regulator.
Power is supplied at all times to generator terminal B through:

- 100A (QG18DE) or 120A (QR25DE) fusible link (letter **a** , located in the fuse and fusible link box).

Power is supplied at all times to generator terminal S through:

- 10A fuse (No. 33, located in the fuse and fusible link box).

Terminal B supplies power to charge the battery and operate the vehicle's electrical system. Output voltage is controlled by the IC regulator at terminal S detecting the input voltage. The charging circuit is protected by the 100A (QG18DE) or 120A (QR25DE) fusible link.
The generator is grounded to the engine block.
With the ignition switch in the ON or START position, power is supplied:

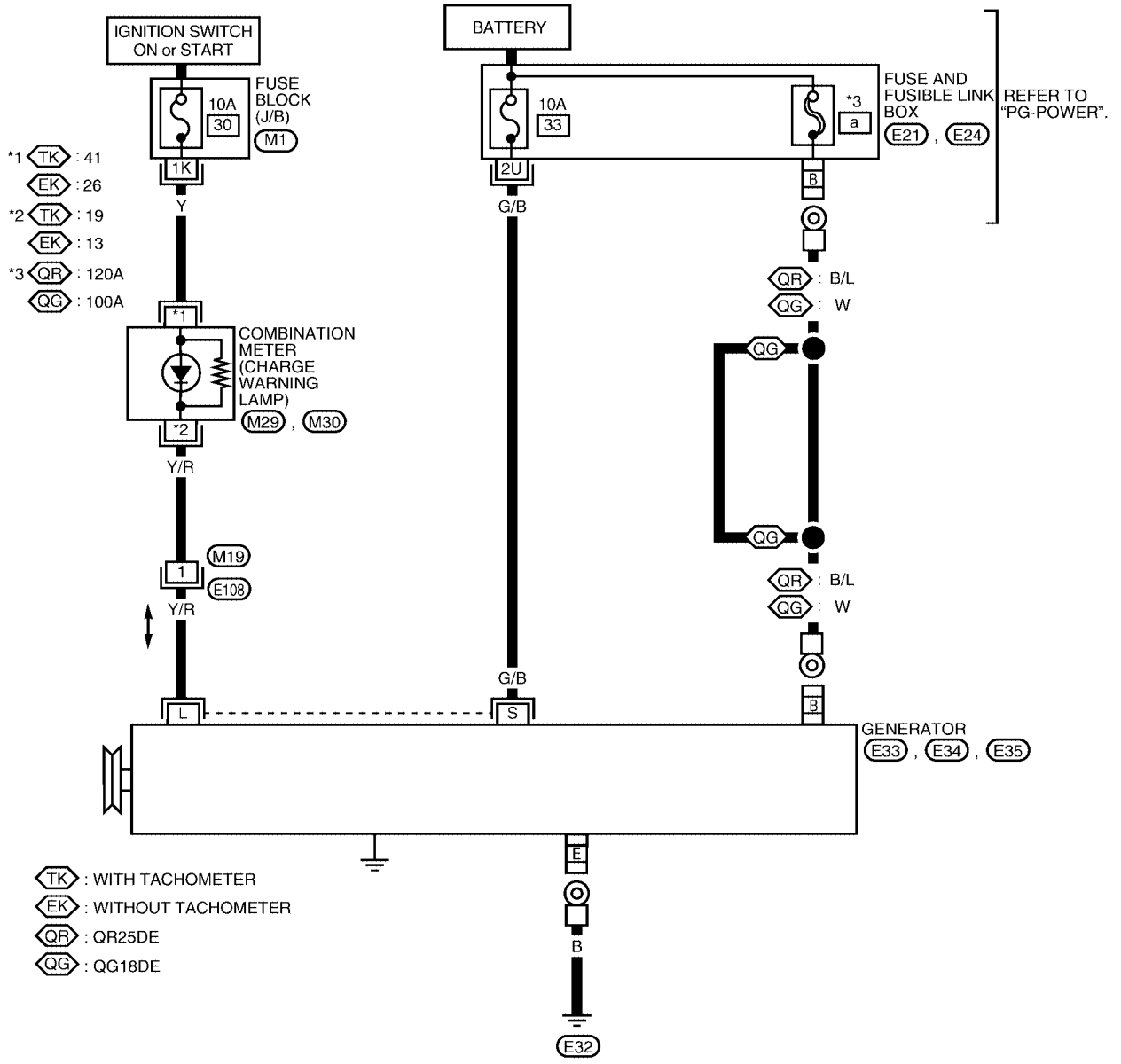
- through 10A fuse [No. 30, located in the fuse block (J/B)]
- to combination meter terminal 26 (without tachometer) or 41 (with tachometer) for the charge warning lamp.

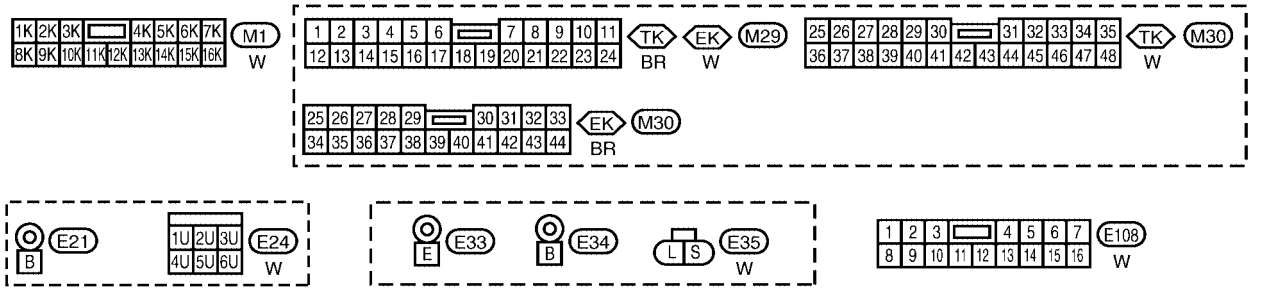
Ground is supplied to terminal 13 (without tachometer) or 19 (with tachometer) of the combination meter through terminal L of the generator. With power and ground supplied, the charge warning lamp will illuminate. When the generator is providing sufficient voltage with the engine running, the ground is opened and the charge warning lamp will go off.
If the charge warning lamp illuminates with the engine running, a fault is indicated.

Wiring Diagram — CHARGE —

EKS0037X

SC-CHARGE-01





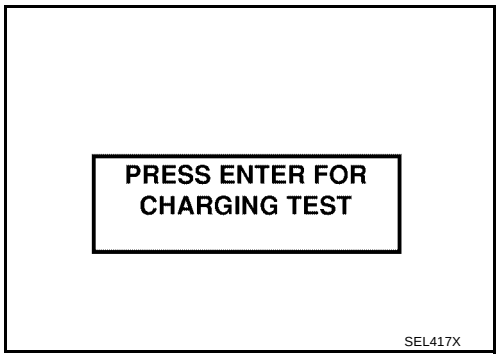
WKWA0004E

Trouble Diagnoses with Battery/Starting/Charging System Tester

EKS0037Y

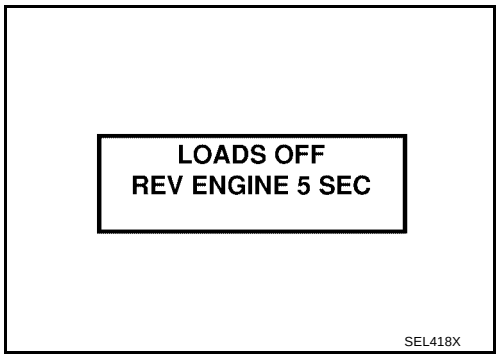
NOTE:
To ensure a complete and thorough diagnosis, the battery, starter and generator test segments must be done as a set from start to finish.

1. Turn off all loads on the vehicle electrical system.
2. Perform battery and starting system test with Battery/Starting/ Charging system tester.
3. Press “ENTER” to begin the charging system test.
4. Start engine.



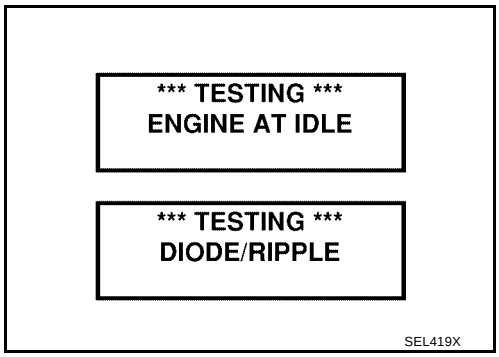
5. Press “ENTER” until “LOADS OFF REV ENGINE 5 SEC” is displayed.
6. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle.
   Once the increase in engine rpm is detected, press “ENTER” to continue.

   NOTE:
   - If after 30 seconds an increase in engine idle speed is not detected, “RPM NOT DETECTED” will display.
   - Some engines may have a higher idle initially after starting, particularly when the engine is cold. The tester may detect this without any other action being taken. If this occurs, continue on with the testing process. The final results will not be affected.

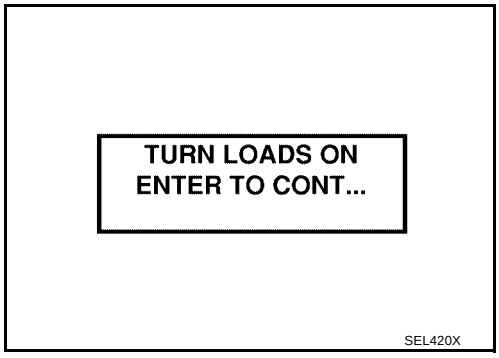


7. The tester now checks the engine at idle and performs the DIODE/RIPPLE check.
8. When complete, the tester will prompt you to turn on the following electrical loads.
   - Heater fan set to highest speed. Do not run the A/C or windshield defroster.
   - Headlamp high beam
   - Rear window defogger

   NOTE:
   Do not run the windshield wipers or any other cyclical loads.

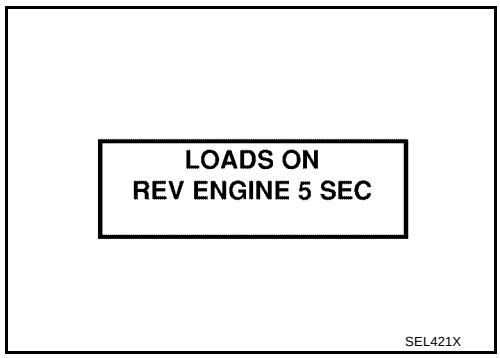


9. Press “ENTER” to continue.

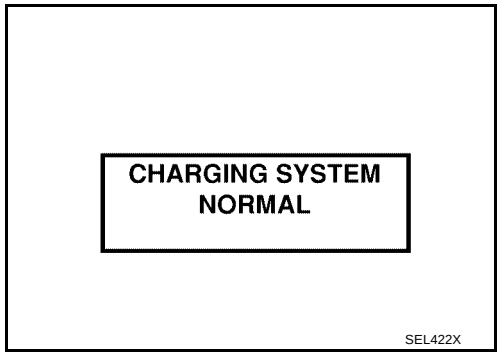


10. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle. Once the increase in engine rpm is detected, press “ENTER” to continue.

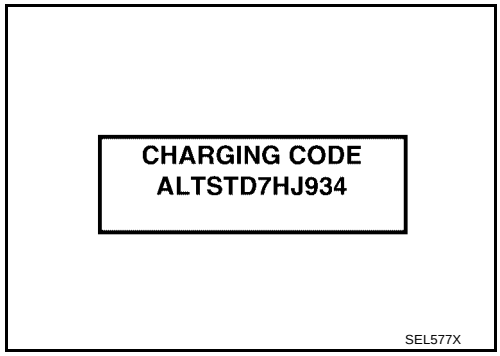
    NOTE:
    If after 30 seconds an increase in engine idle speed is not detected, “RPM NOT DETECTED” will be displayed. Press “ENTER” to restart the test.



11. Diagnostic result is displayed on the tester. Refer to SC-25, "DIAGNOSTIC RESULT ITEM CHART" .



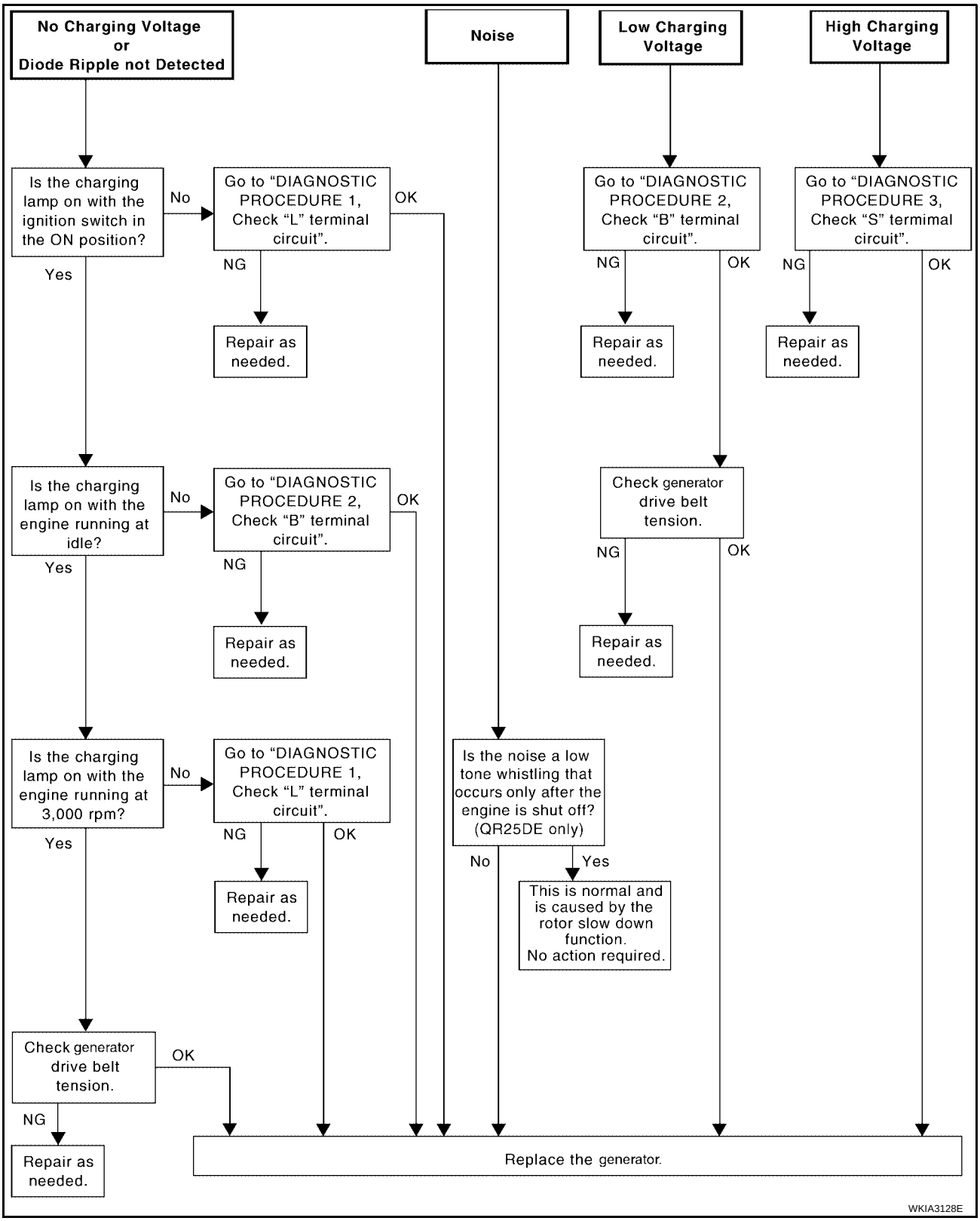
12. Press “ENTER” then test output code is displayed. Record the test output code on the repair order.
13. Toggle back to the “DIAGNOSTIC SCREEN” for test results.



DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
CHARGING SYSTEM NORMAL	Charging system is normal and will also show DIODE RIPPLE test result.
NO CHARGING VOLTAGE	Go to SC-26, "WORK FLOW" .
LOW CHARGING VOLTAGE	Go to SC-26, "WORK FLOW" .
HIGH CHARGING VOLTAGE	Go to SC-26, "WORK FLOW" .
DIODE RIPPLE NORMAL	Diode ripple is OK and will also show CHARGING VOLTAGE test result.
EXCESS RIPPLE DETECTED	Replace the generator. Perform “DIODE RIPPLE” test again using Battery/Starting/Charging system tester to confirm repair.
DIODE RIPPLE NOT DETECTED	Go to SC-26, "WORK FLOW" .

WORK FLOW


No Charging Voltage or Diode Ripple not Detected
Noise
Low Charging Voltage
High Charging Voltage
Is the charging lamp on with the ignition switch in the ON position?
No
Yes
Go to "DIAGNOSTIC PROCEDURE 1, Check "L" terminal circuit".
OK
NG
Repair as needed.
Go to "DIAGNOSTIC PROCEDURE 2, Check "B" terminal circuit".
NG
OK
Repair as needed.
Go to "DIAGNOSTIC PROCEDURE 3, Check "S" termimal circuit".
NG
OK
Repair as needed.
Is the charging lamp on with the engine running at idle?
No
Yes
Go to "DIAGNOSTIC PROCEDURE 2, Check "B" terminal circuit".
OK
NG
Repair as needed.
Check generator drive belt tension.
NG
OK
Repair as needed.
Is the charging lamp on with the engine running at 3,000 rpm?
No
Yes
Go to "DIAGNOSTIC PROCEDURE 1, Check "L" terminal circuit".
NG
OK
Repair as needed.
Is the noise a low tone whistling that occurs only after the engine is shut off? (QR25DE only)
No
Yes
This is normal and is caused by the rotor slow down function. No action required.
Check generator drive belt tension.
OK
NG
Repair as needed.
Replace the generator.
WKIA3128E

DIAGNOSTIC PROCEDURE 1
Check “L” Terminal Circuit

1. CHECK “L” TERMINAL CONNECTION

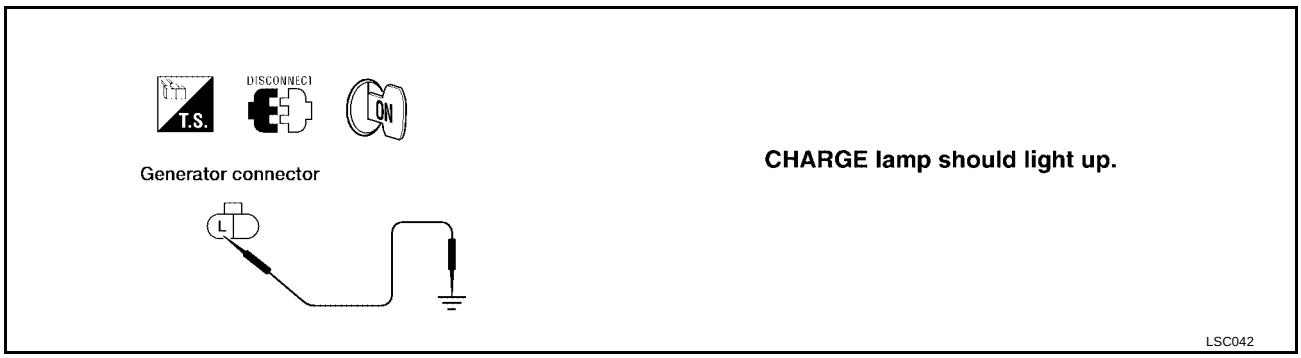
Check to see if “L” terminal is clean and tight.

OK or NG

OK >> GO TO 2.
NG >> Repair “L” terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test.

2. CHECK “L” TERMINAL CIRCUIT

1. Disconnect E35 connector from generator.
2. Apply ground to connector E35 terminal L (Y/R) with the ignition switch in the ON position.



OK or NG

OK >> Replace the generator. Confirm repair by performing complete Battery/Starting/Charging system test.
NG >> Check the following.
- 10A fuse [No. 30, located in fuse block (J/B)]
- CHARGE lamp
- Harness for open or short between combination meter and fuse
- Harness for open or short between combination meter and generator

DIAGNOSTIC PROCEDURE 2
Check “B” Terminal Circuit

1. CHECK “B” TERMINAL CONNECTION

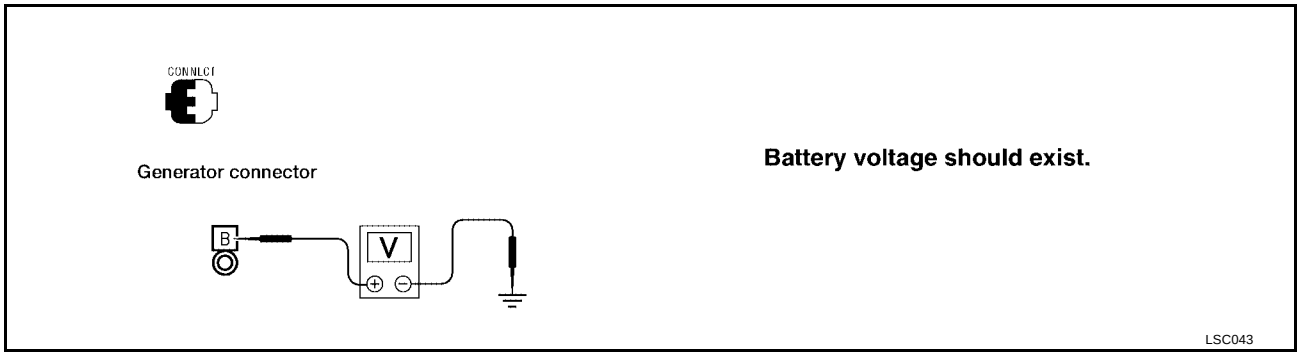
Check to see if “B” terminal is clean and tight.

OK or NG

OK >> GO TO 2.
NG >> Repair “B” terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test.

2. CHECK GENERATOR “B” TERMINAL CIRCUIT

Check voltage between generator connector E34 terminal B (B/L) (QG18DE), (W) (QR25DE) and ground using a digital circuit tester.



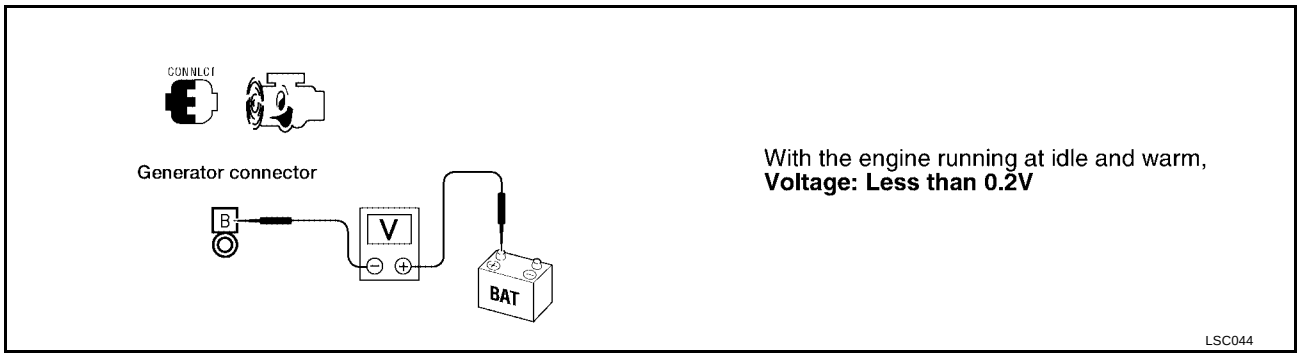
OK or NG

OK >> GO TO 3.
NG >> Check the following.

- 100A (QG18DE), 120A (QR25DE) fusible link (letter **a** , located in fuse and fusible link box)
- Harness for open or short between generator and fusible link

3. CHECK “B” TERMINAL CONNECTION QUALITY (VOLTAGE DROP TEST)

Check voltage between generator connector E34 terminal B (B/L) (QG18DE), (W) (QR25DE) and battery positive terminal using a digital circuit tester.



OK or NG

OK >> Replace the generator. Confirm repair by performing complete Battery/Starting/Charging system test.
NG >> Check harness between the battery and the generator for poor continuity.

DIAGNOSTIC PROCEDURE 3
Check “S” Terminal Circuit

1. CHECK “S” TERMINAL CONNECTION

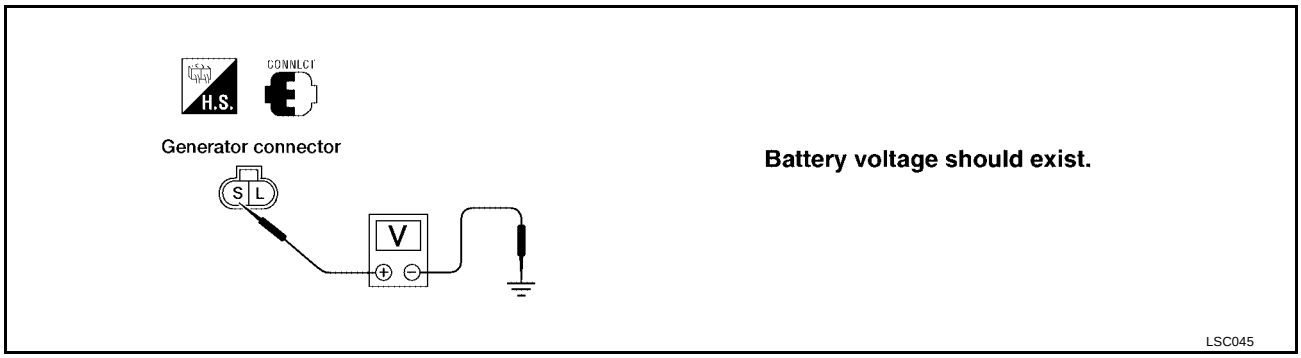
Check to see if “S” terminal is clean and tight.

OK or NG

OK >> GO TO 2.
NG >> Repair “S” terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test.

2. CHECK GENERATOR “S” TERMINAL CIRCUIT

Check voltage between generator connector E35 terminal S (G/B) and ground using a digital circuit tester.



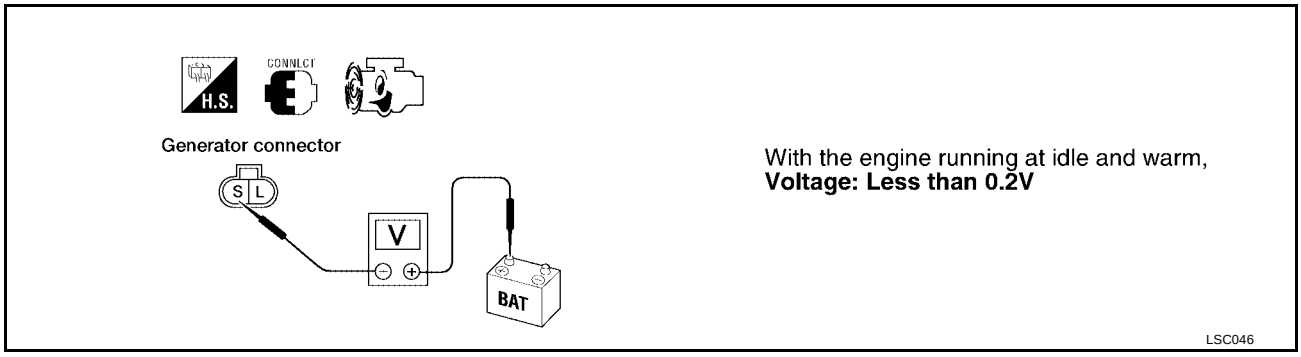
OK or NG

OK >> GO TO 3.
NG >> Check the following.

- 10A fuse (No. 33, located in fuse and fusible link box)
- Harness for open or short between generator and fuse

3. CHECK “S” TERMINAL CONNECTION QUALITY (VOLTAGE DROP TEST)

Check voltage between generator connector E35 terminal S (G/B) and battery positive terminal using a digital circuit tester.



OK or NG

OK >> Replace the generator. Confirm repair by performing complete Battery/Starting/Charging system test.
NG >> Check harness between the battery and the generator for poor continuity.

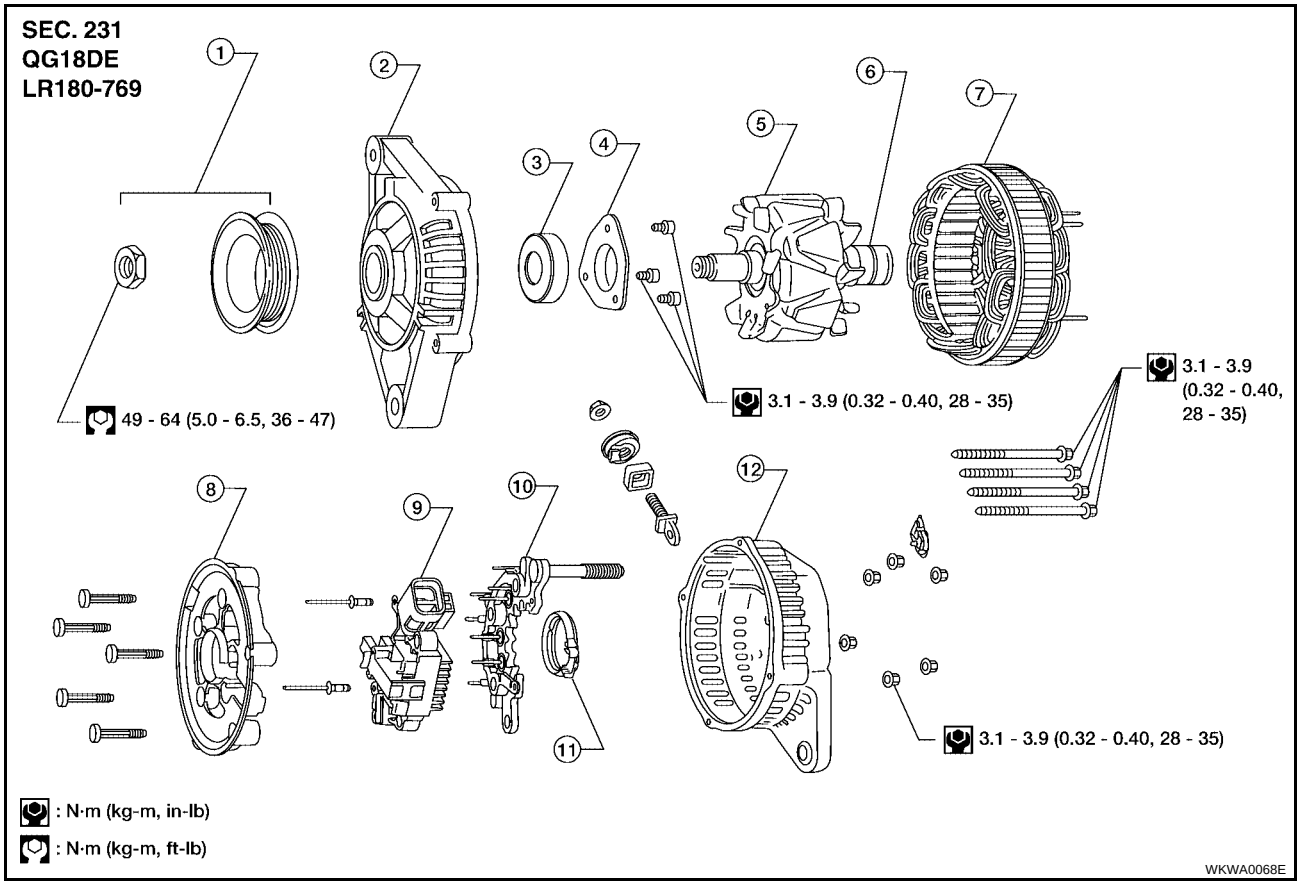
MALFUNCTION INDICATOR

The IC regulator warning function activates to illuminate “CHARGE” warning lamp, if any of the following symptoms occur while generator is operating:

- Excessive voltage is produced.
- No voltage is produced.

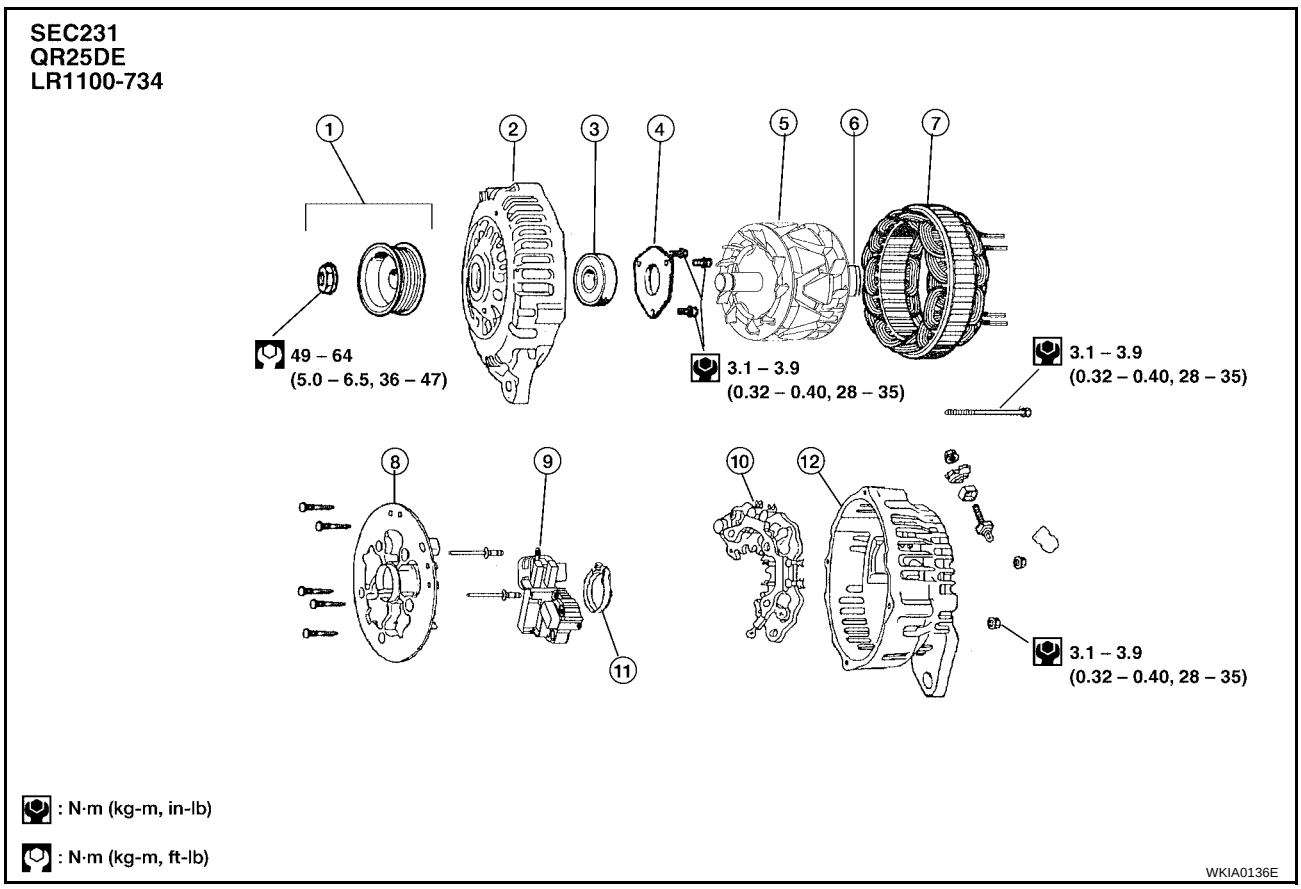
Construction

EKS0037Z



1. Pulley assembly
2. Front cover
3. Front bearing
4. Retainer
5. Rotor
6. Slip ring
7. Stator
8. Fan guide
9. IC regulator assembly
10. Diode assembly
11. Packing
12. Rear cover

SEC231
QR25DE
LR1100-734



1. Pulley assembly
2. Front cover
3. Front bearing
4. Retainer
5. Rotor
6. Slip ring
7. Stator
8. Fan guide
9. IC regulator assembly
10. Diode assembly
11. Packing
12. Rear cover

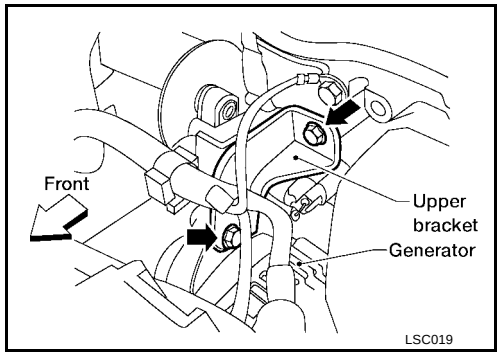
Removal and Installation

EKS00380

QG18DE

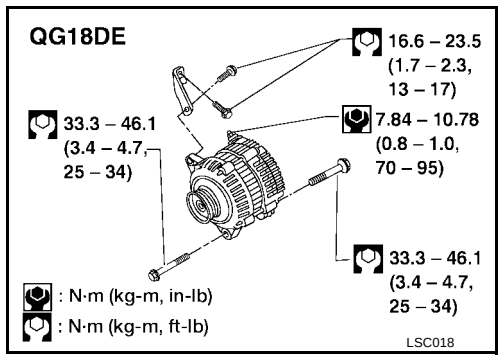
Removal

1. Disconnect the negative battery terminal.
2. Remove the front/right-side engine undercover.
3. Remove the drive belt.
4. Disconnect the A/C compressor harness connector.
5. Remove the four A/C compressor mounting bolts.
6. Slide the A/C compressor forward and support it.
7. Remove the two generator lower mounting bolts.
8. Disconnect the generator harness connectors.
9. Remove the generator upper bracket.
10. Remove the generator.



Installation

To install, reverse the removal procedure.



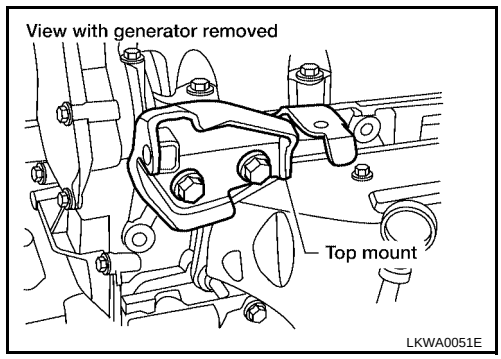
QR25DE

NOTE:

A low tone whistling noise coming from the generator for less than 10 seconds after engine shut down is normal. This is caused by the rotor "slow-down" function. Do not replace the generator exclusively for this symptom.

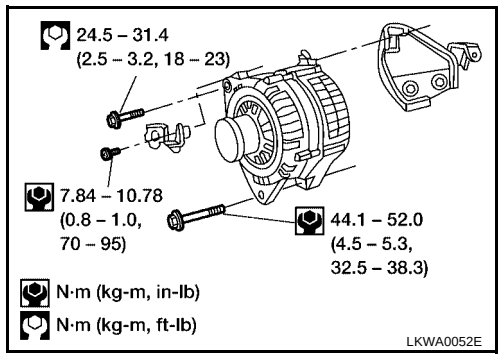
Removal

1. Disconnect the negative battery cable.
2. Remove the front/right-side engine undercover.
3. Remove the drive belt.
4. Disconnect the generator harness connectors.
5. Disconnect the engine ground wire from the top mount.
6. Remove the generator upper and lower mount bolts.
7. Set the generator aside and remove the generator top mount.
8. Slide the generator out and remove.



Installation

To install, reverse the removal procedure.



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Battery

EKS00381

Application	QG18DE	QR25DE
Type	GR.21R (BCI)	GR.24R (BCI)
Capacity (20 HR) minimum V-AH	12-49	12-63
Cold cranking current A (For reference value)	356 @ -18°C (0°F)	550 @ -18°C (0°F)

Starter

EKS00382

Application		QG18DE	QR25DE	
Manufacturer		Hitachi S114-900	Mitsubishi M000T87085ZC	Mitsubishi M000T60781ZC
			M/T models	A/T models
Type		Reduction gear type	Reduction gear type	
System voltage		12V	12V	
No-load	Terminal voltage	11V	11V	
	Current	90A Max.	90A Max.	
	Revolution	2,600 rpm Min.	2,500 rpm Min.	
Minimum diameter of commutator		32.1 mm	28.8 mm	
Minimum length of brush		10.7 mm	5.5 mm	7.0 mm
Brush spring tension		11.5 N (1.17 kg, 2.58 lb)	15.0 - 20.4 (1.53 - 2.08 kg, 3.37 - 4.59 lb)	18.3 - 24.8 (1.87 - 2.53 kg, 4.11 - 5.58 lb)
Clearance between pinion front edge and pinion stopper		1.8 mm	0.5 - 2.0 mm	

Generator

EKS00383

Application	QG18DE	QR25DE
Type	LR180-769	LR1100-734
	HITACHI	
Nominal rating	12V-80A	12V-110A
Ground polarity	Negative	
Minimum revolution under no-load (When 13.5 volts is applied)	1,000 rpm	950 rpm
Hot output current (When 13.5 volts is applied)	23A/1,300 rpm 66A/2,500 rpm 79A/5,000 rpm	35A/1,300 rpm 83A/2,500 rpm 95A/5,000 rpm
Regulated output voltage	14.1 - 14.7V	
Minimum length of brush	6 mm (0.236 in)	
Brush spring pressure	1.000 - 3.432 N (0.102 - 0.350 kg, 0.225 - 0.772 lbs)	
Slip ring minimum outer diameter	26.0 mm (1.024 in)	
Rotor (Field coil) resistance	2.67 ohms	2.31 ohms